

Part 1

Natural Gas for Transportation Deployment Roadmap: Identification and Preliminary Analysis of Existing Compressed Natural Gas Vehicle, Infrastructure, and Fuel Quality, Codes, Standards, and Regulations

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1. Background

In March 2010, Natural Resources Canada (NRCan) convened a group of senior stakeholders to launch the development of a deployment roadmap for increasing the use of natural gas in Canada's transportation sector. The roadmap work is intended to address knowledge gaps, inform decision-making, and define government, industry, and stakeholder roles moving forward with specific emphasis on heavy vehicle deployment. There are six working groups, one of which is focused on codes and standards related to compressed natural gas (CNG) and liquefied natural gas (LNG) vehicles, refuelling stations, and fuel quality.

Canada has a well-developed set of codes, standards and regulations that are relevant to CNG vehicles and refuelling stations, but as there has been limited market activity in recent years, there are issues and gaps that need to be addressed to support potential future market development.

2. Scope of Research

The Standards Council of Canada (SCC) was contracted to document and analyze existing codes, standards, and regulations for CNG Vehicles, CNG Refuelling Infrastructure, and Fuel Quality, so as to complete all fields in the Excel document entitled, "*Preliminary Codes & Standards Matrix – May 2010.*" Based on this aggregate information, SCC performed an analysis for each of these areas that identifies:

- a) Gaps in current codes, standards, and regulations;
- b) Inconsistencies among current codes, standards and regulations including identifying inconsistencies within and between jurisdictions in Canada;
- c) Potential obstacles to harmonizing Canadian codes, standards, and regulations: (a) within Canada; and (b) relative to international codes, standards, and regulations where the primary focus is to be on harmonization issues in the Canadian context with reference to where international codes, standards, and regulations may help to address issue or gap areas.
- d) Existing standards committee structure with reference to: (a) dormant CNG-related committees that could be re-constituted; (b) committee gap areas; (c) overall natural gas committee structure.

The excel sheet entitled *Preliminary Codes & Standards Matrix* is attached as an appendix. This analysis is divided into the following main sections:

- CNG vehicles
- CNG refuelling
- Fuel quality
- Existing standards committee structure
- Suggested additional research

3. Methodology

To complete and itemize the “*Preliminary Codes & Standard Matrix – May 2010*” provided by the NRCan working group, SCC used the following search tools:

- SCC’s standards search tool: <http://www.scc.ca/en/search/standards>
- CANLII (Canadian Legal Information Institute): <http://www.canlii.org/>
- ILI (ILI Standards InfoBase) by SAI Global: <http://www.ili-info.com/>
- ISO’s website: <http://www.iso.org/iso/home.html>
- Federal and provincial/territorial governments websites
- Google and like public search tools

4. CNG Vehicles

Overview of Codes, Standards and Regulations

The research identified a number of codes and standards, covering the following areas of CNG vehicles:

- AGA NGV 3.1 /CGA 12.3- *Fuel System Components for Natural Gas Powered Vehicles*
- NGV1 /CSA NGV1 - *CNG fuelling connection devices*
- ANSI PRD 1 - *Pressure Relief Devices for Natural Gas Vehicle (NGV) Fuel Containers*
- CSA B51-03- *Boiler, Pressure Vessel, and Pressure Piping code*
- CSA B51-09- *Boiler, Pressure Vessel, and Pressure Piping code*
- ANSI NGV 2- *CNG Vehicle Fuel Containers*
- CSA B109- *Natural Gas for Vehicles Installation Codes*
- CGA-B149.4-M91 (superseded by CSA B109)
- CSA B149.5-05 *Installation Code for Propane Fuel Systems and Tanks on Highway Vehicles*
- Test Method 301.2- *CNG Fuel System Integrity* (developed by Transport Canada)

The standards covering fuel system components for natural gas vehicles (NGV), CNG fuelling connection devices, and pressure relief devices for NGV fuel containers, are not referenced in any provincial or federal regulations. There are, however, several regulatory references of the CSA boiler, pressure vessel and piping codes, the ANSI CNG vehicle fuel containers code, CSA’s natural gas for vehicles installation code, and CSA’s *Installation Code for Propane Fuel Systems and Tanks on Highway Vehicles*. All of these codes are referenced in the federal *Motor Vehicles Safety Act* (Motor Vehicle Safety Regulations, C.R.C., c. 1038).

CSA B51-03 is also referenced in provincial regulations in Saskatchewan (*Boiler and Pressure Vessel Act*), Ontario (*Provincial Fire Code & Technical Standards and Safety Act*), Québec (*Highway Safety Code*), New Brunswick (*Boiler and Pressure Vessel Act*), and Nova Scotia (*Crane Operators and Power Engineers Act*). It should be noted that the references in the Ontario and Québec fire and construction codes respectively, are indirect references because the references to CSA B51-03 are actually contained in the national fire and construction codes. Provinces adopt the national codes with or without some deviations.

In addition to being referenced in the federal *Motor Vehicle Safety Act*, CSA B51-09 is also referenced in an Alberta pressure equipment safety regulation contained in the *Alberta Safety Codes Act*. CSA B109 is also referenced in provincial regulations as well as the *Motor Vehicle Safety Act*. It is referenced in B.C.'s *Safety Standards Act*, Alberta's, *Safety Codes Act*, Ontario's *Technical Standards and Safety Act*, and New Brunswick's *Boiler and Pressure Vessel Act*. Also, CSA B149.5-05 (*Installation Code for Propane Fuel Systems and Tanks on Highway Vehicles*) is referenced in several provinces, in addition to its reference in the *Motor Vehicle Safety Act*. It is also referenced in regulations in Alberta (*Safety Codes Act*), Québec (*Highway Safety Code*), New Brunswick (*Boiler and Pressure Vessels Act*), PEI (*Boiler and Pressure Vessels Act*), and the Yukon Territory (*Gas Burning Devices Act*).

Finally, there is one code that is not referenced in the *Motor Vehicle Safety Act*, but is referenced in a provincial regulation. CGA-B149.4-M91- *Natural Gas for Vehicles Installation Codes* (superseded by CSA B109) is referenced in Québec's *Highway Safety Code*.

It appears that while the codes covering boiler and pressure vessels, natural gas fuel containers, natural gas vehicles installation, and propane fuel systems installation, are referenced in provincial and federal regulations, there are no regulatory references to the standards dealing with NGV fuel system components, NGV fuelling connection devices, and pressure relief devices for NGV fuel containers. However, these standards are referenced in other standards and codes.

Inconsistencies between jurisdictions

- There are clear inconsistencies between the provinces and territories in terms of the relative strength of their respective regulatory regimes as they pertain to CNG vehicles.
- For example, Manitoba, Newfoundland, Nunavut, and the North West Territories do not reference any of the fore mentioned codes in their regulations, and B.C, Saskatchewan, PEI, and the Yukon Territory only make reference to one of the codes in a specific regulation. In contrast, Québec and New Brunswick reference three of the codes, Québec in its *Highway Safety and Building Act*, and New Brunswick in its *Boiler and Pressure Vessels Act*. The federal government references six of the codes in its *Motor Vehicle Safety Act*.
- Ontario is unique in that it has the strictest regulations for CNG vehicles. In addition to the fact that it indirectly references CSA B51-03 (*Boiler, Pressure Vessel, and Pressure Piping code*) in its provincial adoption of the *National Fire Code and in its Technical Standards and Safety Act*, Ontario also has additional regulatory requirements for compressed gas and certification requirements for conversion shop personnel, in the *TSSA: Compressed Gas, O. Reg. 214/01, (Technical Standards and Safety Act, 2000) - CALL FOR requirements for conversion shops, and, Fuel Industry Certificates, O. Reg. 215/01, (Technical Standards and Safety Act, 2000) - certificate requirements for conversion shop personnel*.

In summary, the regulation of CNG vehicles across the various Canadian jurisdictions is fairly fragmented. The requirements range from virtually no regulation in this area (Manitoba, Newfoundland, NWT, and Yukon) to quite stringent regulations (Ontario). The provinces and territories, and the federal government, differ in their regulatory references to the suite of codes we identified dealing with boiler and pressure vessel piping, CNG fuel containers, NGV installation, and propane fuel systems and tanks on highway vehicles. And, as previously mentioned, none of the provinces, or the federal government, make reference to the standards

for NGV fuel system components, CNG vehicle fuel connection devices, and pressure relief devices for NGV fuel containers.

Obstacles to Harmonization and Possible Solutions

- One possible solution to this fragmented regulatory picture could be the adoption of a common code by the provinces and territories, and the federal government, that covers all of the areas specified in the codes we have examined. Such a common code would also require a common set of mandatory certification requirements. Something akin to the U.S NFPA 52, which covers both CNG vehicles and CNG refuelling infrastructure, would appear to be what is needed. Updated based on recent experience in the field, the 2010 *NFPA 52: Vehicular Gaseous Fuel Systems Code* presents the latest fire safety rules for hydrogen fuel systems, compressed natural gas (CNG) fuel systems, and liquefied natural gas (LNG) systems on all vehicle types, plus their respective compression, storage, and dispensing systems.
- In order for all of the provinces and territories, and the federal government to agree on the use of a common code such as NFPA 52, there would need to be unanimous agreement from each of the regulatory jurisdictions, which may be difficult. In addition to agreeing to adopt, or create, a common code, each jurisdiction would also have to agree on a common mandatory certification scheme.
- Another approach would be to agree on the increased adoption of international standards for CNG vehicles. The research identified a number of International Organization for Standardization (ISO) standards covering CNG Vehicles: http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_tc_browse.htm?commid=46994&published=

This suite of ISO standards falls under the purview of ISO Technical Committee 22 (ISO TC 22), sub-committee 25 (SC 25), and includes a number of standards for CNG vehicles covering the following areas:

- CNG Refuelling Connector- 20 MPa (200 bar) connector
- CNG Refuelling Connector- 20 MPa (200 bar) connector, size 2
- CNG Refuelling Connector- 25 MPa (250 bar) connector
- CNG Fuel System Components (general, performance, check valve, manual valve, manual cylinder, automatic valve, gas injector, pressure indicator, pressure regulator, gas flow adjuster, gas/air mixer, pressure relief valve, pressure relief device, excess flow valve, gas-tight housing & ventilation hose, rigid fuel line, flexible fuel line, filter, fittings, rigid fuel line in material other than stainless steel)
- CNG Fuel Systems- Safety Requirements
- CNG Fuel Systems- Test Methods

The harmonized adoption of some or all of the above ISO standards by Canadian federal and provincial/territorial regulators is one possible way to create a more unified regulatory system for CNG vehicles. In addition, the adoption of the suite of CNG Fuel System Components and Fuelling Connection Devices standards would fill the regulatory gap that exists in this area. As we have seen, currently, there exist no Canadian regulatory requirements in these areas.

5. CNG Refuelling Infrastructure

Overview of Codes, Standards, and Regulations

The research identified a number of different codes and standards that are relevant to CNG refuelling infrastructure. First, there are a number of North American standards (ANSI and CSA), that are not referenced in any Canadian jurisdictions:

- ANSI NGV1-2006/CSA NGV1-2006- *Compressed Natural Gas Vehicle (NGV) Fuelling Connection Devices*
- CSA 12.6- *Vehicle Refuelling Appliances*
- ANSI NGV 4.1 /CSA 12.5- *NGV Dispensing Systems*
- ANSI NGV 4.2 /CSA 12.52- *Hoses for Natural Gas Vehicles and Dispensing Systems*
- CSA America NGV 4.3 (draft)-*Temperature Compensation Devices for Natural Gas Dispensing Systems*
- ANSI NGV 4.4/ CSA 12.54- *Breakaway Devices for Natural Gas Dispensing Hoses and Systems*
- CSA America NGV 4.5 (draft) *Priority and Sequencing Equipment for Natural Gas Dispensing Systems*
- ANSI NGV 4.6 /CSA 12.56- *Manually Operated Valves for Natural Gas Dispensing Systems*
- CSA America NGV 4.7 (draft) *Automatic Valves for Use in Natural Gas Vehicle Fuelling Stations*
- ANSI NGV4.8 /CSA 12.8- *Natural Gas Fuelling Station Reciprocating Compressor Guidelines*

However, there are also a number of codes that are referenced in multiple Canadian jurisdictions:

- CSA B51 *Boiler, Pressure Vessel, and Pressure Piping Code*, Alberta (*Safety Codes Act*), Manitoba (*Oil and Gas Act*), Saskatchewan (*Boiler & Pressure Vessel Act*), Ontario (*Provincial Fire Code & Technical Standards and Safety Act*), Québec (*Pressure vessels, workforce vocational training and qualification*), New Brunswick (*Boiler & Pressure Vessels Act*), Nova Scotia (*Crane Operators and Power Engineers Act*), PEI (*Boilers & Pressure Vessels Act*), Newfoundland (*Public Safety Act*), the Yukon Territory (*Gas Burning Devices Act and Boiler and Pressure Vessels Act*), North West Territories (*Gas Protection Act*), Nunavut (*Gas Protection Act*), and the federal government (*Canada Oil and Gas Operations Act*).
- CAN/CSA B108 *Natural Gas Fuelling Stations Installation Code*- Alberta (*Safety Codes Act*), Saskatchewan (*Safety Codes Act*), Ontario (*Technical Standards and Safety Act*), Québec (*Construction Code and Building Act*), New Brunswick (*Boiler & Pressure Vessel Act*), and Nova Scotia (*Fire Safety Act*).
- CAN/CSA B149.1 *Natural Gas and Propane Installation code*- BC (*Safety Standards Act*), Alberta (*Safety Codes Act*), Saskatchewan (*Gas Inspection Act*), Manitoba (*Gas & Oil Burner Act*), Ontario (propane storage regulations in *TSSA Act*), Québec (*Construction Code & Highway Safety Code*), New Brunswick (*Boiler & Pressure Vessels Act*), Nova Scotia (*Fire Safety Act*), PEI (*Boiler & Pressure Vessels Act*), Newfoundland (*Public Safety Act*), Northwest Territories (*Fire Prevention Act and Gas*

Protection Act), and Nunavut (*Gas Protection Act*).

- CAN/CSA B149.2 *Propane Storage and Handling code*- BC (*Safety Standards Act*), Alberta (*Safety Codes Act*), Saskatchewan (*Gas Inspection Act*), Manitoba (*Gas & Oil Burner Act*), Ontario (propane storage regulations in *TSSA Act*), Québec (*Construction Code & Highway Safety Code*), NB (*Boiler & Pressure Vessels Act*), NS (*Occupational Health and Safety Act & Fire Safety Act*), PEI (*Boiler & Pressure Vessels Act*), Newfoundland (*Public Safety Act*), Yukon (*Gas Burning Devices Act*), Northwest Territories (*Gas Protection Act*), Nunavut (*Gas Protection Act*), and the federal government (*Canada Occupational Health and Safety Regulations, SOR/86-304, in Canada Labour Code*)
- CAN/CSA B149.3 Code for the field approval of fuel-related components on appliances and equipment- BC (*Safety Standards Act*), Saskatchewan (*Gas Inspection Act*), Manitoba (*Gas & Oil Burner Act*), Québec (*Construction Code & Building Act*), NB (*Boiler & Pressure Vessel Act*), NS (*Fire Safety Act*), PEI (*Boiler & Pressure Vessels Act*), Newfoundland (*Public Safety Act*), and the Yukon Territory (*Gas Burning Devices Act*)

Inconsistencies between Jurisdictions

Federal:

It is notable that the federal government does not have very stringent regulatory requirements for CNG refuelling infrastructure. Whereas for the codes and standards surrounding CNG vehicles, the federal government references five codes and one standard in the *Motor Vehicle Safety Act*, it only references two of the codes specific to the CNG refuelling infrastructure: CSA B51 *Boiler, Pressure Vessel, and Pressure Piping Code* in the *Canada Oil and Gas Operations Act*, and CAN/CSA B149.2 *Propane storage and handling code* –in *Canada Occupational Health and Safety Regulations, SOR/86-304, in the Canada Labour Code*.

Provincial/Territorial:

The provinces and territories are fairly consistent in term of the relative strength of their regulations, with each province and territory averaging around three to four direct regulatory references to codes relevant to CNG refuelling infrastructure. Provinces and territories that reference all five codes include Saskatchewan, Québec, New Brunswick, and Nova Scotia.

Ontario has the most stringent regulatory requirements, just as it does for CNG Vehicle regulations. Ontario references the *Boiler Pressure Vessel and Pressure Piping Code* in its *Fire Protection and Prevention Act and Technical Standards and Safety Act*, as well as the *Natural Gas and Propane Installation Code* and the *Propane Storage and Handling Code* in its *Technical Standards and Safety Act*. Furthermore, Ontario also has additional regulatory requirements in the areas of propane storage and handling, and oil and gas pipeline systems.

It should also be noted that Ontario's *Technical Standards and Safety Act* employs a hierarchical structure to regulate the natural gas industry. The Natural Gas Vehicle industry in Ontario falls under the TSSA regulation # 214-*Compressed Gas*. It does not specifically reference NGV codes and standards but refers to the *Technical Standards and Safety Act Compressed Gas Code Adoption Document*, which references the following:

- NGV stations – B51-03 Part 3 for pressure piping and ground storage;
- B108-99 for NGV station installation;
- NGV vehicle conversions – the CSA B109-01 for vehicle installation code.

There appear to be no regulatory requirements in any Canadian jurisdiction for CNG stations

and vehicle requirements. The research identified ten standards in this area, but none of them are referenced in provincial, territorial, or federal regulations.

Regulatory requirements all fall under four main areas:

- Installation codes (for natural gas fuelling stations, natural gas, and propane);
- Pressure vessel and pressure piping;
- Propane storage and handling; and,
- Field approval of fuel-related components.

Three of the codes are listed in all of the provinces and territories, except PEI: CSA B108 (*Natural Gas Fuelling Stations Installation Code*), CAN/CSA B149.1 (*Natural Gas and Propane Installation Code*), and CAN/CSA B149.2 (*Propane Storage and Handling Code*). This is because all three of these codes are referenced in section 4.6 (fuel dispensing stations) of the *National Fire Code of Canada*, which is adopted with variations by all of the Provinces and Territories except PEI. However, although PEI's provincial government has not adopted the fire code, it is adopted by major municipalities in PEI.

Obstacles to Harmonization and Possible Solutions

On the whole, the regulatory regime for CNG refuelling infrastructure is less fragmented than it is for CNG vehicles, but there are important differences with respect to the relative stringency of each jurisdiction's respective regulations. As mentioned in the section on CNG vehicles, the adoption of a comprehensive code like *NFPA 52* would be one possible way to ensure a more consistent, unified system of regulations of CNG refuelling infrastructure. One possibility would be for each jurisdiction to adopt *NFPA 52* with modifications, as is the case with provincial and territorial adoptions of the national fire, plumbing and building codes.

Unfortunately, there do not appear to be any international standards that could be adopted as a way to achieve a more unified regulatory approach to CNG refuelling infrastructure. Although there is a suite of ISO standards for CNG vehicles, there do not appear to be any ISO standards at present for CNG refuelling infrastructure. However, ISO TC 252 is a project committee looking in to the development of standards for natural gas fuelling stations for vehicles; TC 252 has subcommittees for both LNG and CNG fuelling stations. Perhaps the adoption of international standards could become a more viable regulatory option as standards work in this area further develops.

6. Fuel Quality

Overview of Codes, Standards, and Regulations

The research identified six main standards and/or codes in the North American context, and only three of those are referenced in Canadian regulations. The list of standards and codes is as follows:

- CAN/CGA B105-M93: *Code for Digester Gas and Landfill Gas Installations*
- B105S1-07 Supplement No. 1 to CAN/CGA B105-M93
- CAN/CGSB-3.14-2006 *Liquefied Petroleum Gas (Propane) for Fuel Purposes*
- ASTM D 1945 *Test Method for Analysis of Natural Gas by Gas Chromatography*
- ASTM D 1946 *Practice for Analysis of Reformed Gas by Gas Chromatography*
- ASTM D3246 *Test method for Sulfur in Petroleum Gas by Oxidative Microcoulometry*

Inconsistencies between Jurisdictions

Only the first three on this list are referenced in Canadian regulations. CAN/CGA B105-M93 is referenced in BC's Safety Standards Act, Saskatchewan's Gas Inspection Act, New Brunswick's Boiler and Pressure Vessels Act, Nova Scotia's Fire Safety Act, and PEI's Boiler and Pressure Vessels Act. B105S1-07 is also listed in New Brunswick's Boiler and Pressure Vessels Act, and CAN/CGSB-3.14-2006 is referenced in the federal Motor Vehicle Safety Act. Alberta, Manitoba, Ontario, Québec, Nunavut, the North West Territories and the Yukon Territory, have no fuel quality regulations at all.

Obstacles to Harmonization and Possible Solutions

As we have seen, there appear to be few fuel quality standards and/or codes in North America, so it is not surprising that there are few references to fuel quality standards and/or codes in Canadian regulations. However, there are a number of ISO standards for fuel quality, but none of them are currently referenced in Canadian regulations:

http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_tc_browse.htm?commid=54448.

There are currently ISO standards for fuel quality for natural gas in the following areas:

- Standard reference conditions
- Quality designation
- Organic sulphur compounds used as odorants -- Requirements and test methods
- Vocabulary
- Energy determination
- Natural gas for use as a compressed fuel for vehicles -- Part 1: Designation of the quality
- Natural gas for use as a compressed fuel for vehicles -- Part 2: Specification of the quality
- Measurement of properties -- Volumetric properties: density, pressure, temperature and compression factor
- Measurement of properties -- Calorific value and Wobbe index
- Guidelines for odorizing gases

Thus, there are a number of international standards for fuel quality available for use by Canadian regulators. A harmonized adoption of some or all of these standards by the different Canadian regulatory jurisdictions would be a way to ensure both that Canadian regulatory requirements for fuel quality are up to date and consistent with international norms.

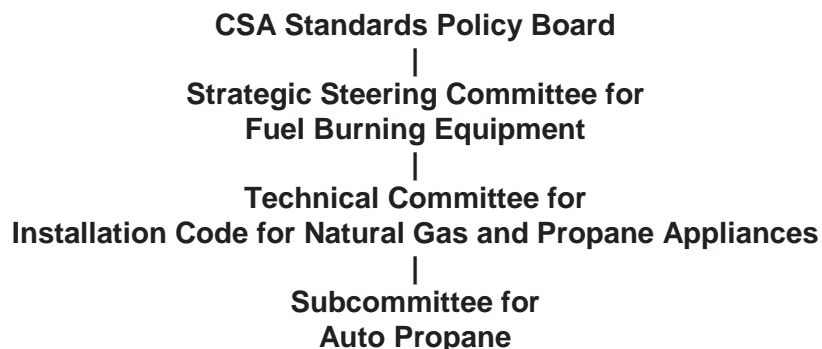
7. Existing Standards Committee Structure for CNG-Related Committees

Active CNG-Related Committees:

The only active CNG-related committee at CSA is the subcommittee on auto propane under the jurisdiction of the B149.5-05 (*Installation Code for Propane Fuel Systems and Tanks on Highway Vehicles*) technical committee (TC); the last meeting occurred in the fall of 2009. There are currently eight members in the subcommittee and under the CSA policies and procedures there is no requirement for a balanced matrix because the subcommittee does not give final approval for the standard; final approval is the responsibility of the technical committee. The B149 TC currently has a matrix made up of the following stakeholder categories: producer

interest, regulatory authority and user interest. There are currently fifty-four members (excluding CSA personnel) on the B149 TC and the matrix is balanced as per CSA policy and procedure.

The B149 TC is an active technical committee and meets regularly. The hierarchy of the committee structure is as follows:



Dormant CNG-Related Committees:

As of 2010, the following CNG-related committees and subcommittees at CSA have been inactive:

- Strategic Steering Committee on Gas Industry
- Technical Committee-J112 Natural Gas-powered Vehicles and Fuelling
 - Technical Subcommittee-J112.10 NGV Refuelling Stations installation Code (B108)
 - Technical Subcommittee-J112.9 Vehicle Refuelling Appliances
 - Technical Subcommittee-J112.11 Natural Gas for Vehicles Installation Code (B109)
- Technical Committee-J113 Installation Code for Natural Gas and Propane Appliances (B149)

8. Suggested Areas for Further Research

This research provided an overall roadmap of existing codes, standards and regulations for CNG Vehicles, CNG Refuelling Infrastructure and Fuel Quality, but given that this is such a complex subject that comprises many new and emerging technologies, there is scope to do more detailed research in a number of areas.

Two main areas of suggested future research are as follows:

- This report did not have the scope to delve into the details of regulation at the municipal level, but it would be useful to do further research in this area, as there may be a number of relevant municipal by-laws that would have an effect on the use of natural gas in the transportation sector (noise by-laws, setbacks, parking requirements, etc.)
- This report also suggested the possibility of the adoption of a common code by the federal government and the provinces and territories for CNG vehicles and CNG refuelling infrastructure, similar to the US code U.S NFPA 52. Not only does U.S NFPA 52 cover CNG vehicles and CNG refuelling infrastructure, but it also covers hydrogen

fuel systems. Clearly, it would be advantageous for a harmonized Canadian code to also include hydrogen fuels systems as well, but before the feasibility of this can be assessed, more research needs to be undertaken on the current interface between Canadian natural gas codes, standards and regulations and hydrogen codes, standards and regulations.

Below are some other suggested areas for further, more specific roadmaps. Research into these more specific roadmaps and jurisdictions would help to further explicate the causes of the gaps and inconsistencies that were uncovered in this preliminary research

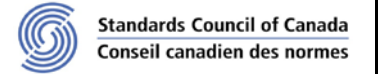
- *Distribution/Transportation of CNG via Truck to Fuelling Stations*
 - *Federal lands*
 - *Provincial/municipal*
- *Construction, Operation and Decommissioning of CNG Fuelling Stations*
 - *Public stations with storage vessels – federal/provincial/municipal lands*
 - *Private stations without storage vessels – federal/provincial/municipal lands*
 - *Private stations with storage vessels*
- *Off- road natural gas vehicles*

CNG VEHICLES



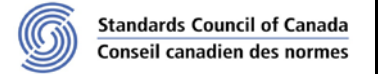
DOCUMENTS	Regulatory Jurisdictions												Referenced in	Referenced Standards	North American	International	Other Key Players	
	Municipal	BC	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	PEI	Yukon	Federal						
AGA NGV 3.1 /CGA 12.3 Fuel System Components for Natural Gas Powered Vehicles		No references identified	No references identified	No references identified	No references identified	No reference identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	NGV1, B109	ANSI NGV1 COMPRESSED NATURAL GAS VEHICLE (NGV) FUELING CONNECTION DEVICES ASME B1.20.1 PIPE THREADS, GENERAL PURPOSE (INCH) PRESSURE VESSELS ASME PV CODE 8 DIV 1 BOILER AND PRESSURE VESSEL CODE - PRESSURE VESSELS ASME PV CODE 9 BOILER AND PRESSURE VESSEL CODE - WELDING AND BRAZING QUALIFICATIONS ASTM B 117 PRACTICE FOR OPERATING SALT SPRAY (FOG) APPARATUS ASTM D 471 TEST METHOD FOR RUBBER PROPERTY - EFFECT OF LIQUIDS ASTM D 572 TEST METHOD FOR RUBBER - DETERIORATION BY HEAT AND OXYGEN CGA B149.1 NATURAL GAS INSTALLATION CODE CGA B149.4 NATURAL GAS FOR VEHICLES INSTALLATION CODE CGA NGV1 COMPRESSED NATURAL GAS VEHICLE (NGV) FUELING CONNECTION DEVICES CGA V 1 STANDARD FOR COMPRESSED GAS CYLINDER VALVE OUTLET AND INLET CONNECTIONS CGSB-3.513 NATURAL GAS FOR VEHICLES CSA B51 BOILER, PRESSURE VESSEL, AND PRESSURE PIPING CODE CSA C22.0.8 SAFETY FUNCTIONS INCORPORATING ELECTRONIC TECHNOLOGY ISO 1179 PIPE CONNECTIONS, THREADED TO ISO 228/1, FOR PLAIN END STEEL AND OTHER METAL TUBES IN INDUSTRIAL APPLICATIONS ISO 228-1 PIPE THREADS WHERE PRESSURE-TIGHT JOINTS ARE NOT MADE ON THE THREADS - PART 1: DIMENSIONS, TOLERANCES AND DESIGNATION ISO 6149 FLUID POWER SYSTEMS AND COMPONENTS - METRIC PORTS - DIMENSIONS AND DESIGN MIL-HDBK 217 RELIABILITY PREDICTION OF ELECTRONIC EQUIPMENT NFPA 52 VEHICULAR GASEOUS FUEL SYSTEMS CODE SAE J 1453 FITTING - O-RING FACE SEAL SAE J 1616 RECOMMENDED PRACTICE FOR COMPRESSED NATURAL GAS VEHICLE FUEL SAE J 1926 SPECIFICATION FOR STRAIGHT THREAD O-RING BOSS PORT SAE J 514 HYDRAULIC TUBE FITTINGS SAE J 516 HYDRAULIC HOSE FITTINGS UL 1998 SOFTWARE IN PROGRAMMABLE COMPONENTS	SAE J2406 (2002) Recommended Practices for CNG Powered Medium and Heavy-Duty Trucks	ISO TC 22 Road vehicles http://www.iso.org/iso/standards_development/technical_committees/other_bodies/iso_technical_committee.htm?commid=46706	
NGV1 /CSA NGV1 Compressed Natural Gas Vehicle (NGV) Fueling Connection Devices		No references identified	No references identified	No references identified	No references identified	No reference identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	CSA B108, NFPA 52, AS 4983(Australian Standard)	ASO Q91 QUALITY SYSTEMS - MODEL FOR QUALITY ASSURANCE IN DESIGN/DEVELOPMENT, PRODUCTION, INSTALLATION AND SERVICING ASO Q92 QUALITY SYSTEMS - MODEL FOR QUALITY ASSURANCE IN PRODUCTION AND INSTALLATION ASO Q93 QUALITY SYSTEMS - MODEL FOR QUALITY ASSURANCE IN FINAL INSPECTION AND TEST ASTM B 117 PRACTICE FOR OPERATING SALT SPRAY (FOG) APPARATUS ASTM B 154 TEST METHOD FOR MERCURIOUS NITRATE TEST FOR COPPER ALLOYS ASTM D 471 TEST METHOD FOR RUBBER PROPERTY - EFFECT OF LIQUIDS ASTM D 572 TEST METHOD FOR RUBBER - DETERIORATION BY HEAT AND OXYGEN CGA B149.1 NATURAL GAS INSTALLATION CODE CGA B149.4 NATURAL GAS FOR VEHICLES INSTALLATION CODE CGA LAB 006 CGA CERTIFICATION LABORATORY REQUIREMENT, TESTING OF NATURAL GAS VEHICLE REFUELLING DEVICES, REVISED PROCEDURE CGA LAB 007 CGA CERTIFICATION LABORATORY REQUIREMENT, THREE WAY VALVE AS AN INTEGRAL PART OF A NATURAL GAS VEHICLE REFUELLING PROBE CR89 002 CERTIFICATION REQUIREMENT, NATURAL GAS VEHICLE REFUELLING PROBES FOR RESIDENTIAL REFUELING APPLIANCE AND SLOW FILL APPLICATIONS CSA Z299.4 QUALITY ASSURANCE PROGRAM - CATEGORY 4 ISO 1179 PIPE CONNECTIONS, THREADED TO ISO 228/1, FOR PLAIN END STEEL AND OTHER METAL TUBES IN INDUSTRIAL APPLICATIONS ISO 228-1 PIPE THREADS WHERE PRESSURE-TIGHT JOINTS ARE NOT MADE ON THE THREADS - PART 1: DIMENSIONS, TOLERANCES AND DESIGNATION ISO 6149 FLUID POWER SYSTEMS AND COMPONENTS - METRIC PORTS - DIMENSIONS AND DESIGN NFPA 52 VEHICULAR GASEOUS FUEL SYSTEMS CODE SAE J 1453 FITTING - O-RING FACE SEAL SAE J 1926 SPECIFICATION FOR STRAIGHT THREAD O-RING BOSS PORT SAE J 516 HYDRAULIC HOSE FITTINGS	TC 22/SC25 - Vehicles using gaseous fuels - http://www.iso.org/iso/standards_development/technical_committees/other_bodies/iso_technical_committee.htm?commid=46994&published=on			
ANSI NGV 2 COMPRESSED NATURAL GAS VEHICLE FUEL CONTAINERS		No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	Motor Vehicle Safety Regulations, C.R.C., c. 1038, (Motor Vehicle Safety Act)	ANSI PRD1, ASTM E2191, CSA B109, NFPA 52	AIAG QS 9000 QUALITY SYSTEM REQUIREMENTS ANSI/ISO/ASQ Q9000 SERIES QUALITY MANAGEMENT STANDARDS ANSI PRD 1 PRESSURE RELIEF DEVICES FOR COMPRESSED NATURAL GAS VEHICLE (NGV) FUEL CONTAINERS ASD1 2006 ALUMINUM STANDARDS AND DATA ASME PV CODE SET BOILER AND PRESSURE VESSEL CODE - COMPLETE SET ASTM D 1186 TEST METHODS FOR NONDESTRUCTIVE MEASUREMENT OF DRY FILM THICKNESS OF NONMAGNETIC COATINGS APPLIED TO A FERROUS BASE ASTM D 1400 TEST METHOD FOR NONDESTRUCTIVE MEASUREMENT OF DRY FILM THICKNESS OF NONCONDUCTIVE COATINGS APPLIED TO A NONFERROUS METAL BASE ASTM D 2344/D 2344M TEST METHOD FOR SHORT-BEAM STRENGTH OF POLYMER MATRIX COMPOSITE MATERIALS AND THEIR LAMINATES ASTM D 3359 TEST METHODS FOR MEASURING ADHESION BY TAPE TEST ASTM D 4138 PRACTICES FOR MEASUREMENT OF DRY FILM THICKNESS OF PROTECTIVE COATING SYSTEMS BY DESTRUCTIVE, CROSS-SECTIONING MEANS ASTM D 4814 SPECIFICATION FOR AUTOMOTIVE SPARK-IGNITION ENGINE FUEL ASTM D 638 TEST METHOD FOR TENSILE PROPERTIES OF PLASTICS ASTM E 23 TEST METHODS FOR NOTCHED BAR IMPACT TESTING OF METALLIC MATERIALS ASTM E 399 TEST METHOD FOR LINEAR-ELASTIC PLANE-STRAIN FRACTURE TOUGHNESS K _{IC} OF METALLIC MATERIALS				

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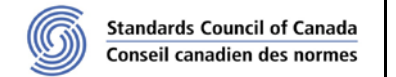
DOCUMENTS	Regulatory Jurisdictions												Referenced in	Referenced Standards	North American	International	Other Key Players
	Municipal	BC	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	PEI	Yukon	Federal					
														ASTM E 647 TEST METHOD FOR MEASUREMENT OF FATIGUE CRACK GROWTH RATES ASTM E 8M TEST METHODS FOR TENSION TESTING OF METALLIC MATERIALS (METRIC) ASTM G 154 PRACTICE FOR OPERATING FLUORESCENT LIGHT APPARATUS FOR UV EXPOSURE OF NONMETALLIC MATERIALS BS 7910(2005) GUIDE TO METHODS FOR ASSESSING THE ACCEPTABILITY OF FLAWS IN METALLIC STRUCTURES BS EN ISO/IEC 17021 CONFORMITY ASSESSMENT - REQUIREMENTS FOR BODIES PROVIDING AUDIT AND CERTIFICATION OF MANAGEMENT SYSTEMS BS PD6493(1991) GUIDANCE ON METHODS FOR ASSESSING THE ACCEPTABILITY OF FLAWS IN FUSION WELDED STRUCTURES CFR 49(PTS1-99) TRANSPORTATION - SUBTITLE A - OFFICE OF THE SECRETARY OF TRANSPORTATION - SUBTITLE B - OTHER REGULATIONS RELATING TO TRANSPORTATION CGA C 1 METHODS FOR PRESSURE TESTING COMPRESSED GAS CYLINDERS CGA C 6.4 METHODS FOR EXTERNAL VISUAL INSPECTION OF NATURAL GAS VEHICLE (NGV) AND HYDROGEN VEHICLE (HV) FUEL CONTAINERS AND THEIR INSTALLATIONS CGSB 3.513 NATURAL GAS FOR VEHICLES CSA B109 NATURAL GAS FOR VEHICLES INSTALLATION CODE CSA B51 BOILER, PRESSURE VESSEL, AND PRESSURE PIPING CODE FMVSS NO. 303 FUEL SYSTEM INTEGRITY OF COMPRESSED NATURAL GAS VEHICLES FMVSS NO. 304 COMPRESSED NATURAL GAS FUEL CONTAINER INTEGRITY ISO 12108 METALLIC MATERIALS - FATIGUE TESTING - FATIGUE CRACK GROWTH METHOD ISO 12737 METALLIC MATERIALS - DETERMINATION OF PLANE-STRAIN FRACTURE TOUGHNESS ISO 148 STEEL - CHARTER IMPACT TEST (V NOTCH) ISO 306 PLASTICS - THERMOPLASTIC MATERIALS - DETERMINATION OF VICAT SOFTENING TEMPERATURE (VST) ISO 7866 GAS CYLINDERS - REFILLABLE SEAMLESS ALUMINIUM ALLOY GAS CYLINDERS - DESIGN, CONSTRUCTION AND TESTING ISO 9001 QUALITY MANAGEMENT SYSTEMS - REQUIREMENTS ISO 9809-1 GAS CYLINDERS - REFILLABLE SEAMLESS STEEL GAS CYLINDERS - DESIGN, CONSTRUCTION AND TESTING - PART 1: QUENCHED AND TEMPERED STEEL CYLINDERS WITH TENSILE STRENGTH LESS THAN 1100 MPA NACE TM 01 77 LABORATORY TESTING OF METALS FOR RESISTANCE TO SULFIDE STRESS CRACKING AND STRESS CORROSION CRACKING IN H ₂ S ENVIRONMENTS NFPA 52 VEHICULAR GASEOUS FUEL SYSTEMS CODE SAE J 1616 RECOMMENDED PRACTICE FOR COMPRESSED NATURAL GAS VEHICLE FUEL SAE J 2576 RECOMMENDED PRACTICE FOR GENERAL FUEL CELL VEHICLE SAFETY			
ANSI PRD 1 Pressure Relief Devices for Natural Gas Vehicle (NGV) Fuel Containers		No references identified	No references identified	No references identified	No references identified	No reference identified	No references identified	No references identified	No references identified	No references identified	No references identified	No reference identified	ANSI NGV2, CSA B51, CSA C22.2.62282-2	AIAG QS 9000 QUALITY SYSTEM REQUIREMENTS ANSI NGV2 COMPRESSED NATURAL GAS VEHICLE FUEL CONTAINERS ASME PT25.3 SAFETY AND RELIEF VALVES, ASTM B 117 PRACTICE FOR OPERATING SALT SPRAY (FOG) APPARATUS ASTM B 154 TEST METHOD FOR MERCURIOS NITRATE TEST FOR COPPER ALLOYS CFR 49(PTS400-999) TRANSPORTATION CGA B149.4 NATURAL GAS FOR VEHICLES INSTALLATION CODE CGA C 6.4 METHODS FOR EXTERNAL VISUAL INSPECTION OF NATURAL GAS VEHICLE (NGV) AND HYDROGEN VEHICLE (HV) FUEL CONTAINERS AND THEIR INSTALLATIONS CGA S 1.1 PRESSURE RELIEF DEVICE STANDARDS - PART 1: CYLINDERS FOR COMPRESSED GASES CGSB 3.513 NATURAL GAS FOR VEHICLES CSA B51 BOILER, PRESSURE VESSEL, AND PRESSURE PIPING CODE ISO 9001 QUALITY MANAGEMENT SYSTEMS - REQUIREMENTS ISO 9002 QUALITY SYSTEMS - MODEL FOR QUALITY ASSURANCE IN PRODUCTION INSTALLATION AND SERVICING NFPA 52 VEHICULAR GASEOUS FUEL SYSTEMS CODE SAE J 1616 RECOMMENDED PRACTICE FOR COMPRESSED NATURAL GAS VEHICLE FUEL SAE J 1739 POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS IN DESIGN (DESIGN FMEA), POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS IN MANUFACTURING AND ASSEMBLY PROCESSES (PROCESS FMEA)			
CSA B51-03 Boiler, Pressure Vessel, and Pressure Piping Code.		No references identified	No references identified	Boiler and Pressure Vessel Regulations, R.R.S. c. B-5.1 Reg. 1, (Boiler and Pressure Vessel Act, 1999)	No references identified	Fire Code, O. Reg. 213/07, (Fire Protection and Prevention Act, 1997) - reference to 1994 version of CSA B51	Regulation respecting safety standards for road vehicles, 1998 G.O.Q. 2, 4557, (Highway Safety Code)	Standards Regulation, N.B. Reg. 84-177, (Boiler and Pressure Vessel Act)	Power Engineers Regulations, N.S. Reg. 108/2001, (Crane Operators and Power Engineers Act)	No references identified	No references identified	Motor Vehicle Safety Regulations, C.R.C., c. 1038, (Motor Vehicle Safety Act)	CSA 12.5, CSA 12.6, CSA 12.8, CSA B108, CSA B109, CSA B149, NFPA 52 NFPA 59A...	See list below ↓			

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DOCUMENTS	Regulatory Jurisdictions												Federal	Referenced in	Referenced Standards	North American	International	Other Key Players
	Municipal	BC	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	PEI	Yukon							
CSA B51-09 BOILER, PRESSURE VESSEL, AND PRESSURE PIPING CODE		No references identified	Pressure Equipment Safety Regulation, Alta. Reg. 49/2006, (Safety Codes Act)	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	Motor Vehicle Safety Regulations, C.R.C., c. 1038, (Motor Vehicle Safety Act)	CSA 12.5, CSA 12.6, CSA 12.8, CSA B108, CSA B109, CSA B149, NFPA 52 NFPA 59A...	ANSI K61.1 SAFETY REQUIREMENTS FOR THE STORAGE AND HANDLING OF ANHYDROUS AMMONIA ANSI NGV4.1 NGV DISPENSING SYSTEMS ANSI PRD 1 PRESSURE RELIEF DEVICES FOR COMPRESSED NATURAL GAS VEHICLE (NGV) FUEL CONTAINERS API 530 CALCULATION OF HEATER-TUBE THICKNESS IN PETROLEUM REFINERIES ASME B31.1 POWER PIPING ASME B31.3 PROCESS PIPING ASME B31.4 PIPELINE TRANSPORTATION SYSTEMS FOR LIQUID HYDROCARBONS AND OTHER LIQUIDS ASME B31.5 REFRIGERATION PIPING AND HEAT TRANSFER COMPONENTS ASME B31.9 BUILDING SERVICES PIPING ASME CSD1 CONTROLS AND SAFETY DEVICES FOR AUTOMATICALLY FIRED BOILERS ASME PV CODE 1 BOILER AND PRESSURE VESSEL CODE - RULES FOR CONSTRUCTION OF POWER BOILERS ASME PV CODE 10 BOILER AND PRESSURE VESSEL CODE - FIBER-REINFORCED PLASTIC PRESSURE VESSELS ASME PV CODE 2A BOILER AND PRESSURE VESSEL CODE - MATERIALS - FERROUS MATERIAL SPECIFICATIONS ASME PV CODE 2B BOILER AND PRESSURE VESSEL CODE - MATERIALS - NONFERROUS MATERIAL SPECIFICATIONS ASME PV CODE 2C BOILER AND PRESSURE VESSEL CODE - MATERIALS - SPECIFICATIONS FOR WELDING RODS, ELECTRODES AND FILLER METALS ASME PV CODE 2D CUSTOMARY BOILER AND PRESSURE VESSEL CODE - MATERIALS - PROPERTIES (CUSTOMARY) ASME PV CODE 2D METRIC BOILER AND PRESSURE VESSEL CODE - MATERIALS - PROPERTIES (METRIC) ASME PV CODE 4 BOILER AND PRESSURE VESSEL CODE - RULES FOR CONSTRUCTION OF HEATING BOILERS ASME PV CODE 5 BOILER AND PRESSURE VESSEL CODE - NONDESTRUCTIVE EXAMINATION ASME PV CODE 8 DIV 1 BOILER AND PRESSURE VESSEL CODE - PRESSURE VESSELS ASME PV CODE 8 DIV 2 BOILER AND PRESSURE VESSEL CODE - PRESSURE VESSELS - ALTERNATIVE RULES ASME PV CODE 8 DIV 3 BOILER AND PRESSURE VESSEL CODE - PRESSURE VESSELS - ALTERNATIVE RULES FOR CONSTRUCTION OF HIGH PRESSURE VESSELS ASME PV CODE 9 BOILER AND PRESSURE VESSEL CODE - WELDING AND BRAZING QUALIFICATIONS ASME PVHO 1 SAFETY STANDARD FOR PRESSURE VESSELS FOR HUMAN OCCUPANCY ASQ Z1.4 SAMPLING PROCEDURES AND TABLES FOR INSPECTION BY ATTRIBUTES ASTM A 105/A105M SPECIFICATION FOR CARBON STEEL FORGINGS FOR PIPING APPLICATIONS ASTM A 106/A106M SPECIFICATION FOR SEAMLESS CARBON STEEL PIPE FOR HIGH-TEMPERATURE SERVICE ASTM A 182/A182M SPECIFICATION FOR FORGED OR ROLLED ALLOY AND STAINLESS STEEL PIPE FLANGES, FORGED FITTINGS, AND VALVES AND PARTS FOR HIGH-TEMPERATURE SERVICE ASTM A 213/A213M SPECIFICATION FOR SEAMLESS FERRITIC AND AUSTENITIC ALLOY-STEEL BOILER, SUPERHEATER, AND HEAT-EXCHANGER TUBES ASTM A 216/A216M SPECIFICATION FOR STEEL CASTINGS, CARBON, SUITABLE FOR FUSION WELDING, FOR HIGH-TEMPERATURE SERVICE ASTM A 312/A312M SPECIFICATION FOR SEAMLESS, WELDED, AND HEAVILY COLD WORKED AUSTENITIC STAINLESS STEEL PIPES ASTM A 333/A333M SPECIFICATION FOR SEAMLESS AND WELDED STEEL PIPE FOR LOW-TEMPERATURE SERVICE ASTM A 334/A334M SPECIFICATION FOR SEAMLESS AND WELDED CARBON AND ALLOY-STEEL TUBES FOR LOW-TEMPERATURE SERVICE ASTM A 350/A350M SPECIFICATION FOR CARBON AND LOW-ALLOY STEEL FORGINGS, REQUIRING NOTCH TOUGHNESS TESTING FOR PIPING COMPONENTS ASTM A 352/A352M SPECIFICATION FOR STEEL CASTINGS, FERRITIC AND MARTENSITIC, FOR PRESSURE-CONTAINING PARTS, SUITABLE FOR LOW-TEMPERATURE SERVICE ASTM B 117 PRACTICE FOR OPERATING SALT SPRAY (FOG) APPARATUS ASTM D 1186 TEST METHODS FOR NONDESTRUCTIVE MEASUREMENT OF DRY FILM THICKNESS OF NONMAGNETIC COATINGS APPLIED TO A FERROUS BASE ASTM D 1308 TEST METHOD FOR EFFECT OF HOUSEHOLD CHEMICALS ON CLEAR AND PIGMENTED ORGANIC FINISHES ASTM D 1400 TEST METHOD FOR NONDESTRUCTIVE MEASUREMENT OF DRY FILM THICKNESS OF NONCONDUCTIVE COATINGS APPLIED TO A NONFERROUS METAL BASE ASTM D 2344/D 2344M TEST METHOD FOR SHORT-BEAM STRENGTH OF POLYMER MATRIX COMPOSITE MATERIALS AND THEIR LAMINATES ASTM D 2794 TEST METHOD FOR RESISTANCE OF ORGANIC COATINGS TO THE EFFECTS OF RAPID DEFORMATION (IMPACT) ASTM D 3170 TEST METHOD FOR CHIPPING RESISTANCE OF COATINGS			

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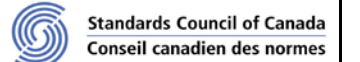
DOCUMENTS	Regulatory Jurisdictions												Federal	Referenced in	Referenced Standards	North American	International	Other Key Players
	Municipal	BC	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	PEI	Yukon							
CODES															ASTM D 3359 TEST METHODS FOR MEASURING ADHESION BY TAPE TEST ASTM D 4138 PRACTICES FOR MEASUREMENT OF DRY FILM THICKNESS OF PROTECTIVE COATING SYSTEMS BY DESTRUCTIVE, CROSS-SECTIONING MEANS ASTM D 4814 SPECIFICATION FOR AUTOMOTIVE SPARK-IGNITION ENGINE FUEL ASTM D 522 TEST METHODS FOR MANDREL BEND TEST OF ATTACHED ORGANIC COATINGS ASTM D 638 TEST METHOD FOR TENSILE PROPERTIES OF PLASTICS ASTM E 23 TEST METHODS FOR NOTCHED BAR IMPACT TESTING OF METALLIC MATERIALS ASTM E 399 TEST METHOD FOR LINEAR-ELASTIC PLANE-STRAIN FRACTURE TOUGHNESS K _{1C} OF METALLIC MATERIALS ASTM E 8 TEST METHODS FOR TENSION TESTING OF METALLIC MATERIALS ASTM G 154 PRACTICE FOR OPERATING FLUORESCENT LIGHT APPARATUS FOR UV EXPOSURE OF NONMETALLIC MATERIALS BS EN 13322-2 TRANSPORTABLE GAS CYLINDERS - REFILLABLE WELDED STEEL GAS CYLINDERS - DESIGN AND CONSTRUCTION - PART 2: STAINLESS STEEL CDA 44015 COPPER TUBE HANDBOOK CGA G 5.4 HYDROGEN PIPING SYSTEMS AT CONSUMER LOCATIONS CGSB 48.9712 NON-DESTRUCTIVE TESTING - QUALIFICATION AND CERTIFICATION OF PERSONNEL CSA 12.5 NGV DISPENSING SYSTEMS CSA 12.6 VEHICLE REFUELLING APPLIANCES CSA B108 NATURAL GAS FUELLING STATIONS INSTALLATION CODE CSA B109 NATURAL GAS FOR VEHICLES INSTALLATION CODE CSA B149.1 NATURAL GAS AND PROPANE INSTALLATION CODE CSA B149.2 PROPANE STORAGE AND HANDLING CODE CSA B149.5 INSTALLATION CODE FOR PROPANE FUEL SYSTEMS AND TANKS ON HIGHWAY VEHICLES CSA B339 CYLINDERS, SPHERES, AND TUBES FOR THE TRANSPORTATION OF DANGEROUS GOODS CSA B340 SELECTION AND USE OF CYLINDERS, SPHERES, TUBES, AND OTHER CONTAINERS FOR THE TRANSPORTATION OF DANGEROUS GOODS, CLASS 2 CSA ISO 9001 QUALITY MANAGEMENT SYSTEMS - REQUIREMENTS CSA Z180.1 COMPRESSED BREATHING AIR AND SYSTEMS CSA Z299.1 QUALITY ASSURANCE PROGRAM - CATEGORY 1 CSA Z299.2 QUALITY ASSURANCE PROGRAM - CATEGORY 2 CSA Z299.3 QUALITY ASSURANCE PROGRAM - CATEGORY 3 CSA Z299.4 QUALITY ASSURANCE PROGRAM - CATEGORY 4 CSA Z305.3 PRESSURE REGULATORS, GAUGES AND FLOW-METERING DEVICES FOR MEDICAL GASES CSA Z305.4 QUALIFICATION REQUIREMENTS FOR AGENCIES TESTING NONFLAMMABLE MEDICAL GAS PIPING SYSTEMS CSA Z662 OIL AND GAS PIPELINE SYSTEMS CSA Z7396.1 MEDICAL GAS PIPELINE SYSTEMS - PART 1: PIPELINES FOR MEDICAL GASES AND VACUUM ISO 11439 GAS CYLINDERS - HIGH PRESSURE CYLINDERS FOR THE ON-BOARD STORAGE OF NATURAL GAS AS A FUEL FOR AUTOMOTIVE VEHICLES ISO 14687-1 HYDROGEN FUEL - PRODUCT SPECIFICATION - PART 1: ALL APPLICATIONS EXCEPT PROTON EXCHANGE MEMBRANE (PEM) FUEL CELLS FOR ROAD VEHICLES ISO 148-1 METALLIC MATERIALS - CHARPY PENDULUM IMPACT TEST - PART 1: TEST METHOD ISO 19078 GAS CYLINDERS - INSPECTION OF THE CYLINDER INSTALLATION, AND REGULATION OF HIGH PRESSURE CYLINDERS FOR THE ON-BOARD STORAGE OF NATURAL GAS AS A FUEL FOR AUTOMOTIVE VEHICLES ISO 306 PLASTICS - THERMOPLASTIC MATERIALS - DETERMINATION OF VICAT SOFTENING TEMPERATURE (VST) ISO 6506-1 METALLIC MATERIALS - BRINELL HARDNESS TEST - PART 1: TEST METHOD ISO 6508-1 METALLIC MATERIALS - ROCKWELL HARDNESS TEST - PART 1: TEST METHOD (SCALES A, B, C, D, E, F, G, H, K, N, T) ISO 7866 GAS CYLINDERS - REFILLABLE SEAMLESS ALUMINIUM ALLOY GAS CYLINDERS - DESIGN, CONSTRUCTION AND TESTING ISO 9001 QUALITY MANAGEMENT SYSTEMS - REQUIREMENTS ISO 9712 NON-DESTRUCTIVE TESTING - QUALIFICATION AND CERTIFICATION OF PERSONNEL ISO 9809-1 GAS CYLINDERS - REFILLABLE SEAMLESS STEEL GAS CYLINDERS - DESIGN, CONSTRUCTION AND TESTING - PART 1: QUENCHED AND TEMPERED STEEL CYLINDERS WITH TENSILE STRENGTH LESS THAN 1100 MPA MSS SP 25 STANDARD MARKING SYSTEMS FOR VALVES, FITTINGS, FLANGES AND UNIONS NACE TM 01 77 LABORATORY TESTING OF METALS FOR RESISTANCE TO SULFIDE STRESS CRACKING AND STRESS CORROSION CRACKING IN H ₂ S ENVIRONMENTS NB 18 NATIONAL BOARD PRESSURE RELIEF DEVICE CERTIFICATIONS NB 23 NATIONAL BOARD INSPECTION CODE (NBIC) NFPA 58 LIQUEFIED PETROLEUM GAS CODE PACE 87.1 GUIDELINE SPECIFICATION FOR THE IMPRESSED CURRENT METHOD OF CATHODIC PROTECTION OF UNDERGROUND PETROLEUM STORAGE TANKS RMA IP2 HOSE HANDBOOK UL 969 MARKING AND LABELLING SYSTEMS ULC S603.1 EXTERNAL CORROSION PROTECTION SYSTEMS FOR STEEL UNDERGROUND TANKS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS			

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DOCUMENTS	Regulatory Jurisdictions												Federal	Referenced in	Referenced Standards	North American	International	Other Key Players
	Municipal	BC	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	PEI	Yukon							
CSA B109 NATURAL GAS FOR VEHICLES INSTALLATION CODE		Gas Safety Regulation, B.C. Reg. 103/2004, (Safety Standards Act)	Gas Code Regulation, Alta. Reg. 113/2005, (Safety Codes Act), Gas Safety Regulation, B.C. Reg. 103/2004, (Safety Standards Act)	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	Motor Vehicle Safety Regulations, C.R.C., c. 1038, (Motor Vehicle Safety Act)	ANSI NGV2, ANSI NGV4.8, CSA 12.8, CSA B51, CSA B51S1	ANSI NGV2 COMPRESSED NATURAL GAS VEHICLE FUEL CONTAINERS ASME B1.20.1 PIPE THREADS, GENERAL PURPOSE (INCH) ASTM A 213/A213M SPECIFICATION FOR SEAMLESS FERRITIC AND AUSTENITIC ALLOY-STEEL BOILER, SUPERHEATER, AND HEAT-EXCHANGER TUBES ASTM A 289 SPECIFICATION FOR SEAMLESS AND WELDED AUSTENITIC STAINLESS STEEL TUBING FOR GENERAL SERVICE CGA 12.3 FUEL SYSTEM COMPONENTS FOR NATURAL GAS POWERED VEHICLES CGA NGV1 COMPRESSED NATURAL GAS VEHICLE (NGV) FUELLING CONNECTION DEVICES CSA B51 BOILER, PRESSURE VESSEL, AND PRESSURE PIPING CODE ISO 1179 PIPE CONNECTIONS, THREADED TO ISO 228/1, FOR PLAIN END STEEL AND OTHER METAL TUBES IN INDUSTRIAL APPLICATIONS ISO 6149 FLUID POWER SYSTEMS AND COMPONENTS - METRIC PORTS - DIMENSIONS AND DESIGN SAE J 1292 AUTOMOBILE AND MOTOR COACH WIRING SAE J 1453 FITTING - O-RING FACE SEAL SAE J 1926 SPECIFICATION FOR STRAIGHT THREAD O-RING BOSS PORT SAE J 514 HYDRAULIC TUBE FITTINGS SAE J 516 HYDRAULIC HOSE FITTINGS			
CGA-B149.4-M91 (superseded by CSA B109)		No references identified	No references identified	No references identified	No references identified	No references identified	Regulation respecting safety standards for road vehicles, 1998 G.O.Q. 2, 4557, (Highway Safety Code)	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	Superseded Standard by CSA B109	N/A		TSSA - Compressed Natural Gas Code Adoption Document - PROVIDES ADDITIONAL REQUIREMENTS TO THE CGA B149.4	
CSA B149.5-05 Installation Code for Propane Fuel Systems and Tanks on Highway Vehicles		No references identified	Gas Code Regulation, Alta. Reg. 113/2005, (Safety Codes Act)	No references identified	No references identified	No references identified	Regulation respecting safety standards for road vehicles, 1998 G.O.Q. 2, 4557, (Highway Safety Code) (older version referenced CAN/CGA-B149.5-M95)	Standards Regulation, N.B. Reg. 84-177, (Boiler and Pressure Vessel Act)	No references identified	General Regulations, P.E.I. Reg. EC234/85, (Boilers and Pressure Vessels Act) (referenced standard is older CGA version; not dated)	Gas Regulations, Y.O.I.C. 1998/213, (Gas Burning Devices Act)	Motor Vehicle Safety Regulations, C.R.C., c. 1038, (Motor Vehicle Safety Act) (previous version CAN/CGA-B149.5 or more recent version of that standard)	CSA 12.2 (Cancelled), CSA B51, CSA B51S1, CSA B149.2	references from 2010 version: ASME B1.20.1 PIPE THREADS, GENERAL PURPOSE (INCH) ASME B16.3 MALLEABLE IRON THREADED FITTINGS: CLASSES 150 AND 300 ASTM A 106/A106M SPECIFICATION FOR SEAMLESS CARBON STEEL PIPE FOR HIGH-TEMPERATURE SERVICE ASTM A 53/A53M SPECIFICATION FOR PIPE, STEEL, BLACK AND HOT-DIPPED, ZINC-COATED, WELDED AND SEAMLESS ASTM A 539 SPECIFICATION FOR ELECTRIC-RESISTANCE-WELDED COILED STEEL TUBING FOR GAS AND FUEL OIL LINES ASTM B 117 PRACTICE FOR OPERATING SALT SPRAY (FOG) APPARATUS ASTM B 43 SPECIFICATION FOR SEAMLESS RED BRASS PIPE, STANDARD SIZES ASTM B 75 SPECIFICATION FOR SEAMLESS COPPER TUBE ASTM D 572 TEST METHOD FOR RUBBER - DETERIORATION BY HEAT AND OXYGEN CGA 8.1 ELASTOMERIC COMPOSITE HOSE AND HOSE COUPLINGS FOR CONDUCTING PROPANE AND NATURAL GAS CGSB 3.13 LIQUEFIED PETROLEUM GAS (BUTANES) CGSB 3.14 LIQUEFIED PETROLEUM GAS (PROPANE) FOR FUEL PURPOSES CSA 12.2 PROPANE FUEL SYSTEM COMPONENTS FOR USE ON HIGHWAY VEHICLES CSA B51 BOILER, PRESSURE VESSEL, AND PRESSURE PIPING CODE PGAC 200-02 VISUAL RE-INSPECTION OF ASME CONTAINERS ON HIGHWAY VEHICLES SAE J 1537 VALIDATION TESTING OF ELECTRIC FUEL PUMPS FOR GASOLINE FUEL INJECTION SYSTEMS SAE J 527 BRAZED DOUBLE WALL LOW-CARBON STEEL TUBING TRANS/WP.29/656 EN67 (REGULATION NO. 67); EQUIPMENT FOR LIQUEFIED PETROLEUM GAS UL 125 FLOW CONTROL VALVES FOR ANHYDROUS AMMONIA AND LP-GAS UL 132 SAFETY RELIEF VALVES FOR ANHYDROUS AMMONIA AND LP-GAS UL 429 ELECTRICALLY OPERATED VALVES UL 565 LIQUID-LEVEL GAUGES AND INDICATORS FOR ANHYDROUS AMMONIA AND LP-GAS ULC S64 COMPOUNDS AND TAPES FOR THREADED PIPE JOINTS				
REGULATIONS Additional Requirements - Provincial						Compressed Gas, O. Reg. 214/01, (Technical Standards and Safety Act, 2000) - CALL FOR REQUIREMENTS FOR CONVERSION SHOPS Fuel Industry Certificates, O. Reg. 215/01, (Technical Standards and Safety Act, 2000) - CERTIFICATE REQUIREMENTS FOR CONVERSION SHOP PERSONNEL												
REGULATIONS Additional Requirements - Federal													Motor Vehicle Safety Regulations, C.R.C., c. 1038, (Motor Vehicle Safety Act)	test Method 301.2, CSA B109, CSA B51 Part 2, ANSI/AGA NGV2(Cancelled)				
TRANSPORT CANADA STANDARD Test Method 301.2 - CNG Fuel System Integrity													Motor Vehicle Safety Regulations, C.R.C., c. 1038, (Motor Vehicle Safety Act)				Transport Canada - Test Method 301.2 - CNG Fuel System Integrity (February 28, 2004) is to be used for demonstrating compliance with the requirements of section 301.2 of Schedule IV to the Motor Vehicle Safety Regulations.	

CNG REFUELLING INFRASTRUCTURE



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DOCUMENTS	Regulatory Jurisdictions														Referenced In	Referenced Standards	North American	International	Other Key Players	
	Municipal	BC	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	PEI	NF & L	NWT	Yukon	Nunavut						Federal
ANSI NGV1-2006/CSA NGV1-2006 Compressed Natural Gas Vehicle (NGV) Fueling Connection Devices		No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	ANSI NGV3.1, CGA 12.3, CSA B108, NFPA 52	ASO Q01 QUALITY SYSTEMS - MODEL FOR QUALITY ASSURANCE IN DESIGN/DEVELOPMENT, PRODUCTION, INSTALLATION AND SERVICING ASO Q02 QUALITY SYSTEMS - MODEL FOR QUALITY ASSURANCE IN PRODUCTION AND INSTALLATION ASO Q03 QUALITY SYSTEMS - MODEL FOR QUALITY ASSURANCE IN FINAL INSPECTION AND TEST ASTM B 117 PRACTICE FOR OPERATING SALT SPRAY (FOG) APPARATUS ASTM B 154 TEST METHOD FOR MERCURIUS NITRATE TEST FOR COPPER ALLOYS ASTM D 471 TEST METHOD FOR RUBBER PROPERTY - EFFECT OF LIQUIDS ASTM D 572 TEST METHOD FOR RUBBER - DETERIORATION BY HEAT AND OXYGEN CGA B149.1 NATURAL GAS INSTALLATION CODE CGA B149.4 NATURAL GAS FOR VEHICLES INSTALLATION CODE CGA L48 006 CGA CERTIFICATION LABORATORY REQUIREMENT, TESTING OF NATURAL GAS VEHICLE REFUELLING DEVICES, REVISED PROCEDURE CGA L48 007 CGA CERTIFICATION LABORATORY REQUIREMENT, THREE WAY VALVE AS AN INTEGRAL PART OF A NATURAL GAS VEHICLE REFUELLING PROBE CR89 002 CERTIFICATION REQUIREMENT, NATURAL GAS VEHICLE REFUELLING PROBES FOR RESIDENTIAL REFUELLING APPLIANCE AND SLOW FILL APPLICATIONS CSA Z298.4 QUALITY ASSURANCE PROGRAM - CATEGORY 4 ISO 1179 PIPE CONNECTIONS, THREADED TO ISO 228/1, FOR PLAIN END STEEL AND OTHER METAL TUBES IN INDUSTRIAL APPLICATIONS ISO 228/1 PIPE THREADS WHERE PRESSURE-TIGHT JOINTS ARE NOT MADE ON THE THREADS - PART 1: DIMENSIONS, TOLERANCES AND DESIGNATION ISO 6149 FLUID POWER SYSTEMS AND COMPONENTS - METRIC PORTS - DIMENSIONS AND DESIGN NFPA 52 VEHICULAR GASEOUS FUEL SYSTEMS CODE SAE J 1453 FITTING - O-RING FACE SEAL SAE J 1926 SPECIFICATION FOR STRAIGHT THREAD O-RING BOSS PORT SAE J 516 HYDRAULIC HOSE FITTINGS	SAE J 2645 (2009) LIQUEFIED NATURAL GAS (LNG) VEHICLE FUELING STATIONS FOR VEHICLES (Canada is a participating member) TC 252/WG 1 CNG stations for fueling vehicles	TC 252 - Project committee: Natural gas fueling stations for vehicles (Canada is a participating member) TC 252/WG 1 CNG stations for fueling vehicles	
CSA 12.6 Vehicle Refueling Appliances (Superseded by CSA 12.6)		No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified		Superseded Standard by CSA 12.6			http://www.scribd.com/doc/1156126/CSA-12.6-Vehicle-Refueling-Apparatus http://www.nrc.ca/energy/resources_and_tools/nrcam_mugy_pamv_smt_2009_to_FCN_EN.pdf
CSA 12.6 VEHICLE REFUELLING APPLIANCES		No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	CSA B51, CSA B51S1	ASTM A 525 SPECIFICATION FOR GENERAL REQUIREMENTS FOR STEEL SHEET, ZINC-COATED (GALVANIZED) BY THE HOT-DIP PROCESS CSA 1.21 GAS FRED APPLIANCES FOR OUTDOOR INSTALLATION CSA 12.54 BREAKAWAY DEVICES FOR NATURAL GAS DISPENSING HOSES AND SYSTEMS CSA B108 NATURAL GAS FUELLING STATIONS INSTALLATION CODE CSA B108.1 NATURAL GAS AND PROPANE INSTALLATION CODE CSA B51 BOILER, PRESSURE VESSEL, AND PRESSURE PIPING CODE CSA C22.1 CANADIAN ELECTRICAL CODE - PART 1: SAFETY STANDARD FOR ELECTRICAL INSTALLATIONS CSA C22.2.0 GENERAL REQUIREMENTS - CANADIAN ELECTRICAL CODE PART 2 CSA C22.2.0.12 WIRING SPACE AND WIRE BENDING SPACE IN ENCLOSURES FOR EQUIPMENT RATED 750 V OR LESS CSA C22.2.0.4 BONDING OF ELECTRICAL EQUIPMENT CSA C22.2.0.8 FLAMMABILITY TESTING OF POLYMERIC MATERIALS (p. 09/83, 01/85, 05/89) CSA C22.2.0.8 SAFETY FUNCTIONS INCORPORATING ELECTRONIC TECHNOLOGY CSA C22.2.236 HEATING AND COOLING EQUIPMENT CSA C22.2.94 SPECIAL PURPOSE ENCLOSURES			http://www.nrcan.gc.ca/transportation/fuels/infrastructure/natural-gas-links/cfm?gtr=16
ANSI NGV 4.1 / CSA 12.5 NGV Dispensing Systems		No references identified	No references identified	No references identified	No references identified	No reference identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	CSA B51	ANSI NGV4.2 HOSES FOR NATURAL GAS VEHICLES AND DISPENSING SYSTEMS ANSI NGV4.4 BREAKAWAY DEVICES FOR NATURAL GAS DISPENSING HOSES AND SYSTEMS ANSI NGV4.6 MANUALLY OPERATED VALVES FOR NATURAL GAS DISPENSING SYSTEMS ANSI NGV4.7 AUTOMATIC, PRESSURE OPERATED VALVES FOR HIGH PRESSURE NATURAL GAS SERVICE API 2003 PROTECTION AGAINST IGNITIONS ARISING OUT OF STATIC, LIGHTNING, AND STRAY CURRENTS API 620-1 SIZING, SELECTION AND INSTALLATION OF PRESSURE-RELIEVING DEVICES IN REFINERIES - PART 1: SIZING AND SELECTION API 620-2 SIZING, SELECTION AND INSTALLATION OF PRESSURE RELIEVING DEVICES IN REFINERIES - INSTALLATION ASME B1 20.1 PIPE THREADS, GENERAL PURPOSE (NCH) ASME B31.3 PROCESS PIPING ASME B94.11M TWIST DRILLS ASME PV CODE SET BOILER AND PRESSURE VESSEL CODE - COMPLETE SET CGA B108 NGV REFUELLING STATIONS INSTALLATION CODE CGA NGV1 COMPRESSED NATURAL GAS VEHICLE (NGV) FUELLING CONNECTION DEVICES CGA S 1 PRESSURE RELIEF DEVICE STANDARDS - PART 1: CYLINDERS FOR COMPRESSED GASES CSA 12.52 HOSES FOR NATURAL GAS VEHICLES AND DISPENSING SYSTEMS CSA 12.54 BREAKAWAY DEVICES FOR NATURAL GAS DISPENSING HOSES AND SYSTEMS CSA 12.56 MANUALLY OPERATED VALVES FOR NATURAL GAS DISPENSING SYSTEMS CSA 12.57 AUTOMATIC, PRESSURE OPERATED VALVES FOR HIGH PRESSURE NATURAL GAS SERVICE CSA B51 BOILER, PRESSURE VESSEL, AND PRESSURE PIPING CODE CSA C22.1 CANADIAN ELECTRICAL CODE - PART 1: SAFETY STANDARD FOR ELECTRICAL INSTALLATIONS CSA C22.2.139 ELECTRICALLY OPERATED VALVES CSA C22.2.22 ELECTRICAL EQUIPMENT FOR FLAMMABLE AND COMBUSTIBLE FUEL DISPENSERS ISO 1179 PIPE CONNECTIONS, THREADED TO ISO 228/1, FOR PLAIN END STEEL AND OTHER METAL TUBES IN INDUSTRIAL APPLICATIONS ISO 6149-1 CONNECTIONS FOR HYDRAULIC FLUID POWER AND GENERAL USE - PORTS AND STUD ENDS WITH ISO 261 METRIC THREADS AND O-RING SEALING - PART 1: PORTS WITH TRUNCATED HOUSING FOR O-RING SEAL NFPA 496 PURGED AND PRESSURIZED ENCLOSURES FOR ELECTRICAL EQUIPMENT NFPA 52 VEHICULAR GASEOUS FUEL SYSTEMS CODE NFPA 70 NATIONAL ELECTRICAL CODE SAE J 1453 FITTING - O-RING FACE SEAL SAE J 1616 RECOMMENDED PRACTICE FOR COMPRESSED NATURAL GAS VEHICLE FUEL SAE J 1926 SPECIFICATION FOR STRAIGHT THREAD O-RING BOSS PORT SAE J 516 HYDRAULIC HOSE FITTINGS UL 1002 ELECTRICALLY OPERATED VALVES FOR USE IN HAZARDOUS (CLASSIFIED) LOCATIONS UL 1238 CONTROL EQUIPMENT FOR USE WITH FLAMMABLE LIQUID DISPENSING DEVICES UL 157 GASKETS AND SEALS UL 404 GAUGES, INDICATING PRESSURE, FOR COMPRESSED GAS SERVICE UL 429 ELECTRICALLY OPERATED VALVES			
ANSI NGV 4.2 / CSA 12.52 Hoses for Natural Gas Vehicles and Dispensing Systems		No references identified	No references identified	No references identified	No references identified	No reference identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	ANSI NGV4.1, ANSI NGV4.2, CSA 12.5	ANSI NGV4.2 HOSES FOR NATURAL GAS VEHICLES AND DISPENSING SYSTEMS ASTM B 117 PRACTICE FOR OPERATING SALT SPRAY (FOG) APPARATUS ASTM D 1149 TEST METHODS FOR RUBBER DETERIORATION - CRACKING IN AN OZONE CONTROLLED ENVIRONMENT ASTM D 572 TEST METHOD FOR RUBBER-DETERIORATION IN AN AIR OVEN ASTM D 638 TEST METHOD FOR TENSILE PROPERTIES OF PLASTICS ASTM G 53 PRACTICE FOR OPERATING LIGHT- AND WATER-EXPOSURE APPARATUS (FLUORESCENT UV-CONDENSATION TYPE) FOR EXPOSURE OF NONMETALLIC MATERIALS CGA B108 NGV REFUELLING STATIONS INSTALLATION CODE CGA B108 RUBBER HOSES - DETERMINATION OF ABRASION RESISTANCE OF THE OUTER COVER			
CSA America NGV 4.3 (draft)		No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	N/A	N/A			
ANSI NGV 4.4 / CSA 12.54 Breakaway Devices for Natural Gas Dispensing Hoses and Systems		No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	ANSI NGV4.1, ANSI NGV4.4, CSA 12.5, CSA 12.6, NFPA 52	ANSI NGV4.4 BREAKAWAY DEVICES FOR NATURAL GAS DISPENSING HOSES AND SYSTEMS ASME B1 20.1 PIPE THREADS, GENERAL PURPOSE (NCH) ASTM B 117 PRACTICE FOR OPERATING SALT SPRAY (FOG) APPARATUS ASTM D 471 TEST METHOD FOR RUBBER PROPERTY - EFFECT OF LIQUIDS CGA B108 NGV REFUELLING STATIONS INSTALLATION CODE ISA 75.02 CONTROL VALVE CAPACITY TEST PROCEDURES ISO 1179 PIPE CONNECTIONS, THREADED TO ISO 228/1, FOR PLAIN END STEEL AND OTHER METAL TUBES IN INDUSTRIAL APPLICATIONS ISO 6149-1 CONNECTIONS FOR HYDRAULIC FLUID POWER AND GENERAL USE - PORTS AND STUD ENDS WITH ISO 261 METRIC THREADS AND O-RING SEALING - PART 1: PORTS WITH TRUNCATED HOUSING FOR O-RING SEAL ISO 2241-2 HYDRAULIC FLUID POWER - QUICK ACTION COUPLINGS - PART 2: TEST METHODS NFPA 52 VEHICULAR GASEOUS FUEL SYSTEMS CODE SAE J 1453 FITTING - O-RING FACE SEAL SAE J 1926 SPECIFICATION FOR STRAIGHT THREAD O-RING BOSS PORT SAE J 516 HYDRAULIC HOSE FITTINGS UL 157 GASKETS AND SEALS			
CSA America NGV 4.5 (draft) Priority		No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	N/A	N/A			
ANSI NGV 4.6 / CSA 12.56 Manually Operated Valves for Natural Gas Dispensing Systems		No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	ANSI NGV4.1, CSA 12.5	ASME B1.1 UNIFIED INCH SCREW THREADS, (UN AND UNR THREAD FORM) ASME B1 20.1 PIPE THREADS, GENERAL PURPOSE (NCH) ASME B16.3 MALLEABLE IRON THREADED FITTINGS, CLASSES 150 AND 300 ASTM B 117 PRACTICE FOR OPERATING SALT SPRAY (FOG) APPARATUS CGA B108 NGV REFUELLING STATIONS INSTALLATION CODE CSA C22.2.139 ELECTRICALLY OPERATED VALVES ISO 1179 PIPE CONNECTIONS, THREADED TO ISO 228/1, FOR PLAIN END STEEL AND OTHER METAL TUBES IN INDUSTRIAL APPLICATIONS ISO 261 ISO GENERAL PURPOSE METRIC SCREW THREADS - GENERAL PLAN ISO 6149-1 CONNECTIONS FOR HYDRAULIC FLUID POWER AND GENERAL USE - PORTS AND STUD ENDS WITH ISO 261 METRIC THREADS AND O-RING SEALING - PART 1: PORTS WITH TRUNCATED HOUSING FOR O-RING SEAL ISO 88 ISO GENERAL PURPOSE SCREW THREADS - BASIC PROFILE NFPA 52 VEHICULAR GASEOUS FUEL SYSTEMS CODE SAE J 1453 FITTING - O-RING FACE SEAL SAE J 1926 SPECIFICATION FOR STRAIGHT THREAD O-RING BOSS PORT SAE J 516 HYDRAULIC HOSE FITTINGS SAE J 525 WELDED AND COLD DRAWN LOW-CARBON STEEL TUBING ANNEALED FOR BENDING AND FLARING UL 1002 ELECTRICALLY OPERATED VALVES FOR USE IN HAZARDOUS (CLASSIFIED) LOCATIONS UL 429 ELECTRICALLY OPERATED VALVES			

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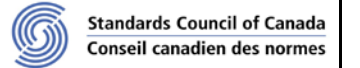
DOCUMENTS	Regulatory Jurisdictions														Referenced In	Referenced Standards	North American	International	Other Key Players	
	Municipal	BC	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	PEI	NF & L	NWT	Yukon	Nunavut						Federal
CSA America NGV 4.7 (draft) ANSI NGV4.8 / CSA 12.8 Natural Gas Fueling Station Reciprocating Compressor Guidelines		No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	N/A	N/A			
CSA B51 Boiler, Pressure Vessel, and Pressure Piping Code.		No references identified	Pressure Equipment Safety Regulation, Alta. Reg. 49/2006, (Safety Codes Act)	Boiler and Pressure Vessel Regulations, R.R.S. c. B-5.1 Reg. 1, (Boiler and Pressure Vessel Act, 1999)	Drilling and Production Regulation, Man. Reg. 111/94, (Oil and Gas Act)	Fire Code, O. Reg. 213/07, (Fire Protection and Prevention Act, 1997) note: section 4.3 Tank storage (Pressure vessels Workforce vocational training and qualification)	Regulation respecting pressure vessels, 1982 G.O. 2, 3433, (Pressure vessels Workforce vocational training and qualification)	Standards Regulation, N.B. Reg. 84-177, (Boiler and Pressure Vessel Act)	Power Engineers Regulations, N.S. Reg. 109/2001, (Crane Operators and Power Engineers Act)	General Regulations, P.E.I. Reg. EC234/85, (Boilers and Pressure Vessels Act)	Boiler, Pressure Vessel and Compressed Gas Regulations, N.L.R. 119/96, (Public Safety Act)	Gas Protection Regulations, R.R.N.W.T. 1990, c. G-1, (Gas Protection Act)	Gas Regulations, Y.O.I.C. 1999/213, (Gas Burning Devices Act) Boilers and Pressure Vessels Act Regulations, Y.O.I.C. 1980/303, (Boiler and Pressure Vessels Act)	Gas Protection Regulations, R.R.N.W.T. (Nu.) 1990 c. G-1, (Gas Protection Act)	Canada Oil and Gas Installations Regulations, SOR/96-118, (Canada Oil and Gas Operations Act)	145 references including: ANSI NGV2, ANSI NGV3.1, ANSI NGV4.1, ANSI NGV4.8, ANSI PRD1, CSA 12.8, CSA 12.6, CSA 12.5, CSA B108, CSA B109, CSA B149.1, CSA B149.2, CSA B149.5, CSA B149.6B...	ANSI K61.1 SAFETY REQUIREMENTS FOR THE STORAGE AND HANDLING OF ANHYDROUS AMMONIA ANSI NGV4.1 NGV DISPENSING SYSTEMS ANSI PRD 1 PRESSURE RELIEF DEVICES FOR COMPRESSED NATURAL GAS VEHICLE (NGV) FUEL CONTAINERS API SPECIFICATION FOR PACKAGED RECIPROCATING COMPRESSORS FOR OIL AND GAS PRODUCTION SERVICES ASME B31.1 POWER PIPING ASME B31.3 PROCESS PIPING ASME B31.4 PIPELINE TRANSPORTATION SYSTEMS FOR LIQUID HYDROCARBONS AND OTHER LIQUIDS ASME B31.5 REFRIGERATION PIPING AND HEAT TRANSFER COMPONENTS ASME B31.9 BUILDING SERVICES PIPING ASME CSD1 CONTROLS AND SAFETY DEVICES FOR AUTOMATICALLY FIRED BOILERS ASME PV CODE 1 BOILER AND PRESSURE VESSEL CODE - RULES FOR CONSTRUCTION OF POWER BOILERS ASME PV CODE 10 BOILER AND PRESSURE VESSEL CODE - FIBER-REINFORCED PLASTIC PRESSURE VESSELS ASME PV CODE 2A BOILER AND PRESSURE VESSEL CODE - MATERIALS - FERROUS MATERIAL SPECIFICATIONS ASME PV CODE 2B BOILER AND PRESSURE VESSEL CODE - MATERIALS - NONFERROUS MATERIAL SPECIFICATIONS ASME PV CODE 2C BOILER AND PRESSURE VESSEL CODE - MATERIALS - SPECIFICATIONS FOR WELDING RODS, ELECTRODES AND FILLER METALS ASME PV CODE 2D CUSTOMARY BOILER AND PRESSURE VESSEL CODE - MATERIALS - PROPERTIES (CUSTOMARY) ASME PV CODE 2D METRIC BOILER AND PRESSURE VESSEL CODE - MATERIALS - PROPERTIES (METRIC) ASME PV CODE 4 BOILER AND PRESSURE VESSEL CODE - RULES FOR CONSTRUCTION OF HEATING BOILERS ASME PV CODE 5 BOILER AND PRESSURE VESSEL CODE - NONDESTRUCTIVE EXAMINATION ASME PV CODE 8 DIV 1 BOILER AND PRESSURE VESSEL CODE - PRESSURE VESSELS ASME PV CODE 8 DIV 2 BOILER AND PRESSURE VESSEL CODE - PRESSURE VESSELS - ALTERNATIVE RULES FOR CONSTRUCTION OF HIGH PRESSURE VESSELS ASME PV CODE 8 DIV 3 BOILER AND PRESSURE VESSEL CODE - PRESSURE VESSELS - ALTERNATIVE RULES FOR CONSTRUCTION OF HIGH PRESSURE VESSELS ASME PV CODE 9 BOILER AND PRESSURE VESSEL CODE - WELDING AND BRAZING QUALIFICATIONS ASME PVH01 SAFETY STANDARD FOR PRESSURE VESSELS FOR HUMAN OCCUPANCY ASQ Z1.4 SAMPLING PROCEDURES AND TABLES FOR INSPECTION BY ATTRIBUTES ASTM A 105/A105M SPECIFICATION FOR CARBON STEEL FORGING FOR PIPING APPLICATIONS ASTM A 106/A106M SPECIFICATION FOR SEAMLESS CARBON STEEL PIPE FOR HIGH-TEMPERATURE SERVICE ASTM A 192/A192M SPECIFICATION FOR FORGED OR ROLLED ALLOY AND STAINLESS STEEL PIPE FLANGES, FORGED FITTINGS, AND VALVES AND PARTS FOR HIGH-TEMPERATURE SERVICE ASTM A 213/A213M SPECIFICATION FOR SEAMLESS FERRITIC AND AUSTENITIC ALLOY-STEEL BOILER, SUPERHEATER, AND HEAT-EXCHANGER TUBES ASTM A 216/A216M SPECIFICATION FOR STEEL CASTINGS, CARBON, SUITABLE FOR FUSION WELDING, FOR HIGH-TEMPERATURE SERVICE ASTM A 312/A312M SPECIFICATION FOR SEAMLESS, WELDED, AND HEAVILY COLD WORKED AUSTENITIC STAINLESS STEEL PIPES ASTM A 333/A333M SPECIFICATION FOR SEAMLESS AND WELDED STEEL PIPE FOR LOW-TEMPERATURE SERVICE ASTM A 334/A334M SPECIFICATION FOR SEAMLESS AND WELDED CARBON AND ALLOY-STEEL TUBES FOR LOW-TEMPERATURE SERVICE ASTM A 350/A350M SPECIFICATION FOR CARBON AND LOW-ALLOY STEEL FORGINGS, REQUIRING NOTCH TOUGHNESS TESTING FOR PIPING COMPONENTS ASTM A 352/A352M SPECIFICATION FOR STEEL CASTINGS, FERRITIC AND MARTENSITIC, FOR PRESSURE-CONTAINING PARTS, SUITABLE FOR LOW-TEMPERATURE SERVICE ASTM B 117 PRACTICE FOR OPERATING SALT SPRAY (FOG) APPARATUS ASTM D 1186 TEST METHODS FOR NONDESTRUCTIVE MEASUREMENT OF DRY FILM THICKNESS OF NONMAGNETIC COATINGS APPLIED TO A FERROUS BASE ASTM D 1308 TEST METHOD FOR EFFECT OF HOUSEHOLD CHEMICALS ON CLEAR AND PIGMENTED ORGANIC FINISHES ASTM D 1400 TEST METHOD FOR NONDESTRUCTIVE MEASUREMENT OF DRY FILM THICKNESS OF NONCONDUCTIVE COATINGS APPLIED TO A NONFERROUS METAL BASE ASTM D 2344D 2344M TEST METHOD FOR SHORT-BEAM STRENGTH OF POLYMER MATRIX COMPOSITE MATERIALS AND THEIR LAMINATES ASTM D 2794 TEST METHOD FOR RESISTANCE OF ORGANIC COATINGS TO THE EFFECTS OF RAPID DEFORMATION (IMPACT) ASTM D 3170 TEST METHOD FOR CHIPPING RESISTANCE OF COATINGS references are from latest version ASTM D 3359 TEST METHODS FOR MEASURING ADHESION BY TAPE TEST ASTM D 4138 PRACTICES FOR MEASUREMENT OF DRY FILM THICKNESS OF PROTECTIVE COATING SYSTEMS BY DESTRUCTIVE, CROSS-SECTIONING MEANS ASTM D 4814 SPECIFICATION FOR AUTOMOTIVE SPARK-IGNITION ENGINE FUEL ASTM D 522 TEST METHODS FOR MANDREL BEND TEST OF ATTACHED ORGANIC COATINGS ASTM D 538 TEST METHOD FOR TENSILE PROPERTIES OF PLASTICS ASTM E 23 TEST METHODS FOR NOTCHED BAR IMPACT TESTING OF METALLIC MATERIALS ASTM E 399 TEST METHOD FOR LINEAR-ELASTIC PLANE-STRAIN FRACTURE TOUGHNESS K _{IC} OF METALLIC MATERIALS ASTM E 8 TEST METHODS FOR TENSION TESTING OF METALLIC MATERIALS ASTM G 154 PRACTICE FOR OPERATING FLUORESCENT LIGHT APPARATUS FOR UV EXPOSURE OF NONMETALLIC MATERIALS BS EN 15322-2 TRANSPORTABLE GAS CYLINDERS - REFILLABLE WELDED STEEL GAS CYLINDERS - DESIGN AND CONSTRUCTION - PART 2: STAINLESS STEEL CDA A4015 COPPER TUBE HANDBOOK CGA G 5.4 HYDROGEN PIPING SYSTEMS AT CONSUMER LOCATIONS CGSB 48.9712 NON-DESTRUCTIVE TESTING - QUALIFICATION AND CERTIFICATION OF PERSONNEL CSA 12.8 NGV DISPENSING SYSTEMS CSA 12.8 VEHICLE REFUELLING APPLIANCES CSA B108 NATURAL GAS FUELLING STATIONS INSTALLATION CODE CSA B109 NATURAL GAS FOR VEHICLES INSTALLATION CODE CSA B149.1 NATURAL GAS AND PROPANE INSTALLATION CODE CSA B149.2 PROPANE STORAGE AND HANDLING CODE CSA B149.5 INSTALLATION CODE FOR PROPANE FUEL SYSTEMS AND TANKS ON HIGHWAY VEHICLES CSA B339 CYLINDERS, SPHERES, AND TUBES FOR THE TRANSPORTATION OF DANGEROUS GOODS CSA B340 SELECTION AND USE OF CYLINDERS, SPHERES, TUBES, AND OTHER CONTAINERS FOR THE TRANSPORTATION OF DANGEROUS GOODS, CLASS 2 CSA ISO 9001 QUALITY MANAGEMENT SYSTEMS - REQUIREMENTS CSA Z189.1 COMPRESSED BREATHING AIR AND SYSTEMS			

CNG REFUELLING INFRASTRUCTURE



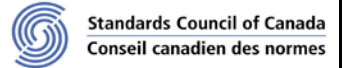
DOCUMENTS	Regulatory Jurisdictions														Referenced In	Referenced Standards	North American	International	Other Key Players	
	Municipal	BC	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	PEI	NF & L	NWT	Yukon	Nunavut						Federal
																	CSA Z299.1 QUALITY ASSURANCE PROGRAM - CATEGORY 1 CSA Z299.2 QUALITY ASSURANCE PROGRAM - CATEGORY 2 CSA Z299.3 QUALITY ASSURANCE PROGRAM - CATEGORY 3 CSA Z299.4 QUALITY ASSURANCE PROGRAM - CATEGORY 4 CSA Z305.3 PRESSURE REGULATORS, GAUGES AND FLOW-METERING DEVICES FOR MEDICAL GASES CSA Z305.4 QUALIFICATION REQUIREMENTS FOR AGENCIES TESTING NONFLAMMABLE MEDICAL GAS PIPING SYSTEMS CSA Z662 OIL AND GAS PIPELINE SYSTEMS CSA Z7396.1 MEDICAL GAS PIPELINE SYSTEMS - PART 1: PIPELINES FOR MEDICAL GASES AND VACUUM ISO 1438 GAS CYLINDERS - HIGH PRESSURE CYLINDERS FOR THE ON-BOARD STORAGE OF NATURAL GAS AS A FUEL FOR AUTOMOTIVE VEHICLES ISO 14687-1 HYDROGEN FUEL - PRODUCT SPECIFICATION - PART 1: ALL APPLICATIONS EXCEPT PROTON EXCHANGE MEMBRANE (PEM) FUEL CELLS FOR ROAD VEHICLES ISO 148-1 METALLIC MATERIALS - CHARPY PENDULUM IMPACT TEST - PART 1: TEST METHOD ISO 19078 GAS CYLINDERS - INSPECTION OF THE CYLINDER INSTALLATION, AND REQUALIFICATION OF HIGH PRESSURE CYLINDERS FOR THE ON-BOARD STORAGE OF NATURAL GAS AS A FUEL FOR AUTOMOTIVE VEHICLES ISO 306 PLASTICS - THERMOPLASTIC MATERIALS - DETERMINATION OF VICAT SOFTENING TEMPERATURE (VST) ISO 6506-1 METALLIC MATERIALS - BRINELL HARDNESS TEST - PART 1: TEST METHOD ISO 6506-2 METALLIC MATERIALS - ROCKWELL HARDNESS TEST - PART 1: TEST METHOD (SCALES A, B, C, D, E, F, G, H, K, N, T) ISO 7886 GAS CYLINDERS - REFRILLABLE SEAMLESS ALUMINIUM ALLOY GAS CYLINDERS - DESIGN, CONSTRUCTION AND TESTING ISO 9001 QUALITY MANAGEMENT SYSTEMS - REQUIREMENTS ISO 9712 NON-DESTRUCTIVE TESTING - QUALIFICATION AND CERTIFICATION OF PERSONNEL ISO 9809-1 GAS CYLINDERS - REFRILLABLE SEAMLESS STEEL GAS CYLINDERS - DESIGN, CONSTRUCTION AND TESTING - PART 1: QUENCHED AND TEMPERED STEEL CYLINDERS WITH TENSILE STRENGTH LESS THAN 1100 MPA NACE TM 01 77 LABORATORY TESTING OF METALS FOR RESISTANCE TO SULFIDE STRESS CRACKING AND STRESS CORROSION CRACKING IN H ₂ S ENVIRONMENTS NB 18 NATIONAL BOARD PRESSURE RELIEF DEVICE CERTIFICATIONS NB 23 NATIONAL BOARD INSPECTION CODE (NBIC) NFPA 58 LIQUEFIED PETROLEUM GAS CODE NACE 877 GUIDELINE SPECIFICATION FOR THE IMPRESSED CURRENT METHOD OF CATHODIC PROTECTION OF UNDERGROUND PETROLEUM STORAGE TANKS RMA IP2 HOSE HANDBOOK UL 969 MARKING AND LABELLING SYSTEMS ULC S605.1 EXTERNAL CORROSION PROTECTION SYSTEMS FOR STEEL UNDERGROUND TANKS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS			
CAN/CSA B108 Natural Gas Fueling Stations Installation Code		No references identified	Gas Code Regulation, Alta. Reg. 113/2005, (Safety Codes Act)	Gas Inspection Regulations, R.R.S. c. G-3.2 Reg. 1, (Gas Inspection Act, 1993)	No references identified	No references identified	Construction Code, 2000 G.O.Q. 2, 4203 and 4437, (Building Act) Safety Code, 2002 G.O.Q. 2, 4654, (Building Act)	Standards Regulation, N.B. Reg. 84-177, (Boiler and Pressure Vessel Act)	Fuel Safety Regulations, N.S. Reg. 186/2006, (Fire Safety Act)	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	ANSI NGV4.8, CSA 12.6, CSA 12.8, CSA B51, CSA B51S1, CSA B149.1, CSA B149B	ANSI NGV1 COMPRESSED NATURAL GAS VEHICLE (NGV) FUELING CONNECTION DEVICES CGA 12.6 VEHICLE REFUELLING APPLIANCES CGA B149.1 NATURAL GAS INSTALLATION CODE CSA B51 BOILER, PRESSURE VESSEL, AND PRESSURE PIPING CODE CSA Z662 OIL AND GAS PIPELINE SYSTEMS			
CAN/CSA B149.1 Natural gas and propane installation code		Gas Safety Regulation, B.C. Reg. 103/2004, (Safety Standards Act)	Gas Code Regulation, Alta. Reg. 113/2005, (Safety Codes Act)	Gas Inspection Regulations, R.R.S. c. G-3.2 Reg. 1, (Gas Inspection Act, 1993)	Gas and Oil Burner Regulation, Man. Reg. 104/87 R, (Gas and Oil Burner Act) (referenced standard is older CGA version)	Propane Storage and Handling, O. Reg. 211/01, (Technical Standards and Safety Act, 2000) note: the installation of appliances, equipment, components and accessories in residential, commercial or industrial premises, within the scope of CSA B149.1-00, "Natural Gas and Propane Installation Code", as amended from time to time	Construction Code, 2000 G.O.Q. 2, 4203 and 4437, (Building Act); Regulation respecting safety standards for road vehicles, 1998 G.O.Q. 2, 4657, (Highway Safety Code) (old version is referenced CANCGA-B149.1)	Standards Regulation, N.B. Reg. 84-177, (Boiler and Pressure Vessel Act)	Fuel Safety Regulations, N.S. Reg. 120/99, (Repeated or spent), (Fire Safety Act) (referenced standard is older CGA version; not dated)	General Regulations, P.E.I. Reg. EC234/85, (Boilers and Pressure Vessels Act) (referenced standard is older CGA version; not dated)	Boiler, Pressure Vessel and Compressed Gas Regulations, N.L.R. 119/96, (Public Safety Act)	Fire Prevention Regulations, R.R.N.W.T. 1990, c. F-12, (Fire Prevention Act) Gas Protection Regulations, R.R.N.W.T. 1990, c. G-1, (Gas Protection Act)	No references identified	No references identified	No references identified	111 references including: ANSI NGV4.8, CSA 12.6, CSA 12.8, CSA B51, CSA B51S1, CSA B149.2, CSA B149.3, CSA C22.1	ANSI LC1 FUEL GAS PIPING SYSTEMS USING CORRUGATED STAINLESS STEEL TUBING (CSST) ANSI Z21.24 CONNECTORS FOR GAS APPLIANCES ANSI Z21.50 VENTED GAS FIREPLACES ANSI Z21.59 CONVENIENCE GAS OUTLETS AND OPTIONAL ENCLOSURES ANSI Z21.75 CONNECTORS FOR OUTDOOR GAS APPLIANCES AND MANUFACTURED HOMES ANSI Z21.80 LINE PRESSURE REGULATORS ANSI Z21.90 CONVENIENCE GAS OUTLETS AND OPTIONAL ENCLOSURES ANSI Z23.11 GAS FOOD SERVICE EQUIPMENT ANSI Z23.4 NON-RECIRCULATING DIRECT GAS-FIRED INDUSTRIAL AIR HEATERS ASME B1.20.1 PIPE THREADS, GENERAL PURPOSE (INCH) ASME B16.3 WALLEABLE IRON THREADED FITTINGS, CLASSES 150 AND 300 ASME B36.10M WELDED AND SEAMLESS WROUGHT STEEL PIPE ASTM A 106/A106M SPECIFICATION FOR SEAMLESS CARBON STEEL PIPE FOR HIGH-TEMPERATURE SERVICE ASTM A 176/A176M SPECIFICATION FOR SEAMLESS COLD-DRAWN LOW-CARBON STEEL HEAT-EXCHANGER AND CONDENSER TUBES ASTM A 53/AS53M SPECIFICATION FOR PIPE, STEEL, BLACK AND HOT-DIPPED, ZINC-COATED, WELDED AND SEAMLESS ASTM B 837 SPECIFICATION FOR SEAMLESS COPPER TUBE FOR NATURAL GAS AND LIQUEFIED PETROLEUM (LP) GAS FUEL DISTRIBUTION SYSTEMS ASTM B 88 SPECIFICATION FOR SEAMLESS COPPER WATER TUBE CGA 12.6 VEHICLE REFUELLING APPLIANCES CGA 2.17 GAS-FIRED APPLIANCES FOR USE AT HIGH ALTITUDES CGA 8.1 ELASTOMERIC COMPOSITE HOSE AND HOSE COUPLINGS FOR CONDUCTING PROPANE AND NATURAL GAS CGA 8.3 THERMOPLASTIC HOSE AND HOSE COUPLINGS FOR CONDUCTING PROPANE AND NATURAL GAS CGA LAB-000 FLEXIBLE GAS TUBING FOR INTERIOR NATURAL AND PROPANE GAS PIPING SYSTEMS CGSB 3.13 LIQUEFIED PETROLEUM GAS (BUTANES) CGSB 3.14 LIQUEFIED PETROLEUM GAS (PROPANE) FOR FUEL PURPOSES CSA 1.8 GAS FOOD SERVICE EQUIPMENT CSA 2.22 VENTED GAS FIREPLACES CSA 3.7 NON-RECIRCULATING DIRECT GAS-FIRED INDUSTRIAL AIR HEATERS CSA 6.10 CONNECTORS FOR GAS APPLIANCES CSA 6.16 CONNECTORS FOR MOVABLE GAS APPLIANCES CSA 6.18 SERVICE REGULATORS FOR NATURAL GAS CSA 6.2 DRAFT HOODS CSA 6.22 LINE PRESSURE REGULATORS CSA 6.24 CONVENIENCE GAS OUTLETS AND OPTIONAL ENCLOSURES CSA 6.26 FUEL GAS PIPING SYSTEMS USING CORRUGATED STAINLESS STEEL TUBING (CSST) CSA 6.27 CONNECTORS FOR OUTDOOR GAS APPLIANCES AND MANUFACTURED HOMES CSA B108 NATURAL GAS FUELLING STATIONS INSTALLATION CODE CSA B137.4 POLYETHYLENE PIPING SYSTEMS FOR GAS SERVICES CSA B137.4.1 ELECTROFUSION-TYPE POLYETHYLENE FITTINGS FOR GAS SERVICES CSA B149.2 PROPANE STORAGE AND HANDLING CODE CSA B149.3 CODE FOR THE FIELD APPROVAL OF FUEL-RELATED COMPONENTS ON APPLIANCES AND EQUIPMENT CSA B396 INSTALLATION CODE FOR SOLID-FUEL-BURNING APPLIANCES AND EQUIPMENT CSA B51 BOILER, PRESSURE VESSEL, AND PRESSURE PIPING CODE CSA C22.1 CANADIAN ELECTRICAL CODE - PART 1: SAFETY STANDARD FOR ELECTRICAL INSTALLATIONS CSA W117.2 SAFETY IN WELDING, CUTTING, AND ALLIED PROCESSES CSA Z240 MH SERIES MANUFACTURED HOMES CSA Z662 OIL AND GAS PIPELINE SYSTEMS NRC NBCC NATIONAL BUILDING CODE OF CANADA UL 144 LP-GAS REGULATORS UL 969 MEDIUM HEAT APPLIANCE FACTORY-BUILT CHIMNEYS ULC C55 FLEXIBLE METALLIC HOSE ULC S110 STANDARD METHODS OF TEST FOR AIR DUCTS ULC S114 STANDARD METHOD OF TEST FOR DETERMINATION OF NON-COMBUSTIBILITY IN BUILDING MATERIALS ULC S604 STANDARD FOR FACTORY-BUILT TYPE A CHIMNEYS ULC S605 STANDARD FOR GAS VENTS ULC S609 STANDARD FOR LOW TEMPERATURE VENTS TYPE L ULC S629 STANDARD FOR 600 DEGREE C FACTORY-BUILT CHIMNEYS ULC S635 STANDARD FOR LINING SYSTEMS FOR EXISTING MASONRY OR FACTORY-BUILT CHIMNEYS AND VENTS ULC S636 STANDARD FOR TYPE BH GAS VENTING SYSTEMS ULC S642 STANDARD FOR COMPOUNDS AND TAPES FOR THREADED PIPE JOINTS			
CODES																				

CNG REFUELLING INFRASTRUCTURE



DOCUMENTS	Regulatory Jurisdictions														Referenced In	Referenced Standards	North American	International	Other Key Players	
	Municipal	BC	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	PEI	NF & L	NWT	Yukon	Nunavut						Federal
CAN/CSA B149.2 Propane storage and handling code		Gas Safety Regulation, B.C. Reg. 103/2004, (Safety Standards Act)	Gas Code Regulation, Alta. Reg. 113/2005, (Safety Codes Act)	Gas Inspection Regulations, R.R.S. c. G-3.2 Reg. 1, (Gas Inspection Act, 1993)	Gas and Oil Burner Regulation, Man. Reg. 104/87 R., (Gas and Oil Burner Act) (referenced standard is older CGA version)	Propane Storage and Handling, O. Reg. 211/01, (Technical Standards and Safety Act, 2000) note CAN/CSA-B149.2-00, "Propane Installation Code", as amended from time to time. Gaseous Fuels, O. Reg. 212/01, (Technical Standards and Safety Act, 2000) note: installations that are the subject of CSA-B149.2-00, "Propane Storage and Handling Code", as amended from time to time	Construction Code, 2000 G.O.O. 2.4203 and 4437, (Building Act); Regulation respecting safety standards for road vehicles, 1998 G.O.O. 2.4557, (Highway Safety Code) (old version is referenced CAN/CSA-B149.2)	Standards Regulation, N.B. Reg. 84-177, (Boiler and Pressure Vessel Act)	Underground Mining Regulations, N.S. Reg. 286/2008, (Occupational Health and Safety Act); Fuel Safety Regulations, N.S. Reg. 120/99, (Repealed or spent), (Fire Safety Act) (referenced standard not dated)	General Regulations, P.E.I. Reg. EC234/85, (Boilers and Pressure Vessels Act) (referenced standard is older CGA version; not dated)	Boiler, Pressure Vessel and Compressed Gas Regulations, N.L.R. 119/96, (Public Safety Act)	Gas Protection Regulations, R.R.N.W.T. 1990, c. G-1, (Gas Protection Act)	Gas Regulations, Y.O.I.C. 1999/215, (Gas Burning Devices Act)	Gas Protection Regulations, R.R.N.W.T. (Nu.) 1990 c. G-1, (Gas Protection Act)	Canada Occupational Health and Safety Regulations, SOR/86-304, (Canada Labour Code) (previous version CAN/CSA-B149.2-M91, Propane Installation Code, dated 1991, as amended from time to time.)	32 references including CGA 12.4, CSA B51, CSA B51S1, CSA B140.1, CSA B149.3, CSA B149 HB, CSA C22.1	ASTM B 117 PRACTICE FOR OPERATING SALT SPRAY (FOG) APPARATUS CGA C 6 STANDARDS FOR VISUAL INSPECTION OF STEEL COMPRESSED GAS CYLINDERS CGA C 6.3 GUIDELINES FOR VISUAL INSPECTION AND REQUALIFICATION OF LOW PRESSURE ALUMINUM COMPRESSED GAS CYLINDERS CGA S 1.1 PRESSURE RELIEF DEVICE STANDARDS - PART 1: CYLINDERS FOR COMPRESSED GASES CGA V 1 STANDARD FOR COMPRESSED GAS CYLINDER VALVE OUTLET AND INLET CONNECTIONS CGSB 1.184 COAL TAR-EPOXY COATING CGSB 3.13 LIQUEFIED PETROLEUM GAS (BUTANES) CGSB 3.14 LIQUEFIED PETROLEUM GAS (PROPANE) FOR FUEL PURPOSES CGSB 43.123 CONTAINERS, METAL, AEROSOL (TC-2P, TC-2O) CSA B149.1 NATURAL GAS AND PROPANE INSTALLATION CODE CSA B149.3 CODE FOR THE FIELD APPROVAL OF FUEL-RELATED COMPONENTS ON APPLIANCES AND EQUIPMENT CSA B149.5 INSTALLATION CODE FOR PROPANE FUEL SYSTEMS AND TANKS ON HIGHWAY VEHICLES CSA B339 CYLINDERS, SPHERES, AND TUBES FOR THE TRANSPORTATION OF DANGEROUS GOODS CSA B340 SELECTION AND USE OF CYLINDERS, SPHERES, TUBES, AND OTHER CONTAINERS FOR THE TRANSPORTATION OF DANGEROUS GOODS, CLASS 2 CSA B81 BOILER, PRESSURE VESSEL, AND PRESSURE PIPING CODE CSA B620 HIGHWAY TANKS AND TC PORTABLE TANKS FOR THE TRANSPORTATION OF DANGEROUS GOODS CSA B622 SELECTION AND USE OF HIGHWAY TANKS, TC PORTABLE TANKS, AND TON CONTAINERS FOR THE TRANSPORTATION OF DANGEROUS GOODS, CLASS 2 CSA C22.1 CANADIAN ELECTRICAL CODE - PART 1: SAFETY STANDARD FOR ELECTRICAL INSTALLATIONS CSA Z240 MM SERIES MANUFACTURED HOMES CSA Z240 RV SERIES RECREATIONAL VEHICLES CSA Z240.4.2 RECREATIONAL VEHICLES - INSTALLATION REQUIREMENTS FOR PROPANE APPLIANCES AND EQUIPMENT IN RECREATIONAL VEHICLES NRC NSCC NATIONAL BUILDING CODE OF CANADA NFPA 13 INSTALLATION OF SPRINKLER SYSTEMS NFPA 308 CODE FOR THE MANUFACTURE AND STORAGE OF AEROSOL PRODUCTS UL 2227 COVERING AND PREVENTION DEVICES ULC S104 STANDARD METHOD FOR FIRE TESTS OF DOOR ASSEMBLIES ULC S114 STANDARD METHOD OF TEST FOR DETERMINATION OF NON-COMBUSTIBILITY IN BUILDING MATERIALS ULC S603.1 EXTERNAL CORROSION PROTECTION SYSTEMS FOR STEEL UNDERGROUND TANKS FOR FLAMMABLE AND COMBUSTIBLE LIQUIDS			
CAN/CSA B149.3 Code for the field approval of fuel-related components on appliances and equipment		Gas Safety Regulation, B.C. Reg. 103/2004, (Safety Standards Act)	No references identified	Gas Inspection Regulations, R.R.S. c. G-3.2 Reg. 1, (Gas Inspection Act, 1993)	Gas and Oil Burner Regulation, Man. Reg. 104/87 R., (Gas and Oil Burner Act) (referenced standard is older CGA version)	No references identified	Construction Code, 2000 G.O.O. 2.4203 and 4437, (Building Act)	Standards Regulation, N.B. Reg. 84-177, (Boiler and Pressure Vessel Act)	Fuel Safety Regulations, N.S. Reg. 120/99, (Repealed or spent), (Fire Safety Act) (referenced standard not dated)	General Regulations, P.E.I. Reg. EC234/85, (Boilers and Pressure Vessels Act) (referenced standard is older CGA version; not dated)	Boiler, Pressure Vessel and Compressed Gas Regulations, N.L.R. 119/96, (Public Safety Act)	No references identified	Gas Regulations, Y.O.I.C. 1999/215, (Gas Burning Devices Act)	Gas Protection Regulations, R.R.N.W.T. (Nu.) 1990 c. G-1, (Gas Protection Act)	No references identified	CSA B149.1, CSA B149.2, CSA B149HB	ANSI Z21.20 AUTOMATIC ELECTRICAL CONTROLS FOR HOUSEHOLD AND SIMILAR USE - PART 2: PARTICULAR REQUIREMENTS FOR AUTOMATIC BURNER IGNITION SYSTEMS AND COMPONENTS ANSI Z21.21 AUTOMATIC VALVES FOR GAS APPLIANCES ANSI Z21.78 COMBINATION GAS CONTROLS FOR GAS APPLIANCES CSA 6.20 COMBINATION GAS CONTROLS FOR GAS APPLIANCES CSA 6.4 AUTOMATIC GAS IGNITION SYSTEMS AND COMPONENTS CSA 6.5 AUTOMATIC VALVES FOR GAS APPLIANCES CSA B149.1 NATURAL GAS AND PROPANE INSTALLATION CODE CSA B149.2 PROPANE STORAGE AND HANDLING CODE CSA C22.1 CANADIAN ELECTRICAL CODE - PART 1: SAFETY STANDARD FOR ELECTRICAL INSTALLATIONS CSA C22.0.8 SAFETY FUNCTIONS INCORPORATING ELECTRONIC TECHNOLOGY CSA C22.2.13 TRANSFORMERS FOR LUMINOUS-TUBE SIGNS, OIL-OR GAS-BURNER IGNITION EQUIPMENT, COLD-CATHODE INTERIOR LIGHTING CSA C22.2.199 AUTOMATIC ELECTRICAL CONTROLS FOR HOUSEHOLD AND SIMILAR USE - PART 2: PARTICULAR REQUIREMENTS FOR AUTOMATIC BURNER IGNITION SYSTEMS AND COMPONENTS IEC 61511 (ALL PARTS) FUNCTIONAL SAFETY - SAFETY INSTRUMENTED SYSTEMS FOR THE PROCESS INDUSTRY SECTOR ISO 23552-1 SAFETY AND CONTROL DEVICES FOR GAS AND/OR OIL BURNERS AND GAS AND/OR OIL APPLIANCES - PARTICULAR REQUIREMENTS - PART 1: FUEL/AIR RATIO CONTROLS, ELECTRONIC TYPE NFPA 85 BOILER AND COMBUSTION SYSTEMS HAZARDS CODE NFPA 86 OVENS AND FURNACES			
NFPA 52, Vehicular Gaseous Fuel Systems Code		No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	No references identified	35 references including ANSI NGV1 COMPRESSED NATURAL GAS VEHICLE (NGV) FUELING CONNECTION DEVICES ANSI NGV2 COMPRESSED NATURAL GAS VEHICLE (NGV) FUELING CONNECTION DEVICES ANSI NGV3.1 FUEL SYSTEM COMPONENTS FOR NATURAL GAS POWERED VEHICLES ANSI NGV4.1 NGV DISPENSING SYSTEMS ANSI NGV4.4 BREAKAWAY DEVICES FOR NATURAL GAS DISPENSING HOSES AND SYSTEMS ANSI 287.1 UPDATED EYE AND FACE PROTECTION STANDARD FOCUSES ON HAZARDS AND PRODUCT MARKINGS ANSI 288.1 PERSONAL PROTECTION - PROTECTIVE HEADWEAR FOR INDUSTRIAL WORKERS - REQUIREMENTS API 2003 PROTECTION AGAINST IGNITIONS ARISING OUT OF STATIC LIGHTNING, AND STRAY CURRENTS API 610 PRESSURE VESSEL INSPECTION CODE - IN-SERVICE INSPECTION, RATING, REPAIR, AND ALTERATION API 520-1 SIZING, SELECTION AND INSTALLATION OF PRESSURE-RELIEVING DEVICES IN REFINERIES - PART 1: SIZING AND SELECTION API 6. SPECIFICATION FOR LINE PIPE API 620 DESIGN AND CONSTRUCTION OF LARGE, WELDED, LOW-PRESSURE STORAGE TANKS ASME B31.3 PROCESS PIPING ASME B36.10M WELDED AND SEAMLESS WROUGHT STEEL PIPE ASME PV CODE 8 DIV 1 BOILER AND PRESSURE VESSEL CODE - PRESSURE VESSELS ASME PV CODE 8 DIV 2 BOILER AND PRESSURE VESSEL CODE - PRESSURE VESSELS - ALTERNATIVE RULES ASME PV CODE 8 DIV 3 BOILER AND PRESSURE VESSEL CODE - PRESSURE VESSELS - ALTERNATIVE RULES FOR CONSTRUCTION OF HIGH PRESSURE VESSELS ASTM A 395 SPECIFICATION FOR FERRITIC DUCTILE IRON PRESSURE-RETAINING CASTINGS FOR USE AT ELEVATED TEMPERATURES ASTM A 47 SPECIFICATION FOR FERRITIC MALLEABLE IRON CASTINGS ASTM A 536 SPECIFICATION FOR DUCTILE IRON CASTINGS ASTM E 136 TEST METHOD FOR BEHAVIOUR OF MATERIALS IN A VERTICAL TUBE FURNACE AT 750 DEGREE C ASTM E 84 TEST METHOD FOR SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS BS EN 1081 RESILIENT FLOOR COVERINGS - DETERMINATION OF THE ELECTRICAL RESISTANCE CFR 29(PTS1900-1910) LABOR - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, DEPARTMENT OF LABOR CFR 49(PTS100-185) TRANSPORTATION CFR 49(PTS400-599) TRANSPORTATION CGA 341 SPECIFICATION FOR INSULATED CARGO TANK FOR NONFLAMMABLE CRYOGENIC LIQUIDS CGA C 10 RECOMMENDED PROCEDURES FOR CHANGES OF GAS SERVICE FOR COMPRESSED GAS CYLINDERS CGA C 6 STANDARDS FOR VISUAL INSPECTION OF STEEL COMPRESSED GAS CYLINDERS CGA C 6.1 STANDARDS FOR VISUAL INSPECTION OF HIGH PRESSURE ALUMINUM COMPRESSED GAS CYLINDERS CGA C 6.2 GUIDELINES FOR VISUAL INSPECTION AND REQUALIFICATION OF FIBER REINFORCED HIGH PRESSURE CYLINDERS CGA C 6.4 METHODS FOR EXTERNAL VISUAL INSPECTION OF NATURAL GAS VEHICLE (NGV) AND HYDROGEN VEHICLE (HV) FUEL CONTAINERS AND THEIR INSTALLATIONS CGA G 5 HYDROGEN CGA G 5.5 HYDROGEN VENT SYSTEMS CGA S 1.1 PRESSURE RELIEF DEVICE STANDARDS - PART 1: CYLINDERS FOR COMPRESSED GASES CGA S 1.2 PRESSURE RELIEF DEVICE STANDARDS - PART 2: PORTABLE CONTAINERS FOR COMPRESSED GASES CGA S 1.3 PRESSURE RELIEF DEVICE STANDARDS - PART 3: STATIONARY STORAGE CONTAINERS FOR COMPRESSED GASES CGSB 3.513 NATURAL GAS FOR VEHICLES CGS 12.5 NGV DISPENSING SYSTEMS CSA 12.8 NATURAL GAS FUELING STATION RECIPROCATING COMPRESSOR GUIDELINES CSA 12.54 BREAKAWAY DEVICES FOR NATURAL GAS DISPENSING HOSES AND SYSTEMS NACE RP 01 69 CONTROL OF EXTERNAL CORROSION ON UNDERGROUND OR SUBMERGED METALLIC PIPING SYSTEMS NB 23 NATIONAL BOARD INSPECTION CODE (NBIC) NFPA 1 FIRE CODE			

CNG REFUELLING INFRASTRUCTURE



DOCUMENTS	Regulatory Jurisdictions														Referenced In	Referenced Standards	North American	International	Other Key Players			
	Municipal	BC	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	PEI	NF & L	NWT	Yukon	Nunavut						Federal		
																	MANUALLY OPERATED VALVES FOR NATURAL GAS DISPENSING SYSTEMS CSA NG1 COMPRESSED NATURAL GAS VEHICLE (CNG) FUELING CONNECTION DEVICES NFPA 30 FLAMMABLE AND COMBUSTIBLE LIQUIDS CODE NFPA 30A MOTOR FUEL DISPENSING FACILITIES AND REPAIR GARAGES NFPA 54 NATIONAL FUEL GAS CODE NFPA 55 COMPRESSED GASES AND CRYOGENIC FLUIDS CODE NFPA 57 LIQUEFIED NATURAL GAS (LNG) VEHICULAR FUEL SYSTEMS CODE NFPA 59A PRODUCTION, STORAGE, AND HANDLING OF LIQUEFIED NATURAL GAS (LNG) NFPA 68 EXPLOSION PROTECTION BY DEFLAGRATION VENTING NFPA 68A PARKING STRUCTURES NFPA 120 FIRE PREVENTION AND CONTROL IN COAL MINES NFPA 122 FIRE PREVENTION AND CONTROL IN METAL/NONMETAL MINING AND METAL MINERAL PROCESSING FACILITIES NFPA 302 PLEASURE AND COMMERCIAL MOTOR CRAFT NFPA 400 HAZARDOUS MATERIALS CODE NFPA 502 POWERED INDUSTRIAL TRUCKS INCLUDING TYPE DESIGNATIONS, AREAS OF USE, CONVERSIONS, MAINTENANCE, AND OPERATIONS NFPA 853 INSTALLATION OF STATIONARY FUEL CELL POWER SYSTEMS NFPA 5000 BUILDING CONSTRUCTION AND SAFETY CODE SAE J 2406 RECOMMENDED PRACTICES FOR CNG POWERED MEDIUM AND HEAVY-DUTY TRUCKS	NFPA 10 PORTABLE FIRE EXTINGUISHERS NFPA 101 LIFE SAFETY CODE NFPA 1925 MARINE FIRE-FIGHTING VESSELS NFPA 285 TEST OF SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS NFPA 259 POTENTIAL HEAT OF BUILDING MATERIALS NFPA 300 MARINE FIRE-FIGHTING VESSELS NFPA 302 PLEASURE AND COMMERCIAL MOTOR CRAFT NFPA 303 MARINAS AND BOATYARDS NFPA 304 MOTOR FUEL DISPENSING FACILITIES AND REPAIR GARAGES NFPA 37 INSTALLATION AND USE OF STATIONARY COMBUSTION ENGINES AND GAS TURBINES NFPA 496 PURGED AND PRESSURIZED ENCLOSURES FOR ELECTRICAL EQUIPMENT NFPA 497 CLASSIFICATION OF FLAMMABLE LIQUIDS, GASES, OR VAPORS AND OF HAZARDOUS (CLASSIFIED) LOCATIONS FOR ELECTRICAL INSTALLATIONS IN CHEMICAL PROCESS AREAS NFPA 5000 BUILDING CONSTRUCTION AND SAFETY CODE NFPA 518 FIRE PREVENTION DURING WELDING, CUTTING, AND OTHER HOT WORK NFPA 54 NATIONAL FUEL GAS CODE NFPA 55 COMPRESSED GASES AND CRYOGENIC FLUIDS CODE NFPA 58 PRODUCTION, STORAGE, AND HANDLING OF LIQUEFIED NATURAL GAS (LNG) NFPA 68 EXPLOSION PROTECTION BY DEFLAGRATION VENTING NFPA 69 EXPLOSION PREVENTION SYSTEMS NFPA 70 NATIONAL ELECTRICAL CODE NFPA 704 IDENTIFICATION OF THE HAZARDS OF MATERIALS FOR EMERGENCY RESPONSE NFPA 72 NATIONAL FIRE ALARM AND SIGNALING CODE NFPA 77 STATIC ELECTRICITY NFPA 80 FIRE DOORS AND OTHER OPENING PROTECTIVES NFPA 96 VENTILATION CONTROL AND FIRE PROTECTION OF COMMERCIAL COOKING OPERATIONS NFPA 1740.16 SAFETY STANDARD FOR HYDROGEN AND HYDROGEN SYSTEMS SAE J 1618 RECOMMENDED PRACTICE FOR COMPRESSED NATURAL GAS VEHICLE FUEL SAE J 2343 RECOMMENDED PRACTICE FOR LNG MEDIUM AND HEAVY-DUTY POWERED VEHICLES SAE J 2578 RECOMMENDED PRACTICE FOR GENERAL FUEL CELL VEHICLE SAFETY SAE J 2680 COMPRESSED HYDROGEN SURFACE VEHICLE REFUELLING CONNECTION DEVICES SSPC-PA 1 SHOP, FIELD, AND MAINTENANCE PRINTING OF STEEL SSPC-PA 2 MEASUREMENT OF DRY COATING THICKNESS WITH MAGNETIC GAGES SSPC-SP 6 COMMERCIAL BLAST CLEANING				
Model Code Adoption Across Canada		Province-wide building, fire, and plumbing codes that are substantially the same as National Model Codes with variations that are primarily additions.	Province-wide building, fire, and plumbing codes that are substantially the same as National Model Codes with variations that are primarily additions.	Province-wide adoption of the National Building Code, National Fire Code and National Plumbing Code with some modifications and additions.	Province-wide adoption of the National Building Code, National Fire Code and National Plumbing Code with some modifications and additions.	Province-wide building, fire and plumbing codes based on the National Model Codes, but with significant variations in content and scope. The Ontario Fire Code, in particular, is significantly different from the National Fire Code. Ontario also references the Model National Energy Code for Buildings in its building code.	Province-wide building and plumbing codes that are substantially the same as the National Building Code and National Plumbing Code, but with variations that are primarily additions. Major municipalities adopt the National Fire Code.	Province-wide adoption of the National Building Code, National Fire Code and National Plumbing Code with some modifications and additions.	Province-wide adoption of the National Building Code, National Fire Code and National Plumbing Code with some modifications and additions.	Province-wide adoption of the National Fire Code and the National Building Code, except aspects pertaining to means of egress and to one and two-family dwellings within Group C in Part 9. No province-wide plumbing code.	Province-wide fire code not based on the National Fire Code.	Territory-wide adoption of the National Building Code and National Fire Code with some modifications and additions. Yukon adopts the NPC.	Territory-wide adoption of the National Building Code and National Fire Code with some modifications and additions. Yukon adopts the NPC.	Territory-wide adoption of the National Building Code and National Fire Code with some modifications and additions. Yukon adopts the NPC.	No references identified	National Fire Code of Canada 2005, Section 4.6 Fuel Dispensing Stations references the following standards: CSA B108, CAN/CSA B149-1, CAN/CSA B149-2			http://www.nationalcodes.ca/nationalcodes/adopted.htm (Data Modified: 2010-06-21)			
CSA C22.2 - Canadian Electrical Code						Ontario Electrical Safety Code — Product Safety, O. Reg. 438/07 (Electricity Act, 1998); Licensing of Electrical Contractors and Master Electricians, O. Reg. 670/05 (Electricity Act, 1998); Electrical Distribution Safety, O. Reg. 22/04 (Electricity Act, 1998)																
ACOUSTICS STANDARDS																					ISO 1996-1:2003 Acoustics - Description, measurement and assessment of environmental noise — Part 1: Basic quantities and assessment procedures - (references IEC 61672-1, Electromagnetics — Sound level meters — Part 1: Specifications 1) ISO 1996-2:2007 Acoustics - Description, measurement and assessment of environmental noise — Part 2: Determination of environmental noise levels	CSA is gathering information on how municipal fleet managers across Canada http://www150.ca/Partners-for-Climatic-Protection/Enviro-fleet.asp
REGULATIONS	Additional Requirements					1. Ontario Regulation 212/01 (Gaseous Fuels) — 2. Ontario Regulation 211/01 (Propane Storage and Handling) — 3. Ontario Regulation 210/01 (Oil and Gas Pipeline Systems) — 4. Ontario Regulation 213/01 (Fuel Oil) — 5. Ontario Regulation 214/01 (Compressed Gas) PROVIDES ADDITIONAL REQUIREMENTS TO THE CSA B108 — 6. Ontario Regulation 215/01, s. 2 (1), 5, Reg. 256/07, s. 2. Codes and Standards Adopted by Reference. — 7. ONTARIO REGULATION 223/01 CODES AND STANDARDS ADOPTED BY REFERENCE																

FUEL QUALITY

Documents	Regulatory Jurisdictions											Referenced publications	North American	International	Other Key Players	
	Municipal	BC	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	P.E.I.	Federal					
CAN/CGA B105-M93: Code for digester gas and landfill gas installations		Gas Safety Regulation, B.C. Reg. 103/2004, (Safety Standards Act)	No references	Gas Inspection Regulations, R.R.S. c. G-3.2 Reg. 1, (Gas Inspection Act, 1993)	No references	No references	No references	Standards Regulation, N.B. Reg. 84-177, (Boiler and Pressure Vessel Act)	Fuel Safety Regulations, N.S. Reg. 186/2006, (Fire Safety Act)	General Regulations, P.E.I. Reg. EC234/85, (Boilers and Pressure Vessels Act)	No references	ANSI A21.52 DUCTILE IRON PIPE, CENTRIFUGALLY CAST, GAS ANSI Z21.21 AUTOMATIC VALVES FOR GAS APPLIANCES ASME B16.1 GRAY IRON PIPE FLANGES AND FLANGED FITTINGS ASME B16.3 MALLEABLE IRON THREADED FITTINGS, CLASSES 150 AND 300 ASME B16.5 PIPE FLANGES AND FLANGED FITTINGS, NPS 1/2 THROUGH NPS 24 METRIC/INCH STANDARD ASME B16.9 FACTORY-MADE WROUGHT BUTTWELDING FITTINGS ASME B18.2.1 SQUARE AND HEX BOLTS AND SCREWS, INCH SERIES ASME B36.10M WELDED AND SEAMLESS WROUGHT STEEL PIPE ASME B36.19M STAINLESS STEEL PIPE ASTM A 105 FORGINGS, CARBON STEEL FOR PIPING COMPONENTS ASTM A 234/A234M SPECIFICATION FOR PIPING FITTINGS OF WROUGHT CARBON STEEL AND ALLOY STEEL FOR MODERATE AND HIGH TEMPERATURE SERVICE ASTM A 289 SPECIFICATION FOR SEAMLESS AND WELDED AUSTENITIC STAINLESS STEEL TUBING FOR GENERAL SERVICE ASTM A 47 SPECIFICATION FOR FERRITIC MALLEABLE IRON CASTINGS ASTM A 53 SPECIFICATION FOR PIPE, STEEL, BLACK AND HOT-DIPPED, ZINC-COATED WELDED AND SEAMLESS ASTM A 774 SPECIFICATION FOR HIGH-STRENGTH LOW-ALLOY WELDED AND SEAMLESS STEEL PIPE ASTM B 88 SPECIFICATION FOR SEAMLESS COPPER WATER TUBE ASTM D 2996 SPECIFICATION FOR FILAMENT-WOUND "FIBERGLASS" (GLASS-FIBER-REINFORCED THERMOSETTING-RESIN) PIPE AWWA C111/A21.11 RUBBER-GASKET JOINTS FOR DUCTILE-IRON PRESSURE PIPE AND FITTINGS CGA 3.11 LEVER OPERATED PRESSURE LUBRICATED PLUG TYPE GAS SHUT-OFF VALVES CGA 3.16 LEVER OPERATED NON-LUBRICATED GAS SHUT-OFF VALVES CGA 3.9 AUTOMATIC SAFETY SHUT-OFF GAS VALVES CGA 6.3 DOMESTIC GAS APPLIANCE PRESSURE REGULATORS CGA 6.8 GAS FILTERS ON APPLIANCES CGA B149.1 NATURAL GAS INSTALLATION CODE CGA B149.2 PROPANE INSTALLATION CODE CGSB 24-GP-3A IDENTIFICATION AND CLASSIFICATION OF PIPING SYSTEMS CSA 6.5 AUTOMATIC VALVES FOR GAS APPLIANCES CSA B137.3 RIGID POLY(VINYL CHLORIDE) (PVC) PIPE FOR PRESSURE APPLICATIONS CSA B137.4 POLYETHYLENE PIPING SYSTEMS FOR GAS SERVICES CSA B139 INSTALLATION CODE FOR OIL-BURNING EQUIPMENT CSA B51 BOILER, PRESSURE VESSEL, AND PRESSURE PIPING CODE CSA C22.1 CANADIAN ELECTRICAL CODE - PART 1: SAFETY STANDARD FOR ELECTRICAL INSTALLATIONS CSA C22.2.152 COMBUSTIBLE GAS DETECTION INSTRUMENTS CSA C22.2.99 CONSTRUCTION AND TEST OF DOMESTIC ELECTRIC IRONING MACHINES CSA Z184 GAS PIPELINE SYSTEMS	SAE J 1616 (1994) RECOMMENDED PRACTICE FOR COMPRESSED NATURAL GAS VEHICLE FUEL			
CGA B105S1-07 SUPPLEMENT NO. 1 TO CAN/CGA B105-M93		No references	No references	No references	No references	No references	No references	Standards Regulation, N.B. Reg. 84-177, (Boiler and Pressure Vessel Act)	No references	No references	No references	No references	N/A			
CAN/CGSB-3.14-2006 Liquefied Petroleum Gas (Propane) for Fuel Purposes		No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	Motor Vehicle Safety Regulations, C.R.C., c. 1038, (Motor Vehicle Safety Act) ref: CAN/CGSB-3.14-M88	REFERENCED PUBLICATIONS 2.1 The following publications are referenced in this standard: 2.1.1 Canadian General Standards Board (CGSB) CAN/CGSB-3.0 — Methods of Testing Petroleum and Associated Products: No. 14.3 — Standard Test Method for the Identification of Hydrocarbon Components in Automotive Gasoline using Gas Chromatography No. 18.5 — Test for Ethyl Mercaptan Odorant in Propane, Field Method. 2.1.2 Canadian Standards Association (CSA) CAN/CSA-B149.2 — Propane Storage and Handling Code. 2.1.3 ASTM International Annual Book of ASTM Standards (See Appendix A). 1 See the precautions and warning statements in par. 8.2 and Appendix F. CAN/CGSB-3.14-20 2.1.4 Gas Processors Association (GPA) RR-129 — Human Response Research Evaluation of Alternate Odorants for LP-Gas GPA 2140 — Liquefied Petroleum Gas Specifications and Test Methods. 2.1.5 U.S. Department of Commerce BERC/R1-771 — A New Look at Odorization Levels for Propane Gas. 2.2 A dated reference in this standard is to the issue specified. An undated reference in this standard is to the latest issue unless otherwise specified by the authority applying this standard. The sources are given in the Notes section.	Information resource on quality: http://www.uniongas.com/aboutus/abouting/comp/position.asp		

FUEL QUALITY

Documents	Municipal	Regulatory Jurisdictions										Federal	Referenced publications	North American	International	Other Key Players	
		BC	Alberta	Saskatchewan	Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	P.E.I.							
STANDARDS ASTM D1835 - 05 Standard Specification for Liquefied Petroleum (LP) Gases		No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	ASTM D 1265 PRACTICE FOR SAMPLING LIQUEFIED PETROLEUM (LP) GASES, MANUAL METHOD ASTM D 1267 TEST METHOD FOR GAGE VAPOR PRESSURE OF LIQUEFIED PETROLEUM (LP) GASES (LP-GAS METHOD) ASTM D 1657 TEST METHOD FOR DENSITY OR RELATIVE DENSITY OF LIGHT HYDROCARBONS BY PRESSURE HYDROMETER ASTM D 1837 TEST METHOD FOR VOLATILITY OF LIQUEFIED PETROLEUM (LP) GASES ASTM D 1838 TEST METHOD FOR COPPER STRIP CORROSION BY LIQUEFIED PETROLEUM (LP) GASES ASTM D 2158 TEST METHOD FOR RESIDUES IN LIQUEFIED PETROLEUM (LP) GASES ASTM D 2163 TEST METHOD FOR DETERMINATION OF HYDROCARBONS IN LIQUEFIED PETROLEUM (LP) GASES AND PROPANE/PROPENE MIXTURES BY GAS CHROMATOGRAPHY ASTM D 2420 TEST METHOD FOR HYDROGEN SULFIDE IN LIQUEFIED PETROLEUM (LP) GASES (LEAD ACETATE METHOD) ASTM D 2598 PRACTICE FOR CALCULATION OF CERTAIN PHYSICAL PROPERTIES OF LIQUEFIED PETROLEUM (LP) GASES FROM COMPOSITIONAL ANALYSIS ASTM D 2713 TEST METHOD FOR DRYNESS OF PROPANE (VALVE FREEZE METHOD) ASTM D 2784 TEST METHOD FOR SULFUR IN LIQUEFIED PETROLEUM GASES (OXY-HYDROGEN BURNER OR LAMP) ASTM D 3700 PRACTICE FOR OBTAINING LPG SAMPLES USING A FLOATING PISTON CYLINDER ASTM D 6897 TEST METHOD FOR DETERMINATION OF TOTAL VOLATILE SULFUR IN GASEOUS HYDROCARBONS AND LIQUEFIED PETROLEUM GASES BY ULTRAVIOLET FLUORESCENCE ASTM D 6897 TEST METHOD FOR VAPOR PRESSURE OF LIQUEFIED PETROLEUM GASES (LPG) (EXPANSION METHOD) CPA 2140 LIQUEFIED PETROLEUM GAS SPECIFICATIONS AND TEST METHODS			
ASTM D1945-03 (2006), Standard Test Method for Analysis of Natural Gas by Gas Chromatography		No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	ASTM D 2597 TEST METHOD FOR ANALYSIS OF DEMETHANIZED HYDROCARBON LIQUID MIXTURES CONTAINING NITROGEN AND CARBON DIOXIDE BY GAS CHROMATOGRAPHY ASTM D 3588 PRACTICE FOR CALCULATING HEAT VALUE, COMPRESSIBILITY FACTOR, AND RELATIVE DENSITY OF GASEOUS FUELS ASTM E 260 PRACTICE FOR PACKED COLUMN GAS CHROMATOGRAPHY			Canadian Natural Gas Vehicle Alliance http://www.cngva.org/
ASTM D1946-98 (2006), Standard Practice for Analysis of Reformed Gas by Gas Chromatography		No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	ASTM E 260 PRACTICE FOR PACKED COLUMN GAS CHROMATOGRAPHY			Canadian Gas Association http://www.cga.ca/
ASTM D3246 TEST METHOD FOR SULFUR IN PETROLEUM GAS BY OXIDATIVE MICROCOULOMETRY		No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	ASTM D 1193 SPECIFICATION FOR REAGENT WATER ASTM D 1265 PRACTICE FOR SAMPLING LIQUEFIED PETROLEUM (LP) GASES, MANUAL METHOD ASTM D 3120 TEST METHOD FOR TRACE QUANTITIES OF SULFUR IN LIGHT LIQUID PETROLEUM HYDROCARBONS BY OXIDATIVE MICROCOULOMETRY ASTM F 307 PRACTICE FOR SAMPLING PRESSURIZED GAS FOR GAS ANALYSIS CGA G 4 OXYGEN CGA G 4.1 CLEANING EQUIPMENT FOR OXYGEN SERVICE			Natural Gas Interchangeability within Canada http://www.cga.ca/publications/documents/NGI_BrochureJune2006.pdf
ISO 15403-1 NATURAL GAS - NATURAL GAS FOR USE AS A COMPRESSED FUEL FOR VEHICLES - PART 1: DESIGNATION OF THE QUALITY		No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	No references	Referenced Standard: AGA NGV 2 BASIC REQUIREMENTS FOR COMPRESSED NATURAL GAS VEHICLE (NGV) FUEL CONTAINERS ASTM D 1142 TEST METHOD FOR WATER VAPOR CONTENT OF GASEOUS FUELS BY MEASUREMENT OF DEW-POINT TEMPERATURE ASTM D 2699 TEST METHOD FOR RESEARCH OCTANE NUMBER OF SPARK-IGNITION ENGINE FUEL ASTM D 2700 TEST METHOD FOR MOTOR OCTANE NUMBER OF SPARK-IGNITION ENGINE FUEL EN 437 TEST GASES - TEST PRESSURES - APPLIANCE CATEGORIES EN 589 AUTOMOTIVE FUELS - LPG - REQUIREMENTS AND TEST METHODS GRI 92/0123 VARIABILITY OF NATURAL GAS COMPOSITION IN SELECT MAJOR METROPOLITAN AREAS OF THE UNITED STATES GRI 92/0150 EFFECT OF GAS COMPOSITION ON OCTANE NUMBER OF NATURAL GAS FUELS GRI 92/0158 PROCEEDINGS OF THE GAS RESEARCH INSTITUTE NATURAL GAS VEHICLE FUEL COMPOSITION WORKSHOP GRI-92/0054 EFFECT OF GAS COMPOSITION ON OCTANE NUMBER OF NATURAL GAS FUELS - TOPICAL REPORT ISO 10101-1 NATURAL GAS - DETERMINATION OF THE WATER BY THE KARL FISCHER METHOD - INTRODUCTION ISO 10101-2 NATURAL GAS - DETERMINATION OF WATER BY THE KARL FISCHER METHOD - TITRATION PROCEDURE ISO 10101-3 NATURAL GAS - DETERMINATION OF WATER BY THE KARL FISCHER METHOD - COULOMETRIC PROCEDURE ISO 10715 NATURAL GAS - SAMPLING GUIDELINES ISO 11541 NATURAL GAS - DETERMINATION OF WATER CONTENT AT HIGH PRESSURE ISO 12213-1 NATURAL GAS - CALCULATION OF COMPRESSION FACTOR - PART 1: INTRODUCTION AND GUIDELINES			ISO - TC 193- Natural gas http://www.iso.org/iso/iso_catalogue/catalogue_tc_browse.htm?commid=54448 International Association for Natural Gas Vehicles http://www.iangv.org/ Tools and Resources: http://www.iangv.org/tools-resources.html http://www.iangv.org/tools-resources/international-standards-a-k.html#Canadian

FUEL QUALITY

Documents		Regulatory Jurisdictions											Referenced publications	North American	International	Other Key Players	
		Municipal	BC	Alberta	Saskatchewan	Provincial Manitoba	Ontario	Quebec	New Brunswick	Nova Scotia	P.E.I.	Federal					
														ISO 12213-2 NATURAL GAS - CALCULATION OF COMPRESSION FACTOR - PART 2: CALCULATION USING MOLAR COMPOSITION ANALYSIS ISO 12213-3 NATURAL GAS - CALCULATION OF COMPRESSION FACTOR - PART 3: CALCULATION USING PHYSICAL PROPERTIES ISO 13443 NATURAL GAS - STANDARD REFERENCE CONDITIONS ISO 13696 NATURAL GAS - QUALITY DESIGNATION ISO 13734 NATURAL GAS - ORGANIC SULFUR COMPOUNDS USED AS ODORANTS - REQUIREMENTS AND TEST METHODS ISO 14532 NATURAL GAS - VOCABULARY ISO 5163 PETROLEUM PRODUCTS - DETERMINATION OF KNOCK CHARACTERISTICS OF MOTOR AND AVIATION FUELS - MOTOR METHOD ISO 5164 PETROLEUM PRODUCTS - DETERMINATION OF KNOCK CHARACTERISTICS OF MOTOR FUELS - RESEARCH METHOD ISO 6326-1 NATURAL GAS - DETERMINATION OF SULFUR COMPOUNDS - PART 1: GENERAL INTRODUCTION ISO 6326-3 NATURAL GAS - DETERMINATION OF SULFUR COMPOUNDS - DETERMINATION OF HYDROGEN SULFIDE, MERCAPTAN SULFUR AND CARBONYL SULFIDE SULFUR BY POTENTIOMETRY ISO 6326-4 NATURAL GAS - DETERMINATION OF SULFUR COMPOUNDS - GAS CHROMATOGRAPHIC METHOD USING A FLAME PHOTOMETRIC DETECTOR FOR THE DETERMINATION OF HYDROGEN SULFIDE, CARBONYL SULFIDE AND SULFUR-CONTAINING ODORANTS ISO 6326-5 NATURAL GAS - DETERMINATION OF SULFUR COMPOUNDS - PART 5: LINGENER COMBUSTION METHOD ISO 6327 GAS ANALYSIS - DETERMINATION OF THE WATER DEW POINT OF NATURAL GAS - COOLED SURFACE CONDENSATION HYGROMETERS ISO 6570-1 NATURAL GAS - DETERMINATION OF POTENTIAL HYDROCARBON LIQUID CONTENT - PRINCIPLES AND GENERAL REQUIREMENTS ISO 6974 (ALL PARTS) NATURAL GAS - DETERMINATION OF COMPOSITION WITH DEFINED UNCERTAINTY BY GAS CHROMATOGRAPHY ISO 6976 NATURAL GAS - CALCULATION OF CALORIFIC VALUES, DENSITY, RELATIVE DENSITY AND WOBBE INDEX FROM COMPOSITION ISO 7941 COMMERCIAL PROPANE AND BUTANE - ANALYSIS BY GAS CHROMATOGRAPHY MTZ 33 NFPA 52 VEHICULAR GASEOUS FUEL SYSTEMS CODE SAE 922359 EFFECT OF GAS COMPOSITION ON OCTANE NUMBER OF FUELS SAE J 1616 RECOMMENDED PRACTICE FOR COMPRESSED NATURAL GAS VEHICLE FUEL			
CODES																	

Part 2

Natural Gas for Transportation Deployment Roadmap:

Identification and analysis of existing codes and standards related to compressed natural gas refuelling station pressure limitations

November 2012



Standards Council of Canada
Conseil canadien des normes

Canada

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1. Background/Introduction

Interest in compressed natural gas (CNG) for transportation has fluctuated since the 1980s. The development of codes, standards and regulations (CS&R) for natural gas vehicles (NGVs) has long been established in Canada. When NGVs started to enter the Canadian market, it was recognized that adequate CS&R for NGV technologies did not exist. Significant effort throughout the 1990s resulted in improvements in this area. In the early 2000's, these developments faced decline with the deregulation of the natural gas distribution industry, a rise in natural gas prices and a shift in the cost advantage between petroleum and natural gas. There is now a renewed interest in natural gas for transportation. This is the result of improved vehicle and station technologies, an abundance of natural gas supply, a decline in prices, the ongoing need for energy diversification, and the broader expectation of carbon emission reductions from the transportation sector.

The *Natural Gas Use in the Canadian Transportation Sector: Deployment Roadmap* was released on January 6, 2011. The document was facilitated by Natural Resources Canada (NRCan), in partnership with governments at all levels, as well as industry, academic and non-governmental organizations. The initiative aims to identify opportunities and challenges associated with natural gas vehicle deployment. As part of its recommendations, the roadmap identified the importance "...[of] collaborat[ing] with existing Canadian Standards Association [CSA] technical committees to address gaps and issues in existing codes and standards identified during the roadmap process." One of the gaps/ issues identified per the roadmap's ten priority areas was the harmonization of the regulatory requirements for CNG refuelling station pressure limitations in various jurisdictions.

A well-established infrastructure for CS&R is crucial to Canada's competitiveness and well-being. CS&R affects the efficiency of energy-using products entering the market. In the long-term, the deployment of high efficiency energy products will have a positive impact on the Canadian economy. Canada has a well-developed set of CS&R that are relevant to CNG vehicles and refuelling stations, but due to limited market activity in recent years, there are issues and gaps that need to be addressed to support potential future market development.

2. Scope of the Research

The Standards Council of Canada (SCC) was contracted by NRCan to document and analyze existing codes, standards, and regulations pertaining to CNG vehicles and CNG refuelling infrastructure. This was one of the top ten priority issues raised by the Codes and Standards working group¹ that had participated in the development of the roadmap document. Specifically, SCC was asked to conduct research and analysis pertaining to jurisdictional variances in CNG refuelling station pressure limitations (3,000 psi and 3,600 psi), as well as the associated regulatory requirements in each jurisdiction in support of the roadmap. The document was reviewed via consultation with NRCan and the involved technical committees.

This project will help clarify and define some of the issues associated with codes and standards for the use of natural gas in transportation, as identified in the *Medium & Heavy Vehicles – Five Year Codes and Standards Work Plan – March 2011 by Change Energy*².

¹ The Codes and Standards Working Group is one of six NRCan-led groups that focus on compressed natural gas (CNG) and liquefied natural gas (LNG) vehicles, refueling stations and fuel supply.

² Change Energy is an engineering consultancy group and provider of compressed gas fuelling solutions, from feasibility and planning to procurement and delivery. This group provided support to NRCan in the setting of priority areas for the roadmap document.

Part of the intent of this project was also to identify and consult with the “Authorities Having Jurisdiction” (AHJs) in provincial, territorial and federal jurisdictions. The resulting findings are not exhaustive, due to limitations in participation on part of certain AHJs, and limited available data.

An analysis and summary of the original findings, as per the document entitled *Canadian regulatory requirements for infrastructure fill pressure– March 2012* (see Annex A) is divided into the following main sections:

- Refuelling station pressure limitations of NGVs;
- Recommendations and next steps.

3. Methodology

SCC gathered the necessary data through its internal research tools. A spreadsheet with findings entitled *Canadian regulatory requirements for infrastructure fill pressure – March 2012* (Annex A) was developed to track data. The spreadsheet was then confirmed with the federal, provincial and territorial AHJs through consultations. Based on this aggregate information, SCC performed an analysis for the area in question that identifies:

- Gaps in current codes, standards, and regulations;
- Inconsistencies among current codes, standards and regulations between jurisdictions in Canada;
- The number of codes affected by this inconsistency and the significance of the issue;
- The number of times refuelling pressure limitations were mentioned in standards, codes and regulations in provincial and federal jurisdictions;
- Improper referencing of standards and codes in federal, provincial and territorial regulations; and
- Potential to harmonize Canadian codes, standards, and regulations: (a) within Canada and (b) with United States.

SCC used the following tools to produce the *Canadian regulatory requirements for infrastructure fill pressure– March 2012* (Annex A):

- SCC’s standards search tool: <http://www.scc.ca/en/search/standards>
- SCC’s Virtual Technical Document Centre (VTDC)
- CANLII (Canadian Legal Information Institute): <http://www.canlii.org/>
- ILI (ILI Standards InfoBase) by SAI Global: <http://www.ili-info.com/>
- Federal and provincial/territorial governments websites
- Google and other publicly accessible search tools
- Expertise from SCC’s standards research team.

4. Refuelling station pressure limitations for NGVs

In North America, there are currently two maximum pressures specified for fuelling CNG vehicles. The two are 3,000 pounds per square inch (psi) and 3,600 psi. A station designer can choose to design a vehicle refuelling station at either of these pressures. Public stations in Canada dispense CNG at 3,000 psi. Private stations have the option of dispensing CNG at pressures of up to 3,600 psi. There is no risk of over-pressurizing a natural gas vehicle as the connection is designed so that a 3,000 psi vehicle cannot refuel at a 3,600 psi station.

According to British Columbia, Saskatchewan and Ontario, all publically-accessible refuelling stations have been built to the national Canadian standard (*CSA B108 Natural Gas Fuelling Stations Installation Code*) of 3,000 psi delivery to the vehicle. In order to supply CNG at 3,600 psi, changes to legislations and modifications to the existing CNG refuelling facilities would be necessary. Therefore, altering the requirements for refuelling pressure limitations highlighted in the *CSA B108 Natural Gas Fuelling Stations Installation Code* will not suffice without the necessary modifications required in the CNG refuelling stations.

Alberta has also confirmed that all CNG public stations in the province have been built to conform to the national standard of 3,000psi with one exception only. A public station with the capacity of dispensing CNG at 3,600psi is being considered for construction in Calgary. The expectation is that the station will not operate at that pressure due to requirements highlighted in the *CSA B108 Natural Gas Fuelling Stations Installation Code*. It is suspected that the design will be similar to private stations and the lower dispensing pressure will not be considered for this proposed station.

The AHJs also reported on the number of CNG public and private stations in their jurisdictions. There are a total of 24 CNG stations in British Columbia, 12 in Alberta, 10 in Saskatchewan and 90 in Ontario.³

In Canada, the *CSA B108 Natural Gas Fuelling Stations Installation Code* does not allow 3,600 psi filling at a public station. This code allows 3,000 psi systems at public refuelling stations; however, it does not provide guidance on maximum pressure to be dispensed at private refuelling stations, such as those which private fleets may have in-place to meet their own requirements.

Similar refuelling station pressure limitations exist in the standard, *CSA B149.1-10 – Natural Gas for Vehicles Code*:

- Section 10.3 and 10.4 references *CAN/CSA B108 Natural Gas Fuelling Stations Installation Code*.
- Section 10.4 of *CSA B149.1-10* specifies that the discharge piping and hose, not directly connected by the manufacturer, from the outlet of a Vehicle Refuelling Appliances (VRA) must be installed in accordance with requirements of *CAN/CSA B108*.

According to the research conducted by SCC, which includes responses received from consultations with the AHJs, the dominant codes / standards being referenced that relate to the refuelling station pressure limitations of NGVs are:

- *CAN/CSA B108-99 (2004) Natural Gas Fuelling Stations Installation Code* – Alberta (*Safety Code Act*), Saskatchewan (*Gas Inspection Act*), Ontario (*Technical Standards and Safety Act*), Quebec (*Highway Safety Code and Construction Code*), and New Brunswick (*Boiler and Pressure Vessel Act*);
- *CSA B149.1-10 Natural Gas for Vehicles Code* – BC (*Gas Safety Regulation*); and
- *CMVSS 301.2 CNG Fuel System Integrity* – Federal (*Motor Vehicle Safety Act*).

³ Please note that for Saskatchewan and Alberta the number above includes only CNG public stations. Ontario reported on both CNG private and public stations for filling fleet vehicles and fork lifts and BC provided a collective number for both CNG public and private stations for filling fleet vehicles. Also note that Quebec and New Brunswick have not provided any data in regards to their refueling pressure limitations and the number of CNG stations. Also, SCC has not received any additional information from the Province of Alberta or the local authority having jurisdiction (AHJ) in Calgary regarding a CNG public refueling station expected to dispense CNG at 3,600 psi.

Within these codes, the following standards are referenced:

- *CSA NGV1-2006 Compressed Natural Gas Vehicle (NGV) Fuelling Connection Devices:* This standard applies to devices with pressure ratings of either 2400 psi (P24), 3000 psi (P30) or 3600 psi (P36).
- *ANSI NGV2-2007 Compressed Natural Gas Vehicle Fuel Containers:* This standard specifies that service pressures in common usage are 20 700 kPa (3000 psi) and 24 800 kPa (3600 psi) at 21°C (70°F).
- *CSA 12.6-04 Vehicle Refuelling Appliances:* This standard applies to devices with pressure ratings of either 3000 psi (P30) or 3600 psi (P36).
- *CSA 12.52-M99 (ANSI/IAS NG 4.2-1999) Hoses for Natural Gas Vehicles and Dispensing Systems – Service Pressure:* This standard specifies the settled pressure at a uniform gas temperature of 20°C (70°F), which may be at pressure ratings of 2400, 3000 or 3600 psi.
- *CGA NGV 12.3-M95 (ANSI/AGA NGV 3.1-1995) Fuel System Components for Natural Gas Powered Vehicles:* No references to pressure ratings are included.
- *ANSI/IAS PRD 1-1998 Basic Requirements for Pressure Relief Devices for Natural Gas Vehicle (NGV) Fuel Containers – Maximum pressures:* This standard specifies nominal service pressures of fuel containers certified to NGV2 [4] are 20,700 kPa (3000 psi) or 24,800 kPa (3600 psi) at a settled temperature of +21°C (+70°F).

The standards support both 3000 psi and 3600 psi. If a decision were made to change the requirements for refuelling station pressure limitations from 3000 psi to 3600 psi for public stations in the *CSA B108 Natural Gas Fuelling Stations Installation Code*, it would not have an effect on existing standards referenced since these already specify both 3000 psi and 3600 psi refuelling pressure limitations.

Inconsistencies between jurisdictions

The provinces are consistent in terms of referencing the appropriate codes and standards relevant to the refuelling station pressure limitations of NGVs. Alberta, Saskatchewan, Ontario, Quebec, and New Brunswick all refer to *CSA B108 Natural Gas Fuelling Stations Installation Code*. British Columbia references section 10.4 of *CSA B149.1-10 – Natural Gas for Vehicles Code* for VRAs without storage, and *CSA B108 Natural Gas Fuelling Stations Installation Code* as a best practice design code for refuelling installations with storage.

Nova Scotia, Prince Edward Island, Newfoundland and Labrador, Yukon, Northwest Territories, and Nunavut do not have any specific legislative or regulatory requirements regarding NGVs. The AHJs from these provinces / territories have confirmed that no codes / standards have been adopted for NGVs because NGVs and associated natural gas infrastructure are not present in their jurisdictions (see Annex A).

The AHJs have not reported different CNG refuelling station pressure regulatory requirements for Original Equipment Manufacturer (OEM) and After Market Vehicles (AMVs) in their jurisdictions. This could be due to a limited amount of OEM NGVs being produced in the North American market.

British Columbia, Alberta, Saskatchewan, Ontario, Quebec, and New Brunswick have reported that the requirements for CNG refuelling are aligned with those of NGVs in their jurisdictions. This means that since these provinces reference the requirements of *CSA B108*, all 3000 psi refuelling nozzles match to 3600 psi refuelling receptacles per *ANSI NGV-1*, (as referenced in *CSA B108 Natural Gas Fuelling Stations Installation Code*). The above-listed provinces have

also reported that the standards and codes used to highlight requirements for CNG refuelling station pressure limitations were all referenced properly in provincial regulations.

5. Harmonization and possible solutions

All the provincial/ territorial/ federal AHJs consulted expressed their support for harmonization of requirements and regulations between Canadian provinces/ territories and across the border with the United States. Since most vehicles are capable of crossing jurisdictional lines and as such becoming subject to U.S. / international requirements for labelling and refilling, harmonization of CS&R would be beneficial. Having harmonized standards and codes would establish consistent safety requirements throughout North America and thus enable NGVs to move inter-provincially and into the U.S. without unnecessary barriers and limitations. As well, given the Canadian auto industry's dependence on the U.S. market and the number of vehicles imported into Canada from that market, harmonization becomes all the more significant.

Even though all the AHJs have expressed their support for harmonizing CS&R between provinces and with the United States, some AHJs have expressed concerns with respect to harmonization. Officials in British Columbia and Alberta remarked that many facets of the Canadian CS&R are "more stringent" than American requirements and raised concerns about regulatory processes that involve the use of self-declaration⁴ in the U.S. They urge that Canada should remain cautious to not "dilute" its requirements for the purpose of accessing a larger market in the U.S.

6. Recommendations and next steps

The SCC research conducted to date provides an overview of existing codes, standards, and regulations for CNG Vehicles and CNG Refuelling Infrastructure. However, given the complexity of this topic, which is affected by many new and emerging technologies, there is potential for more investigation. Following are recommended areas for further exploration:

CSA Subcommittee

- The Canadian codes and standards regarding refuelling pressure limitations need to be updated to allow vehicles with 3,600 psi cylinders to be filled to that pressure. This would allow more fuel to be carried aboard vehicles and increase the range between refuelling. The standards related to refuelling pressure need to be harmonized with those of the United States.
- Harmonization of standards for the certification and recertification of cylinders used in vehicles is necessary. CNG vehicles are usually certified by AHJs with an expiry date. This date usually corresponds with the recertification date of the on-board fuel cylinders. However, enforcement of conformity becomes an issue when vehicles are refuelled on a "self-serve" basis, or otherwise fleet refuelled. Access cards to card-lock facilities⁵ should automatically expire on the cylinder recertification date. Similarly, the gas service to a VRA should expire. AHJs have expressed their concerns regarding this matter and see the development of concrete CS&R as essential for addressing this issue.

⁴ This process entails a voluntary affirmation of compliance with codes, standards and regulations (CS&R) as released by a manufacturer or supplier of CNG vehicles and/ or fuel supplies.

⁵ In some cases, refueling stations and other CNG-related facilities may be outfitted with securitized card-only access barriers for added safety.

Technical advisory group

- The mobility of the vehicles from one province and territory to another makes it essential to consider harmonizing CS&R to provide equal safety requirements throughout Canada and to facilitate the movement of the vehicles across the country. In regard to refuelling pressure limitations, regulations must include provisions for the filling of NGVs from other jurisdictions and not just NGVs registered within the province. Harmonization of CS&R in this area should be considered in order to facilitate the deployment of NGVs across the country.
- Expanding the scope of this project would help to determine if the AHJs are referencing the most recent versions of the codes related to refuelling pressure limitations in their regulations. It is advisable that if a code or standard is updated, revised or replaced, the regulation should reference the latest edition. Differences between jurisdictions can arise when references to standards in regulations are not consistently monitored and updated as needed, and could thus pose an impediment to broader market development.

General

- A review of jurisdictional variances regarding the minimum gas quality requirements for use in NGVs and natural gas pipelines, as well as the identification of gaps and inconsistencies of CS&R in this area would be beneficial.
- A review of current building codes and standards to assess the indoor maintenance and storage area requirements for NGVs may be relevant. Officials from Québec expressed a concern with the lack of clear and comprehensive safety requirements for CNG vehicle repairs being conducted inside buildings in that province.
- While the scope of this report did not pertain to regulations and bylaws at the municipal level, it would be useful to conduct further similar research in specific local jurisdictions. There may be a number of relevant municipal by-laws with an effect on the use of natural gas in the transportation sector (noise by-laws, setbacks, parking requirements, etc.).

ANNEX A: List of Canadian regulatory requirements for infrastructure fill pressure and vehicle labelling

SCC Research Results: Infrastructure Fill Pressure				AHJ Response: Infrastructure Fill Pressure		
Province/ Territory	Regulation	Enforcement code	NGV Fill Pressure	Regulation	Enforcement code	NGV Fill Pressure
BC	<ul style="list-style-type: none"> B.C. Reg. 103/2004, Gas Safety Regulation 	<i>CAN/CSA B149.1-10 Natural Gas for Vehicles Code (section 10.4 references CAN/CSA B108 Natural Gas Fuelling Stations Installation Code)</i>	3000(2900 and 3770 psi) as per CAN/CSA B108	<ul style="list-style-type: none"> B.C. Reg. 103/2004, Gas Safety Regulation 	<ul style="list-style-type: none"> <i>CAN/CSA B108-99 (2004) Natural Gas Fuelling Stations Installation Code</i> for refuelling installations with storage <i>CAN/CSA B149.1-10 Natural Gas for Vehicles Code</i> for vehicles without storage. 	3000(2900 and 3770 psi) as per CAN/CSA B108
AB	<ul style="list-style-type: none"> ALBERTA REGULATION 111/2010, <i>Safety Codes Act</i>, GAS CODE REGULATION 	<i>CAN/CSA B108-99 (2004) Natural Gas Fuelling Stations Installation Code</i>	3000(2900 and 3770 psi) as per CAN/CSA B108	<ul style="list-style-type: none"> ALBERTA REGULATION 111/2010, <i>Safety Codes Act</i>, GAS CODE REGULATION 	<i>CAN/CSA B108-99 (2004) Natural Gas Fuelling Stations Installation Code</i>	3000(2900 and 3770 psi) as per CAN/CSA B108
SK	<ul style="list-style-type: none"> Gas Inspection Regulations, RRS c G-3.2 Reg 1 RSS 	<i>CAN/CSA-B149.1-10: Natural Gas and Propane Installation Code, CAN/CSA-B108-M99(R2004) NGV Fuelling Stations Installation Code</i>	3000(2900 and 3770 psi) as per CAN/CSA B108	<ul style="list-style-type: none"> Gas Inspection Regulations, RRS c G-3.2 Reg 1 RSS 	<i>CAN/CSA B108-99 (2004) Natural Gas Fuelling Stations Installation Code</i>	3000(2900 and 3770 psi) as per CAN/CSA B108

SCC Research Results: Infrastructure Fill Pressure				AHJ Response: Infrastructure Fill Pressure		
Province/ Territory	Regulation	Enforcement code	NGV Fill Pressure	Regulation	Enforcement code	NGV Fill Pressure
MB	None identified	None identified	None identified	N/A	N/A	N/A
ON	<ul style="list-style-type: none"> Compressed Gas Code Adoption Document – Amendment IN THE MATTER OF: <i>THE TECHNICAL STANDARDS AND SAFETY ACT, 2000, S.O. 2000, c. 16</i> ONTARIO REGULATION 223/01 (Codes and Standards Adopted by Reference) made under the Act ONTARIO REGULATION 214/01 (Compressed Gas) made under the Act 	<i>CAN/CSA B108-99 (2004) Natural Gas Fuelling Stations Installation Code</i>	3000(2900 and 3770 psi) as per <i>CAN/CSA B108</i>	<ul style="list-style-type: none"> Compressed Gas Code Adoption Document – Amendment IN THE MATTER OF: <i>THE TECHNICAL STANDARDS AND SAFETY ACT, 2000, S.O. 2000, c. 16</i> ONTARIO REGULATION 214/01 (Compressed Gas) made under the Act 	<i>CAN/CSA B108-99 (2004) Natural Gas Fuelling Stations Installation Code</i>	3000(2900 and 3770 psi) as per <i>CAN/CSA B108</i>
QC	<ul style="list-style-type: none"> Safety Code, RRQ, c B-1.1, r 3, (<i>Building Act</i>) Construction Code, RRQ, c B-1.1, r 2, (<i>Building Act</i>) Regulations of Quebec — Quebec 	<i>CAN/CSA B108-99 (2004) Natural Gas Fuelling Stations Installation Code</i>	3000(2900 and 3770 psi) as per <i>CAN/CSA B108</i>	<ul style="list-style-type: none"> Safety Code, RRQ, c B-1.1, r 3, (<i>Building Act</i>) Construction Code, RRQ, c B-1.1, r 2, (<i>Building Act</i>) Regulations of Quebec — Quebec 	<i>CAN/CSA B108-99 (2004) Natural Gas Fuelling Stations Installation Code</i>	3000(2900 and 3770 psi) as per <i>CAN/CSA B108</i>

SCC Research Results: Infrastructure Fill Pressure				AHJ Response: Infrastructure Fill Pressure		
Province/ Territory	Regulation	Enforcement code	NGV Fill Pressure	Regulation	Enforcement code	NGV Fill Pressure
NB	<ul style="list-style-type: none"> Standards Regulation, NB Reg 84-177, (<i>Boiler and Pressure Vessel Act</i>) Consolidated Regulations of New Brunswick — New Brunswick 	<i>CAN/CSA B108-99: Natural Gas Fuelling Stations Installation Code</i>	3000(2900 and 3770 psi) as per <i>CAN/CSA B108</i>	<ul style="list-style-type: none"> Standards Regulation, NB Reg 84-177, (<i>Boiler and Pressure Vessel Act</i>) Consolidated Regulations of New Brunswick — New Brunswick 	<i>CAN/CSA B108-99: Natural Gas Fuelling Stations Installation Code</i>	3000 (2900 and 3770 psi) as per <i>CAN/CSA B108</i>
NS	<ul style="list-style-type: none"> Technical Safety Standards Regulations, NS Reg 14/2011, (<i>Technical Safety Act</i>) Regulations of Nova Scotia — Fuel Safety Regulations made under Section 49 of the <i>Technical Safety Act S.N.S. 2008, c. 10 O.I.C. 2011-28</i> (January 18, 2011, effective April 1, 2011), N.S. Reg. 11/2011 	<i>CAN/CSA B108-99: Natural Gas Fuelling Stations Installation Code</i>	3000(2900 and 3770 psi) as per <i>CAN/CSA B108</i>	Nova Scotia does not have any natural gas refuelling stations and none are expected in the near future.	N/A	N/A
PEI	None identified - to be confirmed with regulator	None identified	None identified	There are no natural gas vehicles presently in the province and no requests have been made to adopt codes and standards for NGVs	N/A	N/A

SCC Research Results: Infrastructure Fill Pressure				AHJ Response: Infrastructure Fill Pressure		
Province/ Territory	Regulation	Enforcement code	NGV Fill Pressure	Regulation	Enforcement code	NGV Fill Pressure
NL	<ul style="list-style-type: none"> Storage and Handling of Gasoline and Associated Products Regulations, 2003, NLR 58/03, (<i>Environmental Protection Act</i>) Regulations of Newfoundland and Labrador — Newfoundland and Labrador 	Part 4 of the latest edition of the <i>National Fire Code</i> (section 4.6 of <i>National Fire Code</i> references <i>CAN/CSA B108</i>)	3000(2900 and 3770 psi) as per <i>CAN/CSA B108</i>	There is no natural gas infrastructure for refuelling stations of vehicles nor are there plans for introduce NGV refuelling infrastructure in the foreseeable future	N/A	N/A
YK	Fire Safety Regulations, YCO 1976/79, (<i>Fire Prevention Act</i>) Regulations of Yukon — Yukon	<i>National Fire Code of Canada, 1975 edition</i> , as amended from time to time, (section 4.6 of <i>National Fire Code</i> references <i>CAN/CSA B108</i>)	3000(2900 and 3770 psi) as per <i>CAN/CSA B108</i>	Yukon has no specific standards or regulations for NGVs and their associated refuelling stations of vehicles	N/A	N/A
NT	Fire Prevention Regulations, RRNWT 1990, c F-12, (<i>Fire Prevention Act</i>) Regulations of the Northwest Territories — Northwest Territories	<i>National Fire Code of Canada 2010</i> (section 4.6 Fuel-Dispensing Stations of <i>National Fire Code</i> references <i>CAN/CSA B108</i>)	3000(2900 and 3770 psi) as per <i>CAN/CSA B108</i>	There are no natural gas vehicles presently in the NWT	N/A	N/A

SCC Research Results: Infrastructure Fill Pressure				AHJ Response: Infrastructure Fill Pressure		
Province/Territory	Regulation	Enforcement code	NGV Fill Pressure	Regulation	Enforcement code	NGV Fill Pressure
NU	Fire Prevention Regulations, RRNWT (Nu) 1990 c F-12, (<i>Fire Prevention Act</i>) Regulations of Nunavut — Nunavut	<i>National Fire Code of Canada 1995</i> (needs update)	3000(2900 and 3770 psi) as per <i>CAN/CSA B108</i>	There is no Natural Gas Infrastructure in Nunavut for refuelling stations of vehicles	N/A	N/A
FED	NA	NA	NA	N/A	N/A	N/A

ANNEX B: Stakeholder Participation

Provinces	Authorities Having Jurisdiction (AHJs)
<p>1. British Columbia: Eric Skehor, Gas Safety Manager, BC Safety Authority E-mail: Eric.Skehor@safetyauthority.ca</p>	<p>BC Safety Authority</p>
<p>2. Alberta: Sidney Manning Chief Plumbing & Gas Administrator Municipal Affairs, Safety Services, Gov. of Alberta Phone: (866) 421-6929 E-mail: sidney.manning@gov.ab.ca</p>	<p>Safety Services, Government of Alberta</p>
<p>3. Saskatchewan: Douglas Hird, P. Eng. Senior Engineer, Gas Codes & Standards Gas Inspections, SaskPower Tel: (306) 566-2592 E-mail: dhird@saskpower.com</p> <p>Ciaran Downes, P.Eng., MBA Manager Vehicle Standards & Inspection SGI Auto Fund Tel: (306) 751-3563 E-mail: cdownes@sgi.sk.ca</p>	<p>SaskPower and SGI Auto Fund</p>
<p>4. Manitoba: David K. Schafer Fire Commissioner Province of Manitoba Tel: (204) 945-0453 E-mail: dave.schafer@gov.mb.ca</p>	<p>Office of the Fire Commissioner</p>
<p>5. Ontario: Oscar Alonso Fuels Safety Branch Technical Standards and Safety Authority Tel: (416) 734-3353 E-mail: oalonso@tssa.org</p>	<p>Technical Standards and Safety Authority</p>

Provinces	Authorities Having Jurisdiction (AHJs)
<p>6. Quebec: Mr. Jacques Renaud Gas Expert Régie du Bâtiment du Québec Technical Installations Tel: (514) 873-2224 E-Mail: Jacques.Renaud@rbq.gouv.qc.ca</p> <p>Michel Légaré, ing. M.Sc.A., Société de l'assurance automobile du Québec, Service de la sécurité des véhicules et du transport Tel: (418) 528-3823 E-mail:Michel.Legare@ saaq.gouv.qc.ca</p>	<p>Regie du batiment and Société de l'assurance automobile du Québec</p>
<p>7. Nova Scotia: Dale Stewart, Chief Inspector, Fuel Safety Tel: (902) 424-8017 Email: stewardc@gov.ns.ca</p>	<p>Building Fire and Technical Safety Office</p>
<p>8. Prince Edward Island: Brian Reid Safety Standards Officer Inspection Services Tel: (902)368-5566 Email: bwreid@gov.pe.ca</p>	<p>Boiler and Pressure Vessel Branch</p>
<p>9. Newfoundland & Labrador: Dennis Eastman, P.Eng. Director, Engineering and Inspection Services, Government of Newfoundland and Labrador Tel: (709) 729-2747 deastman@gov.nl.ca</p>	<p>Engineering and Inspection Services Office</p>
<p>10. New Brunswick: Michael Davidson, Manager Gas Inspections, Technical Inspection Services, NB Public Safety Tel: (506) 453-2187 Email: Michael.Davidson@gnb.ca</p>	<p>Technical Inspection Services Office</p>
<p>11. Yukon: Dan Boyd, Assistant Deputy Minister Building Safety Infrastructure Development, Community Services Tel : (867) 667-3224 Email: dan.boyd@gov.yk.ca</p>	<p>Fire Marshal Office and the Building Safety Branch</p>

Provinces	Authorities Having Jurisdiction (AHJs)
<p>12. Northwest Territories: Ron McRae, Manager, Electrical / Mechanical Safety Public Works and Services Government of Northwest Territories Tel: (867) 920-8801 Email: ron_mcrae@gov.nt.ca</p>	<p>Public Works and Services (Electrical Mechanical Inspection Services section)</p>
<p>13. Nunavut: Ed Zebedee Director of Protection Services Tel: (867) 975-5448 Email: ezebedee@gov.nu.ca</p>	<p>Protection Services, Government of Nunavut</p>
<p>14. Canada: Ghislain Lalime, A/Chief, Standards and Regulations, Transport Canada Tel: (613) 998-1959 E-mail: ghislain.lalime@tc.gc.ca</p>	<p>Transport Canada</p>

Part 3

Natural Gas for Transportation Deployment Roadmap:

Identification and analysis of existing codes and standards related to the safety labelling of NGVs and safety signage of CNG refuelling stations

November 2012



Standards Council of Canada
Conseil canadien des normes

Canada

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1. Background/ Introduction

Since the 1980's interest in natural gas for transportation has fluctuated. The development of Codes, Standards and Regulations (CS&R) for natural gas vehicles (NGVs) has long been established in Canada. When NGVs started to enter the Canadian market, it was recognized that adequate CS&R for NGV technologies did not exist. Significant effort throughout the 1990s resulted in improvements in this area. In the early 2000's, these developments faced decline with the deregulation of the natural gas distribution industry, a rise in natural gas prices and a shift in the cost advantage between petroleum and natural gas. There is now a renewed interest in natural gas for transportation. This is the result of improved vehicle and station technologies, an abundance of natural gas supply, a decline in prices, the ongoing need for energy diversification, and the broader expectation of carbon emission reductions from the transportation sector.

The *Natural Gas Use in the Canadian Transportation Sector: Deployment Roadmap* was released on January 6, 2011. The document was facilitated by Natural Resources Canada (NRCan), in partnership with governments at all levels, as well as industry, academic and non-governmental organizations. The initiative aims to identify opportunities and challenges associated with natural gas vehicle deployment.

As part of its recommendations, the roadmap identified the importance "... [of] collaborat[ing] with existing Canadian Standards Association technical committees to address gaps and issues in existing codes and standards identified during the Roadmap process." One of the gaps/issues identified per the roadmap's ten priority areas was the harmonization of the regulatory requirements for safety signage (e.g. blue diamond usage on NGVs) in various jurisdictions.

A well-established infrastructure for CS&R is crucial to Canada's competitiveness and the health of its economy. CS&R affects the efficiency of energy-using products entering the market. In the long-term, the deployment of high efficiency energy products will have a positive impact on the Canadian economy. Canada has a well-developed set of CS&R that are relevant to CNG vehicles and refuelling stations, but due to limited market activity in recent years, there are issues and gaps that need to be addressed to support potential future market development.

2. Scope of the research

The Standards Council of Canada (SCC) was contracted by NRCan to document and analyze existing codes, standards, and regulations pertaining to CNG vehicles and CNG refuelling infrastructure. This was one of the top ten priority issues that were raised by the Codes and Standards working group¹ that had participated in the development of the roadmap document. Specifically, SCC was asked to conduct research and analysis pertaining to the regulatory requirements for safety labelling (i.e. CNG blue diamond) for natural gas vehicles (NGVs). The document was reviewed via consultation with NRCan and the involved technical committees.

This project will help clarify and define some of the issues associated with codes and standards intended for the use of natural gas in transportation, as identified in the *Medium & Heavy Vehicles – Five Year Codes and Standards Work Plan – March 2011* by Change Energy².

¹ The Codes and Standards Working Group is one of six NRCan-led groups that focus on compressed natural gas (CNG) and liquefied natural gas (LNG) vehicles, refueling stations and fuel supply.

² Change Energy is an engineering consultancy group and provider of compressed gas fuelling solutions, from feasibility and planning to procurement and delivery. This group provided support to NRCan in the setting of priority areas for the roadmap document.

Part of the intent of this project was also to identify and consult with the “Authorities Having Jurisdiction” (AHJs) in provincial, territorial and federal jurisdictions. . The resulting findings are not exhaustive, due to limitations in participation on part of certain AHJs, and limited available data.

An analysis and summary of the original findings, as per the document entitled *Canadian regulatory requirements for vehicle labelling and infrastructure signage matrix – March 2012* (see Annex A) is divided into the following main sections:

- Safety labelling/ Signage for NGVs and CNG refuelling stations; and
- Recommendations and next steps.

3. Methodology

SCC gathered the necessary data through its internal research tools. A spreadsheet with findings entitled, *Canadian regulatory requirements for vehicle labelling and infrastructure signage matrix – March 2012* (Annex A) was developed. The spreadsheet was then confirmed with the federal, provincial and territorial AHJs through consultations. Based on this aggregate information, SCC performed an analysis for each area that identifies:

- Gaps in current codes, standards, and regulations;
- Inconsistencies among current codes, standards and regulations between jurisdictions in Canada;
- Number of codes affected by this inconsistency and the severity of the issue;
- Improper referencing of standards and codes in federal, provincial and territorial regulations; and
- Potential to harmonize Canadian codes, standards, and regulations: (a) within Canada and (b) with the United States.

SCC used the following tools to produce the *Canadian regulatory requirements for vehicle labelling and infrastructure signage matrix – March 2012* (Annex A):

- SCC’s standards search tool: <http://www.scc.ca/en/search/standards>
- SCC’s Virtual Technical Document Centre (VTDC)
- CANLII (Canadian Legal Information Institute): <http://www.canlii.org/>
- ILI (ILI Standards InfoBase) by SAI Global: <http://www.ili-info.com/>
- Federal and provincial/territorial governments websites
- Google and other publicly accessible search tools
- Expertise from SCC’s standards research team.

4. Safety labelling/ Signage for NGVs and CNG refuelling stations

SCC consulted with provincial, territorial and federal AHJs to determine if requirements exist on the use of safety labelling/ signage for NGVs and CNG refuelling stations in each jurisdiction. A distinction should be made between labelling versus signage. Any label or decal on a vehicle is

considered labelling from an Original Equipment Manufacturer (OEM) perspective, and the term signage is used in a stationary context (i.e. at refuelling stations).

According to internal research and the responses received from the surveying of the AHJs, the dominant codes used for the safety labelling/ signage of NGVs and CNG refuelling stations are:

- *CSA B109 Natural Gas for Vehicles Installation Code*, which requires that a durable diamond-shaped label shall be installed in a position clearly visible on the rear of the vehicle. The label shall be a minimum of 100 mm (4 inch) wide × 70 mm (2.75 inch) high. The marking shall consist of a border, with letters identifying the vehicle as operating on natural gas centred in a diamond of silver or white reflective luminous material on a blue background. Section 4.8.2 of the code requires the vehicle to have a label at the fill point, readily visible during fuelling, that indicates the last date on which the vehicle can be fuelled.
- Under the *Quebec Highway Safety Code*, clause 85 of the regulation respecting safety standards for road vehicles states that a vehicle shall bear a sticker inside the rear window or the rear wide window of the vehicle, near the filler cap so that the sticker may be seen by the person filling the tank. The sticker shall be affixed by a mechanic holding the appropriate certificate of competency. Clause 70 of the *Highway Safety Code* specifies that the natural gas supply system of a road vehicle may be filled only if a vehicle bears the appropriate sticker mandatory under the regulation respecting safety standards for road vehicles. **NOTE:** The vehicle shall bear the sticker referred to in Schedule I of the regulation respecting safety standards for road vehicles, not the sticker appearing in *CSA B109 Natural Gas for Vehicles Installation Code*.
- Under the *Technical Standards and Safety Act (TSSA)* in Ontario, CNG After-Market Vehicles (AMVs) are required to have affixed labels provided by TSSA and which have been attached at vehicle conversion centres licensed by TSSA. The label should be attached inside the left door or left window of the vehicle. The safety label provided for AMVs by TSSA is not associated with the sticker appearing in *CSA B109 Natural Gas for Vehicles Installation Code*. In Ontario, *CSA B109* is used only for Original Equipment Manufacturer (OEM) vehicles.
- Under the *British Columbia Safety Authority Act (BCSA)*, CNG after-market vehicles are required to have a CNG red diamond affixed label provided by BCSA. The BCSA red diamond serves as a safety label for first responders, who look for the label as an indication of a CNG fuel system on the vehicle. The preferred location for the decal is the lower left corner of the windshield. The label also has a serial number, and information regarding the conversion installed on the vehicle.
- Under the *Motor Vehicle Safety Act (Act)*, Transport Canada develops and enforces the *Canada Motor Vehicle Safety Standards (CMVSS)*. The Act stipulates that vehicle manufacturers must certify that all their vehicles imported into or offered for sale in Canada comply with all applicable *CMVSS* in effect at the time the main assembly of the vehicle was completed. *CMVSS 301.2 CNG Fuel System Integrity* requires that a vehicle is affixed with a National Safety Mark (NSM) compliance label and provides the option of using labelling as stipulated in *CSA B109 Natural Gas for Vehicles Installation Code* in addition to the NSM.
- *CSA B108 Natural Gas Fuelling Stations Installation Code*, section B4.3, provides requirements for the safety signage of CNG refuelling stations. The requirements highlighted include that the letters must be in a black typeface with a yellow background, and that all symbols should be red and black in colour with a white background. Also, the

code requires that signs be installed around the natural gas dispenser in the interior of the fuelling area and a visual indicator be installed near every entrance to the fuelling area to indicate that a fuelling operation is in process.

Inconsistencies between Jurisdictions

At the federal level

The federal government has well-established requirements for the safety labelling of NGVs in Canada. *CMVSS 301.2 CNG Fuel System Integrity* requires that CNG vehicles be affixed with a National Safety Mark (NSM) compliance label and provides the option of using *CSA B109 Natural Gas for Vehicles Installation Code* in addition to the NSM. The federal government does not have any CS&R requirements for the safety signage of CNG refuelling stations.

At the provincial level

The provinces are consistent in terms of referencing the appropriate codes relevant to the safety signage of CNG refuelling stations. *CSA B108 Natural Gas Fuelling Stations Installation Code* is used in British Columbia (*Gas Safety Regulation*), Alberta (*Safety Code Act*), Saskatchewan (*Gas Inspection Act*), Ontario (*Technical Standards and Safety Act*), Quebec (*Highway Safety Code*) and New Brunswick (*Boiler and Pressure Vessel Act*). In addition, British Columbia and New Brunswick also refer to *CSA B149.1 Natural Gas for Vehicles* for their CNG refuelling station safety signage requirements.

The scenario is different with respect to the inclusion of safety labelling for NGVs in CS&R in Canada, where there are some inconsistencies in provincial and federal jurisdictions. These are evident when it comes to the different regulatory requirements and the adoption of codes for the use of safety labelling for Original Equipment Manufacturers (OEMs) and Aftermarket Vehicle's (AMVs). Alberta, New Brunswick and the federal government refer to *CSA B109 Natural Gas for Vehicles Installation Code* to highlight their requirements for the use of safety labelling for OEMs and AMVs. British Columbia and Ontario have adopted *CSA B109* for the safety labelling of OEM vehicles, and their own appropriate codes for AMVs. British Columbia requires the use of a red diamond label for CNG AMVs provided by the *British Columbia Safety Authority (BCSA)* and Ontario requires CNG AMVs to have affixed labels provided by the *Technical Standards and Safety Authority (TSSA)*.

Québec refers to its *Highway Safety Code* for all its NGV safety labelling requirements. OEMs and AMVs are all covered under clause 70 and 85 of the regulation pertaining to safety standards for road vehicles.

Saskatchewan is the only province that refers to *CMVSS 301.2 CNG Fuel System Integrity*, which requires that CNG vehicles be affixed with a National Safety Mark (NSM) compliance label and provides the option of using *CSA B109 Natural Gas for Vehicles Installation Code* in addition to the NSM.

British Columbia, Alberta, Saskatchewan, Ontario, Quebec, and New Brunswick have reported that the requirements for the safety labelling of NGVs and safety signage of CNG refuelling stations are well aligned with those of NGVs in their jurisdictions. Officials from these provinces have also confirmed that the standards and codes regarding safety labelling and safety signage were all being referenced properly in provincial regulations.

Nova Scotia, Prince Edward Island, Newfoundland and Labrador, Yukon, Northwest Territories, and Nunavut do not have any specific legislative or regulatory requirements for NGVs. The AHJs from these provinces/ territories confirmed that no codes/ standards have been adopted

because NGVs and the associated natural gas infrastructure are not relevant in these jurisdictions (see Annex A).

5. Harmonization and possible solutions

All the provincial/ territorial/ federal AHJs surveyed expressed their support for harmonization of requirements and regulations between Canadian provinces / territories and across the border with the United States. Since most vehicles are capable of crossing jurisdictional lines and as such becoming subject to U.S./ international requirements for labelling and refilling, harmonization of CS&R would be beneficial. Having harmonized standards and codes would establish consistent safety requirements throughout North America and thus enable NGVs to move inter-provincially and into the U.S. without unnecessary barriers and limitations. As well, given the Canadian auto industry's dependence on the U.S. market and the number of vehicles imported into Canada from that market, harmonization becomes all the more significant.

Even though all the AHJs have expressed their support for harmonizing CS&R between provinces and with the United States, some AHJs have expressed concerns with respect to harmonization. Alberta stated that there may be concerns between regulatory processes that involve the use of self-declaration in the U.S. and current Canadian protocols that may limit regulatory ability to protect users. British Columbia remarked that many facets of the Canadian CS&R are "more stringent" than American requirements and urges that Canada should be cautious to not "dilute" its requirements for the purpose of accessing a larger market in the U.S.

6. Recommendations and next steps

The SCC research conducted to-date provides an overview of existing codes, standards, and regulations for CNG Vehicles and CNG refuelling infrastructure. However, given the complexity of this topic, as the many new and emerging technologies being contemplated, there is potential for more investigation. Following are recommended areas for further exploration:

CSA subcommittee

- As mentioned above, inconsistencies exist with respect to the safety labelling of NGVs in provincial and federal jurisdictions. Different requirements exist for the safety labelling of OEM and AMVs across the country. Harmonization of CS&R in this area should be considered, in order to facilitate the deployment of NGVs in Canada.

Technical advisory group

- A more in-depth and thorough review of CS&R related to the safety labelling of NGVs at the federal level may be required. Transport Canada has provided limited information regarding specific requirements such as size, location and colour of the National Safety Mark (NSM) compliance label. Further research in this area could facilitate the harmonization of CS&R across the country.
- Expanding the scope of this project would help to determine if the AHJs are referencing the most recent version of the codes related to the safety labelling of NGVs and safety signage of CNG refuelling stations in their regulations. If a code or standard is updated, revised or replaced, the regulation should reference the latest edition. Differences between jurisdictions can arise when references to standards in regulations are not consistently monitored and updated as needed, and could thus pose an impediment to broader market development.

General

- A review of jurisdictional variances regarding the minimum gas quality requirements for use in NGVs and natural gas pipelines, as well as the identification of gaps and inconsistencies of CS&R in this area would be beneficial.
- A review of current building codes and standards to assess the indoor maintenance and storage area requirements for NGVs may be relevant. Officials from Québec expressed a concern with the lack of clear and comprehensive safety requirements for CNG vehicle repairs being conducted inside buildings in that province.
- While the scope of this report did not pertain to regulations and by-laws at the municipal level, it would be useful to conduct further similar research in specific local jurisdictions. There may be a number of relevant municipal by-laws with an effect on the use of natural gas in the transportation sector (noise by-laws, setbacks, parking requirements, etc.).



ANNEX A: List of Canadian regulatory requirements for infrastructure fill pressure and vehicle labelling

Province/ Territory	SCC Research Results: Vehicle Exterior			AHJ Response: Vehicle			AHJ Response: Infrastructure safety signage
	Regulation	Enforcement code	Signage used	Regulation	Enforcement code	Signage used	Enforcement code
BC	<ul style="list-style-type: none"> B.C. Reg. 103/2004, Gas Safety Regulation 	CSA B109-01 <i>Natural Gas for Vehicles Installation Code</i>	Blue diamond-shaped label as per CSA B109	<ul style="list-style-type: none"> B.C. Reg. 103/2004, Gas Safety Regulation 	<ul style="list-style-type: none"> CSA B109-01 <i>Natural Gas for Vehicles Installation Code</i> (standard used for OEM vehicles) BCSA CNG Red Diamond (standard used for vehicle conversions) 	<ul style="list-style-type: none"> CNG blue diamond (OEM vehicles) BCSA CNG red diamond (AMVs) 	<ul style="list-style-type: none"> CAN/CSA B108-99 (2004) <i>Natural Gas Fuelling Stations Installation Code</i> CAN/CSA-B149.1-10: <i>Natural Gas and Propane Installation Code</i>
AB	<ul style="list-style-type: none"> ALBERTA REGULATION 111/2010, Safety Codes Act, GAS CODE REGULATION 	CSA B109-01 <i>Natural Gas for Vehicles Installation Code</i>	Blue diamond-shaped label as per CSA B109	<ul style="list-style-type: none"> ALBERTA REGULATION 111/2010, Safety Codes Act, GAS CODE REGULATION 	CSA B109-01 <i>Natural Gas for Vehicles Installation Code</i>	Blue diamond-shaped label as per CSA B109	CAN/CSA B108-99 (2004) <i>Natural Gas Fuelling Stations Installation Code</i>
SK	None identified	None identified	None identified	<ul style="list-style-type: none"> The Vehicle Equipment Regulations 1987 Vehicle Inspection Regulations 2001 	CMVSS CNG Fuel System Integrity (Standard 301.2)	National safety mark (NSM) as per CSA B109	CAN/CSA B108-99 (2004) <i>Natural Gas Fuelling Stations Installation Code</i>
MB	None identified	None identified	None identified	N/A	N/A	N/A	N/A

Province/ Territory	SCC Research Results: Vehicle Exterior			AHJ Response: Vehicle			AHJ Response: Infrastructure safety signage
	Regulation	Enforcement code	Signage used	Regulation	Enforcement code	Signage used	Enforcement code
ON	<ul style="list-style-type: none"> Compressed Gas Code Adoption Document – Amendment IN THE MATTER OF: THE TECHNICAL STANDARDS AND SAFETY ACT, 2000, S.O. 2000, c. 16 ONTARIO REGULATION 223/01 (Codes and Standards Adopted by Reference) made under the Act ONTARIO REGULATION 214/01 (Compressed Gas) made under the Act 	<i>CSA B109-01 Natural Gas for Vehicles Installation Code</i> (standard used for vehicle conversions)	<ul style="list-style-type: none"> Label supplied by Director (TSSA) Numbered label (inside left door or left window, additional info as to conversion date) 	<ul style="list-style-type: none"> Compressed Gas Code Adoption Document – Amendment IN THE MATTER OF: THE TECHNICAL STANDARDS AND SAFETY ACT, 2000, S.O. 2000, c. 16 ONTARIO REGULATION 214/01 (Compressed Gas) made under the Act 	<ul style="list-style-type: none"> <i>CSA B109-01 Natural Gas for Vehicles Installation Code</i> (standard used for OEM vehicles) Label supplied by TSSA (standard used for vehicle conversions) 	<ul style="list-style-type: none"> CNG blue diamond (OEM vehicles) label supplied by TSSA (AMVs) 	<i>CAN/CSA B108-99 (2004) Natural Gas Fuelling Stations Installation Code</i>

SCC Research Results: Vehicle Exterior				AHJ Response: Vehicle			AHJ Response: Infrastructure safety signage
Province/Territory	Regulation	Enforcement code	Signage used	Regulation	Enforcement code	Signage used	Enforcement code
QC	<ul style="list-style-type: none"> Regulation respecting safety standards for road vehicles, RRQ, c C-24.2, r 32, (Highway Safety Code) Regulations of Quebec — Quebec 	CSA B109-01 <i>Natural Gas for Vehicles Installation Code</i> (standard used for vehicle conversions)	<ul style="list-style-type: none"> National safety mark (NSM) or blue diamond shaped label as per CSA B109. If a conversion vehicle, sticker referred to in Schedule 1 of Highway Safety Code (Quebec) 	<ul style="list-style-type: none"> Regulation respecting safety standards for road vehicles, RRQ, c C-24.2, r 32, (Highway Safety Code) Regulations of Quebec — Quebec 	<i>Highway Safety Code</i>	The vehicle shall bear the sticker referred to in <i>Schedule 1</i> of the regulation respecting safety standards for road vehicles, NOT the sticker appearing in CSA B109.	CAN/CSA B108-99 (2004) <i>Natural Gas Fuelling Stations Installation Code</i>
NB	<ul style="list-style-type: none"> Standards Regulation, NB Reg 84-177, (<i>Boiler and Pressure Vessel Act</i>) Consolidated Regulations of New Brunswick — New Brunswick 	CSA B109-01 <i>Natural Gas for Vehicles Installation Code</i>	Blue diamond-shaped label as per CSA B109	<ul style="list-style-type: none"> Standards Regulation, NB Reg 84-177, (<i>Boiler and Pressure Vessel Act</i>) Consolidated Regulations of New Brunswick — New Brunswick 	CSA B109-01 <i>Natural Gas for Vehicles Installation Code</i>	Blue diamond-shaped label as per CSA B109	<ul style="list-style-type: none"> CAN/CSA B108-M99 (R2004) <i>Natural Gas Fuelling Stations Installation Code</i> CAN/CSA-B149.1-10: <i>Natural Gas and Propane Installation Code</i>

SCC Research Results: Vehicle Exterior				AHJ Response: Vehicle			AHJ Response: Infrastructure safety signage
Province/Territory	Regulation	Enforcement code	Signage used	Regulation	Enforcement code	Signage used	Enforcement code
NS	None identified	None identified	None identified	Nova Scotia does not have any natural gas vehicles and does not regulate over-the-highway vehicles.	N/A	N/A	N/A
PEI	None identified	None identified	None identified	N/A	N/A	N/A	N/A
NL	None identified	None identified	None identified	There are presently no NGVs in the province.	N/A	N/A	N/A
YK	None identified	None identified	None identified	Yukon has no specific standards or regulations for NGVs and none regarding the labeling of NGVs.	N/A	N/A	N/A
NT	None identified	None identified	None identified	N/A	N/A	N/A	N/A
NU	None identified	None identified	None identified	There is no mention of NGVs in any regulations in the province.	N/A	N/A	N/A

SCC Research Results: Vehicle Exterior				AHJ Response: Vehicle			AHJ Response: Infrastructure safety signage
Province/Territory	Regulation	Enforcement code	Signage used	Regulation	Enforcement code	Signage used	Enforcement code
FED	<ul style="list-style-type: none"> Motor Vehicle Safety Regulations, CRC, c 1038, (Motor Vehicle Safety Act) Consolidated Regulations of Canada — Canada (Federal) 	<i>Test Method 301.2 — CNG Fuel System Integrity</i> (February 28, 2004) or section 4 of <i>CSA B109, Natural Gas for Vehicles Installation Code</i>	National safety mark (NSM) compliance label	<ul style="list-style-type: none"> Motor Vehicle Safety Regulations, CRC, c 1038, (Motor Vehicle Safety Act) Consolidated Regulations of Canada — Canada (Federal) 	<i>Test Method 301.2 — CNG Fuel System Integrity</i> (February 28, 2004) or section 4 of <i>CSA B109, Natural Gas for Vehicles Installation Code</i>	National safety mark (NSM) compliance label, or compliance label and labelling in accordance with <i>CSA B109</i> .	N/A



ANNEX B: Stakeholder Participation

Provinces	Authorities Having Jurisdiction (AHJs)
<p>1. British Columbia: Eric Skehor, Gas Safety Manager, BC Safety Authority E-mail: Eric.Skehor@safetyauthority.ca</p>	BC Safety Authority
<p>2. Alberta: Sidney Manning Chief Plumbing & Gas Administrator Municipal Affairs, Safety Services, Gov. of Alberta Phone: (866) 421-6929 E-mail: sidney.manning@gov.ab.ca</p>	Safety Services, Government of Alberta
<p>3. Saskatchewan: Douglas Hird, P. Eng. Senior Engineer, Gas Codes & Standards Gas Inspections, SaskPower Tel: (306) 566-2592 E-mail: dhird@saskpower.com</p> <p>Ciaran Downes, P.Eng., MBA Manager Vehicle Standards & Inspection SGI Auto Fund Tel: (306) 751-3563 E-mail: cdownes@sgi.sk.ca</p>	SaskPower and SGI Auto Fund
<p>4. Manitoba: David K. Schafer Fire Commissioner Province of Manitoba Tel: (204) 945-0453 E-mail: dave.schafer@gov.mb.ca</p>	Office of the Fire Commissioner
<p>5. Ontario: Oscar Alonso Fuels Safety Branch Technical Standards and Safety Authority Tel: (416) 734-3353 E-mail: oalonso@tssa.org</p>	Technical Standards and Safety Authority

Provinces	Authorities Having Jurisdiction (AHJs)
<p>6. Quebec: Mr. Jacques Renaud Gas Expert Régie du Bâtiment du Québec Technical Installations Tel: (514) 873-2224 E-Mail: Jacques.Renaud@rbq.gouv.qc.ca</p> <p>Michel Légaré, ing. M.Sc.A., Société de l'assurance automobile du Québec, Service de la sécurité des véhicules et du transport Tel: (418) 528-3823 E-mail:Michel.Legare@saaq.gouv.qc.ca</p>	<p>Regie du batiment and Société de l'assurance automobile du Québec</p>
<p>7. Nova Scotia: Dale Stewart, Chief Inspector, Fuel Safety Tel: (902) 424-8017 Email: stewardc@gov.ns.ca</p>	<p>Building Fire and Technical Safety Office</p>
<p>8. Prince Edward Island: Brian Reid Safety Standards Officer Inspection Services Tel: (902)368-5566 Email: bwreid@gov.pe.ca</p>	<p>Boiler and Pressure Vessel Branch</p>
<p>9. Newfoundland & Labrador: Dennis Eastman, P.Eng. Director, Engineering and Inspection Services, Government of Newfoundland and Labrador Tel: (709) 729-2747 deastman@gov.nl.ca</p>	<p>Engineering and Inspection Services Office</p>
<p>10. New Brunswick: Michael Davidson, Manager Gas Inspections, Technical Inspection Services, NB Public Safety Tel: (506) 453-2187 Email: Michael.Davidson@gnb.ca</p>	<p>Technical Inspection Services Office</p>

Provinces	Authorities Having Jurisdiction (AHJs)
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<p>11. Yukon: Dan Boyd, Assistant Deputy Minister Building Safety Infrastructure Development, Community Services Tel : (867) 667-3224 Email: dan.boyd@gov.yk.ca</p>	<p>Fire Marshal Office and the Building Safety Branch</p>
<p>12. Northwest Territories: Ron McRae, Manager, Electrical / Mechanical Safety Public Works and Services Government of Northwest Territories Tel: (867) 920-8801 Email: ron_mcrac@gov.nt.ca</p>	<p>Public Works and Services (Electrical Mechanical Inspection Services section)</p>
<p>13. Nunavut: Ed Zebedee Director of Protection Services Tel: (867) 975-5448 Email: ezebedee@gov.nu.ca</p>	<p>Protection Services, Government of Nunavut</p>
<p>14. Canada: Ghislain Lalime, A/Chief, Standards and Regulations, Transport Canada Tel: (613) 998-1959 E-mail: ghislain.lalime@tc.gc.ca</p>	<p>Transport Canada</p>