

Work Plan
Codes and Standards Working Group
Canadian Transportation Fuel Cell Alliance

Version 1.3

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Mission Statement

The objectives of the Codes and Standards Working Group (C&S) of the Canadian Transportation Fuel Cell Alliance (CTFCA) include ensuring there are no barriers in the areas of codes and standards and in training and certification of personnel to the work of the CTFCA working groups developing demonstration projects. This mandate is further interpreted to extend to facilitating the development of an ensemble of codes and standards, preparing and disseminating information documents, and providing training and certification tools that will facilitate the implementation of such fueling stations beyond the scope of the immediate projects under development by the CTFCA.

Working Group Tasks

Three general types of tasks have been identified for the C&S WG:

- Facilitation of Codes and Standards development
- Dissemination of Codes and Standards information
- Providing training and certification material

The work plan for each of these tasks is described below.

Task 1: Codes and Standards Development

Task Mandate

The C&S WG is focusing its efforts on facilitating the development and acceptance of national and international standards related to hydrogen fuel cell and hydrogen internal combustion engine (ICE) systems and hydrogen vehicle fuelling systems including hydrogen supply, on-site production, storage, fueling station configurations and locations, and fueling interfaces with fuel cell and ICE vehicles. As a guideline, this work, the purpose of which is to ultimately facilitate the introduction of a fueling infrastructure in Canada, will tend to facilitate to the extent possible, the adoption, adaptation, and development of international standards and compatibility with North American Free Trade Act (NAFTA) and World Trade Organization (WTO) considerations. This work should also be done in such a way as to ensure seamless integration into the federal and provincial regulatory systems. Work on product or system quality or other standards to specify functional performance strictly for industrial purposes was deemed to be beyond the scope of this Working Group and the responsibility of industry.

The task will include:

- Assessing the adequacy of existing standards and identifying areas requiring standards development, to ensure that there will be appropriate safety standards in place to protect vehicle owners, filling station personnel, hydrogen transport workers and the general public, as the hydrogen filling station infrastructure evolves and expands.
- Assessing the steps required by CTFCA to ensure that appropriate federal, provincial and territorial regulations are in place to facilitate electrical, gas, building and fire inspections by the local authorities having jurisdiction, so that there are no impediments to the expedient implementation of the demonstration projects.

Action 1.1: Document Regulatory and Standards Process in Canada

Action Objective This action will prepare a background document on the standards and regulatory process in Canada and identify the areas where work is required to facilitate the project work of the Alliance and produce corresponding permanent change in the structure for future systems. It will also outline the work to be addressed in the immediate future to address these requirements. This will be distributed to the C&S members and made available on the C&S Web site as a PDF for download.

Status: Completed. A codes and standards process document has been compiled by TISEC Inc. This document is available at www.hydrogensociety.net . This is to be linked to the CTFCA website.

Action 1.2: Codes & Standards Requirement Analysis (CSRA)

Action Objective This action will develop a generalized schematic of a service station with a list of components. This list will then be reviewed to identify missing codes and standards. The results of this exercise will be provided as a Codes & Standards Requirement Analysis (CSRA), which will identify the areas where codes and standards need to be developed.

A matrix related to the fuelling stations (all fuels should be considered as long as the output is hydrogen) will be prepared. This matrix will include the needs for C&S as well as the technical data that will need to be provided to make this C&S work possible.

Once this matrix is available, the C&S WG will define a prioritized list. Some items have already been given a high priority, they are listed in the next subsections of Task 1.

Status: Started. A task group has been formed.

Action 1.3: *Initiate the development of a Canadian Hydrogen Installation Code and the required revisions to The Canadian Electrical Code.*

Action Objectives

(1) Working with the BNQ TC on the Hydrogen Installation Code to develop a code that will facilitate the approval of hydrogen installations after the code is approved by the Interprovincial Gas Advisory Council (IGAC).

Status: Action is initiated and coordination is ongoing.

(2) Working with the Canadian Advisory Council on Electrical Safety (CACES) and the Canadian Standards Association (CSA) standards development committees on the Canadian Electrical Code (CEC), to initiate the incorporation of hazardous location criteria for hydrogen (Class I, Zone 0, Zone 1 & Zone 2) into the CEC, to complement similar data presently included for propane, natural gas and liquid fuels.

Status: Task has been initialized in coordination with the BNQ TC task group 2, Electrical Equipment and Wiring.

Action 1.4: *Develop Quantitative Clearance Distance Criteria*

Action Objectives

The current standards in place for the siting of hydrogen systems with regard to the minimum distances needed to separate storage vessels and dispensers from exposure to ignition sources, buildings, lot lines and other areas of concern, are considered by some experts to be too conservative. There is a concern that these separation distances may impede the development of a hydrogen infrastructure.

The source of the information used to adopt the current separation distances cannot be verified and a new body of work needs to be conducted in order to justify changes that are deemed necessary to promote the formation of a hydrogen fuelling infrastructure.

This action item will provide simulations that will enable the establishment of the minimum safe separation distances for all of the elements contained in the previously enumerated codes and standards.

- (1) As part of this study, typical fuelling station components will be modeled to track the development of hydrogen concentrations reaching lower flammability limit concentrations for selected ventilation rates. This will produce comparative hazardous zone criteria for hydrogen to complement similar data presently included in the CEC for propane, natural gas and liquid fuels and will define ventilation design rates to declassify specific fuelling station areas.

(2) It is intended to verify the modeled results with experimental work conducted in the United States and /or Canada.

Status (1): Two proposals have been received. The evaluation work group has been identified and the evaluations will be completed soon.

Status (2): Richard Fry is establishing a liaison with US DOE to ensure there is no duplication of effort.

Action 1.5: Develop Quantitative Criteria for Controlled Emergency Releases

Action Objective To develop guidelines for safe emergency release of stored hydrogen into the atmosphere. This addresses the situation where for some reason it is prudent to discharge all the hydrogen stored at a fuelling station, at a controlled rate, to safely disperse the hydrogen into the surrounding atmosphere. The modeling will consider the following three station locations and will address the controlled discharge of both liquid and gaseous hydrogen:

- Open field (unconfined release)
- Built-up, low-lying commercial and residential
- Urban high rise

For each of these locations, a hydrogen release will consider:

- Stack design
- Release rate
- Total quantity released
- Ambient conditions, such as the wind velocity at the stack outlet.
- Potential of environmental damage

Status: Included with Action 1.4

Action 1.6: Develop Schematic, Virtual Detailed Fuelling Station

Action Objective This action item will develop a generic model for fuelling stations upon which can be overlaid the results of the work of C&S. The generic model will evolve into practical representations of the actual sites to be built as part of the CTFCA program as details of these are released. These models will have the capability to overlay clearance zones and details of regulatory requirements for each type of component in the station.

Status: A task group was formed to setup the criteria for the Virtual Fuelling Station.

Task 2: Information Documents

Task Mandate

The objective of this task is to produce comprehensive materials documenting the work of C&S, and for reducing and organizing this information for distribution to the target *stakeholder community* including:

- Advisory bodies working with C&S in the adaptation of model codes to accommodate hydrogen
- Regulatory officials
- Project developers
- The general public

Documentation of ongoing work in Task 1 will be provided under the respective Action items. Additional immediately required action items for the outside stakeholders are described below.

For each action item under this task, a document will be prepared by a C&S task force in conjunction with the CTFCA Communications Working Group.

Action 2.1: Information Bulletin for Regulatory Officials

Action Objective An information bulletin describing the basics of hydrogen and the regulatory tools available to simplify decision making will be prepared for distribution to regulatory officials at all levels including local, municipal, city, provincial and federal. A basic objective of this bulletin is to recommend that all officials use similar approaches based on appropriate interpretation of national codes. Early release of this bulletin has been emphasized by representation from the end user community.

The bulletin is planned as two 8.5 x 11 in pages printed on both sides. It will include:

- a rationale for distribution of the bulletin
- a description of hydrogen and why it is becoming an important fuel
- a description of how hydrogen is stored and transported
- a description of the six Canadian model codes and their relevance to hydrogen
- a review of changes underway in the codes to accommodate hydrogen
- a description of the types of projects that regulatory officials may encounter in the near future
- a list of relevant standards and reference documents
- a recommended approach to project approvals

Status: Task group has been formed to investigate the available information and insure there is no duplication of effort. Immediate focus is available DOE information. The group is investigating the suitability of this information for CTFCA use.

Action 2.2: Project Management Manual for Engineers and Architects

Action Objectives

To develop a manual detailing special requirements that have to be considered in setting up a hydrogen processing or storage facility. This manual is intended as a reference document for project engineers and architects in developing drawings and layout plans; in selecting equipment, components and installation techniques; and in supervising facility construction. The manual is planned to be in 8.5 x 11 in size, formatted for inclusion in a three-ring binder. This format will permit easy update of sections as the Canadian model codes are updated and as new technical standards and related regulations are developed. Individual sections of the binder will also serve as special instructions for trades-people (such as pipe fitters). It will include:

- a rationale for development of the Manual
- the physical properties of hydrogen
- how hydrogen is stored and transported
 - ✓ gaseous storage and transport
 - ✓ liquid storage and transport
 - ✓ use of metal hydride storage techniques
 - ✓ special considerations for each type of storage and transport
- on-site production of hydrogen
- a description of the six Canadian model codes and their relevance to hydrogen
- a review of changes underway in the codes to accommodate hydrogen
- fire prevention and control
- risk management plan
- emergency response plan
- do's and don'ts for building a hydrogen facility
- special requirements related to ventilation of hydrogen facilities
- selection and installation of equipment and components (this section will include a number of fact sheets related to each installation trade)
- a list of relevant standards and reference documents
- a guide to achieving regulatory approvals

Status: Work is ongoing. Gaps in existing information are being investigated.

Action 2.3: Emergency Response Plan

To develop emergency response plans for hydrogen fuelling stations to be put in place for employees of these facilities as well as fire and rescue authorities.

Status: This is a new action. C&S WG members are providing information on emergency response plans and examples of existing plans.

Task 3: Training and Certification

Task Mandate

This is a provincial responsibility. The Working Group will identify personnel categories requiring certification. At present, “installers”, “maintenance personnel” and owner/operators are candidates. It is anticipated that the program will be offered as a skills upgrade to such trades and pipe fitters and mechanic as a “hydrogen endorsement” to their basic tickets. (There are similar trade certification in the US such as for welding and pipe-fitting are there models to use for this certification perhaps from the gas or chemical industry here in the US)

The Working Group will coordinate with the Interprovincial Apprenticeship Program for the trades. This option could be facilitated by coordination with CAMPE, the Association of Motive Power Educators for training and certification. However, the Working Group will have to develop the content for the training program.

Action 3.1: Coordination With CAMPE

Action Objective: To initiate a discussion with CAMPE to determine their role and how the C&S WG can work with them. Among data to be gathered is information on integration of hydrogen related training into existing apprenticeship and licensing programs versus situations where completely new training is required. We can also look into HazMat technician training under provincial fire marshal programs. The National Fire Academy in the US can be a resource for such standardized programs as the Academy trains fire departments and other emergency responders from all over the US.

Status: CAMPE is being approached to determine what role it could play.

Action 3.2: Develop Training Course Content

Action Objectives: To develop a comprehensive list of the hydrogen-related topics for which content is required and to define the target audience(s) for each. Subtasks for this action item include:

- Analyze needs
- Create audience profile
- Write training objectives
- Analyze and outline content
- Storyboard the content
- Select learner activities
- Produce content
- Develop evaluation criteria
- Author course

Status: Deferred until contact is made with CAMPE.

Action 3.3: Training for Hydrogen Fuelling Station Operators and Maintenance Personnel

This will be discussed at future meetings. However it may involve coordination with occupational safety and health organizations.

Status: Deferred.