



## SPS 340.80 Gaseous Hydrogen Systems (GH<sub>2</sub>) CHECK LIST

### Vehicular Fuel Gas Systems Code NFPA 52 – 2010 Ed

Owner: \_\_\_\_\_ City: \_\_\_\_\_ State/zip \_\_\_\_\_

Location: \_\_\_\_\_ Contact Phone: \_\_\_\_\_ Cell: \_\_\_\_\_

Tank Manufacturers \_\_\_\_\_ Tank Capacity \_\_\_\_\_ Year Built \_\_\_\_\_

Vessel Marking: \_\_\_\_\_ NB Ser No. \_\_\_\_\_ MAWP \_\_\_\_\_ QTY. \_\_\_\_\_

<b>General GH<sub>2</sub> Requirements and Equipment Qualifications</b>	
<i>Code Section</i>	<i>Item Description</i>
<b>5.1 Application</b>	Applies only to pressurized system components handling GH <sub>2</sub> at fueling stations
<b>5.2 Sys. Approval</b> (listed approved)	1) PRD's, 2) Pressure Gages, 3) Pressure Regulators, 4) Valves, 5) Hose and Connections, 6) Nozzle 7) Metal hydride storage, 8) Elec equip used with GH <sub>2</sub> , 9) Gas Detection & Alarms, 10) H generators, 11) H dispensers, 12) Pressure Switches, 13) Flow Meters
<b>5.2.2</b>	Devices no specifically provided for shall be constructed to safety equivalent required for other parts
<b>5.3.1.1</b>	Containers, cylinders and tanks designed in accordance DOT, TC, ASME
<b>5.3.1.3</b>	Containers, cylinders and tanks shall be designed for GH <sub>2</sub> and permanently marked "Hydrogen"
<b>5.3.1.4</b>	Containers, cylinders and tanks mfg prior to effective date shall be permitted if designed for GH <sub>2</sub>
<b>5.3.1.5</b>	Supports for Containers, cylinders and tanks shall be engineered with non-combustible materials
<b>5.3.2.1</b>	PV manufactured to DOT specs shall not be used for stationary storage containers ( <i>see also NFPA 55</i> )
<b>5.3.4.1</b>	ASME Sect VIII or Sect X shall be signed for GH <sub>2</sub> service
<b>5.4</b>	Pressure Relief devices shall be provided to protect containers and systems containing compressed gases
<b>5.4.1</b>	PVR shall be designed in accordance CGA S-1.1 cylinders, CGA S-1.2 Cargo and portable tanks and ASME VII for stationary tanks
<b>5.4.3 9.6.1</b>	Pressure relief device shall have the capacity to prevent the MAWP form being exceeded
<b>5.4.4, 5.5.1</b>	Pressure relief devices shall discharge to open air to prevent impingement on container or structures
<b>5.4.5, 5.5.2.1</b>	Pressure relief devices or vent piping designed prevent moisture from collecting and freeze
<b>5.6.1, 9.8</b>	Pressure Gage provided capable of reading at least 1.2 times system MAWP
<b>5.7.1, 9.7.1</b>	Pressure Regulator inlet and chamber designed with safety factor of at least 3
<b>5.7.2</b>	Low pressures chambers shall provide for overpressure relief or withstand service pressure upstream
<b>5.8.1</b>	Pipe, tubing and fittings shall be suitable for hydrogen service and for max and min temperatures
<b>5.8.1.2</b>	Gray, ductile and cast iron pipe and fittings shall not be used
<b>5.8.2</b>	Pipe, tubing and fittings and other components shall be designed with min safety factor of 3
<b>5.8.3, 9.9.1.4</b>	Hydrogen gas piping shall be fabricated and tested with ANSI/ASME B31.3 <i>Process Piping</i>
<b>5.8.4.1,</b>	Piping joints made with taper threads shall not be used above 3000 psi
<b>5.8.4.2</b>	Tapered joint exceeding 3000 psi may be used under following conditions 1) Where valves and instrumentation are not available with straight threads 2) Where tapered joints are seal welded in accordance with ANSI/ASME B31.3
<b>5.9.1</b>	Valves, packing and gaskets shall be designed for the fuel over the full range of pressures and temp
<b>5.9.1.1</b>	Shut-off valves shall have a rated pressure not less than pressure of entire system w/ safety factor of 3
<b>5.9.1.2</b>	Leakage shall not occur when tested to 1.5 times the rated pressure
<b>5.9.2</b>	Valves designed that allows the valve stem to be removed without removing the valve shall not be used
<b>5.9.3</b>	Valves shall be marked by manufacture to indicate the service rating
<b>5.10.1, 9.9.3</b>	Hoses shall be designed for hydrogen exposure
<b>5.10.2</b>	Hoses shall have a pressure rating at least 3 times MAWP
<b>5.10.4</b>	Hoses shall be distinctly marked by the manufacture design pressure and flow direction
<b>5.11.1</b>	Fueling nozzles for GH <sub>2</sub> listed in accordance with SAE J2600
<b>5.11.2</b>	The use of adapters shall be prohibited
<b>GH<sub>2</sub> Compression, Gas Processing, Storage, and Dispensing Systems</b>	
<b>9.1</b>	System components shall comply with appropriate provisions in Chapter 5
<b>9.2.1</b>	Where systems are served by gas utility, the utility shall be notified of all GH <sub>2</sub> installations
<b>9.2.2</b>	Dispensing and storage facilities shall be certified as meeting code requirements by qualified engineer
<b>9.2.3</b>	<b>Hazard analysis</b> shall be conducted on hydrogen fueling system installations by qualified engineer
<b>9.2.3.1</b>	<b>Hazard analysis</b> includes: 1) Fire protect & suppression systems, 2) Detection systems & 3) Ventilation
<b>9.2.3.2</b>	Consideration of potential failures in hoses, nozzles, dispensing equipment & failure maint & service
<b>9.2.4</b>	<b>Out of Service Stationary Bulk Gas Systems</b> that remain in place shall be safeguarded:
<b>9.20</b>	1)Required Permits maintained, 2) Source &fill valves shall be closed, 3) Cylinders, containers& tanks shall be maintained, 4) Security shall be maintained in accordance with 9.2.5



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9.2.5.2	Compression, processing, generation, storage and dispensing equipment shall be <b>protected from vehicles</b> and physical damage and vandalism.
9.2.5.3	Compressed gas containers, cylinders, tanks and system shall be secured from dislodgement
9.2.5.4	Where guard posts are installed the posts shall meet: 1) Constructed of steel (min. 4" dia) and filled with concrete. 2) Spaced not more than 4 ft between posts. 3) Set not less than 3 ft deep. 4) Min 3 ft above ground. 5) Located not less than 5 ft from the tank.
9.2.6.5.1	The transfer system shall be capable of depressurizing to facilitate disconnection
9.2.6.5.2	Bleed connections shall be connected to hydrogen venting in accordance with 5.5.1
9.2.6.6	Backflow prevention or check valves shall be provided for hazardous materials
9.2.6.8	Emergency shutoff valve shall be provided in accordance with 9.11.1
9.2.7	Control devices shall be installed so that internal or external icing does no cause fueling malfunction
9.2.9	The fueling connection shall prevent the escape of gas if not properly engaged
9.2.10	Compression & gas processing equip. shall have PRV for each stage pressure to MAWP
9.2.10.2	Compression equip un-attended shall have a high & low suction press. auto shutdown control
9.2.10.3	Automatic shut down control circuits shall have a manual reset
9.2.11	Engine-driven compressor installations shall conform to NFPA 37
9.2.12	Where H <sub>2</sub> is used as a fuel for engine-driven comp. engine shall comply with 9.3 source of ignition
9.2.14	Dispensing equipment shall be provided with leak detection, flame detectors over entire system
9.2.14.1	Detectors shall be maintained & calibrated and accessible to the inspector
9.2.14.2	Owner or operator shall maintain a record of detector maintenance and calibration
9.2.14.3	A sticker at least 6 in <sup>2</sup> shall be affixed on dispenser with date of next scheduled maint. & calibration
9.3.1.1	GH <sub>2</sub> compression, generation, storage & dispensing shall be located outdoors or indoors
9.3.1.2	Equip to be installed on foundations with anchoring to meet requirements of adopted building code
9.3.1.3	The min. distance from bulk HG <sub>2</sub> comp gas system locate outdoors to specified exposure Table 9.3.1.3(a) or Table 9.3.1.3(b)
9.3.1.3.1	Max internal dia. of piping system used for interconnecting piping between shutoff valve & single storage container to source valve shall not exceed the values in Table 9.3.1.3(a), Table 9.3.1.3(b)
9.3.2.1	GH <sub>2</sub> facility sheltered by enclosure constructed weather protection in 9.3.2.1.1 with roof designed for ventilation shall be considered to be located outdoors
9.3.3.1	GH <sub>2</sub> facility permitted to locate inside of buildings reserved exclusively for these purposes or in rooms within or attached to building used for other purposes
9.3.3.2	Bulk hydrogen storage shall be in accordance with NFPA 55
9.3.3.5.4.1	Indoor room ventilation shall be continuous mechanical or by mechanical ventilation activated by H <sub>2</sub> detection gas system monitor
9.3.3.11.1	Access doors shall have warning signs with <b>"WARNING-NO SMOKING—FLAMMABLE GAS"</b>
9.3.3.11.2	<b>"Non-odorized Gas"</b> Legible bright red letters not less than 1" high w/ white background
9.11	<b><i>Installation of Emergency Shutdown Equipment</i></b>
9.11.1.1	Storage vessels up to max combined capacity of 10,000 scf shall have manual shutoff valve
9.11.1.2	Manual shutoff valve shall be install in manifold as close to container or group containers as practical
9.11.1.3	The valve in 9.11.1.2 shall be located downstream the backflow check valve specified in 9.11.2
9.11.2	Compressor discharge line supplying the storage container shall be equipped with backflow check valve
9.11.4	Gas piping from outdoor compressor or storage into building shall be provided w/ shutoff valve
9.11.5	An emergency shutdown device shall be provided at the dispensing area & remote location
9.11.5.2	LH <sub>2</sub> converting to GH <sub>2</sub> , emergency shutdown system shall also shut off the liquid supply and power LH <sub>2</sub>
9.11.5.3	ESD's shall be distinctly marked for easy recognition with permanently affixed legible sign
9.11.6	A breakaway device stopping hydrogen flow between hose connection & dispenser shall be installed
9.11.7	Manual reset shall be installed for emergency shutdown controls & when electric power is interrupted
9.13.1	Stray or impressed currents if present on dispensing systems, cathodic protection shall be provided
9.16	<b><i>Maintenance</i></b>
9.16.1	Containers & their appurtenances, piping, compressors, controls & detection devices shall be maintained
9.16.2.1	Hoses, nozzles & breakaways shall be examined according to Mfg's recommendations or monthly
9.16.2.2	Hose shall be tested for leaks per Mfg's recommendations or at least monthly and maintained
9.16.2.3	Testing shall be carried out using an inert gas as the test medium
9.16.2.3.1	If testing w/ inert gas is not possible the hose assembly shall be isolated from system & tested with GH <sub>2</sub>