COMM 340.90 Liquid Hydrogen Fueling Facilities (LH_2) 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. _____

Facility Design	
Code Section	***Item Description***
14.3.1	All hydrogen refueling station sites shall have a complete HAZOP analysis prior to dispensing fuel
14.3.1.1	Cryogenic containers and systems shall be secured against accidental dislodgement & access
14.3.1.1.1	LH_2 dispensers shall be designed to secure all equipment from tampering
14.3.1.1.2	Storage containers, piping, valves regulating equip. & other accessories shall be accessible & protected
14.3.1.2	Operating instructions identifying the location & operation of emergency controls shall be posted
14.3.1.2.1	Identification of ESV's on stationary containers shall be identified by visible sign.
14.3.1.5	LH_2 refueling site or dispensing LH_2 shall provide personnel protection barriers such as walls, cabinets, vacuum-jacketed pipe. All facility piping other than the refueling line to vehicle shall be behind barrier
14.3.2	***Stationary Storage Tanks***
14.3.2.1	Aboveground tanks for storage LH_2 shall be installed in accordance NFPA 55
14.3.2.1.1	The min distance from aboveground tanks indicated capacity to exposures shall be accordance table 14.3.2.1.1
14.3.2.2	Underground tanks for storage shall be in accordance with NFPA 55
14.3.2.2.1	Stationary tanks shall be designed & constructed in accordance (Sect VIII Div1 of ASME)
14.3.2.2.1.1	Vacuum jacket construction shall be designed & constructed in accordance (Sect VIII Div1 of ASME)
14.3.2.2.1.2	Vacuum jacket installed below grade shall be designed to withstand hydrostatic and seismic loading
14.3.2.2.1.2 (A)	Vacuum jacket material shall be stainless steel or other approved corrosion-resistant material
14.3.2.2.1.2 (B)	Vacuum jacket shall be protected by engineered cathodic protection system w/ maintenance schedule
14.3.2.2.2.1	Underground storage tanks shall not be locate beneath buildings
14.3.2.2.2.3	The distance from any part of tank to nearest wall of basement, pit, cellar or lot line not less 10 feet
14.3.2.2.2.4	Min 1 feet shell to shell shall be maintained between adjacent underground tanks
14.3.2.2.3	Tank shall be buried with a min of 1ft of earth and with concrete a min 4in
14.3.2.2.3.1	Concrete shall extend a minimum of 1ft horizontally beyond the footprint of the tank in all directions
14.3.2.2.3.2	Underground tanks shall be set on foundations constructed in accordance with the building code
14.3.2.2.3.3	Vertical extension of vacuum jacket required for service connections shall be allowed above ground
14.3.2.2.5	Venting of underground tanks shall be in accordance with 14.8.1.5
14.3.2.2.6	Underground liquid hydrogen piping shall be vacuumed jacketed
14.3.2.2.7	Overfill protection & prevention system shall be provided to prevent overfilling of tanks
14.3.2.2.8	Vacuum level monitoring shall be provided to indicate vacuum degradation within vacuum jacket(s)
14.3.2.2.10	Tanks not in service shall be maintained in accordance with 14.3.2.2.10.1(corrosion protection)
14.3.2.3	Table 11.3.2.2 of NFPA 55 shall not be cocated beneath or where exposed by failure of the following 1) Electric power lines 50' from vertical plane below the nearest overhead wire of elect. trolley or bus not less than 5' from vertical plane below the nearest overhead electric wire 2) Piping containing other hazardous materials
14.3.2.4	Not less than 50 ft from cryogenic fluid storage or delivery systems shall be higher than grade of flammable or combustible liquids are stored or used
14.3.2.6	Points of transfer shall be located no less than 25 ft from nearest important building not associated with the LH_2 facility or fixed sources of ignition. Length of refueling hose shall be included points of transfer
14.3.3	**Spill Containment:** Diking shall not be used to contain liquid hydrogen spill
14.3.4	**Indoor Fueling**: shall not be permitted
14.4 - 14.4.6	Cargo transport unloading: Bleed or vent connections shall be provided for loading arms and hoses
14.4.2	Transfer piping shall be equipped with a check valve to prevent backflow from container
14.4.3	Stationary storage containers shall be located so they are accessible to mobile supply equipment
14.4.3.1	Below grade fueling facility shall have operating status indicators indicating container level in unloading area
14.4.5	Sources of ignition shall not be permitted in the unloading area while transfer is in progress
14.4.7	Prior to connection, a cargo transport vehicle's wheels shall be rendered immobile

COMM 340.90 Liquid Hydrogen Fueling Facilities (LH_2) CHECK LIST

Vehicular Fuel Gas Systems Code NFPA 52 – 2010 Ed

14.5	***LH_2 Vehicle Fuel Dispensing Systems***
14.5.1	Shall be designed in the event of power or equip. failure, system shall go into a fail-safe mode
14.5.2	Dispensing device shall be protected from vehicle collision damage
14.5.3	Emergency Shutdown system (ESD) shall be provided that includes a shut-off valve within 10' of the dispenser. Actuator for the valve, distinctly marked w/ permanently legible sign & another shutdown point located at a safe, remote location
14.5.5	Hose & arms shall be equipped with shut-off valve at the fuel end and a breakaway device
14.5.6	When not in use, hose shall be secured to protect it from damage
14.5.7	Hose or arm 3in dia. or larger for liquid transfer or 4in dia. or larger for vapor transfer and emergency shut-off valve shall be installed in the piping transfer system with 10 ft from nearest end of hose or arm
14.5.7.1	Where flow is away from hose, a check valve shall be permitted to be used as a shut-off valve
14.5.7.2	If liquid or vapor line has two or more legs and emergency shut-off valve shall be installed in each leg
14.5.8	Bleed or vent connections shall be provided for loading arms and hose's
14.5.9	A fueling connector and mating vehicle receptacle shall be used for transfer of LH_2 or gas vapor
14.7	***Piping Systems and Components (ANSI/ASME B31.3)***
14.8.1.1	Pressure-relief devices shall be provided to protect containers and systems
14.8.1.2	PRV shall be designed in accordance with CGA S-1.1
14.8.1.3	Heat exchangers, vaporizers, insulation casings and coaxial piping in which liquefied cryogenic fluids could be trapped due to leakage from primary container shall be provided with a pressure relief device
14.8.2.1	PRV shall be sized in accordance with specifications of container
14.8.2.2	PRV shall have capacity to prevent the MAWP of container or system from being exceeded
14.8.3	PRV shall be located so they are accessible for inspection & repair
14.8.4.1	PRV shall be arranged to discharge unobstructed to the open air
14.8.5.2	Shutoff valves shall not be installed between PRV and containers unless meet req. of 14.8.5.3
14.8.5.3	Shutoff valves shall be the locking type & limited to service under the req. of ASME
14.8.6	PRV shall not be subjected to cryogenic fluid temperatures except when operating
14.8.7	Signage shall be provided that warns against spraying water on or into the vent opening
14.9.1	Aboveground piping shall be protected against corrosion
14.9.2	Belowground piping shall be protected against corrosion
14.9.3	Insulation on piping systems shall be noncombustible material and shall be designed to be vapor tight
14.9.4.2	Containers equipped with cathodic protection shall be inspected by a cathodic protection tester
14.9.4.2.1	Cathodic protection tester shall be certified by NACE
14.9.4.3.2	System owner shall maintain records that the cathodic protection is in conformance with req. of design
14.10.1	Valves shall be installed such that each pump or compressor can be isolated for maintenance
14.10.1.1	Pumps or compressors installed in parallel: each discharge line shall be equipped with a check valve
14.10.2	Foundations used for supporting pumps and equip. shall be designed to prevent frost heaving
14.10.3	Where EDS is required activation shall shut down operation of all pumps & compressors
14.10.4	Each pump & compressor shall be provided with a vent or relief device
14.10.5	Pressure on each pump & compressor discharge shall be monitored by a control system
14.10.6	Transfer piping, pumps & compressors shall be protected from vehicular damage.
14.11.1	Heat supplied to LH_2 vaporizer shall be by the indirect means utilizing a transfer medium
14.11.2	A low temp shutoff switch or valve shall be provided in the vaporizer discharge piping
14.11.2.1	Discharge from PR device serving the vaporizer system shall be connected to a vent pipe system
14.12.1	**LH_2 to GH_2** req. of chap 14 shall be applicable to LH_2 systems only. GH_2 requirements shall be chap. 9
14.12.2	emergency shutdown system shall shut off the liquid supply & power to LH_2 transfer equip for producing GH_2 from LH_2
14.13.1	Emergency Shutdown Device (ESD) shall be required to have a manual reset
14.13.2.1 **14.13.2.2 & .3**	ESD shall be provided at bulk storage and be remotely located w/ manual activated control located not less than 15 ft from the source of supply & reactivated with a manual reset.
14.13.2.4	ESD system shall be identified by means of a sign
14.14.2	The LH_2 container and associated piping shall be electrically bonded and grounded
14.14.3	Electrical equipment & wiring shall be as specified and shall be installed in accordance with NFPA 70
14.15	***Maintenance***
14.15.1	Maint. based on OEM rec. & not less than every 6 months, records shall be made available on demand
14.15.1.1	Refueling site shall have a written maintenance record or safety analysis program in place

COMM 340.90 Liquid Hydrogen Fueling Facilities (LH_2) CHECK LIST
Vehicular Fuel Gas Systems Code NFPA 52 – 2010 Ed

14.15.1.2	Records of required maintenance shall be provided to the authority having jurisdiction upon request
14.15.1.3	Fueling facilities shall be free within 25 ft from rubbish, debris, weed and other fire hazard materials
14.15.6	Safety, gas detection, & fire protection equip shall be tested & inspected every 6 months
14.16	**Out of Service Stationary Bulk Gas Systems:** installed but not in use shall be removed from service by the supplier or shall be safeguarded in accordance with the following: 1) Required permits shall be maintained 2) Source & Fill valves shall be closed 3) Cylinders, containers & tanks shall be maintained in serviceable condition 4) Security shall be maintained in accordance with 9.2.5
14.17	**Refueling from Transport Vehicles:** mobile refueling vehicles, temporary trailers (with or without tractors) & other means of vehicle refueling or onsite storage shall be subject to the same requirements as a permanent refueling or storage installation
14.17.3	Transport vehicle shall comply with US DOT requirements for the transportation of LH_2
14.17.4	Smoking materials, including matches, lighters & other sources of ignition including torches shall not be use within 20 ft of the dispensing of LH_2
14.17.5	Each area where dispensing of LH_2 in the open from a transport vehicle to a motor vehicle shall be provide with one or more listed fire extinguishers with a minimum of 40-B:C
14.17.5.1	The fire extinguishers shall be within the dispensing operation
14.17.7	Persons performing dispensing operations shall be qualified to deliver & dispense LH_2 fuels

NOTES: