Example Safety Distances For Hydrogen Fuelling Stations

1 General

ISO 19880-1, “Gaseous hydrogen - Fuelling stations - Part 1: General requirements”, includes requirements for, and additional guidance on, safety and risk assessment methodologies used at hydrogen fuelling stations.

ISO 19880-1: 2020, Annex A, includes information on regional specific permitting guidance, in addition to methodologies for semi-quantitative and quantitative risk assessment for assessing hydrogen installation safety.

ISO 19880-1: 2020, Annex A.2 provides examples of specific hydrogen fuelling station regulations, codes or guidance documents applicable in some countries/regions, which typically detail prescriptive requirements or recommendations to be followed in the design, installation or operation of a fuelling station.

To supplement the content of ISO 19880-1: 2020, this document provides examples of safety distances sourced from countries involved in the preparation of the preceding document, ISO/TS 19880-1 (2016).

2 Example safety distances from different countries/regions

Below is a table of examples of safety distances meant to convey a status of country specific safety distances at the time of publication of the ISO/TS 19880-1 (2016). This table is not an inclusive list of values internationally.

It demonstrates the wide range of results that can be found for similar equipment in similar environments around the world, and highlights the benefits of a quantitative or semi-quantitative risk assessment methodology, as discussed in ISO 19880-1.

Table A.1 is not meant to be a recommendation for these applications and is subject to change from local regulations, codes and standards.

Units are in metres unless otherwise noted.

Table A.1 - Examples of hydrogen fuelling station safety distances currently in use globally

			CA	CN	FR	DE	IT	JP	KR	SE	UK	US
RESTRICTION DISTANCES *The restriction distance is the minimum distance from, or area around, hydrogen equipment where certain activities are restricted or subject to special precautions*	Potential area of flammable / explosive atmosphere round compression unit	m				IEC 60079- 10		8	8		5	0 to 4,6 m Class1 Div2
	Potential area of flammable / explosive atmosphere around storage unit	m						8	8		5	0 to 4,6 m Class1 Div2
	Potential area of flammable / explosive atmosphere around dispenser	m		4,5				0,6			-	0 to 1,5 m Class1 Div2
	Sparking equipment, open flames, welding	m	7,6	20-40				8	8		5	10,7
	Outdoor discharge for relief valves or vents	m		3-10							-	1,5 m Div1 4,6 m Div2
INSTALLATION LAYOUT DISTANCES *The installation lay-out distance is the minimum distance between the various units of the main equipment of the hydrogen installation required to*	Between Sub-System / Equipment of any kind	m		3-15		1 m vessels without opening 0,5 m				1	-	
	Between H2 Storage and other Sub-System / Equipment	m		3-15					Max [1, (radius 1+ radius 2)/2]		-	
	Between Compressor and other Sub-System / Equipment	m		3-9							-	

prevent units causing damage to one another in case of incidents.	Between Equipment and barriers around the plant (access and circulation)	m		2-5 (walls)							0,6	
	Between hydrogen dispenser and other non hydrogen equipment except vehicle	m				2					-	
PROTECTION DISTANCES *The protection distance is the minimum distance required between the installation/equipment to be protected of the possible source of an external hazard (e.g. a fire) to prevent damage***.**	Presence of (liquid) combustibles above ground (like gasoline storage or a tank truck)	m	7,6 to 15,2	18-35		5			8	50	8	
	Private or public road (Collision by a vehicle, either present at the fuelling station or passing by on a nearby road)	m		2-5				3	5	10	8	
		m		12-35		5				25	-	

CLEARANCE DISTANCES *The clearance distance is the minimum distance between the potentially hazardous installation /equipment and the vulnerable targets within the fuelling station. Here, the hydrogen installation is regarded to be the source, while the surrounding people /objects are considered to be the targets.*	Personnel of the HRS (1st party)	m									-	
	Users of the HRS (clients, 2nd party)	m					10				-	
	Public (Third party)	m									8	4,6
	Other fuelling facilities within the fuelling station, like delivery facilities.	m								12		
	Gasoline storage	m	3,1 to 7,6 (below ground)	3-8		3	10			25	8	4,6
	LPG storage	m	7,6 to 15,2 (above ground)			8	20			25	8	4,6

	CNG hazardous elements	m	7,6 to 15,2	5-12			15	6		12	5	4,6
	Bulk liquid oxygen storage	m	7,5 to 15			5		10	10 (5 if firewall)	12	5	
	Between H2 dispensing and others fuels (LPG, CNG, gasoline)	m		4			8				-	4,6
	Buildings inside the plant	m		5-15	8					12	-	
	Building of combustible material	m	15,2							12	8	4,6
	Building openings / windows / access doors	m	3,1 to 7,6							Same as for buildings in general	8	10,7
	Building non combustible material	m	1,5 (2 h) 7,6 (< 2 h)								-	1.6
	Air intakes / ventilation	m	15,2			Out of hazardous area				Outside of hazardous area	8	10,7
	Other	m	4,6 (haz. mat. piping)								-	

EXTERNAL RISK ZONE *The external risk zone is the distance (or area) outside the fuelling station which has to be protected against hazards caused by the hydrogen installation. Here, the H2 installation (i.e. dangerous units thereof) is clearly the hazard source, while people and constructions offsite are regarded to be the target(s).*	Lot line	m	1,5		8			8	10 (5 firewall)		8	10,7
	Public Road	m	4,6	5-15	8			8	5	10 (up to 50 km/h)	8	3 (Dispen-ser)
	Specific public buildings Houses	m							12-20		-	
	Parking	m	4,6							6	8	4,6
	School / Hospital Place of public assembly / Other	m	15.2	50					17-30	100 (exits from difficult to evacuate buildings)	-	

	High voltage line	m	15 tram, bus overhead 1,5 others overhead electrical	1.5 times of the height of the pole			30		5 (Rail 30)	15 (Valid for 12-72,5 kV)		4,6
Comments:									where "-" is un-specified			

NOTE:

CA: Sourced from CHIC, Canadian Hydrogen Installation Code, CAN/BNQ 1784-000/2007, Table 2, for gaseous hydrogen storage greater than 35 kg

CN: The values provided above for China have been derived from Chinese National Code GB 50516-2010: Technical code for hydrogen fuelling station.

FR: The values provided above for France have been derived from the specific French regulation “Arrêté du 12 février 1998 relatif aux prescriptions générales applicables aux installations classées pour la protection de l'environnement soumises à déclaration sous la rubrique n° 1416 (Stockage ou emploi de l'hydrogène) : for stored quantity of hydrogen between 100 kg and 1 T.

Values provided available for installations using gaseous hydrogen:

• Distance can be reduced to 5 m if located in a dedicated closed building

• Distance can be reduced to 3 m by installing a dedicated fire-resistance wall

DE: The values provided above for Germany have been derived from the VdTÜV-Merkblatt: Compressed gases 514: Requirements for hydrogen fuelling stations and other sources.

IT: The values provided above for Italy have been derived from the Italian Regulation of the 2006-08-31: Technical rule for the design, construction and exercise of hydrogen refuelling stations.

JP: The values provided above for Japan have been derived from High Pressure Gas Safety Law, Code of General High Pressure Gas Safety Article 7-3 Paragraph 2. These distances are applied for gaseous hydrogen systems (< 82 MPa) and liquid hydrogen storage (< 1 MPa).

KR: The values provided above for Korea have been derived from interpretation of the High Pressure Gas Safety Management Law and KGS FP216.

SE: Swedish distances are based on distances used for CNG-stations. They can be found in TSA 2015, "Anvisningar för tankstationer för metangasdrivna fordon", published by The Swedish Gas Association (Energigas Sverige).

Note that most of the values are valid for storage volumes larger than 4000 litres. Shorter distances are available in TSA for smaller volumes and for dispensers. Many of the distances may be halved with walls with 1 h fire resistance.

UK: The values provided above for the UK have been derived from interpretation of the published British Compressed Gases Association (BCGA) Code of Practice CP41, 2014 - The design, construction, maintenance and operation of filling stations dispensing gaseous fuels. These distances are based on those for bulk gaseous hydrogen storage published in BCGA Code of Practice CP33. Other distances may apply for smaller gaseous hydrogen storage systems, or for liquid hydrogen storage.

US: NFPA 2: Derived from National Fire Protection Association (NFPA) Code 2, for gaseous hydrogen systems of a pressure between 51,7 MPa to 100 MPa, and with a piping system of internal diameter 7,16 mm. (also NFPA 55: Compressed gases and cryogenic fluids code)

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