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Technical Specification of Hydrogen Fueling Station for Fuel Cell Vehicles

燃料电池汽车加氢站技术规程

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2 Glossary

2.0.1 Hydrogen fueling station

A dedicated place for fueling hydrogen into fuel cell vehicles.

2.0.2 Automobile gasoline and hydrogen fueling station

A dedicated place with oil storage facilities that can not only fuel gasoline and diesel for the vehicles, but also can fuel vehicle-used compressed hydrogen or mixture of hydrogen and natural gas for the fuel cell vehicles, or hydrogen-storing cylinder for the hydrogen internal combustion engine vehicle or hydrogen and natural gas hybrid vehicle.

2.0.3 Automobile hydrogen and gas fueling station

A dedicated place with gas storage facilities that can not only fuel gas for vehicles, but also fuel vehicle-used compressed hydrogen or mixture hydrogen and natural gas for the fuel cell vehicles, or hydrogen internal combustion engine vehicles, or hydrogen and natural gas hybrid vehicle.

2.0.4 Fuel cell vehicle

A vehicle that uses hydrogen as fuel and a fuel cell engine as a power source to transport goods or people.

2.0.5 Hydrogen dispenser

A special equipment for fueling hydrogen storage bottles of fuel cell vehicles with hydrogen and equipped with control, metering and pricing devices.

2.0.6 Hydrogen filling hose

A metal hose that connects the hydrogen dispenser and the hydrogen filling nozzle.

2.0.7 Hydrogen filling nozzle

A filling device with a hydrogen on-off function that is inserted into the receptacle of a fuel cell vehicle.

2.0.8 Receptacle

A connector that connects the hydrogen filling nozzle and the vehicle-mounted hydrogen storage system.

2.0.9 Vessels for hydrogen gas storage

A hydrogen storage device that is fixedly installed in a hydrogen fueling station and is used to

5 General Layout

5.0.1 The equipment arranged in the station shall have reliable infrastructure, and the buildings and structures in the station shall meet the relevant requirements for seismic design in the current national standards GB 50011 *Code for Seismic Design of Buildings,* and GB 50191 *Design Code for Anti-Seismic of Special Structures*.

5.0.2 The fence setting of the hydrogen fueling station shall comply with the following provisions:

1 When the distance between the process facilities of the hydrogen fueling station and the buildings and structures outside the station is less than or equal to 25m, and less than or equal to 1.5 times the safe distance in Table 4.0.4, the adjacent side shall be set non-combustible solid wall at a height of no less than 2.2m.

2 A non-physical fence should be set up on the side facing the entrance and exit roads.

5.0.3 The vehicle entrance and exit of the hydrogen fueling station shall be set up separately.

5.0.4 Roads within the station area shall comply with the following provisions:

1 The width of a single lane shall be no less than 3.5m, and the width of a double lane shall be no less than 6m.

2 The turning radius of the road within the station is determined according to the model of the hydrogen fueling vehicle; and should be no less than 9 m. The road slope shall be no greater than 6%, and should be sloping toward the outside of the station. The unloading parking space of the hydrogen transport device should be designed with a flat slope.

3 The loading and unloading parking spaces and road surfaces within the station shall use non-fire floors.

5.0.5 A canopy should be set on the installation site of the hydrogen filling island and hydrogen dispenser; the canopy should be made of non-combustible materials. The lower part of the canopy should be flat and made into a structure that does not accumulate hydrogen.

5.0.6 The design of the hydrogen filling island shall comply with the following provisions:

1 The hydrogen filling island shall be 0.15m~0.2m higher than the floor of the hydrogen-filling parking space.

2 The width of the hydrogen filling island should be no less than 1.2m.

5.0.7 The layout of the hydrogen transport unit in the hydrogen fueling station shall comply with the following provisions:

6 Hydrogen Fueling Technics and Main Equipment

6.1 Quality, pressure regulation and metering of hydrogen

6.1.1 The quality of the hydrogen gas entering the hydrogen fueling station shall comply with the high-purity hydrogen quality standards specified in the current national standard GB/T 3634.2 *Hydrogen - Part 2: Pure Hydrogen, High-Purity Hydrogen and Ultra-Pure Hydrogen*.

6.1.2 External hydrogen supply should be provided by hydrogen transport unit or pipeline to supply hydrogen. When using pipelines to supply hydrogen, a pressure regulating device and a flow metering device should be installed on the incoming pipeline.

6.1.3 For the equipment and pipelines in the hydrogen fueling station, wherever pressure needs to be displayed, pressure detection points shall be set up, and a safety pressure relief device for high-pressure gas pressure relief should be installed, when the pressure gauge is disassembled. The measuring range of the pressure gauge shall be 2 times the working pressure, and the accuracy of the pressure gauge shall be no lower than level 1.5.

6.2 Hydrogen storage system and equipment

6.2.1 The working pressure of the hydrogen storage system in the hydrogen fueling station shall be determined based on the hydrogen charging pressure of the hydrogen fueling vehicle. When the hydrogen charging pressure is 35MPa ~ 70 MPa, the working pressure of the hydrogen storage system of the hydrogen fueling station is generally 40 MPa ~ 100 MPa. The hydrogen storage device in the hydrogen fueling station should select a fixed hydrogen storage tank or hydrogen storage cylinder group. Hydrogen storage devices shall comply with provisions of relevant standards and specifications, and shall comply with the following provisions:

1 The manufacturing, inspection and testing of hydrogen storage device shall comply with provisions of relevant national regulations; for hydrogen storage devices manufactured by overseas companies, the manufacturing company must obtain relevant licenses.

2 The hydrogen storage device shall be designated by the manufacturer with specified colors and markings.

6.2.2 The hydrogen storage device in the hydrogen fueling station should be set up in 2 ~ 3 levels according to the operating pressure. The hydrogen storage capacity at each level shall be determined by the total hydrogen storage capacity of the hydrogen fueling station, the hydrogen storage pressure at each level, the hydrogen filling pressure, and the hydrogen filling volume, and filling time, etc.

6.2.3 Hydrogen storage devices of the same specification and model should be used in hydrogen filling station.

6.2.4 The hydrogen storage device should be fixed on reliable infrastructure and should be

placed horizontally.

6.2.5 The hydrogen storage device shall be equipped with a safety pressure relief device and connected to the corresponding vent stack.

6.2.6 On the side adjacent to the hydrogen storage device and the vehicle passage in the station, a safety guardrail or other prevention measures shall be taken.

6.3 Compression system and equipment

6.3.1 The selection of the hydrogen compressor in the station shall be determined according to the factors such as the pressure before and after hydrogen gas boosting, hydrogen filing capacity, hydrogen storage parameters and etc. Hydrogen fueling station shall be equipped with backup compressors.

6.3.2 The layout of the hydrogen compressor shall meet the following requirements:

1 The hydrogen compressors installed in the compressor room should be arranged in a single row. The width of the main channel should be no less than 2m, and the clear distance between the compressor and the wall should be no less than 1m.

2 The control system of the hydrogen compressor should be located in the adjacent control room.

6.3.3 The safety protection of the compressor shall comply with the following provisions:

1 A safety valve shall be installed between the compressor inlet and outlet and the first cut-off valve.

2 High-and-low pressure alarms shall be installed at the inlet of the compressor, and a high-pressure over-limit shutdown device shall be installed at the outlet.

3 The cooling system of the compressor shall be equipped with temperature, pressure and flow alarm and shutdown devices.

4 The lubricant system of the compressor shall be equipped with an alarm and shutdown device for low oil pressure or high oil temperature.

5 When using a diaphragm compressor, a diaphragm rupture alarm and shutdown device shall be installed.

6 The compressor inlet and outlet pipelines shall be equipped with replacement purge ports.

6.3.4 The condensed water discharged from the coolers, gas-water separators and hydrogen pipelines at all stages of the hydrogen compressor shall be collected into the condensed water discharge device through their respective dedicated drain devices and discharged to the outdoors.

gun according to the filling requirements.

6.5.3 The hydrogen dispenser should not be installed indoors, but for users with special purposes, the hydrogen dispenser can be installed indoors with adequate safety measures.

6.5.4 The hydrogen dispenser shall have filling, metering and control functions, and shall meet the following requirements:

1 The rated working pressure of the hydrogen dispenser shall meet the filling pressure requirements.

2 The hydrogen filling flow shall be less than 5kg/min.

3 A safety pressure relief device shall be installed.

4 Mass flow meter shall be used for measurement, the measurement accuracy shall be no lower than Level-0.5, and the minimum graduation value shall be 10g.

5 An automatic cut-off valve shall be installed on the air inlet pipe of the hydrogen dispenser.

6.5.5 The fueling hose of the hydrogen dispenser shall be equipped with a break away coupling. After the break away coupling is separated under the action of external force, both ends shall be self-sealing.

6.5.6 A defense column (rail) shall be set up near the hydrogen dispenser, and the height of the defense column (rail) shall be no less than 0.5m.

6.6 Instrument and control system

6.6.1 In the hydrogen filling station, in addition to the pressure and temperature instruments that come with the equipment, pressure and temperature control instruments with signal transmission functions should also be installed at corresponding locations and pre-cooling devices according to process flow requirements.

6.6.2 A real-time monitoring system in operating status shall be installed in the hydrogen filling station.

6.6.3 The hydrogen concentration detector and hydrogen flame detector shall be interlocked with the control system in the hydrogen filling station.

6.7 Hydrogen unloading site

6.7.1 A break away coupling should be installed on the gas unloading pipeline connected to the hydrogen transport unit.

6.7.2 The gas unloading pipeline connected to the hydrogen transport unit in the station shall be equipped with filters and electrostatic grounding devices. The flow area of the filter screen

shall be no less than 5 times the cross-sectional area of the pipe; and shall be able to prevent the passing of solid impurities with a particle size greater than 2μm.

6.7.3 The gas unloading parking space of hydrogen transport unit shall be equipped with fixed devices.

6.8 Safety and security measures

6.8.1 Safety valves, emergency shut-off valves, and pressure gauges shall be installed on the main hydrogen inlet pipe and the main hydrogen outlet pipe of the hydrogen storage device.

6.8.2 Emergency shut-off valves shall be installed on the process pipeline between the hydrogen storage device and the hydrogen dispenser.

6.8.3 The discharge exhaust gas of the safety valve of the hydrogen system in the hydrogen fueling station shall be collected and reused according to provisions or connected to the centralized safety discharge device; the opening pressure (P_o) of the safety valve shall comply with the following provisions:

1 When 1.8MPa<P≤4.0MPa, P_o = 1.lP.

2 When 4.0MPa< P≤25.0MPa, P_o = 1.05P.

3 When 25.0MPa < P≤75.0MPa, P_o = P + l.25MPa.

NOTE: P is the maximum working pressure of the equipment and system.

6.8.4 In order to avoid overpressure of the vehicle-used hydrogen storage cylinder, an overpressure protection device shall be installed in the hydrogen dispenser. The set pressure of the hydrogen dispenser overpressure protection device shall be no higher than 1.25 times the working pressure of the hydrogen filling nozzle.

6.8.5 Pressure relief protection devices such as safety valves shall be made of copper alloy or stainless steel.

6.8.6 Hydrogen pipelines and hydrogen storage devices in hydrogen fueling station shall be equipped with pressure relief protection devices such as safety valves. The pressure relief protection device shall take anti-blocking and anti-freezing measures.

6.8.7 The hydrogen stack of the hydrogen fueling station shall comply with the following provisions:

1 Pressure relief protection devices such as vent stack and safety valve shall be led to a safe place outdoors for centralized relief.

2 The openings of centralized vent stack shall be protected from the entry of rainwater, snow

8 Electric Installation

8.1 Power supply

8.1.1 The power supply of the hydrogen fueling station should be classified as Level-3 load according to the load classification specified in the current national standard GB 50052 *Code for Design Electric Power Supply Systems*. The communication and control system within the station shall be equipped with uninterrupted power supply.

8.1.2 Electrical facilities in rooms or areas with explosion risk shall comply with the following provisions:

1 Electrical facilities in rooms or areas with explosion risk shall be fortified according to Zone-1 or Zone-2, and the fortification level of each zone shall be determined according to the requirements of Appendix B.

2 Electrical facilities in rooms or areas with explosion risk shall comply with the provisions of current national standard GB 50058 *Code for Design of Electrical Installations in Explosive Atmospheres*.

8.1.3 Explosion-proof lamps shall be used for lighting in rooms with explosion risk and shall not be installed directly above the hydrogen relief source.

8.1.4 Emergency lighting shall be installed in the hydrogen compressor room, hydrogen filling island, operation room and other places in the hydrogen fueling station.

8.1.5 The laying of cables and wires in explosion-risk environments shall comply with the provisions of the current national standard GB 50217 *Code for Design of Cables of Electric Work*.

8.1.6 In areas with explosive hazardous environments, the protective steel pipes used for laying wires or cables must be isolated and sealed in the following places:

1 The conductor or cable leads to the electrical equipment connector part.

2 Between adjacent environments.

8.1.7 When laying cables in trenches, the cables must not be laid in the same trench as the hydrogen pipeline.

8.2 Lighting and grounding

8.2.1 For lightning protection of hydrogen fueling stations, lightning protection and grounding facilities shall be installed in accordance with the requirements of the current national standards GB 50057 *Design Code for Lightning Protection of Buildings* and GB 50058 *Code for Design of Electrical Installations in Explosive Atmospheres*.

8.2.2 The lightning protection classification of hydrogen fueling stations should be no lower than the Class-II lightning protection buildings. Its lightning protection facilities shall prevent direct lightning strikes, lightning induction and lightning wave intrusion. The lightning protection arrester to prevent direct lightning strikes shall keep the protected hydrogen fueling station buildings, structures, hydrogen vent stack and other objects protruding from the roof within the protection range.

8.2.3 The grounding devices in the hydrogen fueling station can be divided into electrical equipment working (system) grounding, protective grounding, lightning protection grounding, and anti-static grounding according to their uses. When grounding for different purposes shares a general grounding device, the grounding resistance shall comply with the minimum value among them and shall be no greater than 10Ω.

8.2.4 The equipment, pipes, structures, cable metal sheaths, steel roof trusses and vent stack and air ducts protruding from the roof in the hydrogen fueling station shall be connected to the lightning protection induction grounding device.

8.2.5 Outdoor overhead hydrogen pipelines shall be connected to lightning protection induction grounding devices. Pipes within 100m from the building shall be grounded every 25m or so, and their impact grounding resistance shall be no greater than 20Ω. Buried hydrogen pipelines shall also be connected to lightning protection induction grounding devices at the entrance and exit of the building.

8.2.6 Open-air steel closed containers with explosion risk such as hydrogen storage devices do not need to install lightning arrester when their wall thickness is greater than 4mm, but they shall be reliably grounded and the grounding points shall be no less than 2; the distance between two grounding points shall be no greater than 30m, and the impact grounding resistance shall be no greater than 10Ω.

8.2.7 Equipment, pipelines, etc. that require grounding shall be equipped with grounding terminals. Bolts can be used to tighten the connection between the ground terminal and the ground wire. For equipment and pipelines that are subject to vibration and displacement, a flexible connecting wire shall be added to the connection.

8.3 Electrostatic prevention

8.3.1 Anti-static measures shall be taken for objects that may generate static electricity in explosive environments. In the hydrogen compressor room, hydrogen pressure regulating valve group room, inlet and outlet pipelines of hydrogen dispenser, etc., at the boundaries of different explosive hazardous environments, pipeline bifurcations, and long-distance unbranched pipelines, electrostatic prevention grounding shall be guarded every 50 m, its grounding resistance shall be no greater than 10Ω.

8.3.2 The unloading site of the hydrogen transport unit of the hydrogen fueling station shall be equipped with an anti-static grounding device for unloading the vehicle.

9 Structure, Ventilation and Planting

9.1 Structure

9.1.1 The fire resistance grade of the buildings in the hydrogen fueling station shall be no lower than Level-2.

9.1.2 The building in the hydrogen fueling station shall be a single-story building. When the load-bearing components of the canopy are steel structures, their fire resistance rating shall be no less than 0.25h, and other parts of the ceiling shall be constructed of non-combustible materials.

9.1.3 Rooms with explosion risks such as hydrogen compressor room shall adopt load-bearing frames or rack structures with reinforced concrete columns. When steel columns are used to bear load, fire protection measures shall be installed on the steel columns, and their fire resistance limit shall be no less than 2.0 h.

9.1.4 Rooms with explosion risks in hydrogen fueling stations shall be equipped with pressure-relief facilities in accordance with the current national standard GB 50016 *Code of Design on Building Fire Protection and Prevention*. The setting of pressure relief facilities shall comply with the following provisions:

1 Pressure relief facilities shall use non-combustible lightweight roofs as pressure relief areas. Doors, windows, and lightweight walls that are easy to release pressure can also be used as pressure relief areas.

2 The pressure relief area shall be no less than the area of the roof or 1.2 times the longest wall.

3 Pressure relief facilities should be installed away from crowded places and main traffic roads, and shall be close to areas with explosion risks.

9.1.5 The hydrogen compressor room should be a semi-open or open building with a net height no lower than 3.5m; the roof should be made of non-combustible lightweight materials.

9.1.6 Doors and windows of rooms with explosion hazards shall open outwards and be made of materials that do not produce sparks upon impact.

9.1.7 The upper space of a room with explosion risk shall be well ventilated. The inner surface of the ceiling shall be flat to avoid dead corners where hydrogen gas accumulates.

9.1.8 The hydrogen storage device in the hydrogen fueling station is arranged adjacent to the hydrogen compressor room and power transformation and distribution room. If the spacing cannot meet the requirements of Table 5.0.8 of this Specification, reinforced concrete solid walls shall be used to separate them. The top of the partition wall shall be 1m or higher than the

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