

9.10.1.1 This leak test shall be in addition to the ANSI/ASME B31.3, *Process Piping*, testing required by 5.4.

9.10.1.2 The assembly shall be leak tested using hydrogen or helium.

9.10.1.3 Where hydrogen is to be used as the leak test media, the system shall first be purged with an inert gas to ensure that all oxygen is removed.

9.10.2 Pressure relief valves shall be tested at least every 3 years.

## 9.11 Installation of Emergency Shutdown Equipment.

### 9.11.1 Manually Operated Container Valve.

9.11.1.1 Each group of storage vessels up to a maximum combined capacity of 10,000 scf (283 m<sup>3</sup>) shall be provided with a manually operated shutoff valve.

9.11.1.2 A manually operated shutoff valve shall be installed in a manifold as close to a container or group of containers as practical.

9.11.1.3 The valve in 9.11.1.2 shall be located downstream of the backflow check valve specified in 9.11.2.

9.11.2 The compressor discharge line supplying the storage container shall be equipped with a backflow check valve near the container to prevent discharge of hydrogen from the container in case of the rupture of the line, hose, or fittings.

9.11.3 Where excess-flow check valves are used, the closing flow shall be greater than the design flow maximum system design flow rate and less than the flow rating of the piping system that results from a complete line failure between the excess-flow valve and the equipment downstream of the excess-flow check valve.

9.11.4 Gas piping from an outdoor compressor or storage system into a building shall be provided with shut-off valves located outside the building.

9.11.5 An emergency manual shutdown device shall be provided at the dispensing area and also at a location remote from the dispensing area.

9.11.5.1 This device, when activated, shall shut off the power supply and gas supply to the compressor and the dispenser.

9.11.5.2 When GH<sub>2</sub> is being produced from the conversion of LH<sub>2</sub>, the emergency shutdown system also shall shut off the liquid supply and power to the LH<sub>2</sub> transfer equipment necessary for the conversion process.

9.11.5.3 ESDs shall be distinctly marked for easy recognition with a permanently affixed legible sign.

9.11.6 A breakaway device that causes hydrogen gas flow to stop shall be installed between the connection of the hose to the dispenser and the filling nozzle.

9.11.6.1 Such a device shall be arranged to separate using a force not greater than 150 lb (68 kg) when applied in any direction that the vehicle would move.

9.11.6.2 Breakaway devices shall be compatible with ANSI/IAS NGV 4.4, *Breakaway Devices for Dispensing Systems*.

9.11.7 Control circuits shall be arranged so that, when an emergency shutdown device is activated or electric power is cut off, systems that shut down shall remain down until manually activated or reset after a safe condition is restored.

### 9.11.8 Fast-Fill Station.

9.11.8.1 Each line between a gas storage facility and a dispenser at a fast-fill station shall have a valve that closes when one of the following occurs:

- (1) The power supply to the dispenser is cut off.
- (2) Any emergency shutdown device at the refueling station is activated.

9.11.8.2 A fast-closing, "quarter turn" manual shut-off valve shall be provided at a fast-fill station upstream of the breakaway device specified in 9.11.6, where it is readily accessible to the person dispensing hydrogen, unless one of the following occurs:

- (1) The self-closing valve referred to in 9.11.8.1 is located immediately upstream of the dispenser.
- (2) The dispenser is equipped with a self-closing valve that closes each time the control arm is turned to the OFF position or when an emergency device is activated.

9.11.9 A self-closing valve shall be provided on the inlet of the compressor that shuts off the gas supply to the compressor when one of the following occurs:

- (1) An emergency shutdown device is activated.
- (2) A power failure occurs.
- (3) The power to the compressor is switched to the OFF position.

## 9.12 Installation of Electrical Equipment.

9.12.1 Fixed electrical equipment and wiring within areas specified in Table 9.3.3.9 shall comply with Table 9.3.3.9 and shall be installed in accordance with *NFPA 70, National Electrical Code*.

*Exception: Electrical equipment on internal combustion engines installed in accordance with NFPA 77, Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines.*

9.12.2 With the approval of the authority having jurisdiction, the classified areas specified in Table 9.3.3.9 shall be permitted to be reduced or eliminated by positive pressure ventilation from a source of clean air or inert gas in conjunction with effective safeguards against ventilator failure by purging methods recognized in NFPA 496, *Standard for Purged and Pressurized Enclosures for Electrical Equipment*.

9.12.2.1 Modifications shall be signed off by a qualified engineer with expertise in fire safety and gaseous fuels.

9.12.3 Classified areas shall not extend beyond an unpierced wall, roof, or gastight partition.

9.12.4 Space around welded pipe and equipment without flanges, valves, or fittings shall be a nonhazardous location.

*Exception: Listed dispensers shall be permitted to be installed using classified areas in accordance with the terms of the listing.*

## 9.13 Stray or Impressed Currents and Bonding.

9.13.1\* Where stray or impressed currents are used or can be present on dispensing systems, such as cathodic protection, protective measures to prevent ignition shall be taken.

9.13.2 Additional static protection shall not be required where GH<sub>2</sub> is transferred by conductive hose, flexible metallic tubing, or pipe connections where both halves of the metallic coupling are in continuous contact.