



Ohio Administrative Code

Rule 1301:7-7-58 Flammable gases and flammable cryogenic fluids.

Effective: December 15, 2017

(A) Section 5801 General

(1) 5801.1 Scope. The storage and use of flammable gases and flammable cryogenic fluids shall be in accordance with this rule and rule 1301:7-7-55 of the Administrative Code. Compressed gases shall also comply with rule 1301:7-7-53 of the Administrative Code and cryogenic fluids shall also comply with rule 1301:7-7-55 of the Administrative Code. Flammable cryogenic fluids shall comply with paragraph (F)(5806) of this rule. Hydrogen motor fuel-dispensing stations and repair garages and their associated above-ground hydrogen storage systems shall also be designed, constructed and maintained in accordance with rule 1301:7-7-23 of the Administrative Code and NFPA 2 as listed in rule 1301:7-7-80 of the Administrative Code.

Exceptions:

1. Gases used as refrigerants in refrigeration systems (see paragraph (F)(606) of rule 1301:7-7-06 of the Administrative Code).
2. Liquefied petroleum gases and natural gases regulated by rule 1301:7-7-61 of the Administrative Code.
3. Fuel-gas systems and appliances regulated under the International Fuel Gas Code as listed in rule 1301:7-7-80 of the Administrative Code other than gaseous hydrogen systems and appliances.
4. Pyrophoric gases in accordance with rule 1301:7-7-64 of the Administrative Code.

(2) 5801.2 Permits. Permits shall be required as set forth in rule 1301:7-7-01 of the Administrative Code.

(B) Section 5802 Definitions



(1) 5802.1 Definitions. The following terms are defined in rule 1301:7-7-02 of the Administrative Code.

"Flammable gas."

"Flammable liquefied gas."

"Gaseous hydrogen system."

"Hydrogen fuel gas room."

"Metal hydride."

"Metal hydride storage system."

(C) Section 5803 General requirements

(1) 5803.1 Quantities not exceeding the maximum allowable quantity per control area. The storage and use of flammable gases in amounts not exceeding the maximum allowable quantity per control area indicated in paragraph (C)(1)(5003.1) of rule 1301:7-7-50 of the Administrative Code shall be in accordance with paragraphs (A)(5001) and (C)(5003) of rule 1301:7-7-50 of the Administrative Code, and paragraphs (A)(5801) and (C)(5803) of this rule.

(a) 5803.1.1 Special limitations for indoor storage and use. Flammable gases shall not be stored or used in Group A, E, I or R occupancies or in offices in Group B occupancies.

Exceptions:

1. Cylinders of nonliquefied compressed gases not exceeding a capacity of 250 cubic feet (7.08 m³) or liquefied gases not exceeding a capacity of 40 pounds (18 kg) each at normal temperature and pressure (NTP) used for maintenance purposes, patient care or operation of equipment.



2. Food service operations in accordance with paragraph (C)(2)(a)(vii)(6103.2.1.7) of rule 1301:7-7-61 of the Administrative Code.

3. Hydrogen gas systems located in a hydrogen fuel gas room constructed in accordance with section 421 of the building code as listed in rule 1301:7-7-80 of the Administrative Code.

(i) 5803.1.1.1 Medical gases. Medical gas system supply cylinders shall be located in medical gas storage rooms or gas cabinets as set forth in paragraph (F)(5306) of rule 1301:7-7-53 of the Administrative Code.

(ii) 5803.1.1.2 Aggregate quantity. The aggregate quantities of flammable gases used for maintenance purposes and operation of equipment shall not exceed the maximum allowable quantity per control area indicated in Table 5003.1.1(1) of rule 1301:7-7-50 of the Administrative Code.

(b) 5803.1.2 Storage containers. Cylinders and pressure vessels for flammable gases shall be designed, constructed, installed, tested and maintained in accordance with rule 1301:7-7-53 of the Administrative Code.

(c) 5803.1.3 Emergency shutoff. Compressed gas systems conveying flammable gases shall be provided with approved manual or automatic emergency shutoff valves that can be activated at each point of use and at each source.

(i) 5803.1.3.1 Shutoff at source. A manual or automatic fail-safe emergency shutoff valve shall be installed on supply piping at the cylinder or bulk source. Manual or automatic cylinder valves are allowed to be used as the required emergency shutoff valve where the source of supply is limited to unmanifolded cylinder sources.

(ii) 5803.1.3.2 Shutoff at point of use. A manual or automatic emergency shutoff valve shall be installed on the supply piping at the point of use or at a point where the equipment using the gas is connected to the supply system.

(d) 5803.1.4 Ignition source control. Ignition sources in areas containing flammable gases in storage or in use shall be controlled in accordance with paragraph (C)(7)(5003.7) of rule 1301:7-7-50 of the



Administrative Code.

Exception: Fuel gas systems connected to building service utilities in accordance with the International Fuel Gas Code as listed in rule 1301:7-7-80 of the Administrative Code.

(i) 5803.1.4.1 Static producing equipment. Static-producing equipment located in flammable gas storage areas shall be grounded.

(ii) 5803.1.4.2 Signs. "No Smoking" signs shall be posted at entrances to rooms and in areas containing flammable gases in accordance with paragraph (C)(7)(a)(5003.7.1) of rule 1301:7-7-50 of the Administrative Code.

(e) 5803.1.5 Electrical. Electrical wiring and equipment shall be installed and maintained in accordance with paragraph (E)(605) of rule 1301:7-7-06 of the Administrative Code and NFPA 70 as listed in rule 1301:7-7-80 of the Administrative Code.

(i) 5803.1.5.1 Bonding of electrically conductive materials and equipment. Exposed noncurrent-carrying metal parts, including metal gas piping systems, that are part of flammable gas supply systems located in a hazardous (electrically classified) location shall be bonded to a grounded conductor in accordance with the provisions of NFPA 70 as listed in rule 1301:7-7-80 of the Administrative Code.

(ii) 5803.1.5.2 Static-producing equipment. Static-producing equipment located in flammable gas storage or use areas shall be grounded.

(f) 5803.1.6 Liquefied flammable gases and flammable gases in solution. Containers of liquefied flammable gases and flammable gases in solution shall be positioned in the upright position or positioned so that the pressure relief valve is in direct contact with the vapor space of the container.

Exceptions:

1. Containers of flammable gases in solution with a capacity of 1.3 gallons (5 L) or less.



2. Containers of flammable liquefied gases, with a capacity not exceeding 1.3 gallons (5 L), designed to preclude the discharge of liquid from safety relief devices.

(2) 5803.2 Quantities exceeding the maximum allowable quantity per control area. The storage and use of flammable gases in amounts exceeding the maximum allowable quantity per control area indicated in paragraph (C)(1)(5003.1) of rule 1301:7-7-50 of the Administrative Code shall be in accordance with rule 1301:7-7-50 of the Administrative Code and this rule.

(D) Section 5804 Storage

(1) 5804.1 Indoor storage. Indoor storage of flammable gases in amounts exceeding the maximum allowable quantity per control area indicated in Table 5003.1.1(1) of rule 1301:7-7-50 of the Administrative Code, shall be in accordance with paragraphs (A)(5001), (C)(5003) and (D)(5004) of rule 1301:7-7-50 of the Administrative Code, and this rule.

(a) 5804.1.1 Explosion control. Buildings or portions thereof containing flammable gases shall be provided with explosion control in accordance with paragraph (K)(911) of rule 1301:7-7-09 of the Administrative Code.

(2) 5804.2 Outdoor storage. Outdoor storage of flammable gases in amounts exceeding the maximum allowable quantity per control area indicated in Table 5003.1.1(3) of rule 1301:7-7-50 of the Administrative Code shall be in accordance with paragraphs (A)(5001), (C)(5003) and (D)(5004) of rule 1301:7-7-50 of the Administrative Code, and this rule.

(E) Section 5805 Use

(1) 5805.1 General. The use of flammable gases in amounts exceeding the maximum allowable quantity per control area indicated in Table 5003.1.1(1) or 5003.1.1(3) of rule 1301:7-7-50 of the Administrative Code shall be in accordance with paragraphs (A)(5001), (C)(5003) and (E)(5005) of rule 1301:7-7-50 of the Administrative Code, and this rule.

(F) Section 5806 Flammable cryogenic fluids



(1) 5806.1 General. The storage and use of flammable cryogenic fluids shall be in accordance with paragraphs (F)(2)(5806.2) to (F)(4)(g)(iii)(5806.4.8.3) of this rule and rule 1301:7-7-55 of the Administrative Code.

(2) 5806.2 Limitations. Storage of flammable cryogenic fluids in stationary containers outside of buildings is prohibited within the limits established by law as the limits of districts in which such storage is prohibited.

(3) 5806.3 Above-ground tanks for liquid hydrogen. Above-ground tanks for the storage of liquid hydrogen shall be in accordance with paragraphs (F)(3)(5806.3) to (F)(3)(b)(i)(5806.3.2.1) of this rule.

(a) 5806.3.1 Construction of the inner vessel. The inner vessel of storage tanks in liquid hydrogen service shall be designed and constructed in accordance with Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code as listed in rule 1301:7-7-80 of the Administrative Code and shall be vacuum jacketed in accordance with paragraph (F)(3)(b)(5806.3.2) of this rule.

(b) 5806.3.2 Construction of the vacuum jacket (outer vessel). The vacuum jacket used as an outer vessel for storage tanks in liquid hydrogen service shall be of welded steel construction designed to withstand the maximum internal and external pressure to which it will be subjected under operating conditions to include conditions of emergency pressure relief of the annular space between the inner and outer vessel. The jacket shall be designed to withstand a minimum collapsing pressure differential of 30 psi (207 kPa).

(i) 5806.3.2.1 Vacuum level monitoring. A connection shall be provided on the exterior of the vacuum jacket to allow measurement of the pressure within the annular space between the inner and outer vessel. The connection shall be fitted with a bellows-sealed or diaphragm-type valve equipped with a vacuum gauge tube that is shielded to protect against damage from impact.

(4) 5806.4 Underground tanks for liquid hydrogen. Underground tanks for the storage of liquid hydrogen shall be in accordance with paragraphs (F)(4)(a)(5806.4.1) to (F)(4)(g)(iii)(5806.4.8.3) of this rule.



(a) 5806.4.1 Construction. Storage tanks for liquid hydrogen shall be designed and constructed in accordance with ASME Boiler and Pressure Vessel Code (Section VIII, Division 1) as listed in rule 1301:7-7-80 of the Administrative Code and shall be vacuum jacketed in accordance with paragraph (F)(4)(h)(5806.4.8) of this rule.

(b) 5806.4.2 Location. Storage tanks shall be located outside in accordance with the following:

(i) Tanks and associated equipment shall be located with respect to foundations and supports of other structures such that the loads carried by the latter cannot be transmitted to the tank.

(ii) The distance from any part of the tank to the nearest wall of a basement, pit, cellar or lot line shall be not less than 3 feet (914 mm).

(iii) A minimum distance of 1 foot (305 mm), shell to shell, shall be maintained between underground tanks.

(c) 5806.4.3 Depth, cover and fill. The tank shall be buried such that the top of the vacuum jacket is covered with not less than 1 foot (305 mm) of earth and with concrete not less than 4 inches (102 mm) thick placed over the earthen cover. The concrete shall extend not less than 1 foot (305 mm) horizontally beyond the footprint of the tank in all directions. Underground tanks shall be set on firm foundations constructed in accordance with the building code as listed in rule 1301:7-7-80 of the Administrative Code and surrounded with not less than 6 inches (152 mm) of noncorrosive inert material, such as sand.

Exception: The vertical extension of the vacuum jacket as required for service connections.

(d) 5806.4.4 Anchorage and security. Tanks and systems shall be secured against accidental dislodgement in accordance with this rule.

(e) 5806.4.5 Venting of underground tanks. Vent pipes for underground storage tanks shall be in accordance with (paragraph (C)(3)(5503.3) of rule 1301:7-7-55 of the Administrative Code.

(f) 5806.4.6 Underground liquid hydrogen piping. Underground liquid hydrogen piping shall be



vacuum jacketed or protected by an approved means and designed in accordance with rule 1301:7-7-55 of the Administrative Code.

(g) 5806.4.7 Overfill protection and prevention systems. An approved means or method shall be provided to prevent the overfill of all storage tanks.

(h) 5806.4.8 Vacuum jacket construction. The vacuum jacket shall be designed and constructed in accordance with Section VIII of ASME Boiler and Pressure Vessel Code as listed in rule 1301:7-7-80 of the Administrative Code and shall be designed to withstand the anticipated loading, including loading from vehicular traffic, where applicable. Portions of the vacuum jacket installed below grade shall be designed to withstand anticipated soil, seismic and hydrostatic loading.

(i) 5806.4.8.1 Material. The vacuum jacket shall be constructed of stainless steel or other approved corrosion-resistant material.

(ii) 5806.4.8.2 Corrosion protection. The vacuum jacket shall be protected by approved or listed corrosion-resistant materials or an engineered cathodic protection system. Where cathodic protection is utilized, an approved maintenance schedule shall be established. Exposed components shall be inspected not less than twice a year. Records of maintenance and inspection events shall be maintained.

(iii) 5806.4.8.3 Vacuum level monitoring. An approved method shall be provided to indicate loss of vacuum within the vacuum jacket(s).

(G) Section 5807 Metal hydride storage systems

(1) 5807.1 General requirements. The storage and use of metal hydride storage systems shall be in accordance with paragraphs (A)(5801), (C)(5803), (D)(5804), (E)(5805) and (G)(5807) of this rule. Those portions of the system that are used as a means to store or supply hydrogen shall also comply with rules 1301:7-7-50 and 1301:7-7-53 of the Administrative Code as applicable.

(a) 5807.1.1 Classification. The hazard classification of the metal hydride storage system, as required by paragraph (A)(2)(b)(5001.2.2) of rule 1301:7-7-50 of the Administrative Code, shall be based on



the hydrogen stored without regard to the metal hydride content.

(b) 5807.1.2 Listed or approved systems. Metal hydride storage systems shall be listed or approved for the application and designed in a manner that prevents the addition or removal of the metal hydride by other than the original equipment manufacturer.

(c) 5807.1.3 Containers, design and construction. Compressed gas containers, cylinders and tanks shall be designed and constructed in accordance with paragraph (C)(2)(5303.2) of rule 1301:7-7-53 of the Administrative Code.

(d) 5807.1.4 Service life and inspection of containers. Metal hydride storage system cylinders, containers or tanks shall be inspected, tested and requalified for service at not less than 5- year intervals.

(e) 5807.1.5 Marking and labeling. Marking and labeling of cylinders, containers, tanks and systems shall be in accordance with paragraph (C)(4)(5303.4) of rule 1301:7-7-53 of the Administrative Code and paragraphs (G)(1)(e)(i)(5807.1.5.1) to (G)(1)(e)(iv)(5807.1.5.4) of this rule.

(i) 5807.1.5.1 System marking. Metal hydride storage systems shall be marked with all of the following:

(a) Manufacturer's name.

(b) Service life indicating the last date the system can be used.

(c) A unique code or serial number specific to the unit.

(d) System name or product code that identifies the system by the type of chemistry used in the system.

(e) Emergency contact name, telephone number or other contact information.

(f) Limitations on refilling of containers to include rated charging pressure and capacity.



(ii) 5807.1.5.2 Valve marking. Metal hydride storage system valves shall be marked with the following:

(a) Manufacturer's name;

(b) Service life indicating the last date the valve can be used; and

(c) Metal hydride service in which the valve can be used, or a product code that is traceable to this information.

(iii) 5807.1.5.3 Pressure relief device marking. Metal hydride storage system pressure relief devices shall be marked with all of the following:

1. Manufacturer's name.

2. Metal hydride service in which the device can be used, or a product code that is traceable to this information.

3. Activation parameters to include temperature, pressure or both.

(a) 5807.1.5.3.1 Pressure relief devices integral to container valves. The required markings for pressure relief devices that are integral components of valves used on cylinders, containers and tanks shall be allowed to be placed on the valve.

(iv) 5807.1.5.4 Pressure vessel markings. Cylinders, containers and tanks used in metal hydride storage systems shall be marked with all of the following:

(a) Manufacturer's name.

(b) Design specification to which the vessel was manufactured.

(c) Authorized body approving the design and initial inspection and test of the vessel.



(d) Manufacturer's original test date.

(e) Unique serial number for the vessel.

(f) Service life identifying the last date the vessel can be used.

(g) System name or product code that identifies the system by the type of chemistry used in the system.

(f) 5807.1.6 Temperature extremes. Metal hydride storage systems, whether full or partially full, shall not be exposed to artificially created high temperatures exceeding 125^o F (52^o C) or subambient (low) temperatures unless designed for use under the exposed conditions.

(g) 5807.1.7 Falling objects. Metal hydride storage systems shall not be placed in areas where they are capable of being damaged by falling objects.

(h) 5807.1.8 Piping systems. Piping, including tubing, valves, fittings and pressure regulators, serving metal hydride storage systems, shall be maintained gas tight to prevent leakage.

(i) 5807.1.8.1 Leaking systems. Leaking systems shall be removed from service.

(i) 5807.1.9 Refilling of containers. The refilling of listed or approved metal hydride storage systems shall be in accordance with the listing requirements and manufacturers' instructions.

(i) 5807.1.9.1 Industrial trucks. The refilling of metal hydride storage systems serving powered industrial trucks shall be in accordance with paragraph (I)(309) of rule 1301:7-7-03 of the Administrative Code.

(ii) 5807.1.9.2 Hydrogen purity. The purity of hydrogen used for the purpose of refilling containers shall be in accordance with the listing and the manufacturer's instructions.

(j) 5807.1.10 Electrical. Electrical components for metal hydride storage systems shall be designed,



constructed, and installed in accordance with NFPA 70 as listed in rule 1301:7-7-80 of the Administrative Code.

(2) 5807.2 Portable containers or systems. Portable containers or systems shall comply with paragraphs (F)(2)(a)(5807.2.1) to (F)(2)(b)(5807.2.2) of this rule.

(a) 5807.2.1 Securing containers. Containers, cylinders and tanks shall be secured in accordance with paragraph (C)(5)(c)(5303.5.3) of rule 1301:7-7-53 of the Administrative Code.

(i) 5807.2.1.1 Use on mobile equipment. Where a metal hydride storage system is used on mobile equipment, the equipment shall be designed to restrain containers, cylinders or tanks from dislodgement, slipping or rotating when the equipment is in motion.

(ii) 5807.2.1.2 Motorized equipment. Metal hydride storage systems used on motorized equipment, shall be installed in a manner that protects valves, pressure regulators, fittings and controls against accidental impact.

(a) 5807.2.1.2.1 Protection from damage. Metal hydride storage systems, including cylinders, containers, tanks and fittings, shall not extend beyond the platform of the mobile equipment.

(b) 5807.2.2 Valves. Valves on containers, cylinders and tanks shall remain closed except when containers are connected to closed systems and ready for use.

(H) Section 5808 Hydrogen fuel gas rooms

(1) 5808.1 General. Where required by this rule, hydrogen fuel gas rooms shall be designed and constructed in accordance with paragraphs (H)(1)(5808.1) to (H)(7)(5808.7) of this rule and the building code as listed in rule 1301:7-7-80 of the Administrative Code.

(2) 5808.2 Location. Hydrogen fuel gas rooms shall not be located below grade.

(3) 5808.3 Design and construction. Hydrogen fuel gas rooms not exceeding the maximum allowable quantity per control area in Table 5003.1.1(1) of rule 1301:7-7-50 of the Administrative Code shall



be separated from other areas of the building in accordance with section 509.1 of the building code as listed in rule 1301:7-7-80 of the Administrative Code.

(a) 5808.3.1 Pressure control. Hydrogen fuel gas rooms shall be provided with a ventilation system designed to maintain the room at a negative pressure in relation to surrounding rooms and spaces.

(b) 5808.3.2 Windows. Operable windows in interior walls shall not be permitted. Fixed windows shall be permitted where in accordance with section 716 of the building code as listed in rule 1301:7-7-80 of the Administrative Code.

(4) 5808.4 Exhaust ventilation. Hydrogen fuel gas rooms shall be provided with mechanical exhaust ventilation in accordance with the applicable provisions of paragraph (K)(7)(a)(i)(2311.7.1.1) of rule 1301:7-7-23 of the Administrative Code.

(5) 5808.5 Gas detection system. Hydrogen fuel gas rooms shall be provided with an approved flammable gas detection system in accordance with paragraphs (H)(5)(a)(5808.5.1) to (H)(5)(d)(5808.5.4) of this rule.

(a) 5808.5.1 System design. The flammable gas detection system shall be listed for use with hydrogen and any other flammable gases used in the hydrogen fuel gas room. The gas detection system shall be designed to activate when the level of flammable gas exceeds 25 per cent of the lower flammable limit (LFL) for the gas or mixtures present at their anticipated temperature and pressure.

(b) 5808.5.2 Gas detection system components. Gas detection system control units shall be listed and labeled in accordance with UL 864 or UL 2017 as listed in rule 1301:7-7-80 of the Administrative Code. Gas detectors shall be listed and labeled in accordance with UL 2075 as listed in rule 1301:7-7-80 of the Administrative Code for use with the gases and vapors being detected.

(c) 5808.5.3 Operation. Activation of the gas detection system shall result in both of the following:

(i) Initiation of distinct audible and visual alarm signals both inside and outside of the hydrogen fuel gas room.



- (ii) Activation of the mechanical exhaust ventilation system.

- (d) 5808.5.4 Failure of the gas detection system. Failure of the gas detection system shall result in activation of the mechanical exhaust ventilation system, cessation of hydrogen generation and the sound of a trouble signal in an approved location.

- (6) 5808.6 Explosion control. Explosion control shall be provided where required by paragraph (K)(911) of rule 1301:7-7-09 of the Administrative Code.

- (7) 5808.7 Standby power. Mechanical ventilation and gas detection systems shall be connected to a standby power system in accordance with paragraph (D)(604) of rule 1301:7-7-06 of the Administrative Code.