

# CHAPTER 41

## PYROPHORIC MATERIALS

### SECTION 4101 GENERAL

**4101.1 Scope.** The storage and use of pyrophoric materials shall be in accordance with this chapter. Compressed gases shall also comply with Chapter 30.

**4101.2 Permits.** Permits shall be required as set forth in Section 105.6.

### SECTION 4102 DEFINITIONS

**4102.1 Definition.** The following word and term shall, for the purposes of this chapter and as used elsewhere in this code, have the meaning shown herein.

**PYROPHORIC.** A chemical with an autoignition temperature in air, at or below a temperature of 130°F (54°C).

### SECTION 4103 GENERAL REQUIREMENTS

**4103.1 Quantities not exceeding the maximum allowable quantity per control area.** The storage and use of pyrophoric materials in amounts not exceeding the maximum allowable quantity per control area indicated in Section 2703.1 shall be in accordance with Sections 2701, 2703, 4101 and 4103.

**4103.1.1 Emergency shutoff.** Compressed gas systems conveying pyrophoric 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.

**4103.1.1.1 Shutoff at source.** An automatic emergency shutoff valve shall be installed on supply piping at the cylinder or bulk source. The shutoff valve shall be operated by a remotely located manually activated shutdown control located not less than 15 feet (4572 mm) from the source of supply. Manual or automatic cylinder valves are allowed to be used as the required emergency shutoff valve when the source of supply is limited to unmanifolded cylinder sources.

**4103.1.1.2 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.

**4103.2 Quantities exceeding the maximum allowable quantity per control area.** The storage and use of pyrophoric materials in amounts exceeding the maximum allowable quantity per control area indicated in Section 2703.1 shall be in accordance with Chapter 27 and this chapter.

### SECTION 4104 STORAGE

**4104.1 Indoor storage.** Indoor storage of pyrophoric materials in amounts exceeding the maximum allowable quantity per control area indicated in Table 2703.1.1(1), shall be in accordance with Sections 2701, 2703, 2704 and this chapter.

The storage of silane gas and gas mixtures with a silane concentration of 2 percent or more by volume, shall be in accordance with Section 4106.

**4104.1.1 Liquid-tight floor.** In addition to the requirements of Section 2704.12, floors of storage areas containing pyrophoric liquids shall be of liquid-tight construction.

**4104.1.2 Pyrophoric solids and liquids.** Storage of pyrophoric solids and liquids shall be limited to a maximum area of 100 square feet (9.3 m<sup>2</sup>) per pile. Storage shall not exceed 5 feet (1524 mm) in height. Individual containers shall not be stacked.

Aisles between storage piles shall be a minimum of 10 feet (3048 mm) in width.

Individual tanks or containers shall not exceed 500 gallons (1893 L) in capacity.

**4104.1.3 Pyrophoric gases.** Storage of pyrophoric gases shall be in detached buildings where required by Section 2703.8.2.

**4104.1.4 Separation from incompatible materials.** In addition to the requirements of Section 2703.9.8, indoor storage of pyrophoric materials shall be isolated from incompatible hazardous materials by 1-hour fire barriers with openings protected in accordance with the *International Building Code*.

**Exception:** Storage in approved hazardous materials storage cabinets constructed in accordance with Section 2703.8.7.

**4104.2 Outdoor storage.** Outdoor storage of pyrophoric materials in amounts exceeding the maximum allowable quantity per control area indicated in Table 2703.1.1(3) shall be in accordance with Sections 2701, 2703, 2704 and this chapter.

The storage of silane gas, and gas mixtures with a silane concentration of 2 percent or more by volume, shall be in accordance with Section 4106.

**4104.2.1 Distance from storage to exposures.** The separation of pyrophoric solids, liquids and gases from buildings, lot lines, public streets, public alleys, public ways or means of egress shall be in accordance with the following:

1. Solids and liquids. Two times the separation required by Chapter 34 for Class IB flammable liquids.
2. Gases. The location and maximum amount of pyrophoric gas per storage area shall be in accordance with Table 4104.2.1.

TABLE 4104.2.1  
PYROPHORIC GASES—DISTANCE FROM STORAGE TO EXPOSURES<sup>a</sup>

MAXIMUM AMOUNT PER STORAGE AREA (cubic feet)	MINIMUM DISTANCE BETWEEN STORAGE AREAS (feet)	MINIMUM DISTANCE TO LOT LINES OF PROPERTY THAT CAN BE BUILT UPON (feet)	MINIMUM DISTANCE TO PUBLIC STREETS, PUBLIC ALLEYS OR PUBLIC WAYS (feet)	MINIMUM DISTANCE TO BUILDINGS ON THE SAME PROPERTY		
				Nonrated construction or openings within 25 feet	Two-hour construction and no openings within 25 feet	Four-hour construction and no openings within 25 feet
250	5	25	5	5	0	0
2,500	10	50	10	10	5	0
7,500	20	100	20	20	10	0

For SI: 1 foot = 304.8 mm, 1 cubic foot = 0.02832 m<sup>3</sup>.

a. The minimum required distances shall be reduced to 5 feet when protective structures having a minimum fire resistance of 2 hours interrupt the line of sight between the container and the exposure. The protective structure shall be at least 5 feet from the exposure. The configuration of the protective structure shall allow natural ventilation to prevent the accumulation of hazardous gas concentrations.

**4104.2.2 Weather protection.** When overhead construction is provided for sheltering outdoor storage areas of pyrophoric materials, the storage areas shall be provided with approved automatic fire-extinguishing system protection.

**SECTION 4105  
USE**

**4105.1 General.** The use of pyrophoric materials in amounts exceeding the maximum allowable quantity per control area indicated in Table 2703.1.1(1) or 2703.1.1(3) shall be in accordance with Sections 2701, 2703, 2705 and this chapter.

**4105.2 Weather protection.** When overhead construction is provided for sheltering of outdoor use areas of pyrophoric materials, the use areas shall be provided with approved automatic fire-extinguishing system protection.

**4105.3 Silane gas.** The use of silane gas, and gas mixtures with a silane concentration of 2 percent or more by volume, shall be in accordance with Section 4106.

**SECTION 4106  
SILANE GAS**

**4106.1 General requirements.** The storage and use of silane gas and gas mixtures with a silane concentration of 2 percent or more by volume, in amounts exceeding the maximum allowable quantity per control area indicated in Table 2703.1.1(1) or 2703.1.1(3), shall be in accordance with this section.

**4106.1.1 Building construction.** Indoor storage and use of silane gas shall be within a room or building conforming to the *International Building Code*.

**4106.1.2 Flow control.** Compressed gas containers, cylinders and tanks containing silane gas, and gas mixtures with a silane concentration of 2 percent or more by volume, shall be equipped with reduced flow valves equipped with restrictive-flow orifices not exceeding 0.010 inch (0.254 mm) in diameter. The presence of the restrictive flow orifice shall be indicated on the valve and on the container, cylinder or tank by means of a label placed at a prominent location by the manufacturer.

**Exceptions:**

1. Manufacturing and filling facilities where silane is produced or mixed and stored prior to sale.
2. Outdoor installations consisting of permanently mounted cylinders connected to a manifold, provided that the outlet connection from the manifold is equipped with a restrictive flow orifice not exceeding 0.125 inch (3.175 mm) in diameter and the setback distance to exposures is not less than 40 feet (12 192 mm). Footnote a of Table 4104.2.1 shall not apply.

**4106.1.3 Valves.** Container, cylinder and tank valves shall be constructed of stainless steel or other approved materials. Valves shall be equipped with outlet fittings in accordance with CGA V-1.

**4106.2 Indoor storage.** Indoor storage of silane gas, and gas mixtures with a silane concentration of 2 percent or more by volume, shall be in accordance with Section 4104.1 and Sections 4106.2.1 through 4106.2.3.

**4106.2.1 Fire protection.** When automatic fire-extinguishing systems are required, automatic sprinkler systems shall be used.

**4106.2.2 Exhausted enclosures or gas cabinets.** When provided, exhausted enclosures and gas cabinets shall be constructed as follows:

1. Exhausted enclosures and gas cabinets shall be in accordance with Sections 2703.8.5 and 2703.8.6, respectively.
2. Exhausted enclosures and gas cabinets shall be internally sprinklered.
3. The velocity of ventilation across unwelded fittings and connections on the piping system shall not be less than 200 feet per minute (1.02 m/s).
4. The average velocity at the face of the access ports or windows in the gas cabinet shall not be less than 200 feet per minute (1.02 m/s) with a minimum velocity of 150 feet per minute (0.76 m/s) at any point of the access port or window.

**4106.2.3 Emergency power.** The ventilation system shall be provided with an automatic emergency power source in accordance with Section 604 and designed to operate at full capacity.

**4106.3 Outdoor storage.** Outdoor storage of silane gas, and gas mixtures with a silane concentration of 2 percent or more by volume, shall be in accordance with Section 4104.2 and Sections 4106.3.1 through 4106.3.4.

**4106.3.1 Volume.** The maximum volume for each nest shall not exceed 10,000 cubic feet (283.2 m<sup>3</sup>) of gas.

**4106.3.2 Aisles.** Storage nests shall be separated by aisles a minimum of 6 feet (1829 mm) in width.

**4106.3.3 Separation.** Storage shall be located a minimum of 25 feet (7620 mm) from lot lines, public streets, public alleys, public ways, means of egress or buildings.

**4106.3.4 Weather protection.** The clear height of overhead construction provided for sheltering of outdoor storage shall not be less than 12 feet (3658 mm).

**4106.4 Indoor use and dispensing.** The indoor use and dispensing of silane gas and gas mixtures with a silane concentration of 2 percent or more by volume, in amounts exceeding the maximum allowable quantity per control area indicated in Table 2703.1.1(1) shall be in accordance with Sections 4105 and this section.

**4106.4.1 Exhausted enclosures or gas cabinets.** When provided, exhausted enclosures and gas cabinets shall be installed in accordance with Section 4106.2.2.

**4106.4.2 Remote manual shutdown.** A remotely located, manually activated shutdown control shall be provided outside each gas cabinet.

**4106.4.3 Emergency power.** The ventilation system shall be provided with an approved automatic emergency power source in accordance with Section 604 and designed to operate at full capacity.

**4106.4.4 Purge panels.** Automated purge panels shall be provided.

**4106.4.4.1 Purge gases.** Purging of piping and controls located in gas cabinets or exhausted enclosures shall only be performed using a dedicated inert gas supply that is designed to prevent silane from entering the inert gas supply. The use of nondedicated systems or portions of piping systems is allowed on portions of the venting system that are continuously vented to atmosphere. Devices that could interrupt the continuous flow of purge gas to the atmosphere shall be prohibited.

**Exception:** Manufacturing and filling facilities where silane is produced or mixed.

**4106.4.4.2 Venting.** Gas vent headers or individual purge panel vent lines shall have a continuous flow of inert gas. The inert gas shall be introduced upstream of the first vent or exhaust connection to the header.

**4106.4.4.3 Purging operations.** Purging operations shall be performed by means ensuring complete purging of the piping and control system before the system is opened to the atmosphere.

**4106.5 Outdoor use and dispensing.** The outdoor use and dispensing of silane gas, and gas mixtures with a silane concentration of 2 percent or more by volume, exceeding the maximum allowable quantity per control area indicated in Table 2703.1.1(3) shall be in accordance with Sections 4105, 4106.4 and 4106.5.1.

**4106.5.1 Outdoor use weather protection.** When overhead construction is provided for sheltering outdoor use areas containing silane gas, or gas mixtures with a silane concentration of 2 percent or more by volume, the use areas shall be provided with approved automatic fire-extinguishing system protection.

