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Required Changes to the 2012 International Fire Code to Comply
with the A2L Refrigerant Related Code Provisions of the 2024 I-Codes

Based on the
2012 International Fire Code®
2015 International Fire Code®
2018 International Fire Code® and
2021 International Fire Code®

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2012 International Fire Code Required Changes

CHAPTER 2: DEFINITIONS

FLAMMABLE GAS. A material that is a gas at 68°F (20°C) or less at 14.7 pounds per square inch atmosphere (psia) (101 kPa) of pressure [a material that has a *boiling point* of 68°F (20°C) or less at 14.7 psia (101 kPa)] ~~which~~ subdivided as follows:

1. ~~Category 1A.~~
 1. A gas that is ignitable at 14.7 psia (101 kPa) when in a mixture of 13 percent or less by volume with air; or has
 2. A gas with a flammable range at 14.7 psia (101 kPa) with air of not less than 12 percent, regardless of the lower limit, unless data show compliance with Category 1B.
2. Category 1B.

A gas that meets the flammability criteria for Category 1A, is not pyrophoric or chemically unstable, and meets one of more of the following:

 1. A lower flammability limit of more than 6 percent by volume of air; or
 2. A fundamental burning velocity of less than 3.9 in/s (10 cm/s).

The limits specified shall be determined at 14.7 psia (101 kPa) of pressure and a temperature of 68°F (20°C) in accordance with ASTM E681.

Where not otherwise specified, the term "flammable gas" includes both Category 1A and Category 1B.

CHAPTER 6: BUILDING SERVICES AND SYSTEMS

DELETE SECTION 601 GENERAL in its entirety and replace with new SECTION 601 as follows:

601.1 Scope. The provisions of this chapter shall apply to the installation, operation and maintenance of the following building services and systems:

1. Electrical systems, equipment and wiring.
2. Information technology server rooms.
3. Elevator systems, emergency operation and recall.
4. Fuel-fired appliances, heating systems, chimneys and fuel oil storage.
5. Commercial cooking equipment and systems.
6. Commercial cooking oil storage.
7. Mechanical refrigeration systems.
8. Hyperbaric facilities.
9. Clothes dryer exhaust systems.

601.2 Hazard abatement. Operations or conditions deemed unsafe or hazardous by the *fire code official* shall be abated. Equipment, appliances, materials and systems that are modified or damaged and constitute an electrical shock or fire hazard shall not be used.

601.2.1 Correction of unsafe conditions. The *fire code official* shall be authorized to require the *owner*, the *owner's* authorized agent, operator or occupant of a building or premises to abate or cause to be abated or corrected such unsafe operations or conditions either by repair, rehabilitation, demolition or other *approved* corrective action in compliance with this code.

601.3 Permits. Permits shall be obtained for refrigeration systems, battery systems and solar photovoltaic power systems as set forth in Sections 105.6 and 105.7.

606.1.1 Refrigerants other than ammonia. Where a refrigerant other than ammonia is used, refrigeration systems and the buildings in which such systems are installed shall be in accordance with ASHRAE 15.

606.8 Refrigerant detector detection. Machinery rooms shall ~~contain~~ be provided with a refrigerant detector with an audible and visual alarm. ~~The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant from a leak will concentrate. The alarm shall be actuated at a value not greater than the corresponding TLV-TWA values shown in the *International Mechanical Code* for the refrigerant classification. Detectors and alarms shall be placed in *approved* locations. The detector shall transmit a signal to an *approved* location.~~ Where ammonia is used as the refrigerant, detection shall comply with IIAR 2. For refrigerants other than ammonia, refrigerant detection shall comply with Section 606.8.1.

606.8.1 Refrigerants other than ammonia. A detector, or a sampling tube that draws air to a detector, shall be provided at an *approved* location where refrigerant from a leak is expected to accumulate. The system shall be designed to initiate audible and visible alarms inside of and outside each entrance to the refrigerating machinery room and transmit a signal to an *approved* location where the concentration of refrigerant detected exceeds the lesser of the following:

1. The corresponding TLV-TWA values shown in the *International Mechanical Code* for the refrigerant classification.
2. Twenty-five percent of the lower flammable limit (LFL).

Detection of a refrigerant concentration exceeding the upper detection limit or 25 percent of the lower flammable limit (LFL), whichever is lower, shall stop refrigerant equipment in the machinery room in accordance with Section 606.9.1.

606.13 Discharge location for refrigeration machinery room ventilation. [Text unchanged]

Exception: Refrigeration systems containing Group A2L complying with Section 606.17.

[M] 606.17 Group A2L and B2L Refrigerant. Machinery rooms for Group A2L and B2L refrigerant shall comply with Sections 606.17.1 through Section 606.17.3.

606.17.1 Elevated Temperatures. Open flame-producing devices or continuously operating hot surfaces over 1290 °F (700 °C) shall not be permanently installed in the room.

[M] 606.17.2 Refrigerant Detector. In addition to the requirements of Section 1105.3 of the International Mechanical Code, refrigerant detectors shall signal an alarm and activate the ventilation system in accordance with the response time specified in Table 606.17.2.

[M] 606.17.3 Mechanical Ventilation. The machinery room shall have a mechanical ventilation system complying with ASHRAE 15.

**[M] TABLE 606.17.2
GROUP A2L AND B2L DETECTOR ACTIVATION**

<u>Activation Level</u>	<u>Maximum Response Time (seconds)</u>	<u>ASHRAE 15 Ventilation Level</u>	<u>Alarm Reset</u>	<u>Alarm Type</u>
Less than or equal to the OEL in Table 1103.1 of the International Mechanical Code	300	1	Automatic	Trouble
Less than or equal to the refrigerant concentration level in Table 1103.1 of the International Mechanical Code	15	2	Manual	Emergency

CHAPTER 9: FIRE PROTECTION AND LIFE SAFETY SYSTEMS

**TABLE 911.1
EXPLOSION CONTROL REQUIREMENTS^f**

[Portions of table not shown remain unchanged.]

<u>MATERIAL</u>	<u>CLASS</u>	<u>EXPLOSION CONTROL METHODS</u>	
		<u>Barricade construction</u>	<u>Explosion (deflagration) venting or explosion (deflagration) prevention systems</u>
<u>Hazard Category</u>			
Flammable gas	Gaseous	Not required	Required ^e
	Liquefied	Not required	Required ^e

e. Not required for Category 1B Flammable Gases having a burning velocity not exceeding 3.9 in/s (10 cm/s).

CHAPTER 10: MEANS OF EGRESS

[B] 1008.1.10 Panic and fire exit hardware. Doors serving a Group H occupancy and doors serving rooms or spaces with an occupant load of 50 or more in a Group A or E occupancy shall not be provided with a latch or lock unless it is panic hardware or fire exit hardware.

Exception: A main exit of a Group A occupancy in compliance with Section 1008.1.9.3, Item 2.

Electrical rooms with equipment rated 1,200 amperes or more and over 6 feet (1829 mm) wide that contain overcurrent devices, switching devices or control devices with exit or exit access doors shall be equipped with panic hardware or fire exit hardware. The doors shall swing in the direction of egress travel.

Refrigeration machinery rooms larger than 1,000 square feet (93 m²) shall have not less than two exit or exit access doorways that swing in the direction of egress travel and shall be equipped with panic hardware or fire exit hardware.

CHAPTER 33: FIRE SAFETY DURING CONSTRUCTION AND DEMOLITION

3306.2 Cleaning with flammable gas. Flammable gases shall not be used to clean or remove debris from piping open to the atmosphere.

3306.2.1 Pipe cleaning and purging. The cleaning and purging of flammable gas piping systems, including cleaning new or existing piping systems, purging piping systems into service and purging piping systems out of service, shall comply with NFPA 56.

Exceptions:

1. Compressed gas piping systems other than fuel gas piping systems where in accordance with Chapter 53.
2. Piping systems regulated by the International Fuel Gas Code.
3. Liquefied petroleum gas systems in accordance with Chapter 61.
4. Cleaning and purging of refrigerant piping systems shall comply with the International Mechanical Code.

CHAPTER 50: HAZARDOUS MATERIALS – GENERAL PROVISIONS

TABLE 5003.1.1(1)
MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD^{a, j, m, n, p}

[Portions of table not shown remain unchanged.]

MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED	STORAGE ^b			USE-CLOSED SYSTEMS ^b			USE-OPEN SYSTEMS ^b	
			Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas (cubic feet at NTP)	Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas (cubic feet at NTP)	Solid pounds (cubic feet)	Liquid gallons (pounds)
Flammable gas	Gaseous									
	<u>1A and 1B (High BV)</u> [†]	H-2	NA	NA	1,000 ^{d, e}	NA	NA	1,000 ^{d, e}	NA	NA
	<u>1B (Low BV)</u> [†]				<u>162,500</u> ^{d, e}			<u>162,500</u> ^{d, e}		
	Liquified									
	<u>1A and 1B (High BV)</u> [†]	H-2	NA	(150) ^{d, e}	NA	NA	(150) ^{d, e}	NA	NA	NA
	<u>1B (Low BV)</u> [†]			(10,000) ^{d, e}			(10,000) ^{d, e}			

- a. For use of control areas, see Section 5003.8.3.
- b. The aggregate quantity in use and storage shall not exceed the quantity listed for storage.
- c. The quantities of alcoholic beverages in retail and wholesale sales occupancies shall not be limited providing the liquids are packaged in individual containers not exceeding 1.3 gallons. In retail and wholesale sales occupancies, the quantities of medicines, foodstuff or consumer products and cosmetics containing not more than 50 percent by volume of water-miscible liquids with the remainder of the solutions not being flammable shall not be limited, provided that such materials are packaged in individual containers not exceeding 1.3 gallons.
- d. Maximum allowable quantities shall be increased 100 percent in buildings equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1. Where Note e applies, the increase for both notes shall be applied accumulatively.
- e. Maximum allowable quantities shall be increased 100 percent where stored in approved storage cabinets, day boxes, gas cabinets, gas rooms, exhausted enclosures or in listed safety cans in accordance with Section 5003.9.10. Where Note d also applies, the increase for both notes shall be applied accumulatively.
- f. Quantities shall not be limited in a building equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1.
- g. Allowed only in buildings equipped throughout with an approved automatic sprinkler system.
- h. Containing not more than the maximum allowable quantity per control area of Class IA, Class IB or Class IC flammable liquids.
- i. The maximum allowable quantity shall not apply to fuel oil storage complying with Section 605.4.2.
- j. Quantities in parenthesis indicate quantity units in parenthesis at the head of each column.
- k. A maximum quantity of 220 pounds of solid or 22 gallons of liquid Class 3 oxidizers is allowed where such materials are necessary for maintenance purposes, operation or sanitation of equipment where the storage containers and the manner of storage are approved.
- l. Net weight of pyrotechnic composition of the fireworks. Where the net weight of the pyrotechnic composition of the fireworks is not known, 25 percent of the gross weight of the fireworks including packaging shall be used.
- m. For gallons of liquids, divide the amount in pounds by 10 in accordance with Section 5003.1.2.
- n. For storage and display quantities in Group M and storage quantities in Group S occupancies complying with Section 5003.11, see Table 5003.11.1.
- o. Densely-packed baled cotton that complies with the packing requirements of ISO 8115 shall not be included in this material class.
- p. The following shall not be included in determining the maximum allowable quantities:
 1. Liquid or gaseous fuel in fuel tanks on vehicles.
 2. Liquid or gaseous fuel in fuel tanks on motorized equipment operated in accordance with this code.
 3. Gaseous fuels in piping systems and fixed appliances regulated by the *International Fuel Gas Code*.
 4. Liquid fuels in piping systems and fixed appliances regulated by the *International Mechanical Code*.
- q. Where manufactured, generated or used in such a manner that the concentration and conditions create a fire or explosion hazard based on information prepared in accordance with Section 104.8.2.
- r. "High BV" Category 1B flammable gas has a burning velocity greater than 3.9 in/s (10cm/s). "Low BV" Category 1B flammable gas has a burning velocity of 3.9 in/s (10 cm/s) or less.

**TABLE 5003.1.1(3)
MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD IN
AN OUTDOOR CONTROL AREA^{a, b, c, d}**

[Portions of table not shown remain unchanged.]

MATERIAL	CLASS	STORAGE ^b			USE-CLOSED SYSTEMS ^b			USE-OPEN SYSTEMS ^b	
		Solid pounds (cubic feet)	Liquid gallons (pounds) ^d	Gas (cubic feet at NTP)	Solid pounds (cubic feet)	Liquid gallons (pounds) ^d	Gas (cubic feet at NTP)	Solid pounds (cubic feet)	Liquid gallons (pounds) ^d
Flammable gas	Gaseous								
	<u>1A and 1B (High BV)</u> ^e	Not Applicable	Not Applicable	3,000	Not Applicable	Not Applicable	1,500	Not Applicable	Not Applicable
	<u>1B (Low BV)</u> ^e			<u>195,000</u>			<u>97,500</u>		
	Liquified								
	<u>1A and 1B (High BV)</u> ^e	Not Applicable	(300)	Not Applicable	Not Applicable	(150)	Not Applicable	Not Applicable	Not Applicable
	<u>1B (Low BV)</u> ^e		<u>(20,000)</u>			<u>(10,000)</u>			

For SI: 1 pound = 0.454 kg, 1 gallon = 3.785 L, 1 cubic foot = 0.02832 m³.

- a. For gallons of liquids, divide the amount in pounds by 10 in accordance with Section 5003.1.2.
- b. The aggregate quantities in storage and use shall not exceed the quantity listed for storage.
- c. The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials allowed in outdoor storage per single property under the same ownership or control used for retail or wholesale sales is allowed to exceed the maximum allowable quantity per control area where such storage is in accordance with Section 5003.11.
- d. Quantities in parentheses indicate quantity units in parentheses at the head of each column.
- e. "High BV" Category 1B flammable gas has a burning velocity greater than 3.9 in/s (10cm/s). "Low BV" Category 1B flammable gas has a burning velocity of 3.9 in/s (10 cm/s) or less.

5003.8.3.5 Hazardous material in Group M display and storage areas and in Group S storage areas. ~~The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials allowed within a single control area of a Group M display and storage area or a Group S storage area is allowed to exceed the maximum allowable quantities per control area specified in Tables 5003.1.1(1) and 5003.1.1(2) without classifying the building or use as a Group H occupancy, provided that the materials are displayed and stored in accordance with Section 5003.11.~~ Hazardous materials located in Group M and Group S occupancies shall be in accordance with Sections 5003.8.3.5.1 through 5003.8.3.5.4.

5003.8.3.5.1 Nonflammable solids and nonflammable and noncombustible liquids. ~~The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials allowed within a single control area of a Group M display and storage area or a Group S storage area is allowed to exceed the maximum allowable quantities per control area specified in Tables 5003.1.1(1) and 5003.1.1(2) without classifying the building or use as a Group H occupancy, provided that the materials are displayed and stored in accordance with Section 5003.11.~~

5003.8.3.5.2 Flammable and combustible liquids. ~~In Group M occupancy wholesale and retail sales uses, indoor storage of flammable and combustible liquids shall not exceed the maximum allowable quantities per control area as indicated in Table 5704.3.4.1, provided that the materials are displayed and stored in accordance with Chapter 57.~~

5003.8.3.5.3 Aerosols. ~~The maximum quantity of aerosol products in Group M occupancy retail display areas, storage areas adjacent to retail display areas and retail storage areas shall be in accordance with Chapter 51.~~

5003.8.3.5.4 Flammable gas. ~~The aggregate quantity of Category 1B flammable gas having a burning velocity of 3.9 in/s (10 cm/s) or less stored and displayed within a single control area of a Group M occupancy, or in an outdoor control area, or stored in a single control area of a Group S occupancy, is allowed to exceed the maximum allowable quantities per control area specified in Table 5003.1.1(1) without classifying the building or use as a Group H occupancy, provided the materials are stored and displayed in accordance with Section 5003.11.2.~~

5003.11 Maximum allowable quantity for Group M storage and display and Group S storage. ~~The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials stored and displayed within a single control area of a Group M occupancy, or an outdoor control area, or stored in a single control area of a Group S occupancy, is allowed to exceed the maximum allowable quantity per control area indicated in Section 5003.1 where in accordance with Sections 5003.11.1 and 5003.11.2 through 5003.11.3.11.~~

5003.11.1 Nonflammable solid and nonflammable or noncombustible liquid hazardous materials Maximum allowable quantity per outdoor control area in Group M or S occupancies. ~~The aggregate amount of nonflammable solid and nonflammable or noncombustible liquid hazardous materials stored and displayed within a single control area of a Group M occupancy, or an outdoor control area, or stored in a single control area of a Group S occupancy, shall not exceed the amounts set forth in Table 5003.11.1.~~

5003.11.2 Maximum allowable quantity per outdoor control area in Group M or S occupancies. ~~The aggregate amount of nonflammable solid and nonflammable or noncombustible liquid hazardous materials stored and displayed within a single outdoor control area of a Group M occupancy shall not exceed the amounts set forth in Table 5003.11.1.~~

~~5003.11.3~~ 5003.11.1.1 Storage and display. Storage and display shall be in accordance with Sections ~~5003.11.3.1~~ 5003.11.1.1 through ~~5003.11.3.11~~ 5003.11.1.11.

~~5003.11.3.1~~ 5003.11.1.1.1 Density. Storage and display of solids shall not exceed 200 pounds per square foot (976 kg/m²) of floor area actually occupied by solid merchandise. Storage and display of liquids shall not exceed 20 gallons per square foot (0.50 L/m²) of floor area actually occupied by liquid merchandise.

~~5003.11.3.2~~ 5003.11.1.1.2 Storage and display height. Display height shall not exceed 6 feet (1829 mm) above the finished floor in display areas of Group M occupancies. Storage height shall not exceed 8 feet (2438 mm) above the finished floor in storage areas of Group M and Group S occupancies.

~~5003.11.3.3~~ 5003.11.1.1.3 Container location. Individual containers less than 5 gallons (19 L) or less than 25 pounds (11 kg) shall be stored or displayed on pallets, racks or shelves.

~~5003.11.3.4~~ 5003.11.1.1.4 Racks and shelves. Racks and shelves used for storage or display shall be in accordance with Section 5003.9.9.

~~5003.11.3.5~~ 5003.11.1.1.5 Container type. Containers shall be *approved* for the intended use and identified as to their content.

~~5003.11.3.6~~ 5003.11.1.1.6 Container size. Individual containers shall not exceed 100 pounds (45 kg) for solids or 10 gallons (38 L) for liquids in storage and display areas.

~~5003.11.3.7~~ 5003.11.1.1.7 Incompatible materials. *Incompatible materials* shall be separated in accordance with Section 5003.9.8.

~~5003.11.3.8~~ 5003.11.1.1.8 Floors. Floors shall be in accordance with Section 5004.12.

~~5003.11.3.9~~ 5003.11.1.1.9 Aisles. Aisles 4 feet (1219 mm) in width shall be maintained on three sides of the storage or display area.

~~5003.11.3.10~~ 5003.11.1.1.10 Signs. Hazard identification signs shall be provided in accordance with Section 5003.5.

5003.11.2 Category 1B flammable gas with low burning velocity. The aggregate quantity of Category 1B flammable gas having a burning velocity of 3.9 in/s (10 cm/s) or less stored and displayed within a single *control area* of a Group M occupancy, or an outdoor control area, or stored in a single control area of a Group S occupancy, shall not exceed the amounts set forth in Table 5003.11.2.

TABLE 5003.11.2

MAXIMUM ALLOWABLE QUANTITY OF LOW BURNING VELOCITY CATEGORY 1B FLAMMABLE GAS IN GROUP M AND S OCCUPANCIES PER CONTROL AREA ^a

FLAMMABLE GAS CATEGORY	MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA	
	Sprinklered in accordance with Note b	Nonsprinklered
Category 1B (Low BV) ^d		
Gaseous	390,000 cu. ft.	195,000 cu. ft
Liquefied	40,000 lbs. ^c	20,000 lbs.

For SI: 1 pound = 0.454 kg, 1 cubic foot = 0.02832 m³, 1 square foot = 0.093 m², 1 inch/second = 2.5641 cm/s.

- Control areas shall be separated from each other by not less than a 1-hour fire barrier.
- The building shall be equipped throughout with an approved automatic sprinkler system with minimum sprinkler design density of Ordinary Hazard Group 2 in the area where flammable gases are stored or displayed.
- Where storage areas exceed 50,000 square feet in area, the maximum allowable quantities are allowed to be increased by 2 percent for each 1,000 square feet of area in excess of 50,000 square feet, up to not more than 100 percent of the table amounts. Separation of control areas is not required. The aggregate amount shall not exceed 80,000 pounds.
- "Low BV" Category 1B flammable gas has a burning velocity of 3.9 in/s (10 cm/s) or less.

5003.11.2.1 Fire protection and storage arrangements. Fire protection and container storage arrangements for quantities of Category 1B flammable gases permitted by Table 5003.11.2 shall be in accordance with the all of the following:

- Storage of the Category 1B flammable gases on shelves shall not exceed 6 feet (1829 mm) in height, and shelving shall be metal.
- Rack storage, pallet storage or piles of the Category 1B flammable gas greater than 6 feet 6 inches (1981 mm) in height shall be provided with an automatic sprinkler system with a minimum design of Extra Hazard Group 1.
- Combustible commodities shall not be stored above the Category 1B flammable gases.
- Flammable liquids shall be separated from the Category 1B flammable gases by a distance 20 feet (6096 mm). The separation is permitted to be reduced to 10 feet (3048 mm) where secondary containment or diking is provided to retain a flammable liquid spill at a distance of 10 feet (3048 mm) from the Category 1B flammable gas storage.