HARDI

2021 Proposed Model Code Revisions Impacting the HVAC Industry and the Results of First Round of Code Hearings (April and May 2021)

INTERNATIONAL FIRE CODE

Proposal #	Code Section(s)	Summary of Proposed Revision	Technical Committee Decision
F3	Definitions	**FLAMMABLE GAS.** A material which 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 ○ A gas which is ignitable at 14.7 psia (101 kPa) when in a mixture of 13 percent or less by volume with air; or ~~has~~ ○ 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 shows compliance with Category 1B. 2. Category 1B A gas which meets the flammability criteria for Category 1A, is not pyrophoric or chemically unstable, and meets one of more of the following: - A lower flammability limit of more than 6% by volume of air; or - A fundamental burning velocity of less than 3.9 in/s (10 cm/s). The limits specified shall be determined at 14.7 psi (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 1B.	Approved as Submitted
F 53	608.9	**608.9 Refrigerant detection.** Machinery rooms shall be provided with a refrigerant detector with an audible and visible alarm. ~~Where ammonia is used as the refrigerant, detection shall comply with IIAR 2. For refrigerants other than ammonia, refrigerant detection shall comply with Section~~ 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	Approved as Submitted

HARDI

2021 Proposed Model Code Revisions Impacting the HVAC Industry and the Results of First Round of Code Hearings (April and May 2021)

INTERNATIONAL FIRE CODE

Proposal #	Code Section(s)	Summary of Proposed Revision	Technical Committee Decision
		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 I*nternational 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 608.10.1. The proposal goes onto to delete references to ammonia refrigerants since they are not covered in the IFC.	
F 56	608.12	608.12 Storage, use and handling. Flammable and combustible materials shall not be stored in machinery rooms for refrigeration systems having a refrigerant circuit containing more than 220 pounds (100 kg) of Group A1 or 30 pounds (14 kg) of any other group refrigerant. Storage, use or handling of extra refrigerant or refrigerant oils shall be as required by Chapters 50, 53, 55 and 57. Exception: These provisions shall not apply to: 1. 1. ~~This provision shall not apply to~~ Spare parts, tools and incidental materials necessary for the safe and proper operation and maintenance of the system. 2. 2. Refrigerant removed from equipment during a repair or replacement and temporarily stored in a pressure vessel complying with ASME BPVC Section VIII, for reuse after the repair or replacement has been completed.	Approved as Submitted
F 98	Table 911.1	Table for Explosion Control Methods revised to include a new footnote stating that category 1 B flammable gases (see F 3 above) are not required to have explosion venting or explosion prevention systems.	Approved as Submitted

HARDI

2021 Proposed Model Code Revisions Impacting the HVAC Industry and the Results of First Round of Code Hearings (April and May 2021)

INTERNATIONAL FIRE CODE

Proposal #	Code Section(s)	Summary of Proposed Revision	Technical Committee Decision
F 192	MAQs	Updates to the Maximum Allowable Quantities for Category 1B flammable gases with a low burning velocity including the following: 162,500 cubic feet (gas) and 10,000 gallons (liquid).	Approved as Submitted

INTERNATIONAL BUILDING CODE

Proposal #	Code Section(s)	Summary of Proposed Revision	Technical Committee Decision
G 41	307	Adds new flammable gas categories to the High Hazard Group classifications. Category 1A and Category 1Bwith a burning velocity greater than 3.9 in. per second fall under Group H-2 and Category 1B flammable gases with a burning velocity or 3.9 in. per second or less are placed un Group H-3.	Approved as Submitted

INTERNATIONAL MECHANICAL CODE

Proposal #	Code Section(s)	Summary of Proposed Revision	Technical Committee Decision
M 72	1101	1101.2.1 Group A2L, A2, A3 and B1 high probability equipment. High probability equipment using Group A2L, A2, A3, or B1 refrigerant shall comply with UL 484, UL/CSA 60335-2-40, or UL/CSA 60335-2-89.	Approved as Submitted
M 73	1101.7	Provided revisions to section 1101.7 based on ASHRAE 15 requirements related to change in refrigerant type to address the change of refrigerant from one safety class to another.	Approved as Submitted
M 80	Table 1107.4	Adds new pipe product for Group A2 refrigerants1 – polyethylene of raised temperature / aluminum / polyethylene of raised temperature (PERT/AL/PERT)	Approved as Submitted

HARDI

2021 Proposed Model Code Revisions Impacting the HVAC Industry and the Results of First Round of Code Hearings (April and May 2021)

UNIFORM MECHANICAL CODE

Proposal #	Code Section(s)	Summary of Proposed Revision	Technical Committee Decision
181	903.2	**903.2.7 Air-Conditioning Coil Freeze Protection.** A sensor shall be attached to the air-conditioning coils that will shut off the equipment if it detects a temperature of 29°F (-2°C) to prevent icing of the coils. A manual reset button that is on the sensor shall be pushed to return the system to normal operation.	Rejected
194	934	Add UL 109 – *Tube Fittings for Flammable and Combustible Fluids, Refrigeration Service and Marine Use* as a compliance standard along with UL 207	Rejected
208	1103	Provides significant revisions to Chapter 11 on Refrigerant Systems for the inclusion of A2L refrigerants.	Approved as Modified Modification was to add a requirement that all refrigeration piping containing A2L refrigerants shall be brazed.
210	1104	Provides significant revisions to Chapter 11 on Refrigerant Systems for the inclusion of A2L refrigerants. Of significance is that each refrigerating machinery room will be required to contain one or more refrigerant detectors.	Approved as Submitted
222	1109	Creates a new table listing materials for refrigerant piping, tubing and fittings along with the appropriate product standards.	Approved as Modified Modification deleted “or other approved standards” and “shall be acceptable to the AHJ”
223 and 224	1109	Adds new piping product under 1109. Refrigerant Piping, Containers, and Valves - Polyethylene of Raised Temperature/Aluminum/Polyethylene of Raised Temperature (PERT/AL/PE-RT)	Rejected Rejection of proposal was supported by AHRI based on the potential use with A2L refrigerants.
225	1109	Deletes reference to UL 207 – Refrigerant Containing Components and Accessories Nonelectrical and deletes the use of following joining methods: press connect, soldered, and mechanical. Only acceptable joining method would be brazing.	Approved as Submitted

HARDI

2021 Proposed Model Code Revisions Impacting the HVAC Industry and the Results of First Round of Code Hearings (April and May 2021)

UNIFORM MECHANICAL CODE

Proposal #	Code Section(s)	Summary of Proposed Revision	Technical Committee Decision
226	1109	Adds UL 109 products under Refrigeration Piping, Containers and Valves for acceptable joints.	Rejected
229	1109	Adds new sections to 1109.1 which reference compliance to UL 109 and UL 207.	Rejected



IFC

2021 GROUP A PROPOSED CHANGES TO THE I-CODES

April 11 – May 5, 2021
Virtual Committee Action Hearings

ICC
INTERNATIONAL CODE COUNCIL®

F3-21

IFC: SECTION 202; IBC: SECTION 202

Proponents: Michael O'Brian, representing FCAC (fcac@iccsafe.org)

2021 International Fire Code

Revise as follows:

FLAMMABLE GAS. A material which 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. ~~Is~~ Category 1A.
    1. A gas which 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 shows compliance with Category 1B.
2. Category 1B.

    A gas which 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% 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 psi (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 1B.

2021 International Building Code

Revise as follows:

[F] 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 also meets one of the following~~ subdivided as follows:

1. ~~Is~~ Category 1A.
    1. A gas which is ignitable at 14.7 psia (101 kPa) when in a mixture of 13 percent or less by volume with air.~~has~~
    2. A gas with a flammable range at 14.7 psia (101 kPa) with air of at least 12 percent, regardless of the lower limit unless data shows compliance with Category 1B.
2. Category 1B.

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

    1. A lower flammability limit of more than 6% by volume in 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 psi (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 1B.

Reason Statement: In the 7th edition of the Global Harmonization System of Classification and Labelling of Chemicals (GHS) the classification of flammable gas was expanded. Flammable gases have three categories, Category 1A, Category 1B, and Category 2. The definition is revised to be consistent with the GHS. However, some of the subgroups of Category 1A are not identified since all of the subclass still fall within Category 1A. Not included in the definition are pyrophoric (flammable) gas and chemically unstable (flammable) gas. Within these two additional terms is a requirement

that the gas must first meet the Category 1A definition. Hence, including these terms becomes unnecessary in the Fire Code. GHS also defines a Category 2 flammable gas. The definition of a Category 2 flammable gas is: Category 2 - A gas not meeting the criteria of Category 1A or 1B, which, at 68°F (20 °C) and a pressure of 14.7 psia (101 kPa), has a flammable range while mixed in air. It is recommended that ICC consider adding a note in the commentary that Category 2 flammable gases are not regulated as flammable gases in the Fire Code, however, GHS has a classification for such flammable gases.

The GHS table on flammable gases is as follows:

Table 2.2.1: Criteria for categorisation of flammable gases

Category			Criteria
1A	Flammable gas		Gases, which at 20 °C and a standard pressure of 101.3 kPa: (a) are ignitable when in a mixture of 13% or less by volume in air; or (b) have a flammable range with air of at least 12 percentage points regardless of the lower flammability limit unless data show they meet the criteria for Category 1B
	Pyrophoric gas		Flammable gases that ignite spontaneously in air at a temperature of 54 °C or below
	Chemically unstable gas	A	Flammable gases which are chemically unstable at 20°C and a standard pressure of 101.3 kPa
		B	Flammable gases which are chemically unstable at a temperature greater than 20°C and/or a pressure greater than 101.3 kPa
1B	Flammable gas		Gases which meet the flammability criteria for Category 1A, but which are not pyrophoric, nor chemically unstable, and which have at least either: (a) a lower flammability limit of more than 6% by volume in air; or (b) a fundamental burning velocity of less than 10 cm/s;
2	Flammable gas		Gases, other than those of Category 1A or 1B, which, at 20 °C and a standard pressure of 101.3 kPa, have a flammable range while mixed in air

NOTE 1: *Ammonia and methyl bromide may be regarded as special cases for some regulatory purposes.*

NOTE 2: *Aerosols should not be classified as flammable gases. See Chapter 2.3.*

NOTE 3: *In the absence of data allowing classification into Category 1B, a flammable gas that meets the criteria for Category 1A is classified per default in Category 1A.*

NOTE 4: *Spontaneous ignition for pyrophoric gases is not always immediate, and there may be a delay.*

NOTE 5: *In the absence of data on its pyrophoricity, a flammable gas mixture should be classified as a pyrophoric gas if it contains more than 1% (by volume) of pyrophoric component(s).*

Category 1A flammable gases have a higher flammability and become explosive. These are the flammable gases typically understood such as propane, acetylene, and butane. Category 1B flammable gases have a lower flammability and are not inherently explosive, although all flammable gases can have a deflagration under the right conditions. A typical Category 1B flammable gas would be difluoromethane. The gas has a lower flammable limit of 13.8 percent and an upper flammable limit of 29.9 percent. The burning velocity is 6.7 cm/s or 2.6 in/s. Other Category 1B flammable gases would include: 1,1,1-trifluoroethane; and 2,3,3,3-tetrafluoro-1-propene. Trans-1,3,3,3-tetrafluoro-1-propene and ammonia are a Category 2 flammable gas.The last statement in the definition is to clarify that when not indicated, the term flammable gas applies to both Category 1A and Category 1B. When appropriate, the section in the code will state, “Category 1A flammable gas” or “Category 1B flammable gas.”

This proposal is submitted by the ICC Fire Code Action Committee (FCAC). The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire and life safety in new and existing buildings and facilities as well as the protection of life and property in wildland urban interface areas. In 2020 and 2021 the Fire-CAC held multiple virtual meetings that were open to any interested party. In addition, there were numerous virtual specific working group meetings that were also open to any interested parties, to develop, discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: https://www.iccsafe.org/products-and-services/i-codes/code-development/cs/fire-code-action-committee-fcac/

Cost Impact: The code change proposal will not increase or decrease the cost of construction
This change neither increases or decreases the cost of construction. The change only impacts the classification of flammable gases, thus there are no other technical changes to the code through this revision of the definition.

F3-21

F53-21 Part I

PART I IFC: 608.9, 608.9.1, 608.11, 608.13, 608.13.2, 608.13.3, 608.13.4, 608.13.5, 608.13.6, 608.13.7, 608.14

PART II IFC: [M] 608.17

Proponents: Jeffrey Shapiro, representing IIAR (jeff.shapiro@intlcodeconsultants.com)

THIS IS A TWO PART CHANGE. PART 1 OF THIS PROPOSAL WILL BE HEARD BY THE FIRE CODE COMMITTEE AND PART II OF THIS PROPOSAL WILL BE HEARD BY THE MECHANICAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2021 International Fire Code

Revise as follows:

608.9 Refrigerant detection. Machinery rooms shall be provided with a refrigerant detector with an audible and visible alarm. ~~Where ammonia is used as the refrigerant, detection shall comply with IIAR 2. For refrigerants other than ammonia, refrigerant detection shall comply with Section 608.9.1.~~ 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 I*nternational 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 608.10.1.

Delete without substitution:

~~**608.9.1 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 608.10.1.~~

Revise as follows:

608.11 Emergency pressure control system. Permanently installed refrigeration systems in machinery rooms containing more than 6.6 pounds (3 kg) of flammable, toxic or highly toxic refrigerant ~~or ammonia~~ shall be provided with an emergency pressure control system in accordance with Sections 608.11.1 and 608.11.2.

608.13 Discharge and termination of pressure relief and purge systems. Pressure relief devices, fusible plugs and purge systems discharging to the atmosphere from refrigeration systems containing flammable, toxic or highly toxic refrigerants ~~or ammonia~~ shall comply with Sections 608.13.2 ~~through 608.13.4~~ and 608.13.3.

608.13.2 Flammable refrigerants. Systems containing more than 6.6 pounds (3 kg) of flammable refrigerants having a density equal to or greater than the density of air shall discharge vapor to the atmosphere only through an *approved* treatment system in accordance with Section ~~608.13.5~~ 608.13.4 or a flaring system in accordance with Section ~~608.13.6~~ 608.13.5. Systems containing more than 6.6 pounds (3 kg) of flammable refrigerants having a density less than the density of air shall be permitted to discharge vapor to the atmosphere provided that the point of discharge is located outside of the structure at not less than 15 feet (4572 mm) above the adjoining grade level and not less than 20 feet (6096 mm) from any window, ventilation opening or *exit*.

608.13.3 Toxic and highly toxic refrigerants. Systems containing more than 6.6 pounds (3 kg) of toxic or highly toxic refrigerants shall discharge vapor to the atmosphere only through an *approved* treatment system in accordance with Section ~~608.13.5~~ 608.13.4 or a flaring system in accordance with Section ~~608.13.6~~ 608.13.5.

Delete without substitution:

~~**608.13.4 Ammonia refrigerant.** Systems containing more than 6.6 pounds (3 kg) of ammonia refrigerant shall discharge vapor to the atmosphere~~

~~in accordance with one of the following methods:~~

1. ~~Directly to atmosphere where the *fire code official* determines, on review of an analysis prepared in accordance with Section 104.8.2, that a health hazard would not result from atmospheric discharge of ammonia.~~
2. ~~Through an *approved* treatment system in accordance with Section 608.13.5.~~
3. ~~Through a flaring system in accordance with Section 608.13.6.~~
4. ~~Through an *approved* ammonia diffusion system in accordance with Section 608.13.7.~~
5. ~~By other *approved* means.~~

~~**Exception:** Ammonia/water absorption systems containing less than 22 pounds (10 kg) of ammonia and for which the ammonia circuit is located entirely outdoors.~~

Revise as follows:

608.13.4 ~~**608.13.5**~~ **Treatment systems.** Treatment systems shall be designed to reduce the allowable discharge concentration of the refrigerant gas to not more than 50 percent of the IDLH at the point of exhaust. Treatment systems shall be in accordance with Chapter 60.

608.13.5 ~~**608.13.6**~~ **Flaring systems.** Flaring systems for incineration of flammable refrigerants shall be designed to incinerate the entire discharge. The products of refrigerant incineration shall not pose health or environmental hazards. Incineration shall be automatic upon initiation of discharge, shall be designed to prevent blowback and shall not expose structures or materials to threat of fire. Standby fuel, such as LP-gas, and standby power shall have the capacity to operate for one and one-half the required time for complete incineration of refrigerant in the system. Standby electrical power, where required to complete the incineration process, shall be in accordance with Section 1203.

Delete without substitution:

~~**608.13.7 Ammonia diffusion systems.** Ammonia diffusion systems shall include a tank containing 1 gallon of water for each pound of ammonia (8.3 L of water for each 1 kg of ammonia) that will be released in 1 hour from the largest relief device connected to the discharge pipe. The water shall be prevented from freezing. The discharge pipe from the pressure relief device shall distribute ammonia in the bottom of the tank, but not lower than 33 feet (10 058 mm) below the maximum liquid level. The tank shall contain the volume of water and ammonia without overflowing.~~

Revise as follows:

608.14 Mechanical ventilation exhaust. Exhaust from mechanical ventilation systems serving refrigeration machinery rooms containing flammable, toxic or highly toxic refrigerants~~, other than ammonia,~~ capable of exceeding 25 percent of the LFL or 50 percent of the IDLH shall be equipped with *approved* treatment systems to reduce the discharge concentrations to those values or lower.

Exception: Refrigeration systems containing Group A2L complying with Section 608.18.

F53-21 Part I

F56-21

IFC: 608.12

Proponents: Michael O'Brian, representing FCAC (fcac@iccsafe.org)

2021 International Fire Code

Revise as follows:

608.12 Storage, use and handling. Flammable and combustible materials shall not be stored in machinery rooms for refrigeration systems having a refrigerant circuit containing more than 220 pounds (100 kg) of Group A1 or 30 pounds (14 kg) of any other group refrigerant. Storage, use or handling of extra refrigerant or refrigerant oils shall be as required by Chapters 50, 53, 55 and 57.

Exception: These provisions shall not apply to:

1. ~~This provision shall not apply to~~ Spare parts, tools and incidental materials necessary for the safe and proper operation and maintenance of the system.
2. Refrigerant removed from equipment during a repair or replacement and temporarily stored in a pressure vessel complying with ASME BPVC Section VIII, for reuse after the repair or replacement has been completed.

Reason Statement: During repairs and replacement, refrigerant is removed from a system and stored in the machinery room in ASME rated pressure vessels. The proposed exception recognizes this practice. It must be noted that the machinery room has refrigerant detectors as well as ventilation in the event of a leak. Hence, the machinery room is an appropriate environment for temporarily storing the refrigerant that will be added back into the system following any repair or replacement. Since the refrigerant is either in the refrigeration equipment or pressure vessel, there is no added hazard to the machinery room. It should be noted that in a machinery room any group of refrigerant can be used in the refrigeration equipment.
This proposal is submitted by the ICC Fire Code Action Committee (FCAC). The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire and life safety in new and existing buildings and facilities as well as the protection of life and property in wildland urban interface areas. In 2020 and 2021 the Fire-CAC held multiple virtual meetings that were open to any interested party. In addition, there were numerous virtual specific working group meetings that were also open to any interested parties, to develop, discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: https://www.iccsafe.org/products-and-services/i-codes/code-development/cs/fire-code-action-committee-fcac/

Cost Impact: The code change proposal will not increase or decrease the cost of construction
None, this practice appears to be an industry standard for containers and best practice.

F98-21

IFC: TABLE 911.1, 3307.2.1; IBC: TABLE 414.5.1

Proponents: Michael O'Brian, representing FCAC (fcac@iccsafe.org)

2021 International Fire Code

Revise as follows:

TABLE 911.1

EXPLOSION CONTROL REQUIREMENTS[f]

Portions of table not shown remain unchanged.

MATERIAL	CLASS	EXPLOSION CONTROL METHODS	
		Barricade construction	**Explosion (deflagration) venting or explosion (deflagration) prevention systems**
Hazard Category			
Flammable gas	Gaseous	Not required	Required[h]
	Liquefied	Not required	Required[h]

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

3307.2.1 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.

2021 International Building Code

Revise as follows:

F192-21

IFC: TABLE 5003.1.1(1), TABLE 5003.1.1(3), 5003.8.3.5, 5003.8.3.5.4 (New), 5003.11, 5003.11.1, 5003.11.2, 5003.11.3, 5003.11.3.1, 5003.11.3.2, 5003.11.3.3, 5003.11.3.4, 5003.11.3.5, 5003.11.3.7, 5003.11.3.6, 5003.11.3.8, 5003.11.3.9, 5003.11.3.10, 5003.11.3.11, 5003.11.2 (New), TABLE 5003.11.2 (New), 5003.11.2.1 (New); IBC: TABLE 307.1(1), [F] 414.2.5, TABLE 414.2.5(3) (New), 414.2.5.4 (New)

Proponents: Michael O'Brian, representing FCAC (fcac@iccsafe.org)

2021 International Fire Code

Revise as follows:

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	H-2	NA			NA	NA		NA	NA
	1A and 1B (High BV)[r]			NA	1,000[d, e]			1,000[d,e]		
	1B (Low BV)[r]				162,500[d,e]			162,500[d,e]		
	Liquefied				NA			NA		
	1A and 1B (High BV)[r]			(150)[d, e]			(150)[d, e]			
	1B (Low BV)[r]			(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 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.

   Liquid or gaseous fuel in fuel tanks on motorized equipment operated in accordance with this code.

   Gaseous fuels in piping systems and fixed appliances regulated by the International Fuel Gas Code.

   Liquid fuels in piping systems and fixed appliances regulated by the International Mechanical Code.

   Alcohol-based hand rubs classified as Class I or II liquids in dispensers that are installed in accordance with Sections 5705.5 and 5705.5.1. The location of the alcohol-based hand rub (ABHR) dispensers shall be provided in the construction documents.

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 <u>"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.</u>

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	Not Applicable	Not Applicable		Not Applicable	Not Applicable		Not Applicable	Not Applicable
	1A and 1B (High BV)[e]			3,000			1,500		
	1B (Low BV)[e]			195,000			97,500		
	Liquefied								
	1A and 1B (High BV)[e]		(300)	Not Applicable		(150)	Not Applicable		
	1B (Low BV)[e]		(20,000)			(10,000)			

For SI: 1 pound = 0.454 kg, 1 gallon = 3.785 L, 1 cubic foot = 0.02832 m^3.

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 materials in Group M display and storage areas and in Group S storage areas. Hazardous materials located in Group M and Group S occupancies shall be in accordance with Sections 5003.8.3.5.1 through ~~5003.8.3.5.3~~ 5003.8.3.5.4.

Add new text as follows:

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.

Revise as follows:

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.

Delete without substitution:

~~**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.~~

Revise as follows:

~~5003.11.3~~ 5003.11.1.1 **Storage and display.** Storage and display shall be in accordance with Sections ~~5003.11.3.1~~ 5003.1.1.1 through ~~5003.11.3.11~~ 5003.11. 1.1.11 .

~~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/m^2) of floor area actually occupied by solid merchandise. Storage and display of liquids shall not exceed 20 gallons per square foot (0.50 L/m^2) 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.

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

~~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.

~~5003.11.3.8~~ 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.

~~5003.11.3.11~~ 5003.11.1.1.11 **Storage plan.** A storage plan illustrating the intended storage arrangement, including the location and dimensions of aisles, and storage racks shall be provided.

Add new text as follows:

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 cu. ft. = 0.028 m3

a. Control areas shall be separated from each other by not less than a 1-hour fire barrier.

b. 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.

c. Where storage areas exceed 50,000 square feet in area, the maximum allowable quantities area 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.

d. "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:

1. Storage of the Category 1B flammable gases on shelves shall not exceed 6 feet (1829 mm) in height, and shelving shall be metal.
2. 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.
3. Combustible commodities shall not be stored above the Category 1B flammable gases.
4. 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.

2021 International Building Code

Revise as follows:

TABLE 307.1(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	H-2	NA	NA		NA	NA		NA	NA
	1A and 1B(High BV)[r]				1,000[d,e]			1,000[d,e]		
	1B (Low BV)[r]				162,500[d,e]			162,500[d,e]		
	Liquefied				NA			NA		
	1A and 1B(High BV)[r]			(150)[d,e]			(150)[d,e]			
	1B (Low BV)[r]			(10,000)[d,e]			(10,000)[d,e]			

a. For use of control areas, see Section 414.2.

b The aggregate quantity in use and storage shall not exceed the quantity specified for storage.

c. The quantities of alcoholic beverages in retail and wholesale sales occupancies shall not be limited provided the liquids are packaged in individual containers not exceeding 1.3 gallons. In retail and wholesale sales occupancies, the quantities of medicines, foodstuffs 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 automatic sprinkler system in accordance with Section 903.3.1.1. Where Note e also applies, the increase for both notes shall be applied accumulatively.

e. Maximum allowable quantities shall be increased 100 percent when stored in approved storage cabinets, day boxes, gas cabinets, gas rooms or exhausted enclosures or in listed safety cans in accordance with Section 5003.9.10 of the International Fire Code. 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 automatic sprinkler system in accordance with Section 903.3.1.1.

g. Allowed only in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1.

h. Containing not more than the maximum allowable quantity per control area of Class IA, IB or IC flammable liquids.

i. The maximum allowable quantity shall not apply to fuel oil storage complying with Section 605.4.2 of the International Fire Code.

j. Quantities in parentheses indicate quantity units in parentheses 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 when such materials are necessary for maintenance purposes, operation or sanitation of equipment when the storage containers and the manner of storage are approved.

l. Net weight of the 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 of the International Fire Code.

n. For storage and display quantities in Group M and storage quantities in Group S occupancies complying with Section 414.2.5, see Tables 414.2.5(

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 the International Fire 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.
   5. Alcohol-based hand rubs classified as Class I or II liquids in dispensers that are installed in accordance with Sections 5705.5 and 5705.5.1 of the International Fire Code. The location of the alcohol-based hand rub (ABHR) dispensers shall be provided in the construction

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 414.1.3.

r. <u>"High BV" Category 1B flammable gas has a burning velocity greater than 3.9 in/s (10 cm/s). "Low BV" Category 1B flammable gas has a burning velocity of 3.9 in/s (10 cm/s) or less.</u>

[F] 414.2.5 Hazardous material in Group M display and storage areas and in Group S storage areas. *Hazardous materials* located in Group M and Group S occupancies shall be in accordance with Sections 414.2.5.1 through ~~414.2.5.3~~ <u>414.2.5.4</u>.

Add new text as follows:

TABLE 414.2.5(3)
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)[e]		
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 cu. ft. = 0.028 m3

a. Control areas shall be separated from each other by not less than a 1-hour fire barrier.

b. 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.

c. Where storage areas exceed 50,000 square feet in area, the maximum allowable quantities area 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.

d. "Low BV" Category 1B flammable gas has a burning velocity of 3.9 in/s (10 cm/s) or less.

414.2.5.4 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 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 307.1(1) without classifying the building or use as a Group H occupancy, provided the materials are stored and displayed in accordance with the *International Fire Code* and quantities do not exceed the amounts specified in Table 414.2.5(3).

Reason Statement: This change coordinates the requirements for flammable gas with the change in definition to “flammable gas.” The change in definition results in two categories of flammable gas, Category 1A and Category 1B. The existing requirements in the code are based on Category 1A flammable gases. As a result, new requirements had to be developed to regulate Category 1B flammable gases. It should be noted that there is a distinction between Category 1B flammable gas based on the burning velocity. The research on this code change is based on a burning velocity of 3.9 in/s (10 cm/s) or less. Higher burning velocity Category 1B flammable gases are not commercially available, hence there is no means of evaluating their performance. The changes to the table for the higher allowable quantities are for the Category 1B low burning velocity flammable gases. There is no change to the Category 1B high burning velocity flammable gases.

A change is necessary to Tables 5003.1.1(1) and 5003.1.1(3) regarding the maximum allowable quantities for control area. The approach that was taken is similar to the approach used in the code for other hazardous materials that have different classes or categories based on the hazard level of the material. The current requirements in the tables will continue to apply to Category 1A flammable gases. This requires the addition of the words “Category 1A and Category 1B (High BV)” to be added in front of the term “flammable gas.” The new requirements for "Category 1B (Low BV)" flammable gases are based on a comparative analysis of the hazard of these flammable gases. The approach was to added limitations in the maximum allowable quantity table with a new section added that specifically regulates the requirements for storage in Use Group M and S. It should be noted that other than Use Group H, the predominant storage location of flammable gases is in Use Group M and S buildings. Section 5803.1.1 of the Fire Code will continue to have restrictions on the storage and use of flammable gases in other Use Groups. A new Section 5003.11.2 and Table 5003.11.2 in the Fire Code will add specific requirements for Use Group M and S. A similar Section 414.2.5.3 will be added to the Building Code. In developing these limitations, a comparison of existing requirements was evaluated for other hazardous materials.

The following table provides a comparison between various flammable gases and flammable liquids:

Item	Liquid or Gas	Gas Cat.	Liquid Class	LFL (LEL)	UFL (UEL)	lb per 10,000 cu ft to LFL	Burning Velocity (in/sec)	Heat of Combustion (Btu/lb)	Min. Ignition Energy (mJ)	Deflagration Index K_G (or K_{ST})[c] (100kPa/s)	Auto Ignition Temp.	Flash Point	Basic MAQ
Propane	Gas	1A		2.1	9.6	5.6	17.9	21,638	0.25	100	920°F		150 lb
Acetylene	Gas	1A		2.5	81		50.4	21,500	0.017	1415	581°F		150 lb
Hydrogen	Gas	1A		4	75	2.1	116.5	60,870	0.019	550	932°F		150 lb
Difluoromethane	Gas	1B		14.4	29.9	192	2.6	4,041	65	11	1,198°F		?
2,3,3,3-tetrafluoro-1-propene	Gas	1B		6.2	12.3	188	0.6	4,601	>1000	8	761°F		?
R454B	Gas	1B		11.8	21.5	880	2.5	4,319	100-300		928°F		?
Trans-1,3,3,3-tetrafluoro-1-propene	Gas	2		Note a	Note a	188	0.5	4,601	62,500	9	694°F		Unlimited
Ammonia	Gas	2		16.7	28	292[b]	2.8	8,020	100-300	10	1,204°F		Unlimited
Gasoline	Liquid		IB	1.4	7.6	NG[d]	15	20,400	0.8		536°F	-45°F	120 gallons (756 lb)
Propyl Alcohol	Liquid		IC	2.1	13.5	NG[d]	19.6	13,192	0.65		700°F	77°F	120 gallons (809 lb)
Kerosene	Liquid		II	0.7	5.0	NG[d]	15.7	19,862	20		428°F	110-150°F	120 gallons (816 lb)
Diesel (2-D)	Liquid		II	0.6	7.5	NG[d]		18,900			410°F	126-205°F	120 gallons (816 lb)
Linseed Oil	Liquid		IIIA	-	-	NG[d]		16,800			650°F	200°F	330 gallons (2,558 lb)
Ethylene Glycol	Liquid		IIIB	3.2	15.2	NG[d]	15.7	7,297	1.2		770°F	232°F	13,200 gallons (122,232 lb)
Olive Oil	Liquid		IIIB	-	-	NG[d]	7.8	16,663			815°F	437°F	13,200 gallons (100,452 lb)

Note a. No LFL and UFL at 20°C, flame begins at 28°C, classified as flammable refrigerant A2L when used as a refrigerant.

Note b. Ammonia is toxic at 0.56 pounds per 10,000 cubic feet.

Note c. Deflagration index based on NFPA 68. K_G (K_{ST}) is the maximum rate of pressure increase normalized to the volume in which the rate was measured.

Note d. NG is not germane. Any spill can result in ignition. The grouping is not appropriate for comparison purposes.

A survey was conduct by HARDI to determine the amount of refrigerant gas that is stored in facilities today. That information helped to ascertain the quantity of Category 1B Low BV flammable gas that will be stored as Group A2L refrigerant in the near future.

A study from Japan by Tei Saburi, National Institute of Advanced Industrial Science and Technology, indicates that Category 1B (Low BV) flammable gases are most closely aligned with Category 2 flammable gases. As the chart indicates, Category 2 flammable gas has never been regulated in the MAQ table. While Category 2 flammable gas is identified as unlimited, this value could not be justified for Category 1B (Low BV) flammable gas. However, when comparing Category 1A to both Category 1B (Low BV) and Category 2 flammable gas, a much higher MAQ can be established for Category 1B (low BV) than Category 1A since the fire hazard from storage is much lower.

An evaluation of various fire tests on Category 1B (Low BV)flammable gas also helped to establish the MAQ. A conservative value of 10,000 pounds of Category 1B (Low BV) flammable gas was established as the maximum for a nonsprinklered control area. Comparing the deflagration index, Category 1B (Low BV) range from 0.5 to 11 percent of the deflagration index of Category 1A flammable gases. The minimum ignition energy varies by as much at 58,000 times. The heat of combustion is between 6 and 19 percent of Category 1B (Low BV). Thus, the value selected is conservative but agreeable to industry.

With the established base maximum, the value for a control area is double for a sprinklered control area. The special requirements for Use Group M and S are also doubled for a nonsprinklered control area. The maximum allowable quantity is double to 40,000 for a sprinklered control area in a Use Group M or S. The sprinklered control area storage maximum can double again when additional floor area is provided in the control area.

The appendices have been updated to correlate with the revisions to the MAQ table.**If the proposal reclassifying 1B Flammable Gases to association with the Group H-3 occupancy classification is successful, Tables 5003.1.1(1) and 307.1(1) will need to be revised so that the "GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED" row says "H-2 or H-3."

This proposal is submitted by the ICC Fire Code Action Committee (FCAC). The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire and life safety in new and existing buildings and facilities as well as the protection of life and property in wildland urban interface areas. In 2020 and 2021 the Fire-CAC held multiple virtual meetings that were open to any interested party. In addition, there were numerous virtual specific working group meetings that were also open to any interested parties, to develop, discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: https://www.iccsafe.org/products-and-services/i-codes/code-development/cs/fire-code-action-committee-fcac/

Cost Impact: The code change proposal will decrease the cost of construction
This code change reduces the cost of construction. By modifying the maximum allowable quantities for Category 1B flammable gas, the construction

costs are lowered. The construction costs for Category 1A flammable gas remain unchanged, neither increased nor decreased in the cost of construction.

F192-21



IBC — General

2021 GROUP A PROPOSED CHANGES TO THE I-CODES

April 11 – May 5, 2021
Virtual Committee Action Hearings

ICC
INTERNATIONAL CODE COUNCIL®

G41-21

IBC: [F] 307.4, [F] 307.5

Proponents: Mike Nugent, Chair, representing ICC Building Code Action Committee (bcac@iccsafe.org)

THIS CODE CHANGE WILL BE HEARD BY THE FIRE CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THAT COMMITTEE.

2021 International Building Code

Revise as follows:

[F] 307.4 High-hazard Group H-2. Buildings and structures containing materials that pose a deflagration hazard or a hazard from accelerated burning shall be classified as Group H-2. Such materials shall include, but not be limited to, the following:

Class I, II or IIIA *flammable or combustible liquids* that are used or stored in normally open containers or systems, or in closed containers or systems pressurized at more than 15 pounds per square inch gauge (103.4 kPa).
Combustible dusts 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 414.1.3.
Cryogenic fluids, flammable.
Category 1A*Flammable gases.*
Category 1B *Flammable gases* having a burning velocity greater than 3.9 inches per second (10 cm/s).
Organic peroxides, Class I.
Oxidizers, Class 3, that are used or stored in normally open containers or systems, or in closed containers or systems pressurized at more than 15 pounds per square inch gauge (103 kPa).
*Pyrophoric*liquids, solids and gases, nondetonable.
Unstable (reactive) materials, Class 3, nondetonable.
Water-reactive materials, Class 3.

[F] 307.5 High-hazard Group H-3. Buildings and structures containing materials that readily support combustion or that pose a *physical hazard* shall be classified as Group H-3. Such materials shall include, but not be limited to, the following:

Class I, II or IIIA *flammable or combustible liquids* that are used or stored in normally closed containers or systems pressurized at 15 pounds per square inch gauge (103.4 kPa) or less
Combustible fibers, other than densely packed *baled cotton*, 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 414.1.3
Consumer *fireworks*, 1.4G (Class C, Common)
Cryogenic fluids, oxidizing
Category 1B *flammable gases* having a burning velocity of 3.9 inches per second (10 cm/s) or less
Flammable solids
Organic peroxides, Class II and III
Oxidizers, Class 2
Oxidizers, Class 3, that are used or stored in normally closed containers or systems pressurized at 15 pounds per square inch gauge (103 kPa) or less
Oxidizing gases
Unstable (reactive) materials, Class 2
Water-reactive materials, Class 2

Reason Statement: This change coordinates the classification of high hazard with the change in definition to “flammable gas.” Category 1A flammable gases have an explosive component in that their deflagration index is extremely low. By comparison, Category 1B flammable gases with a burning velocity of 3.9 in/s or less have a very high deflagration index. Thus, there is a significant difference in the hazard level between the two flammable gas categories.
The more appropriate classification for a Category 1B flammable gas with a burning velocity of 3.9 in/s or less appears to be Use Group H-3. This classification can be supported by a comparison of level of hazard identified in the code change to the MAQ table for flammable gas. The minimum ignition energy varies by as much at 58,000 times. The heat of combustion is between 6 and 19 percent of these Category 1B flammable gases. Thus, Use Group H-3 is the proper classification for Category 1B flammable gas with a burning velocity of 3.9 in/s or less.

This proposal is submitted by the ICC Fire Code Action Committee (FCAC) and the ICC Building Code Action Committee (BCAC).

BCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. In 2020 the BCAC has held several virtual meetings open to any interested party. In addition, there were numerous virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the BCAC website at BCAC.

The FCAC was established by the ICC Board of Directors to pursue opportunities to improve and enhance assigned International Codes with regard to fire and life safety in new and existing buildings and facilities as well as the protection of life and property in wildland urban interface areas. In 2020 and 2021 the Fire-CAC held multiple virtual meetings that were open to any interested party. In addition, there were numerous virtual specific working group meetings that were also open to any interested parties, to develop, discuss and debate the proposed changes. Related documentation and reports are posted on the FCAC website at: FCAC.

Cost Impact: The code change proposal will decrease the cost of construction
This code change reduces the cost of construction. By modifying the Use Group for Category 1B flammable gas, the construction costs are also lowered. The construction costs for Category 1A flammable gas remain unchanged, neither increased nor decreased in the cost of construction.

G41-21

2021

UMC® TECHNICAL COMMITTEE MEETING MONOGRAPH

VIRTUAL MEETING | **MAY 17 – 21, 2021**

Proposals

Item #: 072

UMC 2024 Section: 310.3.2

SUBMITTER: Arnie Rodio
Self

RECOMMENDATION:
Add new text

310.0 Condensate Wastes and Control.

310.3 Condensate Waste Pipe Material and Sizing. (remaining text unchanged)

310.3.2 Material. Condensate waste pipes shall be constructed of DWV materials in accordance with the plumbing code.

SUBSTANTIATION:
There is currently no direction for acceptable piping material for condensate waste pipe in the code. This code change adds provisions for condensate waste pipe materials to assist the installer and AHJ with installation of condensate waste pipe. The UPC, Table 701.2, lists the acceptable materials for condensate lines.

See Piping Systems Meeting Notes

Proposals

Item #: 073

UMC 2024 Section: 310.5

SUBMITTER: Arnie Rodio
Self

RECOMMENDATION:
Revise text

310.0 Condensate Wastes and Control.

310.5 Point of Discharge. Air-conditioning condensate waste pipes shall connect indirectly, except where permitted in Section 310.6, to the drainage system through an air gap or air break to trapped and vented receptors, dry wells, mop sinks, leach pits, or the tailpiece of plumbing fixtures. A condensate drain shall be trapped in accordance with the appliance manufacturer's instructions or as approved.

SUBSTANTIATION:
The change clarifies that mop sinks are an option for indirect connections for condensate waste pipes. Condensate drainage through mop sinks is common and will assist the end user in installing indirect waste piping.

UMC Discussion:

Move to reject based on action taken on 074. Motion passed based on unanimous consent.

Proposals

Item #: 080

UMC 2024 Section: 313.0 - 313.2

SUBMITTER: Phillip H Ribbs
PHR Consultants

RECOMMENDATION:
Revise text

313.0 Hangers, ~~and~~ Supports, and Anchors.
313.1 General. Piping, tubing, appliances, and appurtenances shall be supported in accordance with this code, the manufacturer's installation instructions, and in accordance with the Authority Having Jurisdiction. Seismic restraints shall be as required by the building code.
313.2 Material. Hangers, supports, and anchors shall be of sufficient strength to support the weight of the pipe or tubing and its contents. Piping or tubing shall be isolated from incompatible materials.

SUBSTANTIATION:
The proposed text is adding seismic restraints to ensure these provisions are not overlooked when designing in areas prone to seismic conditions. Additionally, Section 313.0 and Section 313.2 are being modified as the sections address hangers, supports, and anchors.

SUBSTANTIATION:
This proposal clarifies the application of Section 402.1, regarding required minimum outdoor ventilation airflow rates, in storage occupancies. The code is clear that storage rooms do not require ventilation, however, the code language is inconsistently applied when there are storage areas that are not separated from other areas by a solid partition. This code change intends to clarify that fixed storage areas that cannot change without a permit are no different in their fresh air requirements than a closed off storage room. Examples of such floor areas may include those dedicated to high-piled rack storage, self-storage facility units that are not fully partitioned off from interior corridors, and other floor areas that are designated solely for storage. By not considering the volume taken up by storage and the thermal mass it provides in helping with temperature regulation, HVAC equipment is oversized, increasing energy use and limiting the effectiveness of humidity control that properly-sized systems provide. By adding this footnote, the minimum outdoor airflow rates for occupiable space in storage occupancies can be properly calculated and consistently enforced.

UMC Discussion:

Motion to reject passed by unanimous consent.

Proposals **Move to reject based on no direction given as to the location of the sensor and no standard referenced. Also, not every unit needs icing protection. Finally, no rationale for it just being for gas-fired units. Motion passed based on unanimous consent.**

Item #: 181

UMC 2024 Section: 903.2.7

SUBMITTER: Brad Ketner
KBE, INC

RECOMMENDATION:
Add new text

903.0 Air-Conditioning Appliances.

903.2 Gas-Fired Air Conditioners and Heat Pumps.

903.2.7 Air-Conditioning Coil Freeze Protection. A sensor shall be attached to the air-conditioning coils that will shut off the equipment if it detects a temperature of 29°F (-2°C) to prevent icing of the coils. A manual reset button that is on the sensor shall be pushed to return the system to normal operation.

SUBSTANTIATION:
When any part of the air conditioning unit fails, i.e., the blower motor, low refrigerant, poor air flow, etc., the coils will begin to freeze. This leads to potential flood damage for the homeowner, mold, mildew, and additional equipment failure due running while frozen (txv fails, compressor slugs...), not to mention it is wasted time for the technicians that are waiting for the system to thaw before they can fix the problem, and the homeowner is financially burdened as well. With this safety sensor in place, hundreds of millions of dollars in property damage and equipment breakage can be alleviated.

Proposals

Motion to accept as modified by removing "listed and labeled" and replacing with "comply". AHRI supported the proposal. Motion did not pass.

Item #: 194

UMC 2024 Section: 934.1 - 934.5, Table 1701.1

Motion to reject passed on unanimous consent.

SUBMITTER: John Taecker
UL LLC

RECOMMENDATION:
Revise text

934.0 Refrigeration Appliances.
934.1 Self-Contained Refrigerators and Freezers. Factory-built commercial refrigerators and freezers shall ~~comply~~ be listed and labeled in accordance with UL 471 or UL 60335-2-89 and shall be installed in accordance with the manufacturer's installation instructions.
934.2 Unit Coolers. Factory-built unit coolers for use in refrigerators, freezers, refrigerated warehouses, and walk-in coolers shall ~~comply~~ be listed and labeled in accordance with UL 412 or UL 60335-2-89 and shall be installed in accordance with the manufacturer's installation instructions.
934.3 Self-Contained Mechanical Refrigeration Systems. Self-contained mechanical refrigeration systems for use in walk-in coolers shall ~~comply~~ be listed and labeled in accordance with UL 427 or UL 60335-2-89 and shall be installed in accordance with the manufacturer's installation instructions.
934.4 Refrigerant-Containing Components and Accessories. Nonelectrical refrigerant-containing components and accessories shall be listed and labeled in accordance with UL 207, and shall be installed in accordance with the manufacturer's installation instructions.
934.5 Refrigeration Fittings. Refrigeration fittings, including press-connect, flared and threaded shall be listed and labeled in accordance with UL 109 and UL 207, and shall be installed in accordance with the manufacturer's installation instructions.

TABLE 1701.1
REFERENCED STANDARDS

STANDARD NUMBER	STANDARD TITLE	APPLICATION	REFERENCED SECTIONS
UL 109-1997	Tube Fittings for Flammable and Combustible Fluids, Refrigeration Service, and Marine Use (with revisions through May 20, 2020)	Fittings	934.5

(portions of table not shown remain unchanged)

Note: UL 109 and UL 207 meet the requirements for mandatory reference standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
Sections are being added to Chapter 9 (Installation of Specific Appliances) to address the safety standards for refrigerant-containing components, accessories, and fittings to aid the code official in verifying safe installation for such systems.

Proposals

Item #: 208

UMC 2024 Section: 1103.1.1, Table 1103.1.1, 1104.6 - 1104.7

SUBMITTER: Jay Egg
Egg Geothermal
Rep. Chair, A2L Task Group

RECOMMENDATION:
Revise text

1103.0 Classification.
1103.1 Classification of Refrigerants. Refrigerants shall be classified in accordance with Table 1102.3 or in accordance with ASHRAE 34 where approved by the Authority Having Jurisdiction.
1103.1.1 Safety Group. Table 1102.3 classifies refrigerants by toxicity and flammability, and assigns safety groups using combinations of toxicity class and flammability class. For the purposes of this chapter, the refrigerant Groups A1, A2L, A2, A3, B1, B2L, B2, and B3 shall be considered to be individual and distinct safety groups, as shown in Table 1103.1.1. Each refrigerant is assigned into not more than one group.

TABLE 1103.1.1
REFRIGERANT SAFETY GROUP CLASSIFICATIONS

Higher Flammability	A3	B3
Flammable	A2	B2
Lower Flammability	A2L	B2L
No Flame Propagation	A1	B1
	Lower Toxicity	**Higher Toxicity**

1104.0 Requirements for Refrigerant and Refrigeration System Use.

1104.6 Group A2L Refrigerants for Human Comfort. High-probability systems using Group A2L refrigerants for human comfort applications shall comply with this section. [ASHRAE 15:7.6]
1104.6.1 Refrigerant Concentration Limits. Occupied spaces shall comply with Section 1104.2. Unoccupied spaces with refrigerant containing equipment, including but not limited to piping or tubing, shall comply with Section 1104.6.4. {ASHRAE 15:7.6.1-7.6.1.2}
1104.6.2 Listing and Installation Requirements. Refrigeration systems shall be listed and shall be installed in accordance with listing, the manufacturer's instructions, and any markings on the equipment restricting the installation. [ASHRAE 15:7.6.2]
1104.6.2.1 Nameplate. The nameplate required by Section 1115.5 shall include a symbol indicating that a flammable refrigerant is used, as specified by the product listing. [ASHRAE 15:7.6.2.1]
1104.6.2.2 Labeling. A label indicating a flammable refrigerant is used shall be placed adjacent to service ports and other locations where service involving components containing refrigerant is performed, as specified by the product listing. [ASHRAE 15:7.6.2.2]
1104.6.2.3 Refrigerant Detectors. A refrigerant detector shall be provided in accordance with Section 1104.6.5 as a part of the listed equipment where any of the following apply:
(1) The charge size of any independent circuit exceeds 0.212 × *LFL* (lb), where *LFL* is in pounds per 1000 ft^3 (6 × *LFL* [kg] where *LFL* is in kg/m^3).
(2) When the occupancy classification is institutional.
(3) When using the provisions of Section 1104.6.4.

Exception: For commercial, public assembly, and large mercantile occupancies, when the refrigerant charge of any independent circuit does not exceed 50 percent of the RCL, a detector shall not be required.

1104.6.2.4 Refrigerant Concentration Above Limit. When the refrigerant detector senses a refrigerant concentration at the maximum value specified in Section 1104.6.5(2), the following actions shall be taken:

(1) The minimum airflow rate of the supply air fan shall be in accordance with the following equation.

Q min = 1000 × M/LFL [Equation 1104.6.2.4]

Where:

$Qmin$ = minimum airflow rate, ft^3/min

M = refrigerant charge of the largest independent refrigerating circuit of the system, lb

LFL = lower flammability limit, lb per 1000 ft^3

For SI units: Q = 60 000 × M /LFL, where Q is the supply air flow rate (m^3/h), M is the refrigerant charge (kg), LFL is the lower flammability limit (g/m^3).

(2) Turn off the compressor and all other electrical devices, excluding the control power transformers, control systems, and the supply air fan. The supply air fan shall continue to operate for at least five minutes after the refrigerant detector has sensed a drop in the refrigerant concentration below the value specified in Section 1104.6.5(2).

(3) Any device that controls airflow located within the product or in ductwork that supplies air to the occupied space shall be fully open. Any device that controls airflow shall be listed.

(4) Turn off any heaters and electrical devices located in the ductwork. The heaters and electrical devices shall remain off for at least five minutes after the refrigerant detector has sensed a drop in the refrigerant concentration below the value specified in Section 1104.6.5(2). {ASHRAE 15:7.6.2.4}

1104.6.3 Ignition Sources Located in Ductwork. Open-flame-producing devices shall not be permanently installed in the ductwork that serves the space. Unclassified electrical devices shall not be located within the ductwork that serves the space. Devices containing hot surfaces exceeding 1290°F (700°C) shall not be located in the ductwork that serves the space unless there is a minimum airflow of 200 ft/min (1.0 m/s) across the heating device(s) and there is proof of airflow before the heating device(s) is energized. [ASHRAE 15:7.6.3-7.6.3.3]

1104.6.4 Compressors and Pressure Vessel Located Indoors. For refrigeration compressors and pressure vessels located in an indoor space that is accessible only during service and maintenance, it shall be permissible to exceed the RCL if all of the following provisions are met:

(1) The refrigerant charge of largest independent refrigerating circuit shall not exceed:

(a) 6.6 lb (3 kg) for residential and institutional occupancies and

(b) 22 lb (10 kg) for commercial and public/large mercantile occupancies.

(2) The space where the equipment is located shall be provided with a mechanical ventilation system in accordance with Section 1104.6.4(3) and a refrigerant detector in accordance with Section 1104.6.5. The mechanical ventilation system shall be started when the refrigerant detector senses refrigerant in accordance with Section 1104.6.5. The mechanical ventilation system shall continue to operate for at least five minutes after the refrigerant detector has sensed a drop in the refrigerant concentration below the value specified in Section 1104.6.5(2).

(3) A mechanical ventilation system shall be provided that will mix air with leaked refrigerant and remove it from the space where the equipment is located. The space shall be provided with an exhaust fan. The exhaust fan shall remove air from the space where the equipment is located in accordance with the following equation.

$Qmin$ = 1000 × M/LFL

Where:

$Qmin$ = minimum airflow rate, ft^3/min

M = refrigerant charge of the largest independent refrigerating circuit of the system, lb

LFL = lower flammability limit in lb per 1000 ft^3

For SI units: Q = 60 000 × M /LFL, where Q is the supply air flow rate (m^3/h), M is the refrigerant charge (kg), LFL is the lower flammability limit (g/m^3).

(4) The exhaust air inlet shall be located where refrigerant from a leak is expected to accumulate. The bottom of the air inlet elevation shall be within 12 inches (30 cm) of the lowest elevation in the space where the compressor or pressure vessel is located. Provision shall be made for make-up air to replace that being exhausted. Openings for the make-up air shall be positioned such that air will mix with leaked refrigerant.

(5) Air that is exhausted from the ventilation system shall be either:

(a) discharged outside of the building envelope or

(b) discharged to an indoor space, provided that the refrigerant concentration will not exceed the limit specified in Section 1104.6.1.

(6) In addition to the requirements of Section 1104.6.3, there shall be no open-flame-producing devices that do not contain a flame arrestor, or hot surfaces exceeding 1290°F (700 °C) that are installed within space where the equipment is located. [ASHRAE 15:7.6.4]

1104.6.5 Refrigerant Detectors. Refrigerant detectors required by Section 1104.6.2 shall meet the following requirements:

(1) Refrigerant detectors that are part of the listing shall be evaluated by the testing laboratory as part of the equipment listing.

(2) Refrigerant detectors, as installed, shall activate the functions required by Section 1104.6.2.4 within a time not to exceed 15 seconds when the refrigerant concentration reaches 25 percent of the lower flammability limit (LFL).

(3) Refrigerant detectors shall be located such that refrigerant will be detected if the refrigerating system is operating or not operating. Use of more than one refrigerant detector shall be permitted.

(a) For refrigerating systems that are connected to the occupied space through ductwork, refrigerant detectors shall be located within the listed equipment.

(b) For refrigerating systems that are directly connected to the occupied space without ductwork, the refrigerant detector shall be located in the equipment, or shall be located in the occupied space at a height of not more than 12 inches. (30 cm) above the floor and within a horizontal distance of not more 3.3 feet (1.0 m) with a direct line of sight of the unit.

(4) Refrigerant detectors shall provide a means for an automatic operational self-test as provided in the product listing. Use of a refrigerant test gas is not required. If a failure is detected, a trouble alarm shall be activated, and the actions required by Section 1104.6.2.4 shall be initiated. {ASHRAE 15:7.6.5}

~~1104.6~~ 1104.7 **Applications for Human Comfort and for Nonindustrial Occupancies.** In nonindustrial occupancies, Group A2, ~~A2L,~~ A3, B1, B2L, B2, and B3 refrigerants shall not be used in high-probability systems for human comfort. Use of Group A2L refrigerants shall be in accordance with Section 1104.6.

(renumber remaining sections)

SUBSTANTIATION:
Task Group Recommendation 1 - Human Comfort: These are the extracted requirements from ASHRAE 15-2019 that regulate low GWP refrigerants used in direct systems that fall into the safety classification of Group A2L. The A2L Task Group modified various portions of the extracted language as needed to address enforceability and health and safety concerns. The requirements follow the extraction policy of IAPMO.

Motion to accept as modified.

Revise 1104.6 adding "all joints on refrigeration piping containing A2L refrigerant shall be brazed.

1104.6.2.3 (1) add at end, exceeds 4 lb (1.8 kg and strikeout remainder of sentence.

Exception: Male flared joint connections for system servicing.

1104.6.4 (a) strike out residential
add a new (b) 4 lb for unitary products
strikeout (5) (b)

JB noted concern about eliminating mechanical joints especially where appliance mfgs do not want brazing to be occurring near the appliance and would go against some manufacturer installation instructions.

Concern about striking (b) since all refrigerants have a toxicity level and flammability and no need to delete.

JB noted an ASHRAE study on the joints - NEED TO FOLLOW UP WITH HIM to get the study. Also, he noted the max temp put on the rubber gasket in the UL standard is the same temperature that the brazing would fail.

Motion failed based on 12 yes, 14 no and 1 abstention. Motion was remade and passed 15 yes to 13 no

Proposals

Motion to accept as submitted and AHRI supported.
Motion passed based on unanimous consent.

Item #: 210

UMC 2024 Section: 220.0, Chapter 11, Table 1701.1

SUBMITTER: Jay Egg
Egg Geothermal
Rep. Chair, A2L Task Group

RECOMMENDATION:
Revise text

1104.0 Requirements for Refrigerant and Refrigeration System Use.
1104.5 Flammable Refrigerants. The total of Group A2, B2, A3, and B3 refrigerants, other than Group A2L and B2L refrigerants shall not exceed 1100 pounds (498.9 kg) without approval by the Authority Having Jurisdiction. Institutional Occupancies shall comply with Section 1104.3. Machinery rooms required in accordance with Section 1106.0 based on flammability shall be constructed and maintained in accordance with Section 1106.2.1 through Section 1106.2.6 and Section 1106.13 for Group A2L and B2L refrigerants.

1106.0 Refrigeration Machinery Rooms.
1106.1 Where Required. (remaining text unchanged)
1106.2 Refrigeration Machinery Room, General Requirements. Where a refrigeration system is located indoors and a machinery room is required in accordance with Section 1106.1, the machinery room shall be in accordance with Section 1106.2.1 through Section 1106.2.5.2.
1106.2.1 Access. Machinery rooms shall not be prohibited from housing other mechanical equipment unless specifically prohibited elsewhere in this chapter. A machinery room shall be so dimensioned that parts are accessible with space for service, maintenance, and operations. There shall be clear head room of not less than 7.25 feet (2210 mm) below equipment situated over passageways. [ASHRAE 15:8.11.1]
1106.2.2 Openings. Each refrigeration machinery room shall have a tight-fitting door or doors opening outward, self-closing where they open into the building and adequate in number to ensure freedom for persons to escape in an emergency. With the exception of access doors and panels in air ducts and air-handling units in accordance with Section ~~1106.6~~ 1106.2.3, there shall be no openings that will permit passage of escaping refrigerant to other parts of the building. [ASHRAE 15: 8.11.2]
~~**1106.6**~~ **1106.2.3 Airflow.** There shall be no airflow to or from an occupied space through a machinery room unless the air is ducted and sealed in such a manner as to prevent a refrigerant leakage from entering the airstream. Access doors and panels in ductwork and air-handling units shall be gasketed and tight fitting. [ASHRAE 15:~~8.11.7~~8.11.3]
~~**1106.11**~~ **1106.2.4 Restricted Access.** Access to the refrigeration machinery room shall be restricted to authorized personnel. Doors shall be clearly marked or permanent signs shall be posted at each entrance to indicate this restriction. [ASHRAE 15:~~8.11.8~~8.11.4]
~~**1106.2.2.1**~~ **1106.2.5 Detectors and Alarms.** Each refrigeration machinery room shall contain one or more refrigerant detectors in accordance with Section 1106.2.6, located in areas where refrigerant from a leak will concentrate, that actuate an alarm and mechanical ventilation in accordance with Section ~~1106.2.2.2~~ 1106.2.4 at a set point not more than the corresponding Occupational Exposure Limit, OEL, in accordance with Table 1102.3, a set point determined in accordance with the OEL as defined in Chapter 2 shall be approved by the Authority Having Jurisdiction. The alarm shall annunciate visual and audible alarms inside the refrigeration machinery room and outside each entrance to the refrigeration machinery room. The alarms required in this section shall be of the manual reset type with the reset located inside the refrigeration machinery room. Alarms set at other levels, such as IDLH, and automatic reset alarms shall be permitted in addition to those required in accordance with this section. The meaning of each alarm shall be clearly marked by signage near the annunciator.
Exception: Refrigerant detectors are not required where only systems using R-718 (water) are located in the refrigeration machinery room. For Group A2L and B2L, refrigerant detectors shall comply with Section 1106.13.
~~**1106.2.2.2**~~ **1106.2.6 Refrigerant Detectors.** Refrigerant detectors required in accordance with Section ~~1106.2.2.1~~

1106.2.5 or Section 1107.1.7 shall meet all of the following conditions:
(1) The refrigerant detector shall perform automatic self-testing of sensors. Where a failure is detected, a trouble signal shall be activated.
(2) The refrigerant detector shall have one or more set points to activate responses in accordance with Section ~~1106.2.2.1~~ 1106.2.5 or Section 1107.1.7.
(3) The refrigerant detector as installed, including any sampling tubes, shall activate responses within a time not to exceed 30 seconds after exposure to refrigerant concentration exceeding the set point value specified in Section ~~1106.2.2.1~~ 1106.2.5 or Section 1107.1.7.

(renumber remaining sections)

1106.2.5 Emergency Ventilation-Required Airflow. An emergency ventilation system shall be required to exhaust an accumulation of refrigerant due to leaks or a rupture of the system. The emergency ventilation required shall be capable of removing air from the machinery room in not less than the airflow quantity in Section 1106.2.5.1 ~~or Section 1106.2.5.2~~. Where multiple refrigerants are present, then the highest airflow quantity shall apply.
1106.2.5.1 Ventilation - A1, A2, A3, B1, ~~B2L,~~ B2 and B3 ~~r~~Refrigerants. The emergency ventilation for A1, A2, A3, B1, ~~B2L,~~ B2 and B3 refrigerants shall have the capacity to provide mechanical exhaust at a rate as determined in accordance with Equation 1106.2.5.1:

$Q = 100\ vG$ (Equation 1106.2.5.1)

Where:
Q = Air flow rate, cubic feet per minute.
G = Refrigerant mass in largest system, pounds.
For SI units: 1 cubic foot per minute = 0.00047 m^3/s, 1 pound = 0.453 kg

~~**1106.2.5.2 Ventilation - Group A2L Refrigerants.** The emergency ventilation for A2L refrigerants shall have the capacity to provide mechanical exhaust at a rate determined in accordance with Table 1106.2.5.2:~~

~~**TABLE 1106.2.5.2**~~
~~**REQUIRED AIRFLOW FOR GROUP A2L REFRIGERANTS**~~

~~REFRIGERANT~~	~~MINIMUM AIR FLOW*~~
	~~(CFM)~~
~~R-32~~	~~32 500~~
~~R-143a~~	~~28 600~~
~~R-444A~~	~~13 700~~
~~R-444B~~	~~22 400~~
~~R-445A~~	~~16 400~~
~~R-446A~~	~~50 500~~
~~R-447A~~	~~50 200~~
~~R-447B~~	~~29 600~~
~~R-451A~~	~~14 900~~
~~R-451B~~	~~14 900~~
~~R-452B~~	~~31 500~~
~~R-454A~~	~~4290~~
~~R-454B~~	~~6650~~
~~R-454C~~	~~32 800~~
~~R-455A~~	~~4770~~
~~R-457A~~	~~31 400~~
~~R-1234yf~~	~~16 500~~
~~R-1234zcE~~	~~12 600~~

~~*For* SI units: 1 cubic foot per minute = 0.00047 m^3/s~~
~~* The values were tabulated from the following equation:~~
~~$Q_{A2L} = [(P \cdot V \cdot A)/(LFL \cdot 0.50)]$ (Equation 1106.2.5.2)~~
~~*Where:*~~

~~*P* = Refrigerant density, pounds per cubic feet (kg/m^3).~~
~~*V* = Refrigerant velocity equal to the refrigerant acoustic velocity (speed of sound), feet per second (m/s).~~
~~*A* = Cross-section flow area of refrigerant leak, square feet (m^2), A = 0.00136 ft^2 (0.000126 m^2).~~
~~*LFL* = Lower Flammability Limit, or $ETFL_{60}$ where no LFL exist, published value in accordance with ASHRAE 34.~~
~~Q_{A2L} = Minimum required air flow rate, conversion to other units of measures is permitted, cubic feet per second (m^3/s).~~
~~For exact ventilation rates and for refrigerants not listed, the ventilation rate shall be calculated using this equation.~~

1106.4 Natural Ventilation. ~~Where~~ When a refrigerating system is located outdoors more than 20 feet (6096 mm) from building~~s~~ openings and is enclosed by a penthouse, lean-to, or other open structure, natural or mechanical ventilation shall be provided. The requirements for such natural ventilation shall be in accordance with the following:
(1) The free-aperture cross section for the ventilation of a machinery room shall be not less than as determined in accordance with Equation 1106.4.

$F = vG$ (Equation 1106.4)

Where:
F = The free opening area, square feet.
G = The mass of refrigerant in the largest system, any part of which is located in the machinery room, pounds.
For SI units: 1 cubic foot per minute = 0.00047 m^3/s, 1 pound = 0.453 kg

(2) ~~The~~ ~~l~~Locations of the gravity ventilation openings shall be based on the relative density of the refrigerant to air. [ASHRAE 15:~~8.11.5(a), (b)~~8.14]

1106.13 Machinery Room, A2L and B2L. When required by Section 1106.1, machinery rooms shall comply with Section 1106.13.1 through Section 1106.13.6. [ASHRAE 15:8.13]
1106.13.1 Flame-Producing Device. There shall be no flame-producing device or hot surface over 1290°F (700°C) in the room, other than that used for maintenance or repair, unless installed in accordance with Section 1106.5. [ASHRAE 15:8.13.1]
1106.13.2 Communicating Spaces. Doors communicating with the building shall be approved, self-closing, tight-fitting fire doors. [ASHRAE 15:8.13.2]
1106.13.3 Noncombustible Construction. Walls, floor, and ceiling shall be tight and of noncombustible construction. Walls, floor, and ceiling separating the refrigerating machinery room from other occupied spaces shall be of at least one-hour fire-resistive construction. [ASHRAE 15:8.13.3]
1106.13.4 Exterior Openings. Exterior openings, if present, shall not be under any fire escape or any open stairway. [ASHRAE 15:8.13.4]
1106.13.5 Pipe Penetrations. All pipes piercing the interior walls, ceiling, or floor of such rooms shall be tightly sealed to the walls, ceiling, or floor through which they pass. [ASHRAE 15:8.13.5]
1106.13.6 Machinery Room Designation. When any refrigerant of Groups A2, A3, B2, or B3 are used, the machinery room shall be designated as Class I, Division 2 hazardous (classified) electrical location in accordance with NFPA 70. When the only flammable refrigerants used are from Group A2L or B2L, the machinery room shall comply with both Section 1106.13.6.1 for ventilation and Section 1106.13.6.2 for refrigerant detection, or shall be designated as Class I, Division 2 hazardous (classified) electrical location in accordance with NFPA 70. [ASHRAE 15:8.13.6]
1106.13.6.1 Mechanical Ventilation. The machinery room shall have a mechanical ventilation system in accordance with Section 1106.13.11. The mechanical ventilation system shall:
(1) Run continuously, and failure of the mechanical ventilation system actuates an alarm, or
(2) Be activated by one or more refrigerant detectors, conforming to requirements of Section 1106.13.8. [ASHRAE 15:8.13.6.1]
1106.13.6.2 Detection System. Detection of refrigerant concentration that exceeds 25 percent of the LFL or the upper detection limit of the refrigerant detector, whichever is lower, shall automatically de-energize the following equipment in the machinery room:
(1) Refrigerant compressors
(2) Refrigerant pumps
(3) Normally closed automatic refrigerant valves
(4) Other unclassified electrical sources of ignition with apparent power rating greater than 1 kVA, where the apparent power is the product of the circuit voltage and current rating. [ASHRAE 15:8.13.6.2]
1106.13.7 Mechanical Equipment Control. Remote control of the mechanical equipment in the refrigerating machinery room shall be provided immediately outside the machinery room door solely for the purpose of shutting down the equipment in an emergency. Ventilation fans shall be on a separate electrical circuit and have a control switch located immediately outside the machinery room door. [ASHRAE 15:8.13.7]
1106.13.8 Refrigerant Detectors. Each refrigerating machinery room in accordance with Section 1106.13 shall contain one or more refrigerant detectors in accordance with Section 1106.13.9. The detector(s) sensing element shall be located in areas where refrigerant from a leak will concentrate, with one or more set points that activate responses in

accordance with Section 1106.13.10 for alarms and Section 1106.13.11 for mechanical ventilation. Multiport-type devices shall be prohibited. {ASHRAE 15:8.13.8}

1106.13.9 Refrigerant Detectors Requirements. Refrigerant detectors required by Section 1106.13 shall meet all of the following conditions:

(1) A refrigerant detector shall be capable of detecting each of the specific refrigerant designations in the machinery room.

(2) The refrigerant detector shall activate responses within a time not to exceed a limit specified in Section 1106.13.10 and Section 1106.13.11 after exposure to refrigerant concentration exceeding a limit value specified in Section 1106.13.10 and Section 1106.13.11.

(3) The refrigerant detector shall have a set point not greater than the applicable Occupational Exposure Limit (OEL) value in accordance with Table 1102.3. The applicable OEL value shall be the lowest OEL value for any refrigerant designation in the machinery room. For refrigerants that do not have an OEL value in Table 1102.3, use a value determined in accordance with the OEL as defined by ASHRAE 34 where approved by the Authority Having Jurisdiction.

(4) The refrigerant detector shall have a set point not more than the applicable Refrigerant Concentration Limit (RCL) value in accordance with Table 1102.3. The applicable RCL value shall be the lowest RCL value for any refrigerant designation in the machinery room. For refrigerants that do not have a RCL value in Table 1102.3, use a value determined in accordance with the RCL as defined by ASHRAE 34 where approved by the Authority Having Jurisdiction.

(5) The refrigerant detector shall provide a means for automatic self-testing and shall be in accordance with Section 1106.13.10.4. The refrigerant detector shall be tested during installation and annually thereafter in accordance with the fire code, or at an interval not exceeding the manufacturer's installation instructions, whichever is less. Testing shall verify compliance with the alarm set points and response times per Section 1106.13.10 and Section 1106.13.11. [ASHRAE 15:8.13.9]

1106.13.10 Alarms. Alarms required by Section 1106.13.8 shall comply with Section 1106.13.10.1 through Section 1106.13.10.4.

1106.13.10.1 Visual and Audio. The alarm shall have visual and audible annunciation inside the refrigerating machinery room and outside each entrance to the refrigerating machinery room. [ASHRAE 15:8.13.10.1]

1106.13.10.2 Detector Activation. The refrigerant detector set points shall activate an alarm in accordance with the type of reset in Table 1106.13.10.2. Manual reset type alarms shall have the reset located inside the refrigerating machinery room. [ASHRAE 15:8.13.10.2]

TABLE 1106.13.10.2
REFRIGERANT DETECTOR SET POINTS, RESPONSE TIMES, ALARMS, AND VENTILATION LEVELS
[ASHRAE 15:TABLE 8-1]

LIMIT VALUE	RESPONSE TIME (seconds)	ALARM TYPE	ALARM RESET TYPE	VENTILATION RATE	VENTILATION RESET TYPE
Set point <= OEL	<= 300	Trouble Alarm	Automatic	Level 1	Automatic
Set point <= RCL	<= 15	Emergency Alarm	Manual	Level 2	Manual

1106.13.10.3 Alarm Levels. Alarms set at levels other than Table 1106.13.10.2 (such as IDLH) and automatic reset alarms are permitted in addition to those required by Section 1106.13.10. The meaning of each alarm shall be clearly marked by signage near the annunciators. [ASHRAE 15:8.13.10.3]

1106.13.10.4 Emergency. In the event of a failure during a refrigerant detector self-test in accordance with Section 1106.13.9(5), a trouble alarm signal shall be transmitted to an approved monitored location. [ASHRAE 15:8.13.10.4]

1106.13.11 Mechanical Ventilation. Machinery rooms, in accordance with Section 1106.13, shall be vented to the outdoors, using mechanical ventilation in accordance with Section 1106.13.11.1, Section 1106.13.11.2, and Section 1106.13.11.3. [ASHRAE 15:8.13.11]

1106.13.11.1 Mechanical Ventilation Requirements. Mechanical ventilation referred to in Section 1106.13.11 shall be in accordance with all of the following:

(1) Include one or more power-driven fans capable of exhausting air from the machinery room; multispeed fans shall be permitted.

(2) Electric motors driving fans shall not be placed inside ducts; fan rotating elements shall be nonferrous or non-sparking, or the casing shall consist of or be lined with such material.

(3) Include provision to supply make-up air to replace that being exhausted; ducts for supply to and exhaust from the machinery room shall serve no other area; the makeup air supply locations shall be positioned relative to the exhaust air locations to avoid short circuiting.

(4) Inlets to the exhaust ducts shall be located in an area where refrigerant from a leak will concentrate, in consideration of the location of the replacement supply air paths, refrigerating machines, and the density of the refrigerant relative to

air.
(5) Inlets to exhaust ducts shall be within 1 foot (0.3 m) of the lowest point of the machinery room for refrigerants that are heavier than air and shall be within 1 foot (0.3 m) of the highest point for refrigerants that are lighter than air.
(6) The discharge of the exhaust air shall be to the outdoors in such a manner as not to cause a nuisance or danger. [ASHRAE 15:8.13.11.1]

TABLE 1106.13.11.2
LEVEL 1 VENTILATION RATE FOR CLASS 2L REFRIGERANTS
[ASHRAE 15: Table 8-2]

STATUS	AIRFLOW
Operated when occupied and operated when activated in accordance with Section 1106.13.10.2 and Table 1106.13.10.2	The greater of the following: (1) 0.5 ft^3/min per ft^3 (2.54 L/s per m^3) of machinery room area, or (2) 20 ft^3/min (9.44 L/s) per person
Operable when occupied	With or without mechanical cooling of the machinery room, the greater of: (1) The airflow rate required to not exceed a temperature rise of 18°F (10°C) above inlet air temperature or (2) The airflow rate required to not exceed a maximum air temperature of 122°F (50°C) in the machinery room.

1106.13.11.2 Level 1 Ventilation Rate. The refrigerating machinery room mechanical ventilation in Section 1106.13.11.1 shall exhaust at an airflow rate not less than shown in Table 1106.13.11.2. [ASHRAE 15:8.13.11.2]
1106.13.11.3 Level 2 Ventilation. A part of the refrigerating machinery room mechanical ventilation referred to in Section 1106.13.11.1 shall exhaust an accumulation of refrigerant due to leaks or a rupture of a refrigerating system, or portion thereof, in the machinery room. The refrigerant detectors required in accordance with Section 1106.13.8 shall activate ventilation at a set point and response time in accordance with Table 1106.13.10.2, at an airflow rate not less than the value determined in accordance with Section 1106.13.11.4.

When multiple refrigerant designations are in the machinery room, evaluate the required airflow according to each refrigerating system, and the highest airflow quantity shall apply.

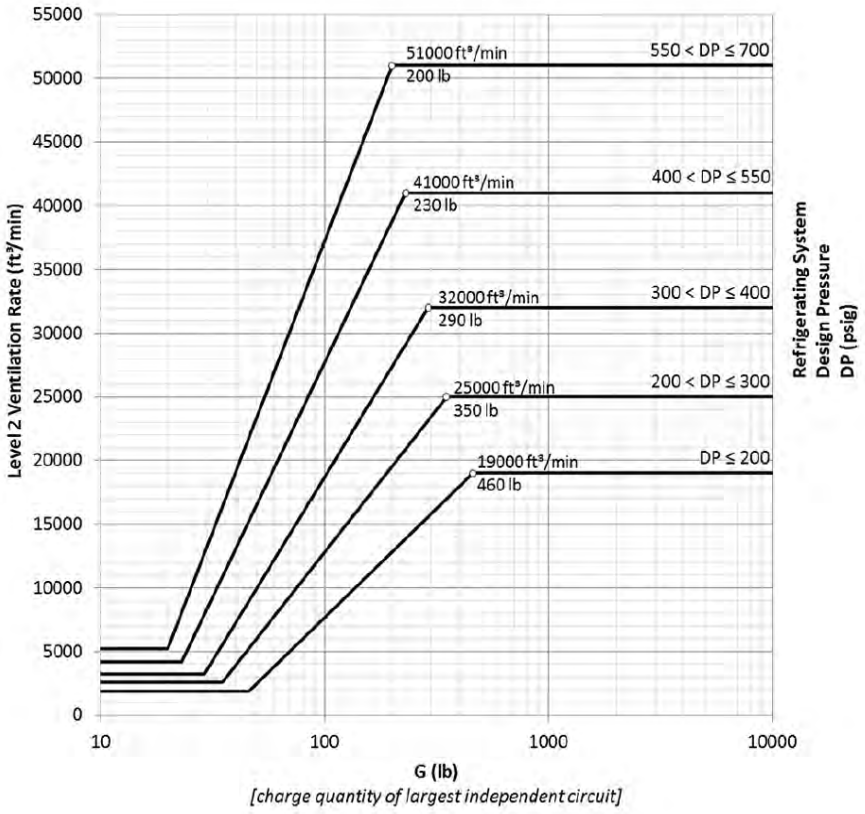
Ventilation reset shall be in accordance with the type of reset in Table 1106.13.10.2. Manual-type ventilation reset shall have the reset located inside the refrigerating machinery room. [ASHRAE 15:8.13.11.3]
1106.13.11.4 Level 2 Ventilation Rate When required by Section 1106.13.11.3, the total airflow for Level 2 ventilation shall be not less than the airflow rate determined by Figure 1106.13.11.4. [ASHRAE 15:8.13.11.4]

1107.1.7 Group A2L and B2L Refrigerants. Where refrigerant of Groups A2L or B2L are used, the requirements of Class 1, Division 2, of NFPA 70, shall not apply to the machinery room provided that the conditions in Section 1107.1.7.1 through Section 1107.1.7.3 are met.
1107.1.7.1 Mechanical Ventilation. The mechanical ventilation system in the machinery room is run continuously in accordance with Section ~~1106.2.5~~1106.13.6.1 and failure of the mechanical ventilation system actuates an alarm, or the mechanical ventilation system in the machinery room is activated by one or more refrigerant detectors, in accordance with the requirements of Section ~~1106.2.2.1 and Section 1106.2.2.2~~1106.13.11.
1107.1.7.2 Refrigeration Detectors. For the refrigerant detection required in Section ~~1106.2.2.1~~ 1106.2.5, detection of refrigerant concentration that exceeds 25 percent of the LFL or the upper detection limit of the refrigerant detector, whichever is lower, shall automatically de-energize the following equipment in the machinery room:
(a) refrigerant compressors
(b) refrigerant pumps
(c) normally-closed automatic refrigerant valves
1107.1.7.3 Machinery Rooms. The machinery room shall comply with Section ~~1107.1.8~~1106.13.

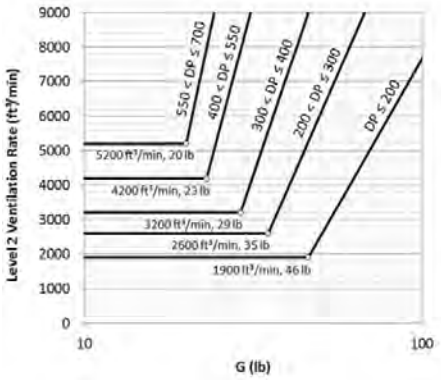
1112.11 Discharge from Pressure-Relief Devices. Pressure-relief systems designed for vapor shall comply with Section 1112.11.1 through Section 1112.11.4.1.

1112.11.1 Discharging Location Interior to Building. Pressure-relief devices, including fusible plugs, serving refrigeration systems shall be permitted to discharge to the interior of a building where in accordance with the following:
(1) The system contains less than 110 pounds (49.9 kg) of a Group A1 or A2L refrigerant.
(2) The system contains less than 6.6 pounds (2.99 kg) of a Group A2, B1, ~~or~~ B2 or B2L refrigerant.
(3) The system does not contain any quantity of a Group A3 or B3 refrigerant.
(4) The system is not required to be installed in a machinery room in accordance with Section 1106.0.

(5) The refrigerant concentration limits in Section 1104.0 are not exceeded. Refrigeration systems that do not comply with the above requirements shall comply with the requirements of Section 1112.11.2 through Section 1112.11.4. [ASHRAE 15:9.7.8.1]

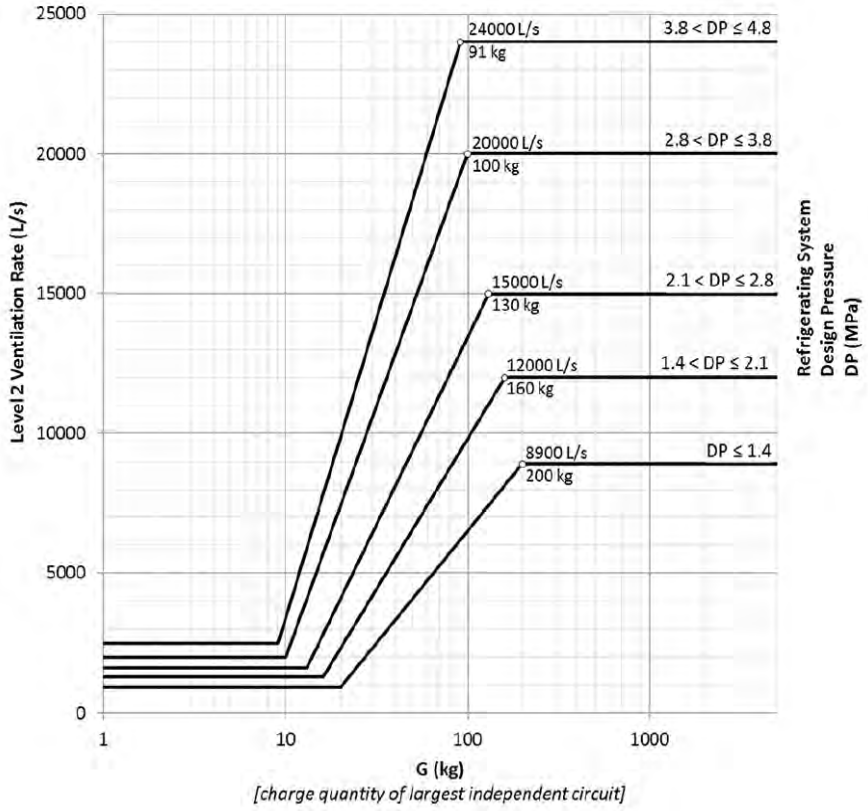


(a)

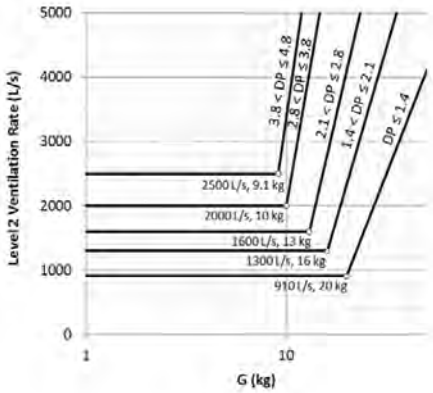


(b)

FIGURE 1106.13.11.4(1)
LEVEL 2 VENTILATION RATE FOR CLASS 2L REFRIGERANTS
[ASHRAE 15: FIGURE 8-1]



(a)



(b)

FIGURE 1106.13.11.4(2)
LEVEL 2 VENTILATION RATE FOR CLASS 2L REFRIGERANTS (SI)
[ASHRAE 15: FIGURE 8-2]

220.0 – R –

Refrigerant Concentration Limit (RCL). The refrigerant concentration limit, in air, determined in accordance with this code and intended to reduce the risks of acute toxicity, asphyxiation, and flammability hazards in normally occupied, enclosed spaces. [ASHRAE 34:3.1]

TABLE 1701.1
REFERENCED STANDARDS

STANDARD NUMBER	STANDARD TITLE	APPLICATION	REFERENCED SECTION
ASHRAE 15-~~2016~~ 2019	Safety Standard for Refrigeration Systems	Refrigeration Systems	1102.1, 1106.1, Table 1113.5
ASHRAE 34-~~2016~~ 2019	Designation and Safety Classification of Refrigerants	Refrigeration Classifications	1102.3, 1103.1, Table 1102.3, ~~Table 1106.2.5.2~~ 1106.13.9(3), 1106.13.9(4)
NFPA 70-2017	National Electrical Code	Miscellaneous	301.4(1), 301.4(3), 511.1.6, 512.2.5, 516.2.7, 516.2.9(4), 602.2.1, 905.8.2, 1104.4(5), 1106.13.6, 1107.1.7, 1107.1.8, 1217.8.1, 1310.14.5(2), 1311.2.4, 1311.7
UL 60335-2-40-~~2012~~ 2019	Household and Similar Electrical Appliances, Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers	Appliances	903.1

(portions of table not shown remain unchanged)

Note: The ASHRAE, NFPA, and UL standards meet the requirements for mandatory reference standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
Task Group Recommendation 2 - Machinery Rooms: The proposed modification would bring the Uniform Mechanical Code in line with ASHRAE 15. The 3rd edition of UL/CSA 60335-2-40 has requirements for testing (and listing) of equipment using Group A2L refrigerants. The A2L Task Group modified various portions of the extracted language as needed to address enforceability and health and safety concerns. The requirements follow the extraction policy of IAPMO. Furthermore, a definition for Refrigerant Concentration Limit (RCL) is being added from ASHRAE 34 as the term is used but currently not defined in the code.

Proposals

Item #: 222

UMC 2024 Section: 1109.1, Table 1109.1, Table 1701.1

Motion to approve. It was noted by UL that the phrase "or other approved standards" is open ended. Motion was withdrawn and a motion to modify was made to strikeout "or other approved standards" and to strike out "shall be acceptable to the Authority Having Jurisdiction and" Motion accepted based on unanimous consent.

SUBMITTER: Phil Pettit
Control Air Conditioning Corporation
Rep. Self

RECOMMENDATION:
Revise text

1109.0 Refrigeration Piping, Containers, and Valves.
1109.1 Materials. Materials used in the construction and installation of refrigerating systems shall be suitable for conveying the refrigerant used. Materials shall not be used that will deteriorate because of the refrigerant, lubricant, or their combination in presence of air or moisture to a degree that poses a safety hazard. [ASHRAE 15:9.1.1] Refrigerant piping shall be metallic. Materials for refrigerant piping, tubing, and fittings shall be acceptable to the Authority Having Jurisdiction and shall comply with the applicable standards in Table 1109.1 or other approved standards.

TABLE 1109.1
MATERIALS FOR REFRIGERANT PIPING, TUBING, AND FITTINGS

MATERIAL	STANDARDS	
	PIPING/TUBING	FITTINGS
Aluminum	ASTM B210, ASTM B491	ASTM B361
Copper/copper alloy	ASTM B42, ASTM B43, ASTM B68, ASTM B75, ASTM B88, ASTM B280, ASTM B302, ASTM B819, ASTM B1003	ASME B16.15, ASME B16.18, ASME B16.22, ASME B16.24, ASME B16.26, ASME B16.50
Steel	ASTM A53, ASTM A106, ASTM A254, ASTM A333, ASTM A334	ASTM A105, ASTM A181, ASTM A193, ASTM A234, ASTM A420, ASTM A707

TABLE 1701.1
REFERENCED STANDARDS

STANDARD NUMBER	STANDARD TITLE	APPLICATION	REFERENCED SECTIONS
ASME B16.50-2018	Wrought Copper and Copper Alloy Braze-joint Pressure Fittings	Piping	Table 1109.1
ASTM A105/A105M-2021	Carbon Steel Forgings for Piping Applications	Piping	Table 1109.1
ASTM A181/A181M-2014 (R2020)	Carbon Steel Forgings, for General-Purpose Piping	Piping	Table 1109.1
ASTM A193/A193M-2020	Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications	Fittings	Table 1109.1
ASTM A234/A234M-2019	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service	Fittings	Table 1109.1
ASTM A333/A333M-2018	Seamless and Welded Steel Pipe for Low-Temperature Service and Other Applications with Required Notch Toughness	Piping	Table 1109.1
ASTM A334/A334M-2004a (R2016)	Seamless and Welded Carbon and Alloy-Steel Tubes for Low-Temperature Service	Piping	Table 1109.1
ASTM A707/A707M-2019	Forged Carbon and Alloy Steel Flanges for Low-Temperature Service	Fittings	Table 1109.1
ASTM B68/B68M-2019	Seamless Copper Tube, Bright Annealed	Piping	Table 1109.1
ASTM B361-2016	Factory-made Wrought Aluminum and Aluminum-alloy Welding Fittings	Fittings	Table 1109.1
ASTM B491/ASTM B491M-2015	Aluminum and Aluminum-Alloy Extruded Round Tubes for General-Purpose Applications	Piping	Table 1109.1
ASTM B819-2019	Seamless Copper Tube for Medical Gas Systems	Piping	Table 1109.1

(portions of table not shown remain unchanged)

Note: The ASME and ASTM standards meet the requirements for mandatory reference standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
The first step in refrigerant piping design and installation is to gather product and jobsite information. Installing a new HVAC system requires skill and knowledge of appropriate procedures in electrical wiring, controls wiring, and pipework, including the refrigeration piping and fittings. Proper refrigeration piping installation practices requires the use of proper and rated materials for the installation. The new table provides an easy to reference list of acceptable standards for each application to assist the AHJ in approving refrigerant piping.

Proposals

Motion to reject was supported by AHRI based on concern with A2L refrigerant and the standard appears to need to be more robust. Motion passed based on unanimous consent.

Item #: 223

UMC 2024 Section: 1109.1.3, Table 1701.1

SUBMITTER: William E Chapin
Professional Code Consulting, LLC

RECOMMENDATION:
Add new text

1109.0 Refrigeration Piping, Containers, and Valves.
1109.1 Materials.

1109.1.3 Polyethylene of Raised Temperature/Aluminum/Polyethylene of Raised Temperature (PERT/AL/PERT) Linesets. PE-RT/AL/PE-RT piping shall be approved for the intended use and shall comply with ASTM F3346.

(renumber remaining sections)

TABLE 1701.1
REFERENCES STANDARDS

STANDARD NUMBER	STANDARD TITLE	APPLICATION	REFERENCED SECTION
ASTM F3346-2019	Standard Specification for Polyethylene of Raised Temperature/Aluminum/Polyethylene of Raised Temperature (PERT/AL/PE-RT) Composite Pressure Pipe	Piping	1109.1.3

(portions of table not shown remain unchanged)

Note: ASTM F3346 meets the requirements for mandatory reference standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
ASTM F3346 was published in 2019. The standard includes all of the design and testing requirements of other existing composite piping standards and includes requirements for testing in accordance with UL 207 for each refrigerant intended to be used.

Proposals

Motion to reject supported by AHRI based on concern with A2L refrigerants and the standard needs to be more robust. Motion passed based on unanimous consent.

Item #: 224

UMC 2024 Section: 218.0, 1109.1.5, Table 1701.1

SUBMITTER: Brad Campbell
Gastite

RECOMMENDATION:
Add new text

1109.0 Refrigeration Piping, Containers, and Valves.
1109.1 Materials.

1109.1.5 Polyethylene of Raised Temperature-Aluminum-Polyethylene of Raised Temperature (PE-RT/AL/PE-RT) Linesets. PE-RT/AL/PE-RT linesets shall comply with ASTM FXXXX.

218.0 – P –
PE-RT/AL/PE-RT. Polyethylene of raised temperature-aluminum-polyethylene of raised temperature.

TABLE 1701.1
REFERENCED STANDARDS

STANDARD NUMBER	STANDARD TITLE	APPLICATION	REFERENCED SECTION
ASTM FXXXX-2021 (Working Draft)	Polyethylene of Raised Temperature - Aluminum - Polyethylene of Raised Temperature (PERT/AL/PERT) Composite Pressure Pipe based on Inner Diameter (ID) for use in Air Conditioning and Refrigeration Line Set Systems	PE-RT/AL/PE-RT	1109.1.5

(portions of table not shown remain unchanged)

Note: ASTM FXXXX is a working draft and is not completed at the time of this monograph.

SUBSTANTIATION:
PERT-AL-PERT pipe material is not listed in the UMC Section 1109.1 Refrigeration Piping Materials section. This type of composite pipe has primarily been used for water conveyance applications but if the pipe is designed and tested to the new ASTM FXXXX Standard for “Polyethylene of Raised Temperature - Aluminum - Polyethylene of Raised Temperature (PERT/AL/PERT) Composite Pressure Pipe based on Inner Diameter (ID) for use in Air Conditioning and Refrigeration Line Set Systems” will be a comparable line set option. Given previous requests to add PERT/AL/PERT pipe to Sections 1109.1.5 and 1109.2 (for refrigeration pipe material and joints), the definition of PERT/AL/PERT should be defined in Section 218.0. This new ASTM FXXXX standard will be finalized and published in the next 30 days.

Proposals

Motion to accept passed based on a vote of 13 yes, 11 no and 1 abstention

Item #: 225

UMC 2024 Section: 1109.2, Table 1701.1

SUBMITTER: Donald (DJ) Berger
Self

RECOMMENDATION:
Revise text

1109.0 Refrigeration Piping, Containers, and Valves.

1109.2 Joints. Iron or steel pipe joints shall be of approved threaded, flanged, or welded types. Exposed threads shall be tinned or coated with an approved corrosion inhibitor. Copper or copper alloy pipe joints of iron pipe size shall be of approved threaded, flanged, ~~press-connect~~ or brazed types. Copper tubing joints and connections shall be connected by approved flared, lapped, swaged, or brazed joints~~, soldered joints, or mechanical joints that comply with UL 207 either individually or as part of an assembly or a system by an approved nationally recognized laboratory~~. Piping and tubing shall be installed so as to prevent vibration and strains at joints and connections.

TABLE 1701.1
REFERENCED STANDARDS

STANDARD NUMBER	STANDARD TITLE	APPLICATION	REFERENCED SECTION
~~UL 207-2009~~	~~Refrigerant-Containing Components and Accessories, Nonelectrical (with revisions through June 27, 2014)~~	~~Refrigeration Components~~	~~1109.2~~

(portions of table not shown remain unchanged)

SUBSTANTIATION:
Section 1109.2 of the UMC originally listed only those joint types for refrigeration piping which have been time tested for soundness. Fittings for each joining process were required to be manufactured in accordance with recognized ASME and ASTM Standards, with the intent of the code being a leak-free piping system installed to safely contain the refrigerant within it.

The use of press-connect technology on copper or copper alloy pipe joints of iron pipe size, as well as the use of press-connect technology on copper tubing joints and connections, was introduced into the 2018 UMC through ROP #154 and finally approved into the UMC as being tested per the industry standard, UL 207. It is my intention to substantiate that UL 207 was misapplied for the allowance of press-connect technology into this section of the 2021 UMC.

The Scope: Section 1.1 of the UL 207-2009 Refrigerant-Containing Components and Accessories, Nonelectrical (with revisions through June 27, 2014) clearly states which nonelectrical refrigerant-containing components and accessories are covered by the requirements of the UL 207. The subsequent paragraph of the Scope; Section 1.2 (a), clearly states “These requirements do not apply to: Electrical valves and electric refrigeration controllers, hermetic refrigerant motor compressors, tubing fittings such as flare or compression type fittings, and the like, which are covered in or as part of separate, individual requirements.”

There is an existing ASME B16.51 Copper and Copper Alloy Press-Connect Pressure Fittings Standard listed in the 2021 UMC, but that standard does not include ASTM B280 copper and copper alloy piping or the use of press-connect technology as a joining process for refrigeration piping.

As press-connect technology for fittings would be covered by other recognized standards, such as the ASME B31.5 Refrigeration Piping and Heat Transfer Components, it is my opinion that the UL 207 was incorrectly substantiated by the Submitter of the original proposal.

Additionally, Section 1109.1 Materials, of the 2021 UMC clearly states “Refrigerant piping shall be metallic.” As press-connect fittings rely upon a non-metallic elastomeric seal to contain refrigerant, press-connect technology for refrigerant piping applications would be considered as non-compliant with the requirements of the 2021 UMC.

As the UMC Technical Committee did not recognize the error in the Submitter’s substantiation, I am requesting the UMC Technical Committee to consider my substantiation for this proposal.

UL 207-2009, Refrigerant Containing Components and Accessories, Nonelectrical (with revisions through June 27, 2014), was incorrectly referenced for this section of the 2021 UMC. As there are no additional sections of the 2021 UMC that reference this standard, there is no reason to retain it in the code. Therefore, UL 207 should be deleted from Table 1701.1.

Proposals

Motion to reject passed based on unanimous consent

Item #: 226

UMC 2024 Section: 1109.2, Table 1701.1

SUBMITTER: John Taecker
UL LLC

RECOMMENDATION:
Revise text

1109.0 Refrigeration Piping, Containers, and Valves.

1109.2 Joints. Iron or steel pipe joints shall be of approved threaded, flanged, or welded types. Exposed threads shall be tinned or coated with an approved corrosion inhibitor. Copper or copper alloy pipe joints of iron pipe size shall be of approved threaded, flanged, press-connect or brazed types. Copper tubing joints and connections shall be connected by approved flared, lapped, swaged, or brazed joints, soldered joints, or mechanical joints that comply with UL 109 and UL 207 either individually or as part of an assembly or a system by an approved nationally recognized laboratory. Piping and tubing shall be installed so as to prevent vibration and strains at joints and connections.

TABLE 1701.1
REFERENCED STANDARDS

STANDARD NUMBER	STANDARD TITLE	APPLICATION	REFERENCED SECTIONS
UL 109-1997	Tube Fittings for Flammable and Combustible Fluids, Refrigeration Service, and Marine Use (with revisions through May 20, 2020)	Fittings	1109.2

(portions of table not shown remain unchanged)

Note: UL 109 meets the requirements for mandatory reference standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
UL 109, “Tube Fittings for Flammable and Combustible Fluids, Refrigeration Service, and Marine Use,” is being added to Section 1109.2 (Joints) as the standard provides requirements that apply to copper tubing joints.

Proposals

Item #: 229

UMC 2024 Section: 1109.1.5, 1109.1.6, Table 1701.1

Motion to approve failed on a vote of 10 yes, 14 no and 1 abstention.

Motion to reject passed based on unanimous consent.

SUBMITTER: John Taecker
UL LLC

RECOMMENDATION:
Add new text

1109.0 Refrigeration Piping, Containers, and Valves.
1109.1 Materials.

1109.1.5 Refrigerant-Containing Components and Accessories. Nonelectrical refrigerant-containing components and accessories shall be listed and labeled in accordance with UL 207, and shall be installed in accordance with the manufacturer's installation instructions.
1109.1.6 Refrigeration Fittings. Refrigeration fittings, including press-connect, flared and threaded shall be listed and labeled in accordance with UL 109 and UL 207, and shall be installed in accordance with the manufacturer's installation instructions.

TABLE 1701.1
REFERENCED STANDARDS

STANDARD NUMBER	STANDARD TITLE	APPLICATION	REFERENCED SECTIONS
UL 109-1997	Tube Fittings for Flammable and Combustible Fluids, Refrigeration Service, and Marine Use (with revisions through May 20, 2020)	Fittings	1109.1.6
UL 207-2009	Refrigerant-Containing Components and Accessories, Nonelectrical (with revisions through ~~June 27, 2014~~ January 21, 2020)	Refrigeration Components	1109.1.5, 1109.1.6, 1109.2

(portions of table not shown remain unchanged)

Note: The UL standards meet the requirements for mandatory reference standards in accordance with Section 3-3.7.1 of IAPMO's Regulations Governing Committee Projects.

SUBSTANTIATION:
Sections are being added to Chapter 11 (Refrigeration) to address the safety standards for refrigerant-containing components, accessories, and fittings to aid the code official in verifying safe installation for such systems.