June 25, 2024

To Department of Business and Professional Regulation
Agency Clerk's Office
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Tallahassee, Florida 32399-2202
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Petition for Declaratory Statement Before the Florida Building Commission

Petitioner
Broward County Board of Rules and Appeals (BORA)
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DS 2024-024

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The Petition for Declaratory Statement is sought on the following code sections
Florida Building Code, Mechanical, (FMC) 8th Edition (2023), Chapter 11, Refrigeration, sections
1101 6 General,
1104 3 2 Nonindustrial occupancies,
Table 1104 3 2 Maximum Permissible Quantities of Refrigerants

Florida Building Code, Building, (FBC) 8th Edition (2023), Chapter 1, Administration, sections
102 4 General,
102 4 1 Conflicts
See Attachments 1 and 2

Key points
- The air conditioning and refrigeration industry is transitioning from non-flammable (A1) to low-flammability refrigerants (A2L)
- The FMC 8th Edition (2023) classifies the new refrigerants as flammable refrigerants A2, not as A2L
- The FMC 8th Edition (2023) refers to the outdated ASHRAE-15-2019 standard
- The FMC 8th Edition (2023) and the ASHRAE-15-2019 standard severely restrict the use of A2 refrigerants In some cases, using A2, including A2Ls, is prohibited

- The 2024 International Mechanical Code, International Building Code, and ASHRAE 15-2022 have corrected this problem.

A designer has approached us with questions regarding the use of A2L refrigerants. The designer is working on a mixed-use project that will apply for permits in 2025.

Questions:

1. Can a refrigeration system using an A2L refrigerant be designed and installed using ASHRAE 15-2019 if the Florida Building Code, Mechanical, 8th Edition (2023), Chapter 11 addresses said refrigerant and has more restrictive requirements?

   Note: While ASHRAE 15-2019 is somewhat less restrictive than the FMC 2023, it is still very restrictive for some occupancies.

   In our opinion, the answer is no. FMC 1101.6 General states that ASHRAE 15 can only be used as modified by this code.

   FMC 1101.6 Refrigeration systems shall comply with the requirements of this code and, except as modified by this code, ASHRAE 15. Ammonia-refrigerating systems shall comply with this code and, except as modified by this code, ASHRAE 15 and IIAR 2.

   Additionally:

   FBC 102.4.1 Where conflicts occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

   FBC 102.4.2 Provisions in referenced codes and standards. Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code or the Florida Codes listed in Section 101.4, the provisions of this code or the Florida Codes listed in Section 101.4, as applicable, shall take precedence over the provisions in the referenced code or standard.

2. Can the A2L refrigerant quantity in an independent refrigerant circuit in a high-probability system exceed the amount for A2 refrigerants stated in Table 1104.3.2 of the Florida Building Code, Mechanical, 8th Edition (2023), Chapter 11 or in ASHRAE 15-2019, Table 7.1?

1104.3.2 Nonindustrial occupancies.

Group A2 and B2 refrigerants shall not be used in high-probability systems where the quantity of refrigerant in any independent refrigerant circuit exceeds the amount shown in Table 1104.3.2. Group A3 and B3 refrigerants shall not be used except where *approved*.

Exception: This section does not apply to laboratories where the floor area per occupant is not less than 100 square feet (9.3 m^2).

TABLE 1104.3.2 MAXIMUM PERMISSIBLE QUANTITIES OF REFRIGERANTS

TYPE OF REFRIGERATION SYSTEM	MAXIMUM POUNDS FOR VARIOUS OCCUPANCIES			
	Institutional	Assembly	Residential	All other occupancies
Sealed absorption system				
In exit access	0	0	3.3	3.3
In adjacent outdoor locations	0	0	22	22
In other than exit access	0	6.6	6.6	6.6
Unit systems				
In other than exit access	0	0	6.6	6.6

ASHRAE 15-2019

Table 7-1 Special Quantity Limits for Sealed Ammonia/Water Absorption and *Self-Contained Systems*

Type of Refrigeration System	Maximum lb (kg) for Various *Occupancies*			
	Institutional	Public/Large Mercantile	Residential	Commercial
Sealed Ammonia/*Water Absorption System*				
In public hallways or *lobbies*	0 (0)	0 (0)	3.3 (1.5)	3.3 (1.5)
In adjacent outdoor locations	0 (0)	0 (0)	22 (10)	22 (10)
In other than public hallways or *lobbies*	0 (0)	6.6 (3)	6.6 (3)	22 (10)
Unit Systems				
In other than public hallways or *lobbies*	0 (0)	0 (0)	6.6 (3)	22 (10)

In our opinion, the answer is no. A2L refrigerants are listed as A2 in the Florida Building Code, Mechanical, 8th Edition (2023), Chapter 11, Table 1103.1.

For example,

TABLE 1103.1 REFRIGERANT CLASSIFICATION, AMOUNT AND OEL

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE				[F] DEGREES OF HAZARD[a]
				Pounds per 1,000 cubic feet	ppm	g/m³	OEL[a]	
R-1234yf	$CF_3CF=CH_2$	2,3,3,3-tetrafluoro-1 propene	A2[f]	4.7	16,000	75	500	—

f. The ASHRAE Standard 34 flammability classification for this refrigerant is 2L, which is a subclass of Class 2.

3. Can an alternative method be used to design and install an independent refrigerant circuit in a high-probability system that exceeds the amount of A2 or A2L refrigerant stated in Table 1104.3.2 of the Florida Building Code, Mechanical, 8th Edition (2023), Chapter 11?

   In our opinion, the answer is maybe. The designer would have to analyze and possibly upgrade the whole building, including structural integrity, exit capacity, fire resistivity, fire suppression, and fire alarm, among other factors, to compensate for the added risk of introducing an A2 refrigerant into the space, as required by Florida Building Code, Existing Buildings, 8th Edition (2023), Chapter 14, and Florida Building Code, Buildings, 8th Edition (2023), Chapter 1, section 104.11.

   FBC 104.11 Alternative materials, design, and methods of construction and equipment, states.

   An alternative material, design, or method of construction shall be approved where the building official finds that the proposed alternative meets all of the following:

   a) The alternative material, design, or method of construction is satisfactory and complies with the intent of the provisions of this code.
   b) The material, method, or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code as it pertains to the following:
      1) Quality
      2) Strength
      3) Effectiveness
      4) Fire Resistance
      5) Durability

6) Safety

4. Can a refrigeration system be designed and installed using ASHRAE 15-2022 or Chapter 11 of the 2024 International Mechanical Code as an alternative to the current FMC?

   Note: ASHRAE 15-2022 or Chapter 11 of the 2024 International Mechanical Code recognizes the lower flammability of the A2L refrigerants compared with the A2 refrigerants and uses a different methodology to determine maximum quantities of refrigerants.

   In our opinion, the answer is no. The Florida Building Commission must adopt ASHRAE 15-2022 or Chapter 11 of the 2024 International Mechanical Code.

Reasons For the Petition:
The United States Environmental Protection Agency has issued a rule phasing down hydrofluorocarbon refrigerants. *Please see Attachment # 3.*

More information at:
https://www.epa.gov/climate-hfcs-reduction/frequent-questions-phasedown-hydrofluorocarbons
According to Chapter 11, Refrigeration, of the Florida Building Code, Mechanical, 8th Edition (2023), the refrigerants chosen to replace hydrofluorocarbons are included in the A2 category, flammable refrigerants. The 2023 FMC severely restricts allowed quantities of A2 refrigerant in air conditioning equipment. In the case of Institutional and Assembly occupancies, the allowed quantity is zero (0) pounds; please see section 1104.3 Refrigerant Restrictions and Table 1104.3.2 MAXIMUM PERMISSIBLE QUANTITIES OF REFRIGERANTS in Chapter 11 of the Florida Building Code, Mechanical, 8th Edition, 2023. According to sections FMC 1101.6 and FBC 102.4.1, 102.4.2, *"Where conflicts occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply."*

Additionally, the use of alternative methods for A2L refrigerants will require extensive whole-building analysis by a professional designer and possibly costly and lengthy modifications, especially in the case of air-conditioning equipment replacement in existing buildings. Manufacturers will begin shipping equipment containing these refrigerants, and contractors could potentially begin applying for permits for their installation by the second half or third quarter of 2024. *See Attachment # 4.*

The 2024 International Mechanical Code (IMC) classifies these refrigerants as A2L, meaning low toxicity and flammability. The 2024 IMC and International Building Code, Building reflect the A2L refrigerant category with new and specific requirements to allow and regulate their installation and use. *Please see Attachment # 5.*

Description of how the Statutes, Rules, or Orders substantially affect the petitioner:
The Broward County Board of Rules and Appeals supervises the enforcement of the Florida Building Code and the Inspectors, Plan Examiners, and Building Officials who apply it throughout Broward County. The Board also hears appeals on decisions made by Building and Fire Code Officials. *Please see attachment # 7.*

To comply with the current Chapter 11 Refrigeration of the Florida Building Code, Mechanical, 8th Edition (2023), Broward Inspectors, Plans Examiners, and Building Officials will be forced to deny many permit applications for the installation of air-conditioning systems containing A2L refrigerants, thus creating great hardship for contractors and customers alike. *Please see Attachment # 4.*

The Broward County Board of Rules and Appeals and its staff receive, review, and recommend resolutions for appeals from customers whose permit applications were denied. However, the Board cannot grant variances to the code. The Board cannot help customers or code officers in case of a permit application denial due to the use of A2L refrigerants.

The petitioners are asking for answers to the above questions on behalf of all the municipalities of Broward County.

Additional Information:
In the applicant's opinion, the solution to this problem is for the Florida Building Commission to replace Chapter 11, Refrigeration of the Florida Building Code, Mechanical, 8th Edition (2023) with Chapter 11, Refrigeration of the 2024 International Mechanical Code and update the Florida Building Code, Building, 8th Edition (2023) to allow for the use of A2L refrigerants.

Rolando Soto, P.E.
Mechanical Chief Code Compliance Officer
Broward County Board of Rules and Appeals

Attachments:
1. Specific text of code sections on which the Declaratory Statement is sought and IMC Commentary to Section 1101.6 General.
2. Chapter 11 Refrigeration, of the Florida Building Code, Mechanical, 8th Edition (2023).
3. ENVIRONMENTAL PROTECTION AGENCY, 40 CFR Part 84, [EPA–HQ–OAR–2021–0643; FRL–11594–02–OAR], Phasedown of Hydrofluorocarbons: Technology Transitions Program Residential and Light Commercial Air Conditioning and Heat Pump Subsector.
4. EPA timeline "Technology Transition HFC restriction by Sector."
5. Chapter 11 Refrigeration of the 2024 International Mechanical Code.
6. ICC A2L-related changes to the IBC.
7. Excerpt of the Broward County Code of Ordinances.

Attachment # 1

2023 Florida Building Code

Bold italics added for enfaces.

2023 Florida Building Code, Mechanical, Eighth Edition

CHAPTER 11 REFRIGERATION

SECTION 1101 GENERAL

1101.6 General.
Refrigeration systems shall comply with the requirements of this code and, except as modified by this code, ASHRAE 15. Ammonia-refrigerating systems shall comply with this code and, except as modified by this code, ASHRAE 15 and IIAR 2.

1104.3 Refrigerant restrictions.

Refrigerant applications, maximum quantities and use shall be restricted in accordance with Sections 1104.3.1 through 1104.3.4.

1104.3.1 Air-conditioning for human comfort.

In other than industrial occupancies where the quantity in a single independent circuit does not exceed the amount in Table 1103.1, Group B1, B2 and B3 refrigerants shall not be used in high-probability systems for air-conditioning for human comfort.

1104.3.2 Nonindustrial occupancies.

Group A2 and B2 refrigerants shall not be used in high-probability systems where the quantity of refrigerant in any independent refrigerant circuit exceeds the amount shown in Table 1104.3.2. Group A3 and B3 refrigerants shall not be used except where approved.

Exception: This section does not apply to laboratories where the floor area per occupant is not less than 100 square feet (9.3 m2).

TABLE 1104.3.2 MAXIMUM PERMISSIBLE QUANTITIES OF REFRIGERANTS

TYPE OF REFRIGERATION SYSTEM	MAXIMUM POUNDS FOR VARIOUS OCCUPANCIES			
	Institutional	Assembly	Residential	All other occupancies
Sealed absorption system				
In exit access	0	0	3.3	3.3
In adjacent outdoor locations	0	0	22	22
In other than exit access	0	6.6	6.6	6.6
Unit systems				
In other than exit access	0	0	6.6	6.6

For SI: 1 pound = 0.454 kg.

2023 Florida Building Code, Building, Eighth Edition

Chapter 1 Scope and Administration

SECTION 102 APPLICABILITY

[A]102.1 General.
Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern.

[A]102.3 Application of references.
References to chapter or section numbers, or to provisions not specifically identified by number, shall be construed to refer to such chapter, section or provision of this code.

[A]102.4 Referenced codes and standards.
The codes and standards referenced in this code shall be considered part of the requirements of this code to the prescribed extent of each such reference and as further regulated in Sections 102.4.1 and 102.4.2.

[A]102.4.1 Conflicts.
Where conflicts occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

[A]102.4.2 Provisions in referenced codes and standards.
Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code or the Florida Codes listed in Section 101.4, the provisions of this code or the Florida Codes listed in Section 101.4, as applicable, shall take precedence over the provisions in the referenced code or standard.

1101.6 General. Refrigeration systems shall comply with the requirements of this code and, except as modified by this code, ASHRAE 15. Ammonia-refrigerating systems shall comply with this code and, except as modified by this code, ASHRAE 15, IIAR 2, IIAR 3, IIAR 4 and IIAR 5.

❖ This section requires full compliance with ASHRAE 15 and IIAR standards 2 through 5, except for any instances where the code has intentionally modified or exceeded the requirements of the standards. Chapter 11 is based on ASHRAE 15; however, there are requirements that are unique to both documents, and the code official and designer must be familiar with both documents. Where there are conflicts with ASHRAE 15, the provisions of this code shall apply pursuant to Section 102.8. Furthermore, many provisions in ASHRAE 15 are not contained in the code, including general system and component location restrictions, general installation requirements, mate-

Attachment # 2

2023 Florida Building Code, Mechanical, Eighth Edition

CHAPTER 11 REFRIGERATION

SECTION 1101 GENERAL

1101.1 Scope.

This chapter shall govern the design, installation, construction and repair of refrigeration systems that vaporize and liquefy a fluid during the refrigerating cycle. Refrigerant piping design and installation, including pressure vessels and pressure relief devices, shall conform to this code. Permanently installed refrigerant storage systems and other components shall be considered as part of the refrigeration system to which they are attached.

1101.2 Factory-built equipment and appliances.

Listed and *labeled* self-contained, factory-built *equipment* and appliances shall be tested in accordance with UL 207, UL 412, UL 471, UL 1995, UL/CSA 60335-2-40 or UL 60335-2-89. Such *equipment* and appliances are deemed to meet the design, manufacture and factory test requirements of this code if installed in accordance with their listing and the manufacturer's instructions.

1101.3 Protection.

Any portion of a refrigeration system that is subject to physical damage shall be protected in an *approved* manner.

101.4 Water connection.

Water supply and discharge connections associated with refrigeration systems shall be made in accordance with this code and the *Florida Building Code, Plumbing*.

101.5 Fuel gas connection.

Fuel gas devices, *equipment* and *appliances* used with refrigeration systems shall be installed in accordance with the *Florida Building Code, Fuel Gas*.

1101.6 General.

Refrigeration systems shall comply with the requirements of this code and, except as modified by this code, ASHRAE 15. Ammonia-refrigerating systems shall comply with this code and, except as modified by this code, ASHRAE 15 and IIAR 2.

1101.7 Maintenance.

Mechanical refrigeration systems shall be maintained in proper operating condition, free from accumulations of oil, dirt, waste, excessive corrosion, other debris and leaks.

1101.8 Change in refrigerant type.

The type of refrigerant in refrigeration systems having a refrigerant circuit containing more than 220 pounds (99.8 kg) of Group A1 or 30 pounds (13.6 kg) of any other group refrigerant shall not be changed without prior notification to the code official and compliance with the applicable code provisions for the new refrigerant type.

[F] 1101.9 Refrigerant discharge.

Notification of refrigerant discharge shall be provided in accordance with the *Florida Fire Prevention Code*.

1101.10 Locking access port caps.

Refrigerant circuit access ports located outdoors shall be fitted with locking-type tamper-resistant caps or shall be otherwise secured to prevent unauthorized access.

Exception: This section shall not apply to refrigerant circuit access ports on *equipment* installed in controlled areas such as on roofs with locked access hatches or doors.

SECTION 1102
SYSTEM REQUIREMENTS

1102.1 General.

The system classification, allowable refrigerants, maximum quantity, enclosure requirements, location limitations, and field pressure test requirements shall be determined as follows:

1. Determine the refrigeration system's classification, in accordance with Section 1103.3.
2. Determine the refrigerant classification in accordance with Section 1103.1.
3. Determine the maximum allowable quantity of refrigerant in accordance with Section 1104, based on type of refrigerant, system classification and *occupancy*.
4. Determine the system enclosure requirements in accordance with Section 1104.
5. Refrigeration *equipment* and *appliance* location and installation shall be subject to the limitations of Chapter 3.
6. Nonfactory-tested, field-erected *equipment* and appliances shall be pressure tested in accordance with Section 1108.

1102.2 Refrigerants.

The refrigerant shall be that which the *equipment* or *appliance* was designed to utilize or converted to utilize. Refrigerants not identified in Table 1103.1 shall be *approved* before use.

1102.2.1 Mixing.

Refrigerants, including refrigerant blends, with different designations in ASHRAE 34 shall not be mixed in a system.

Exception: Addition of a second refrigerant is allowed where permitted by the *equipment* or *appliance* manufacturer to improve oil return at low temperatures. The refrigerant and amount added shall be in accordance with the manufacturer's instructions.

1102.2.2 Purity.

Refrigerants used in refrigeration systems shall be new, recovered or *reclaimed refrigerants* in accordance with Section 1102.2.2.1, 1102.2.2.2 or 1102.2.2.3. Where required by the *equipment* or *appliance* owner or the code official, the installer shall furnish a signed declaration that the refrigerant used meets the requirements of Section 1102.2.2.1, 1102.2.2.2 or 1102.2.2.3.

Exception: The refrigerant used shall meet the purity specifications set by the manufacturer of the *equipment* or *appliance* in which such refrigerant is used where such specifications are different from that specified in Sections 1102.2.2.1, 1102.2.2.2 and 1102.2.2.3.

1102.2.2.1 New refrigerants.

Refrigerants shall be of a purity level specified by the *equipment* or *appliance* manufacturer.

1102.2.2.2 Recovered refrigerants.

Refrigerants that are recovered from refrigeration and air-conditioning systems shall not be reused in other than the system from which they were recovered and in other systems of the same owner. *Recovered refrigerants* shall be filtered and dried before reuse. *Recovered refrigerants* that show clear signs of contamination shall not be reused unless reclaimed in accordance with Section 1102.2.2.3.

1102.2.2.3 Reclaimed refrigerants.

Used refrigerants shall not be reused in a different owner's *equipment* or appliances unless tested and found to meet the purity requirements of AHRI 700. Contaminated refrigerants shall not be used unless reclaimed and found to meet the purity requirements of AHRI 700.

1102.3 Access port protection.

Refrigerant access ports shall be protected in accordance with Section 1101.10 whenever refrigerant is added to or recovered from refrigeration or air-conditioning systems.

SECTION 1103
REFRIGERATION SYSTEM CLASSIFICATION

1103.1 Refrigerant classification.

Refrigerants shall be classified in accordance with ASHRAE 34 as listed in Table 1103.1.

TABLE 1103.1
REFRIGERANT CLASSIFICATION, AMOUNT AND OEL

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANTCLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE				[F] DEGREESOF HAZARD[a]
				Pounds per 1,000 cubic feet	ppm	g/m^3	OEL[e]	
R-11[d]	CCl_3F	trichlorofluoromethane	A1	0.39	1,100	6.2	C1,000	2-0-0[b]
R-12[d]	CCl_2F_2	dichlorodifluoromethane	A1	5.6	18,000	90	1,000	2-0-0[b]
R-13[d]	$CClF_3$	chlorotrifluoromethane	A1	—	—	—	1,000	2-0-0[b]
R-13B1[d]	$CBrF_3$	bromotrifluoromethane	A1	—	—	—	1,000	2-0-0[b]
R-14	CF_4	tetrafluoromethane (carbon tetrafluoride)	A1	25	110,000	400	1,000	2-0-0[b]

R-22	$CHClF_2$	chlorodifluoromethane	A1	13	59,000	210	1,000	2-0-0[b]
R-23	CHF_3	trifluoromethane (fluoroform)	A1	7.3	41,000	120	1,000	2-0-0[b]
R-32	CH_2F_2	difluoromethane (methylene fluoride)	A2[f]	4.8	36,000	77	1,000	1-4-0
R-113[d]	CCl_2FCClF_2	1,1,2-trichloro-1,2,2-trifluoroethane	A1	1.2	2,600	20	1,000	2-0-0[b]
R-114[d]	$CClF_2CClF_2$	1,2-dichloro-1,1,2,2-tetrafluoroethane	A1	8.7	20,000	140	1,000	2-0-0[b]
R-115	$CClF_2CF_3$	chloropentafluoroethane	A1	47	120,000	760	1,000	—
R-116	CF_3CF_3	hexafluoroethane	A1	34	97,000	550	1,000	1-0-0
R-123	$CHCl_2CF_3$	2,2-dichloro-1,1,1-trifluoroethane	B1	3.5	9,100	57	50	2-0-0[b]
R-124	$CHClFCF_3$	2-chloro-1,1,1,2-tetrafluoroethane	A1	3.5	10,000	56	1,000	2-0-0[b]

R-125	CHF_2CF_3	pentafluoroethane	A1	23	75,000	370	1,000	2-0-0[b]
R-134a	CH_2FCF_3	1,1,1,2-tetrafluoroethane	A1	13	50,000	210	1,000	2-0-0[b]
R-141b	CH_3CCl_2F	1,1-dichloro-1-fluoroethane	—	0.78	2,600	12	500	2-1-0
R-142b	CH_3CClF_2	1-chloro-1,1-difluoroethane	A2	5.1	20,000	83	1,000	2-4-0
R-143a	CH_3CF_3	1,1,1-trifluoroethane	A2[f]	4.5	21,000	70	1,000	2-0-0[b]
R-152a	CH_3CHF_2	1,1-difluoroethane	A2	2.0	12,000	32	1,000	1-4-0
R-170	CH_3CH_3	ethane	A3	0.54	7,000	8.7	1,000	2-4-0
R-E170	CH_3OCH_3	Methoxymethane (dimethyl ether)	A3	1.0	8,500	16	1,000	—
R-218	$CF_3CF_2CF_3$	octafluoropropane	A1	43	90,000	690	1,000	2-0-0[b]
R-227ea	CF_3CHFCF_3	1,1,1,2,3,3,3-heptafluoropropane	A1	36	84,000	580	1,000	—

R-236fa	$CF_3CH_2CF_3$	1,1,1,3,3,3-hexafluoropropane	A1	21	55,000	340	1,000	2-0-0[b]
R-245fa	$CHF_2CH_2CF_3$	1,1,1,3,3-pentafluoropropane	B1	12	34,000	190	300	2-0-0[b]
R-290	$CH_3CH_2CH_3$	propane	A3	0.56	5,300	9.5	1,000	2-4-0
R-C318	$-(CF_2)_4-$	octafluorocyclobutane	A1	41	80,000	660	1,000	—
R-400[d]	zeotrope	R-12/114 (50.0/50.0)	A1	10	28,000	160	1,000	2-0-0[b]
R-400[d]	zeotrope	R-12/114 (60.0/40.0)	A1	11	30,000	170	1,000	
R-401A	zeotrope	R-22/152a/124 (53.0/13.0/34.0)	A1	6.6	27,000	110	1,000	2-0-0[b]
R-401B	zeotrope	R-22/152a/124 (61.0/11.0/28.0)	A1	7.2	30,000	120	1,000	2-0-0[b]
R-401C	zeotrope	R-22/152a/124 (33.0/15.0/52.0)	A1	5.2	20,000	84	1,000	2-0-0[b]
R-402A	zeotrope	R-125/290/22 (60.0/2.0/38.0)	A1	17	66,000	270	1,000	2-0-0[b]

R-402B	zeotrope	R-125/290/22 (38.0/2.0/60.0)	A1	15	63,000	240	1,000	2-0-0[b]
R-403A	zeotrope	R-290/22/218 (5.0/75.0/20.0)	A2	7.6	33,000	120	1,000	2-0-0[b]
R-403B	zeotrope	R-290/22/218 (5.0/56.0/39.0)	A1	18	70,000	290	1,000	2-0-0[b]
R-404A	zeotrope	R-125/143a/134a (44.0/52.0/4.0)	A1	31	130,000	500	1,000	2-0-0[b]
R-405A	zeotrope	R-22/152a/142b/C318 (45.0/7.0/5.5/2.5)	—	16	57,000	260	1,000	—
R-406A	zeotrope	R-22/600a/142b (55.0/4.0/41.0)	A2	4.7	21,000	25	1,000	—
R-407A	zeotrope	R-32/125/134a (20.0/40.0/40.0)	A1	19	83,000	300	1,000	2-0-0[b]
R-407B	zeotrope	R-32/125/134a (10.0/70.0/20.0)	A1	21	79,000	330	1,000	2-0-0[b]

R-407C	zeotrope	R-32/125/134a (23.0/25.0/52.0)	A1	18	81,000	290	1,000	2-0-0[b]
R-407D	zeotrope	R-32/125/134a (15.0/15.0/70.0)	A1	16	68,000	250	1,000	2-0-0[b]
R-407E	zeotrope	R-32/125/134a (25.0/15.0/60.0)	A1	17	80,000	280	1,000	2-0-0[b]
R-407F	zeotrope	R-32/125/134a (30.0/30.0/40.0)	A1	20	95,000	320	1,000	—
R-408A	zeotrope	R-125/143a/22 (7.0/46.0/47.0)	A1	21	95,000	340	1,000	2-0-0[b]
R-409A	zeotrope	R-22/124/142b (60.0/25.0/15.0)	A1	7.1	29,000	110	1,000	2-0-0[b]
R-409B	zeotrope	R-22/124/142b (65.0/25.0/10.0)	A1	7.3	30,000	120	1,000	2-0-0[b]
R-410A	zeotrope	R-32/125 (50.0/50.0)	A1	26	140,000	420	1,000	2-0-0[b]
R-410B	zeotrope	R-32/125 (45.0/55.0)	A1	27	140,000	430	1,000	2-0-0[b]

R-411A	zeotrope	R-127/22/152a (1.5/87.5/11.0)	A2	2.9	14,000	46	990	—
R-411B	zeotrope	R-1270/22/152a (3.0/94.0/3.0)	A2	2.8	13,000	45	980	—
R-412A	zeotrope	R-22/218/142b (70.0/5.0/25.0)	A2	5.1	22,000	82	1,000	—
R-413A	zeotrope	R-218/134a/600a (9.0/88.0/3.0)	A2	5.8	22,000	94	1,000	—
R-414A	zeotrope	R-22/124/600a/142b (51.0/28.5/4.0/16.5)	A1	6.4	26,000	100	1,000	—
R-414B	zeotrope	R-22/124/600a/142b (50.0/39.0/1.5/9.5)	A1	6.0	23,000	95	1,000	—
R-415A	zeotrope	R-22/152a (82.0/18.0)	A2	2.9	14,000	47	1,000	—
R-415B	zeotrope	R-22/152a (25.0/75.0)	A2	2.1	12,000	34	1,000	—
R-416A	zeotrope	R-134a/124/600	A1	3.9	14,000	62	1,000	2-0-0[b]

		(59.0/39.5/1.5)						
R-417A	zeotrope	R-125/134a/600 (46.6/50.0/3.4)	A1	3.5	13,000	56	1,000	2-0-0[b]
R-417B	zeotrope	R-125/134a/600 (79.0/18.3/2.7)	A1	4.3	15,000	70	1,000	—
R-418A	zeotrope	R-290/22/152a (1.5/96.0/2.5)	A2	4.8	22,000	77	1,000	—
R-419A	zeotrope	R-125/134a/E170 (77.0/19.0/4.0)	A2	4.2	15,000	67	1,000	—
R-420A	zeotrope	R-134a/142b (88.0/12.0)	A1	12	45,000	190	1,000	2-0-0[b]
R-421A	zeotrope	R-125/134a (58.0/42.0)	A1	17	61,000	280	1,000	2-0-0[b]
R-421B	zeotrope	R-125/134a (85.0/15.0)	A1	21	69,000	330	1,000	2-0-0[b]
R-422A	zeotrope	R-125/134a/600a (85.1/11.5/3.4)	A1	18	63,000	290	1,000	2-0-0[b]

R-422B	zeotrope	R-125/134a/600a (55.0/42.0/3.0)	A1	16	56,000	250	1,000	2-0-0[b]
R-422C	zeotrope	R-125/134a/600a (82.0/15.0/3.0)	A1	18	62,000	290	1,000	2-0-0[b]
R-422D	zeotrope	R-125/134a/600a (65.1/31.5/3.4)	A1	16	58,000	260	1,000	2-0-0[b]
R-423A	zeotrope	R-134a/227ea (52.5/47.5)	A1	19	59,000	310	1,000	2-0-0[c]
R-424A	zeotrope	R-125/134a/600a/600/601a (50.5/47.0/0.9/1.0/0.6)	A1	6.2	23,000	100	970	2-0-0[b]
R-425A	zoetrope	R-32/134a/227ea (18.5/69.5/12.0)	A1	16	72,000	260	1,000	2-0-0[b]
R-426A	zeotrope	R-125/134a/600a/601a (5.1/93.0/1.3/0.6)	A1	5.2	20,000	83	990	—
R-427A	zeotrope	R-32/125/143a/134a	A1	18	79,000	290	1,000	2-1-0

		(15.0/25.0/10.0/50.0)						
R-428A	zeotrope	R-125/143a/290/600a (77.5/20.0/0.6/1.9)	A1	23	83,000	370	1,000	—
R-429A	zeotrope	R-E170/152a/600a (60.0/10.0/30.0)	A3	0.81	6,300	13	1,000	—
R-430A	zeotrope	R-152a/600a (76.0/24.0)	A3	1.3	8,000	21	1,000	—
R-431A	zeotrope	R-290/152a (71.0/29.0)	A3	0.69	5,500	11	1,000	—
R-432A	zeotrope	R-1270/E170 (80.0/20.0)	A3	0.13	1,200	2.1	700	—
R-433A	zeotrope	R-1270/290 (30.0/70.0)	A3	0.34	3,100	5.5	880	—
R-433B	zeotrope	R-1270/290 (5.0-95.0)	A3	0.51	4,500	8.1	950	—
R-433C	zeotrope	R-1270/290 (25.0-75.0)	A3	0.41	3,600	6.6	790	—
R-434A	zeotrope	R-125/143a/600a (63.2/18.0/16.0/2.8)	A1	20	73,000	320	1,000	—

R-435A	zeotrope	R-E170/152a (80.0/20.0)	A3	1.1	8,500	17	1,000	—
R-436A	zeotrope	R-290/600a (56.0/44.0)	A3	0.50	4,000	8.1	1,000	—
R-436B	zeotrope	R-290/600a (52.0/48.0)	A3	0.51	4,000	8.1	1,000	—
R-437A	zeotrope	R-125/134a/600/601 (19.5/78.5/1.4/0.6)	A1	5.0	19,000	82	990	—
R-438A	zeotrope	R-32/125/134a/600/601a (8.5/45.0/44.2/1.7/0.6)	A1	4.9	20,000	79	990	—
R-439A	zeotrope	R-32/125/600a (50.0/47.0/3.0)	A2	4.7	26,000	76	990	—
R-440A	zeotrope	R-290/134a/152a (0.6/1.6/97.8)	A2	1.9	12,000	31	1,000	—
R-441A	zeotrope	R-170/290/600a/600 (3.1/54.8/6.0/36.1)	A3	0.39	3,200	6.3	1,000	—
R-442A	zeotrope	R-32/125/134a/152a/227ea	A1	21	100,000	330	1,000	—

		(31.0/31.0/30.0/3.0/5.0)						
R-500[e]	azeotrope	R-12/152a (73.8/26.2)	A1	7.6	30,000	120	1,000	2-0-0[b]
R-501[d]	azeotrope	R-22/12 (75.0/25.0)	A1	13	54,000	210	1,000	—
R-502[e]	azeotrope	R-22/115 (48.8/51.2)	A1	21	73,000	330	1,000	2-0-0[b]
R-503[e]	azeotrope	R-23/13 (40.1/59.9)	—	—	—	—	1,000	2-0-0[b]
R-504[d]	azeotrope	R-32/115 (48.2/51.8)	—	28	140,000	450	1,000	—
R-507A	azeotrope	R-125/143a (50.0/50.0)	A1	32	130,000	520	1,000	2-0-0[b]
R-508A	azeotrope	R-23/116 (39.0/61.0)	A1	14	55,000	220	1,000	2-0-0[b]
R-508B	azeotrope	R-23/116 (46.0/54.0)	A1	13	52,000	200	1,000	2-0-0[b]
R-509A	azeotrope	R-22/218 (44.0/56.0)	A1	24	75,000	390	1,000	2-0-0[b]
R-510A	azeotrope	R-E170/600a (88.0/12.0)	A3	0.87	7,300	14	1,000	—
R-511A	azeotrope	R-290/E170 (95.0/5.0)	A3	0.59	5,300	9.5	1,000	—

R-512A	azeotrope	R-134a/152a (5.0/95.0)	A2	1.9	11,000	31	1,000	—
R-600	$CH_3CH_2CH_2CH_3$	butane	A3	0.15	1,000	2.4	1,000	1-4-0
R-600a	$CH(CH_3)_2CH_3$	2-methylpropane (isobutane)	A3	0.59	4,000	9.6	1,000	2-4-0
R-601	$CH_3CH_2CH_2CH_2CH_3$	pentane	A3	0.18	1,000	2.9	600	—
R-601a	$(CH_3)_2CHCH_2CH_3$	2-methylbutane (isopentane)	A3	0.18	1,000	2.9	600	—
R-717	NH_3	ammonia	B2[f]	0.014	320	0.22	25	3-3-0[c]
R-718	H_2O	water	A1	—	—	—	—	0-0-0
R-744	CO_2	carbon dioxide	A1	4.5	40,000	72	5,000	2-0-0[b]
R-1150	$CH_2=CH_2$	ethene (ethylene)	A3	—	—	—	200	1-4-2
R-1234yf	$CF_3CF=CH_2$	2,3,3,3-tetrafluoro-1 propene	A2[f]	4.7	16,000	75	500	—
R-1234ze(E)	$CF_3CH=CHF$	trans-1,3,3,3-tetrafluoro-1-propene	A2[f]	4.7	16,000	75	800	—

R-1270	$CH_3CH=CH_2$	Propene (propylene)	A3	0.1	1,000	1.7	500	1-4-1

For SI: 1 pound = 0.454 kg, 1 cubic foot = 0.0283 m^3.

1. a. Degrees of hazard are for health, fire, and reactivity, respectively, in accordance with NFPA 704.
2. b. Reduction to 1-0-0 is allowed if analysis satisfactory to the code official shows that the maximum concentration for a rupture or full loss of refrigerant charge would not exceed the IDLH, considering both the refrigerant quantity and room volume.
3. c. For installations that are entirely outdoors, use 3-1-0.
4. d. Class I ozone depleting substance; prohibited for new installations.
5. e. Occupational Exposure Limit based on the OSHA PEL, ACGIH TLV-TWA, the AIHA WEEL or consistent value on a time-weighted average (TWA) basis (unless noted C for ceiling) for an 8 hr/d and 40 hr/wk.
6. f. The ASHRAE Standard 34 flammability classification for this refrigerant is 2L, which is a subclass of Class 2.

1103.2 Occupancy classification.

Locations of refrigerating systems are described by *occupancy* classifications that consider the ability of people to respond to potential exposure to refrigerants. Where *equipment* or appliances, other than piping, are located outside a building and within 20 feet (6096 mm) of any building opening, such *equipment* or appliances shall be governed by the *occupancy* classification of the building. *Occupancy* classifications shall be defined as follows:

1. 1. Institutional *occupancy* is that portion of premises from which occupants cannot readily leave without the assistance of others because they are disabled, debilitated or confined. Institutional *occupancies* include, among others, hospitals, nursing homes, asylums and spaces containing locked cells.
2. 2. Public assembly *occupancy* is that portion of premises where large numbers of people congregate and from which occupants cannot quickly vacate the space. Public assembly *occupancies* include, among others, auditoriums, ballrooms, classrooms, passenger depots, restaurants and theaters.
3. 3. Residential *occupancy* is that portion of premises that provides the occupants with complete independent living facilities, including permanent provisions for living, sleeping, eating, cooking and sanitation. Residential *occupancies* include, among others, dormitories, hotels, multiunit apartments and private residences.
4. 4. Commercial *occupancy* is that portion of premises where people transact business, receive personal service or purchase food and other goods.
   Commercial *occupancies* include, among others, office and professional buildings, markets (but not large mercantile occupancies) and work or storage areas that do not qualify as industrial *occupancies*.
5. 5. Large mercantile *occupancy* is that portion of premises where more than 100 persons congregate on levels above or below street level to purchase personal merchandise.
6. 6. Industrial *occupancy* is that portion of premises that is not open to the public, where access by authorized persons is controlled, and that is used to manufacture, process or store goods such as chemicals, food, ice, meat or petroleum.

7. 7.Mixed *occupancy* occurs where two or more occupancies are located within the same building. Where each *occupancy* is isolated from the rest of the building by tight walls, floors and ceilings and by self-closing doors, the requirements for each *occupancy* shall apply to its portion of the building. Where the various occupancies are not so isolated, the *occupancy* having the most stringent requirements shall be the governing *occupancy*.

1103.3 System classification.
Refrigeration systems shall be classified according to the degree of probability that refrigerant leaked from a failed connection, seal or component could enter an occupied area. The distinction is based on the basic design or location of the components.

1103.3.1 Low-probability systems.
Double-indirect open-spray systems, indirect closed systems and indirect-vented closed systems shall be classified as low-probability systems, provided that all refrigerant-containing piping and fittings are isolated when the quantities in Table 1103.1 are exceeded.

1103.3.2 High-probability systems.
Direct systems and indirect open-spray systems shall be classified as high-probability systems.

Exception: An indirect open-spray system shall not be required to be classified as a high-probability system if the pressure of the secondary coolant is at all times (operating and standby) greater than the pressure of the refrigerant.

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SECTION 1104
SYSTEM APPLICATION REQUIREMENTS

1104.1 General.
The refrigerant, occupancy and system classification cited in this section shall be determined in accordance with Sections 1103.1, 1103.2 and 1103.3, respectively.

1104.2 Machinery room.
Except as provided in Sections 1104.2.1 and 1104.2.2, all components containing the refrigerant shall be located either outdoors or in a *machinery room* where the quantity of refrigerant in an independent circuit of a system exceeds the amounts shown in Table 1103.1. For refrigerant blends not listed in Table 1103.1, the same requirement shall apply when the amount for any blend component exceeds that indicated in Table 1103.1 for that component. This requirement shall also apply when the combined amount of the blend components exceeds a limit of 69,100 parts per million (ppm) by volume. *Machinery rooms* required by this section shall be constructed and maintained in accordance with Section 1105 for Group A1 and B1 refrigerants and in accordance with Sections 1105 and 1106 for Group A2, B2, A3 and B3 refrigerants.
Exceptions:

1. 1.Machinery rooms are not required for *listed equipment* and *appliances* containing not more than 6.6 pounds (3 kg) of refrigerant, regardless of the refrigerant's safety classification, where installed in accordance with the *equipment's* or *appliance's* listing and the *equipment* or *appliance* manufacturer's installation instructions.
2. 2.Piping in conformance with Section 1107 is allowed in other locations to connect components installed in a *machinery room* with those installed outdoors.

1104.2.1 Institutional occupancies.

The amounts shown in Table 1103.1 shall be reduced by 50 percent for all areas of institutional *occupancies* except kitchens, laboratories and mortuaries. The total of all Group A2, B2, A3 and B3 refrigerants shall not exceed 550 pounds (250 kg) in occupied areas or *machinery rooms*.

1104.2.2 Industrial occupancies and refrigerated rooms.

This section applies only to industrial occupancies and refrigerated rooms for manufacturing, food and beverage preparation, meat cutting, other processes and storage. Machinery rooms are not required where all of the following conditions are met:

1. The space containing the machinery is separated from other *occupancies* by tight construction with tight-fitting doors.
2. Access is restricted to authorized personnel.
3. The floor area per occupant is not less than 100 square feet (9.3 m^2) where machinery is located on floor levels with exits more than 6.6 feet (2012 mm) above the ground. Where provided with egress directly to the outdoors or into *approved* building exits, the minimum floor area shall not apply.
4. Refrigerant detectors are installed as required for machinery rooms in accordance with Section 1105.3.
5. Surfaces having temperatures exceeding 800°F (427°C) and open flames are not present where any Group A2, B2, A3 or B3 refrigerant is used (see Section 1104.3.4).
6. All electrical *equipment* and appliances conform to Class 1, Division 2, *hazardous location* classification requirements of NFPA 70 where the quantity of any Group A2, B2, A3 or B3 refrigerant, other than ammonia, in a single independent circuit would exceed 25 percent of the lower flammability limit (LFL) upon release to the space.
7. All refrigerant-containing parts in systems exceeding 100 horsepower (hp) (74.6 kW) drive power, except evaporators used for refrigeration or dehumidification; condensers used for heating; control and pressure relief valves for either; and connecting piping, shall be located either outdoors or in a *machinery room*.

1104.3 Refrigerant restrictions.

Refrigerant applications, maximum quantities and use shall be restricted in accordance with Sections 1104.3.1 through 1104.3.4.

1104.3.1 Air-conditioning for human comfort.

In other than industrial *occupancies* where the quantity in a single independent circuit does not exceed the amount in Table 1103.1, Group B1, B2 and B3 refrigerants shall not be used in high-probability systems for air-conditioning for human comfort.

1104.3.2 Nonindustrial occupancies.

Group A2 and B2 refrigerants shall not be used in high-probability systems where the quantity of refrigerant in any independent refrigerant circuit exceeds the amount shown in Table 1104.3.2. Group A3 and B3 refrigerants shall not be used except where *approved*.

Exception: This section does not apply to laboratories where the floor area per occupant is not less than 100 square feet (9.3 m^2).

TABLE 1104.3.2
MAXIMUM PERMISSIBLE QUANTITIES OF REFRIGERANTS

TYPE OF REFRIGERATION SYSTEM	MAXIMUM POUNDS FOR VARIOUS OCCUPANCIES			
	Institutional	Assembly	Residential	All other occupancies
Sealed absorption system				
In exit access	0	0	3.3	3.3
In adjacent outdoor locations	0	0	22	22
In other than exit access	0	6.6	6.6	6.6
Unit systems				
In other than exit access	0	0	6.6	6.6

For SI: 1 pound = 0.454 kg.

1104.3.3 All occupancies.
The total of all Group A2, B2, A3 and B3 refrigerants other than R-717, ammonia, shall not exceed 1,100 pounds (499 kg) except where *approved*.

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1104.3.4 Protection from refrigerant decomposition.
Where any device having an open flame or surface temperature greater than 800°F (427°C) is used in a room containing more than 6.6 pounds (3 kg) of refrigerant in a single independent circuit, a hood and exhaust system shall be provided in accordance with Section 510. Such exhaust system shall exhaust *combustion* products to the outdoors.

Exception: A hood and exhaust system shall not be required where any of the following apply:

1. The refrigerant is R-717, R-718 or R-744.
2. The *combustion* air is ducted from the outdoors in a manner that prevents leaked refrigerant from being combusted.
3. A refrigerant detector is used to stop the *combustion* in the event of a refrigerant leak (see Sections 1105.3 and 1105.5).

1104.4 Volume calculations.
Volume calculations shall be in accordance with Sections 1104.4.1 through 1104.4.3.

1104.4.1 Noncommunicating spaces.

Where the refrigerant-containing parts of a system are located in one or more spaces that do not communicate through permanent openings or HVAC ducts, the volume of the smallest, enclosed occupied space shall be used to determine the permissible quantity of refrigerant in the system.

1104.4.2 Communicating spaces.
Where an evaporator or condenser is located in an air duct system, the volume of the smallest, enclosed occupied space served by the duct system shall be used to determine the maximum allowable quantity of refrigerant in the system.

Exception: If airflow to any enclosed space cannot be reduced below one-quarter of its maximum, the entire space served by the air duct system shall be used to determine the maximum allowable quantity of refrigerant in the system.

1104.4.3 Plenums.
Where the space above a suspended ceiling is continuous and part of the supply or return air *plenum* system, this space shall be included in calculating the volume of the enclosed space.

SECTION 1105
MACHINERY ROOM, GENERAL REQUIREMENTS

[BF] 1105.1 Design and construction.
Machinery rooms shall be designed and constructed in accordance with the *Florida Building Code, Building* and this section.

1105.2 Openings.
Ducts and air handlers in the *machinery room* that operate at a lower pressure than the room shall be sealed to prevent any refrigerant leakage from entering the airstream.

[F] 1105.3 Refrigerant detector.
Refrigerant detectors in machinery rooms shall be provided as required by of the *Florida Fire Prevention Code*.

1105.4 Tests.
Periodic tests of the mechanical ventilating system shall be performed in accordance with manufacturer's specifications and as required by the code official.

1105.5 Fuel-burning appliances.
Fuel-burning appliances and *equipment* having open flames and that use *combustion* air from the *machinery room* shall not be installed in a *machinery room*.

Exceptions:

1. 1.Where the refrigerant is carbon dioxide or water.
2. 2.Fuel-burning appliances shall not be prohibited in the same *machinery room* with refrigerant-containing *equipment* or appliances where *combustion* air is ducted from outside the *machinery room* and sealed in such a manner as to prevent any refrigerant leakage from entering the *combustion* chamber, or where a refrigerant vapor detector is employed to automatically shut off the *combustion* process in the event of refrigerant leakage.

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1105.6 Ventilation.
Machinery rooms shall be mechanically ventilated to the outdoors.

Exception: Where a refrigerating system is located outdoors more than 20 feet (6096 mm) from any building opening and is enclosed by a penthouse, lean-to or other open structure, natural or mechanical ventilation shall be provided. Location of the openings shall be based on the relative density of the refrigerant to air. The free-aperture cross section for the ventilation of the *machinery room* shall be not less than:

$$F = \sqrt{G}$$

(Equation 11-1)

$$\text{For SI: } F = 0.138\sqrt{G}$$

where:

F = The free opening area in square feet (m^2).
G = The mass of refrigerant in pounds (kg) in the largest system, any part of which is located in the *machinery room*.

1105.6.1 Discharge location.
The discharge of the air shall be to the outdoors in accordance with Chapter 5. Exhaust from mechanical ventilation systems shall be discharged not less than 20 feet (6096 mm) from a property line or openings into buildings.

1105.6.2 Makeup air.
Provisions shall be made for *makeup air* to replace that being exhausted. Openings for *makeup air* shall be located to avoid intake of *exhaust air*. Supply and exhaust ducts to the *machinery room* shall not serve any other area, shall be constructed in accordance with Chapter 5 and shall be covered with corrosion-resistant screen of not less than $^1/_4$-inch (6.4 mm) mesh.

1105.6.3 Ventilation rate.
For other than ammonia systems, the mechanical ventilation systems shall be capable of exhausting the minimum quantity of air both at normal operating and emergency conditions, as required by Sections 1105.6.3.1 and 1105.6.3.2. The minimum required emergency ventilation rate for ammonia shall be 30 air changes per hour in accordance with IIAR2. Multiple fans or multispeed fans shall be allowed to produce the emergency ventilation rate and to obtain a reduced airflow for normal ventilation.

1105.6.3.1 Quantity—normal ventilation.
During occupied conditions, the mechanical ventilation system shall exhaust the larger of the following:

1. Not less than 0.5 cfm per square foot (0.0025 $m^3/s \cdot m^2$) of *machinery room* area or 20 cfm (0.009 m^3/s) per person.
2. A volume required to limit the room temperature rise to 18°F (10°C) taking into account the ambient heating effect of all machinery in the room.

1105.6.3.2 Quantity-emergency conditions.
Upon actuation of the refrigerant detector required in Section 1105.3, the mechanical ventilation system shall *exhaust air* from the *machinery room* in the following quantity:

$$Q = 100 \times \sqrt{G}$$

(Equation 11-2)

$$\text{For SI: } Q = 0.07 \times \sqrt{G}$$

where:

Q = The airflow in cubic feet per minute (m^3/s).
G = The design mass of refrigerant in pounds (kg) in the largest system, any part of which is located in the *machinery room*.

1105.7 Termination of relief devices.
Pressure relief devices, fusible plugs and purge systems located within the *machinery room* shall terminate outside of the structure at a location 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.

1105.8 Ammonia discharge.
Pressure relief valves for ammonia systems shall discharge in accordance with ASHRAE 15.

[F] 1105.9 Emergency pressure control system.
Permanently installed refrigeration systems 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 the *Florida Fire Prevention Code*.

SECTION 1106
MACHINERY ROOM, SPECIAL REQUIREMENTS

1106.1 General.
Where required by Section 1104.2, the *machinery room* shall meet the requirements of this section in addition to the requirements of Section 1105.

1106.2 Elevated temperature.
There shall not be an open flame-producing device or continuously operating hot surface over 800°F (427°C) permanently installed in the room.

1106.3 Ammonia room ventilation.
Ventilation systems in ammonia machinery rooms shall be operated continuously at the ventilation rate specified in Section 1105.6.3.
Exceptions:
1. Machinery rooms equipped with a vapor detector that will automatically start the ventilation system at the ventilation rate specified in Section 1105.6.3, and that will actuate an alarm at a detection level not to exceed 1,000 ppm.
2. Machinery rooms conforming to the Class 1, Division 2, *hazardous location* classification requirements of NFPA 70.

1106.4 Flammable refrigerants.
Where refrigerants of Groups A2, A3, B2 and B3 are used, the *machinery room* shall conform to the Class 1, Division 2, *hazardous location* classification requirements of NFPA 70.
Exception: Ammonia machinery rooms that are provided with ventilation in accordance with Section 1106.3.

[F] 1106.5 Remote controls.
Remote control of the mechanical equipment and *appliances* located in the *machinery room* shall comply with Sections 1106.5.1 and 1106.5.2.

[F] 1106.5.1 Refrigeration system emergency shutoff.
A clearly identified switch of the break-glass type or with an approved tamper-resistant cover shall provide off-only control of refrigerant compressors, refrigerant pumps, and normally closed, automatic refrigerant valves located in the *machinery room*. Additionally,

this *equipment* shall be automatically shut off whenever the refrigerant vapor concentration in the *machinery room* exceeds the vapor detector's upper detection limit or 25 percent of the LEL, whichever is lower.

[F] 1106.5.2 Ventilation system.
A clearly identified switch of the break-glass type or with an approved tamperresistant cover shall provide on-only control of the *machinery room* ventilation fans.

[F] 1106.6 Emergency signs and labels.
Refrigeration units and systems shall be provided with *approved* emergency signs, charts, and labels in accordance with the *Florida Fire Prevention Code*.

SECTION 1107
REFRIGERANT PIPING

1107.1 General.
The design of refrigerant piping shall be in accordance with ASME B31.5. Refrigerant piping shall be installed, tested and placed in operation in accordance with this chapter.

1107.2 Piping location.
Refrigerant piping that crosses an open space that affords passageway in any building shall be not less than 7 feet 3 inches (2210 mm) above the floor unless the piping is located against the ceiling of such space. Refrigerant piping shall not be placed in any elevator, dumbwaiter or other shaft containing a moving object or in any shaft that has openings to living quarters or to means of egress. Refrigerant piping shall not be installed in an enclosed public stairway, stairway landing or means of egress.

1107.2.1 Piping in concrete floors.
Refrigerant piping installed in concrete floors shall be encased in pipe ducts. The piping shall be isolated and supported to prevent damaging vibration, stress and corrosion.

1107.2.2 Refrigerant penetrations.
Refrigerant piping shall not penetrate floors, ceilings or roofs.

Exceptions:

1. Penetrations connecting the basement and the first floor.
2. Penetrations connecting the top floor and a machinery penthouse or roof installation.
3. Penetrations connecting adjacent floors served by the refrigeration system.
4. Penetrations by piping in a direct system where the refrigerant quantity does not exceed Table 1103.1 for the smallest occupied space through which the piping passes.
5. In other than industrial occupancies and where the refrigerant quantity exceeds Table 1103.1 for the smallest space, penetrations for piping that connects separate pieces of *equipment* that are either:
    1. Enclosed by an *approved* gas-tight, fire-resistive duct or shaft with openings to those floors served by the refrigeration system.
    2. Located on the exterior of the building where vented to the outdoors or to the space served by the system and not used as an air shaft, closed court or similar space.

1107.3 Pipe enclosures.
Rigid or flexible metal enclosures or pipe ducts shall be provided for soft, annealed copper tubing and used for refrigerant piping erected on the premises and containing other than Group A1 or B1 refrigerants. Enclosures shall not be required for connections between condensing units and the nearest riser box(es), provided such connections do not exceed 6 feet (1829 mm) in length.

1107.4 Condensation.
Refrigerating piping and fittings, brine piping and fittings that, during normal operation, will reach a surface temperature below the dew point of the surrounding air, and are located in spaces or areas where condensation will cause a safety hazard to the building occupants, structure, electrical *equipment* or any other *equipment* or appliances, shall be protected in an *approved* manner to prevent such damage.

1107.5 Materials for refrigerant pipe and tubing.
Piping materials shall be as set forth in Sections 1107.5.1 through 1107.5.5.

1107.5.1 Steel pipe.
Carbon steel pipe with a wall thickness not less than Schedule 80 shall be used for Group A2, A3, B2 or B3 refrigerant liquid lines for sizes 1.5 inches (38 mm) and smaller. Carbon steel pipe with a wall thickness not less than Schedule 40 shall be used for Group A1 or B1 refrigerant liquid lines 6 inches (152 mm) and smaller, Group A2, A3, B2 or B3 refrigerant liquid lines sizes 2 inches (51 mm) through 6 inches (152 mm) and all refrigerant suction and discharge lines 6 inches (152 mm) and smaller. Type F steel pipe shall not be used for refrigerant lines having an operating temperature less than -20°F (-29°C).

1107.5.2 Copper, brass and copper-alloy pipe.
Standard iron-pipe size, brass, copper and copper-alloy (not less than 80-percent copper) pipe shall conform to ASTM B42 and ASTM B43.

1107.5.3 Copper tube.
Copper tube used for refrigerant piping erected on the premises shall be seamless copper tube of Type ACR (hard or annealed) complying with ASTM B280. Where *approved*, copper tube for refrigerant piping erected on the premises shall be seamless copper tube of Type K, L or M (drawn or annealed) in accordance with ASTM B88. Annealed temper copper tube shall not be used in sizes larger than a 2-inch (51 mm) nominal size. Mechanical joints shall not be used on annealed temper copper tube in sizes larger than $^{7}/_{8}$-inch (22.2 mm) OD size.

1107.5.4 Copper tubing joints.
Copper tubing joints used in refrigerating systems containing Group A2, A3, B2 or B3 refrigerants shall be brazed. Soldered joints shall not be used in such refrigerating systems.

1107.5.5 Aluminum tube.
Type 3003-0 aluminum tubing with high-pressure fittings shall not be used with methyl chloride and other refrigerants known to attack aluminum.

1107.6 Joints and refrigerant-containing parts in air ducts.
Joints and all refrigerant-containing parts of a refrigerating system located in an air duct of an air-conditioning system carrying conditioned air to and from human-occupied space shall be constructed to withstand, without leakage, a pressure of 150 percent of the higher of the design pressure or pressure relief device setting.

1107.7 Exposure of refrigerant pipe joints.
Refrigerant pipe joints erected on the premises shall be exposed for visual inspection prior to being covered or enclosed.

1107.8 Stop valves.
Systems containing more than 6.6 pounds (3 kg) of a refrigerant in systems using positive-displacement compressors shall have stop valves installed as follows:

1. At the inlet of each compressor, compressor unit or condensing unit.
2. At the discharge outlet of each compressor, compressor unit or condensing unit and of each liquid receiver.

   Exceptions:
   1) Systems that have a refrigerant pumpout function capable of storing the entire refrigerant charge in a receiver or heat exchanger.
   2) Systems that are equipped with provisions for pumpout of the refrigerant using either portable or permanently installed recovery *equipment*.
   3) Self-contained systems.

1107.8.1 Liquid receivers.
Systems containing 100 pounds (45 kg) or more of a refrigerant, other than systems utilizing nonpositive displacement compressors, shall have stop valves, in addition to those required by Section 1107.8, on each inlet of each liquid receiver. Stop valves shall not be required on the inlet of a receiver in a condensing unit, nor on the inlet of a receiver which is an integral part of the condenser.

1107.8.2 Copper tubing.
Stop valves used with soft annealed copper tubing or hard-drawn copper tubing $^{7}/_{8}$-inch (22.2 mm) OD standard size or smaller shall be securely mounted, independent of tubing fastenings or supports.

1107.8.3 Identification.
Stop valves shall be identified where their intended purpose is not obvious. Numbers shall not be used to label the valves, unless a key to the numbers is located near the valves.

SECTION 1108
FIELD TEST

1108.1 General.
Every refrigerant-containing part of every system that is erected on the premises, except compressors, condensers, vessels, evaporators, safety devices, pressure gauges and control mechanisms that are *listed* and factory tested, shall be tested and proved tight after complete installation, and before operation. Tests shall include both the high- and low-pressure sides of each system at not less than the lower of the design pressures or the setting of the pressure relief device(s). The design pressures for testing shall be those listed on the condensing unit, compressor or compressor unit nameplate, as required by ASHRAE 15.

Exceptions:
1. Gas bulk storage tanks that are not permanently connected to a refrigeration system.
2. Systems erected on the premises with copper tubing not exceeding $^{5}/_{8}$-inch (15.8 mm) OD, with wall thickness as required by ASHRAE 15, shall be tested in

accordance with Section 1108.1, or by means of refrigerant charged into the system at the saturated vapor pressure of the refrigerant at 70°F (21°C) or higher.

3. Limited-charge systems equipped with a pressure relief device, erected on the premises, shall be tested at a pressure not less than one and one-half times the pressure setting of the relief device. If the *equipment* or *appliance* has been tested by the manufacturer at one and one-half times the design pressure, the test after erection on the premises shall be conducted at the design pressure.

1108.1.1 Booster compressor.
Where a compressor is used as a booster to obtain an intermediate pressure and discharges into the suction side of another compressor, the booster compressor shall be considered a part of the low side, provided that it is protected by a pressure relief device.

1108.1.2 Centrifugal/nonpositive displacement compressors.
In field-testing systems using centrifugal or other nonpositive displacement compressors, the entire system shall be considered as the low-side pressure for field test purposes.

1108.2 Test gases.
Tests shall be performed with an inert dried gas including, but not limited to, nitrogen and carbon dioxide. Oxygen, air, combustible gases and mixtures containing such gases shall not be used.

Exception: The use of air is allowed to test R-717, ammonia, systems provided that they are subsequently evacuated before charging with refrigerant.

1108.3 Test apparatus.
The means used to build up the test pressure shall have either a pressure-limiting device or a pressure-reducing device and a gauge on the outlet side.

1108.4 Declaration.
A certificate of test shall be provided for all systems containing 55 pounds (25 kg) or more of refrigerant. The certificate shall give the name of the refrigerant and the field test pressure applied to the high side and the low side of the system. The certification of test shall be signed by the installer and shall be made part of the public record.

[F] SECTION 1109
PERIODIC TESTING

[F] 1109.1 Testing required.
The following emergency devices and systems shall be periodically tested in accordance with the manufacturer's instructions and as required by the code official:

1) Treatment and flaring systems.
2) Valves and appurtenances necessary to the operation of emergency refrigeration control boxes.
3) Fans and associated *equipment* intended to operate emergency ventilation systems.
4) Detection and alarm systems.

Attachment # 3

Attachment # 3

to 5 U.S.C. 552a(k)(6): 5 U.S.C. 552a(c)(3), 5 U.S.C. 552a(d)(1), (2), (3), and (4), 5 U.S.C. 552a(e)(1), 5 U.S.C. 552a(e)(4)(G), (H), and (I), and 5 U.S.C. 552a(f).

(n) *Reasons for exemptions under 5 U.S.C. 552a(k)(6).* The reason for exempting the system of records is that disclosure of the material in the system would compromise the objectivity or fairness of the examination process.

(o) *Exempt information included in another system.* Any information from a system of records for which an exemption is claimed under 5 U.S.C. 552a(j) or (k) which is also included in another system of records retains the same exempt status such information has in the system for which such exemption is claimed.

Ryan Law,

Deputy Assistant Secretary Privacy, Transparency, and Records, U.S. Department of the Treasury.

[FR Doc. 2023–27299 Filed 12–22–23; 8:45 am]

BILLING CODE 4810–AK–P

POSTAL SERVICE

39 CFR Part 111

Use of Foreign Return Addresses on Domestic Mailpieces

AGENCY: Postal Service™.

ACTION: Final rule.

SUMMARY: The Postal Service is amending *Mailing Standards of the United States Postal Service,* Domestic Mail Manual (DMM®) to clarify the consequences for using a foreign return address on a domestic mailpiece.

DATES: *Effective date:* January 1, 2024.

FOR FURTHER INFORMATION CONTACT: Catherine Knox at (202) 268–5636, Treishawna Harris at (202) 268–2965, or Garry Rodriguez at (202) 268–7281.

SUPPLEMENTARY INFORMATION: On November 6, 2023, the Postal Service published a notice of proposed rulemaking (88 FR 76162–76163) to further amend subsections 602.1.5.4 and 609.4.3 to clarify the procedures applicable to undeliverable domestic mailpieces bearing a foreign return address. The Postal Service did not receive any formal comments.

The Postal Service is revising DMM subsections 602.1.5.4, and 609.4.3, to clarify that undeliverable domestic mailpieces with a foreign return address will be handled in accordance with the Postal Service's dead mail procedures.

In a separate rule, the Postal Service will also revise a few related sections of the International Mail Manual (IMM) including subsection 762.2, *Undeliverable Domestic Mail Bearing U.S. Postage and a Foreign Return Address.*

We believe these revisions will provide customers with a more efficient mailing experience. The Postal Service adopts the described changes to *Mailing Standards of the United States Postal Service,* Domestic Mail Manual (DMM), incorporated by reference in the *Code of Federal Regulations.*

We will publish an appropriate amendment to 39 CFR part 111 to reflect these changes.

List of Subjects in 39 CFR Part 111

Administrative practice and procedure, Postal Service.

Accordingly, 39 CFR part 111 is amended as follows:

PART 111—GENERAL INFORMATION ON POSTAL SERVICE

■ 1. The authority citation for 39 CFR part 111 continues to read as follows:

Authority: 5 U.S.C. 552(a); 13 U.S.C. 301–307; 18 U.S.C. 1692–1737; 39 U.S.C. 101, 401–404, 414, 416, 3001–3018, 3201–3220, 3401–3406, 3621, 3622, 3626, 3629, 3631–3633, 3641, 3681–3685, and 5001.

■ 2. Revise the *Mailing Standards of the United States Postal Service,* Domestic Mail Manual (DMM) as follows:

Mailing Standards of the United States Postal Service, Domestic Mail Manual (DMM)

* * * * *

600 Basic Standards for All Mailing Services

* * * * *

602 Addressing

1.0 Elements of Addressing

* * * * *

1.5 Return Addresses

* * * * *

[Revise the heading of 1.5.4 to read as follows:]

1.5.4 Use of Foreign Return Addresses

[Revise the text of 1.5.4 to read as follows:]

When U.S. postage is applied to a domestic mailpiece, as defined under 608.2.1 and 608.2.2, only a domestic return address is authorized. An undeliverable domestic mailpiece bearing a foreign return address cannot be returned to sender and will be handled as dead mail under 507.1.9.

* * * * *

609 Filing Indemnity Claims for Loss or Damage

* * * * *

4.0 Claims

* * * * *

4.3 Nonpayable Claims

Indemnity is not paid for insured mail (including Priority Mail Express and Priority Mail), Registered Mail, COD, or Priority Mail and Priority Mail Express in these situations:

* * * * *

[Revise the text of 4.3 by adding a new item "ag" to read as follows:]

ag. An undeliverable, registered or insured domestic mailpiece bearing a foreign return address.

* * * * *

Sarah Sullivan,

Attorney, Ethics and Legal Compliance.

[FR Doc. 2023–27975 Filed 12–22–23; 8:45 am]

BILLING CODE 7710–12–P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 84

[EPA–HQ–OAR–2021–0643; FRL–11594–02–OAR]

Phasedown of Hydrofluorocarbons: Technology Transitions Program Residential and Light Commercial Air Conditioning and Heat Pump Subsector

AGENCY: Environmental Protection Agency (EPA).

ACTION: Interim final rule and request for comments.

SUMMARY: The U.S. Environmental Protection Agency is amending a provision of the recently finalized Technology Transitions Program under the American Innovation and Manufacturing Act (AIM Act). This action allows one additional year, until January 1, 2026, solely for the installation of new residential and light commercial air conditioning and heat pump systems using components manufactured or imported prior to January 1, 2025. The existing January 1, 2025, compliance date for the installation of certain residential and light commercial air conditioning and heat pump systems may result in significant stranded inventory that was intended for new residential construction. EPA is promulgating this action to mitigate the potential for significant stranded inventory in this subsector. In addition, EPA is clarifying

that residential ice makers are not included in the household refrigerator and freezer subsector under the Technology Transitions Rule and are not subject to the restrictions for that subsector. EPA is requesting comments on all aspects of this rule.

DATES: This interim final rule is effective on December 26, 2023. Comments on this rule must be received on or before February 9, 2024.

ADDRESSES: You may send comments, identified by docket identification number EPA–HQ–OAR–2021–0643, by any of the following methods:

- *Federal eRulemaking Portal: https://www.regulations.gov* (our preferred method). Follow the online instructions for submitting comments.
- *Mail:* U.S. Environmental Protection Agency, EPA Docket Center, Air and Radiation Docket, Mail Code 2822T, 1200 Pennsylvania Avenue NW, Washington, DC 20460.
- *Hand Delivery or Courier (by scheduled appointment only):* EPA Docket Center, WJC West Building, Room 3334, 1301 Constitution Avenue NW, Washington, DC 20004. The Docket Center's hours of operations are 8:30 a.m.–4:30 p.m., Monday–Friday (except Federal Holidays).

Instructions: All submissions received must include the Docket ID number for this rulemaking. Comments received may be posted without change to *https://www.regulations.gov,* including any personal information provided.

You may find the following suggestions helpful for preparing your comments: Direct your comments to specific sections of this rulemaking and note where your comments may apply to future separate actions where possible; explain your views as clearly as possible; describe any assumptions that you used; provide any technical information or data you used that support your views; provide specific examples to illustrate your concerns; offer alternatives; and, make sure to submit your comments by the comment period deadline. Please provide any published studies or raw data supporting your position. Multimedia submissions (audio, video, etc.) must be accompanied by a written comment. The written comment is considered the official comment and should include discussion of all points you wish to make. EPA will generally not consider comments or comment contents located outside of the primary submission (*e.g.,* on the web, cloud, or other file sharing system).

Do not submit any information you consider to be Confidential Business Information (CBI) through *https://www.regulations.gov.* For submission of confidential comments, please work with the person listed in the **FOR FURTHER INFORMATION CONTACT** section. For additional submission methods, the full EPA public comment policy, information about CBI or multimedia submissions, and general guidance on making effective comments, please visit *https://www.epa.gov/dockets/commenting-epa-dockets.*

FOR FURTHER INFORMATION CONTACT: Allison Cain, Stratospheric Protection Division, Office of Atmospheric Programs (Mail Code 6205A), Environmental Protection Agency, 1200 Pennsylvania Ave. NW, Washington, DC 20460; telephone number: 202–564–1566; email address: *cain.allison@epa.gov.* You may also visit EPA's website at *https://www.epa.gov/climate-hfcs-reduction* for further information.

SUPPLEMENTARY INFORMATION: EPA is taking this action as an interim final rule without prior proposal and public comment because EPA finds that the good cause exemption from the notice and comment rulemaking requirement of the Administrative Procedure Act (APA), 5 U.S.C. 551 *et seq.,* applies here.

Subsection (k)(1)(C) of the American Innovation and Manufacturing Act (AIM Act) provides that Clean Air Act (CAA) sections 113, 114, 304, and 307 apply to the AIM Act and any regulations EPA promulgates under the AIM Act as though the AIM Act were part of title VI of the CAA. However, section 307(d) does not apply to any rule referred to in subparagraphs (A) or (B) of section 553(b) of the APA. *See* CAA section 307(d)(1). Section 553(b)(B) of the APA, 5 U.S.C. 553(b)(B), provides that, when an agency for good cause finds (and incorporates the finding and a brief statement of reasons therefor in the rule issued) that notice and comment public procedures are impracticable, unnecessary or contrary to the public interest, the agency may issue a rule without providing notice and an opportunity for public comment.

EPA has determined there is good cause for promulgating this rule without prior proposal and opportunity for comment. After signature of EPA's October 2023 final rule that established, among other things, a prohibition beginning on January 1, 2025, of the installation of new residential and light commercial air conditioning and heat pump systems using regulated substances with a global warming potential of 700 or more, stakeholders brought to the Agency's attention that builders order equipment in this subsector well in advance of installation, often even before the installation date is known, and that the final rule's compliance date would potentially strand a significant amount of inventory. EPA is issuing this rule to address these concerns and to mitigate the harm that would be caused by unintentionally stranding inventory as a result of the January 1, 2025, compliance date for the installation of certain air conditioning and heat pump systems. Subsection (i)(6) of the AIM Act states that "[n]o rule under this subsection may take effect before the date that is 1 year after the date on which the Administrator promulgates the applicable rule under this subsection." In order to provide relief for entities subject to the January 1, 2025, compliance date, and in light of subsection (i)(6)'s one-year delay between promulgation and compliance date, EPA is taking this rulemaking action prior to January 1, 2024, one year in advance of the existing compliance date. It is impossible for the Agency to conclude a notice-and-comment rulemaking to provide this needed relief by January 1, 2024, and therefore EPA finds that this impracticability constitutes good cause for dispensing with the required procedures under 5 U.S.C. 553(b)(B). Nonetheless, EPA is providing 45 days for submission of public comments following today's action. EPA will consider all written comments submitted in the allotted time period to determine if any change is warranted. Because the rule revisions relieve a restriction and advance notice is not needed, the rule is effective upon publication.

Throughout this document, whenever "we," "us," "the Agency," or "our" is used, we mean EPA. Acronyms that are used in this rulemaking that may be helpful include:

AC—Air Conditioning
AHRI—Air-Conditioning, Heating, and Refrigeration Institute
AIM Act—American Innovation and Manufacturing Act of 2020
APA—Administrative Procedure Act
CAA—Clean Air Act
EPA—U.S. Environmental Protection Agency
FR—Federal Register
HARDI—Heating, Air-conditioning & Refrigeration Distributors International
HFC—Hydrofluorocarbon
OEM—Original Equipment Manufacturer
SNAP—Significant New Alternatives Policy
VRF—Variable Refrigerant Flow

I. Executive Summary

A. What is the purpose of this regulatory action?

The U.S. Environmental Protection Agency (EPA) is implementing provisions of the American Innovation and Manufacturing Act of 2020, codified

at 42 U.S.C. 7675 (AIM Act or the Act). Subsection (i) of the Act, entitled "Technology Transitions," authorizes EPA, by rulemaking, to restrict the use of regulated substances (used interchangeably with "HFCs" in this document) [1] in sectors or subsectors where the regulated substances are used.

On October 24, 2023, EPA's final rule establishing the Technology Transitions Program was published in the **Federal Register** (88 FR 73098, hereafter "Technology Transitions Rule"). That rule restricted the use of higher-GWP HFCs in over 40 subsectors in which they are used. It also prohibited, among other things, the manufacture and import of factory-completed products and the installation of certain refrigeration, air conditioning, and heat pump systems using higher-GWP HFCs. The compliance dates for these restrictions vary by subsector and range from January 1, 2025, to January 1, 2028. The rule also prohibited the sale, distribution, and export of factory-completed products that do not comply with the relevant restrictions three years after the prohibition on manufacture and import.

After issuance of the Technology Transitions Rule, manufacturers, importers, and distributors of residential and light commercial air conditioning and heat pump equipment informed EPA that the compliance date for the restriction on installation will result in substantial stranded inventory in that subsector for residential new construction, including both single-family and multi-family dwellings, where builders order heating and cooling equipment well in advance of knowing the exact date of installation. This rule narrowly addresses the unique circumstances of that particular subsector to prevent such equipment from being stranded.

B. What is the summary of this regulatory action?

This interim final rulemaking provides one additional year for the installation of new residential and light commercial air conditioning and heat pump systems when using components that were manufactured or imported before January 1, 2025. Specifically, this rule allows for pre-2025 condensing units, evaporators, and air handlers using R–410A, or other regulated substances and blends of regulated substances not meeting the Technology Transitions Rule's restrictions, to be assembled into new systems (*i.e.*, installed), so long as those systems are assembled prior to January 1, 2026.

We also clarify that residential ice makers are not included in the household refrigerator and freezer subsector and are not subject to the restrictions for that subsector under the Technology Transitions Rule. The preamble to the Technology Transitions Rule incorrectly included them as an example of a product in that subsector.

C. What is the summary of the costs and benefits?

This rule will reduce regulatory burden associated with the Technology Transitions Program while having a negligible environmental impact. Original equipment manufacturers (OEMs) have indicated that collectively, over $1 billion of inventory could go unsold without an extension of the installation date. Stranding significant amounts of equipment that does not meet the new restrictions is counter to the overall approach EPA has taken in the Technology Transitions Rule. Extending the installation date for these systems will not have an impact on the benefits modeled in the Technology Transitions Rule because EPA is limiting the extension to equipment manufactured or imported before the existing compliance date of January 1, 2025.

II. General Information

A. Does this action apply to me?

You may be potentially affected by this rule if you manufacture, import, export, sell or otherwise distribute, or install residential and light commercial air conditioning and heat pump equipment. Potentially affected categories, by North American Industry Classification System code, include:

- Plumbing, Heating, and Air Conditioning Contractors (238220)
- Air Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing (333415)
- Major Household Appliance Manufacturing (335220)
- Household Appliances, Electric Housewares, and Consumer Electronics Merchant Wholesalers (423620)
- Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers (423720)
- Warm Air Heating and Air Conditioning Equipment and Supplies Merchant Wholesalers (423730)
- Appliance Stores, Household-Type (449210)
- Appliance Repair and Maintenance (811412)

This list is not intended to be exhaustive, but rather provides a guide for readers regarding entities that EPA expects could potentially be affected by this action. Other types of entities not listed could also be affected. To determine whether your entity may be affected by this action, you should carefully examine the regulatory text at the end of this notice. If you have questions regarding the applicability of this action to a particular entity, consult the person listed in the **FOR FURTHER INFORMATION CONTACT** section.

B. What is EPA's authority for taking this action?

On December 27, 2020, the AIM Act was enacted as section 103 in Division S, Innovation for the Environment, of the Consolidated Appropriations Act, 2021 (codified at 42 U.S.C. 7675). Subsection (k)(1)(A) of the AIM Act provides EPA with the authority to promulgate necessary regulations to carry out EPA's functions under the Act, including its obligations to ensure that the Act's requirements are satisfied. Subsection (k)(1)(C) of the AIM Act also provides that CAA sections 113, 114, 304, and 307 apply to the AIM Act and any regulations EPA promulgates under the AIM Act as though the AIM Act were part of title VI of the CAA.

The AIM Act authorizes EPA to address HFCs by providing new authorities in three main areas: phasing down the production and consumption of listed HFCs; managing these HFCs and their substitutes; and facilitating the transition to next-generation technologies by restricting use of these HFCs in the sector or subsectors in which they are used. This rulemaking focuses on the third area: the transition to next-generation technologies by restricting use of these HFCs in the sector or subsectors in which they are used. Subsection (i) of the AIM Act, "Technology Transitions," provides that "the Administrator may by rule restrict, fully, partially, or on a graduated schedule, the use of a regulated substance in the sector or subsector in which the regulated substance is used." 42 U.S.C. 7675(i)(1). The Act lists 18 saturated HFCs, and by reference any of their isomers not so listed, that are covered by the statute's provisions, referred to as "regulated substances" under the Act.[2] (42 U.S.C. 7675(c)(1)). Through this rule, EPA is amending recently finalized restrictions on the use

[1] The Act lists 18 saturated HFCs, and by reference any of their isomers not so listed, that are covered by the statute's provisions, referred to as "regulated substances" under the Act.

[2] As noted previously in this notice, "regulated substance" and "HFC" are used interchangeably in this notice.

of certain HFCs in the residential and light commercial air conditioning and heat pump subsector.

C. How is EPA considering negotiated rulemaking?

Prior to proposing a rule, subsection (i)(2)(A) of the Act directs EPA to consider negotiating with stakeholders in the sector or subsector subject to the potential rule in accordance with negotiated rulemaking procedures established under subchapter III of chapter 5 of title 5, United States Code (commonly known as the "Negotiated Rulemaking Act of 1990"). If EPA makes a determination to use the negotiated rulemaking procedures, subsection (i)(2)(B) requires that EPA, to the extent practicable, give priority to completing that rulemaking over completing rulemakings under subsection (i) that are not using that procedure. If EPA does not use the negotiated rulemaking process, subsection (i)(2)(C) requires the Agency to publish an explanation of the decision not to use that procedure before commencement of the rulemaking process.

EPA noted in the final Technology Transitions Rule that, where appropriate, EPA will consider recent Agency actions and decisions related to restrictions on the use of HFCs in sectors and subsectors when considering using negotiated rulemaking procedures. EPA provided the example of not issuing a separate notice to consider using negotiated rulemaking for four petitions received after a first round of petitions had received public notice. EPA's reasoning was that these petitions were received well ahead of the final action and the requested restrictions are in the same sectors and subsectors contained in petitions for which a determination had already been made. EPA stated that nothing in those four petitions caused EPA to reconsider that decision and that it was unnecessary for the Agency to reconsider whether to use negotiated rulemaking procedures.

Upon considering recent Agency action, specifically the Technology Transitions Rule, today's interim final rulemaking does not merit a reconsideration of the prior determination not to use negotiated rulemaking procedures. This rule is a direct and immediate response to a specific concern arising from the recent agency action to establish a compliance date for the installation of certain systems within the residential and light commercial air conditioning and heat pump subsector. EPA is not addressing a new subsector nor even establishing a new restriction. Instead, this rule provides targeted relief to address concerns about stranded inventory in a particular subsector subject to a recently finalized restriction.

Furthermore, this action has been requested through a November 13, 2023, letter signed jointly by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI), the Alliance for Responsible Atmospheric Policy (the Alliance), and Heating, Air-conditioning & Refrigeration Distributors International (HARDI), which together represents a majority of the stakeholders in the subsector subject to the rule.[3] EPA does not believe that the rule would benefit from the negotiated rulemaking procedure especially because timeliness is a concern universally shared by stakeholders in this subsector.

III. Final Rule

A. Addressing Stranded Inventory

The November 13, 2023, letter to the EPA from AHRI, the Alliance, and HARDI requested clarification of the provisions of the rule regarding two categories of equipment: Residential and Light Commercial Air Conditioning and Heat Pump Systems and Variable Refrigerant Flow (VRF) Systems. The letter states that these organizations understand that components for systems in these two categories manufactured or imported before January 1, 2025, and January 1, 2026, respectively, using a regulated substance with a GWP of 700 or more, cannot be installed as new systems after each such compliance date. 40 CFR 84.54(a)–(c). They note that this would be "particularly problematic for residential new construction, including both single-family and multi-family dwellings, where builders order heating and cooling equipment well in advance of knowing the exact date of install. Such equipment is not installed until construction is nearly complete, but at time of order builders do not know when this date will be." The letter further articulates that allowing the use of components manufactured or imported prior to the compliance date to be installed as part of new systems for one year after the compliance date would provide some relief to the economic and practical burdens.

An important consideration in the final rule was avoiding the stranding of inventory of existing equipment. This includes systems that are already installed and operating as well as unsold equipment in the manufacturing and distribution chain. EPA stated that "[w]e recognize that the production and purchase of products or components that are unable to be sold to consumers is an economic and environmental outcome no parties desire, and the proposed rule's forward-looking compliance dates were intended to allow all parties in the market supply chain sufficient time to avoid that outcome." 88 FR 73123. In response to concerns about stranded inventory raised during the public comment period on the proposed rule, EPA made two significant adjustments in the final rule.

First, EPA removed the applicability of the rule's use restrictions to components. EPA explained that components are pieces of equipment that, unlike factory-completed products, do not function independently and must be assembled together in the field in order to function for its intended purpose. Components are replaceable and a faulty component can be swapped out to avoid replacing an entire system. Recognizing the ongoing need for servicing and updating previously installed systems, EPA allowed for the continued manufacture, import, sale, distribution, offer for sale and distribution, and export of components that rely on regulated substances, which would not meet the new restrictions. Components are therefore not subject to the restrictions in the Technology Transitions Rule, except insofar as those components may not be installed in new systems on or after the installation compliance dates.

Second, the rule imposed a date by which factory-completed products, more narrowly defined as an item that is functional upon completion of manufacturing, could no longer be distributed, sold, and offered for sale or distribution, and extended that date in the final rule. EPA proposed that the "sell-through" limitation for such products would be one year after the compliance date for manufacturing and importing. The Agency received many comments on this topic, including from those that considered one year to be insufficient especially for certain seasonal products. In the final rule, EPA provided a sell-through for factory-completed products for three years after the manufacture and import compliance date.

Through these two modifications in the final rule, EPA believed it had minimized the potential for stranded inventory. Specifically, with respect to components, the Agency's view was that there would continue to be a market for components not meeting the GWP limit thresholds for new systems, because

[3] This letter can be found in the docket for this interim final rule at EPA docket number EPA–HQ–OAR–2021–0643.

those components could continue to enter the market to service existing systems. However, since the rule's signature, stakeholders representing the air conditioning and heat pump subsector have raised concerns indicating that certain aspects of the rule's compliance date structure may result in unintended stranded inventory. EPA has reevaluated the specific circumstances for residential and light commercial air conditioning and heat pumps, and for the reasons articulated below is extending the installation compliance date for that subsector from January 1, 2025, to January 1, 2026, when using components that were manufactured or imported prior to January 1, 2025. In this interim final rule, the Agency is not considering the January 1, 2026, installation compliance date applicable to VRF systems; however, EPA intends to consider VRF systems in a separate notice and comment action.

EPA has evaluated the planning, purchasing, and installation timeframes for residential new construction as referenced in the November 13, 2023, letter from industry stakeholders. We recognize that it is common in the residential new construction industry for communities and dwellings to be planned well in advance, including plans for the heating and cooling systems intended to be installed in that new construction. Builders of residential new construction may order those planned heating and cooling systems in concert with the planning process without knowing when those systems will be installed. As noted by stakeholders, installation of these systems is often one of the final steps in residential construction. We acknowledge that it may therefore be the case that for new residential construction planned to occur in 2025, builders may have already taken action with respect to the heating and cooling systems that are planned to be installed in that new construction. Specifically, for construction occurring during 2025, components of residential and light commercial air conditioning and heat pump systems may have already been ordered or purchased by builders, such that leaving the January 1, 2025, installation compliance date unaltered could result in builders of new residential construction being left with stranded inventory—residential and light commercial air conditioning and heat pump components—that could not be used. In particular, because such equipment may already be well along the distribution chain, including in the possession of the end-user builder, it would be challenging to redirect that equipment to another user who would be in a different segment of the market, such as those servicing existing systems. As discussed, EPA made changes to the final Technology Transitions Rule specifically to avoid stranding inventory, as this outcome is undesirable economically and environmentally, and the issue addressed in this rule was not brought to the Agency's attention until after the final rule was signed. This action's extension of the January 1, 2025, new installation compliance date to January 1, 2026, for components that were manufactured or imported prior to January 1, 2025, is intended to avoid stranding those components in the distribution chain.

We also acknowledge that some areas of the residential and light commercial air conditioning and heat pump subsector are experiencing rapid growth. In 2022, sales of heat pumps in the United States outpaced gas furnaces for the first time ever, following a 50% increase from 2015 to 2020. For certain technologies with extremely limited historic use in the United States, such as mini-split and multi-split systems, the final Technology Transitions Rule's continued allowance of high-GWP HFCs in components for repair and servicing only may be insufficient to absorb projected inventory of those components. Anticipated manufacture and import of mini-split systems, for example, is much larger than the stock of installed systems that are old enough to need components for repair or replacement. The nascent and rapid expansion of certain subsets of the residential and light commercial air conditioning and heat pump subsector therefore further supports the extension of the January 1, 2025, compliance date to January 1, 2026, for installation of components manufactured or imported prior to January 1, 2025.

B. Limiting the Environmental Impact of This Action

EPA is narrowly tailoring this rule to respond to stakeholder concerns about stranded inventory in this subsector while maintaining the environmental benefits of the Technology Transitions Rule. To do so, EPA is extending the installation compliance date only for new systems installed from specified components (*e.g.,* condensing units and indoor evaporators) that were manufactured or imported prior to January 1, 2025. This restriction means that the total number of higher-GWP systems installed in 2024 and 2025 would match what the Agency modeled for installation in 2024. The extra year for installation would not increase demand for HFCs in this subsector but rather could shift some of the demand from 2024 into 2025.

EPA is not extending the original compliance date for new installations in this subsector beyond January 1, 2025, when using components manufactured or imported on or after January 1, 2025. These components remain subject to the original restrictions of the Technology Transitions Rule. Specifically, if they contain an HFC with a GWP of 700 or greater their use is limited to servicing previously installed systems. As elaborated on more below, all the existing labeling, reporting, and recordkeeping requirements also continue to apply to components using, or intended to use, any HFC. Extending the compliance date for all installations in the subsector by one year is not warranted based on EPA's prior analysis of the availability of substitutes within this subsector, as described in the Technology Transitions Rule and supporting documents in the docket for that rule.

EPA finds that this approach effectively responds to stakeholder concerns about stranded inventory while remaining protective of the environment. This approach was suggested by industry stakeholders in their letter dated November 13, 2023, and it aligns with industry's plans to transition in this subsector.

This interim final rule provides an additional year for installation only if all "specified components" of that system are manufactured or imported prior to January 1, 2025. The term "specified component" is defined under the Technology Transitions Rule as "condensing units, condensers, compressors, evaporator units, and evaporators." Other components of an air conditioning or heat pump system such as valves or refrigerant piping are not restricted by the Technology Transitions Rule and can be installed regardless of manufacture or import date.

C. How do the labeling, recordkeeping, and reporting provisions apply?

The Technology Transitions Rule requires labels on products and certain components that use HFCs. The labeling requirement takes effect for each subsector at the same time as the manufacture and import prohibition for products or the installation prohibition for systems. This timing reflects the primary purpose of the labels, which is for assessing compliance of products and systems in sectors and subsectors with active HFC restrictions.

This action does not require any specific labeling for components that are manufactured or imported prior to January 1, 2025. Nameplates typically include the date that a component is manufactured, which is sufficient for the purposes of this rule. Furthermore, it would be impractical to require entities that are not OEMs to relabel components that are already within the distribution chain.

This action does not change the existing labeling requirements related to components that are effective January 1, 2025. For specified components of systems, the Technology Transitions Rule required labels as of the applicable installation compliance date. This means that for specified components manufactured or imported on or after January 1, 2025, the final Technology Transition Rule's requirements continue to apply. These requirements include, among other things, that such components must be labeled with the statement "For servicing existing equipment only." This labeling is particularly important to distinguish components manufactured or imported before January 1, 2025, from those that are not.

The Technology Transitions Rule established recordkeeping and reporting requirements for any entity that manufactures or imports products or specified components that use or are intended to use HFCs in the sectors and subsectors covered in that rule. The reporting period for all sectors and subsectors starts on January 1, 2025, and the first reports must be submitted to the Agency by March 31, 2026.

This action does not add to nor modify the existing reporting and recordkeeping requirements for specified components. EPA is not establishing new reporting and recordkeeping requirements related to the sale or installation of components manufactured or imported prior to January 1, 2025. Reporting and recordkeeping is still required for specified components that are manufactured or imported on or after January 1, 2025.

D. Evaluation of the Subsection (i)(4) Factors

Subsection (i)(4) of the AIM Act directs EPA to factor in, to the extent practicable and using best available data, various considerations when carrying out a rulemaking under subsection (i). As discussed in detail in the preamble to the final Technology Transitions Rule, EPA views subsection (i)(4)(A) through (D) as providing overarching direction for setting restrictions under subsection (i). 88 FR at 73129–73141. EPA is not in this rule reconsidering the interpretations provided in the final Technology Transitions Rule regarding how it considers the factors laid out in subsection (i)(4). Nor is the Agency revisiting its analysis of the (i)(4) factors with respect to the residential and light commercial air conditioning and heat pump subsector as set forth in the final rule preamble. 88 FR 73177–73180. However, in issuing this narrow adjustment to the January 1, 2025, compliance date for the residential and light commercial air conditioning and heat pump subsector, we have considered the (i)(4) factors to the extent practicable, as applicable to the Agency's adjustment of that compliance date.

The issue being addressed by this interim final rule was brought to the Agency's attention by stakeholders impacted by the Technology Transitions Rule. As noted in EPA's discussion of subsection (i)(4)(A), in addition to information generated by other governing bodies and agencies, the Agency does also take into account information provided by industry, environmental organizations, trade associations, and academia, to name a few. *See* 88 FR 73129. We acknowledge that in some cases, regulated entities may be best situated to identify best available information regarding implementation challenges. We are as part of this action providing an opportunity for comment and invite stakeholders who may have information relevant to this action to weigh in.

With respect to the Agency's evaluation of the availability of substitutes under subsection (i)(4)(B), EPA previously determined that substitutes with a GWP less than 700 are available effective January 1, 2025, for the residential and light commercial air conditioning and heat pump subsector. EPA has not changed that determination and continues to find that substitutes with a GWP less than 700 will be available January 1, 2025, across this subsector. Manufacturers and importers in this subsector are currently making air conditioning and heat pump systems and components with lower-GWP refrigerants for other markets and are prepared to meet the January 1, 2025, installation compliance date for such systems. This action is not reconsidering the Agency's prior evaluation of the availability of substitutes for meeting the use restrictions issued in the final Technology Transitions Rule for this subsector; rather, this action is narrowly tailored to address the disposition of components manufactured or imported prior to January 1, 2025.

EPA's action to adjust the installation compliance date for certain installations within this subsector is motivated in large part by the policy goal of avoiding stranding inventory where possible. We believe this goal to be consistent with the direction in subsection (i)(4)(C), which instructs the Agency to factor in, to the extent practicable, overall economic costs and environmental impacts, as compared to historical trends. As discussed in the Technology Transitions Rule, EPA interprets (i)(4)(C) as purposefully accommodating different types and degrees of analysis of economic costs and environmental impacts, including costs and impacts that may be difficult to quantify. The narrow adjustment made in this interim final rule reduces the potential to unintentionally strand components. This action will not affect the overall consumption of HFCs and thus is not anticipated to have environmental impacts compared to the recently finalized Technology Transitions Rule. Further discussion of environmental impacts can be found in Section III.B.

EPA requests comment on the incremental costs and benefits associated with this action, including avoiding impacts such as stranded inventory (*e.g.,* number and type of units affected) and on the incremental impacts to regulated entities regarding compliance (*e.g.,* avoiding redistribution of equipment, avoiding revisions or new permits to replace previously secured building permits).

Finally, subsection (i)(4)(D) directs the Agency to factor in, to the extent practicable, the remaining phasedown period for regulated substances under the allowance allocation program. The reduction in the supply of HFCs is an important factor supporting compliance dates and GWP limits that are as stringent as feasible under the analysis of all the (i)(4) factors. EPA finds that this rule will not materially affect the demand for HFCs because it limits installations to components that were manufactured or imported prior to January 1, 2025. The effect of this rule is to extend the installations that EPA modeled to occur in 2024 over the two-year period of 2024 and 2025. EPA does not anticipate an increase from the total number of installed systems modeled in the Technology Transitions Rule's Regulatory Impact Assessment Addendum. Were the Agency to allow for the installation of new systems using components manufactured or imported through January 1, 2026, for instance, EPA would then find an effect on the

number of new systems and increased demand for HFCs.

IV. Other Matters

This interim rule is also providing a clarification regarding the scope of equipment within the household refrigerators and freezers subsector. For the reasons discussed below, household ice makers are not included within that subsector for purposes of the Technology Transitions Rule.

The proposed Technology Transitions Rule provided a functional description of the equipment found in each subsector and a non-exhaustive list of examples. EPA did not list all of the applications within a particular subsector given the variety of equipment types and end-uses. The proposed rule listed residential refrigeration systems as household refrigerators, freezers, and combination refrigerator/freezers and described the subsector as follows: "The designs and refrigeration capacities of equipment vary widely. Household freezers only offer storage space at freezing temperatures, while household refrigerators only offer storage space at non-freezing temperatures. Products with both a refrigerator and freezer in a single unit are most common. For purposes of this proposed rule, other small refrigerated household appliances such as chilled kitchen drawers, wine coolers, and minifridges also fall within this subsector." 87 FR 76785.

The final rule incorrectly added "household ice makers" to the list of examples. 88 FR 73173. The functional description of this subsector in the Technology Transitions Rule remained the same between proposal and final and was equipment that offers storage space at freezing and non-freezing temperatures. Residential ice makers merit additional consideration because they are primarily designed to produce the ice in addition to providing storage for that ice at freezing temperatures. The types of ice and processes used to make them may differ from the other equipment covered by the restrictions for this subsector and additional analysis of available substitutes for household ice makers is warranted. As such, EPA does not consider residential ice makers to be within the scope of the household refrigerators and freezers subsector or the requirements of the Technology Transitions Rule.

V. Statutory and Executive Order Review

Additional information about these statutes and Executive Orders can be found at *https://www.epa.gov/laws-regulations/laws-and-executive-orders.*

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 14094: Modernizing Regulatory Review

This action is a "significant regulatory action" under Executive Order 12866, as amended by Executive Order 14094. Nevertheless, the Office of Management and Budget waived review of this action. The EPA prepared an analysis of the potential impacts associated with this action. This analysis, *Regulatory Impact Analysis of the Proposed Waste Emission Charge,* is available in docket EPA–HQ–OAR–2023–0434 to this rulemaking and is briefly summarized in Section V of this preamble.

B. Paperwork Reduction Act (PRA)

This action does not impose an information collection burden under the PRA because it does not contain any information collection activities.

C. Regulatory Flexibility Act (RFA)

I certify that this action will not have a significant economic impact on a substantial number of small entities under the RFA. In making this determination, EPA concludes that the impact of concern for this rule is any significant adverse economic impact on small entities and that the agency is certifying that this rule will not have a significant economic impact on a substantial number of small entities because the rule relieves regulatory burden on the small entities subject to the rule. This rule prevents the stranding of components used to install residential and light commercial air conditioning and heat pump systems. We have therefore concluded that this action will relieve regulatory burden for all directly regulated small entities.

D. Unfunded Mandates Reform Act (UMRA)

This action does not contain any unfunded mandate as described in UMRA, 2 U.S.C. 1531–1538, and does not significantly or uniquely affect small governments. The action imposes no enforceable duty on any state, local or tribal governments or the private sector.

E. Executive Order 13132: Federalism

This action does not have federalism implications. It will not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications as specified in Executive Order 13175. It will not have substantial direct effects on tribal governments, on the relationship between the Federal government and Indian tribes, or on the distribution of power and responsibilities between the Federal government and Indian tribes, as specified in Executive Order 13175. Thus, Executive Order 13175 does not apply to this action.

G. Executive Order 13045: Protection of Children From Environmental Health and Safety Risks

EPA interprets Executive Order 13045 as applying only to those regulatory actions that concern environmental health or safety risks that EPA has reason to believe may disproportionately affect children, per the definition of "covered regulatory action" in section 2–202 of the Executive Order. This action is narrowly tailored to prevent the stranding of certain air conditioning and heat pump equipment while not affecting the demand for HFCs. Therefore, this action is not subject to Executive Order 13045 because it does not concern an environmental health risk or safety risk. Since this action does not concern human health, EPA's Policy on Children's Health also does not apply.

H. Executive Order 13211: Actions That Significantly Affect Energy Supply, Distribution, or Use

This action is not a "significant energy action" because it is not likely to have a significant adverse effect on the supply, distribution or use of energy. This action applies to certain regulated substances and certain applications containing regulated substances, none of which are used to supply or distribute energy.

I. National Technology Transfer and Advancement Act (NTTAA)

This rulemaking does not involve technical standards.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations and Executive Order 14096: Revitalizing Our Nation's Commitment to Environmental Justice for All

The EPA believes that this type of action does not concern human health or environmental conditions and therefore cannot be evaluated with respect to potentially disproportionate

and adverse effects on communities with environmental justice concerns. This action is narrowly tailored to prevent the stranding of inventory of air conditioning and heat pump equipment while not affecting the demand for HFCs.

Although this action does not concern human health or environmental conditions, the EPA identified and addressed environmental justice concerns within the Technology Transitions Rule (88 FR 73098; October 24, 2023).

K. Congressional Review Act (CRA)

This action is subject to the CRA, and the EPA will submit a rule report to each House of the Congress and to the Comptroller General of the United States. The CRA allows the issuing agency to make a rule effective sooner than otherwise provided by the CRA if the agency makes a good cause finding that notice and comment rulemaking procedures are impracticable, unnecessary or contrary to the public interest (5 U.S.C. 808(2)). The EPA has made a good cause finding for this rule as discussed in the supplementary information section of the preamble where this is discussed, including the basis for that finding.

List of Subjects in 40 CFR Part 84

Environmental protection, Administrative practice and procedure, Air pollution control, Chemicals, Climate change, Emissions, Imports, Reporting and recordkeeping requirements.

Michael S. Regan,

Administrator.

For the reasons stated in the preamble, EPA amends 40 CFR part 84 as follows:

PART 84—PHASEDOWN OF HYDROFLUOROCARBONS

■ 1. The authority citation for part 84 continues to read as follows:

Authority: Pub. L. 116–260, Division S, Sec. 103.

■ 2. Amend § 84.54 by revising paragraph (c)(1) as follows:

§ 84.54 Restrictions on the use of hydrofluorocarbons.

* * * * *

(c) * * *

(1) Effective January 1, 2025, residential or light commercial air-conditioning or heat pump systems using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater, except for variable refrigerant flow air-conditioning and heat pump systems. New residential and light commercial air-conditioning and heat pump systems using a regulated substance, or a blend containing a regulated substance, with a global warming potential of 700 or greater may be installed prior to January 1, 2026, where all specified components of that system are manufactured or imported prior to January 1, 2025.

* * * * *

[FR Doc. 2023–28500 Filed 12–22–23; 8:45 am]

BILLING CODE 6560–50–P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 300

[RTID 0648–XD573]

Fraser River Pink Salmon Fisheries; Inseason Orders

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Temporary rule; inseason orders.

SUMMARY: NMFS publishes inseason orders to regulate treaty tribal and non-tribal (all citizen) commercial salmon fisheries in United States (U.S.) waters of the Fraser River Panel (Panel) Area. The orders were issued by the (Panel) of the Pacific Salmon Commission (Commission) and subsequently approved and issued by NMFS during 2023 for pink salmon fisheries within the U.S. Panel Area. These orders established fishing dates, times, and areas for the gear types of U.S. treaty tribal and all citizen commercial fisheries during the period the Panel exercised jurisdiction over these fisheries.

DATES: The effective dates for the inseason orders are set out in this document under the heading Inseason Orders.

FOR FURTHER INFORMATION CONTACT: Anthony Siniscal at 971–322–8407, email: *Anthony.siniscal@noaa.gov.*

SUPPLEMENTARY INFORMATION: The Treaty between the Government of the United States of America and the Government of Canada concerning Pacific salmon was signed at Ottawa on January 28, 1985, and subsequently was given effect in the United States by the Pacific Salmon Treaty Act (Act) at 16 U.S.C. 3631–3644.

Under authority of the Act, Federal regulations at 50 CFR part 300, subpart F, provide a framework for the implementation of certain regulations of the Commission and inseason orders of the Commission's Panel for U.S. sockeye and pink salmon fisheries in the Fraser River Panel Area.

The regulations close the U.S. portion of the Panel Area to U.S. sockeye and pink salmon tribal and non-tribal commercial fishing unless opened by Panel regulations that are given effect by inseason orders issued by NMFS (50 CFR 300.94(a)(1)). During the fishing season, NMFS may issue inseason orders that establish fishing times and areas consistent with the Commission agreements and regulations of the Panel. Such orders must be consistent with domestic legal obligations and are issued by the Regional Administrator, West Coast Region, NMFS. Official notification of these inseason actions is provided by two telephone hotline numbers described at 50 CFR 300.97(b)(1) and in 84 FR 19729 (May 6, 2019). The inseason orders are published in the **Federal Register** as soon as practicable after they are issued. Due to the frequency with which inseason orders are issued, publication of orders during the fishing season is impracticable.

Inseason Orders

NMFS issued the following inseason orders for U.S. fisheries within Panel Area waters during the 2023 fishing season, consistent with the orders adopted by the Panel. Each of the following inseason actions was effective upon announcement on telephone hotline numbers as specified at 50 CFR 300.97(b)(1) and in 88 FR 30235 (May 11, 2023); those dates and times are listed herein. The times listed are local times, and the areas designated are Puget Sound Management and Catch Reporting Areas as defined in the Washington State Administrative Code at Chapter 220–301–030.

Fraser River Panel Order Number 2023–01: Issued 3:30 p.m., August 18, 2023

Treaty Tribal Fishery

Areas 4B, 5, and 6C: Open for drift gillnet fishing from 12 p.m. (noon), Saturday, August 19, 2023, through 12 p.m. (noon), Tuesday, August 22, 2023.

Areas 6, 7, and 7A: Open for net fishing from 5 a.m. through 9 p.m., Sunday, August 20, 2023.

Attachment # 4

Technology Transitions HFC Restrictions by Sector

Beginning January 1, 2025, certain technologies may no longer use high global warming potential (GWP) hydrofluorocarbons (HFCs) or HFC blends. Prohibitions apply to the manufacture, distribution, sale, installation, import, and export of products containing restricted HFCs and on the installation of new systems that use restricted HFCs. More information on the sectors and subsectors, regulatory context, and ongoing rulemakings is available on the Technology Transitions Program website <https://epa.gov/climate-hfcs-reduction/technology-transitions>.

- Aerosols – Restricted Products by Sector and Subsector Table
- Foams – Restricted Products by Sector and Subsector Table
- Self-contained Refrigeration, Air Conditioning, and Heat Pumps – Restricted Products by Sector and Subsector Table
- Refrigeration, Air Conditioning, and Heat Pumps – Restricted Systems by Sector and Subsector Table

More information

- Final Rule Fact Sheet: Restrictions on the Use of HFCs in Certain Sectors (PDF) <https://epa.gov/system/files/documents/2023-10/technology-transitions-final-rule-fact-sheet-2023.pdf> – Find tables of restricted products for all sectors and subsectors

Aerosols – Restricted Products by Sector and Subsector Table*

Subsector	Global Warming Potential Limit or Prohibited Substances	Manufacture and Import Compliance Date[1]
Consumer aerosol products	150	January 1, 2025
Technical aerosol products[2]	150	January 1, 2028

Foams – Restricted Products by Sector and Subsector Table*

Subsector	Global Warming Potential Limit or Prohibited Substances	Manufacture and Import Compliance Date[1]
Polyurethane[3] (rigid, flexible, integral skin, laminated boardstock)	150	January 1, 2025
Polystyrene extruded boardstock and billet and extruded sheet	150	January 1, 2025
Phenolic insulation board and bunstock	150	January 1, 2025

Subsector	Global Warming Potential Limit or Prohibited Substances	Manufacture and Import Compliance Date[1]
Polyisocyanurate laminated boardstock	150	January 1, 2025
Polyolefin	150	January 1, 2025

Self-contained Refrigeration, Air Conditioning, and Heat Pumps – Restricted Products by Sector and Subsector Table*

Sort by

- **Subsector**:

Show All Subsectors

Or, search:

Show 10 entries

Previous 1 2 3 4 Next

Subsector	Product	Global Warming Potential Limit or Prohibited Substances	Manufacture and Import Compliance Date[1]
Stationary residential and light commercial air conditioning and heat pumps (e.g., window units, portable room air conditioning)	Stationary residential and light commercial air conditioning and heat pumps (e.g., window units, portable room air conditioning)	700	January 1, 2025
Residential dehumidifiers	Residential dehumidifiers	700	January 1, 2025
Household refrigerators and freezers	Household refrigerators and freezers	150	January 1, 2025
Vending machines	Vending machines	150	January 1, 2025
Motor vehicle air conditioning	Light-duty passenger vehicles	150	Model Year 2025, and no earlier than [One year after date of publication in the Federal Register]
Motor vehicle air conditioning	Medium-duty passenger vehicles, heavy-duty pick-up trucks, complete heavy-duty vans	150	Model Year 2028
Motor vehicle air conditioning	Listed nonroad vehicles (agricultural tractors greater than 40 horsepower; self-propelled agricultural machinery; compact equipment; construction, forestry, and mining equipment; and commercial utility vehicles)	150	January 1, 2028

Subsector	Product	Global Warming Potential Limit or Prohibited Substances	Manufacture and Import Compliance Date[1]
Chillers (as a stand-alone product)	Industrial process refrigeration with exiting fluid below -50 °C (-58 °F)	Not covered	Not covered
Chillers (as a stand-alone product)	Industrial process refrigeration with exiting fluid greater than or equal to -50 °C (-58 °F) and less than -30 °C (-22 °F)	700	January 1, 2028
Chillers (as a stand-alone product)	Industrial process refrigeration with exiting fluid equal to or above -30 °C (-22 °F)	700	January 1, 2026

Showing 1 to 10 of 33 entries Previous 1 2 3 4 Next

Refrigeration, Air Conditioning, and Heat Pumps – Restricted Systems by Sector and Subsector Table*

Sort by

- **Subsector:** Show All Subsectors

Or, search:

Show 10 entries

Previous 1 2 3 Next

Subsector	System	Global Warming Potential Limit or Prohibited Substances	Installation Compliance Date[5]
Stationary residential and light commercial air conditioning and heat pumps	Residential and light commercial air conditioning and heat pump systems (e.g., mini-splits, unitary systems)	700	January 1, 2025[6]
Stationary air conditioning and heat pumps	Variable refrigerant flow systems	700	January 1, 2026
Chillers	Industrial process refrigeration with exiting fluid below -50 °C (-58 °F)	Not covered	Not covered
Chillers	Industrial process refrigeration with exiting fluid from -50 °C (-58 °F) to -30 °C (-22 °F)	700	January 1, 2028
Chillers	Industrial process refrigeration with exiting fluid above -30 °C (-22 °F)	700	January 1, 2026
Chillers	Comfort cooling	700	January 1, 2025

Subsector	System	Global Warming Potential Limit or Prohibited Substances	Installation Compliance Date[5]
Ice rinks	Ice rinks	700	January 1, 2025
Data centers, computer room air conditioning, and information technology equipment cooling	Data centers, computer room air conditioning, and information technology equipment cooling	700	January 1, 2027
Industrial process refrigeration (not using chillers)	With 200 or more lb refrigerant charge excluding high temperature side of cascade system and temperature of the refrigerant entering the evaporator above -30 °C (-22 °F)	150	January 1, 2026
Industrial process refrigeration (not using chillers)	With less than 200 lb refrigerant charge and temperature of the refrigerant entering the evaporator above -30 °C (-22 °F)	300	January 1, 2026

Showing 1 to 10 of 28 entries Previous 1 2 3 Next

*These tables are for informational purposes only and should not be relied on for compliance purposes. Please refer to 40 CFR Part 84, Subpart B for full details.

1. Sale, distribution, and export of these products is prohibited three years after the manufacture and import compliance date.

2. See regulatory text for specific types of aerosol products subject to the later compliance date. Excludes metered dose inhalers using HFC-134a or HFC-227ea or defense sprays using HFC-134a as a propellant.

3. Includes blown foam, products incorporating blown foam, and pre-blended polyol products. Excludes composite structural preformed polyurethane foam for trailer use and for marine use.

4. New products only; does not apply to equipment that is operational during transport.

5. EPA is restricting the installation of new field-assembled systems. Components used to repair existing systems are not subject to these restrictions.

6. New systems with a GWP above 700 can be installed until January 1, 2026, so long as all components are manufactured or imported prior to January 1, 2025 (refer to the Interim Final Rule <https://epa.gov/climate-hfcs-reduction/regulatory-actions-technology-transitions> for additional details).

Contact Us <https://epa.gov/climate-hfcs-reduction/forms/contact-us-about-reducing-hfcs> to ask a question, provide feedback, or report a problem.

LAST UPDATED ON DECEMBER 21, 2023

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Attachment # 5

IMC 2024
Chapter 11 Refrigeration
Section 1101 General

1101.1 Scope.

This chapter shall govern the design, installation, construction and repair of *refrigeration systems*. Permanently installed refrigerant storage systems and other components shall be considered as part of the *refrigeration system* to which they are attached.

1101.1.1 Refrigerants other than ammonia.

Refrigeration systems using a refrigerant other than ammonia shall comply with this chapter, ASHRAE 15 and the *International Fire Code*. *Refrigeration systems* containing carbon dioxide as the refrigerant shall also comply with IIAR CO2 .

1101.1.2 Ammonia refrigerant.

Refrigeration systems using ammonia refrigerant shall comply with IIAR 2 for system design, IIAR 3 for valves, IIAR 4 for installation, IIAR 5 for start-up, and IIAR 6 and shall not be required to comply with this chapter.

1101.2 Factory-built equipment and appliances.

Listed and *labeled* self-contained, factory-built *equipment* and *appliances* shall be tested in accordance with the applicable standards specified in Table 1101.2.
Such *equipment* and *appliances* are deemed to meet the design, manufacture and factory test requirements of this code if installed in accordance with their listing and the manufacturer's instructions.

Table **1101.2 Factory-built equipment and appliances**

EQUIPMENT	STANDARDS
→	
Air-conditioning equipment	UL 1995 or UL/CSA 60335-2-40
Packaged terminal air conditioners and heat pumps	UL 484 or UL/CSA 60335-2-40
Split-system air conditioners and heat pumps	UL 1995 or UL/CSA 60335-2-40
Dehumidifiers	UL 474 or UL/CSA 60335-2-40
Unit coolers	UL 412 or UL/CSA 60335-2-89
Commercial refrigerators, freezers, beverage coolers and walk-in coolers	UL 471 or UL/CSA 60335-2-89

Refrigerating units and walk-in coolers	UL 427 or UL 60335-2-89
Refrigerant-containing components and accessories	UL 207

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.

1101.3 Protection.
Any portion of a *refrigeration system* that is subject to physical damage shall be protected in an *approved* manner.

1101.4 Water connection.
Water supply and discharge connections associated with *refrigeration systems* shall be made in accordance with this code and the *International Plumbing Code*.

1101.5 Fuel gas connection.
Fuel gas devices, *equipment* and *appliances* used with *refrigeration systems* shall be installed in accordance with the *International Fuel Gas Code*.

1101.6 Maintenance.
Refrigeration systems shall be maintained in proper operating condition, free from accumulations of oil, dirt, waste, excessive corrosion, other debris and leaks.

1101.7 Changing refrigerant.
Changes of refrigerant in an existing system to a refrigerant with a different *refrigerant designation* shall be allowed only where in accordance with the following:

1. The owner or the owner's authorized agent shall be notified prior to making a change of refrigerant, and the change of refrigerant shall not be made where the owner objects to the change.
2. The change in refrigerant shall be in accordance with one of the following:
    1) Written instructions of the original equipment manufacturer.
    2) An evaluation of the system by a *registered design professional* or by an *approved* agency that validates safety and suitability of the replacement refrigerant.
    3) *Approved* by the code official.
3. Where the replacement refrigerant is classified into the same safety group, requirements that were applicable to the existing system shall continue to apply.
4. Where the replacement refrigerant is classified into a different safety group, the system shall comply with the requirements of this standard for a new installation, and the change of refrigerant shall require code official approval.

[F] 1101.8 Refrigerant discharge.
Notification of refrigerant discharge shall be provided in accordance with the *International Fire Code*.

1101.9 Locking access port caps.
Refrigerant circuit access ports located outdoors shall be fitted with locking-type tamper-resistant caps or shall be otherwise secured to prevent unauthorized access.

Exception: This section shall not apply to refrigerant circuit access ports on *equipment* installed in controlled areas such as on roofs with locked access hatches or doors.

Section 1102 System requirements

1102.1 General.

The refrigeration system classification, allowable refrigerants, maximum quantity, enclosure requirements, location limitations, and field pressure test requirements shall be determined as follows:

1. Determine the *refrigeration system's* classification, in accordance with Section 1103.3.
2. Determine the refrigerant classification in accordance with Section 1103.1.
3. Determine the maximum allowable quantity of refrigerant in accordance with Section 1104, based on type of refrigerant, refrigeration system classification and *occupancy*.
4. Determine the *refrigeration system* enclosure requirements in accordance with Section 1104.
5. Refrigeration *equipment* and *appliance* location and installation shall be subject to the limitations of Chapter 3.
6. Nonfactory-tested, field-erected *equipment* and *appliances* shall be pressure tested in accordance with Section 1108.

1102.2 Refrigerants.

The refrigerant shall be that which the *equipment* or *appliance* was designed to utilize or converted to utilize. Refrigerants not identified in Table 1103.1 shall be *approved* before use.

1102.2.1 Mixing.

Refrigerants with different *refrigerant designations* shall only be mixed in a system in accordance with both of the following:

1. The addition of a second refrigerant is allowed by the equipment manufacturer and is in accordance with the manufacturer's written instructions.
2. The resulting mixture does not change the refrigerant safety group.

1102.2.2 Purity.

Refrigerants used in *refrigeration systems* shall be new, recovered or *reclaimed refrigerants* in accordance with Section 1102.2.2.1, 1102.2.2.2 or 1102.2.2.3. Where required by the *equipment* or *appliance* owner or the code official, the installer shall furnish a signed declaration that the refrigerant used meets the requirements of Section 1102.2.2.1, 1102.2.2.2 or 1102.2.2.3.

Exception: The refrigerant used shall meet the purity specifications set by the manufacturer of the *equipment* or *appliance* in which such refrigerant is used where such specifications are different from that specified in Sections 1102.2.2.1, 1102.2.2.2 and 1102.2.2.3.

1102.2.2.1 New refrigerants.

Refrigerants shall be of a purity level specified by the *equipment* or *appliance* manufacturer.

1102.2.2.2 Recovered refrigerants.

Refrigerants that are recovered from refrigeration and air-conditioning systems shall not be reused in other than the system from which they were recovered and in other systems of the same owner. *Recovered refrigerants* shall be filtered and dried before reuse. *Recovered refrigerants* that show clear signs of contamination shall not be reused unless reclaimed in accordance with Section 1102.2.2.3.

1102.2.2.3 Reclaimed refrigerants.

Used refrigerants shall not be reused in a different owner's *equipment* or *appliances* unless tested and found to meet the purity requirements of AHRI 700. Contaminated refrigerants shall not be used unless reclaimed and found to meet the purity requirements of AHRI 700.

1102.3 Access port protection.

Refrigerant access ports shall be protected in accordance with Section 1101.9 whenever refrigerant is added to or recovered from refrigeration or air-conditioning systems.

Section 1103 Refrigeration system classification

1103.1 Refrigerant classification.

Refrigerants shall be classified in accordance with ASHRAE 34 as listed in Table 1103.1.

Table **1103.1 Refrigerant classification, amount and OEL**

CHEMICAL REFRIGERANT	FORMULA	CHEMICAL NAME OF BLEND	REFRIGERANT SAFETY GROUP CLASSIFICATION	AMOUNT OF REFRIGERANT PER OCCUPIED SPACE							(F) DEGREES OF HAZARD[a]
				RCL			LFL			OEL	
				lb/MCf	ppm	g/m³	lb/MCf	ppm	g/m³	ppm	
R-11[c]	CCl_3F	trichlorofluoromethane	A1	0.39	1,100	6.1	—	—	—	1,000	2-0-0[b]
R-12[c]	CCl_2F_2	dichlorodifluoromethane	A1	5.6	18,000	90	—	—	—	1,000	2-0-0[b]
R-13[c]	$CClF_3$	chlorotrifluoromethane	A1	—	—	—	—	—	—	1,000	2-0-0[b]
R-13B1[c]	$CBrF_3$	bromotrifluoromethane	A1	—	—	—	—	—	—	1,000	2-0-0[b]
R-13I1	CF_3I	trifluoroiodomethane	A1	1.0	2,000	16	—	—	—	500	—
R-14	CF_4	tetrafluoromethane (carbon tetrafluoride)	A1	25	110,000	400	—	—	—	1,000	2-0-0[b]
R-22	$CHClF_2$	chlorodifluoromethane	A1	13	59,000	210	—	—	—	1,000	2-0-0[b]
R-23	CHF_3	trifluoromethane (fluoroform)	A1	7.3	41,000	120	—	—	—	1,000	2-0-0[b]
R-30	CH_2Cl_2	dichloromethane (methylene chloride)	B1	—	—	—	—	—	—	—	—
R-31	CH_2ClF	chlorofluoromethane	—	—	—	—	—	—	—	—	—
R-32	CH_2F_2	difluoromethane (methylene fluoride)	A2L	4.8	36,000	77	19.1	144,000	306	1,000	1-4-0
R-40	CH_3Cl	chloromethane (methyl chloride)	B2	—	—	—	—	—	—	—	—

R-41	CH_3F	fluoromethane (methyl fluoride)	—	—	—	—	—	—	—	—	—
R-50	CH_4	methane	A3	—	—	—	—	50,000	—	1,000	—
R-113[c]	CCl_2FCClF_2	1,1,2-trichloro-1,2,2-trifluoroethane	A1	1.2	2,600	20	—	—	—	1,000	2-0-0[b]
R-114[c]	$CClF_2CClF_2$	1,2-dichloro-1,1,2,2-tetrafluoroethane	A1	8.7	20,000	140	—	—	—	1,000	2-0-0[b]
R-115	$CClF_2CF_3$	chloropentafluoroethane	A1	47	120,000	760	—	—	—	1,000	—
R-116	CF_3CF_3	hexafluoroethane	A1	34	97,000	550	—	—	—	1,000	1-0-0
R-123	$CHCl_2CF_3$	2,2-dichloro-1,1,1-trifluoroethane	B1	3.5	9,100	57	—	—	—	50	2-0-0[b]
R-124	$CHClFCF_3$	2-chloro-1,1,1,2-tetrafluoroethane	A1	3.5	10,000	56	—	—	—	1,000	2-0-0[b]
R-125	CHF_2CF_3	pentafluoroethane	A1	23	75,000	370	—	—	—	1,000	2-0-0[b]
R-134a	CH_2FCF_3	1,1,1,2-tetrafluoroethane	A1	13	50,000	210	—	—	—	1,000	2-0-0[b]
R-141b	CH_3CCl_2F	1,1-dichloro-1-fluoroethane	—	0.78	2,600	12	17.8	60,000	287	500	2-1-0
R-142b	CH_3CClF_2	1-chloro-1, 1-difluoroethane	A2	5.1	20,000	82	20.4	80,000	329	1,000	2-4-0
R-143a	CH_3CF_3	1,1,1-trifluoroethane	A2L	4.4	21,000	70	17.5	82,000	282	1,000	2-0-0[b]
R-152a	CH_3CHF_2	1,1-difluoroethane	A2	2.0	12,000	32	8.1	48,000	130	1,000	1-4-0
R-170	CH_3CH_3	ethane	A3	0.54	7,000	8.6	2.4	31,000	38	1,000	2-4-0
R-E170	CH_3OCH_3	Methoxymethane (dimethyl ether)	A3	1.0	8,500	16	4.0	34,000	64	1,000	—
R-218	$CF_3CF_2CF_3$	octafluoropropane	A1	43	90,000	690	—	—	—	1,000	2-0-0[b]
R-227ea	CF_3CHFCF_3	1,1,1,2,3,3,3-heptafluoropropane	A1	36	84,000	580	—	—	—	1,000	—
R-236fa	$CF_3CH_2CF_3$	1,1,1,3,3,3-hexafluoropropane	A1	21	55,000	340	—	—	—	1,000	2-0-0[b]
R-245fa	$CHF_2CH_2CF_3$	1,1,1,3,3-pentafluoropropane	B1	12	34,000	190	—	—	—	300	2-0-0[b]
R-290	$CH_3CH_2CH_3$	propane	A3	0.59	5,300	9.5	2.4	21,000	38	1,000	2-4-0
R-C318	$-(CF_2)_4-$	octafluorocyclobutane	A1	41	80,000	650	—	—	—	1,000	—
R-400[c]	zeotrope	R-12/114 (50.0/50.0)	A1	10	28,000	160	—	—	—	1,000	2-0-0[b]
R-400[c]	zeotrope	R-12/114 (60.0/40.0)	A1	11	30,000	170	—	—	—	1,000	—
R-401A	zeotrope	R-22/152a/124 (53.0/13.0/34.0)	A1	6.6	27,000	110	—	—	—	1,000	2-0-0[b]

R-401B	zeotrope	R-22/152a/124 (61.0/11.0/28.0)	A1	7.2	30,000	120	—	—	—	1,000	2-0-0[b]
R-401C	zeotrope	R-22/152a/124 (33.0/15.0/52.0)	A1	5.2	20,000	84	—	—	—	1,000	2-0-0[b]
R-402A	zeotrope	R-125/290/22 (60.0/2.0/38.0)	A1	17	66,000	270	—	—	—	1,000	2-0-0[b]
R-402B	zeotrope	R-125/290/22 (38.0/2.0/60.0)	A1	15	63,000	240	—	—	—	1,000	2-0-0[b]
R-403A	zeotrope	R-290/22/218 (5.0/75.0/20.0)	A2	7.6	33,000	120	—	—	—	1,000	2-0-0[b]
R-403B	zeotrope	R-290/22/218 (5.0/56.0/39.0)	A1	18	68,000	290	—	—	—	1,000	2-0-0[b]
R-404A	zeotrope	R-125/143a/134a (44.0/52.0/4.0)	A1	31	130,000	500	—	—	—	1,000	2-0-0[b]
R-405A	zeotrope	R-22/152a/142b/C318 (45.0/7.0/5.5/42.5)	—	16	57,000	260	—	—	—	1,000	—
R-406A	zeotrope	R-22/600a/142b (55.0/4.0/41.0)	A2	4.7	21,000	75	18.8	82,000	301.9	1,000	—
R-407A	zeotrope	R-32/125/134a (20.0/40.0/40.0)	A1	19	83,000	300	—	—	—	1,000	2-0-0[b]
R-407B	zeotrope	R-32/125/134a (10.0/70.0/20.0)	A1	21	79,000	330	—	—	—	1,000	2-0-0[b]
R-407C	zeotrope	R-32/125/134a (23.0/25.0/52.0)	A1	18	81,000	290	—	—	—	1,000	2-0-0[b]
R-407D	zeotrope	R-32/125/134a (15.0/15.0/70.0)	A1	16	68,000	250	—	—	—	1,000	2-0-0[b]
R-407E	zeotrope	R-32/125/134a (25.0/15.0/60.0)	A1	17	80,000	280	—	—	—	1,000	2-0-0[b]
R-407F	zeotrope	R-32/125/134a (30.0/30.0/40.0)	A1	20	95,000	320	—	—	—	1,000	—
R-407G	zeotrope	R-32/125/134a (2.5/2.5/95.0)	A1	13	52,000	210	—	—	—	1,000	—
R-407H	zeotrope	R-32/125/134a (32.5/15.0/52.5)	A1	19	92,000	300	—	—	—	1,000	—
R-407I	zeotrope	R-32/125/124a (19.5/8.5/72.0)	A1	16	71,100	250	—	—	—	1,000	—
R-408A	zeotrope	R-125/143a/22 (7.0/46.0/47.0)	A1	21	94,000	330	—	—	—	1,000	2-0-0[b]
R-409A	zeotrope	R-22/124/142b (60.0/25.0/15.0)	A1	7.1	29,000	110	—	—	—	1,000	2-0-0[b]
R-409B	zeotrope	R-22/124/142b (65.0/25.0/10.0)	A1	7.3	30,000	120	—	—	—	1,000	2-0-0[b]
R-410A	zeotrope	R-32/125 (50.0/50.0)	A1	26	140,000	420	—	—	—	1,000	2-0-0[b]
R-410B	zeotrope	R-32/125 (45.0/55.0)	A1	27	140,000	430	—	—	—	1,000	2-0-0[b]
R-411A	zeotrope	R-127/22/152a (1.5/87.5/11.0)	A2	2.9	14,000	46	11.6	55,000	185.6	970	—

R-411B	zeotrope	R-1270/22/152a (3.0/94.0/3.0)	A2	2.8	13,000	45	14.8	70,000	238.3	940	—
R-412A	zeotrope	R-22/218/142b (70.0/5.0/25.0)	A2	5.1	22,000	82	20.5	87,000	328.6	1,000	—
R-413A	zeotrope	R-218/134a/600a (9.0/88.0/3.0)	A2	5.8	22,000	93	23.4	88,000	374.9	1,000	—
R-414A	zeotrope	R-22/124/600a/142b (51.0/28.5/4.0/16.5)	A1	6.4	26,000	100	—	—	—	1,000	—
R-414B	zeotrope	R-22/124/600a/142b (50.0/39.0/1.5/9.5)	A1	6.0	23,000	96	—	—	—	1,000	—
R-415A	zeotrope	R-22/152a (82.0/18.0)	A2	2.9	14,000	47	—	—	—	1,000	—
R-415B	zeotrope	R-22/152a (25.0/75.0)	A2	2.1	12,000	34	—	—	—	1,000	—
R-416A	zeotrope	R-134a/124/600 (59.0/39.5/1.5)	A1	3.9	14,000	62	—	—	—	1,000	2-0-0[b]
R-417A	zeotrope	R-125/134a/600 (46.6/50.0/3.4)	A1	3.5	13,000	55	—	—	—	1,000	2-0-0[b]
R-417B	zeotrope	R-125/134a/600 (79.0/18.3/2.7)	A1	4.3	15,000	69	—	—	—	1,000	—
R-417C	zeotrope	R-125/134a/600 (19.5/78.8/1.7)	A1	5.4	21,000	87	—	—	—	1,000	—
R-418A	zeotrope	R-290/22/152a (1.5/96.0/2.5)	A2	4.8	22,000	77	19.2	89,000	308.4	1,000	—
R-419A	zeotrope	R-125/134a/E170 (77.0/19.0/4.0)	A2	4.2	15,000	67	16.7	60,000	268.6	1,000	—
R-419B	zeotrope	R-125/134a/E170 (48.5/48.0/3.5)	A2	4.6	17,000	74	18.5	69,000	297.3	1,000	—
R-420A	zeotrope	R-134a/142b (88.0/12.0)	A1	12	44,000	180	—	—	—	1,000	2-0-0[b]
R-421A	zeotrope	R-125/134a (58.0/42.0)	A1	17	61,000	280	—	—		1,000	2-0-0[b]
R-421B	zeotrope	R-125/134a (85.0/15.0)	A1	21	69,000	330	—	—	—	1,000	2-0-0[b]
R-422A	zeotrope	R-125/134a/600a (85.1/11.5/3.4)	A1	18	63,000	290	—	—	—	1,000	2-0-0[b]
R-422B	zeotrope	R-125/134a/600a (55.0/42.0/3.0)	A1	16	56,000	250	—	—	—	1,000	2-0-0[b]
R-422C	zeotrope	R-125/134a/600a (82.0/15.0/3.0)	A1	18	62,000	290	—	—	—	1,000	2-0-0[b]
R-422D	zeotrope	R-125/134a/600a (65.1/31.5/3.4)	A1	16	58,000	260	—	—	—	1,000	2-0-0[b]
R-422E	zeotrope	R-125/134a/600a (58.0/39.3/2.7)	A1	16	57,000	260	—	—	—	1,000	—
R-423A	zeotrope	R-134a/227ea (52.5/47.5)	A1	19	59,000	300	—	—	—	1,000	2-0-0[b]
R-424A	zeotrope	R-125/134a/600a/600/601a (50.5/47.0/0.9/1.0/0.6)	A1	6.2	23,000	100	—	—	—	990	2-0-0[b]

R-425A	zoetrope	R-32/134a/227ea (18.5/69.5/12.0)	A1	16	72,000	260	—	—	—	1,000	2-0-0[b]
R-426A	zeotrope	R-125/134a/600a/601a (5.1/93.0/1.3/0.6)	A1	5.2	20,000	83	—	—	—	990	—
R-427A	zeotrope	R-32/125/143a/134a (15.0/25.0/10.0/50.0)	A1	18	79,000	290	—	—	—	1,000	2-1-0
R-428A	zeotrope	R-125/143a/290/600a (77.5/20.0/0.6/1.9)	A1	23	84,000	370	—	—	—	1,000	—
R-429A	zeotrope	R-E170/152a/600a (60.0/10.0/30.0)	A3	0.81	6,300	13	3.2	25,000	83.8	1,000	—
R-430A	zeotrope	R-152a/600a (76.0/24.0)	A3	1.3	8,000	21	5.2	32,000	44.0	1,000	—
R-431A	zeotrope	R-290/152a (71.0/29.0)	A3	0.68	5,500	11	2.7	22,000	38.6	1,000	—
R-432A	zeotrope	R-1270/E170 (80.0/20.0)	A3	0.13	1,200	2.1	2.4	22,000	39.2	550	—
R-433A	zeotrope	R-1270/290 (30.0/70.0)	A3	0.34	3,100	5.5	2.4	20,000	32.4	750	—
R-433B	zeotrope	R-1270/290 (5.0-95.0)	A3	0.39	3,500	6.3	2.0	18,000	32.1	950	—
R-433C	zeotrope	R-1270/290 (25.0-75.0)	A3	0.41	3,700	6.5	2.0	18,000	83.8	790	—
R-434A	zeotrope	R-125/143a/600a (63.2/18.0/16.0/2.8)	A1	20	73,000	320	—	—	—	1,000	—
R-435A	zeotrope	R-E170/152a (80.0/20.0)	A3	1.1	8,500	17	4.3	34,000	68.2	1,000	—
R-436A	zeotrope	R-290/600a (56.0/44.0)	A3	0.50	4,000	8.1	2.0	16,000	32.3	1,000	—
R-436B	zeotrope	R-290/600a (52.0/48.0)	A3	0.51	4,000	8.2	2.0	16,000	32.7	1,000	—
R-436C	zeotrope	R-290/600a (95.0/5.0)	A3	0.57	5,000	9.1	2.3	20,000	36.5	1,000	—
R-437A	zeotrope	R-125/134a/600/601 (19.5/78.5/1.4/0.6)	A1	5.1	19,000	82	—	—	—	990	—
R-438A	zeotrope	R-32/125/134a/600/601a (8.5/45.0/44.2/1.7/0.6)	A1	4.9	20,000	79	—	—		990	—
R-439A	zeotrope	R-32/125/600a (50.0/47.0/3.0)	A2	4.7	26,000	76	18.9	104,000	303.3	1,000	—
R-440A	zeotrope	R-290/134a/152a (0.6/1.6/97.8)	A2	1.9	12,000	31	7.8	46,000	124.7	1,000	—
R-441A	zeotrope	R-170/290/600a/600 (3.1/54.8/6.0/36.1)	A3	0.39	3,200	6.3	2.0	16,000	31.7	1,000	—
R-442A	zeotrope	R-32/125/134a/152a/227ea (31.0/31.0/30.0/3.0/5.0)	A1	21	100,000	330	—	—		1,000	—

R-443A	zeotrope	R-1270/290/600a (55.0/40.0/5.0)	A3	0.19	1,700	3.1	2.2	20,000	35.6	640	—
R-444A	zeotrope	R-32/152a/1234ze(E) (12.0/5.0/83.0)	A2L	5.1	21,000	81	19.9	82,000	324.8	850	—
R-444B	zeotrope	R-32/152a/1234ze(E) (41.5/10.0/48.5)	A2L	4.3	23,000	69	17.3	93,000	277.3	930	—
R-445A	zeotrope	R-744/134a/1234ze(E) (6.0/9.0/85.0)	A2L	4.2	16,000	67	2.7	63,000	347.4	930	—
R-446A	zeotrope	R-32/1234ze(E)/600 (68.0/29.0/3.0)	A2L	2.5	16,000	39	13.5	62,000	217.4	960	—
R-447A	zeotrope	R-32/125/1234ze(E) (68.0/3.5/28.5)	A2L	2.6	16,000	42	18.9	65,000	303.5	960	—
R-447B	zeotrope	R-32/125/1234ze(E) (68.0/8.0/24.0)	A2L	2.6	16,000	42	20.6	121,000	312.7	970	—
R-448A	zeotrope	R-32/125/1234yf/134a/1234ze(E) (26.0/26.0/20.0/21.0/7.0)	A1	24	110,000	390	—	—		860	—
R-449A	zeotrope	R-32/125/1234yf/134a (24.3/24.7/25.3/25.7)	A1	23	100,000	370	—	—	—	840	—
R-449B	zeotrope	R-32/125/1234yf/134a (25.2/24.3/23.2/27.3)	A1	23	100,000	370	—	—	—	850	—
R-449C	zeotrope	R-32/125/1234yf/134a (20.0/20.0/31.0/29.0)	A1	23	98,000	360	—	—		800	—
R-450A	zeotrope	R-134a/1234ze(E) (42.0/58.0)	A1	20	72,000	320	—	—	—	880	—
R-451A	zeotrope	R-1234yf/134a (89.8/10.2)	A2L	5.0	18,000	81	20.3	70,000	326.6	530	—
R-451B	zeotrope	R-1234yf/134a (88.8/11.2)	A2L	5.0	18,000	81	20.3	70,000	326.6	530	—
R-452A	zeotrope	R-32/125/1234yf (11.0/59.0/30.0)	A1	27	100,000	440	—	—		790	—
R-452B	zeotrope	R-32/125/1234yf (67.0/7.0/26.0)	A2L	4.8	30,000	77	19.3	119,000	310.5	870	—
R-452C	zeotrope	R-32/125/1234yf (12.5/61.0/26.5)	A1	27	100,000	430	—	—	—	810	—
R-453A	zeotrope	R-32/125/134a/227ea/600/601a (20.0/20.0/53.8/5.0/0.6/0.6)	A1	7.8	34,000	120	—	—		1,000	—
R-454A	zeotrope	R-32/1234yf (35.0/65.0)	A2L	3.2	16,000	52	18.3	63,000	293.9	690	—
R-454B	zeotrope	R-32/1234yf (68.9/31.1)	A2L	3.1	19,000	49	22.0	77,000	352.6	850	—
R-454C	zeotrope	R-32/1234yf (21.5/78.5)	A2L	4.4	19,000	71	18.0	62,000	289.5	620	—

R-455A	zeotrope	R-744/32/1234yf (3.0/21.5/75.5)	A2L	4.9	22,000	79	26.9	118,000	432.1	650	—
R-456A	zeotrope	R-32/134a/1234ze(E) (6.0/45.0/49.0)	A1	20	77,000	320	—	—	—	900	—
R-457A	zeotrope	R-32/1234yf/152a (18.0/70.0/12.0)	A2L	3.4	15,000	54	13.5	60,000	216.3	650	—
R-457B	zeotrope	R-32/1234yf/152a (35.0/55.0/10.0)	A2L	3.7	19,000	59	14.9	76,000	239	730	—
R-458A	zeotrope	R-32/125/134a/227ea/236fa (20.5/4.0/61.4/13.5/0.6)	A1	18	76,000	280	—	—		1,000	—
R-459A	zeotrope	R-32/1234yf/1234ze(E) (68.0/26.0/6.0)	A2L	4.3	27,000	69	17.4	107,000	278.7	870	—
R-459B	zeotrope	R-32/1234yf/1234ze(E) (21.0/69.0/10.0)	A2L	30	25,000	92	23.3	99,000	373.5	640	—
R-460A	zeotrope	R-32/125/134a/1234ze(E) (12.0/52.0/14.0/22.0)	A1	24	92,000	380	—	—	—	950	—
R-460B	zeotrope	R-32/125/134a/1234ze(E) (28.0/25.0/20.0/27.0)	A1	25	120,000	400	—	—	—	950	—
R-460C	zeotrope	R-32/125/134a/1234ze(E) (2.5/2.5/46.0/49.0)	A1	20	73,000	310	—	—	—	900	—
R-461A	zeotrope	R-125/143a/134a/227ea/600a (55.0/5.0/32.0/5.0/3.0)	A1	17	61,000	270	—	—	—	1,000	—
R-462A	zeotrope	R-32/125/143a/134a/600 (9.0/42.0/2.0/44.0/3.0)	A2	3.9	16,000	62	16.6	105,000	265.8	1,000	—
R-463A	zeotrope	R-744/32/125/1234yf/134a (6.0/36.0/30.0/14.0/14.0)	A1	19	98,000	300	—	—	—	990	—
R-464A	zeotrope	R-32/125/1234ze(E)/227ea (27.0/27.0/40.0/6.0)	A1	27	120,000	430	—	—	—	930	—
R-465A	zeotrope	R-32/290/1234yf (21.0/7.9/71.1)	A2	2.5	12,000	40	10.0	98,000	160.9	660	—
R-466A	zeotrope	R-32/125/13I1 (49.0/11.5/39.5)	A1	6.2	30,000	99	—	—		860	—

R-467A	zeotrope	R-32/125/134a/600a (22.0/5.0/72.4/0.6)	A2L	6.7	31,000	110	—	—		1,000	—
R-468A	zeotrope	R-1132a/32/1234yf (3.5/21.5/75.0)	A2L	4.1	18,000	66	—	—	—	610	—
R-469A	zeotrope	R-744/R-32/R-125 (35.0/32.5/32.5)	A1	8	53,000		—	—	—	1,600	—
R-470A	zeotrope	R-744/32/125/134a/1234ze(E)/227ea (10.0/17.0/19.0/7.0/44.0/3.0)	A1	17	77,000	270	—	—	—	1,100	—
R-470B	zeotrope	R-744/32/125/134a/1234ze(E)/227ea (10.0/17.0/19.0/7.0/44.0/3.0)	A1	16	72,000	270	—	—	—	1,100	—
R-471A	zeotrope	R-1234ze(E)/227ea/1336mzz(E) (78.7/4.3/17.0)	A1	9.7	31,000	160	—	—		710	—
R-472A	zeotrope	R-744/32/134a (69.0/12.0/19.0)	A1	4.5	35,000	72	—	—	—	2,700	—
R-500[d]	azeotrope	R-12/152a (73.8/26.2)	A1	7.4	29,000	120	—	—	—	1,000	2-0-0[b]
R-501[c]	azeotrope	R-22/12 (75.0/25.0)	A1	13	54,000	210	—	—	—	1,000	—
R-502[d]	azeotrope	R-22/115 (48.8/51.2)	A1	21	73,000	330	—	—	—	1,000	2-0-0[b]
R-503[d]	azeotrope	R-23/13 (40.1/59.9)	—	—	—	—	—	—	—	1,000	2-0-0[b]
R-504[c]	azeotrope	R-32/115 (48.2/51.8)	—	28	140,000	450	—	—	—	1,000	—
R-507A	azeotrope	R-125/143a (50.0/50.0)	A1	32	130,000	510	—	—	—	1,000	2-0-0[b]
R-508A	azeotrope	R-23/116 (39.0/61.0)	A1	14	55,000	220	—	—	—	1,000	2-0-0[b]
R-508B	azeotrope	R-23/116 (46.0/54.0)	A1	13	52,000	200	—	—	—	1,000	2-0-0[b]
R-509A	azeotrope	R-22/218 (44.0/56.0)	A1	24	75,000	380	—	—	—	1,000	2-0-0[b]
R-510A	azeotrope	R-E170/600a (88.0/12.0)	A3	0.87	7,300	14	3.5	29,000	56.1	1,000	—
R-511A	azeotrope	R-290/E170 (95.0/5.0)	A3	0.59	5,300	9.5	2.4	21,000	38.0	1,000	—
R-512A	azeotrope	R-134a/152a (5.0/95.0)	A2	1.9	11,000	31	7.7	45,000	123.9	1,000	—
R-513A	azeotrope	R-1234yf/134a (56.0/44.0)	A1	20	72,000	320	—	—	—	650	—
R-513B	azeotrope	R-1234yf/134a (58.5/41.5)	A1	21	74,000	330	—	—	—	640	—

R-514A	azeotrope	R-1336mzz(S)/1130(E) (74.7/25.3)	B1	0.86	2,400	14	—	—	—	320	—
R-515A	azeotrope	R-1234ze(E)/227ea (88.0/12.0)	A1	19	63,000	300	—	—	—	810	—
R-515B	azeotrope	R-1234ze(E)/227ea (91.1/8.9)	A1	18	61,000	290	—	—		810	
R-516A	azeotrope	R-1234yf/134a/152a (77.5/8.5/14.0)	A2	3.2	13,000	52	13.1	50,000	210.1	590	—
R-600	$CH_3CH_2CH_2CH_3$	butane	A3	0.15	1,000	2.4	3.0	20,000	48	1,000	1-4-0
R-600a	$CH(CH_3)_2CH_3$	2-methylpropane (isobutane)	A3	0.59	4,000	9.5	2.4	16,000	38	1,000	2-4-0
R-601	$CH_3CH_2CH_2CH_2CH_3$	pentane	A3	0.18	1,000	2.9	2.2	12,000	35	600	—
R-601a	$(CH_3)_2CHCH_2CH_3$	2-methylbutane (isopentane)	A3	0.18	1,000	2.9	2.4	13,000	38	600	—
R-610	$CH_3CH_2OCH_2CH_3$	ethoxyethane (ethyl ether)	—	—	—	—	—	—	—	400	—
R-611	$HCOOCH_3$	methyl formate	B2	—	—	—	—	—	—	100	—
R-717	NH_3	ammonia	B2L	0.014	320	0.22	7.2	167,000	116	25	3-3-0[c]
R-718	H_2O	water	A1	—	—	—	—	—	—	—	0-0-0
R-744	CO_2	carbon dioxide	A1	4.5	40,000	72	—	—	—	5,000	2-0-0[b]
R-1130(E)	CHCl=CHCl	trans-1,2-dichloroethene	B2	0.25	1,000	4	16	65,000	258	200	—
R-1132a	$CF_2=CH_2$	1,1-difluoroethylene	A2	2.0	13,000	33	8.1	50,000	131	500	—
R-1150	$CH_2=CH_2$	ethene (ethylene)	A3	—	—	—	2.2	31,000	36	200	1-4-2
R-1224yd(Z)	$CF_3CF=CHCl$	(Z)-1-chloro-2,3,3,3-tetrafluoroethylene	A1	23	60,000	370	—	—	—	1,000	—
R-1233zd(E)	$CF_3CH=CHCl$	trans-1-chloro-3,3,3-trifluoro-1-propene	A1	5.3	16,000	85	—	—	—	800	—
R-1234yf	$CF_3CF=CH_2$	2,3,3,3-tetrafluoro-1-propene	A2L	4.5	16,000	75	18.0	62,000	289	500	—
R-1234ze(E)	$CF_3CH=CFH$	trans-1,3,3,3-tetrafluoro-1-propene	A2L	4.7	16,000	76	18.8	65,000	303	800	—
R-1270	$CH_3CH=CH_2$	Propene (propylene)	A3	0.1	1,000	1.7	—	—	—	500	1-4-1
R-1336mzz(E)	$CF_3CHCHCF_3$	trans 1,1,1,4,4,4-hexafluoro-2-butene	A1	3.0	7,200	48	—	—	—	400	
R-1336mzz(Z)	$CF_3CHCHCF_3$	cis-1,1,1,4,4,4-hexaflouro-2-butene	A1	5.2	13,000	84	—	—	—	500	—

For SI: 1 pound = 0.454 kg, 1 cubic foot = 0.0283 m^3.

a. Degrees of hazard are for health, fire, and reactivity, respectively, in accordance with NFPA 704.
b. Reduction to 1-0-0 is allowed if analysis satisfactory to the code official shows that the maximum concentration for a rupture or full loss of refrigerant charge would not exceed the IDLH, considering both the refrigerant quantity and room volume.
c. →Class I ozone depleting substance; prohibited for new installations.
d. Occupational Exposure Limit based on the OSHA PEL, ACGIH TLV-TWA, the TERA WEEL or consistent value on a time-weighed average (TWA) basis (unless noted C for ceiling) for an 8 hr/d and 40 hr/wk.

1103.2 Occupancy classification.
Locations of refrigerating systems are described by *occupancy* classifications that consider the ability of people to respond to potential exposure to refrigerants.
Where *equipment* or *appliances*, other than piping, are located outside a *building* and within 20 feet (6096 mm) of any *building* opening, such *equipment* or *appliances* shall be governed by the *occupancy* classification of the *building*. *Occupancy* classifications shall be defined as follows:

1. Institutional *occupancy* is that portion of premises from which occupants cannot readily leave without the assistance of others because they are disabled, debilitated or confined. Institutional *occupancies* include, among others, hospitals, nursing homes, asylums and spaces containing locked cells.
2. Public assembly *occupancy* is that portion of premises where large numbers of people congregate and from which occupants cannot quickly vacate the space. Public assembly *occupancies* include, among others, auditoriums, ballrooms, classrooms, passenger depots, restaurants and theaters.
3. Residential *occupancy* is that portion of premises that provides the occupants with complete independent living facilities, including permanent provisions for living, sleeping, eating, cooking and sanitation. Residential *occupancies* include, among others, dormitories, hotels, multiunit apartments and private residences.
4. Commercial *occupancy* is that portion of premises where people transact business, receive personal service or purchase food and other goods.
   Commercial *occupancies* include, among others, office and professional *buildings*, markets (but not large mercantile *occupancies*) and work or storage areas that do not qualify as industrial *occupancies*.
5. Large mercantile *occupancy* is that portion of premises where more than 100 persons congregate on levels above or below street level to purchase personal merchandise.
6. Industrial *occupancy* is that portion of premises that is not open to the public, where access by authorized persons is controlled, and that is used to manufacture, process or store goods such as chemicals, food, ice, meat or petroleum.
7. Mixed *occupancy* occurs where two or more *occupancies* are located within the same *building*. Where each *occupancy* is isolated from the rest of the *building* by tight walls, floors and ceilings and by self-closing doors, the requirements for each *occupancy* shall apply to its portion of the *building*. Where the

various *occupancies* are not so isolated, the *occupancy* having the most stringent requirements shall be the governing *occupancy*.

1103.3 System classification.
Refrigeration systems shall be classified according to the degree of probability that refrigerant leaked from a failed connection, seal or component could enter an occupied area. The distinction is based on the basic design or location of the components.

1103.3.1 Low-probability systems.
Double-indirect open-spray systems, indirect closed systems and indirect-vented closed systems shall be classified as low-probability systems, provided that all refrigerant-containing piping and fittings are isolated where the quantities in Table 1103.1 are exceeded.

1103.3.2 High-probability systems.
Direct systems and indirect open-spray systems shall be classified as high-probability systems.

Exception: An indirect open-spray system shall not be required to be classified as a high-probability system if the pressure of the secondary coolant is at all times (operating and standby) greater than the pressure of the refrigerant.

Section 1104 Refrigeration system application requirements

1104.1 General.
The refrigerant, *occupancy* and system classification cited in this section shall be determined in accordance with Sections 1103.1, 1103.2 and 1103.3, respectively.

1104.2 Machinery room.
Except as provided in Sections 1104.2.1 and 1104.2.2, all components containing the refrigerant shall be located either outdoors or in a *machinery room* where the quantity of refrigerant in an independent circuit of a *refrigeration system* exceeds the amounts shown in Table 1103.1. For refrigerant blends not listed in Table 1103.1, the same requirement shall apply where the amount for any blend component exceeds that indicated in Table 1103.1 for that component. This requirement shall also apply where the combined amount of the blend components exceeds a limit of 69,100 parts per million (ppm) by volume. *Machinery rooms* required by this section shall be constructed and maintained in accordance with Section 1105 for Group A1 and B1 refrigerants and in accordance with Sections 1105 and 1106 for Group A2, B2, A3 and B3 refrigerants.

Exceptions:

1. *Machinery rooms* are not required for *listed equipment* and *appliances* containing not more than 6.6 pounds (3 kg) of refrigerant, regardless of the refrigerant's safety classification, where installed in accordance with the *equipment's* or *appliance's* listing and the *equipment* or *appliance* manufacturer's installation instructions.
2. Piping in compliance with Section 1107 is allowed in other locations to connect components installed in a *machinery room* with those installed outdoors.

1104.2.1 Institutional occupancies.
The amounts shown in Table 1103.1 shall be reduced by 50 percent for all areas of institutional *occupancies* except kitchens, laboratories and mortuaries. The total of all Group A2, B2, A3 and B3 refrigerants shall not exceed 550 pounds (250 kg) in occupied areas or *machinery rooms*.

1104.2.2 Industrial occupancies and refrigerated rooms.
This section applies only to rooms and spaces that: are within industrial *occupancies*; contain a refrigerant evaporator; are maintained at temperatures below 68°F (20°C); and are used for manufacturing, food and beverage preparation, meat cutting, other processes and storage. Where a *machinery room* would otherwise be required by Section 1104.2, a *machinery room* shall not be required where all of the following conditions are met:

1. The space containing the machinery is separated from other *occupancies* by tight construction with tight-fitting doors.
2. Access is restricted to authorized personnel.
3. Refrigerant detectors are installed as required for *machinery rooms* in accordance with Section 1105.3.

   Exception: Refrigerant detectors are not required in unoccupied areas that contain only continuous piping that does not include valves, valve assemblies, *equipment* or *equipment* connections.
4. Surfaces having temperatures exceeding 800°F (427°C) and open flames are not present where any Group A2, B2, A3 or B3 refrigerant is used (see Section 1104.3.4).
5. All electrical *equipment* and *appliances* conform to Class I, Division 2, *hazardous location* classification requirements of NFPA 70 where the quantity of any Group A2, B2, A3 or B3 refrigerant in a single independent circuit would exceed 25 percent of the lower flammability limit (LFL) upon release to the space.
6. All refrigerant-containing parts in refrigeration systems with a total connected compressor power exceeding 100 horsepower (hp) (74.6 kW)—except evaporators used for refrigeration or dehumidification, condensers used for heating, control and pressure relief valves for either, low-probability pumps and connecting piping—are located either outdoors or in a *machinery room*.

1104.3 Refrigerant restrictions.
Refrigerant applications, maximum quantities and use shall be restricted in accordance with Sections 1104.3.1 through 1104.3.4.

1104.3.1 Air conditioning for human comfort.
High-probability systems used for human comfort shall use Group A1 or A2L refrigerant.

Exceptions:

1. Equipment *listed* for and used in residential *occupancies* containing a maximum of 6.6 pounds (3 kg) of refrigerant.
2. Equipment *listed* for and used in commercial *occupancies* containing a maximum of 22 pounds (10 kg) of refrigerant.
3. Industrial *occupancies*.

1104.3.2 Group A2, A3, B2 and B3 refrigerants.
Group A2 and B2 refrigerants shall not be used in high-probability systems. Group A3 and B3 refrigerants shall not be used except where *approved*.

Exceptions: This section does not apply to:

1. Laboratories where the floor area per occupant is not less than 100 square feet (9.3 m^2).
2. *Listed* self-contained systems having a maximum of 0.331 pounds (150 g) of Group A3 refrigerant.
3. Industrial *occupancies*.

4. *Equipment listed* for and used in residential *occupancies* containing a maximum of 6.6 pounds (3 kg) of Group A2 or B2 refrigerant.
5. *Equipment listed* for and used in commercial occupancies containing a maximum of 22 pounds (10 kg) of Group A2 or B2 refrigerant.

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1104.3.3 All occupancies.
The total of all Group A2, B2, A3 and B3 refrigerants shall not exceed 1,100 pounds (499 kg) except where *approved*.

1104.3.4 Protection from refrigerant decomposition.
Where any device having an open flame or surface temperature greater than 800°F (427°C) is used in a room containing more than 6.6 pounds (3 kg) of refrigerant in a single independent circuit, a hood and exhaust system shall be provided in accordance with Section 509. Such exhaust system shall exhaust *combustion products* to the outdoors.

Exception: A hood and exhaust system shall not be required where any of the following apply:
1. The refrigerant is R-718 (water) or R-744 (carbon dioxide).
2. The *combustion air* is ducted from the outdoors in a manner that prevents leaked refrigerant from being combusted.
3. A refrigerant detector is used to stop the *combustion* in the event of a refrigerant leak (see Sections 1105.3 and 1105.5).

1104.4 Volume calculations.
Volume calculations shall be in accordance with Sections 1104.4.1 through 1104.4.3.

1104.4.1 Noncommunicating spaces.
Where the refrigerant-containing parts of a system are located in one or more spaces that do not communicate through permanent openings or HVAC ducts, the volume of the smallest, enclosed occupied space shall be used to determine the permissible quantity of refrigerant in the system.

1104.4.2 Communicating spaces.
Where an evaporator or condenser is located in an air duct system, the volume of the smallest, enclosed occupied space served by the duct system shall be used to determine the maximum allowable quantity of refrigerant in the system.

Exception: If airflow to any enclosed space cannot be reduced below one-quarter of its maximum, the entire space served by the air duct system shall be used to determine the maximum allowable quantity of refrigerant in the system.

1104.4.3 Plenums.
Where the space above a suspended ceiling is continuous and part of the supply or return air *plenum* system, this space shall be included in calculating the volume of the enclosed space.

Section 1105 Machinery room, general requirements

[BF] 1105.1 Design and construction.
Machinery rooms shall be designed and constructed in accordance with the *International Building Code* and this section.

1105.2 Openings.
Ducts and air handlers in the *machinery room* that operate at a lower pressure than the room shall be sealed to prevent any refrigerant leakage from entering the airstream.

[F] 1105.3 Refrigerant detector.

Refrigerant detectors in *machinery rooms* shall be provided as required by Sections 608.9 and 608.18 of the *International Fire Code*.

1105.4 Tests.
Periodic tests of the mechanical ventilating system shall be performed in accordance with manufacturer's specifications and as required by the code official.

1105.5 Fuel-burning appliances.
Fuel-burning *appliances* and *equipment* having open flames and that use *combustion air* from the *machinery room* shall not be installed in a *machinery room*.
Exceptions:

1. Where the refrigerant is water (R-718) or carbon dioxide (R-744).
2. Fuel-burning *appliances* shall not be prohibited in the same *machinery room* with refrigerant-containing *equipment* or *appliances* where *combustion air* is ducted from outside the *machinery room* and sealed in such a manner as to prevent any refrigerant leakage from entering the *combustion* chamber, or where a refrigerant vapor detector is employed to automatically shut off the *combustion* process in the event of refrigerant leakage.

1105.6 Ventilation.
Machinery rooms shall be mechanically ventilated to the outdoors.
Exception: Where a refrigerating system is located outdoors more than 20 feet (6096 mm) from any *building* opening and is enclosed by a penthouse, lean-to or other open structure, natural or mechanical ventilation shall be provided. Location of the openings shall be based on the relative density of the refrigerant to air. The free-aperture cross section for the ventilation of the *machinery room* shall be not less than:
Equation 11-1 $F=G$

For SI: $F=0.138G$

where:
F =
The free opening area in square feet (m^2).
G =
The mass of refrigerant in pounds (kg) in the largest system, any part of which is located in the *machinery room*.

1105.6.1 Discharge location.
The discharge of the air shall be to the outdoors in accordance with Chapter 5. Exhaust from mechanical ventilation systems shall be discharged not less than 20 feet (6096 mm) from a property line or openings into *buildings*.

1105.6.1.1 Indoor exhaust opening location.
Indoor mechanical exhaust intake openings shall be located where refrigerant leakage is likely to concentrate based on the refrigerant's relative density to air, and the locations of the air current paths and refrigerating machinery.

1105.6.2 Makeup air.
Provisions shall be made for *makeup air* to replace that being exhausted. Openings for *makeup air* shall be located to avoid intake of *exhaust air*. Supply and exhaust ducts to the *machinery*

room shall not serve any other area, shall be constructed in accordance with Chapter 5 and shall be covered with corrosion-resistant screen of not less than $^1/_4$-inch (6.4 mm) mesh.

1105.6.3 Ventilation rate.
Mechanical ventilation systems shall be capable of exhausting the minimum quantity of air both at normal operating and emergency conditions, as required by Sections 1105.6.3.1 and 1105.6.3.2. Multiple fans or multispeed fans shall be allowed to produce the emergency ventilation rate and to obtain a reduced airflow for normal ventilation.

1105.6.3.1 Quantity—normal ventilation.
During occupied conditions, the mechanical ventilation system shall exhaust the larger of the following:

1. Not less than 0.5 cfm per square foot (0.0025 $m^3/s \times m^2$) of *machinery room* area or 20 cfm (0.009 m^3/s) per person.
2. A volume required to limit the room temperature rise to 18°F (10°C) taking into account the ambient heating effect of all machinery in the room.

1105.6.3.2 Quantity—emergency conditions.
Upon actuation of the refrigerant detector required in Section 1105.3, the mechanical ventilation system shall *exhaust air* from the *machinery room* in the following quantity:
Equation 11-2 $Q=100\times G$

For SI: $Q=0.07\times G$

where:

Q =
The airflow in cubic feet per minute (m^3/s).
G =
The design mass of refrigerant in pounds (kg) in the largest system, any part of which is located in the *machinery room*.

1105.7 Termination of relief devices.
Pressure relief devices, fusible plugs and purge systems located within the *machinery room* shall terminate outside of the structure at a location 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.

[F] 1105.8 Emergency pressure control system.
Emergency pressure control systems shall be provided in accordance with Section 608.11 of the *International Fire Code*.

[BE] 1105.9 Means of egress.
Machinery rooms larger than 1,000 square feet (93 m^2) shall have not less than two exits or exit access doorways. Where two exit access doorways are required, one such doorway is permitted to be served by a fixed ladder or an alternating tread device. Exit access doorways shall be

separated by a horizontal distance equal to one-half the maximum horizontal dimension of the room. All portions of *machinery rooms* shall be within 150 feet (45 720 mm) of an exit or exit access doorway. An increase in exit access travel distance is permitted in accordance with Section 1017.1 of the International Building Code. Exit and exit access doorways shall swing in the direction of egress travel and shall be equipped with panic hardware, regardless of the occupant load served. Exit and exit access doorways shall be tight fitting and self-closing.

Section 1106 Machinery room, special requirements

1106.1 General.
Where required by Section 1104.2, the *machinery room* shall meet the requirements of this section in addition to the requirements of Section 1105.

1106.2 Elevated temperature.
There shall not be an open flame-producing device or continuously operating hot surface over 800°F (427°C) permanently installed in the room.

1106.3 Class 2 and 3 refrigerants.
Where refrigerants of Groups A2, A3, B2 and B3 are used, the *machinery room* shall conform to the Class I, Division 2, *hazardous location* classification requirements of NFPA 70.

1106.4 Group A2L and B2L refrigerants.
Machinery rooms for Group A2L and B2L refrigerants shall comply with Sections 1106.4.1 through 1106.4.3.
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1106.4.1 Elevated temperatures.
Open flame-producing devices or continuously operating hot surfaces over 1290°F (700°C) shall not be permanently installed in the room.

1106.4.2 Refrigerant detector.
In addition to the requirements of Section 1105.3, refrigerant detectors shall signal an alarm and activate the ventilation system in accordance with the response time specified in Table 1106.4.2.
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Table **1106.4.2 Group A2L and B2L detector activation**

ACTIVATION LEVEL	MAXIMUM RESPONSE TIME (seconds)	ASHRAE 15 VENTILATION (seconds)	ALARM RESET	ALARM TYPE

Less than or equal to the OEL in Table 1103.1	300	1	Automatic	Trouble
Less than or equal to the refrigerant concentration level in Table 1103.1	15	2	Manual	Emergency

1106.4.3 Mechanical ventilation.
The *machinery room* shall have a mechanical ventilation system complying with ASHRAE 15.

[F] 1106.5 Remote controls.
Remote control of the mechanical *equipment* and *appliances* located in the *machinery room* shall comply with Sections 1106.5.1 and 1106.5.2.

[F] 1106.5.1 Refrigeration system emergency shutoff.
A clearly identified switch of the break-glass type or with an *approved* tamper-resistant cover shall provide off-only control of refrigerant compressors, refrigerant pumps, and normally closed, automatic refrigerant valves located in the *machinery room*. Additionally, this *equipment* shall be automatically shut off whenever the refrigerant vapor concentration in the *machinery room* exceeds the vapor detector's upper detection limit or 25 percent of the LEL, whichever is lower.

[F] 1106.5.2 Ventilation system.
A clearly identified switch of the break-glass type or with an *approved* tamper-resistant cover shall provide on-only control of the *machinery room* ventilation fans.

[F] 1106.6 Emergency signs and labels.
Refrigeration units and systems shall be provided with *approved* emergency signs, charts, and labels in accordance with the *International Fire Code*.

Section 1107 Piping material

1107.1 Piping.
Refrigerant piping material shall conform to the requirements in this section.

1107.2 Used materials.
Used pipe, fittings, valves and other materials that are to be reused shall be clean and free from foreign materials and shall be *approved* for reuse.

1107.3 Materials rating.
Materials, joints and connections shall be rated for the operating temperature and pressure of the *refrigeration system*. Materials shall be suitable for the type of refrigerant and type of lubricant in the *refrigeration system*. Magnesium alloys shall not be used in contact with any

halogenated refrigerants. Aluminum, zinc, magnesium and their alloys shall not be used in contact with R-40 (methyl chloride).

1107.4 Piping materials standards.

Refrigerant pipe shall conform to one or more of the standards *listed* in Table 1107.4. The exterior of the pipe shall be protected from corrosion and degradation.

Table **1107.4 Refrigerant pipe**

PIPING MATERIAL	STANDARD
Aluminum tube	ASTM B210 , ASTM B491/B491M
Brass (copper alloy) pipe	ASTM B43
Copper linesets	ASTM B280, ASTM B1003
Copper pipe	ASTM B42, ASTM B302
Copper tube[a]	ASTM B68 , ASTM B75, ASTM B88, ASTM B280, ASTM B819
Steel pipe[b]	ASTM A53, ASTM A106 , ASTM A333
Steel tube	ASTM A254, ASTM A334

a. Soft annealed copper tubing larger than $1^3/_8$ inch (35 mm) O.D. shall not be used for field-assembled refrigerant piping unless it is protected from mechanical damage.

b. ASTM A53, Type F steel pipe shall only be permitted for discharge lines in pressure relief systems.

1107.4.1 Steel pipe Groups A2, A3, B2 and B3.

The minimum weight of steel pipe for Group A2, A3, B2 and B3 refrigerants shall be Schedule 80 for sizes $1^1/_2$ inches or less in diameter.

1107.5 Pipe fittings.

Refrigerant pipe fittings shall be *approved* for installation with the piping materials to be installed, and shall conform to one of more of the standards listed in Table 1107.5 or shall be *listed* and *labeled* as complying with UL 207.

Table **1107.5 Refrigerant pipe fittings**

FITTING MATERIAL	STANDARD
Aluminum	ASTM B361
➡	
Copper and copper alloy (brass)	ASME B16.15, ASME B16.18, ASME B16.22, ASME B16.24, ASME B16.26, ASME B16.50
Steel	ASTM A105, ASTM A181, ASTM A193, ASTM A234, ASTM A420, ASTM A707

1107.5.1 Copper brazed field swaged.

The minimum and maximum cup depth of field-fabricated copper brazed swaged fitting connections shall comply with Table 1107.5.1.

Table **1107.5.1 Copper brazed swaged cup depths**

FITTING SIZE (inch)	MINIMUM DEPTH (inch)	MAXIMUM DEPTH (inch)
1/8	0.15	0.23
3/16	0.16	0.24
1/4	0.17	0.26
3/8	0.20	0.30
1/2	0.22	0.33
5/8	0.24	0.36
3/4	0.25	0.38
1	0.28	0.42
1 1/4	0.31	0.47
1 1/2	0.34	0.51
2	0.40	0.60
2 1/2	0.47	0.71
3	0.53	0.80
3 1/2	0.59	0.89
4	0.64	0.96

For SI: 1 inch = 25.4 mm.

1107.6 Valves.

Valves shall be of materials that are compatible with the type of piping material, refrigerants and oils in the *refrigeration system*. Valves shall be *listed* and *labeled* and rated for the temperatures and pressures of the *refrigeration systems* in which the valves are installed.

1107.7 Flexible connectors, expansion and vibration compensators.

Flexible connectors and expansion and vibration control devices shall be *listed* and *labeled* for use in *refrigeration systems* and pressures at which the components are installed.

Section 1108 Joints and connections

1108.1 Approval.

Joints and connections shall be of an *approved* type. Joints and connections shall be tight for the pressure of the *refrigeration system* when tested in accordance with Section 1110.

1108.1.1 Joints between different piping materials.
Joints between different piping materials shall be made with *approved* adapter fittings. Joints between dissimilar metallic piping materials shall be made with a dielectric fitting or a dielectric union conforming to dielectric tests of ASSE 1079. Adapter fittings with threaded ends between different materials shall be joined with thread lubricant in accordance with Section 1108.3.4.

1108.2 Preparation of pipe ends.
Pipe shall be cut square, reamed and chamfered, and shall be free from burrs and obstructions. Pipe ends shall have full-bore openings and shall not be undercut.

1108.3 Joint preparation and installation.
Where required by Sections 1108.4 through 1108.8, the preparation and installation of brazed, flared, mechanical, press-connect, soldered, threaded and welded joints shall comply with Sections 1108.3.1 through 1108.3.5.

1108.3.1 Brazed joints.
Joint surfaces shall be cleaned. An *approved* flux shall be applied where required by the braze filler metal manufacturer. The piping being brazed shall be purged of air to remove the oxygen and filled with one of the following inert gases: oxygen-free nitrogen, helium or argon. The piping system shall be prepurged with an inert gas for a minimum time corresponding to five volume changes through the piping system prior to brazing. The pre-purge rate shall be at a minimum velocity of 100 feet per minute (0.508 m/s). The inert gas shall be directly connected to the tube system being brazed to prevent the entrainment of ambient air. After the pre-purge, the inert gas supply shall be maintained through the piping during the brazing operation at a minimum pressure of 1.0 psi (6.89 kPa) and a maximum pressure of 3.0 psi (20.67 kPa). The joint shall be brazed with a filler metal conforming to AWS A5.8.

1108.3.2 Mechanical joints.
Mechanical joints shall be installed in accordance with the manufacturer's instructions.

1108.3.2.1 Flared joints.
Flared fittings shall be installed in accordance with the manufacturer's instructions. The flared fitting shall be used with the tube material specified by the fitting manufacturer. The flared tube end shall be made by a tool designed for that operation.

1108.3.2.2 Press-connect joints.
Press-connect joints shall be installed in accordance with the manufacturer's instructions.

1108.3.3 Soldered joints.
Joint surfaces to be soldered shall be cleaned and a flux conforming to ASTM B813 shall be applied. The joint shall be soldered with a solder conforming to ASTM B32. Solder joints shall be limited to *refrigeration systems* using Group A1 refrigerant and having a pressure of less than or equal to 200 psi (1378 kPa).

1108.3.4 Threaded joints.
Threads shall conform to ASME B1.1, ASME B1.13M, ASME B1.20.1 or ASME B1.20.3. Thread lubricant, pipe-joint compound or thread tape shall be applied on the external threads only and shall be *approved* for application on the piping material.

1108.3.5 Welded joints.
Joint surfaces to be welded shall be cleaned by an *approved* procedure. Joints shall be welded with an *approved* filler metal.

1108.4 Aluminum tube.
Joints between aluminum tubing or fittings shall be brazed, mechanical, press-connect or welded joints conforming to Section 1108.3.

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1108.5 Copper pipe.
Joints between copper or copper-alloy pipe or fittings shall be brazed, mechanical, press-connect, soldered, threaded or welded joints conforming to Section 1108.3.

1108.6 Copper tube.
Joints between copper or copper-alloy tubing or fittings shall be brazed, flared, mechanical, press-connect or soldered joints.

1108.7 Steel pipe.
Joints between steel pipe or fittings shall be mechanical joints, threaded, press-connect or welded joints conforming to Section 1108.3.

1108.8 Steel tube.
Joints between steel tubing or fittings shall be flared, mechanical, press-connect or welded joints conforming to Section 1108.3.

Section 1109 Refrigerant pipe installation

1109.1 General.
Refrigerant piping installations shall comply with the requirements of this section. The design of refrigerant piping shall be in accordance with ASME B31.5.

1109.2 Piping location.
Refrigerant piping shall comply with the installation location requirements of Sections 1109.2.1 through 1109.2.7. Refrigerant piping for Groups A2L and B2L shall also comply with the requirements of Section 1109.3. Refrigerant piping for Groups A2, A3, B2 and B3 shall also comply with the requirements of Section 1109.4.

1109.2.1 Minimum height.

Exposed refrigerant piping installed in open spaces that afford passage shall be not less than 7 feet 3 inches (2210 mm) above the finished floor.

1109.2.2 Refrigerant pipe enclosure.
Refrigerant piping shall be protected by locating it within the building elements or within protective enclosures.

Exception: Piping protection within the *building* elements or protective enclosure shall not be required in any of the following locations:

1. Where installed without *ready access* or located more than 7 feet 3 inches (2210 mm) above the finished floor.
2. Where located within 6 feet (1829 mm) of the refrigerant unit or *appliance*.
3. Where located in a *machinery room* complying with Section 1105.
4. Outside the *building*:
    1. Where protected from damage from the weather, including but not limited to hail, ice and snow loads.
    2. Where protected from damage within the expected foot or traffic path.
    3. Where installed underground not less than 8 inches (200 mm) below finished grade and protected against corrosion.

1109.2.3 Prohibited locations.
Refrigerant piping shall not be installed in any of the following locations:

1. Exposed within a fire-resistance-rated exit access corridor.
2. Exposed within an interior exit stairway.
3. Within an interior exit ramp.
4. Within an exit passageway.
5. Within an elevator, dumbwaiter or other shaft containing a moving object.

1109.2.4 Piping in concrete floors.
Refrigerant piping installed in concrete floors shall be encased in pipe, conduit or ducts. The piping shall be protected to prevent damage from vibration, stress and corrosion.

1109.2.5 Refrigerant pipe shafts.
Refrigerant piping that penetrates two or more floor/ceiling assemblies shall be enclosed in a fire-resistance-rated shaft enclosure. The fire-resistance-rated shaft enclosure shall comply with Section 713 of the *International Building Code*.

Exceptions:

1. *Refrigeration* systems using R-718 refrigerant (water).
2. Piping in a direct refrigeration system using Group A1 refrigerant where the refrigerant quantity does not exceed the limits of Table 1103.1 for the smallest occupied space through which the piping passes.
3. Piping located on the exterior of the *building* where vented to the outdoors.

1109.2.6 Exposed piping surface temperature.
Exposed piping having surface temperatures greater than 120°F (49°C) or less than 5°F (-15°C) with *ready access* to nonauthorized personnel shall be protected from contact or shall have thermal insulation that limits the exposed insulation surface temperature to a range of 5°F (-15°C) to 120°F (49°C).

1109.2.7 Pipe identification.
Refrigerant pipe located in areas other than the room or space where the refrigerating *equipment* is located shall be identified. The pipe identification shall be located at intervals not exceeding 20 feet (6096 mm) on the refrigerant piping or pipe insulation. The minimum height of lettering of the identification label shall be $^1/_2$ inch (12.7 mm). The identification shall indicate the *refrigerant designation* and safety group classification of refrigerant used in the piping system. For Group A2L and B2L refrigerants, the identification shall also include the following statement: "WARNING—Risk of Fire. Flammable Refrigerant." For Group A2, A3, B2 and B3 refrigerants, the identification shall also include the following statement: "DANGER—Risk of Fire or Explosion. Flammable Refrigerant." For any Group B refrigerant, the identification shall also include the following statement: "DANGER—Toxic Refrigerant."

1109.3 Installation requirements for Group A2L, A2, A3, B2L, B2 or B3 refrigerant.
Piping systems using Group A2L, A2, A3, B2L, B2 or B3 refrigerant shall comply with the requirements of Sections 1109.3.1 and 1109.3.2.

1109.3.1 Protection against physical damage.
In addition to the requirements of Section 305.5, aluminum, copper and steel tube used for Group A2, A3, B2 and B3 refrigerants and located in concealed locations where tubing is installed in studs, joists, rafters or similar member spaces, and located less than $1^1/_4$ inches (32 mm) from the nearest edge of the member, shall be continuously protected by shield plates. Protective steel shield plates shall cover the area of the tube plus the area extending not less than 2 inches (51 mm) beyond both sides of the tube.

1109.3.1.1 Shield plates.
Shield plates shall be of steel material having a thickness of not less than 0.0575 inch (1.46 mm) (No. 16 gage).

1109.3.2 Shaft ventilation.
Refrigerant pipe shafts with systems using Group A2L or B2L refrigerant shall be naturally or mechanically ventilated. Refrigerant pipe shafts with one or more systems using any Group A2, A3, B2 or B3 refrigerant shall be continuously mechanically ventilated and shall include a refrigerant detector. The shaft ventilation exhaust outlet shall comply with Section 501.3.1. Naturally ventilated shafts shall have a pipe, duct or conduit not less than 4 inches (102 mm) in diameter that connects to the lowest point of the shaft and extends to the outdoors. The pipe, duct or conduit shall be level or pitched downward to the outdoors. Mechanically ventilated shafts shall have a minimum airflow velocity in accordance with Table 1109.3.2. The mechanical ventilation shall be continuously operated or activated by a refrigerant detector. Systems utilizing a refrigerant detector shall activate the mechanical ventilation at a maximum refrigerant concentration of 25

percent of the lower flammable limit of the refrigerant. The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant from a leak will concentrate. The shaft shall not be required to be ventilated for double-wall refrigerant pipe where the interstitial space of the double-wall pipe is vented to the outdoors.

Table **1109.3.2 Shaft ventilation velocity**

CROSS-SECTIONAL AREA OF SHAFT (square inches)	MINIMUM VENTILATION VELOCITY (feet per minute)
≤ 20	100
> 20 ≤ 250	200
> 250 ≤ 1,250	300
> 1,250	400

For SI: 1 square inch = 645 mm^2, 1 foot per minute = 0.0058 m/s.

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1109.4 Refrigerant pipe penetrations.
The annular space between the outside of a refrigerant pipe and the inside of a pipe sleeve or opening in a *building* envelope wall, floor or ceiling assembly penetrated by a refrigerant pipe shall be sealed in an *approved* manner with caulking material or foam sealant or closed with a gasketing system. The caulking material, foam sealant or gasketing system shall be designed for the conditions at the penetration location and shall be compatible with the pipe, sleeve and *building* materials in contact with the sealing materials. Refrigerant pipes penetrating fire-resistance-rated assemblies or membranes of fire-resistance-rated assemblies shall be sealed or closed in accordance with Section 714 of the International Building Code.

1109.5 Stress and strain.
Refrigerant piping shall be installed so as to prevent strains and stresses that exceed the structural strength of the pipe. Where necessary, provisions shall be made to protect piping from damage resulting from vibration, expansion, contraction and structural settlement.

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1109.6 Stop valves.
Stop valves shall be installed in specified locations in accordance with Sections 1109.6.1 and 1109.6.2. Stop valves shall be supported in accordance with Section 1109.6.3 and identified in accordance with Section 1109.6.4.

Exceptions:

1. Systems that have a refrigerant pumpout function capable of storing the entire refrigerant charge in a receiver or heat exchanger.
2. Systems that are equipped with provisions for pumping out the refrigerant using either portable or permanently installed refrigerant recovery *equipment*.
3. Self-contained *listed* and *labeled* systems.

1109.6.1 Refrigeration systems containing more than 6.6 pounds (3.0 kg) of refrigerant.
Stop valves shall be installed in the following locations on refrigeration systems containing more than 6.6 pounds (3.0 kg) of refrigerant:

1. The suction inlet of each compressor, compressor unit or condensing unit.
2. The discharge outlet of each compressor, compressor unit or condensing unit.
3. The outlet of each liquid receiver.

1109.6.2 Refrigeration systems containing more than 100 pounds (45 kg) of refrigerant.
In addition to stop valves required by Section 1109.6.1, refrigeration systems containing more than 100 pounds (45 kg) of refrigerant shall have stop valves installed in the following locations:

1. Each inlet of each liquid receiver.
2. Each inlet and each outlet of each condenser where more than one condenser is used in parallel.

Exceptions:

1. Stop valves shall not be required at the inlet of a receiver in a condensing unit nor at the inlet of a receiver that is an integral part of the condenser.
2. *Refrigeration systems* utilizing nonpositive displacement compressors.

1109.6.3 Stop valve support.
Stop valves shall be supported to prevent detrimental stress and strain on the refrigerant piping system. The piping system shall not be utilized to support stop valves on copper tubing or aluminum tubing 1 inch (25.4 mm) outside diameter or larger.

1109.6.4 Identification.
Stop valves shall be identified where their intended purpose is not obvious. Where valves are identified by a numbering or lettering system, legend(s) or key(s) for the valve identification shall be located in the room containing the indoor refrigeration *equipment*. The minimum height of lettering of the identification label shall be $^1/_2$ inch (12.7 mm).

Section 1110 Refrigeration piping system test

1110.1 General.
Refrigerant piping systems that are erected in the field shall be pressure tested for strength and leak tested for tightness, in accordance with the requirements of this section, after installation and before being placed in operation. Tests shall include both the high- and low-pressure sides of each system.
Exception: *Listed* and *labeled equipment*, including compressors, condensers, vessels, evaporators, gas bulk storage tanks, safety devices, pressure gauges and control mechanisms, shall not be required to be tested.

1110.2 Exposure of refrigerant piping system.

Refrigerant pipe and joints installed in the field shall be exposed for visual inspection and testing prior to being covered or enclosed.

1110.3 Field test gases.
The medium used for field pressure testing the *refrigeration system* shall be one of the following inert gases: oxygen-free nitrogen, helium argon or premixed nonflammable oxygen-free nitrogen with a tracer gas of hydrogen or helium. For R-744 refrigeration systems, carbon dioxide shall be allowed as the test medium. For R-718 *refrigeration systems*, water shall be allowed as the test medium.

1110.3.1 Test gases not permitted.
Oxygen, air, refrigerants other than those identified in Section 1110.3, combustible gases and mixtures containing such gases shall not be used as the pressure test medium.

1110.4 Factory test procedure.
Factory tests shall be performed with dry nitrogen or other nonflammable, nonreactive, dried gas. Oxygen, air or mixtures containing them shall not be used. The means used to build up the test pressure shall have either a pressure-limiting device or a pressure-reducing device and a gauge on the outlet side. The pressure-relief device shall be set above the test pressure but low enough to prevent permanent deformation of the *refrigeration system's* components.
Exceptions:

1. Mixtures of dry nitrogen, inert gases or a combination of them with Class 1 refrigerant in concentrations of a refrigerant weight fraction (mass fraction) not exceeding 5 percent shall be permitted for tests.
2. Mixtures of dry nitrogen, inert gases or a combination of them with Class 2L, Class 2 and Class 3 refrigerants in concentrations not exceeding the lower of a refrigerant weight fraction (mass fraction) of 5 percent or 25 percent of the LFL shall be permitted for tests.
3. Compressed air without added refrigerants shall be permitted for tests, provided that the *refrigeration system* is subsequently evacuated to less than 1,000 microns (0.1333 kPa) before charging with refrigerant. The required evacuation level is atmospheric pressure for *refrigeration systems* using R-718 (water) or R-744 (carbon dioxide) as the refrigerant.
4. Systems erected on the premises using Group A1 refrigerant and with copper tubing not exceeding 0.62 of an inch (15.7 mm) outside diameter shall be tested by means of the refrigerant charged into the system at the saturated vapor pressure of the refrigerant at not less than 68°F (20°C).

1110.5 Test apparatus.
The means used to pressurize the refrigerant piping system shall have on its outlet side a test pressure measuring device and either a pressure-limiting device or a pressure-reducing device. The test pressure measuring device shall have an accuracy of ±3 percent or less of the test pressure and shall have a resolution of 5 percent or less of the test pressure.

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1110.6 Piping system strength test.
Refrigeration system components and refrigerant piping shall be tested in accordance with ASME B31.5 or this section. Separate tests for isolated portions of the system are permitted, provided that all required portions are tested at least once. Pressurize with test gas for a minimum of 10 minutes to not less than the lower of (a) the lowest design pressure for any system component or (b) the lowest value of set pressure for any pressure relief devices in the system. The design pressures for determination of test pressure shall be the pressure identified on the label nameplate of the condensing unit, compressor, compressor unit, pressure vessel or other system component with a nameplate. A passing test result shall have no rupture or structural failure of any system component or refrigerant piping.

Refrigerant piping and tubing greater than $^{3}/_{4}$ inch (19 mm) in diameter shall be tested in accordance with ASHRAE 15.

➡

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1110.7 Contractor or engineer declaration.
The installing contractor or *registered design professional* of record shall issue a certificate of test to the code official for all *refrigeration systems* containing 55 pounds (25 kg) or more of refrigerant. The certificate shall give the test date, name of the refrigerant, test medium and the field test pressure applied to the high-pressure side and the low-pressure side of the *refrigeration system*. The certification of test shall be signed by the installing contractor or *registered design professional* and shall be made part of the public record.

[F] Section 1111 Periodic testing

[F] 1111.1 Testing required.
The following emergency devices and systems shall be periodically tested in accordance with the manufacturer's instructions and as required by the code official:

1. Treatment and flaring systems.
2. Valves and appurtenances necessary to the operation of emergency refrigeration control boxes.
3. Fans and associated *equipment* intended to operate emergency ventilation systems.
4. Detection and alarm systems.

Attachment # 6

Attachment # 6

ICC A2L related changes to the IBC

2021 International Building Code

CHAPTER 2: DEFINITIONS

[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 that 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 show compliance with Category 1B.

2. Category 1B.

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

   1. A lower flammability limit of more than 6 percent 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 Category 1B.

CHAPTER 3: OCCUPANCY CLASSIFICATION AND USE

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									
	1A and 1B (High BV)[k]	H-2	NA	NA	1,000[d, e]	NA	NA	1,000[d, e]	NA	NA
	1B (Low BV)[k]				162,500[d, e]			162,500[d, e]		
	Liquified									
	1A and 1B (High BV)[k]	H-2	NA	(150)[d, e]	NA	NA	(150)[d, e]	NA	NA	NA
	1B (Low BV)[k]			(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(1) and 414.2.5(2).
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. "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.

[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.

CHAPTER 4: SPECIAL DETAILED REQUIREMENTS BASED ON OCCUPANCY AND USE

[F] 414.2.5 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 414.2.5.1 through ~~414.2.5.3~~ 414.2.5.4.

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).

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)[d]		
Gaseous	390,000 cu. ft.	195,000 cu. ft.
Liquefied	40,000 lbs.[c]	20,000 lbs.

For SI: 1 pound = 0.454 kg, 1 cubic foot = 0.02832 m^3, 1 square foot = 0.093 m^2, 1 inch/second = 2.5641 cm/s.

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.

[F] TABLE 414.5.1 EXPLOSION CONTROL REQUIREMENTS[a, h]

MATERIAL	CLASS	EXPLOSION CONTROL METHODS	
		Barricade construction	Explosion (deflagration) venting or explosion (deflagration) prevention systems[b]
HAZARD CATEGORY			
Combustible dusts[c]	---	Not Required	Required
Cryogenic flammables	---	Not Required	Required
Explosives	Division 1.1	Required	Not Required
	Division 1.2	Required	Not Required
	Division 1.3	Not Required	Required
	Division 1.4	Not Required	Required
	Division 1.5	Required	Not Required
	Division 1.6	Required	Not Required
Flammable gas	Gaseous	Not Required	Required[i]
	Liquefied	Not Required	Required[i]
Flammable liquid	IA[e]	Not Required	Required
	IB[e]	Not Required	Required
Organic peroxides	U	Required	Not Permitted
	I	Required	Not Permitted
Oxidizer liquids and solids	4	Required	Not Permitted
Pyrophoric gas	---	Not Required	Required
Unstable (reactive)	4	Required	Not Permitted
	3 Detonable	Required	Not Permitted
	3 Nondetonable	Not Required	Required
Water-reactive liquids and solids	3	Not Required	Required
	2[g]	Not Required	Required

SPECIAL USES			
Acetylene generator rooms	—	Not Required	Required
Electrochemical energy storage system[i]	—	Not Required	Required
Energy storage system[i]	—	Not Required	Required
Grain processing	—	Not Required	Required
Liquefied petroleum gas-distribution facilities	—	Not Required	Required
Where explosion hazards exist[f]	Detonation	Required	Not Permitted
	Deflagration	Not Required	Required

a. See Section 414.1.3.
b. See the *International Fire Code*.
c. 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 104.8.2 of the *International Fire Code*. See definition of "Combustible dust" in Chapter 2.
d. Storage or use.
e. In open use or dispensing.
f. Rooms containing dispensing and use of hazardous materials where an explosive environment can occur because of the characteristics or nature of the hazardous materials or as a result of the dispensing or use process.
g. A method of explosion control shall be provided where Class 2 water-reactive materials can form potentially explosive mixtures.
h. Explosion venting is not required for Group H-5 fabrication areas complying with Section 415.11.1 and the *International Fire Code*.
i. Where explosion control is required in Section 1207 of the *International Fire Code*.
j. Not required for Category 1B Flammable Gases having a burning velocity not exceeding 3.9 in/s (10 cm/s).

Attachment # 7

The Broward County Code of Ordinances, Sec. 9.02. - Building Code and Board of Rules and Appeals.

Purpose:

It shall be the function of the Broward County Board of Rules and Appeals to exercise the powers, duties, responsibilities, and obligations as set forth and established in Chapter 71-575, Laws of Florida, Special Acts of 1971, as amended by Chapter 72-482 and 72-485, Laws of Florida, Special Acts of 1972; Chapter 73-427, Laws of Florida, Special Acts of 1973; Chapters 74-435, 74-437, and 74-448, Laws of Florida, Special Acts of 1974; and Chapter 98-287, as amended by Chapter 2000-141, Laws of Florida, or any successor building code to the Florida Building Code applicable to the County, as amended.

The Board of Rules and Appeals shall conduct a program to monitor and oversee the inspection practices and procedures employed by the various governmental authorities charged with the responsibility of enforcing the Building Code.

End of Attachments