

**BSR/ASHRAE 15a to ANSI/ASHRAE Standard 15-1994, Safety Code for Mechanical
Refrigeration. Final Draft**

Add the following definitions to Section 3.

reclaimed refrigerants: refrigerants reprocessed to the same specifications as new refrigerants by any means including distillation. Such refrigerants have been chemically analyzed to verify that those specifications have been met.

recovered refrigerants: refrigerants removed from a system in any condition without necessarily testing or processing them.

recycled refrigerants: refrigerants for which contaminants have been reduced by oil separation, removal of noncondensable gases, and single or multiple passes through filter driers or other devices that reduce moisture, acidity, and particulate matter.

refrigerating system classification: refrigerating systems are classified according to the degree of probability, low or high, that leaked refrigerant 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.

Replace Section 6, REFRIGERANT SAFETY CLASSIFICATION, with the following:

6.1 Single-Compound Refrigerants. Single compound refrigerants shall be classified into safety groups, based on toxicity and flammability, in accordance with ANSI/ASHRAE Standard 34⁴. The classifications indicated in ANSI/ASHRAE Standard 34 shall be used for refrigerants that have them assigned. Other refrigerants shall be classified in accordance with the criteria in ANSI/ASHRAE Standard 34; such classifications shall be submitted for approval to the authority having jurisdiction.

6.2 Blends. Refrigerant blends shall be classified following the worst-case of fractionation composition, determined in accordance with ANSI/ASHRAE Standard 34. For blends assigned only a single safety group in ANSI/ASHRAE Standard 34, that classification shall be used.

Replace Section 7, RESTRICTIONS ON REFRIGERANT USE, as follows:

7.1 General. The occupancy, refrigerating system, and refrigerant safety classifications cited in this section shall be determined in accordance with Sections 4, 5, and 6, respectively.

7.2 Refrigerant Quantity Limits. The quantity of refrigerant in each independent circuit of high probability systems shall not exceed the amounts shown in Table 1, except as provided in 7.2.1 and 7.2.2, based on volumes determined in accordance with 7.3. For refrigerant blends not listed in Table 1, the amount of each component shall be limited in the same manner and the total of all components in each circuit shall not exceed the quantity that would equal 69,100 ppm by volume upon release to the volume determined by 7.3.

Exception:

- (a). Listed equipment containing not more than 6.6 lb (3 kg) of refrigerant, regardless of its refrigerant safety classification, is exempt from 7.2 provided the equipment is installed in accordance with the listing and with the manufacturer's installation instructions.

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- (b). Listed equipment for use in laboratories with more than 100 ft² (9.3 m²) of space per person, regardless of the refrigerant safety classification, is exempt from 7.2 provided that the equipment is installed in accordance with the listing and the manufacturer's installation instructions.

7.2.1 Institutional Occupancies. The amounts shown in Table 1 shall be reduced by 50% for all areas of institutional occupancies. Also, the total of all Group A2, B2, A3, and B3 refrigerants shall not exceed 550 lb (250 kg) in the occupied areas and machinery rooms of institutional occupancies.

7.2.2 Industrial Occupancies and Refrigerated Rooms. 7.2 does not apply in industrial occupancies and refrigerated rooms where the following seven conditions are met:

1. The space(s) 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 ft² (9.3 m²).

Exception: The minimum floor area shall not apply where the space is provided with egress directly to the outdoors or into approved building exits.

4. Refrigerant detectors are installed with the sensing location and alarm level as required in refrigerating machinery rooms in accordance with 8.13.2.
5. Open flames and surfaces exceeding 800 °F (426.7 °C) are not permitted where any Group A2, B2, A3, or B3 refrigerant other than R-717, ammonia, is used.
6. All electrical equipment conforms to Class 1, Division 2, of NFPA 70 where the quantity of any Group A2, B2, A3, or B3 refrigerant other than R-717, ammonia, in an independent circuit would exceed 25% of the lower flammability limit (LFL) upon release to the space based on the volume determined by 7.2.
7. All refrigerant-containing parts in systems exceeding 100 HP (74.6 kW) compressor drive power, except evaporators used for refrigeration or dehumidification, condensers used for heating, control and pressure-relief valves for either, and connecting piping, are located either in a machinery room or outdoors.

7.3 Volume Calculations. The volume used to determine the refrigerant quantity limits for refrigerants in 7.2 shall be based on the volume of space to which refrigerant disperses in the event of a refrigerant leak.

7.3.1 Non-Connecting Spaces. Where a refrigerating system or a part thereof is located in one or more enclosed occupied spaces that do not connect through permanent openings or HVAC ducts, the volume of the smallest occupied space shall be used to determine the refrigerant quantity limit in the system. Where different stories and floor levels connect through an open atrium or mezzanine arrangement, the volume to be used in calculating the refrigerant quantity limit shall be determined by multiplying the floor area of the lowest space by 8.2 ft (2.5 m).

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7.3.2 Ventilated Spaces. Where a refrigerating system or a part thereof is located within an air handler, an air distribution duct system or in an occupied space served by a mechanical ventilation system, the entire air distribution system shall be analyzed to determine the worst case distribution of leaked refrigerant. The worst case or the smallest volume in which the leaked refrigerant disperses shall be used to determine the refrigerant quantity limit in the system, subject to the following criteria:

7.3.2.1 Closures. Closures in the air distribution system shall be considered; if one or more spaces of several arranged in parallel can be closed off from the source of the refrigerant leak, their volume(s) shall not be used in the calculation.

Exceptions: The following closure devices are not considered:

- (a) smoke dampers, fire dampers, and combination smoke/fire dampers that close only in an emergency not associated with a refrigerant leak,
- (b) dampers, such as VAV boxes, that provide limited closure where air flow is not reduced below 10 percent of its maximum (with the fan running).

7.3.2.2 Plenums. The space above a suspended ceiling shall not be included in calculating the refrigerant quantity limit in the system unless such space is part of the air supply or return system.

7.3.2.3 Supply and Return Ducts. The volume of the supply and return ducts and plenums shall be included when calculating the refrigerant quantity limit in the system.

7.4 Location in a Machinery Room or Outdoors. All components containing refrigerant shall be located either in a machinery room or outdoors, where

- (a) The quantity of refrigerant needed exceeds the limits in 7.2. or
- (b) Direct-fired absorption equipment, other than sealed absorption systems not exceeding the refrigerant quantity limits indicated in Table 2, is used.

7.4.1 Nonflammable Refrigerants. Machinery rooms required by 7.4 shall be constructed and maintained in accordance with 8.13 for Group A1 and B1 refrigerants.

7.4.2 Flammable Refrigerants. Machinery rooms required by 7.4 shall be constructed and maintained in accordance with 8.13 and 8.14 for Group A2, B2, A3, and B3 refrigerants.

7.5 Additional Restrictions

7.5.1 All Occupancies. 7.5.1.1 through 7.5.1.8 apply to all occupancies.

7.5.1.1 Flammable Refrigerants. The total of all Group A2, B2, A3, and B3 refrigerants other than R-717, ammonia, shall not exceed 1100 lb (500 kg) without approval by the authority having jurisdiction.

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7.5.1.2 Corridors and Lobbies. Refrigerating systems installed in a public corridor or lobby shall be limited to either

- (a) Unit systems containing not more than the quantities of Group A1 or B1 refrigerants indicated in Table 1, or
- (b) sealed absorption and unit systems having refrigerant quantities less than or equal to those indicated in Table 2.

7.5.1.3 Refrigerants Type and Purity. Refrigerants shall be of a type specified by the equipment manufacturer unless converted in accordance with 7.5.1.7. Refrigerants used in new equipment shall conform to ARI 700²⁶ in purity unless otherwise specified by the equipment manufacturer.

7.5.1.4 Recovered Refrigerants. Recovered refrigerants shall not be reused except in the system from which they were removed or as provided in 7.5.1.5 or 7.5.1.6. When contamination is evident by discoloration, odor, acid test results, or system history, recovered refrigerants shall be reclaimed in accordance with 7.5.1.6 before reuse.

7.5.1.5 Recycled Refrigerants. Recycled refrigerants shall not be reused except in systems using the same refrigerant and lubricant designation, and belonging to the same owner as the systems from which they were removed. When contamination is evident by discoloration, odor, acid test results, or system history, recycled refrigerants shall be reclaimed in accordance with 7.5.1.6

Exception: Drying is not required in order to use recycled refrigerants where water is the refrigerant, is used as an absorbent, or is a deliberate additive.

7.5.1.6 Reclaimed Refrigerants. Used refrigerants shall not be reused in a different owner's equipment unless tested and found to meet the requirements of ARI 700. Contaminated refrigerants shall not be used unless reclaimed and found to meet the requirements of ARI 700.

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

Exception: Addition of a second refrigerant is allowed where specified by the equipment manufacturer to improve oil return at low temperatures. The refrigerant and amount added shall follow the manufacturer's instructions.

7.5.1.8 Refrigerant or Lubricant Conversion. The type of refrigerant or lubricant in a system shall not be changed without evaluation for suitability, notification of the authority having jurisdiction, and the user, due observance of safety requirements, and replacement or additions of signs and identification as required in 11.2.3.

7.5.2 Applications for Human Comfort. Group B1, B2, and B3 refrigerants shall not be used in high-probability systems for human comfort.

Exceptions:

1. 7.5.2 does not apply to sealed absorption and unit systems having

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refrigerant quantities less than or equal to those indicated in Table 2.
 2. 7.5.2 does not apply to industrial occupancies.

Delete footnote f from Table 1, Refrigerants and Amounts

Delete existing Table 2, System Application Requirements, in its entirety and renumber subsequent tables and replace former Table 3 with the following:

TABLE 2 Special Quantity Limits for Sealed Absorption and Self-Contained Systems

Type of Refrigeration System	Maximum Pounds (kg) for Various Occupancies		
	Institutional	Pub/Large Mercantile	Residential Commercial
<u>Sealed Absorption System</u>			
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)
<u>Unit Systems</u>			
In other than public hallways or lobbies	0(0)	0(0)	6.6(3) 22(10)

Add a new subsection to 8.13 Refrigerating Machinery Rooms as follows:

8.13.8 Access. Access to the refrigerating machinery room shall be restricted to authorized personnel. Doors shall be clearly marked or permanent signs shall be posted at each entrance to indicate this restriction.

Replace existing Section 10 Operation and Testing with the following:

10 OPERATION AND TESTING

10.1 Field Tests

10.1.1. Every refrigerant-containing part of every system that is erected on the premises, except compressors, condensers, evaporators, safety devices, pressure gages, control mechanisms, and systems that are factory-tested, shall be tested and proved tight after complete installation and before operation. The highside and lowside of each system shall be tested and proved tight at not less than the lower of the design pressure or the setting of the pressure-relief device protecting the highside or lowside of the system, respectively.

10.1.2 Testing Procedure. Tests shall be performed with dry nitrogen or another 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 gage on the outlet side. The pressure relief device shall be set above the test pressure but low enough to prevent permanent deformation of the system's components.

Exceptions:

- (a). Mixtures of dry nitrogen, inert gases, or a combination of them with nonflammable refrigerants in concentrations of a refrigerant weight fraction (mass fraction) not exceeding 5% are allowed for tests.

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- (b). Mixtures of dry nitrogen, inert gases, or a combination of them with flammable refrigerants in concentrations not exceeding the lesser of a refrigerant weight fraction (mass fraction) of 5% or 25% of the LFL are allowed for tests.
- (c). Compressed air without added refrigerant is allowed for tests provided the system is subsequently evacuated to less than 1,000 microns (132 Pa) before charging with refrigerant. The required evacuation level is atmospheric pressure for systems using R-718 (water) or R-744 (carbon dioxide) as the refrigerant
- (d). Systems erected on the premises using Group A1 refrigerant and with copper tubing not exceeding 0.62 in. (16 mm) outside diameter shall be tested by means of the refrigerant charged into the system at the saturated vapor pressure of the refrigerant at 68°F (20°C) minimum.

10.2 Declaration. A dated declaration of test shall be provided for all systems containing 55 lb (25 kg) or more of refrigerant. The declaration shall give the name of the refrigerant and the field test pressure applied to the highside and the lowside of the system. The declaration of test shall be signed by the installer and, if an inspector is present at the tests, the inspector shall also sign the declaration. When requested, copies of this declaration shall be furnished to the authority having jurisdiction.

Replace existing 11.1 with the following:

11.1 General Restrictions – Safeguards. Means shall be taken to adequately safeguard piping, controls, and other refrigerating equipment to minimize possible accidental damage or rupture by external sources.

Replace existing 11.2.3 with the following:

11.2.3 Changes in Refrigerant or Lubricant. When the kind of refrigerant or lubricant is changed as provided in 7.5.1.8, the signs required by 11.2.1 and 11.2.2 shall be replaced, or added if not present, to identify the refrigerant and lubricant used.

Add a new Section 12 as follows:

12. Precedence with Conflicting Requirements.

Where there is a conflict between this standard and local building, electrical, fire, mechanical, or other adopted codes, their provisions shall take precedence unless otherwise stated in those codes. No provision in this Standard shall be deemed to restrict the authority of local building, electrical, fire, mechanical, or other officials from approving plans, performing inspections, allowing use of alternative methods and/or materials, or otherwise enforcing adopted codes.

Replace existing normative Appendix C with the following:

(This appendix is not part of this standard but is included for information purposes only)

APPENDIX C

REFRIGERANT CLASSIFICATION SCHEME

Refrigerants are classified by ANSI/ASHRAE STANDARD 34 in a classification scheme illustrated in the following matrix:

		SAFETY GROUP	
F I L N A C M R M E A A B S I I L N I G T Y	↑	Higher Flammability	A3 B3
		Lower Flammability	A2 B2
		No Flame Propagation	A1 B1
			Lower Toxicity Higher Toxicity
		INCREASING TOXICITY →	

Revise informative Appendix D, Informative References, as follows:

Replace the citation for ANSI/AHSRAE 34 with the following:

4. Not an informative reference.

Add a citation for reference 26:

26. Not an informative reference

Revise normative Appendix E, Normative References, as follows:

Replace the existing citation for ANSI/ASHRAE 34 with the following:

4. ANSI/ASHRAE Standard 34-1997 with addenda a-f. *Designation and Safety Classification of Refrigerants*, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Atlanta, GA 30329.

Replace the existing citation for reference 9, NFPA 70 with the following:

9. ANSI/NFPA 70-1999, *National Electrical Code*, National Fire Protection Association (NFPA), Quincy MA 02269.

Add a citation for reference 26

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26. ARI 700-95, *Specifications for Fluorocarbon and Other Refrigerants*, Air-Conditioning and Refrigeration Institute (ARI), Arlington, VA 22203.