ADDENDA

ANSI/ASHRAE Addendum f to
ANSI/ASHRAE Standard 15.2-2022

Safety Standard for Refrigeration Systems in Residential Applications

Approved by ASHRAE and the American National Standards Institute on July 31, 2024.

This addendum was approved by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. Instructions for how to submit a change can be found on the ASHRAE® website (www.ashrae.org/continuous-maintenance).

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FOREWORD

The U.S. EPA promulgated SNAP Final Rule 25 (88 FR 26382) on April 28, 2023. In this rule, the EPA approved the use of R–1234yf, R–32, R–452B, R–454A, R–454B, and R–454C in residential dehumidifiers and chillers for comfort cooling. R–32, R–452B, R–454A, R–454B, R–454C, and R–457A had previously been approved for use in residential and light commercial air conditioning and heat pumps by the EPA in SNAP Final Rule 23 (86 FR 24444). Due to their prior SNAP approval, Tables 9–1, 9–2, 9–5, 9–9, and 9–13 in the standard included R–32, R–452B, R–454A, R–454B, R–454C, and R–457A but not R–1234yf. Since R–1234yf is now SNAP-approved, this addendum adds R–1234yf to those tables.

This addendum also revises equations to calculate releasable refrigerant charge for refrigerants previously published in the standard after an error was identified in the calculator used to determine the refrigerant density correction factors. The last change is to revise the maximum permissible inductive load values for R–452B, R–454A, and R–454B using latest measurements of burning velocity as required by UL 60335–2–40.

Informative Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum f to Standard 15.2-2022

Modify Section 9 as shown. The remainder of Section 9 remains unchanged. Tables 9-1 and 9-2 reflect changes made by previously published Addendum c and errata to Standard 15.2-2022 dated April 19, 2023.

9. REFRIGERANT CHARGE LIMITS

9.3* Flammable A2L Refrigerant Charge Levels for Mitigation. [. . .]

Table 9-1 Flammable A2L Refrigerant Charge Levels for Mitigation

	m_1 Charge Level		m_2 Charge Level	
	lb_m	kg	lb_m	kg
R-32	4.0	1.8	35.0	15.9
R-452B	4.2	1.9	35.4	16.1
R-454A	3.7	1.7	32.1	14.6
R-454B	4.0	1.8	33.9	15.4
R-454C	4.0	1.8	33.4	15.2
R-457A	2.9	1.3	24.6	11.2
R–1234yf	3.8	1.7	33.1	15.0

[. . .]

9.5* Maximum Allowable Refrigerant Charge [. . .]

Table 9-2 LFL Conversion Factor

Refrigerant	*C*
R–32	1.00
R–452B	1.02
R–454A	0.90
R–454B	0.96
R–454C	0.94
R–457A	0.65
R–1234yf	0.93

[. . .]

9.6* Releasable Refrigerant Charge (m_{rel}). *Releasable refrigerant charge* (m_{rel}) *shall* be determined as shown in the following subsections.

9.6.1 For systems without *safety shut-off values*, the *releasable refrigerant charge* (m_{rel}) *shall* be the *system refrigerant charge* (m_s).

9.6.2 For systems using *safety shut-off valves*, the *releasable refrigerant charge* (m_{rel}) *shall* be determined according to Section 9.6.3.

9.6.3 Releasable Refrigerant Charge for Systems Using Safety Shut-Off Valves with A2L Refrigerants. The *releasable refrigerant charge* (m_{rel}) *shall* be the *refrigerant* contained in the interconnecting *tubing* and *indoor section* located downstream of the *safety shut-off valves* and *shall* be the largest value determined by Sections 9.6.3.1, 9.6.3.2, and 9.6.3.3. The *releasable refrigerant charge* (m_{rel}) *shall not* exceed the *maximum refrigerant charge* (m_{max}) as determined by Section 9.5.

9.6.3.1 Releasable Refrigerant Charge in Heating Mode. The *releasable refrigerant charge* in heating mode *shall* be calculated using the appropriate equation from Table 9-5.

9.6.3.2 Releasable Refrigerant Charge in Cooling Mode. The *releasable refrigerant charge* in cooling mode *shall* be calculated using the appropriate equation from Table 9-9.

9.6.3.3 Releasable Refrigerant Charge in Off/Standby Mode. The *releasable refrigerant charge* in off/ standby mode *shall* be calculated using the appropriate equation from Table 9-13.

[. . .]

Table 9-5 m_{rel} Equations for Systems Using Safety Shut-Off Valves in Heating Mode

Refrigerant	Releasable Refrigerant Charge in Heating Mode
R-32	$m_{rel} = ML_H + MG_H + MU_H$
R-452B	$m_{rel} = (1.03 \times ML_H) + (1.11 \times MG_H) + (1.04 \times MU_H)$
R-454A	$m_{rel} = (1.07 \times ML_H) + (1.05 \times MG_H) + (\sout{1.07}1.06 \times MU_H)$
R-454B	$m_{rel} = (1.02 \times ML_H) + (1.08 \times MG_H) + (1.03 \times MU_H)$
R-454C	$m_{rel} = (1.09 \times ML_H) + (0.99 \times MG_H) + (1.08 \times MU_H)$
R-457A	$m_{rel} = (1.08 \times ML_H) + (0.87 \times MG_H) + (\sout{1.07}1.06 \times MU_H)$
R–1234yf	$m_{rel} = (1.16 \times ML_H) + (0.85 \times MG_H) + (1.13 \times MU_H)$

ML_H = *refrigerant* liquid contained in liquid interconnecting *tubing* in heating mode in lb_m (kg) per Table 9–6.
MG_H = *refrigerant* vapor contained in vapor interconnecting *tubing* in heating mode in lb_m (kg) per Table 9–7.
MU_H = *refrigerant* contained in the *indoor section* in heating mode in lb_m (kg) per Table 9–8.

Table 9-9 m_{rel} Equations for Systems Using Safety Shut-Off Valves in Cooling Mode

Refrigerant	Releasable Refrigerant Charge in Cooling Mode
R-32	$m_{rel} = ML_C + MG_C + MU_C$
R-452B	$m_{rel} = (1.02 \times ML_C) + (1.11 \times MG_C) + (\sout{0.91}1.04 \times MU_C)$
R-454A	$m_{rel} = (1.07 \times ML_C) + (1.01 \times MG_C) + (\sout{0.93}1.06 \times MU_C)$
R-454B	$m_{rel} = (1.02 \times ML_C) + (1.07 \times MG_C) + (\sout{0.90}1.03 \times MU_C)$
R-454C	$m_{rel} = (1.10 \times ML_C) + (0.94 \times MG_C) + (\sout{0.94}1.06 \times MU_C)$
R-457A	$m_{rel} = (1.09 \times ML_C) + (0.82 \times MG_C) + (\sout{0.92}1.04 \times MU_C)$
R–1234yf	$m_{rel} = (1.16 \times ML_C) + (0.80 \times MG_C) + (1.09 \times MU_C)$

where
ML_C= *refrigerant* liquid contained in liquid interconnecting *tubing* in cooling mode in lb_m (kg) per Table 9-10
MG_C= *refrigerant* vapor contained in vapor interconnecting *tubing* in cooling mode in lb_m (kg) per Table 9-11
MU_C= *refrigerant* contained in the *indoor section* in cooling mode in lb_m (kg) per Table 9-12

Table 9-13 m_{rel} Equations for Systems Using Safety Shut-Off Valves in Off/Standby Mode

Refrigerant	Releasable Refrigerant Charge in Off/Standby Mode
R–32	$m_{rel} = ML_S + MG_S + MU_S$
R–452B	$m_{rel} = (\sout{1.03}1.05 \times ML_S) + (\sout{1.03}1.05 \times MG_S) + (\sout{1.03}1.05 \times MU_S)$
R–454A	$m_{rel} = (\sout{1.06}1.05 \times ML_S) + (\sout{1.06}1.05 \times MG_S) + (\sout{1.06}1.05 \times MU_S)$
R–454B	$m_{rel} = (1.03 \times ML_S) + (1.03 \times MG_S) + (1.03 \times MU_S)$
R–454C	$m_{rel} = (\sout{1.08}1.06 \times ML_S) + (\sout{1.08}1.06 \times MG_S) + (\sout{1.08}1.06 \times MU_S)$
R–457A	$m_{rel} = (\sout{1.07}1.03 \times ML_S) + (\sout{1.07}1.03 \times MG_S) + (\sout{1.07}1.03 \times MU_S)$
R–1234yf	$m_{rel} = (1.08 \times ML_S) + (1.08 \times MG_S) + (1.08 \times MU_S)$

ML_S = *refrigerant* liquid contained in liquid interconnecting *tubing* in off/standby mode in lb_m (kg) per Table 9–14.
MG_S = *refrigerant* vapor contained in vapor interconnecting *tubing* in off/standby mode in lb_m (kg) per Table 9–15.
MU_S = *refrigerant* contained in the *indoor section* in off/standby mode in lb_m (kg) per Table 9–16.

Modify Section 12 as shown. The remainder of Section 12 remains unchanged.

12. ADD-ON HEAT PUMPS

[. . .]

Table 12-1 Maximum Inductive Loads

Refrigerant	Breaking All Phases	Breaking 2 Legs (3Ph) or 1 Leg (1Ph)
R–32	5.0	2.5
R–452B	~~38.7~~39.4	~~19.4~~19.7
R–454A	~~12.1~~11.8	~~6.1~~5.9
R–454B	~~5.7~~5.6	2.8
R–454C	39.4	19.7
R–457A	6.4	3.2
R–1234yf	39.4	19.7

Modify Informative Appendix A as shown. The remainder of Appendix A remains unchanged.

[. . .]

Section 6.1

~~For A2L refrigerants, this~~ This standard provides tabulated values for ~~covers over~~ the group A2L refrigerants listed as acceptable for use in the residential and light commercial air-conditioning and heat-pumps end uses in the ~~recently proposed~~ SNAP 23 and 25 ~~rule~~ Final Rules from the U.S. EPA: R-32, R-452B, R-454A, R-454B, R-454C, R-457A, and R-1234yf. Other group A2L~~s~~ refrigerants will be added as they ~~become available~~ are approved by the U.S. EPA.

[. . .]

Section 9.6

Tables in this section are derived from equations in UL 60335-2-40/CSA-C22.2 No. 60335-2-40[2]. The factor 68 g/s (0.15 lb/s) was reduced to 6.8 g/s (0.015 lb/s), the 1.3 multiplier was eliminated, and the vapor-liquid ratios were found to be wrong and inverted. The *releasable refrigerant charge*, m_{rel}, is the larger value as calculated by Appendix A, Sections 9.6.3.1, 9.6.3.2, and ~~9.6.3.2~~ 9.6.3.3, below. ~~It was determined that the off-mode *releasable charge* was always lower than the heating mode and cooling mode and is not shown here.~~ The *releasable refrigerant charge* is calculated using the internal volume of all interconnecting *tubing* and all *indoor sections* downstream of the *safety shut-off valves*. Internal volume of *tubing* is determined by multiplying the length of *tubing* times the internal volume per length specified in Table A-1. *Refrigerant* real gas properties are from either NIST REFPROP, or ISO 17584, or the *refrigerant manufacturer*. Table A-2 provides values of *refrigerant* density that may be used to calculate *releasable refrigerant charge* in the absence of *refrigerant* properties from NIST REFPROP, ISO 17584, or the *refrigerant manufacturer*.

[. . .]

Section 12.1.6

The maximum inductive load is a function of the ~~refrigerant~~ highest burning velocity ~~at~~ of the *refrigerant* as determined in accordance with UL 60335-2-40[2], considering both dry and ~~worst-case formulation (*WCF*) condition~~ humid air burning velocity measurements as reported in ISO 817. Currently, ISO 817 does not list ~~there is no value listed~~ humid air burning ~~velocity~~ velocities ~~at *WCF* for R-454C and R-457C~~ for R-1234yf and R-457A. ~~For the table, the worst-case fractionated formulation (*WCFF*) values were used.~~ Based on the trends exhibited by the burning velocities of R-32 and R-32/R-1234yf-containing blends, the highest burning velocity of R-1234yf is expected to be lower than the highest burning velocity of R-454C. Therefore, the maximum inductive loads shown here for R-454C are also used for R-1234yf. For R-457A, the burning velocity reported in ISO 817 is the *WCFF* in dry air. This value is expected to be higher than the *WCF* value. As this is the only available burning velocity value, it was used as the basis for the maximum inductive loads for this blend. ~~This~~ Once the required burning velocities are reported in ISO 817, the maximum inductive loads in Table 12-1 will be updated ~~when those~~ accordingly ~~burning velocities are available~~ for R-1234yf and R-457A. The maximum allowable inductive load (switched electrical load) in kVA for add-on heat pumps is calculated with one of the following equations:

[. . .]

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ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

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