BSR/ASHRAE Addendum o
to ANSI/ASHRAE Standard 15-2024

______First Public Review Draft

Proposed Addendum o to Standard 15-2024, Safety Standard for Refrigeration Systems

First Public Review (July 2025)
(Draft shows Proposed Changes to Current Standard)

This draft has been recommended for public review by the responsible project committee. To submit a comment on this proposed standard, go to the ASHRAE website at https://www.ashrae.org/technical-resources/standards-and-guidelines/public-review-drafts and access the online comment database. The draft is subject to modification until it is approved for publication by the Board of Directors and ANSI. Until this time, the current edition of the standard (as modified by any published addenda on the ASHRAE website) remains in effect. The current edition of any standard may be purchased from the ASHRAE Online Store at www.ashrae.org/bookstore or by calling 404-636-8400 or 1-800-727-4723 (for orders in the U.S. or Canada).

This standard is under continuous maintenance. To propose a change to the current standard, use the change submittal form available on the ASHRAE website, www.ashrae.org.

ASHRAE, 180 Technology Parkway NW, Peachtree Corners, GA 30092

(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

FOREWORD

This proposed addendum revises Informative Appendix C to fix editorial errors in equations and revises the example calculation to use accurate thermodynamic properties of R–410A as calculated using REFPROP v10.0. It also revises Table C–1 to remove refrigerants whose use is banned under the Montreal Protocol and adds refrigerants approved by the US Environmental Protection Agency under the SNAP program in Final Rules 21, 23, 25, and 26.

Note: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.

Addendum o to Standard 15-2024

Modify Section 9 as follows. The remainder of Section 9 remains unchanged.

[…]

9.7.6* The rated discharge capacity of a *pressure relief device* expressed in lb of air/min (kg of air/s) shall be determined in accordance with ASME Boiler and Pressure Vessel Code[15], Section XIII. When the relieving capacity of a *pressure relief device* is expressed in standard ft^3/min (SCFM) of air, the density of air *shall* be set to 0.0764 lb/ft^3. All pipe and fittings between the pressure relief valve and the parts of the refrigeration system it protects shall have at least the area of the pressure relief valve inlet area.

[…]

9.7.9.3.1 The design back pressure due to flow in the discharge *piping* at the outlet of *pressure relief devices* and *fusible plugs*, discharging to atmosphere, *shall* be limited by the allowable equivalent length of *piping* determined using Equation 9-7a or 9-7b:

[…]

where

[…]

C_r = rated capacity as stamped on the pressure relief device in lb/min (kg/s), or in standard cubic feet per minute multiplied by 0.0764 lb/ft^3 (the density of air in accordance with Section 9.7.6), or as calculated in Section 9.7.7 for a rupture member or fusible plug, or as adjusted for reduced capacity due to piping as specified by the manufacturer of the device, or as adjusted for reduced capacity due to piping as estimated by an approved method.

[…]

Modify Section Informative Appendix A as follows. The remainder of Informative Appendix A remains unchanged.

[…]

Section 9.7.6

The specified value for the density of dry air of 0.0764 lb/ft^3 is prescribed by the National Board of Boiler and Pressure Vessel Inspectors in their publication NB–18[68] to convert the calculated relieving capacity of *pressure relief devices* from lb/min to standard ft^3/min (SCFM) of air. The National Board serves as the certification body for the pressure relief device requirements documented in the ASME Boiler and Pressure Vessel Code's Section XIII.

[…]

Modify Section Informative Appendix B as follows. The remainder of Informative Appendix B remains unchanged.

[…]

67. ~~NIST. 2013. NIST REFPROP, Standard Reference Database 23, Version 9.1. National Institute of Standards and Technology, Gaithersburg, MD.~~ Lemmon, E.W., Bell, I.H., Huber, M.L., McLinden, M.O. NIST Standard Reference Database 23: Reference Fluid Thermodynamic and Transport Properties-REFPROP, Version 10.0, National Institute of Standards and Technology, Standard Reference Data Program, Gaithersburg, 2018.

68. The National Board of Boiler and Pressure Vessel Inspectors. (2024). *Pressure relief device certification* (NB–18). https://www.nationalboard.org

Modify Section Informative Appendix C as follows. The remainder of Section Informative Appendix C remains unchanged.

INFORMATIVE APPENDIX C

METHOD FOR CALCULATING DISCHARGE CAPACITY OF POSITIVE DISPLACEMENT COMPRESSOR PRESSURE RELIEF DEVICE

[…]

$$\cancel{W_v}\ W_r = \frac{Q \times PL \times \eta_v}{v_g} \qquad \text{(C–1)}$$

where

W_r = mass flow rate of refrigerant, lb/min (kg/s)

[…]

Example

Determine the flow capacity of a *pressure relief device* for an R-410A *compressor* with a swept volume (Q) of ~~341~~ 342 ft^3/min (~~0.1609~~ 0.1614 m^3/s). The *compressor* is equipped with capacity control that is actuated at 90% of the *pressure relief device set pressure* and has a minimum regulated flow of 10%.

Q = ~~341~~ 342 ft^3/min

Q = ~~0.16095~~ 0.1614 m^3/s

η_v = 0.90, assumed volumetric efficiency of compressor

PL = 0.1, minimum regulated flow factor

v_g~~@~~(R–410A, T = 50 °F) = ~~1.1979~~ 0.38214 ft^3/lb (I-P)

v_g~~@~~(R–410A, T = 10°C) = ~~0.0748~~ 0.023856 m^3/kg (SI)

{Note to reviewers: Terms added to equations are indicated by blue font color but not underlined because underlined text in equation format can be confused with a strikethrough.}

$$W_r = \frac{\cancel{341}\ 342\,\frac{\mathrm{ft}^3}{\mathrm{min}} \times 0.1 \times 0.90}{\cancel{1.1979}\ 0.38214\,\frac{\mathrm{ft}^3}{\mathrm{lb}}} = \cancel{25.52}\ 80.546\,\frac{\mathrm{lb}}{\mathrm{min}} \qquad \text{(I-P [See C–1])}$$

$$W_r = \frac{\cancel{0.16095}\ 0.1614\,\frac{\mathrm{m}^3}{\mathrm{s}} \times 0.1 \times 0.90}{\cancel{0.0748}\ 0.023856\,\frac{\mathrm{m}^3}{\mathrm{kg}}} = \cancel{0.1936}\ 0.60890\,\frac{\mathrm{kg}}{\mathrm{s}} \qquad \text{(SI [See C–1])}$$

$$W_a = \cancel{W_r \times r_w = 25.62}\ 80.546\,\frac{\text{lb}}{\text{min}} \times 0.6208 = \cancel{15.88}\ 50.003\,\frac{\text{lb}}{\text{min}}\ \text{of air} \qquad \text{(I-P [See C–2])}$$

$$W_a = \cancel{W_r \times r_w = 0.1936}\ 0.60890\,\frac{\text{kg}}{\text{s}} \times 0.6208 = \cancel{0.12}\ 0.37801\,\frac{\text{kg}}{\text{s}}\ \text{of air} \qquad \text{(SI [See C–2])}$$

Converting to standard ~~ft^3/min~~ volumetric flow rate of air, $\dot{Q}_{a,std}$, where ~~V_a = specific volume of air = 13.1 ft^3/lb (0.818 m^3/kg) for dry air at 60 °F (15.6 °C)~~ $\rho_{da,std}$ = 0.0764 lb_m/ft^3 (1.224 kg/m^3) for dry air at 60.0 °F (15.6 °C) at a barometric pressure of 14.70 psia (101.3 kPa):

~~SCFM = 13.1 (15.88) = 208.02 ft^3/min (I-P)~~

~~SCFM = 0.818 (0.12) = 0.098 m^3/s (SI)~~

$$\dot{Q}_{a,std} = W_a \times \frac{1}{\rho_{da,std}} = 50.003\,\frac{\text{lb}}{\text{min}} \times \frac{1}{0.0764}\,\frac{\text{ft}^3}{\text{lb}_{\text{m.da}}} = 654\,\frac{\text{ft}^3}{\text{min}} \qquad \text{(I-P)}$$

$$\dot{Q}_{a,std} = W_a \times \frac{1}{\rho_{da,std}} = 0.37801\,\frac{\text{kg}}{\text{s}} \times \frac{1}{1.224}\,\frac{\text{m}^3}{\text{kg}_{\text{da}}} = 0.309\,\frac{\text{m}^3}{\text{s}} \qquad \text{(SI)}$$

Table C–1 Constants for Calculating Discharge Capacity

*{Note to reviewers: Addendum **m** to ASHRAE Standard 15–2022 revised the relative molar masses of R–123, R–290, and R–502. However, a previous erratum published to ASHRAE Standard 34–2022 had corrected the values of relative molar masses for these refrigerants. These corrections can be read in the errata sheet dated July 05, 2024. This errata sheet to ASHRAE 34–2022 is taken to override the changes made in addendum **m** to ASHRAE 15–2022.}*

Refrigerant	k^a	Relative Molar Mass	C_r	r_w
~~R–11~~	~~1.137~~	~~137.4~~	~~330.7~~	~~0.49~~
~~R–12~~	~~1.205~~	~~120.9~~	~~337.7~~	~~0.51~~
~~R–13~~	~~2.050~~	~~104.5~~	~~403.4~~	~~0.46~~
R–22	1.3191	86.5	348.8	0.5~~9~~850
~~R–23~~	~~2.742~~	~~70.0~~	~~439.3~~	~~0.52~~
R–32	1.5337	52.0	367.3	0.7164
~~R–113~~	~~1.081~~	~~187.4~~	~~324.7~~	~~0.43~~
~~R–114~~	~~1.094~~	~~170.9~~	~~326.1~~	~~0.45~~
R–123	1.1035	~~153.0~~ 152.9	327.1	0.4~~7~~691
R–134a	1.1961	102.0	336.8	0.5~~6~~578
R–152a	1.2331	66.1	340.5	0.6854
R–236fa	1.10~~2~~18	152.0	326.9	0.4708
R–245fa	1.09~~8~~78	134.0	326.5	0.5021
R–290	1.2367	~~44.0~~ 44.1	340.9	0.8~~4~~383
R–600a	1.1346	58.1	330.5	0.7533
R–718	1.3278	18.0	349.6	1.2795
R–744	2.690	44.0	437.0	0.6546
R–1234yf	1.1685	114.0	334.0	0.5321
R–1234ze(E)	1.1437	114.0	331.4	0.5362
R–404A	1.2765	97.6	344.7	0.5~~6~~572

R–407C	1.2693	86.2	344.1	0.5940
R–410A	1.4310	72.6	358.8	0.6208
~~R–500~~	~~1.236~~	~~99.3~~	~~340.8~~	~~0.56~~
~~R–502~~	~~1.262~~	~~111.6~~	~~343.4~~	~~0.52~~
~~R–507A~~	~~1.282~~	~~98.9~~	~~345.2~~	~~0.55~~
~~R–600~~	~~1.122~~	~~58.1~~	~~329.2~~	~~0.76~~
~~R–718~~	~~1.328~~	~~18.0~~	~~349.6~~	~~1.28~~
~~R–744~~	~~2.690~~	~~44.0~~	~~437.0~~	~~0.65~~
R–448A	1.2760	86.3	344.7	0.5926
R–449A	1.2755	87.2	344.7	0.5896
R–450A	1.1659	108.7	333.7	0.5453
R–452B	1.4324	63.5	358.9	0.6635
R–454A	1.2903	80.5	346.1	0.6112
R–454B	1.4299	62.6	358.7	0.6687
R–454C	1.2365	90.8	340.9	0.5842
R–455A	1.2435	87.5	341.6	0.5939
R–457A	1.2326	87.6	340.5	0.6055
R–513A	1.1859	108.4	335.8	0.5428
R–515B	1.1410	117.5	331.1	0.5286
R–516A	1.1849	102.6	335.7	0.5580

a. Source: NIST ~~REFPROP,~~ Standard Reference Database 23, REFPROP v~~9.1~~10.0, ~~2013~~2018[67].