ADDENDA

ANSI/ASHRAE Addendum c to
ANSI/ASHRAE Standard 34-2019

Designation and Safety Classification of Refrigerants

Approved by the ASHRAE Standards Committee on October 16, 2019; by the ASHRAE Board of Directors on November 1, 2019; and by the American National Standards Institute on November 5, 2019.

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 (https://www.ashrae.org/continuous-maintenance).

The latest edition of an ASHRAE Standard may be purchased on the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

 ISSN 1041-2336

Approved American National Standard
ANSI
www.ansi.org

SPECIAL NOTE

This American National Standard (ANS) is a national voluntary consensus Standard developed under the auspices of ASHRAE. *Consensus* is defined by the American National Standards Institute (ANSI), of which ASHRAE is a member and which has approved this Standard as an ANS, as "substantial agreement reached by directly and materially affected interest categories. This signifies the concurrence of more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that an effort be made toward their resolution." Compliance with this Standard is voluntary until and unless a legal jurisdiction makes compliance mandatory through legislation.

ASHRAE obtains consensus through participation of its national and international members, associated societies, and public review.

ASHRAE Standards are prepared by a Project Committee appointed specifically for the purpose of writing the Standard. The Project Committee Chair and Vice-Chair must be members of ASHRAE; while other committee members may or may not be ASHRAE members, all must be technically qualified in the subject area of the Standard. Every effort is made to balance the concerned interests on all Project Committees.

The Senior Manager of Standards of ASHRAE should be contacted for

a. interpretation of the contents of this Standard,
b. participation in the next review of the Standard,
c. offering constructive criticism for improving the Standard, or
d. permission to reprint portions of the Standard.

DISCLAIMER

ASHRAE uses its best efforts to promulgate Standards and Guidelines for the benefit of the public in light of available information and accepted industry practices. However, ASHRAE does not guarantee, certify, or assure the safety or performance of any products, components, or systems tested, installed, or operated in accordance with ASHRAE's Standards or Guidelines or that any tests conducted under its Standards or Guidelines will be nonhazardous or free from risk.

ASHRAE INDUSTRIAL ADVERTISING POLICY ON STANDARDS

ASHRAE Standards and Guidelines are established to assist industry and the public by offering a uniform method of testing for rating purposes, by suggesting safe practices in designing and installing equipment, by providing proper definitions of this equipment, and by providing other information that may serve to guide the industry. The creation of ASHRAE Standards and Guidelines is determined by the need for them, and conformance to them is completely voluntary.

In referring to this Standard or Guideline and in marking of equipment and in advertising, no claim shall be made, either stated or implied, that the product has been approved by ASHRAE.

(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

Addendum c corrects errors in several RCL values found in Tables 4-1 and 4-2.

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 c to Standard 34-2019

Modify Table 4-1 as shown.

Table 4-1 Refrigerant Data and Safety Classifications

Refrigerant Number	Chemical Name[a,b]	Chemical Formula[a]	OEL[f], ppm v/v	Safety Group	RCL[c] (ppm v/v)	RCL[c] (lb/Mcf)	RCL[c] (g/m^3)	Highly Toxic or Toxic[d] Under Code Classification
Methane Series								
11	trichlorofluoromethane	CCl_3F	1000	A1	1100	0.39	~~6.2~~6.1	Neither
[. . .]								
Ethane Series								
[. . .]								
142b	1-chloro-1,1-difluoroethane	CH_3CClF_2	1000	A2	20,000	5.1	~~83~~82	Neither
143a	1,1,1-trifluoroethane	CH_3CF_3	1000	A2L	21,000	~~4.5~~4.4	70	Neither
[. . .]								
170	ethane	CH_3CH_3	1000	A3	7000	0.54	~~8.7~~8.6	Neither
[. . .]								
Propane								
[. . .]								
290	propane	$CH_3CH_2CH_3$	1000	A3	5300	~~0.56~~0.59	9.5	Neither
Cyclic Organic Compounds								
C318	octafluorocyclobutane	$-(CF_2)_4-$	1000	A1	80,000	41	~~660~~650	Neither
Miscellaneous Organic Compounds								
hydrocarbons								
[. . .]								
600a	2-methylpropane (isobutane)	$CH(CH_3)_2CH_3$	1000	A3	4000	0.59	~~9.6~~9.5	Neither
Unsaturated Organic Compounds								
1130(E)	trans-1,2-dichloroethene	CHCl=CHCl	200	~~B1~~B2	~~100~~1000	0.25	4	Neither
[. . .]								
1224yd(Z)	(Z)-1-chloro-2,3,3,3-tetrafluoropropene	CF3CF=CHCl	1000	A1	60,000	23	~~360~~370	Neither
[. . .]								
1234yf	2,3,3,3-tetrafluoro-1-propene	$CF_3CF=CH_2$	500	A2L	16,000	~~4.7~~4.5	75	Neither
1234ze(E)	trans-1,3,3,3-tetrafluoro-1-propene	$CF_3CH=CFH$	800	A2L	16,000	4.7	~~75~~76	Neither
[. . .]								
1336mzz(Z)	cis-1,1,1,4,4,4-hexaflouro-2-butene	$CF_3CHCHCF_3$	500	A1	13,000	~~5.4~~5.2	~~87~~84	Neither

Modify Table 4-2 as shown.

Table 4-2 Data and Safety Classifications for Refrigerant Blends

Refrigerant Number	Composition (Mass%)	Composition Tolerances	OEL[h], ppm v/v	Safety Group	RCL[a] (ppm v/v)	RCL[a] (lb/Mcf)	RCL[a] (g/m^3)	Highly Toxic or Toxic[f] Under Code Classification
Zeotropes								
[. . .]								
401B	R-22/152a/124 (61.0/11.0/28.0)	(±2.0/+0.5, –1.5/±1.0)	1000	A1	30,000	7.2	~~120~~110	Neither
[. . .]								
403B[g]	R-290/22/218 (5.0/56.0/39.0)	(+0.2, –2.0/±2.0/±2.0)	1000	A1	~~70,000~~ 68,000	18	290	Neither
[. . .]								
406A	R-22/600a/142b (55.0/4.0/41.0)	(±2.0/±1.0/±1.0)	1000	A2	21,000	4.7	~~25~~75	Neither
[. . .]								
408A[g]	R-125/143a/22 (7.0/46.0/47.0)	(±2.0/±1.0/±2.0)	1000	A1	~~95,000~~ 94,000	21	~~340~~330	Neither
[. . .]								
410B[i]	R-32/125 (45.0/55.0)	(±1.0/±1.0)	1000	A1	140,000	27	430	Neither
411A[e]	R-1270/22/152a (1.5/87.5/11.0)	(+0.0, –1.0/+2.0, –0.0/ +0.0, –1.0)	~~990~~ 970	A2	14,000	2.9	46	Neither
411B[e]	R-1270/22/152a (3.0/94.0/3.0)	(+0.0, –1.0/+2.0, –0.0/ +0.0, –1.0)	~~980~~ 940	A2	13,000	2.8	45	Neither
[. . .]								
413A	R-218/134a/600a (9.0/88.0/3.0)	(±1.0/±2.0/+0.0, –1.0)	1000	A2	22,000	5.8	~~94~~93	Neither
[. . .]								
414B	R-22/124/600a/142b (50.0/39.0/1.5/9.5)	(±2.0/±2.0/±0.5/+0.5, –1.0)	1000	A1	23,000	6.0	~~95~~96	Neither
[. . .]								
417A[e]	R-125/134a/600 (46.6/50.0/3.4)	(±1.1/±1.0/+0.1, –0.4)	1000	A1	13,000	3.5	~~56~~55	Neither
417B	R-125/134a/600 (79.0/18.3/2.7)	(±1.0/±1.0/+0.1, –0.5)	1000	A1	15,000	4.3	~~70~~69	Neither
[. . .]								
420A	R-134a/142b (88.0/12.0)	(+1.0, –0.0/+0.0, –1.0)	1000	A1	~~45,000~~ 44,000	12	~~190~~180	Neither
[. . .]								
423A	R-134a/227ea (52.5/47.5)	(±1.0/±1.0)	1000	A1	59,000	19	~~310~~300	Neither
424A[e]	R-125/134a/600a/600/601a (50.5/47.0/0.9/1.0/0.6)	(±1.0/±1.0/+0.1, –0.2/ +0.1, +0.2/+0.1, –0.2)	~~970~~990	A1	23,000	6.2	100	Neither
[. . .]								
428A	R-125/143a/290/600a (77.5/20.0/0.6/1.9)	(±1.0/±1.0/+0.1, –0.2/ +0.1, –0.2)	1000	A1	~~83,000~~ 84,000	23	370	Neither
[. . .]								
431A	R-290/152a (71.0/29.0)	(±1.0/±1.0)	1000	A3	5500	~~0.69~~0.68	11	Neither
432A	R-1270/E170 (80.0/20.0)	(±1.0/±1.0)	~~700~~550	A3	1200	0.13	~~2.1~~2.2	Neither
433A	R-1270/290 (30.0/70.0)	(±1.0/±1.0)	~~880~~760	A3	3100	0.34	5.5	Neither
433B	R-1270/290 (5.0/95.0)	(±1.0/±1.0)	950	A3	~~4500~~ 3500	~~0.51~~0.39	~~8.1~~6.3	Neither
433C	R-1270/290 (25.0/75.0)	(±1.0/±1.0)	790	A3	~~3600~~ 3700	0.41	~~6.6~~6.5	Neither

Table 4-2 Data and Safety Classifications for Refrigerant Blends *(Continued)*

Refrigerant Number	Composition (Mass%)	Composition Tolerances	OEL[h], ppm v/v	Safety Group	RCL[a] (ppm v/v)	RCL[a] (lb/Mcf)	RCL[a] (g/m^3)	Highly Toxic or Toxic[f] Under Code Classification
[. . .]								
436C	R-290/600a (95.0/5.0)	(±1.2/±1.2)	~~990~~1000	A3	5000	0.57	9.1	Neither
437A	R-125/134a/600/601 (19.5/78.5/1.4/0.6)	(+0.5, –1.8/+1.5, –0.7/ +0.1, –0.2/+0.1, –0.2)	990	A1	19,000	~~5.0~~5.1	82	Neither
[. . .]								
439A	R-32/125/600a (50.0/47.0/3.0)	(±1.0/±1.0/±0.5)	~~990~~1000	A2	26,000	4.7	76	Neither
[. . .]								
443A	R-1270/290/600a (55.0/40.0/5.0)	(±2.0/±2.0/±1.2)	~~580~~640	A3	1700	0.19	3.1	Neither
[. . .]								
444B	R-32/152a/1234ze(E) (41.5/10.0/48.5)	(±1.0/±1.0/±1.0)	~~890~~930	A2L	23,000	4.3	69	Neither
[. . .]								
447A	R-32/125/1234ze(E) (68.0/3.5/28.5)	(+1.5, –0.5/+1.5, –0.5/ +1.0, –1.0)	~~900~~960	A2L	16,000	2.6	42	Neither
447B	R-32/125/1234ze(E) (68.0/8.0/24.0)	(+1.0, –2.0/+2.0, –1.0/ +1.0, –2.0)	970	A2L	~~30,000~~ 16,000	~~23~~2.6	~~360~~42	Neither
448A	R-32/125/1234yf/134a/ 1234ze(E) (26.0/26.0/20.0/21.0/7.0)	(+0.5, –2.0/+2.0, –0.5/ +0.5, –2.0/+2.0, –1.0/ +0.5, –2.0)	~~890~~860	A1	110,000	24	390	Neither
449A	R-32 /125 /1234yf /134a (24.3/24.7/25.3/25.7)	(+0.2, –1.0/+1.0, –0.2/ +0.2, –1.0/+1.0, –0.2)	~~830~~840	A1	100,000	23	370	Neither
[. . .]								
451A	R-1234yf/134a (89.8/10.2)	(±0.2/±0.2)	~~520~~530	A2L	18,000	~~5.3~~5.0	81	Neither
451B	R-1234yf/134a (88.8/11.2)	(±0.2/±0.2)	530	A2L	18,000	~~5.3~~5.0	81	Neither
452A	R-32/125/1234yf (11.0/59.0/ 30.0)	(±1.7/±1.8/+0.1, –1.0)	~~780~~790	A1	~~10,000~~ 100,000	27	440	Neither
452B	R-32/125/1234yf (67.0/7.0/26.0)	(±2.0/±1.5/±2.0)	870	A2L	30,000	~~23~~4.8	~~360~~77	Neither
452C	R-32/125/1234yf (12.5/61.0/ 26.5)	(+0.5, –1.5/±1.0/+0.5, –1.5)	~~800~~810	A1	100,000	27	430	Neither
[. . .]								
454A	R-32/1234yf (35.0/65.0)	(+2.0/–2.0, +2.0/–2.0)	690	A2L	16,000	~~28~~3.2	~~450~~52	Neither
454B	R-32/1234yf (68.9/31.1)	(+1.0/–1.0, +1.0/–1.0)	850	A2L	19,000	~~22~~3.1	~~360~~49	Neither
454C	R-32/1234yf (21.5/78.5)	(±2.0/±2.0)	620	A2L	19,000	~~29~~4.4	~~460~~71	Neither
455A	R-744/32/1234yf (3.0/21.5/75.5)	(+2.0, –1.0/+1.0, –2.0/ ±2.0)	650	A2L	~~30,000~~ 22,000	~~23~~4.9	~~380~~79	Neither
[. . .]								
457A	R-32/1234yf/152a (18.0/70.0/ 12.0)	(+0.5, –1.5/+0.5, –1.5/ +0.1, –1.9)	650	A2L	15,000	~~25~~3.4	~~400~~54	Neither
[. . .]								
459A	R-32/1234yf/1234ze(E) (68.0/26.0/6.0)	(+0.5, –1.5/±2.0/+1.5, –0.5)	870	A2L	27,000	~~23~~4.3	~~360~~69	Neither
459B	R-32/1234yf/1234ze(E) (21.0/69.0/10.0)	(+0.5, –1.0/±2.0/±1.0)	640	A2L	~~16,000~~ 25,000	~~30~~5.8	~~470~~92	Neither
460A	R-32/125/134a/1234ze(E) (12.0/52.0/14.0/22.0)	(±1.0/±1.0/±1.0/±1.0)	~~650~~950	A1	92,000	24	380	Neither
Azeotropes[b]								
500	R-12/152a (73.8/26.2)		1000	A1	~~30,000~~ 29,000	~~7.6~~7.4	120	Neither

Table 4-2 Data and Safety Classifications for Refrigerant Blends *(Continued)*

Refrigerant Number	Composition (Mass%)	Composition Tolerances	OEL[h], ppm v/v	Safety Group	RCL[a] (ppm v/v)	RCL[a] (lb/Mcf)	RCL[a] (g/m^3)	Highly Toxic or Toxic[f] Under Code Classification
[. . .]								
507A[d,i]	R-125/143a (50.0/50.0)		1000	A1	130,000	32	~~520~~510	Neither
[. . .]								
509A[d,g]	R-22/218 (44.0/56.0)		1000	A1	75,000	24	~~390~~380	Neither
[. . .]								
515A	R-1234ze(E)/227ea (88.0/12.0)	(+1.0, –2.0/+2.0, –1.0)	810	A1	~~62,000~~ 63,000	19	300	Neither
516A	R-1234yf/134a/152a (77.5/8.5/14.0)	(±1.4/+0.5, –1.5/+0.1, –1.9)	590	A2L	~~27,000~~ 13,000	~~7.0~~3.2	~~110~~52	Neither

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

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.

ASHRAE · 1791 Tullie Circle NE · Atlanta, GA 30329 · www.ashrae.org

About ASHRAE

Founded in 1894, ASHRAE is a global professional society committed to serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration, and their allied fields.

As an industry leader in research, standards writing, publishing, certification, and continuing education, ASHRAE and its members are dedicated to promoting a healthy and sustainable built environment for all, through strategic partnerships with organizations in the HVAC&R community and across related industries.

To stay current with this and other ASHRAE Standards and Guidelines, visit www.ashrae.org/standards, and connect on LinkedIn, Facebook, Twitter, and YouTube.

Visit the ASHRAE Bookstore

ASHRAE offers its Standards and Guidelines in print, as immediately downloadable PDFs, and via ASHRAE Digital Collections, which provides online access with automatic updates as well as historical versions of publications. Selected Standards and Guidelines are also offered in redline versions that indicate the changes made between the active Standard or Guideline and its previous version. For more information, visit the Standards and Guidelines section of the ASHRAE Bookstore at www.ashrae.org/bookstore.

IMPORTANT NOTICES ABOUT THIS STANDARD

To ensure that you have all of the approved addenda, errata, and interpretations for this Standard, visit www.ashrae.org/standards to download them free of charge.

Addenda, errata, and interpretations for ASHRAE Standards and Guidelines are no longer distributed with copies of the Standards and Guidelines. ASHRAE provides these addenda, errata, and interpretations only in electronic form to promote more sustainable use of resources.

11/19