ADDENDA

ANSI/ASHRAE Addenda p, q, r, s, t, u, v, and y to ANSI/ASHRAE Standard 34-2010

Designation and Safety Classification of Refrigerants

Approved by the ASHRAE Standards Committee on January 21, 2012; by the ASHRAE Board of Directors on January 25, 2012; and by the American National Standards Institute on January 26, 2012.

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FOREWORD

This addendum adds new azeotropic refrigerant 512A to Table 2 and Table D2.

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 p to Standard 34-2010

[Add the following underlined data to Table 2 and Table D2 in the columns indicated.]

TABLE 2 Data and Safety Classifications for Refrigerant Blends

Refrigerant Number = 512A
Composition (Mass %) = R-134a/152a (5.0/95.0)
Composition tolerances = (±1.0/± 1.0)
OEL = 1000
Safety Group = A2
RCL = 11,000 ppm v/v; 31 g/m^3; 1.9 lb/Mcf
Highly Toxic or Toxic Under Code Classification = Neither

TABLE D2 Data for Refrigerant Blends

Refrigerant Number = 512A
Composition (Mass %) = R-134a/152a (5.0/95.0)
Azeotropic Temperature (°C) = –20 to 40
Azeotropic Temperature (°F) = –4 to 104
Azeotropic Molecular Mass = 67.24
Normal BPt. (°C) = –24.0
Normal BPt. (°F) = –11.2

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FOREWORD

This addendum adds new zeotropic refrigerant 442A to Table 2 and Table D2.

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Addendum q to Standard 34-2010

[Add the following underlined data to Table 2 and Table D2 in the columns indicated.]

TABLE 2 Data and Safety Classifications for Refrigerant Blends

Refrigerant Number = 442A
Composition (Mass %) = R-32/125/134a/152a/227ea (31.0/31.0/30.0/3.0/5.0)
Composition tolerances = (±1.0/± 1.0±/1.0/±0.5/±1.0)
OEL = 1000
Safety Group = A1
RCL = 100,000 ppm v/v; 330 g/m^3; 21 lb/Mcf
Highly Toxic or Toxic Under Code Classification = Neither

TABLE D2 Data for Refrigerant Blends

Refrigerant Number = 442A
Composition (Mass %) = R-32/125/134a/152a/227ea (31.0/31.0/30.0/3.0/5.0)
Average Molecular Mass = 81.77
Bubble Point (°C) = –46.5
Bubble Point (°F) = –51.7
Dew Point (°C) = –39.9
Dew Point (°F) = –39.8

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FOREWORD

This addendum adds toxicity Code Classification assignments for refrigerants R-421B to R-433A (inclusive), R-601a, and R-227ea to Tables 1 and 2, which were left unassigned in Standard 34-2010. Highly toxic*,* toxic*, or* neither *under Code Classification:* highly toxic *and* toxic *are as defined in the International Fire Code, Uniform Fire Code, and OSHA regulations, and* neither *identifies those refrigerants having lesser toxicity than either of those groups (see definition of* toxic *and References 1, 2, and 3 in ASHRAE Standard 34-2010).*

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Addendum r to Standard 34-2010

[Add the following underlined data to Table 1 and Table 2 in the column indicated.]

TABLE 1 Refrigerant Data and Safety Classifications

Refrigerant Number	Chemical Name[a,b]	Highly Toxic or Toxic[e] Under Code Classification
227ea	1,1,1,2,3,3,3-heptafluoropropane	Neither
601a	2-methylbutane (isopentane)	Neither

TABLE 2 Data and Safety Classifications for Refrigerant Blends

Refrigerant Number	Composition (Mass %)	Highly Toxic or Toxic[e] Under Code Classification
421B	R-125/134a (85.0/15.0)	Neither
422A	R-125/134a/600a (85.1/11.5/3.4)	Neither
422B	R-125/134a/600a (55.0/42.0/3.0)	Neither
422C	R-125/134a/600a (82.0/15.0/3.0)	Neither
422D	R-125/134a/600a (65.1/31.5/3.4)	Neither
423A	R-134a/227ea (52.5/47.5)	Neither
424A	R-125/134a/600a/600/601a (50.5/47.0/0.9/1.0/0.6)	Neither
425A	R-32/134a/227ea (18.5/69.5/12.0)	Neither
426A	R-125/134a/600/601a (5.1/93.0/1.3/0.6)	Neither
427A	R-32/125/143a/134a (15.0/25.0/10.0/50.0)	Neither
428A	R-125/143a/290/600a (77.5/20.0/0.6/1.9)	Neither
429A	R-E170/152a/600a (60.0/10.0/30.0)	Neither
430A	R-152a/600a (76.0/24.0)	Neither
431A	R-290/152a (71.0/29.0)	Neither
432A	R-1270/E170 (80.0/20.0)	Neither
433A	R-1270/290 (30.0/70.0)	Neither

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FOREWORD

This addendum adds missing RCL data for R-600 in Table 1 and corrects significant figures for RCL data for R1270, R-436B, and R-437A in Tables 1 and 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 s to Standard 34-2010

[Make the following changes to Table 1 and Table 2.]

TABLE 1 Refrigerant Data and Safety Classifications

Refrigerant Number	Chemical Name	RCL (ppm v/v)	RCL (g/m^3)	RCL (lb/Mcf)
600	butane	1000	2.4	0.15
1270	propene (propylene)	1000	1.7	~~0.1~~ 0.11

TABLE 2 Data and Safety Classifications for Refrigerant Blends

Refrigerant Number	Chemical Name	RCL (ppm v/v)	RCL (g/m^3)	RCL (lb/Mcf)
436B	R-290/600a (52.0/48.0)	4000	~~8.1~~8.2	~~0.50~~ 0.51
437A	R-125/134a/600/601 (19.5/78.5/1.4/0.6)	19,000	~~81~~ 82	5.0

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FOREWORD

This addendum clarifies the definitions of lowest observed effect level (LOEL) *and* no-observed-effect level (NOEL) *to be consistent as applied in this Standard.*

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 t to Standard 34-2010

[Change the following definitions as indicated.]

3. DEFINITIONS OF TERMS

lowest observed effect level (LOEL): The concentration of a material, a refrigerant in this standard, that has caused any adverse~~observed~~ effect to even one test animal.

no-observed-effect level (NOEL): The highest concentration of a material, a refrigerant in this standard, at which no adverse effect has been observed in even one test animal.

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FOREWORD

This addendum clarifies Section 7.3 Requirements for Data Calculations and Section 9.6 Toxicity Information for consistency.

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 u to Standard 34-2010

[Make the following changes to sections 7.3 and 9.6.]

7.3 Data for Calculations. The data used to calculate the RCL shall be taken from scientific and engineering studies or published safety assessments by governmental agencies or expert panels. The applications submitted under Section 9, or therein referenced source studies for toxicity data, must indicate the extent of compliance with ~~g~~Good ~~l~~Laboratory ~~p~~Practice~~s~~ (GLP) regulations in accordance with references 10, 11, 12, or 13 or earlier editions of these references in effect at the time when the studies were performed. Data from peer-reviewed publications, including journal articles and reports, also are allowed ~~provided that they demonstrate examination of the same information~~.

9.6 Toxicity Information. Applications shall include the data identified in Sections 9.6.1, 9.6.2, and 9.6.3. The sources for these data shall be identified, and the applicant shall provide copies if requested by the committee. The identified sources shall describe the test methods, specimens, and materials used and also document clinical observations and the test results. The documentation must indicate the extent of compliance with GLP regulations in accordance with reference 10, 11, 12, or 13 or earlier editions of these references in effect at the time when the studies were performed. ~~for toxicity tests since 1985.~~ Data from peer-reviewed publications, including journal articles, reports, and assessments, also are allowed ~~provided that they demonstrate examination of the same information~~. Material Safety Data Sheets (MSDSs), Hygiene Standard Sheets, manufacturers' product literature, and databases are not acceptable as sources for toxicity information for this section.

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FOREWORD

This addendum removes the use of the term toxic concentration factors (TCFs) from Informative Appendix G, Calculation of RCL and ATEL for Blends, as the term is not defined or used in Standard 34 or Standard 15.

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 v to Standard 34-2010

[Make the following changes to Normative Appendix G.]

INFORMATIVE APPENDIX G— CALCULATION OF RCL AND ATEL FOR BLENDS

The ATEL for a refrigerant blend shall be set as the lowest concentration ~~of the blend acute toxic concentration factors (TCFs)~~ based on ~~in~~ Section 7.1.1 (a) through (d), where ~~each~~ the ATEL of the blend ~~acute TCF quantity~~ is calculated from the ~~acute TCF values of its~~ individual components, following the Additivity Method for Mixtures (reference Appendix C of the 2010 American Conference of Governmental Industrial Hygienists (ACGIH), *Threshold Limit Values for Chemical Substances and Physical Agents*).

[...]

In a similar fashion, Blend Cardiac Sensitization Indicator $(b)_{blend}$ can be calculated from $1/(\sum mf_n / b_n)$, where b_n is the cardiac sensitization indicator for component n in the blend (i.e., 100% of the NOEL or, if not determined, 80% of the LOEL), and from the mole fraction mf_n of component n, and so forth as described ~~for the acute TCFs~~ in Section 7.1.1 (a) through (d).

Each acute toxicity endpoint [Section 7.1.1 (a) through (d)] ~~TCF~~ for a blend can be expressed in ppm (parts per million of substance in air by volume) if the acute toxicity values ~~TCFs~~ for each component n are expressed in ppm and mf_n is expressed as the mole fraction of component n in the blend. The toxicity ~~TCF~~ of each component shall be determined according to the endpoints ~~priority~~ indicated in Section 7. Thus, the determining method for each component may not be consistent, such as 100% of NOEL of component A and 80% of LOEL of component B.

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FOREWORD

This addendum better defines the experimental verification of models used to identify the WCFF fractionated compositions, and allows vapor-liquid equilibrium (VLE) data only to be used for experimental verification.

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Addendum y to Standard 34-2010

[Add new Section B2.1.1 Experimental Verification to the Standard.]

B2. FRACTIONATION ANALYSIS

Applications shall include an analysis of fractionation.

B2.1 The applicant shall report results of a fractionation analysis conducted to determine vapor- and liquid-phase compositions of refrigerant blends under conditions of leakage (see Section B2.4) and successive charge/recharge conditions (see Section B2.5). The analysis shall be validated through experimentation. A computer or mathematical model may be used to identify the WCFF. If a computer or mathematical model is used, then the applicant shall identify the model used and shall submit experimental data that verifies the accuracy of the model at the conditions that predict the WCFF.

B2.1.1 Experimental Verification. Experimental verification of the model shall take the form of leakage experiments (carried out in accordance with section B2.4) that result in the WCFF. For blends of three or fewer components where the initial composition of the vapor or liquid phase results in the WCFF, this verification may instead be experimental vapor liquid equilibrium data (VLE) at the temperature of the WCFF or over a range of temperatures that includes the temperature of the WCFF; such experiments may be carried out by the applicant or be taken from the peer-reviewed literature.

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.