



Minutes

SSPC-34: Designation & Safety Classification of Refrigerants

6:30 – 10:00 PM, January 22, 2024

Grand Horizon C, Marriott Marquis Chicago, IL

1. CALL TO ORDER

1.1 ASHRAE Code of Ethics Review ([ATTACHMENT 1](#))

“Commitment to the ASHRAE Code of Ethics – In this and all other ASHRAE meetings, we will act with honesty, fairness, courtesy, competence, inclusiveness and respect for others, which exemplify our core values of excellence, commitment, integrity, collaboration, volunteerism and diversity, and we shall avoid all real or perceived conflicts of interests. (See full Code of Ethics: <https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics>.)”

1.2 ASHRAE Commitment to Care

ASHRAE is committed to the health and safety of our members and conference attendees. ASHRAE is closely monitoring guidance from the Centers for Disease Control and Prevention, World Health Organization and local health agencies. ASHRAE’s Commitment to Care may evolve as the Winter Conference approaches and guidance and local restrictions change.

1.3 Introduction of Members and Guests

1.4 SSPC 34 Roster

SSPC 34 Roster for 2023 – 2024 (12)			
Producer/Refrigerant (3)	User/Systems (3)	User/Components (2)	General (4)
Sarah Kim (2024) Chair	Sivakumar Gopalnarayanan (2027)	Brian Fricke (2025)	Mark Olson (2026)
Gary Jepson (2027)	Stephen Kujak (2026)	Sara Kampfe (2027)	Andrew Kusmierz (2027)
Ankit Sethi (2025)	Julie Majurin (2024) Vice Chair / Flammability Subcommittee Chair		John Senediak (2026)
			Kenji Takizawa (2027)
			Felix Flohr (2024) Consultant (NVM)
			John Scott (2024) Consultant (NVM)
			Asbjorn Vonsild (2024) Consultant (NVM)

1.5 Quorum determination

11 out of 12 voting members present.

1.6 Chair/ASHRAE Announcements (Sarah and Ryan)

- Annual meeting application deadline – **May 17th, 2024**
- ASHRAE SSPC 15/34 will be published in 2024 to align with code cycles and then every 3 years thereafter. Addenda will need to go out for PPR by late March to be included in the publication.
- Committee welcomed Ms. Kai Nguyen, Assistant Manager of Standards, and thanked Mr. Ryan Shanley, Senior Manager of Standards, for his service and support.

2. AGENDA REVIEW

Motion: Readjust agenda order to review application R0156 immediately after other applications are reviewed.

1st : Siva 2nd : John

9 / 0 / 2 / 1 (for / against / abstention / missing)

Reason for abstention: Ankit - Application wasn't received by the committee within 30 days of the meeting; CNV

3. MINUTES OF THE LAST MEETING / TELECONFERENCES

3.1 Approval / revision to the minutes of the interim meeting (9/22/2023)

Motion: Approve the minutes of the September 2023 interim meeting as written

1st : Steve 2nd : Andrew

8 / 0 / 3 / 1 (for / against / abstention / missing)

Reason for abstention: John & Sara – did not attend; CNV

4. ROSTER STATUS

4.1 Current SSPC 34 membership roster for the project committee and associated subcommittees can be found as [ATTACHMENT 3](#).

- Changes to the SSPC 34 roster since July 2023
 - Marc Scancarello resigned from PC and Flammability SC
 - Sara Kampfe joined PC and Flammability SC
 - Valerie Lisi resigned from Flammability SC
 - Arif Rokoni joined Flammability SC
- Anyone interested in becoming a member of SSPC 34 can apply through the ASHRAE website

5. PUBLICATION PUBLIC REVIEW DRAFTS

5.1 Addendum u – numbering after R-499A

Discussion: The motion passed in Tampa, 9 / 2 / 2 / 0 (for / against / abstention / missing). There were no comments received during PPR. In order to proceed with publication, the committee needed to approve the publication with knowledge of unresolved objectors. This motion failed, mainly due to unreturned ballots.



34-2022u_1stPPRDraft.pdf

- Motion: Accept addendum u as written and approve publication with knowledge of unresolved objectors.
 1st: Julie, 2nd: Steve
 Vote: 9-0-2-1 (for-object-abstain-missing)
 Abstain: Andrew-R-4101A doesn't seem like a logical choice; CNV

5.2 The following addenda were approved by the Standards Committee and the Board of Directors (BoD) and are posted on the ASHRAE website since the last SSPC meeting.

ℓ	9/29/2023	New Refrigerant	R-483A (A3)
o	9/29/2023	New Refrigerant	R-474B (A2L)
p	9/29/2023	New Refrigerant	R-486A (A1)
q	9/29/2023	New Refrigerant	R-487A (A3)
r	9/29/2023	New Refrigerant	R-455B (A2L)
s	9/29/2023	New Refrigerant	R-488A (A2L)
t	9/29/2023	Multiple updates	R-489A (A3); Update to R-50, R-1150, and R-1270
v	1/4/2024	New Refrigerant	R-455C (A2L)
w	1/4/2024	New Refrigerant	R-454D (A2L)

- *NO ACTION: Information only*

6. APPLICATIONS FOR REFRIGERANT DESIGNATION AND SAFETY CLASSIFICATION

SSPC 34 reviews new and amended refrigerant applications that are received by SSPC 34 members at least 30 days prior to the first scheduled SSPC 34 subcommittee meeting (Section 9.1.3, "Timing"). Applications are reviewed in the order in which they are received (Section 9.1.4, "Precedence"). The last distributed amendment or supplement to an application is used to determine review precedence.

- 6.1 Amendment to R0143-22-12 (received 10/6/2023) for Zeotropic Refrigerant Blend R-1150/1270 (7.9/92.1) with composition tolerances of (-1.0, +2.0 / -2.0, +1.0) % by mass % from Huazhong University of Science and Technology.

Discussion: D&N – accepted without comment; Flammability – accepted; Toxicity – Couple corrections were requested to the applicant, which were provided in the amendment.

Final motion to SSPC:

Recommend SSPC 34 to accept this application from Huazhong University of Science and Technology, for publication public review of the zeotropic refrigerant blend

R-1150 / 1270 (7.9 / 92.1 by mass%)

with composition tolerances of (+2.0, -1.0 / +1.0, -2.0) % by mass

and to assign the designation R-490A, a safety classification A3, LFL of 22,000 ppm / 2.4 lb/1000 ft³ / 37 g/m³, an RCL of 1,000 ppm / 0.1 lb/1000 ft³ / 1.7 g/m³, an OEL of 430 ppm and a code classification neither highly toxic or toxic to be added to Table 4-2 and submitted average relative molar mass, bubble point, and dew point data to be added to informative Table D-2, with a request that it be published immediately after approval.

Table D-2 Data:

Average Relative Molar Mass: 40.48 g/mol

Bubble Point: -66.9°C (-88.4 °F)

Dew Point: -50.1°C (-58.2°F)

Discussion: All SCs approved amended application.

VOTE: 10 / 0 / 1 / 1 (for / against / abstention / missing)

Abstentions: CNV

- 6.2 R0153-23-12 for Zeotropic Refrigerant Blend R-170/1270 (17.0/83.0) with composition tolerances of (+1.0, -2.0/+2.0, -1.0) % by mass from Huazhong University of Science and Technology.

Discussion:

D&N – recommended to accept pending minor corrections; Flammability – recommended to table the application. Mixing time was not followed and requires other corrections. Toxicity – recommended to reject due to number of deficiencies. Application was disorganized and ATELS were incorrect and OEL was wrong.

➤ **No action was taken.**

- 6.3 R0154-23-12 for Zeotropic Refrigerant Blend R-1270/290 (35.0/65.0) with composition tolerances of (±0.5, ±0.5) by mass % from YM LEMY Corporation.

Discussion:

D&N – recommended to accept pending minor corrections; Flammability – recommended to reject the application. Number of errors were noted and did not follow

standard; Toxicity – recommended to reject the application due to number of deficiencies. R-1270 values and OELs were incorrect.

➤ **No action was taken.**

- 6.4 R0155-23-12 for Zeotropic Refrigerant Blend R-32/152a/13I1/1234ze(E) (75.0/3.0/7.0/15.0) with composition tolerances of (± 1.0 , ± 1.0 , ± 1.0 , ± 1.0) by mass % from Gree Electric Appliances Inc. of Zhuhai.

Discussion:

D&N – recommended to reject application (didn't meet tolerance requirements);
Flammability – recommended to reject application due to number of deficiencies;
Toxicity – recommended to accept the application as written.

➤ **No action was taken.**

- 6.5 Amendment to R0145-23-05 for Zeotropic Refrigerant Blend R-290/600a/600 (9.4/30.9/59.7) with composition tolerances of (± 0.8 / ± 2.0 / ± 2.0) by mass % from Cia Ultragaz S/A for your consideration.

Discussion:

D&N – Accepted with correction, which were received. Additional minor corrections were noted and will be shared with the applicant; Flammability – recommended to reject to application due to deficiencies. Tests were not duplicated; Toxicity – previously accepted.

➤ **No action was taken.**

- 6.6 Amendment to R0146-23-05 for Zeotropic Refrigerant Blend R-290/600a/600 (11.8/29.1/59.1) with composition tolerances of (± 0.8 / ± 2.0 / ± 2.0) by mass % from Cia Ultragaz S/A.

Discussion:

D&N – previously accepted and corrections were received; Flammability – recommended to reject the application. Same deficiencies as in R0145 were noted; Toxicity – previously accepted (June 2023).

➤ **No action was taken.**

- 6.7 Amendment to R0147-23-05 for Zeotropic Refrigerant Blend R-290/600a/600 (15.1/28.3/56.6) with composition tolerances of (± 0.8 / ± 2.0 / ± 2.0) by mass % from Cia Ultragaz S/A.

Discussion:

D&N – No action. Previously approved; Flammability – recommended to reject the application (same as R0145/0146); Toxicity – accepted at June 2023 meeting.

➤ No action was taken.

- 6.8 Amendment to R0132-22-12 for Refrigerant Blend R-290/600a (85.0 / 15.0) with composition tolerances of ($\pm 1.0 / \pm 1.0$) by mass % from Ibrahim Khelifi on behalf of ECO-Freeze International.

Discussion:

D&N – No action taken. Previously approve with corrections. Bubble and dew point were slightly changed; Flammability – recommended to reject application due to number of deficiencies; Toxicity – recommended to accept pending corrections to the OEL.

No action was taken.

- 6.9 Amendment to R0133-22-12 for Refrigerant Blend R-170/290 (8.0 / 92.0) with composition tolerances of ($\pm 0.8 / \pm 0.8$) by mass % from Ibrahim Khelifi on behalf of ECO-Freeze International

Discussion:

D&N – same comment as R0132; Flammability – recommended to reject the application due to deficiencies; Toxicity – voted to accept pending corrections to anesthetic values to R-170;

➤ No action was taken.

- 6.10 Amendment to R0134-22-12 for Refrigerant Blend R-170/290 (2.0 / 98.0) with composition tolerances of ($\pm 0.5 / \pm 0.5$) by mass % from Ibrahim Khelifi on behalf of ECO-Freeze International.

Discussion:

D&N – recommended to accept pending corrections. Was previously rejected; Flammability – recommended to reject the application due to deficiencies; Toxicity – recommended to accept pending corrections to R-170 anesthetic values.

➤ No action was taken.

7. LATE APPLICATIONS RECEIVED AFTER THE DEADLINE

- 7.1 R0156-24-01 for Zeotropic Refrigerant Blend R-1132(E)/152a (35.0/65.0) with composition tolerances of ($\pm 2.0, \pm 2.0$) by mass % from Daikin Industries, Ltd.

D&N – recommended to accept the application. Minor editorial corrections were noted and provided by the applicant; Flammability – recommended to accept the application; Toxicity – recommended to accept the application.

Final motion to SSPC:

Recommend SSPC 34 to accept this application from Daikin Industries, for publication public review of the zeotropic refrigerant blend

R-1132(E) / 152a (35.0 / 65.0 by mass%)

with composition tolerances of (± 2.0 / ± 2.0) % by mass

and to assign the designation R-491A, a safety classification A2, LFL of 46,000 ppm / 7.8 lb/1000 ft³ / 123 g/m³, an RCL of 12,000 ppm / 2.0 lb/1000 ft³ / 30.8 g/m³, an OEL of 600 ppm and a code classification neither highly toxic or toxic to be added to Table 4-2 and submitted average relative molar mass, bubble point, and dew point data to be added to informative Table D-2, with a request that it be published immediately after approval.

Table D-2 Data:

Average Relative Molar Mass: 65.33 g/mol

Bubble Point: -39.6°C (-39.3 °F)

Dew Point: -31.1°C (-24.0°F)

Discussion:

VOTE: **9 / 0 / 2 / 1** (for / against / abstention / missing)

Abstentions: Julie – representative of applicant;CNV

8. CONTINUOUS MAINTENANCE PROPOSALS

There are 17 open CMPs that requires committee response. Proposals have been assigned to respective subcommittees or group of experts where appropriate. See attached.



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8.1 Continuous Maintenance Proposal (CM 34-15-12-0002/001-003)



CM
34-15-12-0002.pdf

- D&N and toxicity SC put forward a proposal as shown in the below word document.



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- Feedback from Flammability SC: edited D&N/toxicity SC section 9.7 as shown below.

D&N/Toxicity version:

9.7 Flammability Information. Applications for single ~~compound~~compound/molecule refrigerants intended for safety classification and refrigerant blends shall include flammability test data and information identified in Normative Appendix B, Section B1.9. Applications for refrigerant blends shall also include tabulated fractionation data and information identified in Normative Appendix B, Section B2.6. See Section 9.1.6 regarding blend components.

Flammability correction:

9.7 Flammability Information. Applications for single components ~~compound/molecule~~ refrigerants ~~intended for safety classification~~ and refrigerant blends containing these components shall include flammability test data and information identified in Normative Appendix B, Section B1.9. Applications for refrigerant blends shall also include tabulated fractionation data and information identified in Normative Appendix B, Section B2.6. See Section 9.1.6 regarding blend components.

Flammability SC vote

Motion: Recommend the above language to SSPC 34.

1st: John Senediak; 2nd: Evan Laganis

9/1/0 CNV

Reason for negative vote:

Mary Koban opposed the motion due to concerns about future use.

- PC Action: Review and vote on PPR if necessary

Note - Flammability SC's recommendation requires the flammability data submissions to remain the same in cases where the applicant is only requesting a number designation and not a safety classification.

Discussions concerning section 9.7

John - Component indicates it's part of a blend. Would prefer compound over component or molecule.

Note - Compound is the original language currently used in 9.7 of the Standard and also defined in Section 3 while component nor molecule is not. Committee felt that the below language was preferred.

9.7 Flammability Information. Applications for single compounds ~~refrigerants~~ and refrigerant blends shall include flammability test data and information identified in Normative Appendix B, Section B1.9. Applications for refrigerant blends shall also include tabulated fractionation data and information identified in Normative Appendix B, Section B2.6. See Section 9.1.6 regarding blend components.

Discussions concerning proposed section 9.1.8

[...] The Committee may also at its discretion choose to assign only a number designation, but not a safety classification to a molecule. [...]

There were varying opinions on whether the committee can choose to not classify a compound even though all data was provided by the applicant and classification is requested by the applicant. Committee agreed to remove the language as there are pathways to unclassify or change a classification via CMP or committee business.

➤ **PC Motion:** Accept modified proposal.

1st: Julie, 2nd: Gary

4-4-3-1 (*for / against / abstention / missing*)

Against – Gary, Steve, John, Ankit

Reason for objection: **Gary** – Did not understand why flammability data is needed for a compound without safety classification if the blend data is required; **John** – Does not believe all flammability data needs to be included; **Ankit** – not comfortable voting on current language;

Steve (provided via email) - It is not clear there is a need to create a pathway to allow for unclassified refrigerants based on the TPS of the standard (designation, safety classification and RCL essentially). Other safety issues identified, like materials compatibility and chemical stability, are not within the scope of this standard. The proposed method unnecessarily complicates the standard with a methodology that mirrors the standard to classify a refrigerant for which the proposed method still requires data to classify the individual component as a refrigerant. It also does not create an unambiguous method for users of the standard and the committee to classify an individual refrigerant or blend and requires the committee to make a judgement to place it in a separate table. Other standards and product development processes are used to control other safety aspects of a refrigerant for use.

Abstain – Andrew, Kenji, CNV

Reason for abstention:

Andrew (provided via email) - Thought that elements needed were there, in the proposed change, but the verbiage was confusing maybe by the mix-up of tox and flammability. If it is confusing to the committee (we are embedded in the standard), then it will be certainly confusing to people outside of the standard.;

Kenji (provided via email) - I understand the necessity of this new proposal. However, from the sentences of this proposal, I cannot imagine how to manage this rule well. If the first applicant requests a compound (e.g. HFO-1123) to be unclassified, and soon after that another applicant requests R-number with the safety class of the same compound, what should we do? If we review only flammability and toxicity data and provide R-number with the safety class, the second applicant may sell this compound as an authorized safe refrigerant ignoring the specific risk (e.g. self decomposition). And if accidents by that risk occur, who is responsible for them, the first applicant or the second one? During the discussion, I couldn't resolve this kind of question and I thought further study is needed.



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8.2 Continuous Maintenance Proposal (CM 34-22-0002/001)

PROPOSAL - PC	
Standard version	2022
Proposer #	0002 (Harshad Inamdar)
Proposal #	001
Proposal Title	Update referenced editions
Section	10
Proposal Text	<p>10. Normative References.</p> <p>1. ICC. 20132021. International Fire Code (IFC), Section 202. Fairfax, VA: Country Club Hills, IL: International Code Council Publications.</p> <p>2. WCFA. 2000. Uniform Fire Code (UFC), Sections 209 and 221 Walnut Creek, CA: Western Fire Chiefs Association. NFPA. 2021. Fire Code (NFPA 1), Sections 3.3.187.7 and 3.3.187.14. Quincy, MA: National Fire Protection Association.</p> <p>...</p> <p>18. ASHRAE. 20132022. ANSI/ASHRAE Standard 15 20132022. Safety Standard for Refrigeration Systems. Atlanta, GA: ASHRAE.</p>
Substantiating Comments	<p>Reason and Substantiation: Definition of "toxic" and "highly toxic", where reference (1.) is cited in the text in section 3.1 is the same in 2021 IFC. So better to update the referenced edition to the latest available.</p> <p>In 2000, NFPA and WCFA agreed to jointly develop a fire code (NFPA 1) instead of the UFC published by WCFA. 2009 edition of NFPA 1 was renamed "Fire Code" from "Uniform Fire Code". Latest edition of NFPA 1 is 2021 edition. Definitions of "toxic" and "highly toxic" in section 3.3.187 of NFPA 1 match those in section 3.1 of ASHRAE 34 where reference (2.) is cited in the text.</p>

- Action: Review and vote on PPR if necessary
Move to accept as written without modification.
1st: Siva, 2nd: Sara
Vote: 10-0-1-1 (for / against / abstention / missing) (CNV, 1 absent)

8.3 Continuous Maintenance Proposal (CM 34-22-0003/001)

PROPOSAL – D&N	
Standard version	2022
Proposer #	0003 (Asbjorn Vonsild)
Proposal #	001
Proposal Title	Ethane and ethene series suffixes
Section	4.1.9, 1 st sentence
Proposal Text	4.1.9 In the case of isomers in the ethane <u>and ethene</u> series, each...
Substantiating Comments	<p>Almost editorial:</p> <p>The logic of the ethane series is also used for the ethene series, e.g. R-1132a.</p> <p>Note that the logic for propene series is not in the same subclause as the propane-series, so it is not self-evident that the subclause for ethane-series applies for the ethene-series.</p> <p>Proposal: Insert “ethene” in the 1st sentence.</p>

- Motion: D&N to recommend to the MC to accept this comment for PPR without modification.

BF move to accept. SG 2nd. 9-0-0-2-CV (yes/no/abstain/absent-chair)

- Action: Review and vote on PPR if necessary

PC Motion: Move to accept without modification.

1st: Julie, 2nd: Gary

10-0-1-1 (*for / against / abstention - CNV / missing*)

8.4 Continuous Maintenance Proposal (CM 34-22-0003/002)

PROPOSAL – D&N	
Standard version	2022
Proposer #	0003 (Asbjorn Vonsild)
Proposal #	002
Proposal Title	HCC and HCO
Section	5.2.2, 4 th sentence
Proposal Text	The composition designating prefixes for halogenated olefins shall be either “CFC,” “HCFC,” “ <u>HCC</u> ,” or “HFC” to refer to chlorofluorocarbon, hydrochlorofluorocarbon, <u>hydrochlorocarbon</u> , or hydrofluorocarbon, respectively, or with substitution of an “O” for the carbon “C” as “CFO,” “HCFO,” “ <u>HCO</u> ,” or “HFO” to refer to chlorofluoro-olefin, hydrochlorofluoro-olefin, <u>hydrochloro-olefin</u> , or hydrofluoro-olefin, respectively.
Substantiating Comments	<p>Almost editorial:</p> <p>ASHRAE 34 allows for using CFO, HCFO, and HFO for unsaturated CFC, HCFC and HFC respectively.</p> <p>In ISO817 it is also allowed to use HCO for unsaturated HCC.</p> <p>This means that R-1130(E), CHCl=CHCl, is HCO-1130(E) in ISO 817, but it is not clear whether it is allowed to use the prefix HCC in ASHRAE, and clearly it is not allowed to use HCO in ASHRAE.</p> <p>Note there is currently typos after CFC, HCFC, CFO, and HCFO in ASHRAE 34</p> <p>Proposal: Add HCC and HCO for unsaturated hydrochloro-olefins.</p>

- Motion: D&N to recommend to the MC to accept this comment for PPR without modification.
MP move to accept. BF 2nd. 8-0-1-2-CV (yes/no/abstain/absent-chair)
AS Abstaining: change not required.

D&N Action: IR to work with AS to look at optimization to the section 5.2.2
- Action: Review and vote on PPR if necessary

8.5 Continuous Maintenance Proposal (CM 34-22-0003/003)

PROPOSAL – D&N	
Standard version	2022
Proposer #	0003 (Asbjorn Vonsild)
Proposal #	003
Proposal Title	Substances which can be explicitly determined from the refrigerant numbers
Section	4.1
Proposal Text	The identifying numbers assigned to the hydrocarbons, halocarbons <u>and ethers</u> of the methane, ethane, ethene, propane, propene, butane, butene, cyclobutane, <u>and cyclobutene</u>
Substantiating Comments	The 1st sentence is missing ethers and cyclobutene in the list of substances which can be explicitly determined from the refrigerant numbers

- Motion: D&N to recommend to the MC to accept this comment for PPR with modification (“cyclobutene”).
DH move to accept. JH 2nd. 9-0-0-2-CV (yes/no/abstain/absent-chair)
- Action: Review and vote on PPR if necessary

8.6 Continuous Maintenance Proposal (CM 34-22-0003/004)

➤ PROPOSAL – PC	
Standard version	2022
Proposer #	0003 (Asbjorn Vonsild)
Proposal #	004
Proposal Title	B2.1 reference to WCFE test
Section	B2.1, 1 st paragraph
Proposal Text	Change: ...under conditions of leakage (see Section B2.34) and successive charge/recharge conditions (see Section B2.4)
Substantiating Comments	Current test references Section B2.3, but this not on leakage. Leakage conditions are in Section B2.4 (both for leakage from containers and from equipment).

- Action: Review and vote on PPR if necessary

8.7 Continuous Maintenance Proposal (CM 34-22-0003/005)

PROPOSAL – PC	
Standard version	2022
Proposer #	0003 (Asbjorn Vonsild)
Proposal #	005
Proposal Title	B2.1.1 reference to WCFE test
Section	B2.1.1, 1 st sentence
Proposal Text	...in accordance with Section B2.34
Substantiating Comments	The WCFE test is not in B2.3, but in B.2.4.

- Action: Review and vote on PPR if necessary

8.8 Continuous Maintenance Proposal (CM 34-22-0004/001)

PROPOSAL – PC	
Standard version	2022
Proposer #	0004 (Jake Rede)
Proposal #	001
Proposal Title	Update to RCL values for A2L refrigerants
Section	Table 4-2
Proposal Text	Specifically: Remove/Delete current RCL's listed and update RCL for applicable refrigerants to 50% of LFL instead of the default 25%.
Increase of engineering or construction cost	no, I do not believe so. Although some existing facilities may wish to update sensor setpoints to the new values.
Substantiating Comments	<p>IEC 60335-2-40 & the 4th edition of UL's version of this standard will show in Annex GG that the acceptable concentration per that standards requirements to be using a safety factor of 1/2 the LFL instead of 1/4. Listed HVAC equipment with A2L, A2 & A3 refrigerants, per that standards requirements, will have instructions that expressly require installers to compute the space volume and ensure that the equipment's total charge cannot exceed the 1/2 of LFL safety factor for installation in that application.</p> <p>It seem prudent, that this standard be updated to match these general requirements, and denote specifically any refrigerants where this value of RCL would pose a toxicity hazard to the occupants, in the event of a refrigerant release.</p>

8.9 Continuous Maintenance Proposal (CM 34-22-0005/001)

PROPOSAL – Toxicity	
Standard version	2022
Proposer #	0005 (Gary Jepson)
Proposal #	001
Proposal Title	New definition of Safety Class A/B boundary
Section	6.1.2
Proposal Text	<p>6.1.2 Toxicity classification Refrigerants shall be assigned to one of two classes, A or B, based on allowable exposure<u>the following:</u></p> <p style="margin-left: 40px;">a. Class A refrigerants have an occupational exposure limit (OEL) of 400 ppm or greater.</p> <p style="margin-left: 40px;">b. Class B refrigerants have an OEL of less than 400 ppm.</p> <p><u>6.1.2.1 Class A</u> <u>A refrigerant is assigned toxicity classification A:</u></p> <ul style="list-style-type: none"> - <u>Where the refrigerant or refrigerant blend mortality toxic concentration, as described in Section 7.1.1 (a), $\geq 2\ 500$ ppm, except when Section 6.1.2.3 applies, and</u> - <u>Where the refrigerant or refrigerant blend (1) cardiac sensitization concentration as described in Section 7.1.1 (b) and (2) the anesthetic or central nervous system TCF as described in Section 7.1.1 (c) and (3) other escape impairing and permanent injury concentration as described in Section 7.1.1 (d) $\geq 10\ 000$ ppm, except when Section 6.1.2.3 applies, and</u> - <u>The occupational exposure limit (OEL) is ≥ 150 ppm.</u> <p><u>6.1.2.2 Class B</u> <u>Where a refrigerant does not comply with Section 6.1.2.1 for Class A, it shall be assigned toxicity classification B.</u></p> <p><u>6.1.2.3 Exceptions</u> <u>Non-aromatic flammable hydrocarbon refrigerants with fewer than six carbon atoms are exempt from the acute toxicity criteria.</u></p> <p><u>Informative Note: Non-aromatic flammable hydrocarbons are known to pose low acute toxicity. Exemptions of these fluids are due to cardiac sensitization, anaesthetic or other escape-impairing symptoms and permanent injury toxic concentration factors being at concentrations higher than the values required for what are considered to be safe (regarding flammability hazards) laboratory practices. Where acute toxicity criteria under Section 6.1.2.1 may not be met, the safety classification is to be based on the occupational exposure limit (OEL).</u></p>
Increase of engineering or construction cost	<p>The current refrigerant R245fa will change from B to A, so it will not increase cost. R11 and R113 will change from A to B, but neither are used. R131I will also change from A to B, but this fluid is not used pure and no blend containing R131I will change tox class.</p> <p>ISO 817 has already adopted the proposed text in the draft circulated for public review. Adopting the same text in ASHRAE will reduce complexity, and potentially lower cost.</p>

<p>Substantiating Comments</p>	<p>The current approach to establishing ASHRAE toxicity classification is based on a simple, arbitrary occupational exposure limit (OEL) boundary of 400 ppm. The current approach is not based on defensible health safety principles, rather it was a convenient boundary at a time when primary refrigerants generally fell into one of two categories. Namely, very low OELs (e.g., <50 ppm) and very high OELs (e.g. 1 000 ppm). The 400 ppm was an intermediate and convenient boundary.</p> <p>Changes in new generation refrigerant properties combined with changes in regulatory approaches to health hazard assessment result in OELs with intermediate values, and the arbitrary 400 ppm boundary is not an appropriate discriminator between refrigerant safety classes. Therefore, there is a current need for a more scientifically defensible approach to establishing the ASHRAE toxicity classifications.</p> <p>The new approach is already adopted in the ISO 817 circulated for public review. It will not affect the RCL nor the data required in the application for new refrigerants.</p> <p>FAQ</p>  <p>474-ISO-TC86-SC8_N 337_ ISO-TC 86-SC 8-</p>
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- Toxicity SC Motion: Recommend to SSPC 34 to accept as proposed
First - Paul, Second - Bennett
4-0-0-3 (For-Against-Abstain-Absent)

Note: Both ASHRAE 34 and ISO 817 Toxicity committees unanimously voted to approve the same proposal submitted to respective Standards.

- **PC Motion:** Accept the CMP without modification
1st: Siva, 2nd: Gary

Discussions: The proposal is a major change to the standard. ASHRAE TRP-1797 received a bid and should address the impact of this change to toxicity criteria. The research will help understand whether there are changes required such as ventilation, detection, etc. as a result of this update to the classification criteria.

TRP-1797 addresses downstream implications. The CMP is proposing an approach that aligns with GHS and driven by scientific approach. The OEL or RCL of refrigerants are not affected by this proposal.

Vote: 7-2-2-1 (for-against-abstain-missing)

Abstain: Julie - didn't have enough background on potential downstream implications; CNV

No: Steve, Ankit (to email reasons)

Note - While the motion passed, reasons for negative votes that were provided via email after the meeting as well as Chair's responses (in red) were captured to provide information for absentees.

Reasons for negative vote:

Ankit (provided via email) – This is a very significant change to the standard. I was not given the opportunity to review the research supporting this change. Further, very limited time was devoted to discussion on this topic, and I was not able to make my comments on this change. The CMP also failed to describe that a recently submitted molecule R1132(E) will change classification from Class B to Class A as a result of this change which should have been discussed further within the committee.

Response:

This proposal (which was developed jointly between toxicity experts on SSPC 34 and ISO/TC 86/SC 8/TF 2, “Toxicity safety classification”) was originally introduced to the committee and discussed during the 2023 Winter Conference meeting in Atlanta (February 2023). Both the proposal and a frequently asked questions type document were distributed to the members at that time with a request to submit comments; no comments were received. The proposal itself does not include updating classification of refrigerants in Table 4-1 or 4-2; however, the committee will review all refrigerants in the tables to comply with the proposal if the CMP is accepted that changes the A/B boundary. While R-1132(E) molecule wasn’t specifically discussed, this change will not increase the cost of engineering or construction, as it is being moved from a Class B (more restrictive) to a Class A (less restrictive). Under the current definition, for refrigerants moving from Class B to Class A would mean systems were being overengineered under stricter rules for a molecule that represents low health hazards from a toxicity perspective, as the proposal aligns with GHS and is driven by a scientific approach.

Steve (provided via email) – I believe that this should be accepted for further study and also perceived committee procedural issues.

Objections and responses (in red) below:

1. ASHRAE has 1797-TRP, Assessment of the A/B toxicity classification used in Standard 34 which is in progress and outcomes will be used to either support or refine these various toxicity limits which should be used as the research to either support or refine these limits. Thus my support for accepted for further study.
“Accept for further study” as a response option requires the committee to respond either accepting or rejecting a proposal within seven months, otherwise the committee should reject the proposal and ask the commenter to resubmit at a later date; As 1797-TRP was just approved during the 2024 Winter Conference and is anticipated to take 18 months to complete, “accept for further study” would not have been the preferred pathway in this case.
2. No scientific data was supplied on how these endpoints were determined in regards to the safe use of these safety endpoint in the design and placement of HVACR equipment other than “trust me” we are experts.
The reason and substantiation statement of the CMP, as well as the “likely or anticipated questions” document which was included, thoroughly outlines the reasoning and logic behind the proposal, as well as noted that the endpoint is based on the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), rather than based on a value established by a single ASHRAE or ISO committee.
3. The impact of the reclassification of various refrigerants, like R-11, to Class B for Class A, which is still in use in applications was not considered nor

explanation given to why it was reclassified from A1 to B1 or the impact and cost to users.

The CMP itself, as well as the “likely or anticipated questions” document which was included, specifically addresses the currently listed refrigerants which would be impacted (change toxicity class) under the proposal, and notes the impact and cost to users.

4. The impact of the reclassification of various refrigerants, like R-245fa and R-1132(E) and others, to Class A, which are used in applications or future use was not considered nor explanation given to why it was reclassified from B to A or the safety impact and cost to users.

The CMP itself, as well as the “likely or anticipated questions” document which was included, specifically addresses the currently listed refrigerants which would be impacted (change toxicity class) under the proposal, and notes the impact and cost to users.

5. We skipped over other CMPs which were serially in front of this CMP.
There is not a procedural requirement to address CMPs in the order in which they are received, and this practice has not been consistently adhered to by the committee in the past.
6. I had to ask 2 times to have discussion after the motion was approved for discussion and there was perceived resistance for discussion.
After reminders of proper procedure, discussion on the proposal was held by the committee. As long as discussion does occur, having needed to be reminded that discussion needs to take place is not in and of itself a procedural violation.

9. SUBCOMMITTEE REPORTS

9.1 Designation and Nomenclature (D&N)

9.2 Flammability

9.3 Toxicity

- Update/modify R-1270 anesthetic values in ASHRAE 34 as follows:
 - a. Note: “other” was changed to ND in ASHRAE 34 per June 2023 meeting.
 - b. Change anesthetic NOEL from 10,000 ppm to ND.
 - c. Add 69,000 ppm as the anesthetic LOEL (This is 50% of the lethality ATEL which is already 28.3% of LC50 value of 490,000 ppm.
 - d. Use 35,000 ppm as the anesthetic ATEL based on 50% of the LOEL and is consistent with the data treatment described in ASHRAE 34 and ISO817.
 - e. Background/basis:
ASHRAE 34 voted at the last meeting to remove the R1270 “other” value from the table and make it ND. No one can find any reference supporting the “other” value. R1270 is a simple asphyxiant and both the anesthetic and “other” categories are without credible, available data. Even the lethality data seems suspect, although there was some rodent acute inhalation work that was done in 1926. In that study, lethality in rodents didn’t occur until concentrations of 700,000 ppm were achieved, minimal anesthesia in rats occurred at 300,000-

400,000 ppm and dogs were unaffected even after hours at 500,000 ppm. This demonstrates that R1270 is not acutely toxic. The R1270 anesthetic NOEL value of 10,000 came from the highest concentration tested in a cancer study, but the cancer study is a chronic study and is not relevant to acute toxicity.

Motion: Use lethality (acute toxicity) value (50 % of lethality ATEL) a basis for R1270 anesthetic value and treat per ASHRAE 34 and/or ISO817. See point C above. Gary Second: Christine ASHRAE, Paul ISO817
Vote: 4-0-0 (For-Against-Abstain)

- Action: Review and vote on PPR if necessary

Table E-1 Toxicity Table for Standard 34—ATEL, ODL, FCL, and RCL Values for Single-Compound Refrigerants^a (ppm v/v) (Continued)

Refrigerant Number	Chemical Name	Cardiac Sensitization			Anesthesia				ATEL	ODL	FCL	RCL	LFL	ATEL Source	RCL Source
		LC ₅₀ ^{b,c}	LOEL ^d	NOEL ^d	EC ₅₀ ^e	LOEL ^f	NOEL ^g	Other ^h							
744	carbon dioxide	159,000	ND	30,000	ND	-p-	50,000	50,000 ^g	30,000	140,000	NA	30,000	—	100% Cardiac NOEL	ATEL
1132a	1,1-difluoroethene	100,000	ND	50,000	ND	ND	200,000	ND	28,000	ND	13,000	13,000	50,000	28.3% LC ₅₀	25% LFL
1132(E)	trans-1,2-difluoroethene	106,000	ND	116,000	ND	ND	106,250	ND	30,000	140,000	11,000	11,000	43,000	Mortality	FCL
1224yd(Z)	cis-1-chloro-2,3,3,3-tetrafluoro-1-propene	213,000	ND	75,000	ND	152,000	ND	ND	60,000	140,000	NA	60,000	ND	28.3% LC ₅₀	ATEL
1234yf	2,3,3,3-tetrafluoro-1-propene	>406,000	ND	>120,000	ND	201,000	ND	ND	100,000	140,000	16,000	16,000	62,000	50% CNS/Anesthesia LOEL	25% LFL
1234ze(E)	trans-1,3,3,3-tetrafluoro-1-propene	>207,000	ND	>120,000	ND	ND	>207,000	ND	59,000	140,000	16,000	16,000	65,000	28.3% LC ₅₀	25% LFL
1270	propene (propylene)	>490,000 ^s	ND	ND	ND	ND	10,000	7200 ^d ND	1000	140,000	6700	1000	27,000	Sect 7.1.1(b)	ATEL

Refrigerant R-	Chemical Name	Cardiac Sensitization			Anesthesia			Other ^h	ATEL	RCL Source
		LC ₅₀ ^{b,c}	LOEL ^d	NOEL ^d	EC ₅₀ ^e	LOEL ^f	NOEL ^g			
1270	Propene (propylene)	>490,000 ^s	ND	ND	ND	ND 69,000	10,000 ND	ND	1,000	

10. OTHER BUSINESS

10.1 Equation (7-3) RCL Unit Conversion factor Inquiry

$$RCL_M = RCL \times a \times M \quad (7-3)$$

where

$$RCL_M = RCL \text{ expressed as lb/1000 ft}^3 \text{ (g/m}^3\text{)}$$

RCL = RCL expressed as ppm v/v

$$a = 1.160 \times 10^{-3} \text{ for lb/1000 ft}^3 \text{ (} 4.096 \times 10^{-5} \text{ for g/m}^3\text{)}$$

M = relative molar mass of the refrigerant, **lb/mol** (g/mol)

- Action: Review Michael, Mary and Clare's recommendation and vote on proposed changes.



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10.2 Review of SSPC 34 Calculator (Michael Petersen)

- Action: No actions, just a verbal report out in this area.

10.3 ISO817 / SSPC34 alignment (Bill Walter, Asbjorn Vonsild)

- Action: No actions, just a verbal report out in this area.

10.4 Update missing LFL and BV for A2Ls in Table 4.2

- Action: Julie, Bob, and Sarah to work together

Refrigerant	LFL ^j			BV ^p
	ppm v/v	lb/1000 ft ³	g/m ³	(cm/s)
467A	125,000 ^m	22.9 ^m	367 ^m	<4
468A	73,000	16.9	270	2.1
468B	72,000	17.3	278	7.3 ^q
468C	92,000	17.2	276	7.6
[...]				
457B				4.9
457C				5.6
[...]				
474A				3.3
[...]				

11. REFRIGERANTS AND RCL VALUES IN THE CODES (M. Koban)

- 11.1 Uniform Mechanical Code (UMC)
- 11.2 International Mechanical Code (IMC & IFC)
- 11.3 Any other information from the CIS (Code Interaction Subcommittee).
 - Action: No actions, just a verbal report in this area.

12. NEW BUSINESS

12.1 Effective Date for New Addendum

There were discussions regarding whether there should be an effective date to comply with new addenda especially if it changes the test conditions or methods. May need a grandfather clause. Some of the rejected applications referenced an older version of the Standard, making it unclear whether an obsolete Standard was followed or if it's a copy and paste error. There were also questions raised whether tabled applications would be required to be updated based on newly published addenda and changes to application requirements. Previously classified refrigerants do not meet the current standard requirements or reclassified based on changes.

In order to provide clarity to new applicants, the outdated flammability checklist will be updated and potentially include a flowchart.

WG to put together a proposal. Julie (team leader), John, Mary, Asbjorn, Sarah.

- 13. NEXT MEETINGS** – ASHRAE 2024 Annual Conference, Indianapolis, IN – Saturday, June 22nd to Wednesday, June 26th, 2024, as noted below (subject to change). Refer to <https://ashrae.org/conferences/2024-annual-conference-indianapolis> for full meeting schedule and details.

Committee Name	Tentative Day/Date	Start Time (EDT)	End Time (EDT)
SSPC 34 D&N Subcommittee	Saturday, June 22 nd , 2024	8:00 AM	11:00 AM
SSPC 34 Flammability Subcommittee	Saturday, June 22 nd , 2024	12:00 PM	4:00 PM
SSPC 34 Toxicity Subcommittee/ISO 817 MA Toxicity Task Force (Joint Meeting)	Monday, June 24 th , 2024	8:00 AM	10:30 AM
SSPC 34 (Project Committee)	Monday, June 24 th , 2024	6:30 PM	10:00 PM

14. ADJOURNMENT

Siva

ATTACHMENT 1

ASHRAE Code of Ethics

(Approved by ASHRAE Board of Directors)

1.140.001.1 As members of ASHRAE or participants in ASHRAE committees, we pledge to act with honesty, fairness, courtesy, competence, integrity and respect for others in our conduct.

- A. Efforts of the Society, its members, and its bodies shall be directed at all times to enhancing the public health, safety and welfare.
- B. Members and organized bodies of the Society shall be good stewards of the world's resources including energy, natural, human and financial resources
- C. Our products and services shall be offered only in areas where our competence and expertise can satisfy the public need.
- D. We shall act with care and competence in all activities, using and developing up to date knowledge and skills.
- E. We shall avoid real or perceived conflicts of interest whenever possible, and disclose them to affected parties when they do exist.
- F. The confidentiality of business affairs, proprietary information, intellectual property, procedures, and restricted Society discussions and materials shall be respected.
- G. Each member is expected and encouraged to be committed to the code of ethics of his or her own professional or trade association in their nation and area of work.
- H. Activities crossing national and cultural boundaries shall respect the ethical codes of the seat of the principal activity.

ATTACHMENT 2

PC Chairs' Meeting Deadlines through 2024

**Please note that some dates are tentatively scheduled a year in advance and are subject to change. If you intend to try to meet one of these deadlines, please confirm the meeting dates and deadlines with Staff well in advance, or agenda items may be moved to the next meeting.*

	2024 Winter Meeting Jan 20 – Jan 24, 2024	SPLS Spring Meeting 2024*	Annual Meeting June 22 – 26, 2024	Fall Meetings 2024*
SPLS Meeting/Conference Call dates	Jan 10, 2024* Feb 1, 2024	Mar 18, 2024*	June 22 & June 26 2024	Oct 2024*
StdC Meeting/Conference Call dates	Jan 15, 2024* Jan 25, 2024	N/A	June 25-June 29, 2024	Oct 2024*
Membership				
New PC member applications & existing member changes (Bio/Bias/Applications** due)	Oct 20, 2023	N/A	April 5, 2024	Aug 2, 2024
PC Chair's Membership Recommendation Form** due	Nov 17, 2023	N/A	May 3 2024	Sep 6, 2024
Publication Public Review Packages				
PC Chairs Publication Public Review Submittal Form** deadline for Normal Track PPR packages (see Note below for Fast Track Process)	Dec 11, 2023	March 1, 2024	May 18, 2024	July 31, 2024
SPLS approval of Normal Track PPRs	Jan 10, 2024	Mar 18, 2024*	June 24, 2024	Oct 13, 2024*
Public Review Starts for 30 and 45 day PRs	Jan 22, 2024	Mar 25, 2024	July 8, 2024	Oct 25, 2024
30-day Public Review ends	Feb 20, 2024	Apr 24, 2024	Aug 7, 2024	Nov 27, 2024
45-day Public Review ends	Mar 7, 2024	May 9, 2024	Aug 22, 2024	Dec 12, 2024
Publication Packages				
PC Chairs' Final Publication Submittal Form deadline (for policy level and documents with unresolved commenters)	Dec 13, 2023	N/A	May 5, 2024	Sep 8, 2024
PC Chairs' Galley Sign-off deadline	Jan 12, 2024	N/A	June 12, 2024	Oct 25, 2024
Other				
TPS Changes and other items**	Dec 20, 2023	Feb 19, 2024	Jun 3, 2024	Sep 15, 2024

* Dates are TBD.

** Membership, TPS Changes, Publication Submittal and other forms can be found on ASHRAE's PC Toolkit page.

Note: Public Review packages that meet the Fast Track criteria noted in PASA Clause 7.2.1.3, *Fast Track Public Review (FTPR)*, may be submitted for public review at any time.

ATTACHMENT 3

SSPC 34 Membership Roster 2023-2024

Interest Categories:

Producer / Refrigerant: an individual who represents a company that produces or sells refrigerants used in air conditioning and refrigeration systems

User / Systems: an individual who represents a company that manufactures, assembles or sells air conditioning and refrigeration systems that make use of refrigerants

User / Components: an individual who represents a company that manufactures or sells components that are used in air conditioning and refrigeration systems that use refrigerants

General: A member who cannot be categorized in any other approved interest category covered in the project scope.

PCVMs (12)			
Producer / Refrigerant (3)	User / Systems (3)	User / Components (2)	General (4)
Sarah Kim (2024) Chair	Sivakumar Gopalnarayanan (2027)	Brian Fricke (2025)	Mark Olson (2026)
Gary Jepson (2027)	Stephen Kujak (2026)	Sara Kampfe (2027)	Andrew Kusmierz (2027)
Ankit Sethi (2025)	Julie Majurin (2024) Vice Chair / Flammability Subcommittee Chair		John Senediak (2026)
			Kenji Takizawa (2027)

PSVMs (22)			
Producer / Refrigerant (8)	User / Systems (8)	User / Components (0)	General (6)
Paul Dugard (2027)	Harshad Inamdar (2026)		Danny Halel (2025)
Christine Glatt (S 2027)	Tatsuro Kobayashi (S 2026)		Thomas Leck (2026)
Joshua Hughes (2024)	Morgan Leehey (2026)		Wenbin Ng (2024)
Mary Koban (S 2025)	Michael Petersen (2025)		George Rusch (2026)
Evan Laganis (2027)	Gurunarayana Ravi (2026)		Greg Woycznski (2025)
Bob Low (2024)	Arif Rokoni (S 2027)		Samuel Yana-Motta (2025)
Christopher Seeton (2025)	Ivan Rydkin (2026)		
Bennett Varsho (S 2027)	William Walter (2024)		

Consultants (3)
Felix Flohr (2024)
John Scott (2024)
Asbjørn Vonsild (2024)

By Subcommittee

(C = PCVM, S = PSVM, year indicates end of term after the June Conference meeting)

Designation & Nomenclature Subcommittee (11) [3 PCVM, 8 PSVM]

Producer / Refrigerant (3)	User / Systems (5)	User / Components (1)	General (2)
Joshua Hughes (S 2024)	Sivakumar Gopalnarayanan (C 2027)	Brian Fricke (C 2025)	Danny Halel (S 2025)
Christopher Seeton (S 2025)	Harshad Inamdar (S 2026)		Thomas Leck (S 2026)
Ankit Sethi (C 2025)	Michael Petersen (S 2025)		
	Ivan Rydkin (S 2026) <i>D&N Subcommittee Chair</i>		
	William Walter (S 2024)		

Toxicity Subcommittee (7) [0 PCVM, 7 PSVM]

Producer / Refrigerant (3)	User / Systems (3)	User / Components (0)	General (1)
Paul Dugard (S 2027)	Tatsuro Kobayashi (S 2026) <i>Toxicity Subcommittee Chair</i>		George Rusch (S 2026)
Christine Glatt (S 2027)	Morgan Leehey (S 2026)		
Bennett Varsho (S 2027)	Gurunarayana Ravi (S 2026)		

Flammability Subcommittee (14) [7 PCVM, 7 PSVM]

Producer / Refrigerant (4)	User / Systems (2)	User / Components (1)	General (7)
Mary Koban (S 2025)	Arif Rokoni (S 2027)	Sara Kampfe (C 2027)	Andrew Kusmierz (C 2027)
Evan Laganis (S 2027)	Julie Majurin (C 2024) <i>Flammability Subcommittee Chair</i>		Wenbin Ng (S 2024)
Bob Low (S 2024)			Mark Olson (C 2026)
Ankit Sethi (C 2025)			John Senediak (C 2026)
			Kenji Takizawa (C 2027)
			Greg Woycznski (S 2025)
			Samuel Yana-Motta (S 2025)