

**DRAFT AGENDA (v1)**

**ASHRAE SSPC 34: Flammability Subcommittee**

**SSPC 34: Designation & Safety Classification of Refrigerants**

## Hybrid Conference

## Toronto, Ontario, Canada – Hilton MacDonald (C)

**Meeting Information:**

[**https://events.rdmobile.com/Sessions/Details/1362578**](https://events.rdmobile.com/Sessions/Details/1362578)**;**

**Under Session Access & Resources, select ‘Enter Meeting’**

**Saturday, June 25, 2022; 10:00 AM - 3:00 PM (EDT)**

1. **CALL TO ORDER**
   1. ASHRAE Code of Ethics Review

“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 at:* [*https://www.ashrae.org/about/governance/code-of-ethics*](https://www.ashrae.org/about/governance/code-of-ethics)

* 1. ASHRAE Commitment to Care

*The health and safety of all ASHRAE conference attendees is a top priority. Out of respect for our fellow attendees, we commit to wear masks indoors, monitor our health, seek medical attention if symptoms develop and adhere to all*[*ASHRAE Commitment to Care*](https://urldefense.proofpoint.com/v2/url?u=https-3A__www.ashrae.org_file-2520library_conferences_winter-2520conference_commitment-2Dto-2Dcare.pdf&d=DwMFaQ&c=euGZstcaTDllvimEN8b7jXrwqOf-v5A_CdpgnVfiiMM&r=JaIGRHZ64cvvVhVryEanzWRsA9s4Em7YGo8bX0aVYg4&m=S3c0b0wQYDh4rhZtwoLJ-1hx_XN2yiAzCZvUNoFbF-A&s=-zK0pDiYcEv1X30LezMxSiPVA-rXdYrcPVBUdFq3Jvk&e=)*protocols. We are committed to the well-being of one another.*

* 1. Introduction of Members and Guests

1. **ROSTER REVIEW** 
   1. Update changes/corrections to SSPC 34 Flammability Subcommittee
   2. Quorum Determination (14 voting members)

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| --- | --- | --- | --- |
| ***Producer / Refrigerant***  (3) | ***User / Systems***  (3) | ***User / Components***  (1) | ***General***  (7) |
| Evan Laganis (S 2023) | Chun-cheng Piao  (C 2022) | Marc Scancarello (C 2025) | Greg Woyczinski (S 2025) |
| Bob Low (S 2024) | Valerie Lisi (S 2024) |  | Mark Olson (C 2022) |
| Ankit Sethi (C 2025) | Julie Majurin (C 2024) *Flammability Subcommittee Chair* |  | John Senediak (C 2022) |
|  |  |  | Andrew Kusmierz (C 2023) |
|  |  |  | Kenji Takizawa (C 2023) |
|  |  |  | WenBin Ng (S 2024) |
|  |  |  | Samuel Yana-Motta (S 2025) |

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

* Anyone interested in becoming a voting member or otherwise active in the SSPC 34 Flammability Subcommittee, please apply online (ashrae.org)

1. **AGENDA REVIEW**

ACTION: *Approve/revise the agenda for the meeting.*

1. **MINUTES OF THE LAST MEETINGS**

ACTION: *Approve/revise the minutes of the April 2022 interim virtual meeting.*

1. **PUBLICATION PUBLIC REVIEW DRAFTS**
   1. Addendum O received comments during the letter ballot in SSPC 34 and the team was still working on this at the last meeting (Mary, Samuel, Chris, Asbjorn, Bob, Andrew)



ACTION: *Review progress of the working group.*

1. **APPLICATIONS FOR REFRIGERANT DESIGNATION & SAFETY CLASSIFICATION**

Eight new refrigerant applications have been submitted; there are three previous applications that require no action at this meeting.

**New Applications:**

* 1. (R0124-22-05) Application for Zeotropic Refrigerant Blend R-1234yf/134a/1234ze(E) (35.4/10.1/54/5) with composition tolerances of (0.0, -1.0/+1.0, -0.1/+1.1,-1.0) by mass % from Jun Chen on behalf of Shanghai Suntech Biochemical Co., Ltd.

ACTION: *Review relevant content of application and make a recommendation.*

* 1. (R0125-22-05) Application for Zeotropic Refrigerant Blend R-32/1234yf/152a (4.0/82.0/14.0) with composition tolerances of (+0.5, -1.5/+1.0, -1.0/+0.5, -1.5) by mass % from Hironobu Akamatsu on behalf of AGC, Inc.

ACTION: *Review relevant content of application and make a recommendation.*

* 1. (R0126-22-05) Application for single component refrigerant 1,1,2-trifluoroethene (R-1123) from Hironobu Akamatsu on behalf of AGC, Inc.

ACTION: *Review relevant content of application and make a recommendation.*

* 1. (R0127-22-05) Application for Zeotropic Refrigerant Blend R-1123/1234yf (32.0/68.0) with composition tolerances of (±2.0/±2.0) by mass % from Hironobu Akamatsu on behalf of AGC, Inc.

ACTION: *Review relevant content of application and make a recommendation.*

* 1. (R0128-22-05) for Zeotropic Refrigerant Blend R-1123/32/1234yf (32.0/37.0/31.0) with composition tolerances of (±2.0/±2.0/±2.0) by mass % from Hironobu Akamatsu on behalf of AGC, Inc.

ACTION: *Review relevant content of application and make a recommendation.*

* 1. (R0129-22-05) for Zeotropic Refrigerant Blend R-1123/32/1234yf (19.0/55.0/26.0) with composition tolerances of (±2.0/±2.0/±2.0) by mass % from Hironobu Akamatsu on behalf of AGC, Inc.

ACTION: *Review relevant content of application and make a recommendation.*

* 1. (R0130-22-05) for Zeotropic Refrigerant Blend R-744/32/125/134a/152a/1234ze(E)/227ea with composition tolerances of (7.0/26.0/15.0/15.0/3.0/30.0/4.0) by mass % from Andrew Kusmierz on behalf of FluoroFusion Specialty Chemicals.

ACTION: *Review relevant content of application and make a recommendation.*

* 1. (R0131-22-05) for Zeotropic Refrigerant Blend R-32/1132(E)/1234yf (21.5/28.0/50.5) with composition tolerances of (±2.0/±2.0/±2.0) by mass % from Tsubasa Nakaue on behalf of Daikin Industries, Ltd.

ACTION: *Review relevant content of application and make a recommendation.*

**Outstanding Previous Applications (no action required by the Flammability SC at this meeting):**

* 1. (R0113-21-05) for Zeotropic Refrigerant Blend R-1270/600a (84.0/16.0) with composition tolerances of (±2.0/±2.0) by mass % from Guogeng He on behalf of Huazhong University of Science and Technology.

The flammability SC has already made a recommendation to SSPC 34.

* 1. (R0114-21-05) Amended Application for Zeotropic Refrigerant Blend R-1270/R-600a (38.0/62.0) (+1.0, -2.0/+2.0, -1.0) from Guogeng He on behalf of Huazhong University of Science and Technology.

The flammability SC has already made a recommendation to SSPC 34.

* 1. R0117-21-05 for Zeotropic Refrigerant Blend R-290/600a/600 (55.0/15.0/30.0) with composition tolerances of (+ 2.0/ + 1.5/ + 2.0) by mass % from Graziele Morelli Gandini on behalf of Cia Ultragaz S/A.

The flammability SC voted to table the application; an amended application has not been received.

1. **CONTINUOUS MAINTENANCE PROPOSALS**

There are several outstanding CMPs that pertain to flammability.

ACTION: *Review the CMP status updates and make recommendations*.

**7.1 Submission by Mary Koban (7/6/2020)**

* Section 4 Tables

Add a new table to section 4, listed as table 4.4. which includes the following:  
 - Information from recently published addenda f to ASHRAE 34:2019 (LFL information)  
 - Hot Surface Ignition Temperature data (following ASTM std D8211:2018 or other published data)  
 -BV information in terms of cm/sec given flammable condition (WCF or WCFF)

*At the January 2022 meeting, the Flammability SC voted to recommend to SSPC 34 to ‘Accept the proposed change for further study’. A response was entered in the system on 3/2/2022:*

Thank you for your proposal. The committee agrees with adding burning velocity data to Section 4, but does not agree to add HSIT data at this time. The committee will develop draft revisions to Section 4 for the incorporation of burning velocity data for review and approval at a future date.

ACTION: Mary Koban to present/discuss the proposed table changes.

**7.2 Submission by Asbjorn Vonsild (12/2/2020)**

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| PROPOSAL | |
| Proposer # | 0004 (Asbjørn Vonsild) |
| Proposal # | 014 |
| Proposal Title | Clarify B1.9 on tolerances/accuracy |
| Section | B1.9 |
| Proposal Text | Modify the B1.9 by making two separate subclauses:  One for tolerances for conducting the testing e.g. 60 °C ± 3K, and one for resolution requirements for reporting data, e.g. to the nearest 0.1 K. |
| Substantiating Comments | Because some of the parameters listed are not realistic to keep within the tolerances listed it is not clear what the intent is of the clause.  For instance, pressure shall be 14.7 PSI ± 0.1 PSI, and this is too impractical to be the intent. Is the intent to control the pressure to 0.1 PSI, or to report to nearest 0.1 PSI, or to be able to measure with 0.1 PSI accuracy? |

At our last meeting, the Flammability SC noted that we had previously made a recommendation on a CMP from Sarah Kim for specifying the pressure range for flammability testing. That addendum (ac) received comments during the first public review.

ACTION: Asbjorn Vonsild & Chris Seeton to provide an update.

**7.3. Submission by Asbjorn Vonsild (6/3/2021)**

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| PROPOSAL | |
| Proposer # | 0004 (Asbjørn Vonsild) |
| Proposal # | 018 |
| Proposal Title | Change A2/A3 border from 0.1 kg/m3 to 3.5 % by volume |
| Section | 6.1.3.2, 6.1.3.3, 6.1.3.4, and Table 6-1 |
| Proposal Text | Replace the LFL limit: "~~0.1 kg/m~~~~3~~" with "3.5 % by volume" |
| Substantiating Comments | ISO 817 use 3.5% as one of the borders between Class 2L/2 and Class 3 flammability, while ASHRAE 34 use 0.1 kg/m3.  The LFL threshold level is not used for categorising any refrigerants today, as the HOC contains sufficient information. However:   * The HOC is not a good measure to classify according to, since TNT has significantly lower HOC than a candlelight. * The HOC and LFL in kg/m3 leads to the same order of fluids, and does not add new information to the classification. * Using LFL in vol % adds information about how easily a flammable cloud is formed. |

At our last meeting, the subcommittee noted that this is a very big change that will need more data and more discussion before making a recommendation. A change to volume % would require the value in kg/m3 to be divided by a conversion factor (0.00041) and the molar mass of the refrigerant; therefore, those refrigerants with a higher molar mass would have lower (more restrictive) LFL values in volume %. There was also a concern that users of the standards or regulations that reference Standard 34 (Standard 15, UL 60335-2-40), or building codes, would have challenges dealing with values in volume %. It was proposed that the ISO 817/SSPC 34 ad hoc group that is convening to align the standards consider this difference between the two standards along with some of the concerns raised by the SSPC 34 Flammability SC.

**7.4. Submission by Asbjorn Vonsild (6/3/2021)**

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| PROPOSAL | |
| Proposer # | 0004 (Asbjørn Vonsild) |
| Proposal # | 020 |
| Proposal Title | Delete repetition of step size for LFL determination |
| Section | B.1 |
| Proposal Text | In 1st paragraph of B.1 delete "~~and at 1% by volume (refrigerant/air) increments~~" |
| Substantiating Comments | The starting concentration for testing LFL is described in B1.3 while the step size is described in both B1 and B1.3.  Repetition should be avoided. |

Discussion: Since B1.3 specifically addresses the ETFL (Elevated Temperature Flame Limit), it was not recommended to remove the language from B.1 as this section would cover testing at room temperature and this could lead to unclarity. There was discussion on whether the entirety of B1.3 should be removed.

ACTION: Julie Majurin to provide an update.

**7.5. Submission by Asbjorn Vonsild (6/3/2021)**

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| PROPOSAL | |
| Proposer # | 0004 (Asbjørn Vonsild) |
| Proposal # | 021 |
| Proposal Title | Removal of dual classification text |
| Section | 6.1.3 |
| Proposal Text | **It is recommended to form a joint ad hoc group with ISO 817 to ensure consistency between the standards.**  **A first proposal for ASHRAE 34 language:**  **6.1.3 Flammability Classification.** Refrigerants shall be assigned to one of four classes (1, 2L, 2, or 3) based on lower flammability limit testing, heat of combustion, and the optional burning velocity measurement. Flammability tests shall be conducted in accordance with ASTM E681, *Standard Test Method for Concentration Limits of Flammability of Chemicals (Vapors and Gases)* 9 using a spark ignition source. Testing of all halocarbon refrigerants shall be in accordance with the Annex of ASTM E681. Single-compound refrigerants shall be assigned a single flammability classification. Refrigerant blends shall be assigned a flammability classification based on their ~~WCF and~~ WCFF, as determined from a fractionation analysis (see Normative Appendix B, Section B2). A fractionation analysis for flammability is not required if the components of the blend are all in one class; the blend shall be assigned the same class (see Table 6-1).  **6.1.3.1/6.1.3.2/6.1.3.3/6.1.3.4 Class …** ~~a)~~ A single-compound refrigerant or the WCFF of a refrigerant blend shall be classified as Class... ~~b) The WCF of a refrigerant blend shall be classified as Class... c) The WCFF of a refrigerant blend shall be classified as Class...~~ |
| Substantiating Comments | ASHRAE 34 contains text suggesting that safety classification needs to be done at both WCF and WCFF. This seems to be text left from before the dual safety classification was removed from ASHRAE 34.  Also, merging the list items in sections 6.1.3.1, 6.1.3.2, 6.1.3.3 and 6.1.3.4 is aligning with the structure of ISO 817 and shortens the standard.  Note that 6.1.3.1 today has the wording “if the WCFF of the blend, as determined from a fractionation analysis specified by Normative Appendix B, Section B2”. The reference to Section B2 is also in 6.1.3, so need not be repeated, and is not in 6.1.3.2, 6.1.3.3 and 6.1.3.4. It is proposed to only have this reference in 6.1.3. |

At the last meeting, the SC agreed that there is room for improvement in the standard language. It was clarified that the ad hoc group is only intending to align the language between the two standards, not to consider a proposal for dual classification in ASHRAE 34. Any recommendation from the ad hoc group will be presented to both ISO 817 and ASHRAE 34 for consideration. No current work is required from the SSPC 34 Flammability SC, other than ensuring participation on the ad hoc.

ACTION: For information.

**7.6. Submission by Asbjorn Vonsild (6/15/2021)**

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| PROPOSAL | |
| Proposer # | 0004 (Asbjørn Vonsild) |
| Proposal # | 022 |
| Proposal Title | Clarifying step size for LFL determination and last no-go as LFL (Staff Note: Replaces Previous CMP with Same Title) |
| Section | B.1.3 |
| Proposal Text | If the approximate flammability limits of the single-compound refrigerant or blend components is known, it is acceptable to start flammability testing at less than half of the stoichiometric concentration for LFL or ETFL determination. When the flammability approximate flammability limits of single-compound refrigerant or blend components is not known, testing shall begin at 1% refrigerant by volume.  Initial concentration increments shall be approximately 10% of the expected flame propagation (>90° angle) concentration (e.g. 8.6%, 10.8%, 12.0% if ~12% is expected) if known. If flame propagation is observed, then subsequent testing concentrations shall begin at the midpoint of the propagation and no-propagation tests. The tests shall be continued in increments of 0.1% absolute or ≤5% of the concentration where flame propagation is first observed, whichever is greater.  For example, when the initial flame propagation concentration is found to be 12.0%, minimum concentration increments of ≤0.6% (e.g. 10.8%, 11.4%, 12.0%) shall be employed for subsequent testing since this is the greater of 5% of the measured value (12% × 0.05 = 0.6%) and 0.1% absolute. Conversely, when the initial flame propagation concentration is found to be 1.5%, minimum concentration increments of 0.1% (e.g. 1.1%, 1.2%, 1.3%, 1.4%, 1.5%) shall be employed for subsequent testing since this is the greater of 5% of the measured value (1.5% × 0.05 = 0.075%) and 0.1% absolute.  If the test results in flame propagation (>90° flame angle), then the last no-propagation test (≤90° flame angle) shall be identified as the LFL or ETFL. |
| Substantiating Comments | The step size of 1% by volume will be too large for determining LFL with sufficient precision. From a safety point of view 1% by volume steps is also too large for A3 refrigerants, as the tester may go directly from a test with a non-flammable mixture to a mixture close to stoichiometric concentration.  The test description also need to describe how the LFL or ETFL is to be determined based on the test results. Specifically it is proposed that the LFL or ETFL is determined as the last test point with no flame propagation. |

ACTION: Julie Majurin to provide an update.

**7.7. Submission by Asbjorn Vonsild (8/12/2021)**

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| PROPOSAL | |
| Proposer # | 0004 (Asbjørn Vonsild) |
| Proposal # | 023 |
| Proposal Title | Altitude adjustment |
| Section | 9.4.2 |
| Proposal Text | Reconsider the altitude adjustment formula. |
| Substantiating Comments | ASHRAE 34 and ISO 817 both include formula for altitude adjustment when going from ppm to kg/m3. In the case of ASHRAE 34 it covers RCL, while in ISO 817 the altitude adjustment formula is for LFL, one of the components of RCL.  The two formula of ASHRAE 34 and ISO 817 are however not in agreement:  ISO 817:  LFLM= LFLppm×a×M×10-6  a = P/RT; T = 298 K; P = 1.01325 × 105 – 10.001 × h; R = 8.314 J/mol K  => **LFLM= LFLppm × M × (4.090 × 10-5 – 4.037 × 10-9 × h)**  ASHRAE 34:  RCLM=RCL×a×M; RCLa= RCLM×(1-b×h)  a = 4.096 × 10-5 g/m3; b = 7.94 × 10-5 m  => **RCLM=RCLppm × M × (4.096 × 10-5 – 3.2522  × 10-9 × h)**  At sea level the difference is very small, however at an altitude of 3000 m ISO 817 is 8% below ASHRAE, and at 6000 m the difference is the difference is 22%.  Attached to this proposal is document N123 from ISO/TC86/SC8/TF1 showing a graph of the two altitude adjustment formula. |

At the last meeting, there was disagreement with the proposed change. One suggestion was that the SC reviews the RCL calculation in ASHRAE 34 in more detail to determine if the altitude adjustment is being properly applied.

ACTION: Chris Seeton and Asbjorn Vonsild to provide an update.

7.8 Submission by Ankit Sethi (2/22/2022)

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| PROPOSAL | |
| Proposer # | 0006 (Ankit Sethi) |
| Proposal # | 001 |
| Proposal Title | Clarify use of WCFF for Flammability Classification |
| Section | 6.1.5.2 |
| Proposal Text | The flammability classification of a refrigerant is based on the worst case of fractionation. For flammability, worst case of fractionation is defined as the composition during fractionation that results in the highest concentration of the flammable components in the vapor or liquid phase. Blends shall be assigned a flammability classification based on the requirements in Section 6.1.3. |
| Substantiating Comments | Addendum n to Standard 34-2016 changed Section 6.1.5 to clarify that toxicity classification was based on nominal formulation. However, during this change, the standard inadvertently removed language which required flammability classification to be based on worst case of fractionation. The change proposed above would reinstate the original intent of the standard. |

ACTION: For information.

1. **OLD BUSINESS**
   1. Technical Review of Flammability Research

It was previously requested by Kenji Takizawa to review the results of 1717-RP, to consider potential changes to the methods. Kenji is working on a publication that reviews differences in test methods, and the committee will review this publication when it’s available.

* 1. Flammability Application Checklist – Julie Majurin

Review standard and checklist for requirements for low temperature refrigerant applications

1. **NEW BUSINESS**
   1. Flammability information that should be included in the motions/minutes.
2. **REFRIGERANT CODES UPDATE**
3. **NEXT MEETINGS**

**NEXT CONFERENCE: February 4-8 – Atlanta, Georgia**

(Note: Meeting schedule or location subject to change)

1. **ADJOURNMENT**