



VIA EMAIL ONLY: EToto@ashrae.org

November 06, 2024

Emily Toto
ASHRAE

Re: IAPMO Standards Council Decision
TIA UMC-003-24
Decision date: November 04, 2024**
2024 Uniform Mechanical Code –Table 1102.3

Dear Ms. Toto:

I am transmitting to you herewith the following decision of the Standards Council. At its meeting on November 4, 2023, the Standards Council considered your request for the issuance of proposed TIA UMC- 003-24 in the 2024 edition of the *Uniform Mechanical Code*. The proposed Tentative Interim Amendment requested an amendment to Table 1102.3 as follows:

**TABLE 1102.3
REFRIGERANT GROUPS, PROPERTIES, AND ALLOWABLE QUANTITIES⁷
[ASHRAE 34: TABLE 4-1, TABLE 4-2]**

REFRIGERANT	CHEMICAL FORMULA	CHEMICAL NAME ¹ (COMPOSITION FOR BLENDS)	SAFETY GROUP	OEL ² (ppm)	RCL (lb/Mcf)	LFL ⁸ (lb/Mcf)
R-444A	zeotrope	R-32/152a/1234ze(E) (12.0/5.0/83.0)	A2L	850	5.45.0	19.9
R-445A	zeotrope	R-744/134a/1234ze (E) (6.0/9.0/85.0)	A2L	930	4.25.4	2.721.6
R-446A	zeotrope	R-32/1234ze(E)/600 (68.0/29.0/3.0)	A2L	960	2.53.7	13.5⁴⁰14.8
R-447A	zeotrope	R-32/125/1234ze(E) (68.0/3.5/28.5)	A2L	960	2.65.2	18.9⁴⁰20.6
R-447B	zeotrope	R-32/125/1234ze(E) (68.0/8.0/24.0)	A2L	970	2.64.8	20.619.5
R-451A	zeotrope	R-1234yf/134a (89.8/10.2)	A2L	530	5.05.3	20.3⁴⁰21.3
R-451B	zeotrope	R-1234yf/134a (88.8/11.2)	A2L	530	5.0	20.3⁴⁰21.3
R-454A	zeotrope	R-32/1234yf (35.0/65.0)	A2L	690	3.24.4	18.3⁴⁰17.5
R-454B	zeotrope	R-32/1234yf (68.9/31.1)	A2L	850	3.14.6	22.0⁴⁰18.5
R-454C	zeotrope	R-32/1234yf (21.5/78.5)	A2L	620	4.44.6	18.0⁴⁰18.2
R-455A	zeotrope	R-744/32/1234yf (3.0/21.5/75.5)	A2L	650	4.96.8	26.9

(portions of table not shown remain unchanged)

The proposed TIA was balloted through the Mechanical Code Technical Committee in accordance with the Regulations Governing Committee Projects to determine if there existed the necessary three-fourths majority support on technical merit and emergency nature to establish the recommendation for issuance. The letter ballot passed on both counts.

In determining whether or not to issue a TIA, the Council looks to the TC letter ballot for a recommendation of support, and in this case, that support exists. Upon a full review and consideration of all of the information available to it, including testimony provided by proponent, the Council agrees with the substantiation submitted by the proponent and thus voted to accept the recommendation of the Technical Committee and issue proposed TIA 003-24 as noted above.

Sincerely,



Hugo Aguilar
Secretary, Standards Council

CC: Heather Koffman, Executive VP & General Counsel
Gaby Davis, Executive Administrative Officer
Enrique Gonzalez, Manager of Code Development
Taylor Duran, Code Development Administrator
IAPMO Standards Council
Members of the Mechanical TC

****NOTE:** Participants in IAPMO's codes and standards making process are advised that limited review of this decision may be sought from the IAPMO Board of Directors. For the rules describing the available review and the method for petitioning the Board of Directors for review, please consult Section 1-7 of the *IAPMO Regulations Governing Committee Projects* and the *IAPMO Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council*. **Notice of the intent to file such a petition must be submitted to the Petitions Clerk of the Board of Directors within 15 calendar days of the Date of Decision noted in the subject line of this letter.** As this document is an American National Standard (ANS), any persons who have directly and materially affected interests by this decision have the right to appeal to ANSI in accordance with ANSI procedures.

IAPMO Regulations Governing Committee Projects
Section 1-7

1-7 Petitions to the Board of Directors.

1-7.1 General. The Standards Council has been delegated the responsibility for the administration of the codes and standards development process and the issuance of Documents. However, where extraordinary circumstances requiring the intervention of the Board of Directors exist, the Board of Directors may take any action necessary to fulfill its obligations to preserve the integrity of the standards development process. Anyone seeking such intervention of the Board of Directors may petition the Board of Directors concerning Standards Council action on any matters. Such petitions shall be filed and processed in accordance with the Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council.

1-7.2 Notice of Intent to File the Petition. Anyone wishing to petition the Board of Directors concerning a Standards Council action related to the issuance of a document, shall file a Notice of Intent to File a Petition within 15 days following the Standards Council action. A Standards Council action related to the issuance of a document includes any action of the Council that issues or returns a Document or that affects the text of a Document. Petitions concerning other Standards Council actions shall be filed within a reasonable period of time.

1-7.3 Effect of Filing. The filing of a Petition will not serve to stay the effective date of a Document or a Tentative Interim Amendment unless the Chief Executive Officer of the Association or the Board of Directors acts, pursuant to 4-7.2 or 5-6, to delay the effective date. Any Petition pending at the time a Document or Tentative Interim Amendment becomes effective will be treated as a Petition to withdraw the Document or Tentative Interim Amendment.

1-8 Use of Visual Aids and Demonstrations Before the Standards Council or Board of Directors. The policy for the use of visual aids and physical demonstrations to the Standards Council and Board of Directors shall be the same as that required for TCCs, TCs, and Task Groups, in accordance with 3-3.3.3(e) and 3-3.3.3(f).

IAPMO Regulations Governing Petitions to the Board of Directors
from Decisions of the Standards Council

ADOPTED BY THE IAPMO BOARD OF DIRECTORS SEPTEMBER 4, 2000. Amended in January 2007.

Section 1 Scope of and Authority for these Regulations.

- (a) These regulations have been issued by the Board of Directors pursuant to its authority under Article 5, 6 and 8 of the IAPMO Bylaws.
- (b) These regulations set forth the procedures to be used for the filing and processing of all petitions to the Board of Directors filed pursuant to 1-7 of the Regulations Governing Committee Projects.
- (c) The Board of Directors can amend these regulations from time to time and waive or supplement, in whole or in part, at any time or times at its discretion.
- (d) For the purposes of these regulations, the Standards Council Secretary, or such other person as the Chair of the Board of Directors may appoint, shall act as a petitions clerk.

Section 2 Subcommittees of the Board of Directors. Unless the Board of Directors otherwise orders, the authority to consider and make recommendations on the disposition of a petition by the Board of Directors shall be delegated to a subcommittee of the Board of Directors, which shall be appointed, in accordance with 2.1 of these regulations. Subcommittees shall be appointed by the Chair of the Board of Directors.

2-1 Composition of Subcommittees. Subcommittees shall consist of three or more members of the Board of Directors. The criteria for selection and appointment of subcommittee members shall be as follows:

- (a) A subcommittee member shall be a person who can decide the petition on the merits in an impartial manner.
- (b) A subcommittee member shall not have any conflict of interest. (A conflict of interest is defined as any situation in which a decision on a petition could substantially and materially affect the member's financial or business interest.)
- (c) Each subcommittee member shall, to the extent practicable, represent diverse interests within the association.

In making a decision of whether or not to serve on a subcommittee, the member may consult with the IAPMO general counsel.

Section 3 The Scope of Review. The petitioner shall generally confine the argument in the petition to matters that were presented below and shall not raise any new matters that could have but were not presented within the standards development process. A petition to the Board of Directors shall not be regarded as simply another opportunity to reargue a position that was rejected by the Standards Council. In considering a petition, the subcommittee shall give due deference to the judgment of the Standards Council and shall not intervene unless it can be demonstrated that extraordinary circumstances exist requiring the Board of Director's intervention to protect the integrity of the standards development process.

Section 4 The Record. In its consideration of the petition, the subcommittee shall have before it the entire record that was before the Standards Council, as well as all proceedings and decisions of the Standards Council on the issue. In addition, the subcommittee may consult any other records of the association that it deems pertinent to the issue, and the subcommittee may seek technical assistance from staff, the technical committee, or any other source or persons that it deems appropriate.

Section 5 Notice of Intent to File the Petition. Anyone wishing to petition the Board of Directors concerning a Standards Council action related to the issuance of a document, shall file a Notice of Intent to File a Petition within 15 days following the Standards Council action. A Standards Council action related to the issuance of a document includes any action of the Council that issues or returns a document or that affects the text of a document. Petitions concerning other Standards Council actions shall be filed within a reasonable period of time.

Section 6 Filing and Contents of the Petition.

- (a) Within 15 days following the receipt of the notice of intent to file, or within such other time as the petitions clerk may allow, the petitioner shall file the petition together with 20 copies. The petition shall be no more than 10 pages in length and shall contain, in separately denominated sections, the following:
 - (1) Name, affiliation, and address of the petitioner;
 - (2) Statement identifying the particular Standards Council action to which the petition relates;
 - (3) Argument setting forth the grounds for the petition and, in particular, addressing why there exist extraordinary circumstances requiring the intervention of the Board of Directors (see the preceding Section 3 and 1-7 of the Regulations Governing Committee Projects); and
 - (4) Statement of the precise relief requested.
- (b) Any part of the record related to the standards development process that is referenced or discussed in the petition should be clearly cited in the petition using available markings such as the title, author, date, and page of the record. Since the full record will be available to the subcommittee during its review, attachments and appendices shall not accompany the petition, unless express permission has been obtained from the petitions clerk.

Section 7 Consideration of the Petition.

7-1 Initial Review. The petitions clerk may, at his or her discretion, arrange for initial review of the petition by meeting, correspondence, or telephone conference. If upon such initial review of the petition and any relevant portions of the record, the subcommittee determines that the petition has no merit, it may dismiss the petition.

7-2 Full Review. If initial review is not conducted, or, if upon such review, the subcommittee determines that further review is warranted, it shall afford the opportunity for responses to be filed by interested parties. Responses, together with 20 copies, shall be filed within 15 days or within such other time as the petitions clerk may allow.

- (a) Responses shall be no more than 10 pages in length and shall contain, in separately denominated sections, the following:
 - (1) Name, affiliation, and address of the respondent;
 - (2) Statement identifying the petition to which the response relates and stating whether the respondent supports or opposes the petition; and
 - (3) Argument setting forth the grounds for opposing or supporting the petition and, in particular, addressing why there does or does not exist extraordinary circumstances requiring the intervention of the Board of Directors (see the preceding Section 3 and 1-7 of the Regulations Governing Committee Projects).
- (b) Any part of the record related to the standards development process that is referenced or discussed in a response should be clearly cited in the response using available markings such as the title, author, date, and page of the record. Since the full record will be available to the subcommittee during its review, attachments and appendices shall not accompany the response, unless express permission has been obtained from the petitions clerk.
- (c) So as to avoid unnecessary repetition and duplication of effort, parties are encouraged to file joint responses where possible and appropriate.
- (d) Unless a hearing has been requested and granted by the subcommittee (see Section 8), the subcommittee shall, either by meeting or telephone conference, review and render a decision on the petition based on the written submissions of the parties and the record before it.

Section 8 Requests for Hearings. If the petitioner requests a hearing on the petition and that hearing is granted, the petitioner shall be assessed a filing fee of \$2,500 to be posted following the granting of the request. This fee may be reduced or waived by the Chief Executive Officer upon application of the petitioner if good cause for reducing or waiving the fee is presented. If a hearing is granted, the Procedures for Hearings shall be followed.

Section 9 Waiver of Regulations. Any of the deadlines or requirements set forth in these regulations may be waived by the subcommittee upon application of the petitioner or any other party for good cause shown, or in the discretion of the subcommittee.

Section 10 Subcommittee Report to the Board of Directors. The subcommittee shall file with the Board of Directors a written report concerning each petition that it has determined.

UMC TIA 003-24

UNIFORM MECHANICAL CODE: TIA FORM – 2024

Reference Code Section: 2024 UMC Table 1102.3

Submitter Name: Emily Toto
Company: ASHRAE
Phone Number: (678) 539-1194

Proposed language for TIA:

Revise Table 1102.3 as follows:

**TABLE 1102.3
 REFRIGERANT GROUPS, PROPERTIES, AND ALLOWABLE QUANTITIES⁷
 [ASHRAE 34: TABLE 4-1, TABLE 4-2]**

REFRIGERANT	CHEMICAL FORMULA	CHEMICAL NAME ¹ (COMPOSITION FOR BLENDS)	SAFETY GROUP	OEL ² (ppm)	RCL (lb/Mcf)	LFL ⁸ (lb/Mcf)
R-444A	zeotrope	R-32/152a/1234ze(E) (12.0/5.0/83.0)	A2L	850	5.15.0	19.9
R-445A	zeotrope	R-744/134a/1234ze (E) (6.0/9.0/85.0)	A2L	930	4.25.4	2.7 21.6
R-446A	zeotrope	R-32/1234ze(E)/600 (68.0/29.0/3.0)	A2L	960	2.53.7	13.5 ¹⁰ 14.8
R-447A	zeotrope	R-32/125/1234ze(E) (68.0/3.5/28.5)	A2L	960	2.65.2	18.9 ¹⁰ 20.6
R-447B	zeotrope	R-32/125/1234ze(E) (68.0/8.0/24.0)	A2L	970	2.64.8	20.6 19.5
R-451A	zeotrope	R-1234yf/134a (89.8/10.2)	A2L	530	5.05.3	20.3 ¹⁰ 21.3
R-451B	zeotrope	R-1234yf/134a (88.8/11.2)	A2L	530	5.0	20.3 ¹⁰ 21.3
R-454A	zeotrope	R-32/1234yf (35.0/65.0)	A2L	690	3.24.4	18.3 ¹⁰ 17.5
R-454B	zeotrope	R-32/1234yf (68.9/31.1)	A2L	850	3.14.6	22.0 ¹⁰ 18.5
R-454C	zeotrope	R-32/1234yf (21.5/78.5)	A2L	620	4.44.6	18.0 ¹⁰ 18.2
R-455A	zeotrope	R-744/32/1234yf (3.0/21.5/75.5)	A2L	650	4.96.8	26.9

(portions of table not shown remain unchanged)

SUBSTANTIATION

The 2024 edition of the Uniform Mechanical Code (UMC) was updated to include reference to the 2019 edition of ASHRAE Standard 34. Additionally, consistent with IAPMO’s extraction policy, Table 1102.3 was also updated to align with the latest information, at that time, from ASHRAE Standard 34. As part of this effort, values for Refrigerant Concentration Limits (RCLs) and Lower Flammability Limits (LFLs) were also included in this table, as were new refrigerants and other updates from the addenda to the 2019 edition of ASHRAE Standard 34.

Unfortunately, the 2019 edition of ASHRAE Standard 34 and its associated addenda contained errors for a number of these newly incorporated refrigerant properties. As such, updates to Table 1102.3 are needed to resolve potential safety concerns that may now arise from the use of incorrect RCLs and LFLs for Safety Group A2L refrigerant blends that were adopted into the 2024 edition of the UMC. Given the ongoing transition towards Safety Group A2L refrigerants, which are classified as having “Lower Flammability” per ASHRAE Standard 34, the need for these changes is critical.

UMC TIA 003-24

Technical Merit

Errors in some of the refrigerant properties for A2L refrigerant blends were unintentionally propagated in ASHRAE Standard 34. Once these errors were discovered, corrective action was taken by SSPC34, as demonstrated by the publication of [Addendum a](#) to the 2022 edition of ASHRAE Standard 34. Regrettably, these errors were not discovered and corrected in time for the 2024 edition of the UMC, which included updates based on the 2019 edition of ASHRAE Standard 34 and its associated addenda. A proposal to update the refrigerant properties in Table 1102.3 has been submitted by ASHRAE for the 2027 UMC. The Technical Committee recommended approval of the change to modify these values. However, this does not rectify the values that currently exist in the 2024 edition of this code.

The values of RCL and LFL for A2Ls are used repeatedly throughout Chapter 11 of the UMC, such as to determine the maximum allowable concentrations of refrigerant resulting from the complete discharge of an independent circuit of a high-probability system (e.g., Section 1104.2), charge limits for Institutional Occupancies (e.g., Section 1104.3), refrigerant detection system requirements for both high and low-probability systems (e.g., Sections 1106.11.6.2 and 1107.1.7.2), and for refrigerant test gas concentrations (e.g., Sections 1116.1.1 and 1116.3). They are also used throughout safety standards, such as ASHRAE Standard 15, as a basis for leak mitigation actions. As such, it is imperative that these values are correct.

Emergency Nature

In accordance with Section 5-2 of IAPMO's Regulations Governing Committee Projects regarding the emergency nature of a TIA, this TIA meets items [c, d, e] for emergency nature.

(c) The proposed TIA intends to correct a previously unknown existing hazard.

&

(d) The proposed TIA intends to offer to the public a benefit that would lessen a recognized (known) hazard or ameliorate a continuing dangerous condition or situation.

Code change proposals submitted to IAPMO for consideration by the UMC Technical Committee were believed to contain accurate refrigerant property information, based on published values in the 2019 edition of ASHRAE Standard 34 and its associated addenda. These values have since been corrected in ASHRAE Standard 34, as evidenced by the publication of Addendum a to the 2022 edition.

Some of the errors identified by this TIA include larger RCLs or LFLs in Table 1102.3. These errors may lead to AHJs erroneously approving larger refrigerant charge sizes for air conditioning and refrigeration (ACR) systems than would be allowed by safety standards, such as ASHRAE Standard 15. This could result in the erosion of safety factors designed to prevent flammable concentrations of refrigerant from forming in a space. This could also result, for example, in the use of improper settings for refrigerant detection levels in machinery rooms, impeding the effective use of ventilation as a life saving measure.

Going forward, the corrections proposed by this TIA to Table 1102.3 would help prevent the use of incorrect values of RCL and LFL that could lead to unsafe installations of ACR systems using Group A2L refrigerants.

(e) The proposed TIA intends to accomplish a recognition of an advance in the art of safeguarding property or life where an alternative method is not in current use or is unavailable to the public.

The EPA's Technology Transition Rule imposes a 700 GWP limit for most new air conditioning system installations, starting January 1, 2025. As such, air conditioning equipment manufacturers are now shifting to the use of A2L refrigerants, like R-454B, in new systems. Given the close proximity of this deadline, and with states now adopting or using the 2024 edition of the UMC, the changes provided by this TIA are urgently required. As the values of RCL and LFL are key to safety mitigations used in next generation ACR system installations, this TIA will help to ensure a safe and effective refrigerant transition.

UMC TIA 003-24

I hereby grant IAPMO all and full rights in copyright, in this proposal, and I understand that I acquire no rights in any publication of IAPMO in which this proposal appears in this or another similar or analogous form.

Submitter signature: *Emily Toto*

Date: 8-19-2024