

UMC TIA 003-24

UNIFORM MECHANICAL CODE: TIA FORM – 2024

Reference Code Section: 2024 UMC Table 1102.3

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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	3.44.6	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.

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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.

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(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.

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