AHRI WELCOME A2Ls

A Review of the Changing Refrigeration Requirements

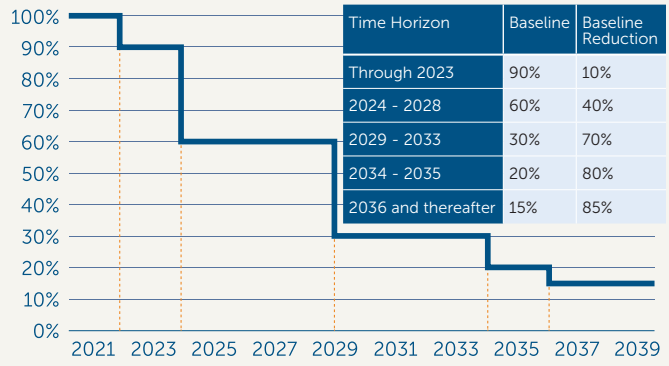
The World is Regulating Refrigerants

The **Kigali Amendment** to the Montreal Protocol, adopted in 2016, is a significant international treaty aimed at phasing down the production and consumption of hydrofluorocarbons (HFCs), which are potent greenhouse gases. The transition to low-global warming potential (GWP) refrigerants is a critical component of this amendment, focusing on stepwise reductions in HFCs and promoting more environmentally friendly alternatives. The U.S. ratified the Kigali Amendment in October 2022.

U.S. Regulatory Framework

The **American Innovation and Manufacturing (AIM) Act** was signed into law in December 2020. The AIM Act mandates the Environmental Protection Agency (EPA) to limit the consumption and production of HFCs, including refrigerants.

AIM Act HFC Phasedown



Time Horizon	Baseline	Baseline Reduction
Through 2023	90%	10%
2024 - 2028	60%	40%
2029 - 2033	30%	70%
2034 - 2035	20%	80%
2036 and thereafter	15%	85%

(*) Reductions in production and consumption are based on 2011-2013.

To enable the safe use of low-GWP refrigerants, the EPA published several lists of refrigerant substitutes under the Significant New Alternatives Policy Program in Commercial and Industrial Refrigeration (SNAP rules).

Technology and Innovation

This transition has driven innovation in refrigeration and air-conditioning (AC) technologies. Over the past decade, manufacturers have invested heavily in research to develop new systems that can operate efficiently with low-GWP refrigerants.

Safety Considerations

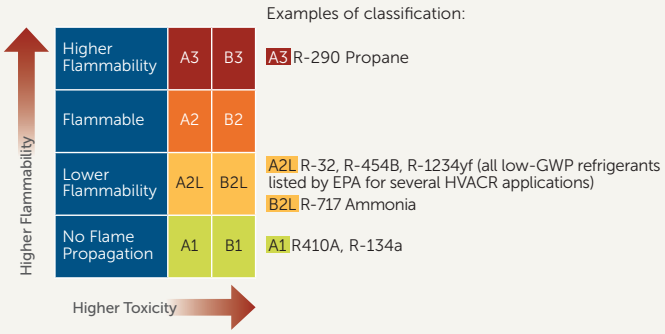
Some low-GWP alternatives have different safety profiles to legacy refrigerants, such as R-410A or R-134a. While low-GWP refrigerants have been commonly used for decades in the automotive sector and for AC and refrigeration in other parts of the world, the HVACR industry has worked closely with expert laboratories in the U.S. to understand the behavior of these new refrigerants better.

Research on flammability, risk assessment, and resulting risk mitigation has been conducted in cooperation with the U.S. Fire Service. Post-ignition behavior of equipment involved in fires was an area of concern raised by their organizations.

Additional testing was conducted at the Fire Safety Research Institute (FSRI), part of UL Research Institutes.

Many low-GWP alternatives are classified as A2L, meaning lower toxicity and lower flammability.

ASHRAE Standard 34 Classification Table



Safety Standards and Model Code Adoption

Extensive research conducted on A2L refrigerants and their safe use in HVACR equipment has led to a revision of the refrigerant classification standard ASHRAE 34, the application standard ASHRAE 15, and of the main product safety standards – CSA/UL 60335-2-40 for HVACR and CSA/UL 60335-2-89 for refrigeration.

Revising these national standards followed the ANSI (American National Standards Institute) accredited consensus-based process, ensuring that they are developed through broad stakeholder engagement, allow all interested parties to participate, and reflect a broad agreement. For example, the working group for UL/CSA 60335-2-40 included experts from various fields, industry representatives, the fire service, authorities having jurisdiction, regulators, consumer groups, and other interested parties.

The International Code Council (ICC) has included the below standards as reference standards in the 2024 edition of the model codes.

- ASHRAE Standard 15-2022, Safety Standard for Refrigeration Systems
- ASHRAE Standard 34-2022, Designation and Safety Classification of Refrigerants
- CSA/UL 60335-2-40:2022, Ed.4, Household and Similar Electrical Appliances - Safety - Part 2-40: Particular Requirements for Electrical Heat Pumps, Air Conditioners and Dehumidifiers
- CSA/UL 60335-2-89:2021, Ed. 2, Household and Similar Electrical Appliances - Safety - Part 2-89: Particular Requirements for Commercial Refrigerating Appliances and Ice-Makers with an Incorporated or Remote Refrigerant Unit or Motor-Compressor

While many sections of the codes currently adopted by local jurisdictions remain unchanged, several portions of the 2024 edition of the model codes had to be amended. New provisions were introduced to address A2L refrigerants in the

International Mechanical Code (IMC), International Residential Code (IRC), International Building Code (IBC), and International Fire Code (IFC).

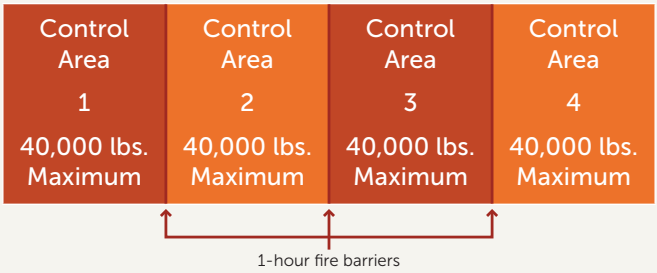
Maximum Allowable Quantities (MAQ) Requirements for Storage

The MAQ for ASHRAE A2L refrigerant storage is based on the type of occupancy and the number of control areas in the building. Each building can have up to four control areas, increasing the total amount of refrigerant that can be stored in the building. The 2024 codes have been revised, and the table shows maximum quantities in each control area for common occupancies.

As illustrated in the diagram below, a building protected with fire sprinklers can include 1-hour, fire-resistance-rated walls to create 4 separate control areas. Each control area can store up to 40,000 pounds of liquefied A2L refrigerants.
See the National Fire Protection Association (NFPA 1) and the International Fire Code (IFC) for more information.

Addressing Concerns

Main concerns from the fire service regarding the development of mildly flammable refrigerants detailed in the paragraph



below were addressed through various research and training efforts by the fire service, code and standards development organizations and industry associations.

Identification of A2Ls

The Globally Harmonized System (GHS) symbol is always required, other safety symbols and/or warning labels may be applied on the equipment.

Detection and Mitigation

For HVACR systems in commercial and residential buildings, the leak detection system is part of the UL 60335-2-40 listing requirements for the equipment. For commercial refrigeration, the leak detection system is part of the UL 60335-2-89 listing requirements.

Questions?
Contact Tom Deary, AHRI Senior Director of Codes:
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Training and Resources

AHRI and other organizations have developed many resources that are available for more information on A2L refrigerants! Use the QR codes below to view these items.

A2L Refrigerant Building Code Map
AHRI's A2L Refrigerant Building Codes Map indicates where state and local building codes have been updated, or legislation has passed to allow for equipment using A2L refrigerants. This map is updated regularly.

U.S. Department of Transportation (DOT) Special Permits
The Department of Transportation has issued 3 special permits to AHRI member companies for the transportation of A2Ls. AHRI has prepared a helpful flyer to explain the differences between the 3 Special Permits and what the process is to apply for them.

Firefighter Safety and Flammable Refrigerants
AHRI, UL, and the Fire Safety Research Institute collaborated on developing this A2L training course.

AHRI A2L Video Series
AHRI developed a series of brief videos to provide helpful information about A2L refrigerants.

International Code Council A2L Refrigerant Transition Resource Site
ICC has provided full markups from previous editions of the code to illustrate what changes were made to the 2024 model codes to allow the use of A2L refrigerants.

National Fire Protection Association Resources
NFPA has a wealth of research and training on A2Ls and other flammable refrigerants available on their website.

NFPA – Refrigerants Research

NFPA – Flammable Refrigerants Safety Training – Fire Service Edition