



Navigating New Refrigerants

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• Agenda

- Regulatory Landscape
- Low GWP Refrigerants
- ASHRAE[®] Standard 15-2022 and Safety Requirements for A2L refrigerants
- Sustainable Refrigerant Management for A2L refrigerants
- FAQ



- **Regulatory Landscape**

• Why Refrigerants are Transitioning and “Decarbonization is the New Trend”



ODP

Ozone Depletion Potential - *Past Concern*

Potential of a substance to **reduce the amount of ozone** in the atmosphere which blocks harmful radiation

GWP

Global Warming Potential - *Current Concern*

Potential for a gas to **trap heat** in the atmosphere - contributing to climate change

CFCs

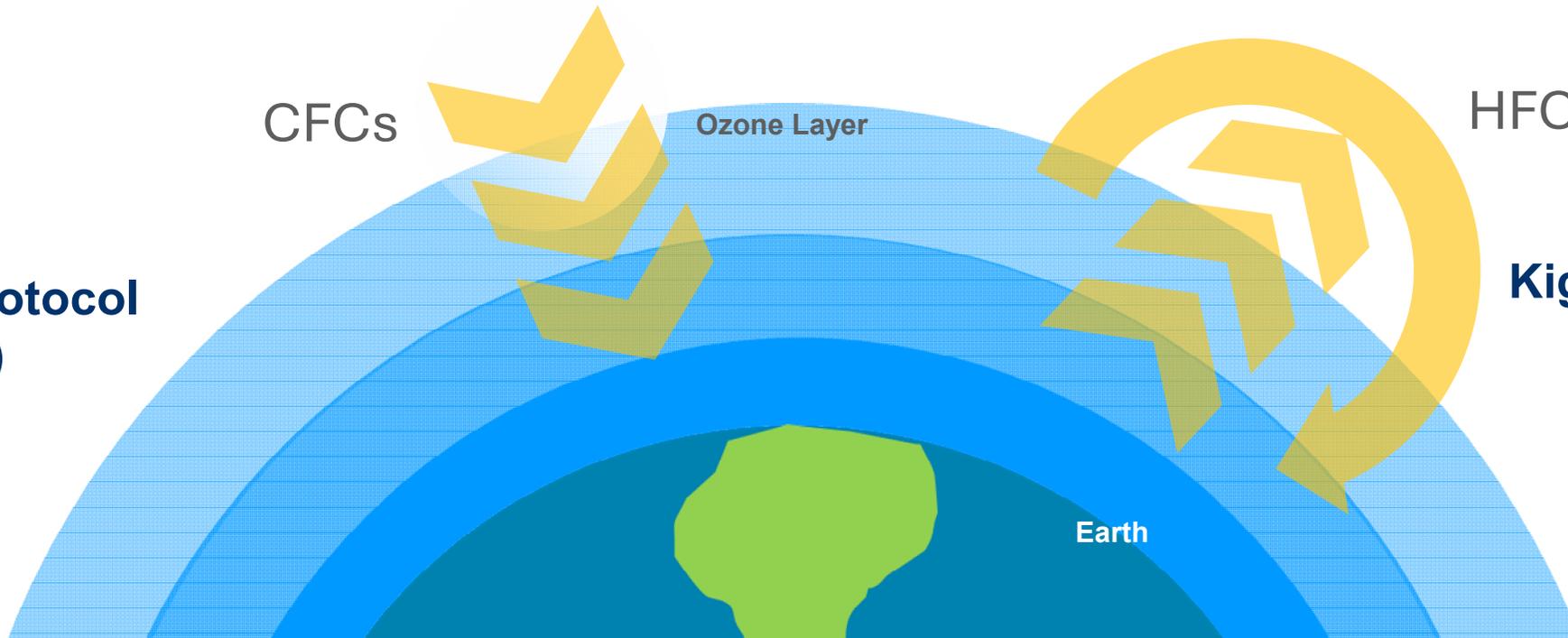
Ozone Layer

HFCs

**Montreal Protocol
(1987)**

**Kigali Amendment
(2016)**

Earth



• United Nations Environment Program (UNEP)



Montreal Protocol – CFC (1987)



Kyoto Protocol – GHG (1997)

Kigali Amendment – HFC (2016)

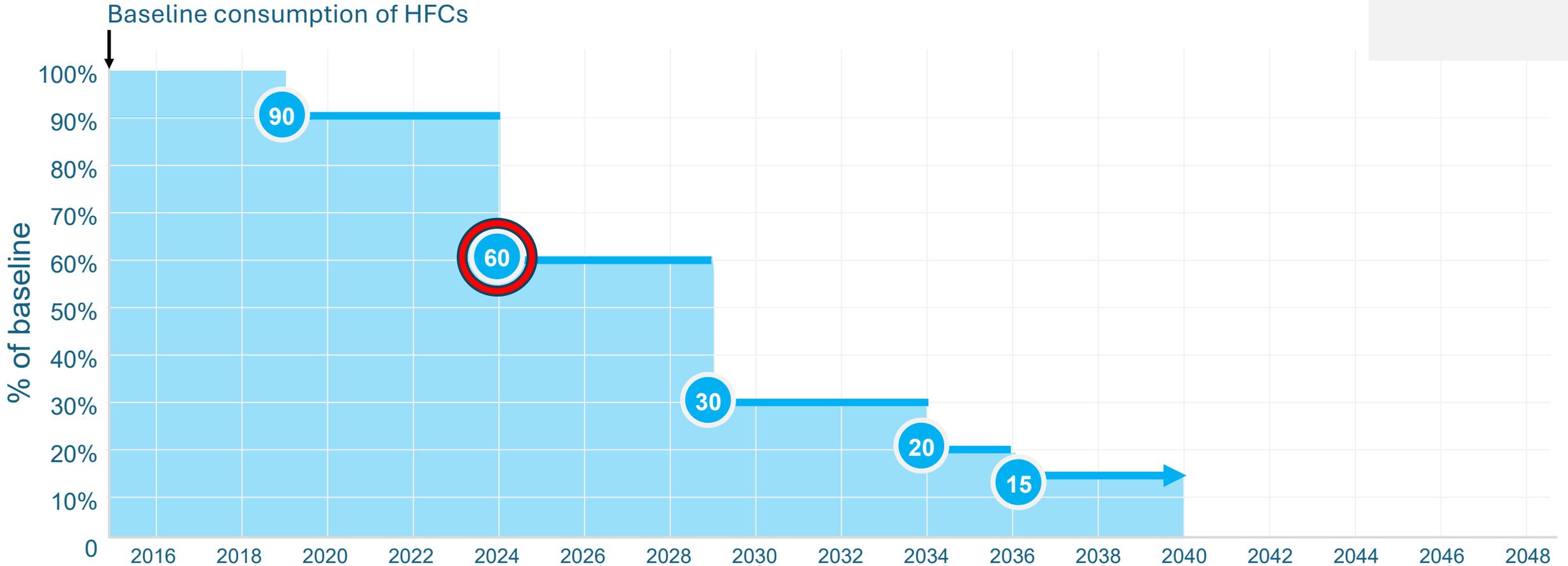
Paris Agreement (2016)

USA Compliance – AIM Act (2020)



• The American Innovation and Manufacturing (AIM) Act

- AIM Act Follows the Montreal Protocol Kigali Schedule



The AIM Act implements the Kigali Amendment to the Montreal Protocol by mandating the Environmental Protection Agency to phase down HFC supply, based on GWP

• U.S. EPA HFC Technology Transfer Rule



The rule operates by:

- Prohibiting the manufacture and import of **products** that use higher-GWP HFCs (700 GWP is the max)
- Prohibiting the sale, distribution, and export of those **products** three years after the manufacture and import restriction
- Prohibiting the installation of new refrigeration, air conditioning, and heat pump (RACHP) **systems** that use higher-GWP HFCs

No compliance dates vary per product, system and sector



• Definitions for Equipment with Refrigerant >700GWP



Product:

Factory-assembled equipment, with a closed refrigerant circuit—“functional upon leaving the factory”

- E.g., Window air unit, RTU, chillers without refrigerant but factory-sealed
- **Manufacture or import restriction date: 01/01/2025**
- **Continued sale, distribution, export for 3 years after manufacture restriction date**



System:

Assemblage of separate components that are typically connected and charged in the field

- Field-assembled or refrigerant lines connected in field
- E.g., split systems with refrigerant piping, disassembled chillers, build-up system with a heat exchanger, refrigerant lines, VRF, etc.
- **Manufacture or import restriction date: 01/01/2025**
- **Continued sell-through and installation for 1 year after manufacture restriction date**

- **VRF \geq 5.5 tons Manufacture or import restriction date: 01/01/2026**
- **VRF sell-through and installation for 1 year after manufacture restriction date**



US EPA will continue to refine details through FAQs



• Low-GWP Transition Timeline



- Moved the GWP (global warming potential) threshold to 700 and below for those appliances
- SNAP (significant new alternatives program) evaluates and releases usage allowances for new refrigerants
- That led to slew of new low-GWP refrigerants the industry needed to choose from for use in their appliances
- States are setting their own limits as well



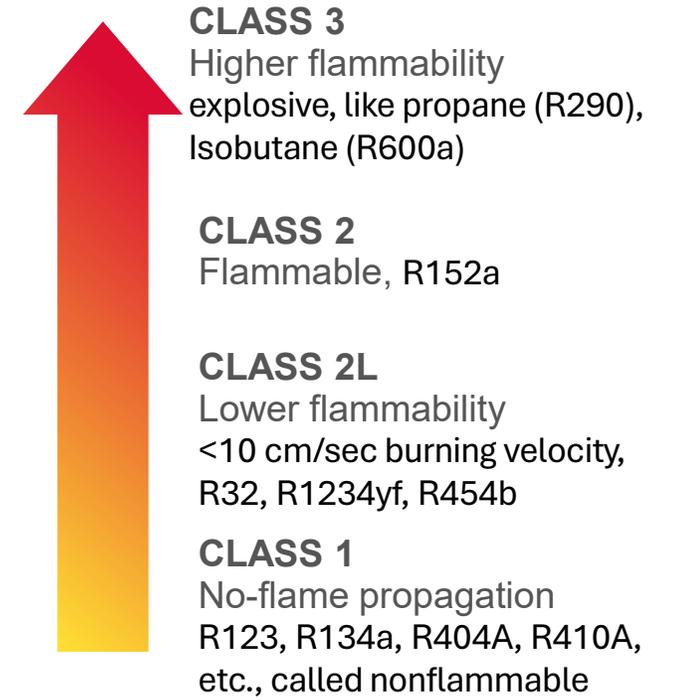


- **Low GWP Refrigerants**



• Next-Generation Refrigerants

- Safety
- ASHRAE® Standard 34: Designation and Safety Classification of Refrigerants
- Toxicity: Occupational exposure limit (ppm in a workday)
- Flammability: Ignition and burn velocity
- New refrigerants A2L: **R-32 and R-454B**
 - Low toxicity (A)
 - Hard to ignite (needs an open flame)
 - Low burning velocity



• Next-Generation Refrigerants for Low Pressure Applications

- Large Water-Cooled Centrifugal Chillers



	Baseline	New Ultra-Low GWP	
Refrigerant	R-123	R-514A	R-1233zd (E)
Classification	B1	B1	A1
GWP	77	1.7	1

Good Long-Term solutions for existing mechanical rooms

Nonflammable with Ultra Low GWP



• Next-Generation Refrigerants for Medium Pressure Application



- Air- and water-cooled chillers, Modular chillers

	Baseline	New Low GWP		New Ultra-Low GWP	
Refrigerant	R-134a	R-513A	R-515B	R-1234yf	R-1234ze (E)
Classification	A1	A1	A1	A2L 	A2L 
GWP	1430	630	298	6	4



R-513A & R515B
 Nonflammable with Low GWP
 Good solutions for existing Mechanical rooms

Longer term –
 Low flammability solutions to meet GWP goals

• Next-Generation Refrigerants for High Pressure Applications

- Chillers, Unitary, Residential and VRF



	Baseline	New Low GWP	
Refrigerant	R-410A	R-32	R-454B
Classification	A1	A2L 	A2L 
GWP	2088	675	467

R-454B & R-32
Low flammability
solutions to meet GWP
current goals

No class A1 options



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- **ASHRAE® Standard 15-2022**
 - **and Safety Requirements for A2L Refrigerants**

• ASHRAE® Standard 15-2022

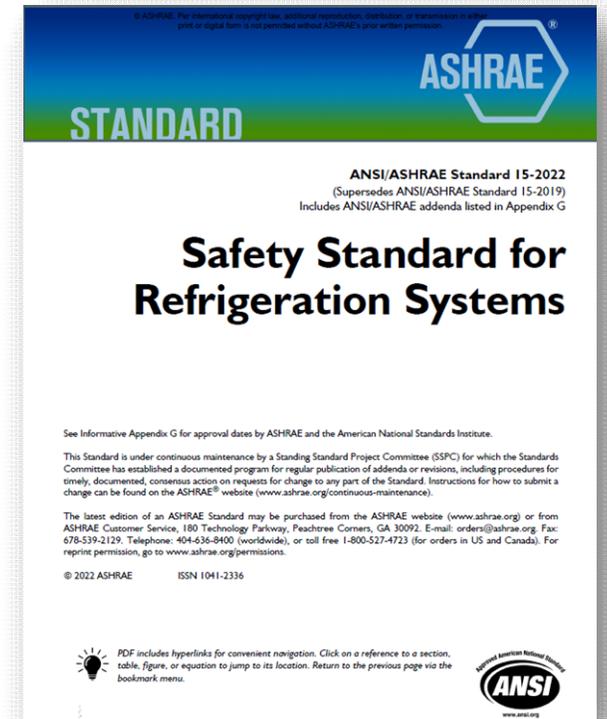


ASHRAE® Standard 15: Safety Standard for Refrigeration Systems

- Design, construction, installation and operation of refrigeration systems
- New systems, replacements, alterations and conversions.

Determine safety requirements

1. Lookup safety group classification of the refrigerant (Std 34)
2. Determine occupancy classification of the building (S. 4)
3. Determine “system probability” classification



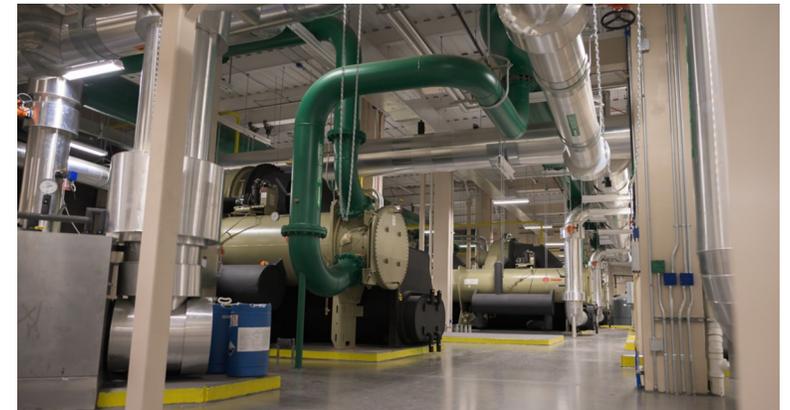
• Safety Requirements for A2L Refrigerants

- ASHRAE® Standard 15 - 2022



Determine system probability:

- **High probability:** leaked refrigerant from components has a high probability of entering an occupied space (S. 5.2.1)
E.g., DX split, DX RTU, WSHP, VRF
- **Low probability:** leaked refrigerant from components has a low probability of entering an occupied space (S. 5.2.2)
E.g., Chiller outside or in a machinery room



• Requirements for Low Probability Systems with 2L Refrigerant



- ASHRAE® Standard 15 - 2022

- All components with refrigerant must be in a machinery room or outdoors
- Machinery room containing 2L refrigerant is **constructed and operated** depending on the classification of the refrigerant (S. 8.11)
 - Refrigerant detection systems installed on site with audible and visual alarms
 - Remote shut-down control located immediately outside of the machinery room
 - Ventilation rate is calculated based on the type of refrigerant and alarm level (significantly higher than for an A1 or B1 refrigerant)
- **Adjust control sequence**
If refrigerant concentration > 25% of LFL (Lower Flammability Limit from Standard 34)
 - Actuate audible and visual alarms
 - Activate mechanical ventilation
 - Turn off compressors, refrigerant pumps, electrical sources of ignition



• Requirements for High Probability Systems with A2L Refrigerant



• ASHRAE® Standard 15 - 2022

- Use of Group A2L refrigerants for **high** probability systems shall be in accordance with Section 7.6
- Equipment must be **UL listed**: UL 60335-2-40 or UL 484
- Manufacturer's **refrigerant detection** systems installed on equipment with charge > 4lb per circuit (S. 7.6.2.3)
- Refrigerant charge limit verification – S.7.6.1.1 calculation- for potential modifications to the system (safety shutoff valves, mechanical ventilation, circuit number, system design modifications)



Refrigerant detector cannot be adjusted or recalibrated in the field



•Mitigation Actions in Case of a Refrigerant Leak (sequence of operation S. 7.6.2.4)



- High probability systems with A2L refrigerant
 1. Generate an output signal within 30 seconds of leak detection
 2. Initiate mitigation actions within 15 seconds after the signal
 3. Maintain the action for 5 minutes after output signal has reset:
 - Energize the *air circulation* fan(s) of the equipment.
 - Open zoning dampers, or set zone dampers to full airflow set point
 - Activate mechanical ventilation if required by Section 7.6.4.
 - De-energize electric resistance heat installed in the *air duct* that is connected to the *refrigeration system*.
 - Activate *safety shutoff valves* to reduce *releasable refrigerant charge*.
 - De-energize potential ignition sources
 4. Unit controller has mitigation actions for the equipment (manufacturer)
 5. System controller has mitigation actions for the full system (on-site)

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- **Sustainable Refrigerant Management**
 - **for A2L Refrigerants**

• Sustainable Refrigerant Management for A2L Refrigerants



- Retrofit

- Systems with A1 refrigerants are not allowed to be retrofitted with A2L flammable refrigerants.

- Refrigerant monitoring / detection

- Refrigerant-specific leak detector
- Refrigerant detection sensors on commercial unitary products with more than 4 lbs. of A2L refrigerant charge per circuit (UL 60335-2-40)

- Ground transportation for Equipment with A2L refrigerant charge

- Up to 25 lbs. of A2L ships the same as equipment with A1 refrigerants
- Unit delivery can be up to 5,000 lbs. for a single-circuit chiller OR 2,500 lbs. max combined for multi-circuited units

- A2L cylinder Storage (AHRI guidelines)

- 150 lbs max no sprinklers
- 300 lbs max sprinklers



• A2L refrigerants Servicing Guidelines



- Refrigerant management
 - Service provider must comply with EPA Section 608 for safe, professional refrigerant handling, inspections and documentation.
 - Low-GWP refrigerant online training for site personnel (ESCO institute, Air Conditioning Contractors of America)
- A2L compatible tools
 - Recovery machine
 - Leak detector
 - Vacuum pump
 - Dedicated recovery cylinders for A2L when available
- Any service vehicle can carry 225 lbs. of A2L, which is included in the 440 lbs. of Materials Of Trade



• **FAQ**



• FAQ

Will the new refrigerant equipment lose capacity or efficiency?

- No, all units are designed to a nominal specific capacity and minimum efficiency rating.

How Flammable are A2L Refrigerants?

- Open flames are ignition sources (torches, candles, canned heat)
- A spark from motor brushes, electrical outlet or static electricity are **not** ignition sources
- Most typical home/office appliances are **not** ignition sources

How Does the equipment change with A2L refrigerants?

- Components will look the same with some labeling differences, red coloring on any access ports and equipment labels. Most equipment will have a refrigerant leak sensor.

Are building codes updated to use A2L refrigerants?

- The 2024 International Building, Fire and Mechanical codes have been updated to address the use of A2L refrigerants. See <https://www.iccsafe.org>



• FAQ

Do we need to change the way we operate and control equipment with A2L refrigerants?

- No - for unit operation
- Yes - for safety
 - Unit controllers installed on equipment containing A2L refrigerants must have capabilities in place to effectively detect and mitigate within the equipment.
 - System controllers must be configured according to the site to notify building operators and to mitigate as a system.

Can I buy repair/ replacement components for my existing R-410A equipment?

- Yes, If I have an installed system, I can buy replacement
- There is no deadline for R-410A replacements charged and factory-assembled.

• FAQ



Can I replace a broken R-410A outdoor condensing unit with one that uses a lower GWP refrigerant?

- No, EPA's Significant New Alternatives Policy (SNAP) Program and industry standards prohibit the use of flammable or mildly flammable refrigerants such as R-32 or R-454B in systems that were not designed to use them.

Is there a point at which replacing components triggers the GWP limits for new systems?

Yes,

- Increasing total capacity in BTU
- Complete replacement of all components within a system at once or over time
- Replacing 75% or more of the evaporators (by number) and 100 percent of the compressor racks, condensers, and connected evaporator loads of an existing system would trigger the requirements of new systems.



• FAQ: VRF

What are the limits to manufacture, sell and install VRF systems with high GWP refrigerant?

VRF <5.5 tons

- Limit to manufacture VRF with refrigerants >700 GWP is 01/01/2025
- Limit to sell, ship and fully install VRF < 5.5 tons with refrigerants >700 GWP is 01/01/2026

VRF >=5.5 tons

- Limit to manufacture VRF with refrigerants >700 GWP is 01/01/2026
- On June 26, 2024, EPA proposed to extend the installation deadline for VRF >= to 65,000 Btu/hr until January 1, 2027

• FAQ: Unitary Split Systems and Field Assembled Chillers



What are the limits to manufacture, sell and install split systems with high GWP refrigerant?

- Limit to manufacture unitary split systems with refrigerants >700 GWP for all states is 01/01/2025.
 - Limit to manufacture unitary split systems and condensing units for replacement with refrigerants >750 GWP for CA is 01/01/2025.
- Limit to sell, ship and fully install **field-assembled systems** (split systems) with refrigerants >700 GWP is 01/01/2026, 1 year after manufacture limit.
- Limit to sell, ship and fully install **field-assembled chiller systems** is 01/01/2025.**

**An approved permit is required in MA and CA to install chillers with refrigerants >700 GWP after 12/31/2023

• Resources

- EPA Technology Transition Program Final Rule: [Restrictions on the Use of Certain HFCs under Subsection \(i\) of the AIM Act \(epa.gov\)](https://www.epa.gov/technology-transition-program/technology-transition-program-final-rule-restrictions-use-certain-hfcs-under-subsection-i-aim-act)
- Trane.com: [Refrigerant Management](#)
 - [Refrigerant Transition Overview & FAQ \(REFR-SLB006-EN\)](#)
 - [HVAC Industry Update on Refrigerants \(REFR-PRB001M-EN\)](#)
 - [Engineers Newsletter: A2L Refrigerants and ASHRAE Standard 15 \(ADM-APN088-EN\)](#)
 - [Applications Engineering Manual: Refrigeration Systems and Machinery Rooms \(APP-APM001G-EN\)](#)
 - [Engineers Newsletter Live: ASHRAE Standard 15-2022](#)
- ESCO institute: <https://www.escogroup.org/training/lowgwprefrigerant.aspx>
- ACCA-Air Conditioning Contractors of America: <https://www.acca.org/education/a2l-refrigerants>
- [AHRI A2L Cylinder Storage Options \(https://www.ahrinet.org\)](https://www.ahrinet.org)



Refrigerant Transition Overview

Buildings need to do better for the planet. And they will.





Thank you!

Any questions?