Navigating Retrofits and Replacements for High GWP Refrigerants

Evaluating High GWP System Upgrades, A2L Retrofit Restrictions, and DX Coil/Condenser Requirements

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The increased use of lower flammability refrigerants ("2L" ASHRAE 34 designation) in building HVACR equipment is changing the game. Keeping up with evolving codes and standards can be challenging. In this publication we'll explore the common questions when evaluating retrofit applications including US EPA restrictions on service replacements and retrofits along with application considerations for DX coils and condensers utilizing A2Ls.

The focus of this document is Daikin Applied HVAC equipment for comfort cooling/heating applications and is not intended to cover all types and applications of equipment. As this topic is rapidly evolving, this content is subject to change without notice and is intended only for educational purposes and does not replace independent professional judgment and/or legal advice. Always consult your state and local codes which may take precedence over standards like ASHRAE Standards 15 and 34, UL 60335-2-40, or other standards which vary in adoption, complete or partial, by state.

Also note that a state may adopt a different year of the standard than the latest version. The local Authority Having Jurisdiction (AHJ) has the final authority in interpreting code requirements. When in doubt, contact the AHJ.

Transitioning to Low GWP Refrigerants

As global access to air conditioning continues to expand, so does the associated greenhouse gas emissions due to HFC refrigerants. Projections suggest that HFC refrigerant emissions alone could contribute up to a rise of 0.5°C in earth's surface temperature over the next 75 years if reduction controls were not put in place. In response to this growing environmental challenge, the Kigali Amendment to the Montreal Protocol was established to phase down the use of HFC refrigerants.

In the United States, the American Innovation and Manufacturing (AIM) Act was passed in December 2020 to align with the goals of the Kigali Amendment. Under this legislation, the Environmental Protection Agency (EPA) has implemented a structured phasedown of HFC production and consumption.

As a result, the HVAC industry is now undergoing a transition to refrigerants with lower global warming potential (GWP). Many of these newer options, such as those classified as A2L refrigerants, come with new handling and application considerations due to their designation as "lower flammability" substances.

Daikin's Preparing Buildings for A2L Refrigerants webinar provides additional background information regarding the refrigerant transition.

Existing High GWP Refrigerant Systems

The Technology Transition rule created by the EPA outlines the timeline and requirements for equipment utilizing high GWP refrigerant. Through this policy the EPA has provided guidance on existing high GWP refrigerant systems, such as R-410A.

Existing high GWP refrigerant systems may continue to operate throughout their full serviceable life. This includes ongoing maintenance, repairs, and the replacement of components defined as condensing units, condensers, compressors, evaporator units, & evaporators. These components can be used to service existing refrigeration, air conditioning and heat pump (RACHP) equipment, provided the repair does not constitute the installation of a new system and the components are properly labeled in compliance with EPA requirements.

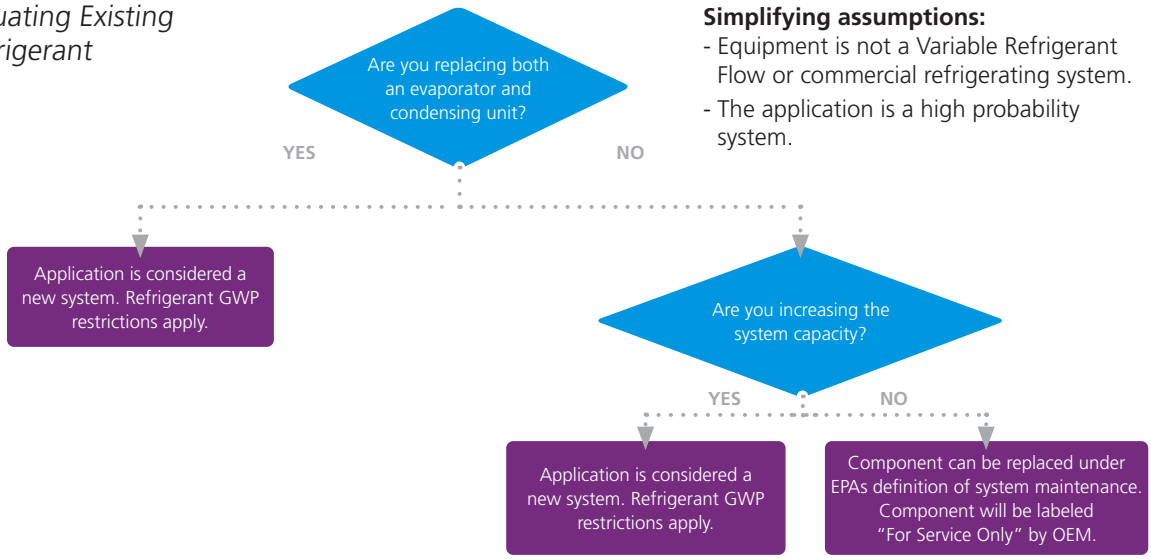
To distinguish between routine maintenance and what qualifies as a new system installation, the EPA has issued specific criteria in its October 2023 Final Rule – Phasedown of Hydrofluorocarbons: Restrictions on the Use of Certain Hydrofluorocarbons under Subsection (i) of the American Innovation and Manufacturing Act of 2020 Facts Sheet. "Specifically, the following actions, upon charging the system to full charge, are considered a new installation of a RACHP system and thus subject to the relevant HFC use restrictions:

- Assembling a system for the first time from used or new components;
- Increasing the cooling capacity, in BTU per hour, of an existing system; or
- Replacing 75 percent or more of evaporators (by number) and 100 percent of the compressor racks, condensers, and connected evaporator loads of an existing system."

Any system modifications meeting these criteria are treated as new installations rather than maintenance and must comply with refrigerant GWP restrictions (Figure 1).

For additional information on refrigerants and their properties reference Daikin's "How a New Crop of Refrigerants Can Deliver Better Performance and Lower Emissions" article.

Figure 1: *Evaluating Existing High GWP Refrigerant DX Systems*



A2L Retrofits

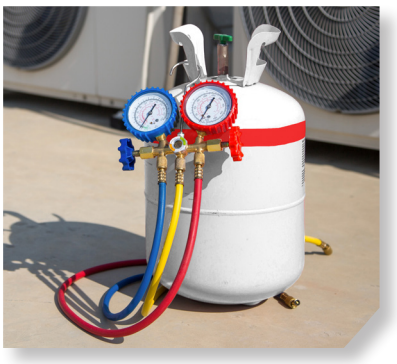
Safety codes and standards have been updated to incorporate the application of A2L refrigerants with lower flammability into buildings. With these enhanced safety standards converting equipment utilizing an A1 refrigerant to an A2L is currently prohibited. This is attributed to regulatory restrictions by the EPA and UL Standard 60335-2-40.

The EPA has stated A2L refrigerants may be used only in "new equipment designed specifically and clearly identified for the refrigerant; i.e., none of these substitutes are being listed for use as a conversion or "retrofit" refrigerant for existing equipment."

The EPA further clarified "existing tubing can be inspected and if suitable re-used and the system would still be considered "new." Building professionals should coordinate with equipment manufacturers for requirements of size, specialties and routing to determine if existing refrigerant piping configuration is suitable. Refrigerant piping also needs to comply with ASHRAE Standard 15 requirements for installation and testing.

In addition to the EPAs retrofit restriction, UL 60335-2-40 certification is required for all electrical heat pumps, air-conditioners and dehumidifiers utilizing an A2L refrigerant. UL 60335-2-40 has design and testing requirements for using A2L refrigerants that existing A1 equipment would not have been tested to be in compliance with, therefore precluding the use of A2L refrigerants in that existing equipment.

UL 60335-2-40 DX Coil and Condenser Restrictions



DX Coils and Condensers utilizing A2Ls have requirements to comply with UL 60335-2-40 certification.

UL Standard 60335-2-40 provides manufacturers guidance on equipment design, installation, and operation requirements. Equipment utilizing an A2L refrigerant must be certified and installed per equipment manufacturers installation and operations manuals to this standard as required by both the EPA and ASHRAE Standard 15.

Historically, UL standards primarily addressed equipment requirements, excluding application related considerations. With the introduction of A2Ls, manufacturers are now required to incorporate application considerations into installation and operation instruction manuals that building professionals must comply with. This paper centers on common retrofit requirements and will not delve deeply into UL 60335-2-40. Instead, our focus will be on the key requirements for DX coils and condensing units. There are considerations to be aware of when selecting new DX coils and condensing units utilizing A2Ls.

Understanding that split system components aren't always sourced from the same manufacturer, UL permits listing condensing and evaporating units as "partial units" allowing them to be assembled to create a complete refrigeration system. "Partial units" are defined as a "condensing unit", "evaporating unit", "condenser unit", or "evaporator unit" which are part of a total assembly of a heat pump, air-conditioner, or "sanitary hot water heat pumps" where not all assemblies to create the complete "refrigerating system" are specified by the manufacturer. Partial units are evaluated as stand-alone pieces of equipment that can be paired with other partial units certified through UL 60335-2-40, assuming they are technically suitable and utilize the same refrigerant. Partial units have labeling requirements for manufacturers including identifying the equipment as a "Partial Unit".

Building professionals should be aware of the requirements of A2L DX coils prior to purchasing stand-alone (loose) coils. There are design and testing requirements for UL certification addressing potential ignition sources, refrigerant leak detection, and surface temperatures, among other considerations. With these enhanced requirements refrigerating systems with a refrigerant charge of more than approximately 3.93~4.05 pounds (the limit varies by refrigerant), must have a Refrigerant Detection Sensor (RDS) provided and mounted in the location utilized during leak testing. DX coils can have their own UL 60335-2-40 certification allowing them to be applied into any technically suitable air handler also listed to UL 60335-2-40. If the DX coil does not have its own listing, it can be applied only if the coil was tested and listed as a partial unit with the air handling unit it is being applied to.

Before buying a stand-alone DX coil, check the DX coil and RDS is listed for use with any UL 60335-2-40 air handling unit. If this is not the case, contact the air handling unit Original Equipment Manufacturer (OEM) to inquire if the desired coil is included in the UL 60335-2-40 partial unit listing (Figure 2).

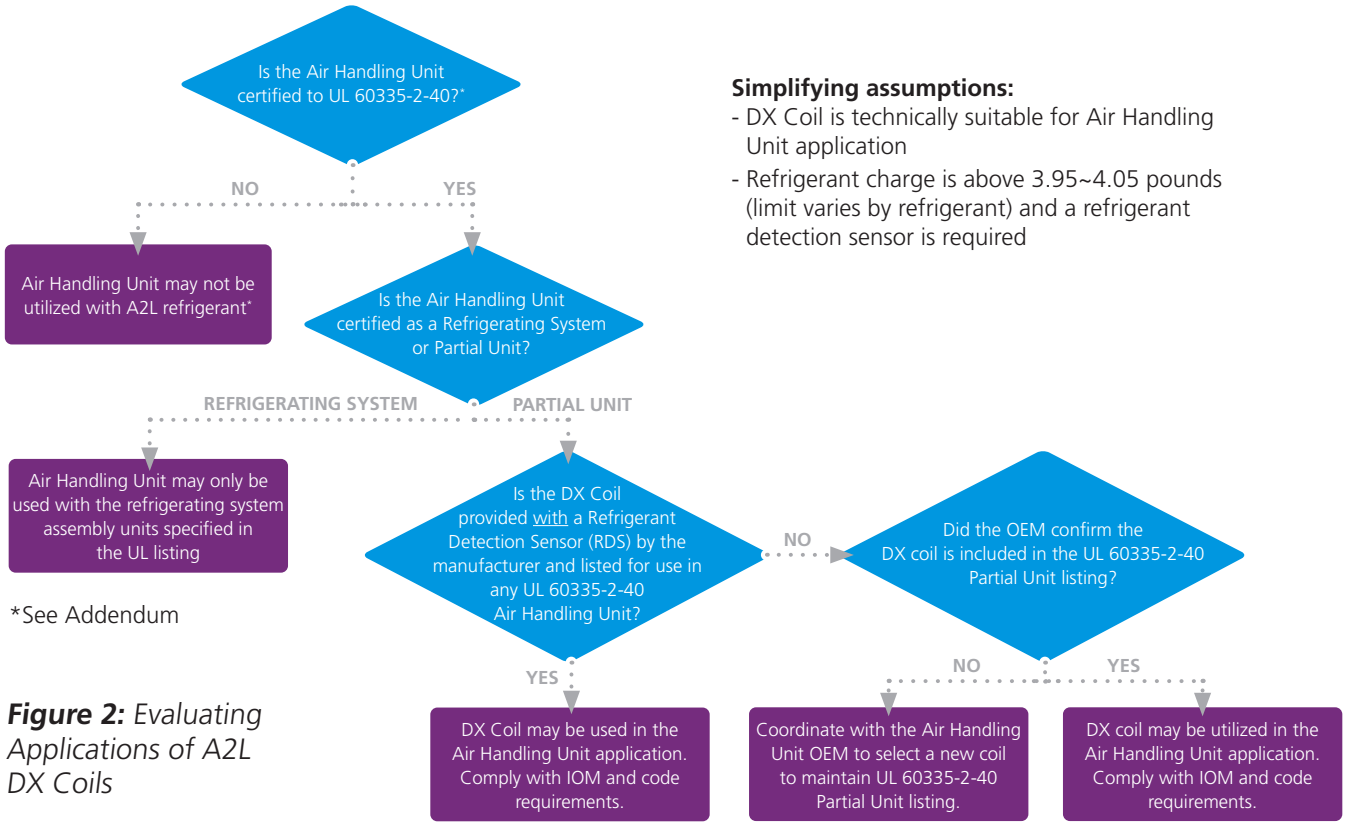
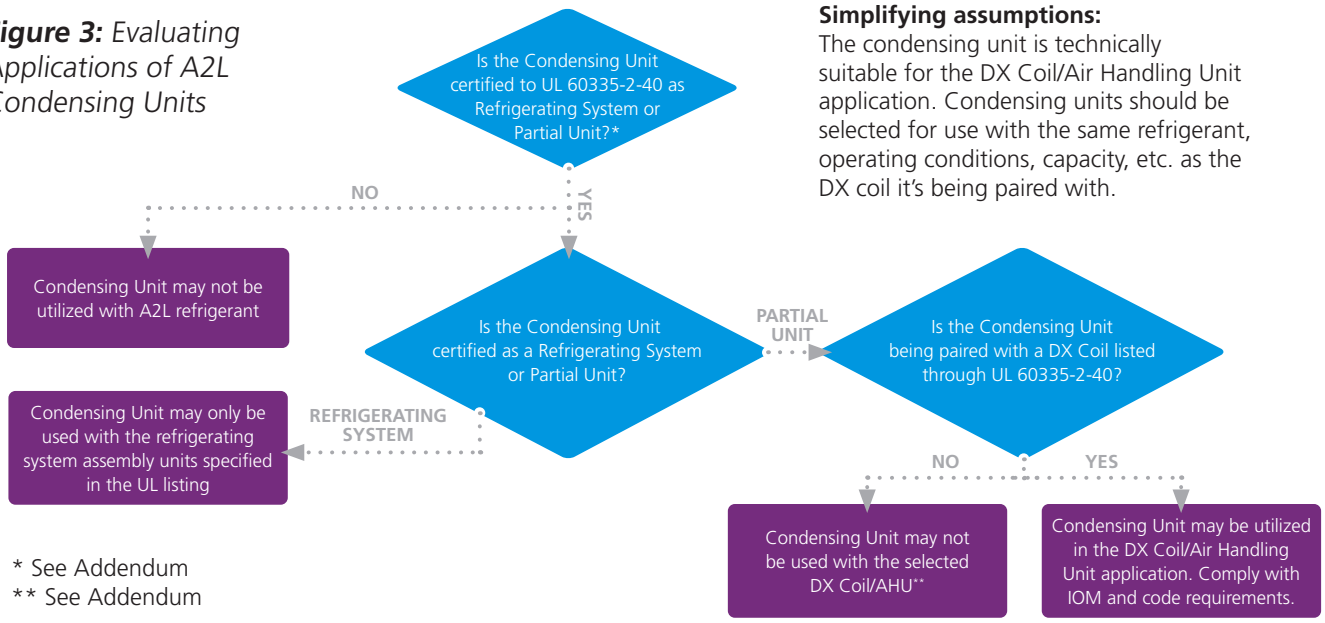


Figure 2: *Evaluating Applications of A2L DX Coils*

Figure 3: *Evaluating Applications of A2L Condensing Units*



Simplifying assumptions:
The condensing unit is technically suitable for the DX Coil/Air Handling Unit application. Condensing units should be selected for use with the same refrigerant, operating conditions, capacity, etc. as the DX coil it's being paired with.

* See Addendum
** See Addendum

Condensing units are also tested as a partial unit in accordance with UL 60335-2-40. This allows operation with other 60335-2-40 partial units, including partial unit listed DX coils and air handling units, assuming the equipment is technically suitable and utilizes the same refrigerant (Figure 3).

The transition to A2L refrigerants brings environmental and in many cases efficiency benefits but requires additional safety measures. By understanding the guidance around servicing existing equipment, restrictions for A2L retrofits, and application requirements for UL 60335-2-40, building professionals can successfully manage applying A2L products to existing buildings to meet enhanced safety requirements and reduce refrigerant emissions.

Resources:

For more information on product specific solutions for A2L refrigerants please contact your local Daikin Applied Sales Representative.

You can find additional resources on navigating the refrigerant transition in our Decarbonization Knowledge Center.

Addendum:

*EPA SNAP Final Rule 23 states "Under this listing, the flammable refrigerants may be used under the SNAP program only in equipment that meets all requirements in UL Standard 60335-2-40, Edition 3 for air conditioning equipment."

ASHRAE Standard 15-2024 7.6.2 Listing and Installation Requirements states "Refrigeration systems shall be listed in accordance with UL 484[11] or UL 60335-2-405/CSA C22.2 No. 60335-2-40.[6] The refrigeration system shall be installed in accordance with Sections 7.6.2.1 through 7.6.2.5, the listing, the manufacturer's instructions, and any markings on the equipment restricting the installation."

**The equipment markings required in UL 60335-2-40 7.104 for Partial Units states "This unit <model xxx> is a PARTIAL UNIT AIR CONDITIONER, complying with PARTIAL UNIT requirements of this Standard, and must only be connected to other units that have been confirmed as complying to corresponding PARTIAL UNIT requirements of this standard, UL 60335-2-40/CSA C22.2 No. 60335-2-40, or UL 1995/CSA 22.2 No 236".