RETROFITS AND REPLACEMENTS FOR HIGH GWP REFRIGERANTS

Presented by: Sharon Haeg

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- Always consult your state & local codes, which may take precedence over standards like ASHRAE Standards 15, 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.

Agenda

Address common questions:

- EPAs phase down schedule and technology transition
- Existing High GWP refrigerant systems
  - Maintaining vs. replacing existing R-410A systems
- What is UL 60335-2-40
- Retrofit restrictions for A2Ls
- Applying A2L DX Coils and Condensers
- Mitigation Actions
  - Mitigation sequences
  - Minimum air circulation
  - Freeze protection
- Refrigerant resources

EPA HFC PHASE DOWN SCHEDULE

AIM Act: Law Passed Dec. 2020 | EPA Rulemaking Status

EPA

The AIM Act gives authority to the EPA to phase down HFC refrigerants in the US

Old news: EPA must write rules to *phase down* production and consumption of bulk HFCs to 15% of baseline, maximize reclamation, minimize releases from equipment and facilitate transition through sector-based restrictions

PHASEDOWN

via CO_2eq Allocations of Bulk HFCs

(Supply Side constraints)

TECHNOLOGY TRANSITIONS

Sector based controls

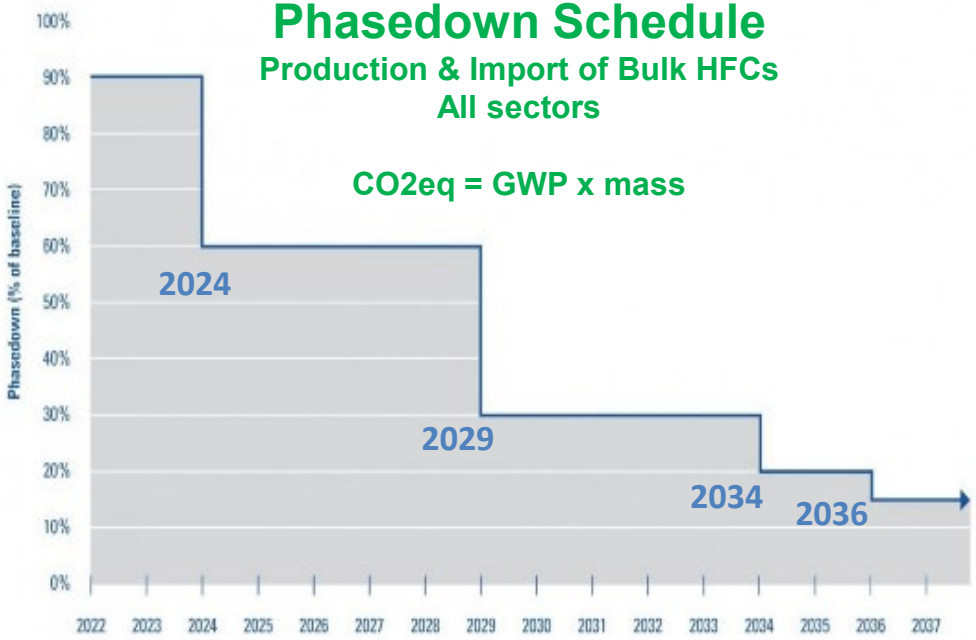
SNAP restrictions

REFRIGERANT MANAGEMENT

Minimizing leaks

Maximizing recovery & reclamation

AIM Act: EPA Phasedown and Allocations



CO2eq Phasedown

- Baseline over 300 million metric tonnes CO2 equivalency
- Phases down creating supply shortage of HFCs

Not refrigerant specific – not a phaseout

- All bulk virgin HFCs in all sectors
- Produced in USA and imported

Existing equipment may be serviced

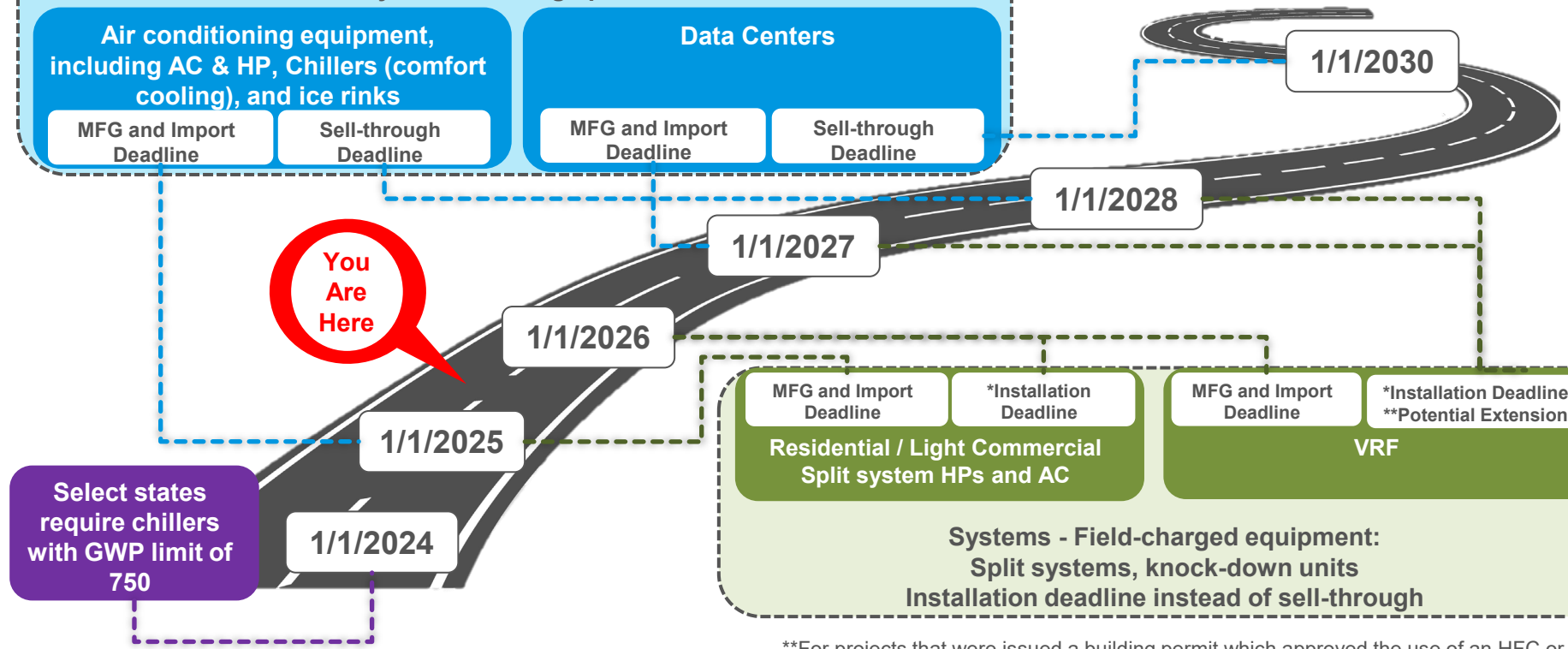
- Installed base can be serviced
- Will need to transition to lower GWP refrigerants

AIM Act: EPA Technology Transition

*Installation deadline means charging the refrigeration circuit to full charge

Products - Factory-Charged Equipment
Chillers, RTUs, WSHP, PTAC
3-year sell-through period

Air conditioning equipment, including AC & HP, Chillers (comfort cooling), and ice rinks		Data Centers	
MFG and Import Deadline	Sell-through Deadline	MFG and Import Deadline	Sell-through Deadline



Select states require chillers with GWP limit of 750

Residential / Light Commercial Split system HPs and AC		VRF	
MFG and Import Deadline	*Installation Deadline	MFG and Import Deadline	*Installation Deadline **Potential Extension

Systems - Field-charged equipment:
Split systems, knock-down units
Installation deadline instead of sell-through

**For projects that were issued a building permit which approved the use of an HFC or blend containing an HFC in a VRF system prior to October 5, 2023, installation is allowed until January 1, 2028.

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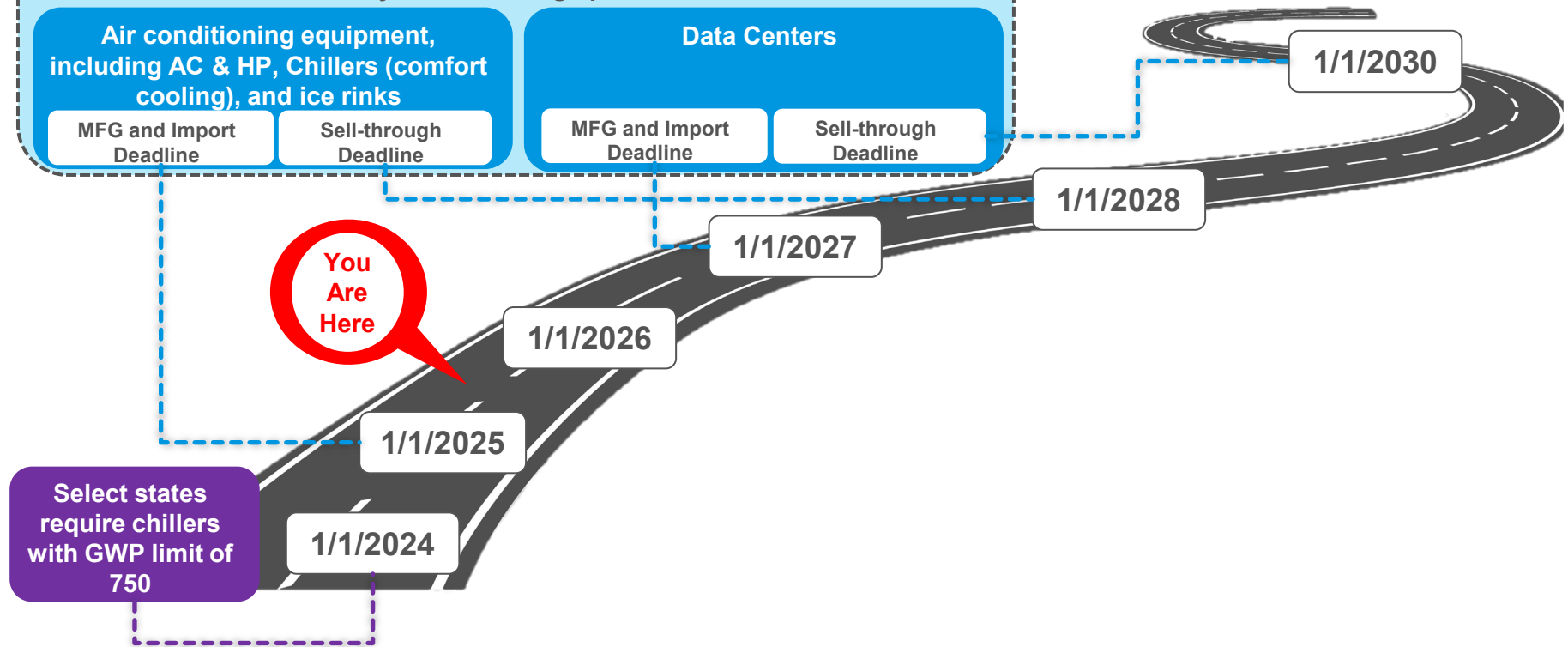

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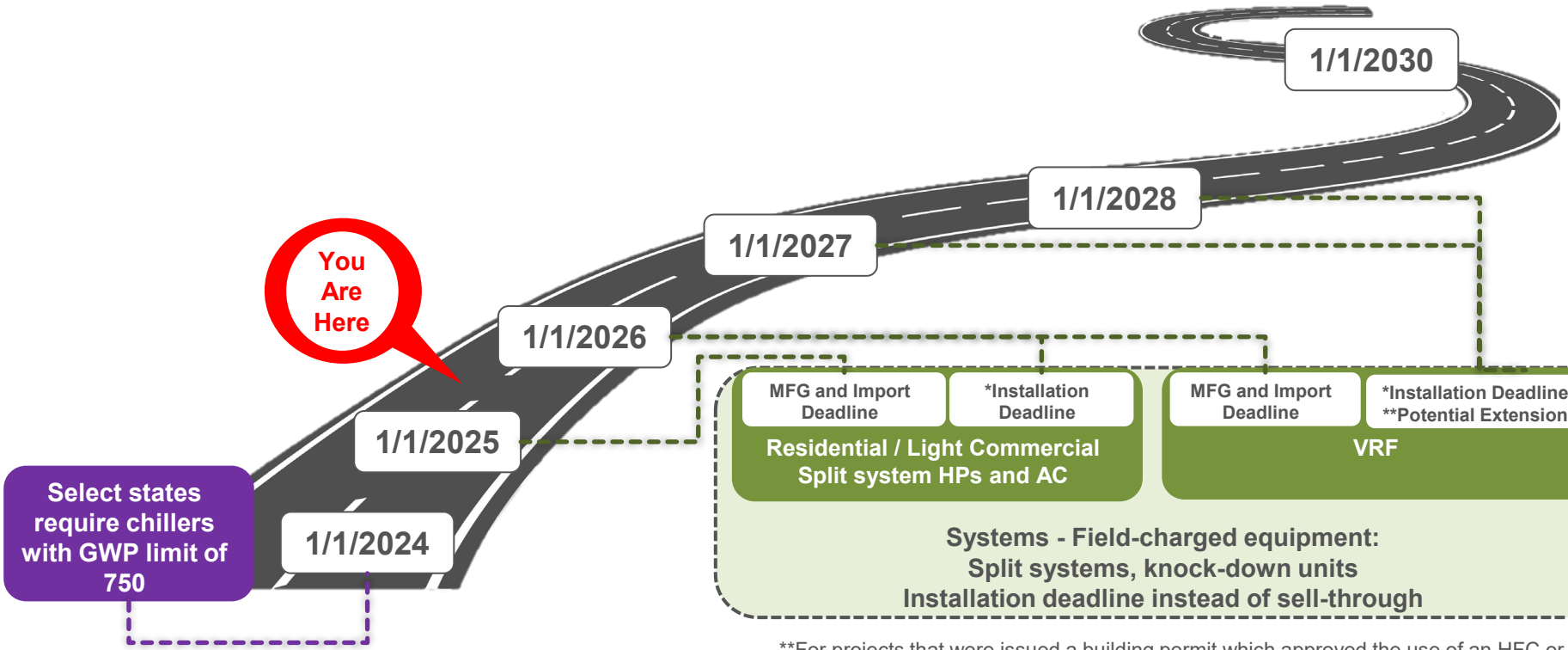

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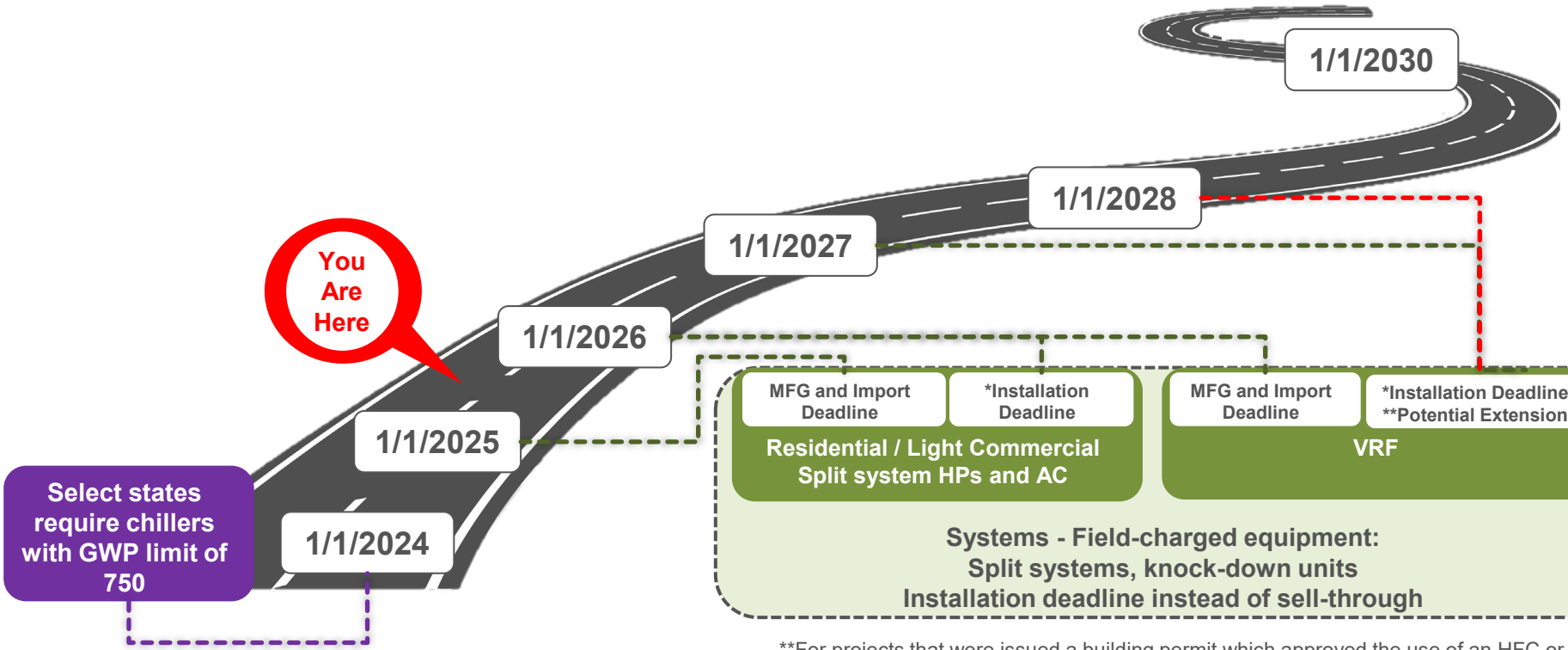

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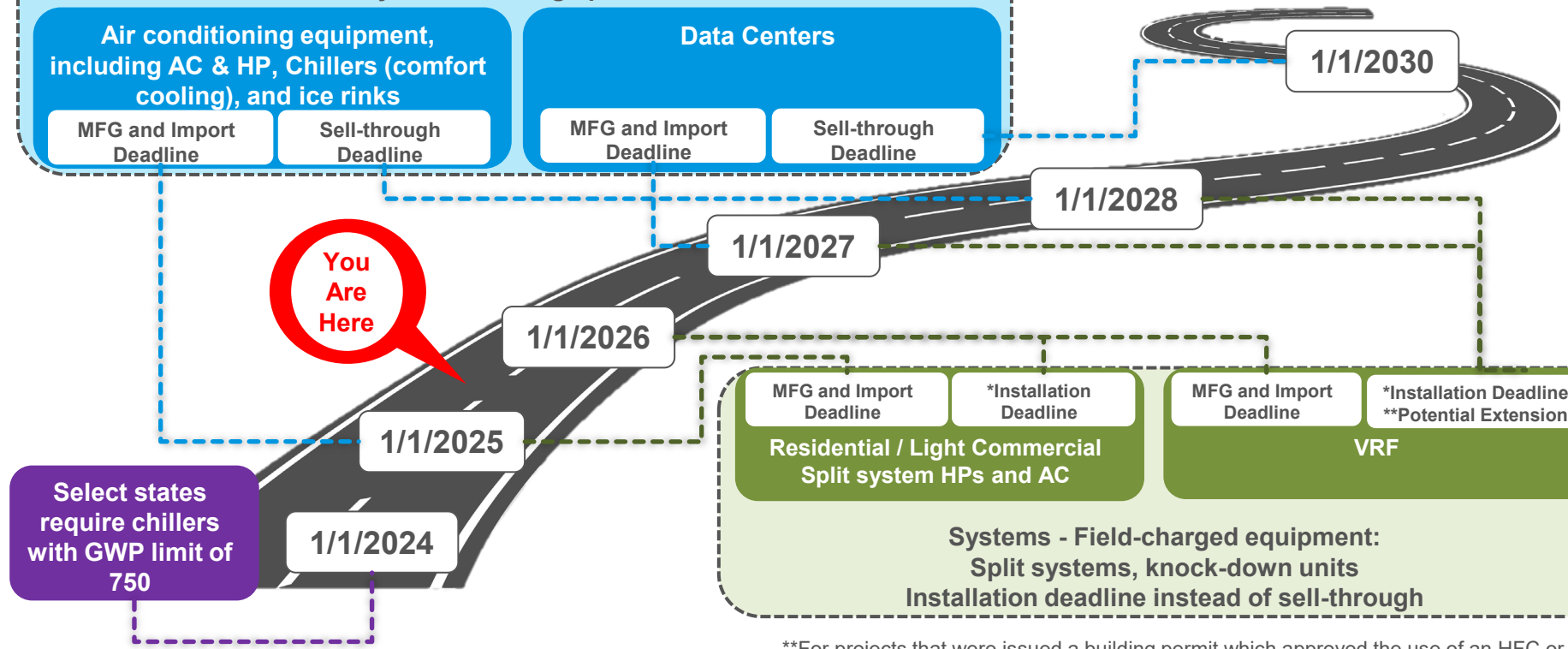

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EXISTING HIGH GWP REFRIGERANT SYSTEMS

Can I Repair My Existing System?

EPA Technology Transition provides regulation on what is considered service on an existing system vs a new installation subject to GWP restrictions

Components (condensing units, condensers, compressors, evaporator units, & evaporators) needed to repair existing RACHP equipment can be serviced as long as the repair doesn't consist of a new system installation and the service parts that are specified components are labeled appropriately.

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).

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Evaluating Existing High GWP Refrigerant DX Systems

Simplifying assumptions:

- Equipment is not a Variable Refrigerant Flow or commercial refrigerating system.
- The application is a high probability system

Figure 1: EPA defines the distinction between maintenance of a system and installation of a new system in the 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:

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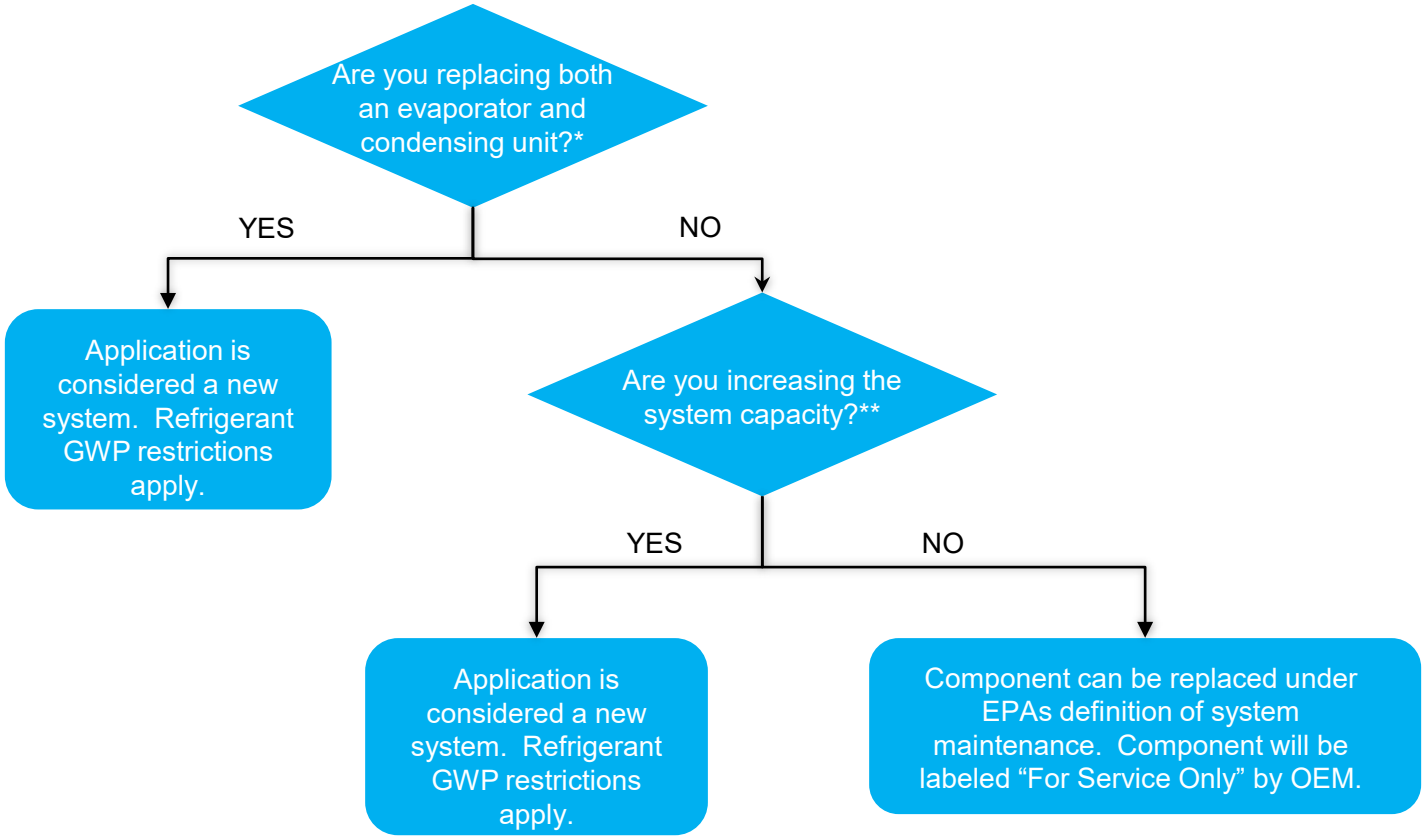

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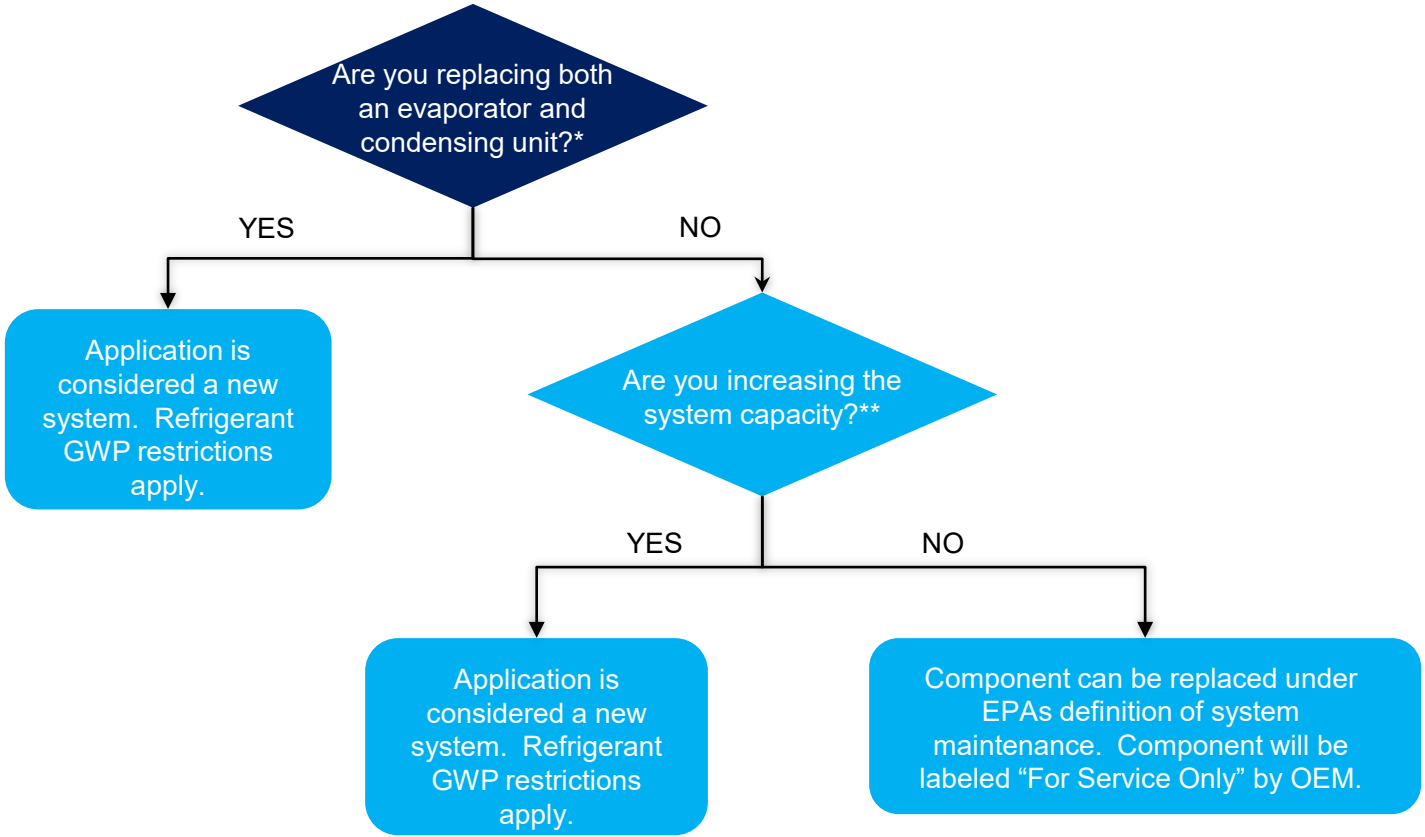

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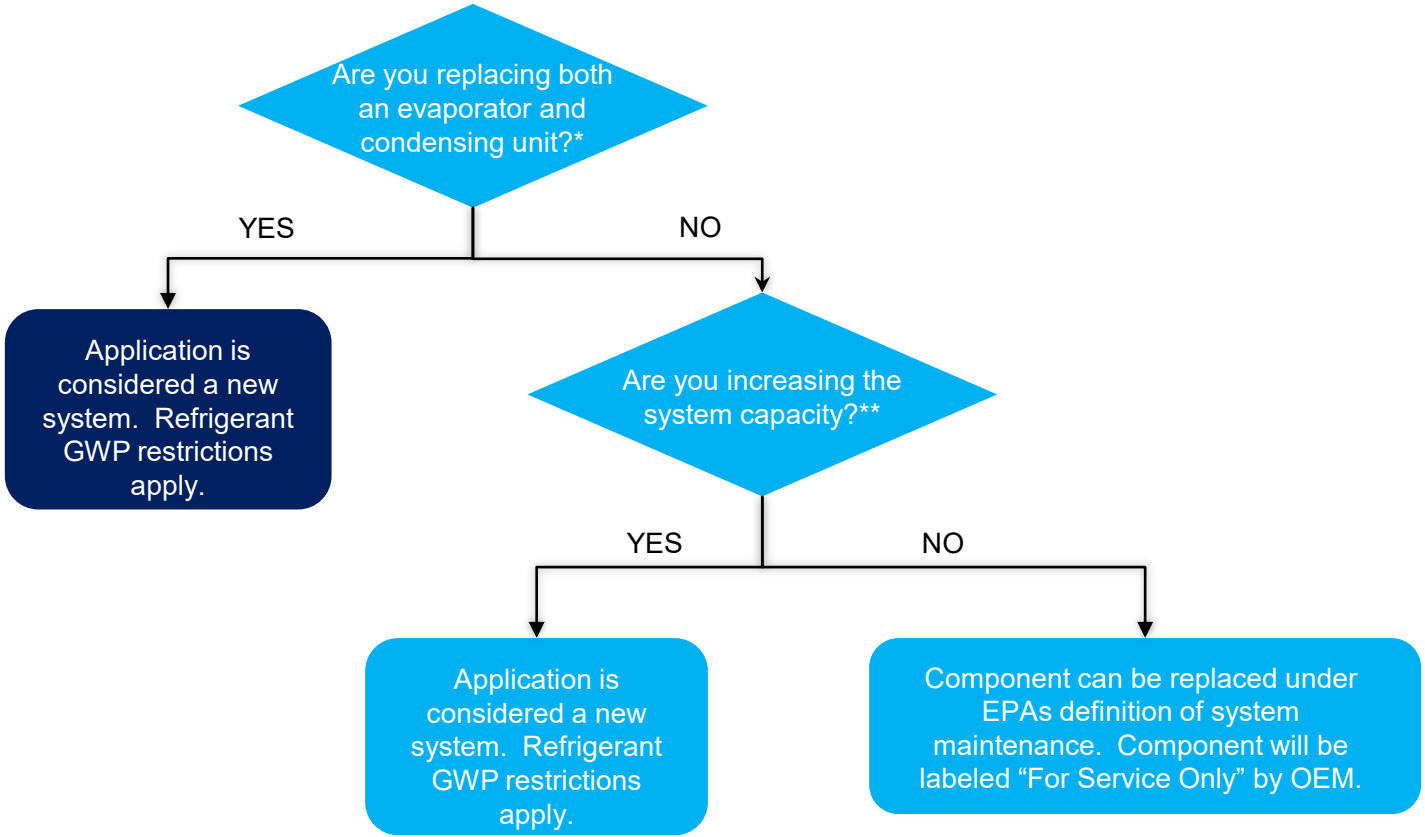

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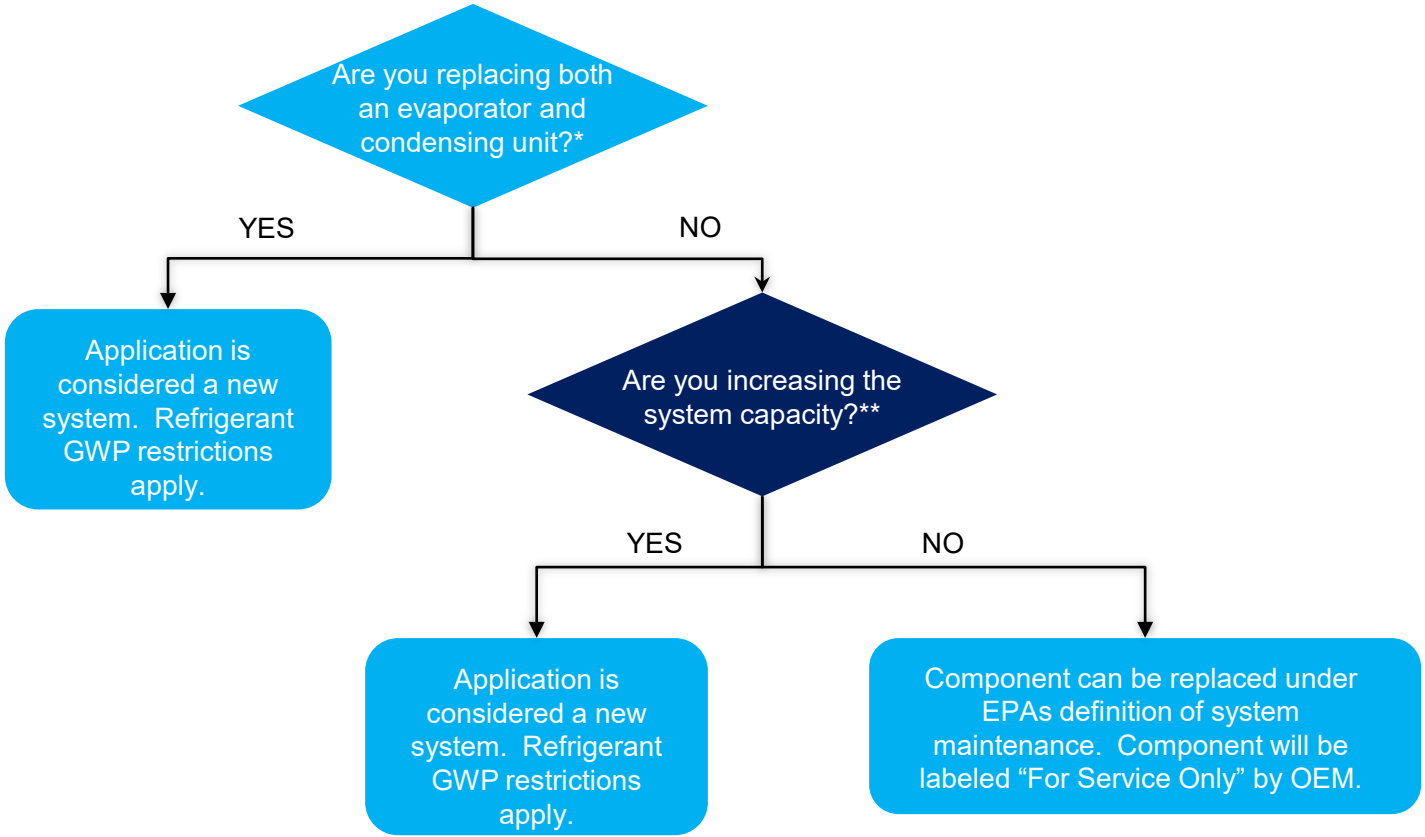

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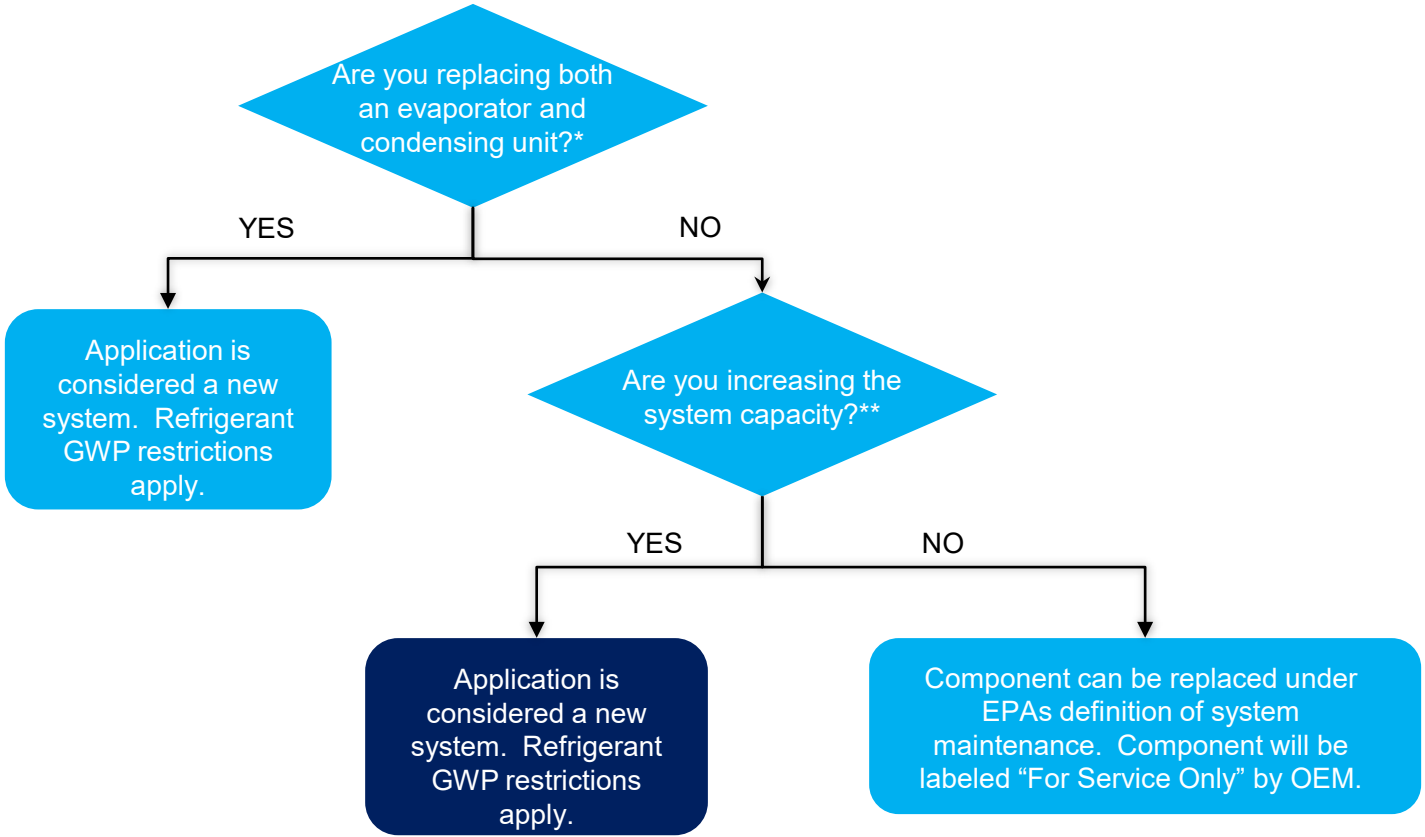

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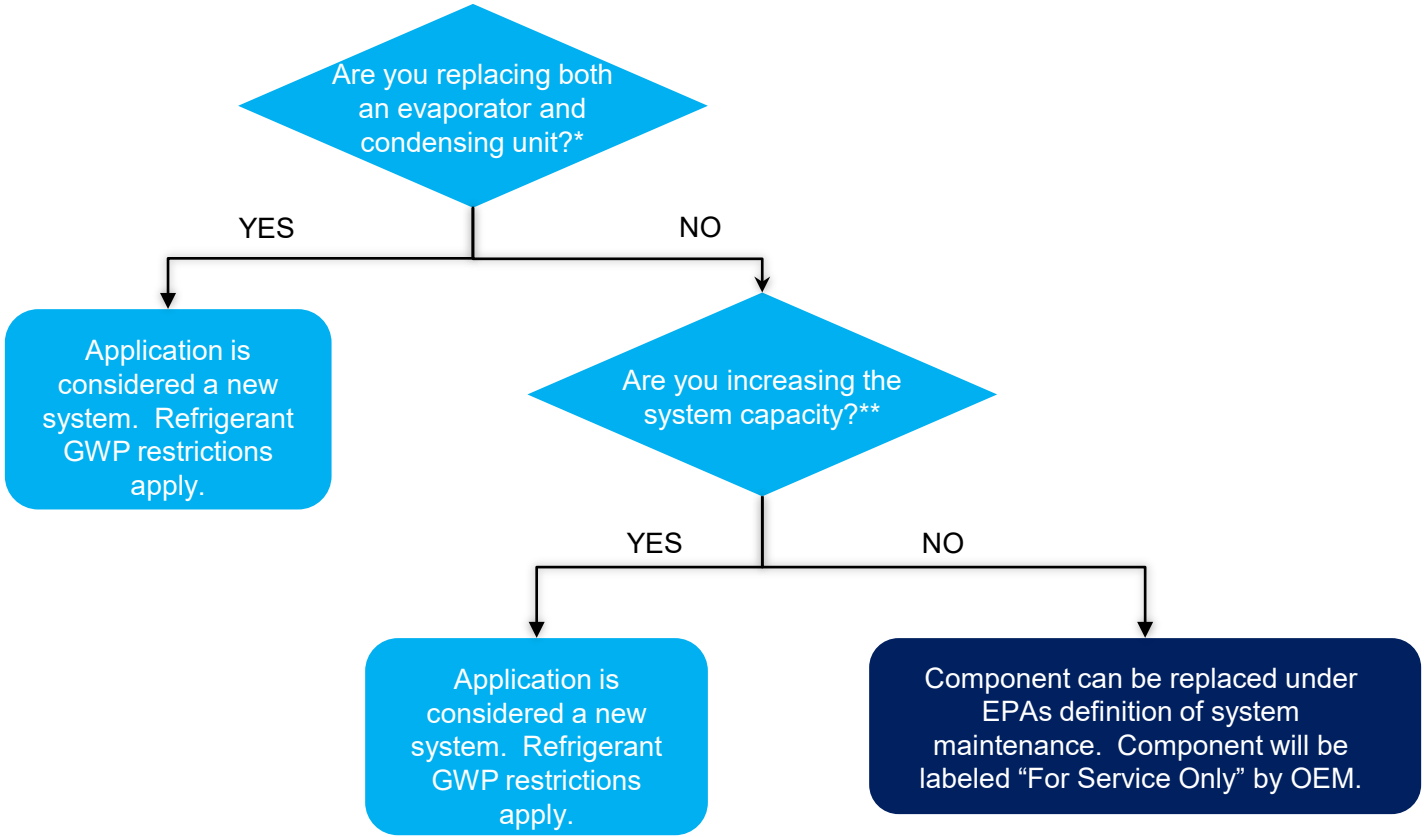
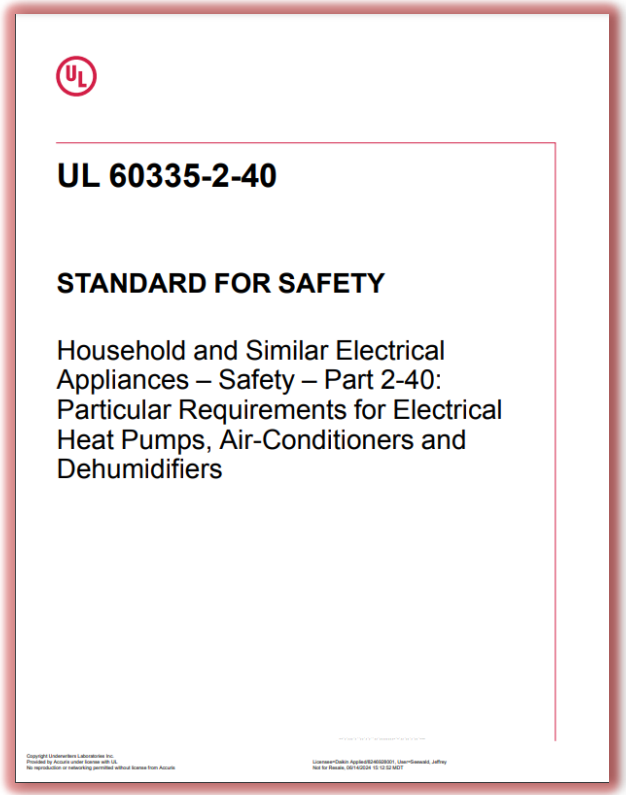


WHAT IS UL 60335-2-40?

UL 60335-2-40

Product Safety Standard(s)

- Refrigeration systems **must be listed** in accordance with **UL 60335-2-40** for HVAC equipment with A2L refrigerants
- Sets safety requirements for equipment manufacturers
  - Leak testing
  - Ignition source restrictions
  - Equipment markings
- Requires certain information that **OEMs must include in IOMs**. For example:
  - Instructions for installation including refrigerant piping and SSOVs
  - Handling, installation, cleaning, servicing and disposal of refrigerant
- **Always refer to the manufacturer's IOM for specific installation requirements!**



RETROFIT RESTRICTIONS FOR A2LS

Is the Equipment Listed to UL 60335-2-40?

Most retrofits are prohibited due to the requirement for a UL 60335-2-40 listing

The EPA prohibited retrofits in the SNAP Final Rule 23

"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. "New" equipment to include a new compressor, evaporator, condenser and refrigerant tubing."

UL prohibits retrofitting equipment from A1 to A2L

Existing equipment has not been certified to UL 60335-2-40 containing the requirements for safety testing, charge sizes, ventilation requirements, identification, etc. when utilizing an A2L.

Retrofit Restrictions for A2Ls

- ***What if an existing air handler designed for A1 refrigerant was set up for a future cooling coil… does that mean I can't install one?***

Unfortunately, as building codes and standards do not currently allow the use of A2L refrigerant without equipment being UL 60335-2-40 listed a new A2L DX coil can not be installed.

UL 60335-2-40 has design and testing requirements for ignition sources, refrigerant detection and mitigation actions. Existing equipment listed to UL 1995 was not designed or tested to comply with these requirements.

- ***What if I have a built-up air handler that it isn't possible to replace?***

Unfortunately, the same restrictions on A2Ls apply for built-up air handlers.

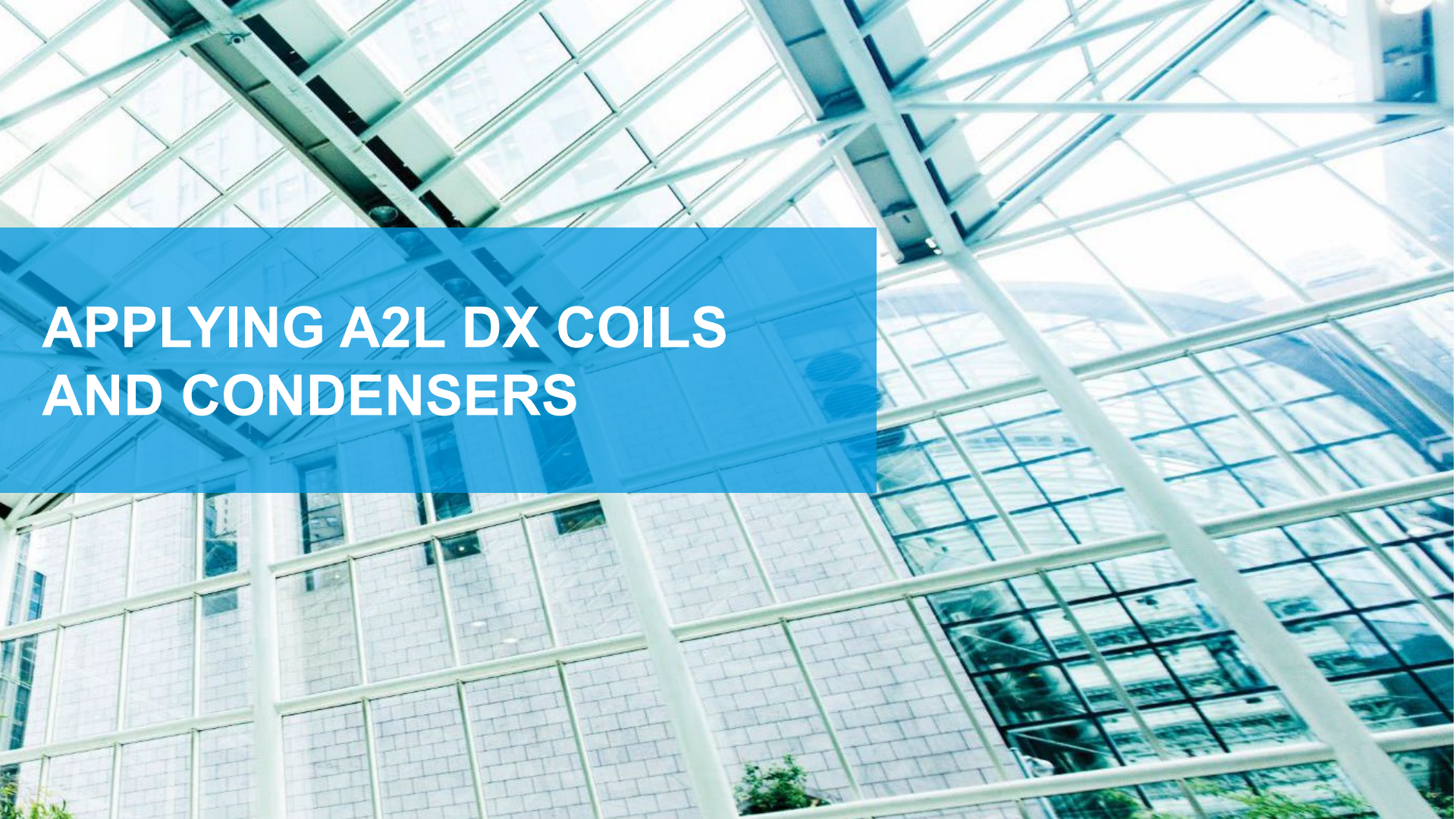
Retrofit Restrictions for A2Ls

- ***Can I reuse existing refrigerant piping from a High GWP refrigerant (A1) to R-32 or R-454B (A2L)?***

The EPA allows refrigerant piping to be reused if suitable

“Existing tubing can be inspected and if suitable re-used and the system would still be considered “new”.”

Refrigerant piping should be coordinated with the OEM for requirements of pipe size, specialties and routing. Refrigerant piping also needs to installed and tested in accordance with ASHRAE Standard 15.



APPLYING A2L DX COILS AND CONDENSERS

A2L Equipment

Understanding UL 60335-2-40 Partial Units

“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

- Must be technically suitable and utilize the same refrigerant.
- Labeling requirements for manufacturers including identifying the equipment as a “Partial Unit”.

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 C22.2 No 236

A2L Equipment

Applying A2L DX Coils

Three ways a DX Coil is listed through UL 60335-2-40

DX coil is listed as part of a refrigerating system

DX coil has a partial unit listing including an air handling unit

DX coils has a partial unit listing that can be applied into any technically suitable air handler also listed to UL 60335-2-40

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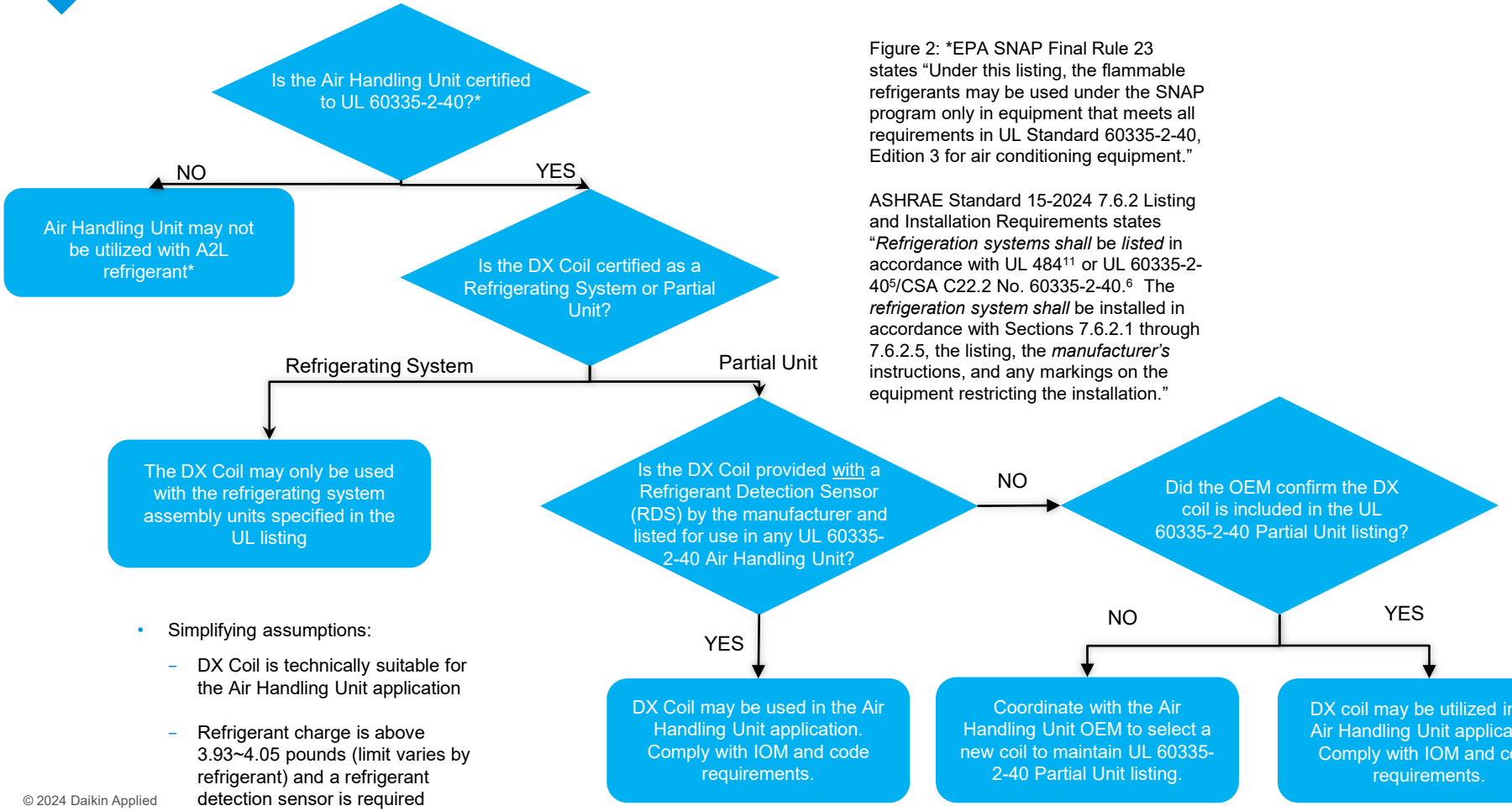

Figure 2: *EPA SNAP Final Rule 23 states "Under this listing, the flammable refrigerants may be used under the SNAP program only in equipment that meets all requirements in UL Standard 60335-2-40, Edition 3 for air conditioning equipment."

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 60335-2-40[5]/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."

- Simplifying assumptions:
  - DX Coil is technically suitable for the Air Handling Unit application
  - Refrigerant charge is above 3.93~4.05 pounds (limit varies by refrigerant) and a refrigerant detection sensor is required

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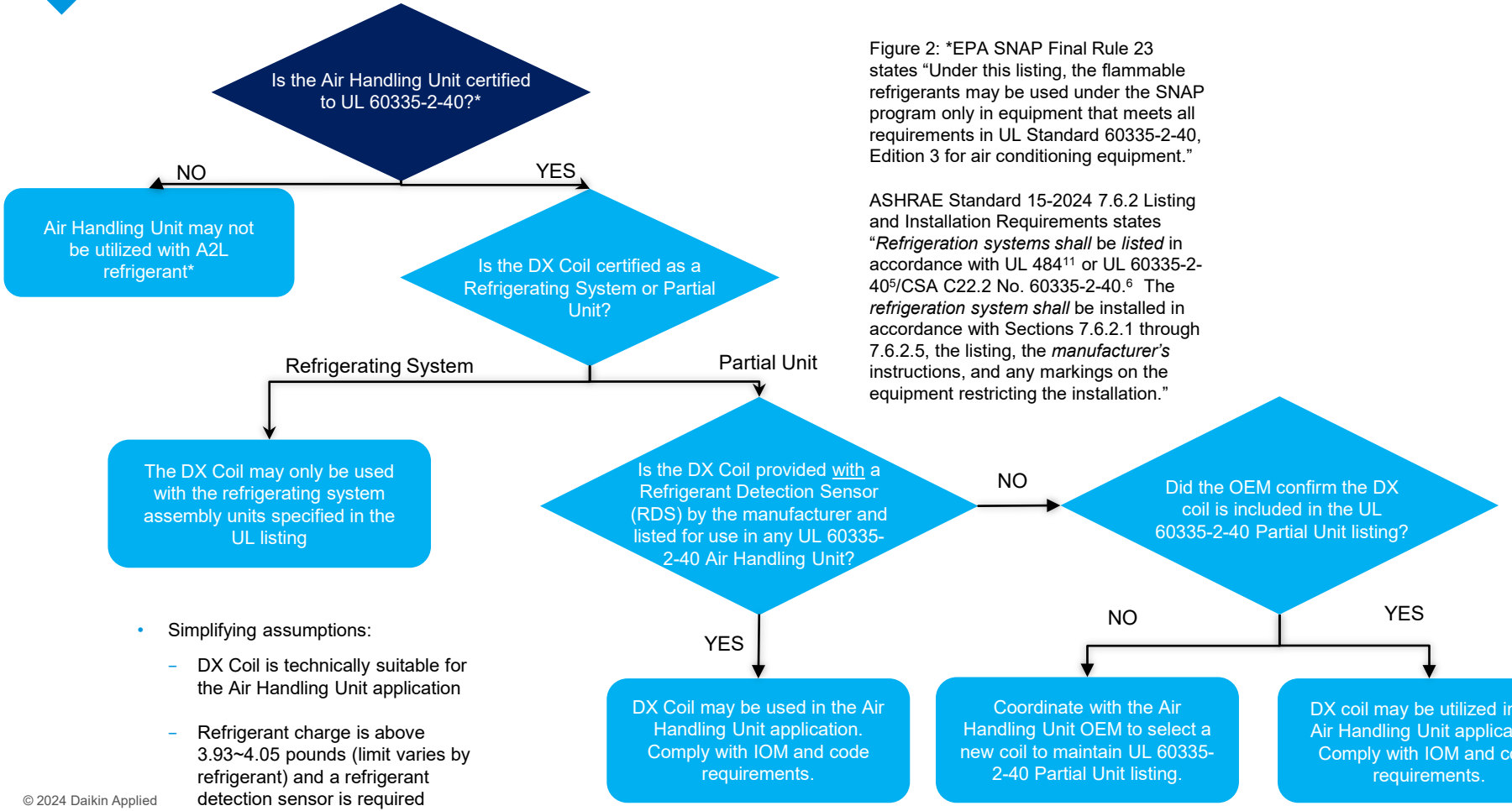

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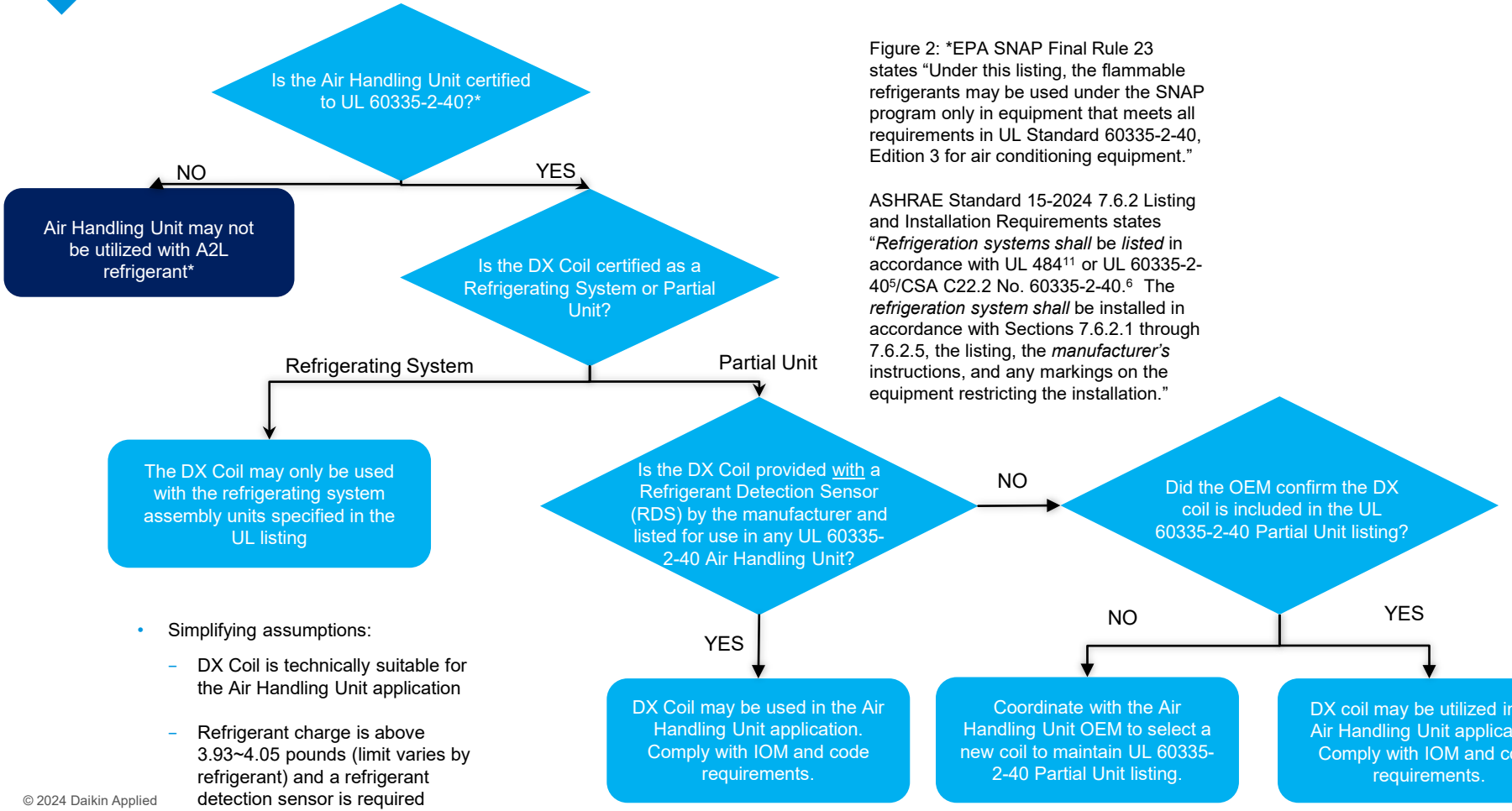

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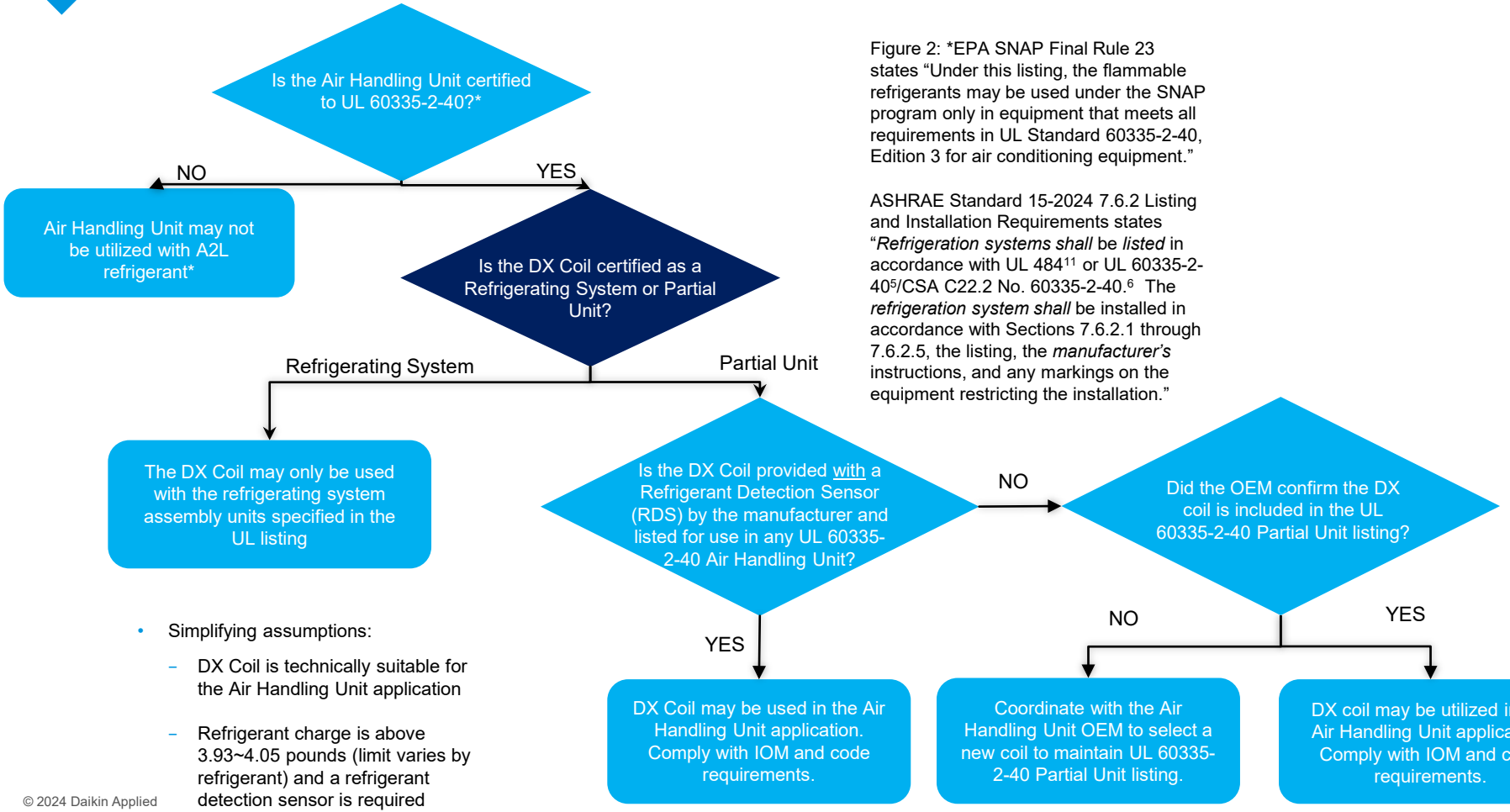

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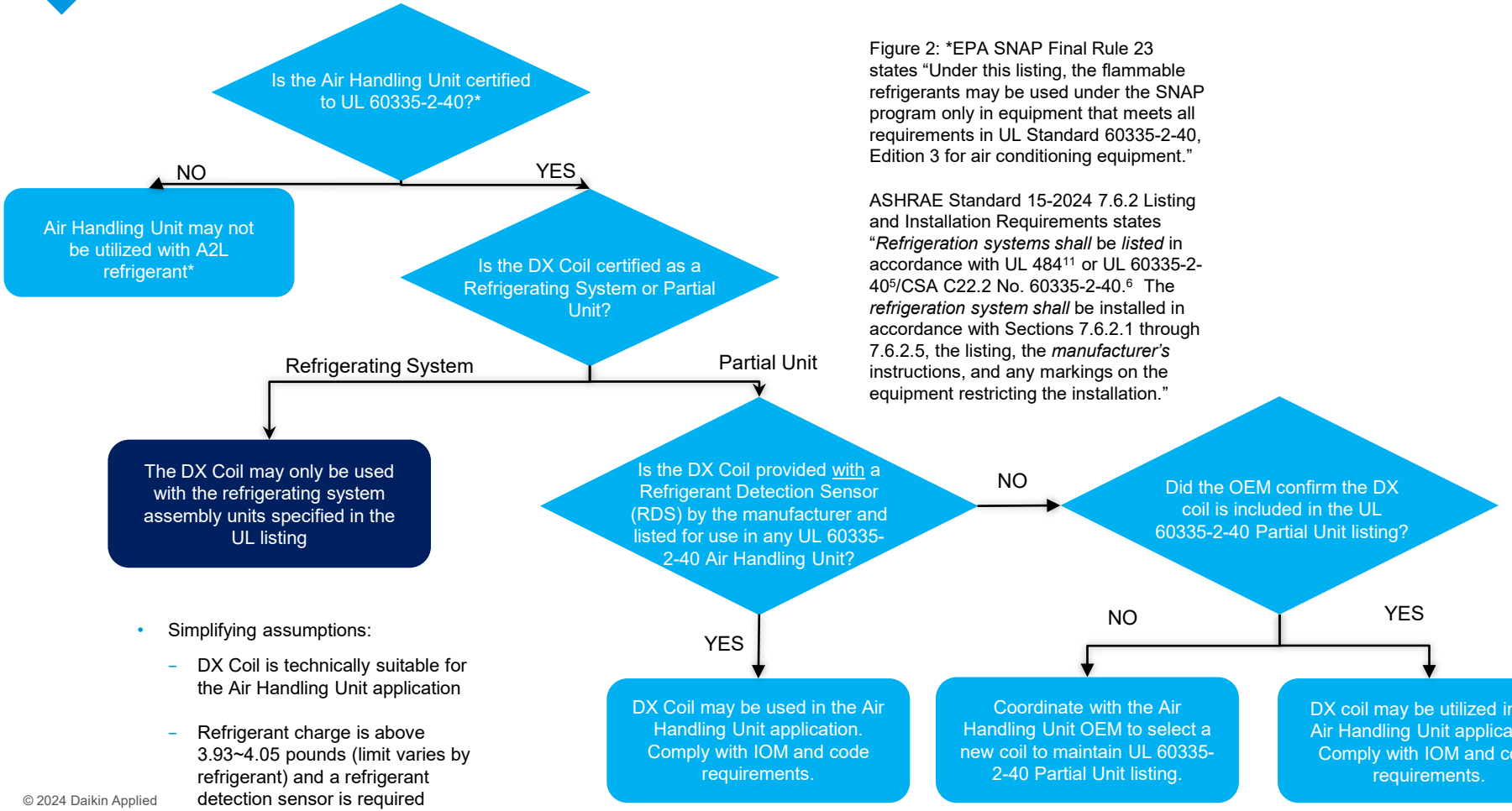

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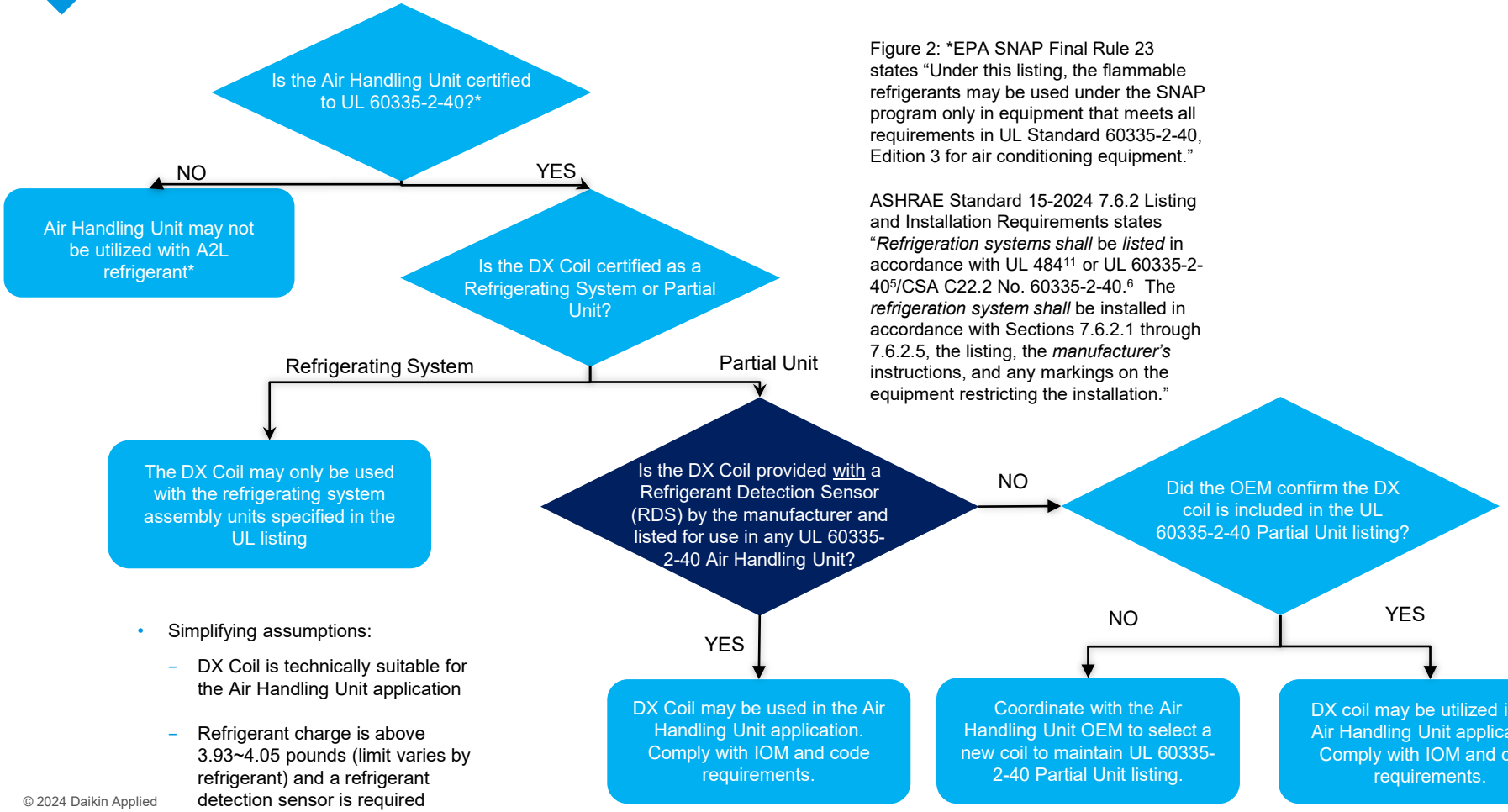
ASHRAE Standard 15-2024 7.6.2 Listing and Installation Requirements states "*Refrigeration systems shall* be *listed* in accordance with UL 484[11] or UL 60335-2-40[5]/CSA C22.2 No. 60335-2-40.[6] The *refrigeration system shall* be installed in accordance with Sections 7.6.2.1 through 7.6.2.5, the listing, the *manufacturer's* instructions, and any markings on the equipment restricting the installation."

- Simplifying assumptions:
  - DX Coil is technically suitable for the Air Handling Unit application
  - Refrigerant charge is above 3.93~4.05 pounds (limit varies by refrigerant) and a refrigerant detection sensor is required

Evaluating Application of A2L DX Coils



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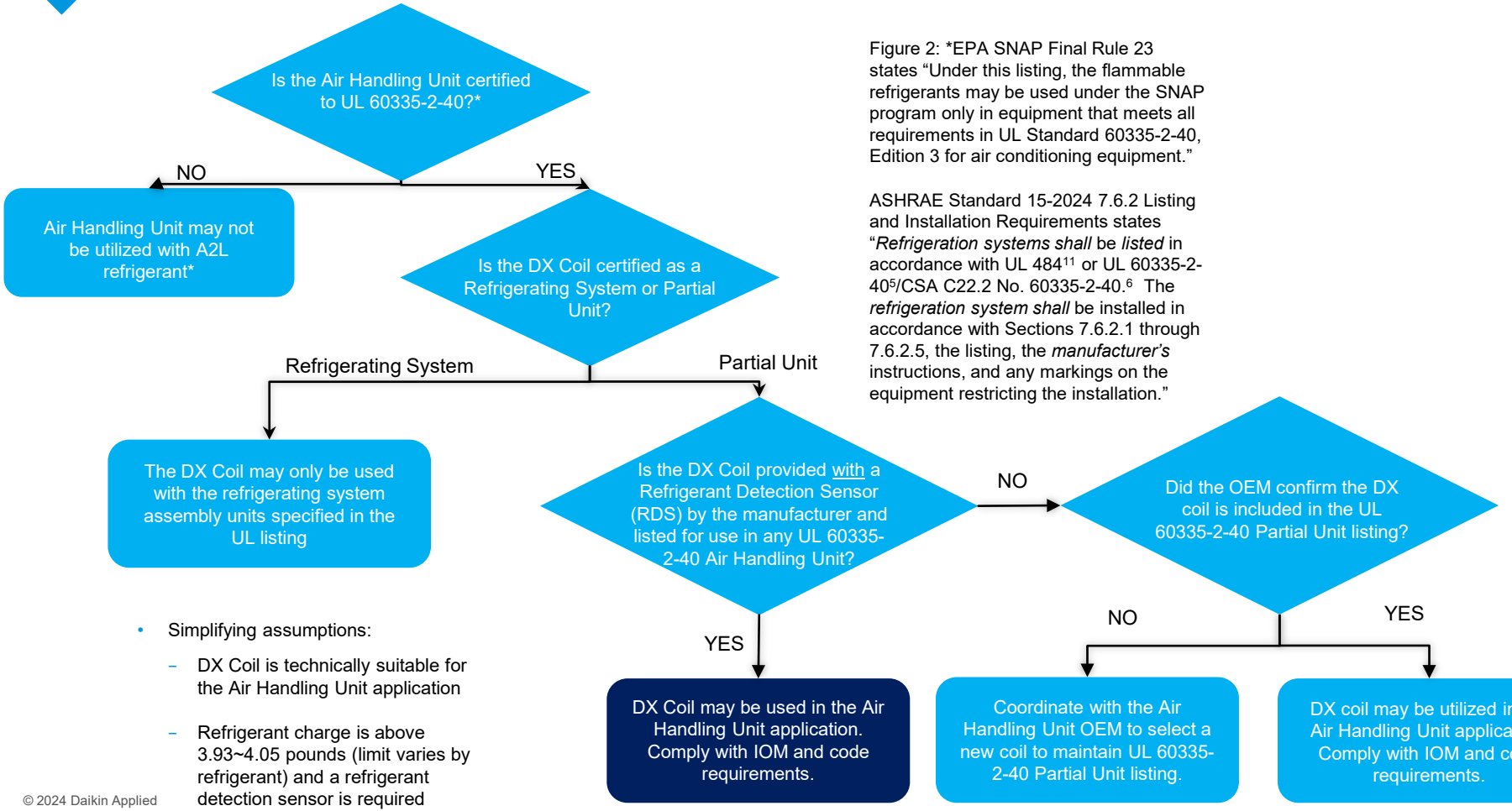
Evaluating Application of A2L DX Coils



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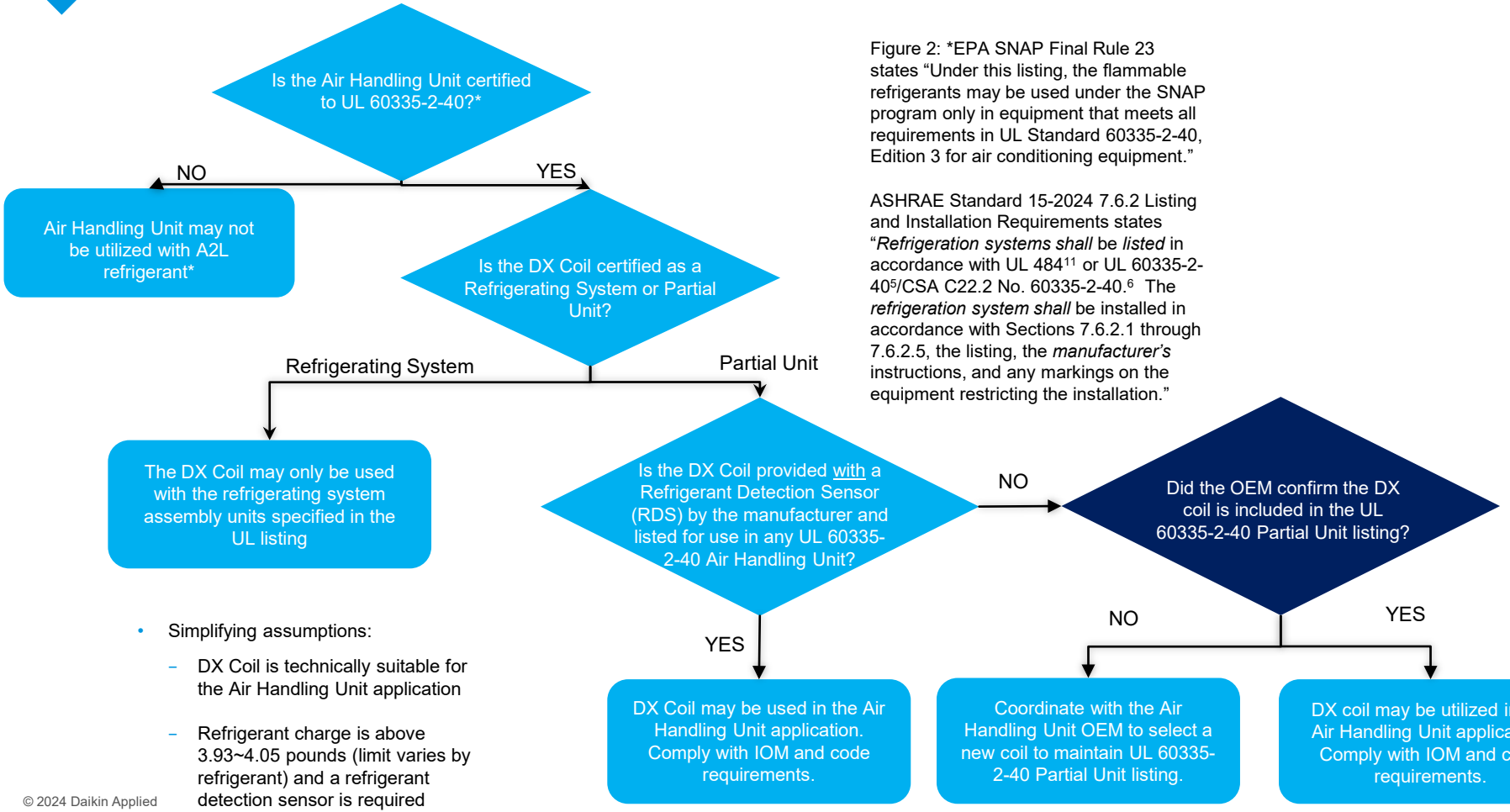
Evaluating Application of A2L DX Coils



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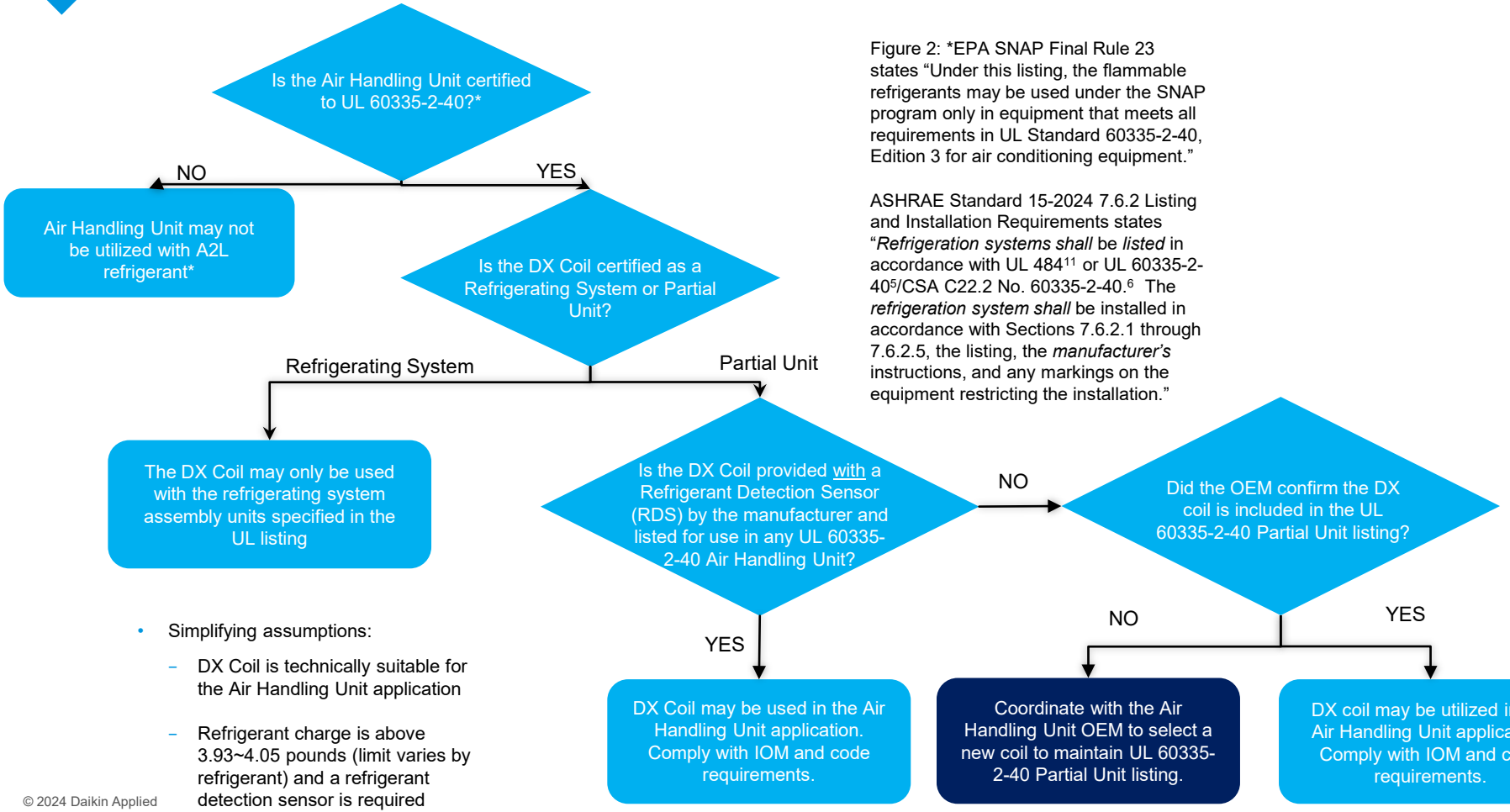
Evaluating Application of A2L DX Coils



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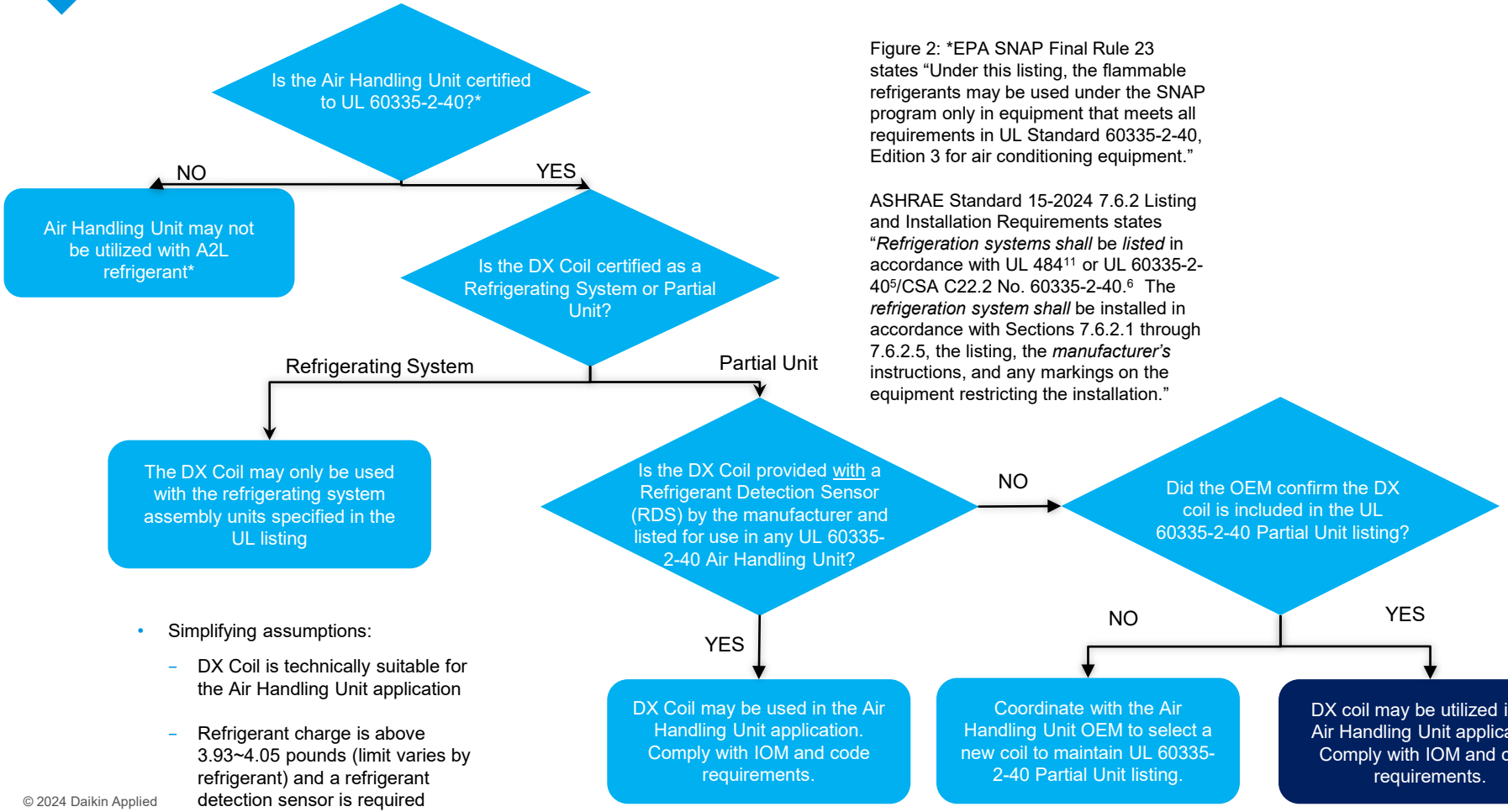
Evaluating Application of A2L DX Coils



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  - DX Coil is technically suitable for the Air Handling Unit application
  - Refrigerant charge is above 3.93~4.05 pounds (limit varies by refrigerant) and a refrigerant detection sensor is required

A2L Equipment

Applying A2L Condensing Units

Condensing units can be certified as a **partial unit** or as part of a **refrigerating system** through UL 60335-2-40.

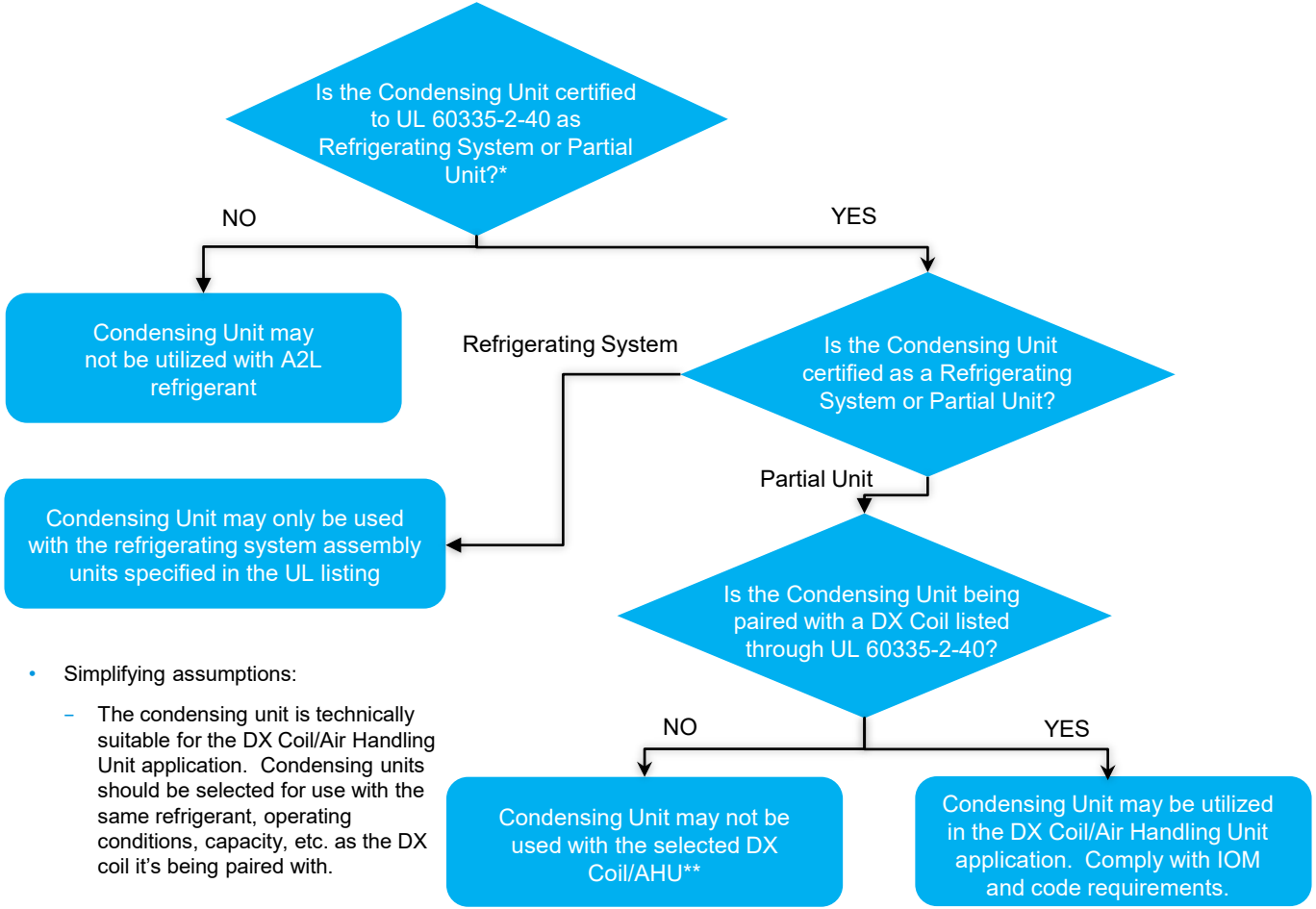
Evaporators and condensers with a partial unit listing are able to be used in combination with other listed partial units assuming they are technically suitable and utilize the same refrigerant.

Evaluating Application of A2L Condensing Units

Figure 3: *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 60335-2-40[5]/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”.



- 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.

Evaluating Application of A2L Condensing Units

Figure 3: *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.”

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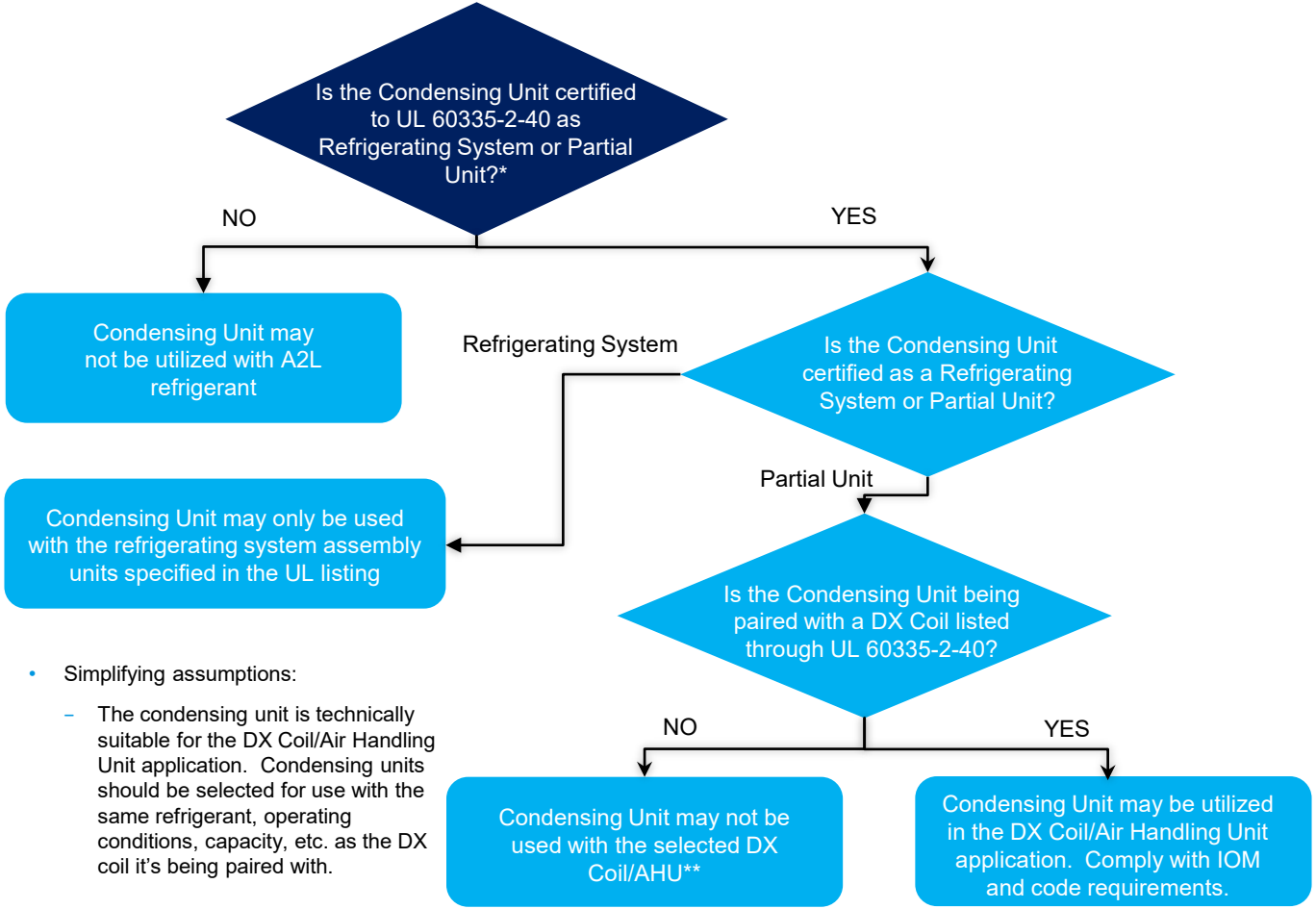

- Simplifying assumptions:
  - The condensing unit is technically suitable for the DX Coil/Air Handling Unit application. Condensing units should be selected for use with the same refrigerant, operating conditions, capacity, etc. as the DX coil it’s being paired with.

Evaluating Application of A2L Condensing Units (Figure 3)

Figure 3: *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.”

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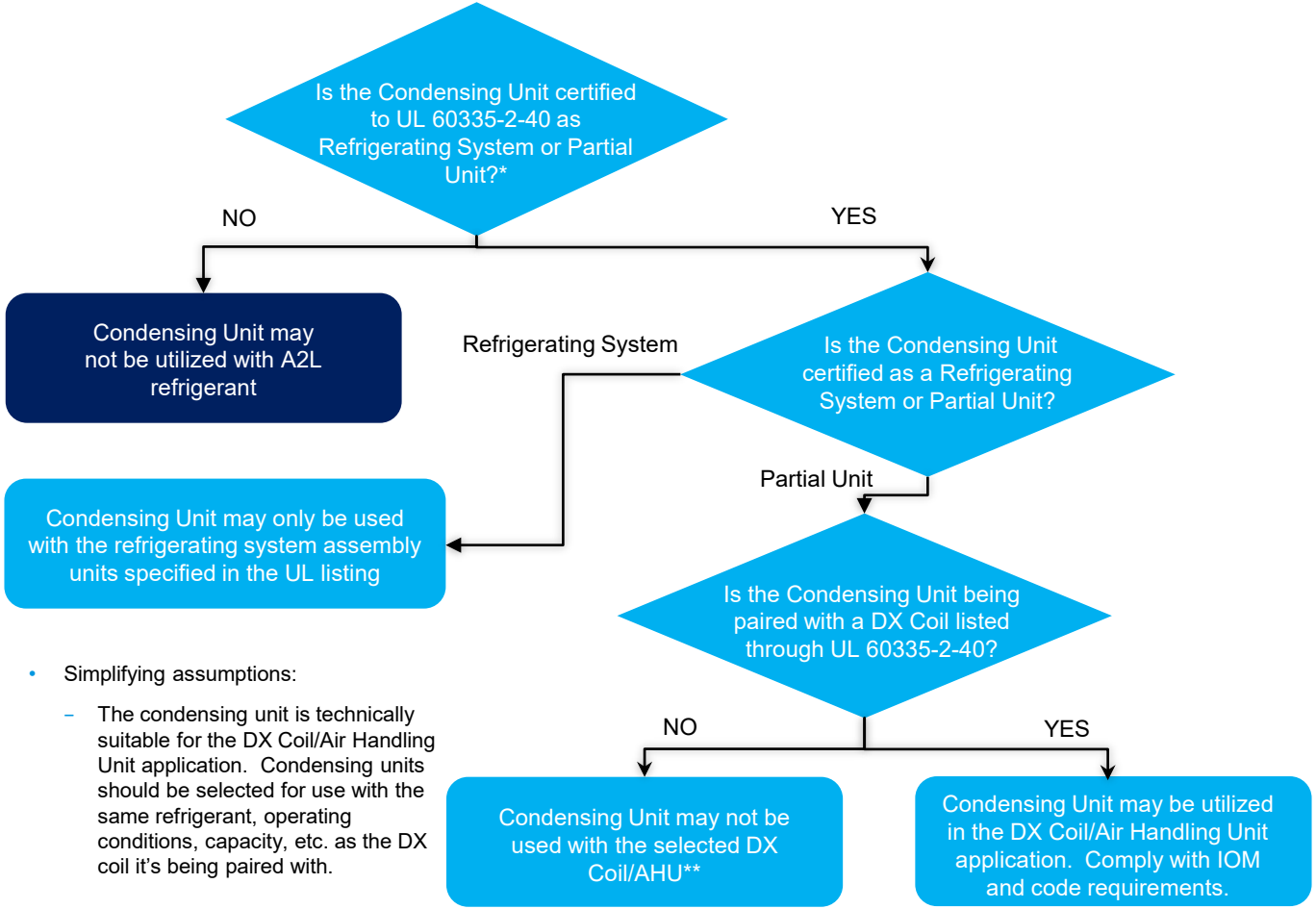

- Simplifying assumptions:
  - The condensing unit is technically suitable for the DX Coil/Air Handling Unit application. Condensing units should be selected for use with the same refrigerant, operating conditions, capacity, etc. as the DX coil it’s being paired with.

Evaluating Application of A2L Condensing Units (Figure 3)

Figure 3: *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.”

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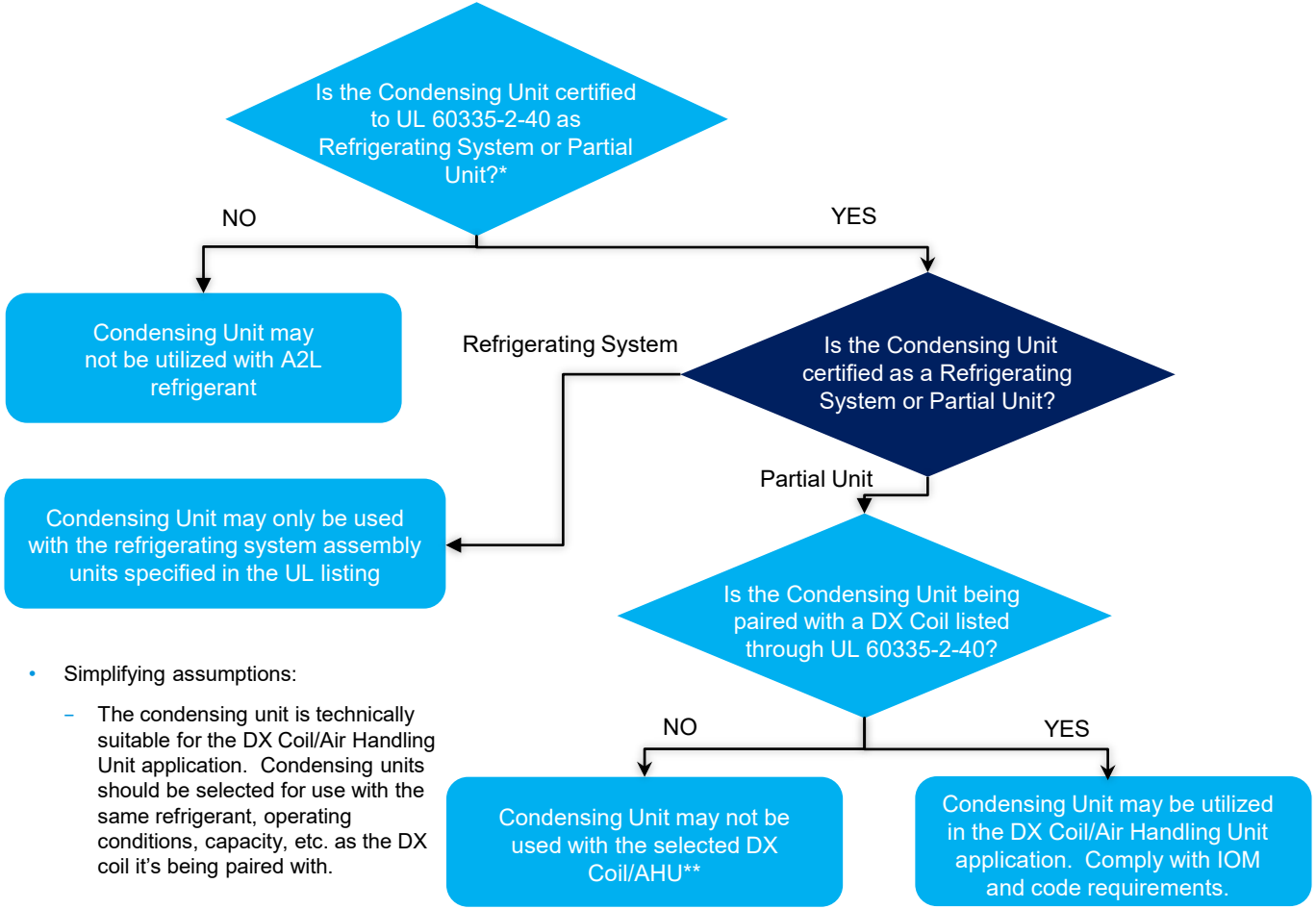

- Simplifying assumptions:
  - The condensing unit is technically suitable for the DX Coil/Air Handling Unit application. Condensing units should be selected for use with the same refrigerant, operating conditions, capacity, etc. as the DX coil it’s being paired with.

Evaluating Application of A2L Condensing Units (Figure 3)

Figure 3: *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.”

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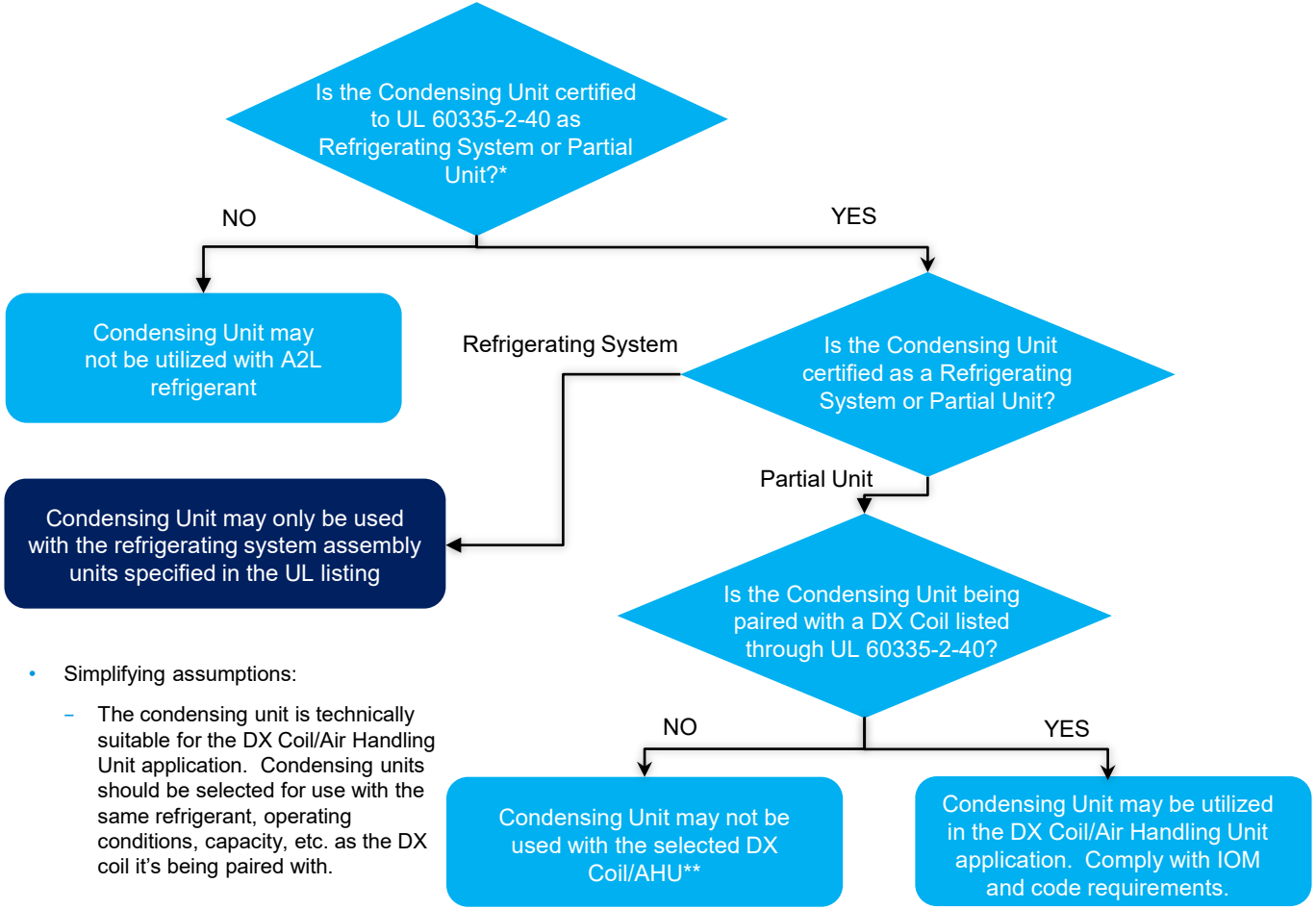

- Simplifying assumptions:
  - The condensing unit is technically suitable for the DX Coil/Air Handling Unit application. Condensing units should be selected for use with the same refrigerant, operating conditions, capacity, etc. as the DX coil it’s being paired with.

Evaluating Application of A2L Condensing Units (Figure 3)

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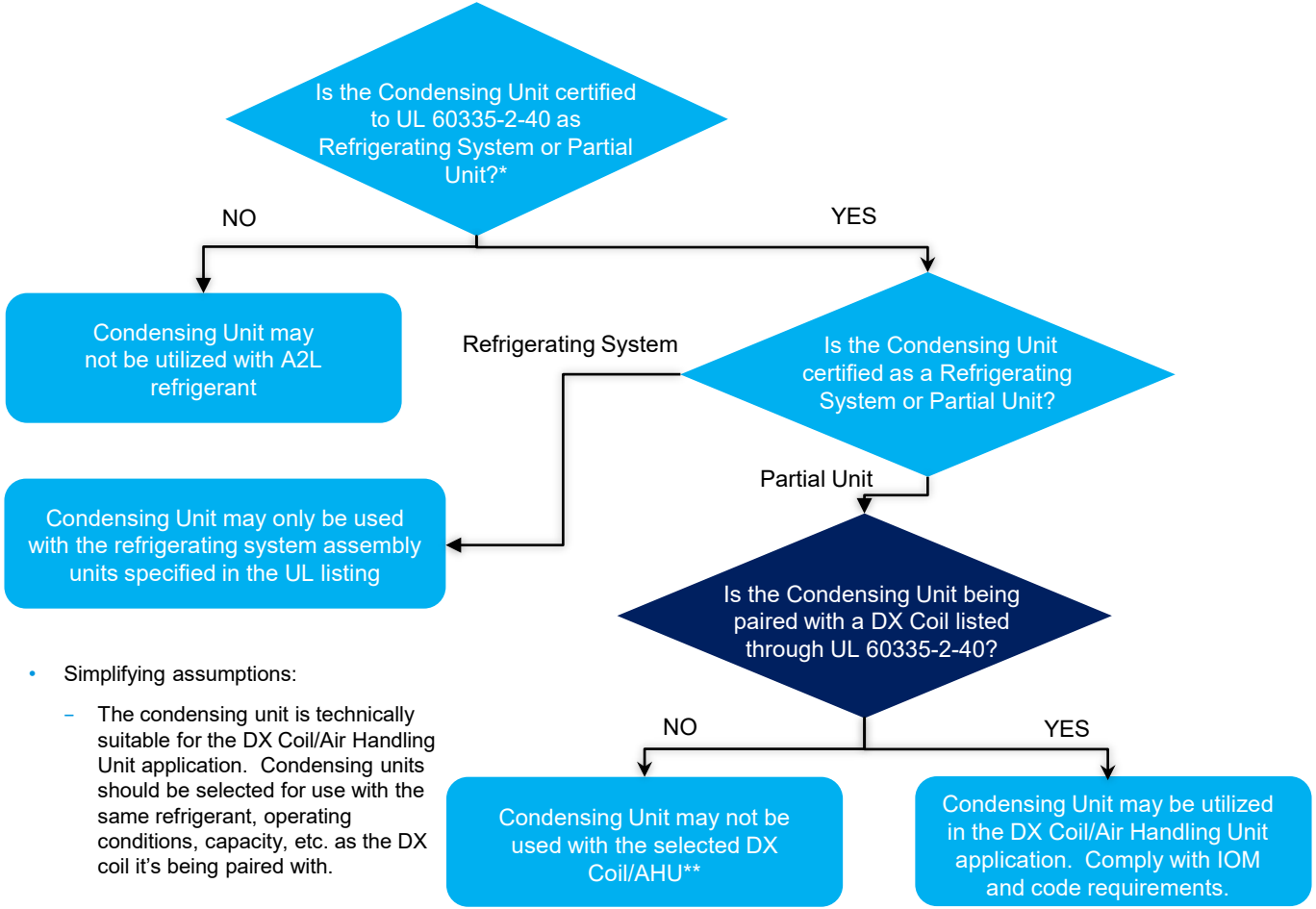

- Simplifying assumptions:
  - The condensing unit is technically suitable for the DX Coil/Air Handling Unit application. Condensing units should be selected for use with the same refrigerant, operating conditions, capacity, etc. as the DX coil it’s being paired with.

Evaluating Application of A2L Condensing Units (Figure 3)

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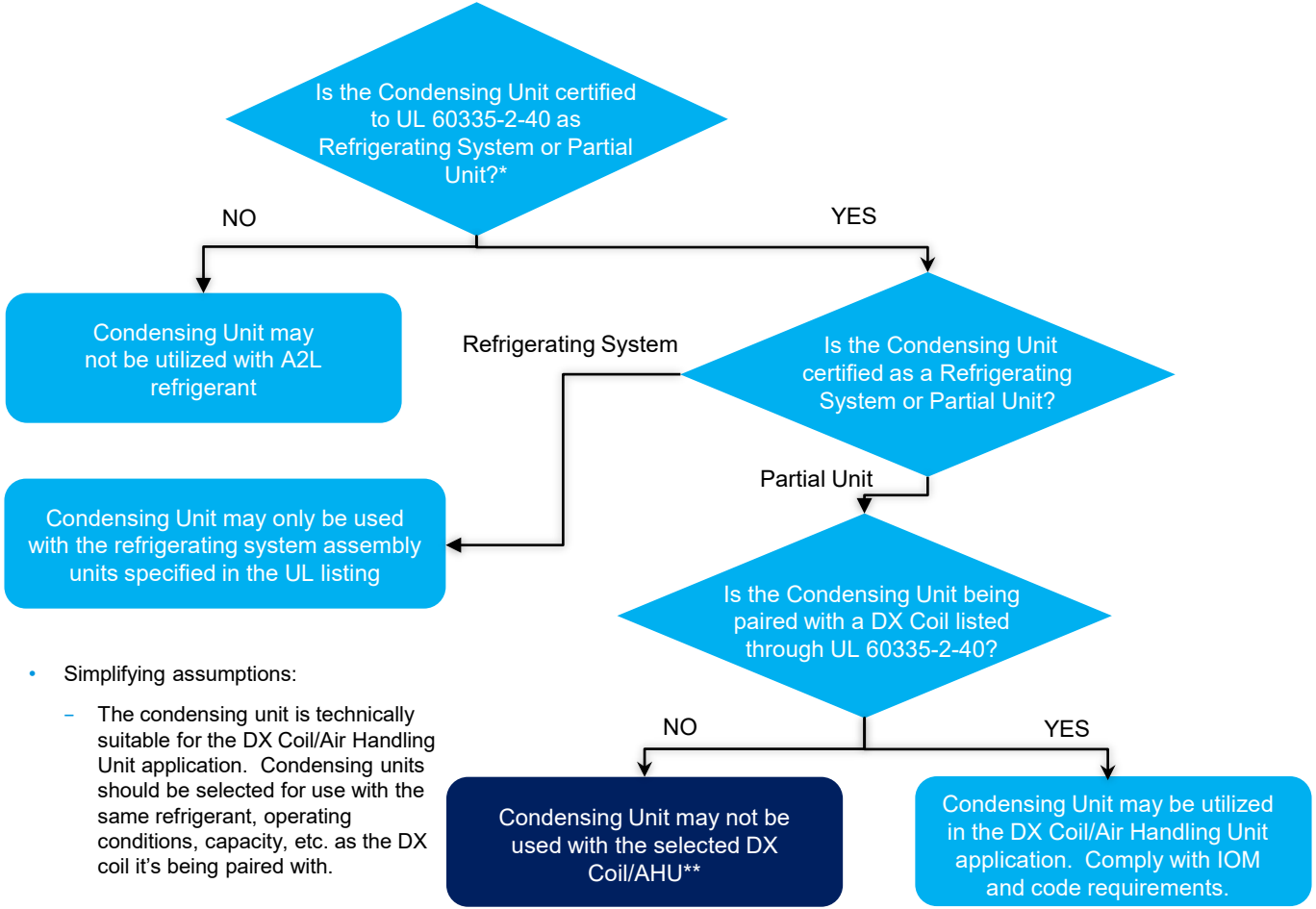

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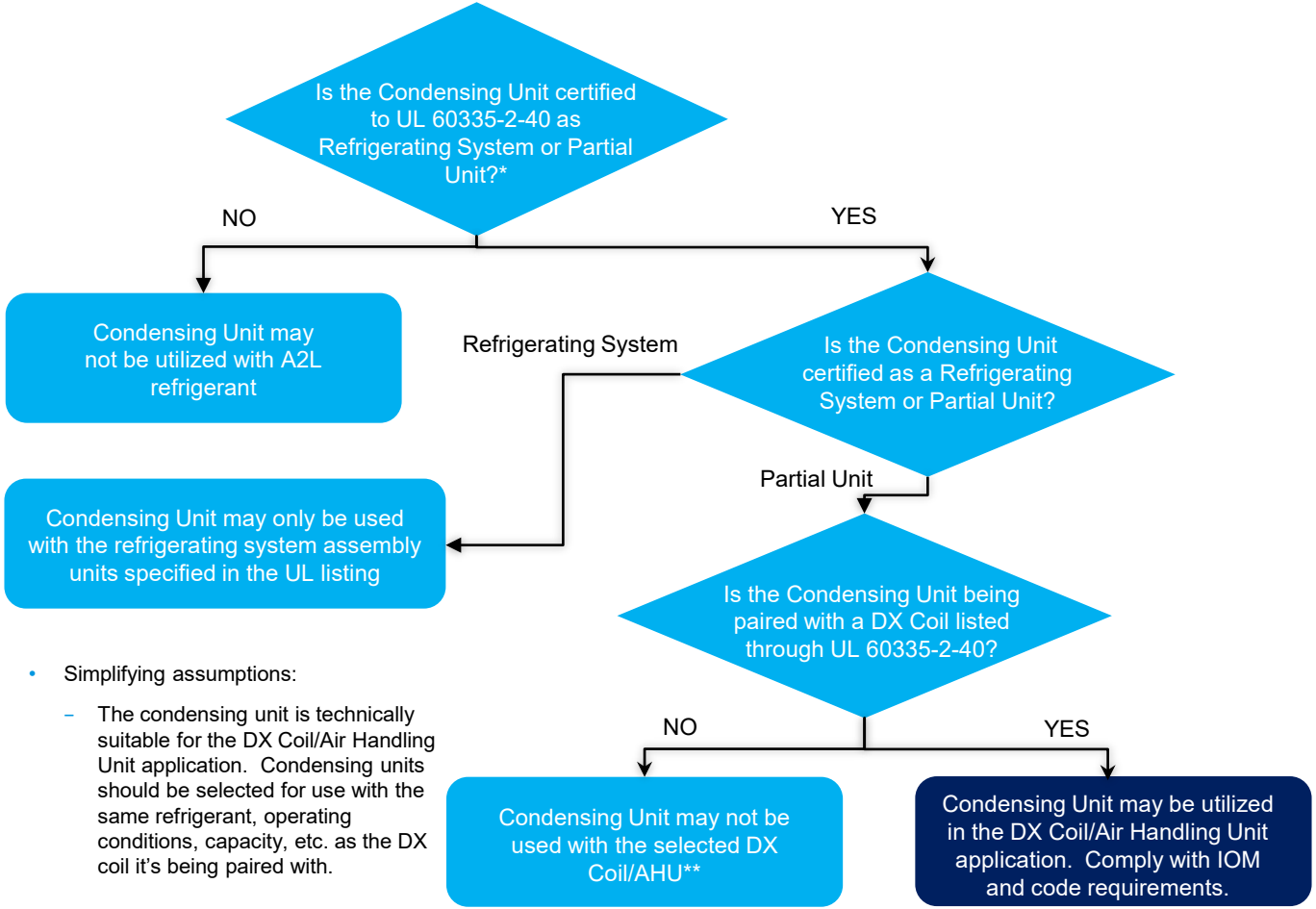

- Simplifying assumptions:
  - The condensing unit is technically suitable for the DX Coil/Air Handling Unit application. Condensing units should be selected for use with the same refrigerant, operating conditions, capacity, etc. as the DX coil it’s being paired with.

MITIGATION ACTIONS

ASHRAE Standard 15 Compliance – Mitigation Actions

7.6.2.5* Mitigation Action Requirements. The following *mitigation actions shall* be completed in not more than 15 seconds after the initiation of the output signal of Section 7.6.2.4(h), and *shall* be maintained for at least five (5) minutes after the output signal has reset:

a. **Energize the *air circulation* fan(s)** of the equipment per the *manufacturer's* instructions.

b. **Open zoning dampers, or set zone dampers to full airflow** setpoint, that are installed in the *air ducts* connected to the *refrigeration system*.

c. ***Activate mechanical ventilation** if required by Section 7.6.4.

d. **De-energize electric resistance** heat installed in an *air duct* that is connect to the *refrigeration system*.

e. **Activate *safety shutoff valves*** utilized to reduce *releasable refrigerant charge*.

f. **De-energize potential ignition sources**, including open flames and unclassified electrical sources of ignition with apparent power rating greater than 1kWA, where the apparent power is the product of the circuit voltage and current rating.

ASHRAE Standard 15 Compliance – Mitigation Actions

7.6.2.5* Mitigation Action Requirements. The following *mitigation actions shall* be completed in not more than 15 seconds after the initiation of the output signal of Section 7.6.2.4(h), and *shall* be maintained for at least five (5) minutes after the output signal has reset:

a. **Energize the *air circulation* fan(s)** of the equipment per the *manufacturer's* instructions.

b. **Open zoning dampers, or set zone dampers to full airflow** setpoint, that are installed in the *air ducts* connected to the *refrigeration system*.

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f. **De-energize potential ignition sources**, including open flames and unclassified electrical sources of ignition with apparent power rating greater than 1kWA, where the apparent power is the product of the circuit voltage and current rating.

ASHRAE Standard 15 Compliance – Mitigation Actions

7.6.2.5* Mitigation Action Requirements. The following *mitigation actions shall* be completed in not more than 15 seconds after the initiation of the output signal of Section 7.6.2.4(h), and *shall* be maintained for at least five (5) minutes after the output signal has reset:

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b. **Open zoning dampers, or set zone dampers to full airflow** setpoint, that are installed in the *air ducts* connected to the *refrigeration system*.

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e. **Activate *safety shutoff valves*** utilized to reduce *releasable refrigerant charge*.

f. **De-energize potential ignition sources**, including open flames and unclassified electrical sources of ignition with apparent power rating greater than 1kWA, where the apparent power is the product of the circuit voltage and current rating.

ASHRAE Standard 15 Compliance – Mitigation Actions

7.6.2.5* Mitigation Action Requirements. The following *mitigation actions shall* be completed in not more than 15 seconds after the initiation of the output signal of Section 7.6.2.4(h), and *shall* be maintained for at least five (5) minutes after the output signal has reset:

a. **Energize the *air circulation* fan(s)** of the equipment per the *manufacturer's* instructions.

b. **Open zoning dampers, or set zone dampers to full airflow** setpoint, that are installed in the *air ducts* connected to the *refrigeration system*.

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e. **Activate *safety shutoff valves*** utilized to reduce *releasable refrigerant charge*.

f. **De-energize potential ignition sources**, including open flames and unclassified electrical sources of ignition with apparent power rating greater than 1kWA, where the apparent power is the product of the circuit voltage and current rating.

ASHRAE Standard 15 Compliance – Mitigation Actions

7.6.2.5* Mitigation Action Requirements. The following *mitigation actions shall* be completed in not more than 15 seconds after the initiation of the output signal of Section 7.6.2.4(h), and *shall* be maintained for at least five (5) minutes after the output signal has reset:

a. **Energize the *air circulation* fan(s)** of the equipment per the *manufacturer's* instructions.

b. **Open zoning dampers, or set zone dampers to full airflow** setpoint, that are installed in the *air ducts* connected to the *refrigeration system*.

c. ***Activate mechanical ventilation** if required by Section 7.6.4.

d. **De-energize electric resistance** heat installed in an *air duct* that is connect to the *refrigeration system*.

e. **Activate *safety shutoff valves*** utilized to reduce *releasable refrigerant charge*.

f. **De-energize potential ignition sources**, including open flames and unclassified electrical sources of ignition with apparent power rating greater than 1kWA, where the apparent power is the product of the circuit voltage and current rating.

ASHRAE Standard 15 Compliance – Mitigation Actions

7.6.2.5* Mitigation Action Requirements. The following *mitigation actions shall* be completed in not more than 15 seconds after the initiation of the output signal of Section 7.6.2.4(h), and *shall* be maintained for at least five (5) minutes after the output signal has reset:

a. **Energize the *air circulation* fan(s)** of the equipment per the *manufacturer's* instructions.

b. **Open zoning dampers, or set zone dampers to full airflow** setpoint, that are installed in the *air ducts* connected to the *refrigeration system*.

c. ***Activate mechanical ventilation** if required by Section 7.6.4.

d. **De-energize electric resistance** heat installed in an *air duct* that is connect to the *refrigeration system*.

e. **Activate *safety shutoff valves*** utilized to reduce *releasable refrigerant charge*.

f. **De-energize potential ignition sources**, including open flames and unclassified electrical sources of ignition with apparent power rating greater than 1kWA, where the apparent power is the product of the circuit voltage and current rating.

ASHRAE Standard 15 Compliance – Mitigation Actions

7.6.2.5* Mitigation Action Requirements. The following *mitigation actions shall* be completed in not more than 15 seconds after the initiation of the output signal of Section 7.6.2.4(h), and *shall* be maintained for at least five (5) minutes after the output signal has reset:

a. **Energize the *air circulation* fan(s)** of the equipment per the *manufacturer's* instructions.

b. **Open zoning dampers, or set zone dampers to full airflow** setpoint, that are installed in the *air ducts* connected to the *refrigeration system*.

c. ***Activate mechanical ventilation** if required by Section 7.6.4.

d. **De-energize electric resistance** heat installed in an *air duct* that is connect to the *refrigeration system*.

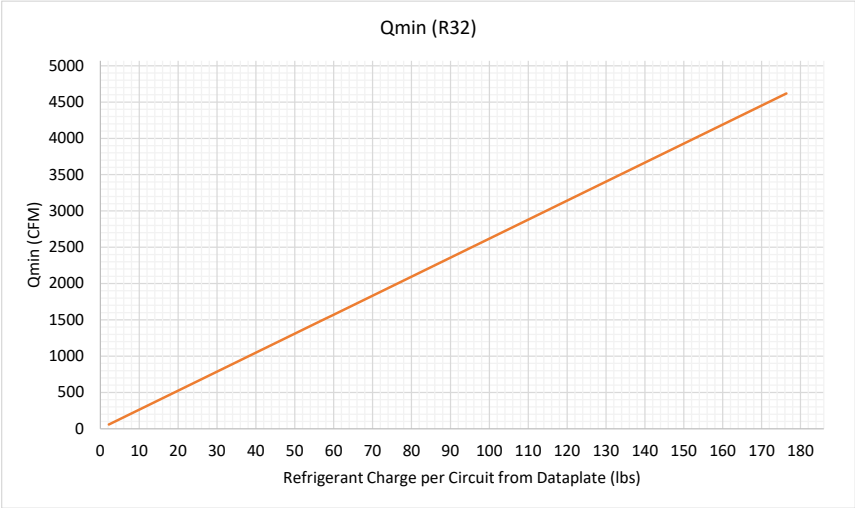
e. **Activate *safety shutoff valves*** utilized to reduce *releasable refrigerant charge*.

f. **De-energize potential ignition sources**, including open flames and unclassified electrical sources of ignition with apparent power rating greater than 1kWA, where the apparent power is the product of the circuit voltage and current rating.

Mitigation Actions

- What is the minimum air circulation rate during a leak event?

Minimum air circulation rates are set by UL 60335-2-40 based on refrigerant type and charge.



The minimum airflow shall be determined as:

$$Q_{min} = 30 \times m_c / LFL \qquad \text{(GG.15DV)}$$

where

Q_{min} is the minimum circulation airflow circulated to the total conditioned space in m^3/h

m_c is the actual refrigerant charge for a single REFRIGERATING SYSTEM in kg

***LFL* is the lower flammability limit in kg/m^3**

Mitigation Actions

- **What is the minimum air circulation rate during a leak event?**

Example:

75T R-32 System

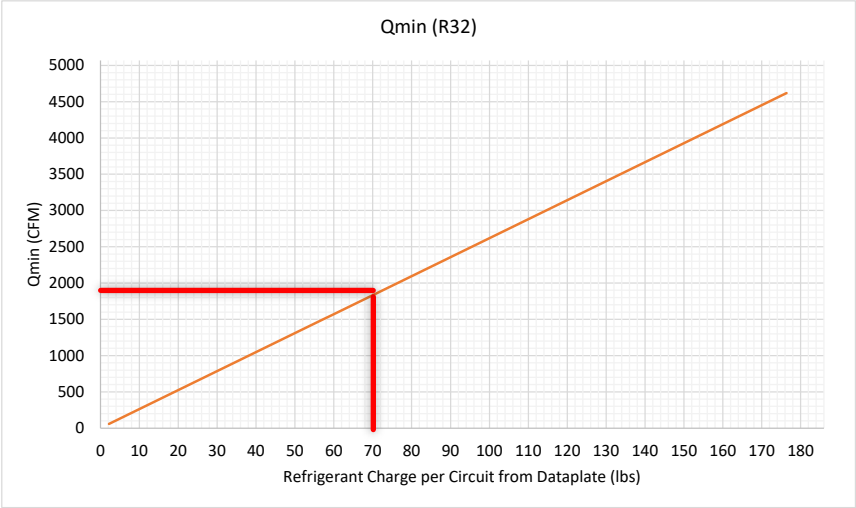
- Circuit 1 – 70.5 lbs = 32.1 kg
- Circuit 2 – 60.4 lbs = 27.5 kg

- R-32 LFL = 0.306 kg/m3

$$Q_{min} = 30 \times m_c \div LFL$$

$$Q_{min} = 30 \times 32.1kg \div 0.306kg/m^3$$

$$Q_{min} = 3147.06 \frac{m^3}{h} = \mathbf{1852\ cfm}$$



A2L Equipment

- **What mitigation actions affect freeze protection?**

  - During a mitigation event **compressors are disabled**
  - **Circulation fans** should be **enabled** to at least the minimum speed as specified by the OEM
    - This airflow is typically less than the designed full airflow
  - **Unit heating may be enabled** depending on the unit operation and if allowed by manufacturer to comply with UL 60335-2-40
    - Heat provided by compressors would be disabled
  - Depending on the refrigerant sensor and manufacturer the unit may **resume normal operation once the refrigerant has been cleared**, and the sensor does not sense refrigerant above the setpoint for a period of 5 minutes.

This is not an exhaustive list of mitigation actions but touches on those associated with freezing

Where Can I Go for Information?

Applying A2L Refrigerants:

- A2L Refrigerant Engineering Guide
- Navigating Retrofits and Replacements for High GWP Refrigerants

Building Codes:

- ASHRAE Standards 15 and 34
- https://www.ashrae.org/technical-resources/bookstore/ashrae-refrigeration-resources
- https://www.ashrae.org/technical-resources/standards-and-guidelines/read-only-versions-of-ashrae-standards

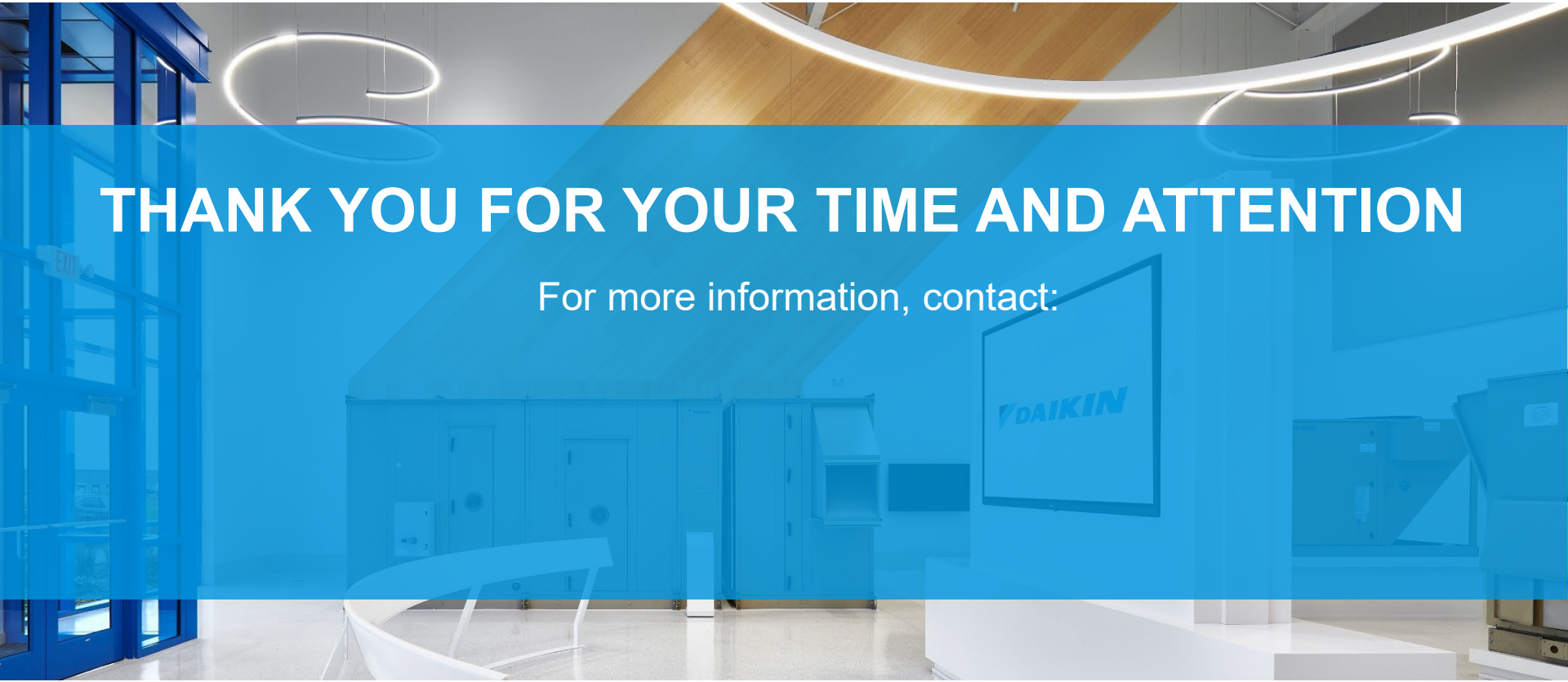
General Guidance:

- Preparing Buildings for A2L Refrigerants
- https://www.daikinapplied.com/decarbonization/refrigerants

Where Can I Go for Information?

General Guidance:

- AHRI Webcast Series
  - An Introduction to A2L Refrigerants
  - A2L Refrigerants Webinar Series Part 2 - Updates to Standards and Model Codes
  - A2L Refrigerants Webinar Series Part 3: State and Local Codes and Available Resources
- https://www.iccsafe.org/products-and-services/i-codes/a2l-refrigerants-transition/
- https://www.ashrae.org/news/ashraejournal/ashrae-journal-podcast-episode-3
- https://www.ahrinet.org/saferefrigerant
- https://www.acca.org/education/a2l-refrigerants
- https://www.rses.org/training/
- https://www.achrnews.com/articles/153195-understanding-a2l-refrigerants
- https://www.esmagazine.com/articles/99996-a2l-refrigerants-safely-addressing-refrigerant-flammability-concerns



THANK YOU FOR YOUR TIME AND ATTENTION

For more information, contact: