A2L REFRIGERANTS: Relevant Code Requirements

Purpose: This memo outlines notable NYC code requirements for managing A2L refrigerants like R32 & R454b. These refrigerants comply with phase 1 of the NYS HFC Law Part 494.1.4 (2) which have a lower Global Warming Potential than R410A but are slightly flammable. This document does not replace a thorough review of code and manufacturer requirements by the design engineer. As A2L best practices are developed, HPD may add resources to the REDi website.

Shaft Enclosures (ASHRAE 15 2022 9.12.1.5)

- Refrigerant lines penetrating 2+ floors require a 1-hour shaft enclosure. If 3+ floors, then a 2-hour fire rating is required (BC 713.4).
- A "Shaft Alternative" exists, but is unlikely to apply in HPD buildings with A2Ls
- An NYC DOB Rule clarifying RCL limits is expected later in 2025, but it does not substantively change the code language.

Shaft Ventilation (ASHRAE 15 2022 9.12.2.2)

- General requirements: Per 9.7.8.2, the shaft vent discharge must be 15' above ground and 20' from wall openings and the shaft must have a makeup air opening per 9.12.2.2.
- Natural Ventilation: Bottom of the shaft must have a 4" pitched exhaust pipe.
    - Given the general requirement above, this is impractical for many shafts that serve the first floor
- Mechanical Ventilation: Airflow rate must be designed to Table 9-12, with a refrigerant sensor at the bottom of the shaft that activates the fan (R32 & R454b are heavier than air).

Plan for rigid copper layouts (2022 NYC Mech 1107.3)

- A2L refrigerant piping must be protected from puncture and damage from nails/screws
- Soft/flexible pre-insulated linesets are typical in apartments for r410a multi-splits, but with A2Ls, a rigid pipe conduit or metal enclosure is required. (eg. Inabadenko slimduct-RD metal pipe enclosure)
- Rigid copper linesets (common for large commercial VRF) is the alternative for apartment branches.

Other Considerations:

- REV1 UPDATE: ASHRAE 15.2 was NOT adopted in NYC, therefore heat pumps serving a single dwelling unit must also comply with ASHRAE 15. All references to the residential focused ASHRAE 15.2 have been removed from this document.
- DOB has a draft NYC Rule due for public hearing this year. It is not expected to substantively change these requirements, just clarify.
    - "Air Circulation" per ASHRAE 15 7.6.1.1 is clarified as NOT applying to fcus serving a single room. 7.6.1.2 applies instead.
    - the next NYC code cycle is effective (likely late 2027 or 2028)

- VRF systems with >50 lbs of refrigerant are discouraged (typically >100ft line length and >5 apts/system):
    - Require Annual Refrigerant Management reporting to NY State (Part 494.2) starting June 2028 due to high potential refrigerant leakage
    - May require a crew of 5 on-site Refrigeration System Operating Engineers (FC606.1.1 A2L update pending the below FDNY rule)
    - TR1 verification of refrigerant pressure tests required over 55lbs (1108.4)
- FDNY Rule is forthcoming to clarify operational considerations
    - 2022 Fire Code section 606 discusses refrigerants but does not include A2L specifics
    - A December 2024 FDNY A2L virtual town hall slide deck notes that fire code rules for A2Ls are in development but the release date is TBD. These rules are expected to affect operations, and may be retroactive.
- Pipe Identification & Labeling: Per 9.12.1.8, refrigerant piping should be identified in accordance with ANSI/ASME A13.1.
- Pipe protection: Refrigerant tubing located in studs, joists, rafters, or similar member spaces and located less than 1.5" from the nearest edge of the member shall be continuously protected by shield plates per 9.12.2.1

Common space heating electrification options are shown below.

HPD Space Heat Pump Categories	Dwellings served	Tons	AHRI	A2L Refrigerant Shafts Apply
Large Commercial VRF	3+	6+	1230	Yes
Multi-Split - Multiple dwellings	2-5	3-5	240	Yes
Multi-Split- Single dwelling	single	1-3	240	Yes
Mini-Split	single	0.5-2	240	Yes
Single Packaged Vertical Heat Pump* Or PTHP (Room Heat Pump)	single	<2	390, 380	None
Hydronic w/ Central AWHP**				None

- *Note: NYC 2022 Mech Code chapter 11 and Fire Code 606 applies to all*
- **Example SPVHP: Ephoca AIO*
- ***Avoids issues with A2L refrigerant in the building*

Design teams are strongly encouraged to reconsider whether VRF is the optimal heating strategy, due to the complexity of managing refrigerant leaks which are still significant even with lower GWP refrigerants. Teams may wish to consider alternative systems, including packaged equipment where all refrigerants are contained within the systems and field leaks are minimized. Some additional context may be found in our VRF Convening Report .

Additional Resource Links:

- **HPD Technical Requirements- Split System Heat Pump for Space Heating** - including Appendix A - Refrigerant Charging and Leak Prevention Requirements
- **HPD A2L Presentation Webinar Recording**
- **HPD A2L Presentation Webinar slides**
- **HPD A2L Presentation Webinar FAQs**
- **Design Professional Guidance-Heat Pump Code and Zoning**

Appendix A: Code Language References

1107.3 Pipe Enclosures

Rigid or flexible metal enclosures or pipe ducts shall be provided for soft, annealed copper tubing used for refrigerant piping erected on the premises and containing other than Group A1 refrigerant. Enclosures shall not be required for connections between condensing units and the nearest riser box(es), provided such connections do not exceed 6 feet (1828.8 mm) in length.

9.12.2.2 Shaft Ventilation

Refrigerant pipe shafts with systems using only Group A2L or B2L *refrigerants shall* be naturally or mechanically ventilated. *Refrigerant* pipe shafts with one or more systems using any Group A2, A3, B2, or B3 *refrigerant shall* be continuously mechanically ventilated and *shall* include a *refrigerant detector.* The shaft ventilation exhaust outlet *shall* comply with the discharge location requirement *specified* in Section 9.7.8.2.

a. Naturally ventilated shafts *shall* have a minimum of a 4.0 in. (102 mm) diameter pipe, *duct,* or conduit that connects at the lowest point of the shaft and connects to the outdoors. The pipe, *duct,* or conduit *shall* be level or pitched down to the outdoors. A *makeup air* opening *shall* be provided at the top of the shaft.

b. When active, mechanically ventilated shafts *shall* have a minimum air velocity in accordance with Table 9-12. *Makeup air shall* be provided at the inlet to the shaft for mechanically ventilated shafts. The mechanical ventilation *shall* either be continuously operated or, for pipe shafts containing only systems using Group A2L or B2L *refrigerants,* activated by a *refrigerant detector*. *Refrigerant* pipe shafts utilizing a *refrigerant detector shall* have a set point not exceeding the *occupational exposure limit* (*OEL*) of the *refrigerant*. The detector, or a sampling tube that draws air to the detector, *shall* be located in an area where *refrigerant* from a leak will concentrate.

c. The shaft *shall not* be required to be ventilated for double-wall *refrigerant* pipe where the interstitial space of the double-wall pipe is vented to the outdoors in accordance with the discharge location requirements *specified* in Section 9.7.8.2.

Table 9-12 Shaft Ventilation Velocity

Shaft Cross-Sectional Area, *A*		Minimum Ventilation Velocity, *V*	
in.^{2}	m^2	ft/min	m/min
$A \le 20$	$A \le 0.0129$	$100 \le V$	$30.5 \le V$
$20 < A \le 250$	$0.0129 < A \le 0.161$	$200 \le V$	$61 \le V$
$250 < A \le 1250$	$0.161 < A \le 0.806$	$300 \le V$	$91 \le V$
$1250 < A$	$0.806 < A$	$400 \le V$	$122 \le V$

9.7.8.2 Discharging Location Exterior to Building. *Pressure relief devices* designed to discharge external to the refrigeration system *shall* be arranged to discharge outside of a building and comply with all of the following:

a. The point of vent discharge *shall* be located not less than 15 ft (4.57 m) above the adjoining ground level. **Exception to (a):** Outdoor systems containing Group A1 *refrigerant shall* be permitted to discharge at any elevation where the point of discharge is located in an access controlled area accessible to authorized personnel only.

b. The point of vent discharge *shall* be located not less than 20 ft (6.1 m) from windows, building ventilation openings, pedestrian walkways, or building exits.

c. For heavier-than-air *refrigerants*, the point of vent discharge *shall* be located not less than 20 ft (6.1 m) horizontally from below-grade walkways, entrances, pits, or ramps if a release of the entire system charge into such a space would yield a concentration of *refrigerant* in excess of the *refrigerant concentration limit* (*RCL*). The direct discharge of a relief vent into enclosed outdoor spaces, such as a courtyard with walls on all sides, *shall not* be permitted if a release of the entire system charge into such a space would yield a concentration of *refrigerant* in excess of the *RCL*. The volume for the *refrigerant* concentration calculation *shall* be determined using the gross area of the space and a height of 8.2 ft (2.5 m), regardless of the actual height of the enclosed space.

d. The termination point of a vent discharge line *shall* be made in a manner that prevents discharged *refrigerant* from spraying directly onto personnel that might be in the vicinity.

e. The termination point of vent discharge lines *shall* be made in a manner that prevents foreign material or debris from entering the discharge *piping*.

f. Relief vent lines that terminate vertically upward and are subject to moisture entry *shall* be provided with a drip pocket having a minimum of 24 in. (0.6 m) in length and having the size of the vent discharge pipe. The drip pocket *shall* be installed to extend below the first change in vent pipe direction and *shall* be fitted with a valve or drain plug to permit removal of accumulated moisture.