

Reviewing and Inspecting HPD Projects that Use A2L Refrigerants

April 21, 2026

Moderators and Presenters:

- *Rosibel (Rosy) Tavares, Moderator*
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Attendees:

- *We will record this event*
- *Please introduce yourself in chat*
- *If you have questions, please use the Q&A function*



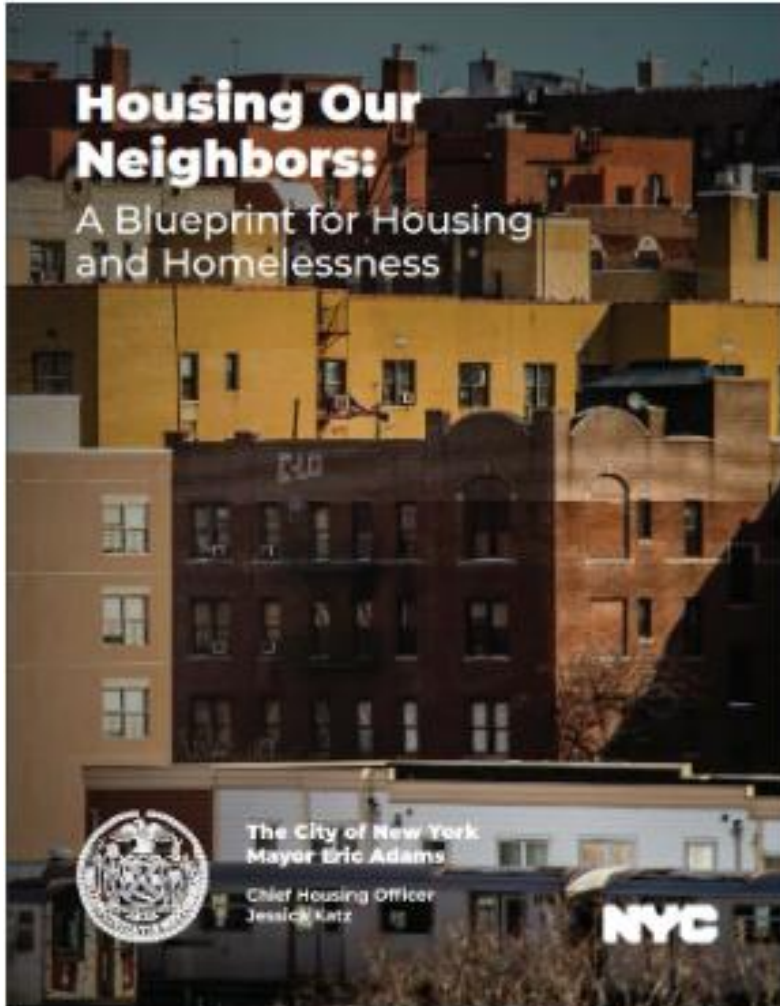
Reviewing and Inspecting A2L Projects: Agenda

Agenda:

- **Introduction: Electrification and A2L Refrigerants**
- **Regulatory Drivers: USEPA & DEC**
 - A2L use variances
- **Reviews and Inspections: A2L Requirements**
 - Calculations to confirm requirements (leak detection, ventilation, alarms)
 - Shaft enclosure, refrigerant line (pipe) identification, line protection
 - Other A2L requirements and design consideration to avoid hazards
- **Field Testing: Line Charging and Leak Prevention**
- **Additional Info and Q&A**

Introduction: Electrification of Heat and Cooling (Heat Pumps) using A2L Refrigerants

HPD's Commitment to Beneficial Electrification:



Fast-track equitable decarbonization and beneficial electrification to serve low-income households

We must ensure that the transition from a fossil-fueled economy is fair and equitable. Reaching New York City's ambitious climate targets while meeting our environmental justice goals will require significant investments in our housing stock, including scaling up beneficial electrification. Beneficial electrification reduces building emissions without creating additional costs for residents, and without stretching the energy grid in ways that may increase pollution and other environmental burdens in communities already disproportionately impacted by climate change.

SPOTLIGHT; Incubate and Pilot new ideas to scale beneficial electrification & resiliency through programs like the Retrofit Electrification Pilot and REDI

SPOTLIGHT: Release Sustainable Design Guidelines that create a clear and equitable pathway to decarbonization

Refrigerant Basics:

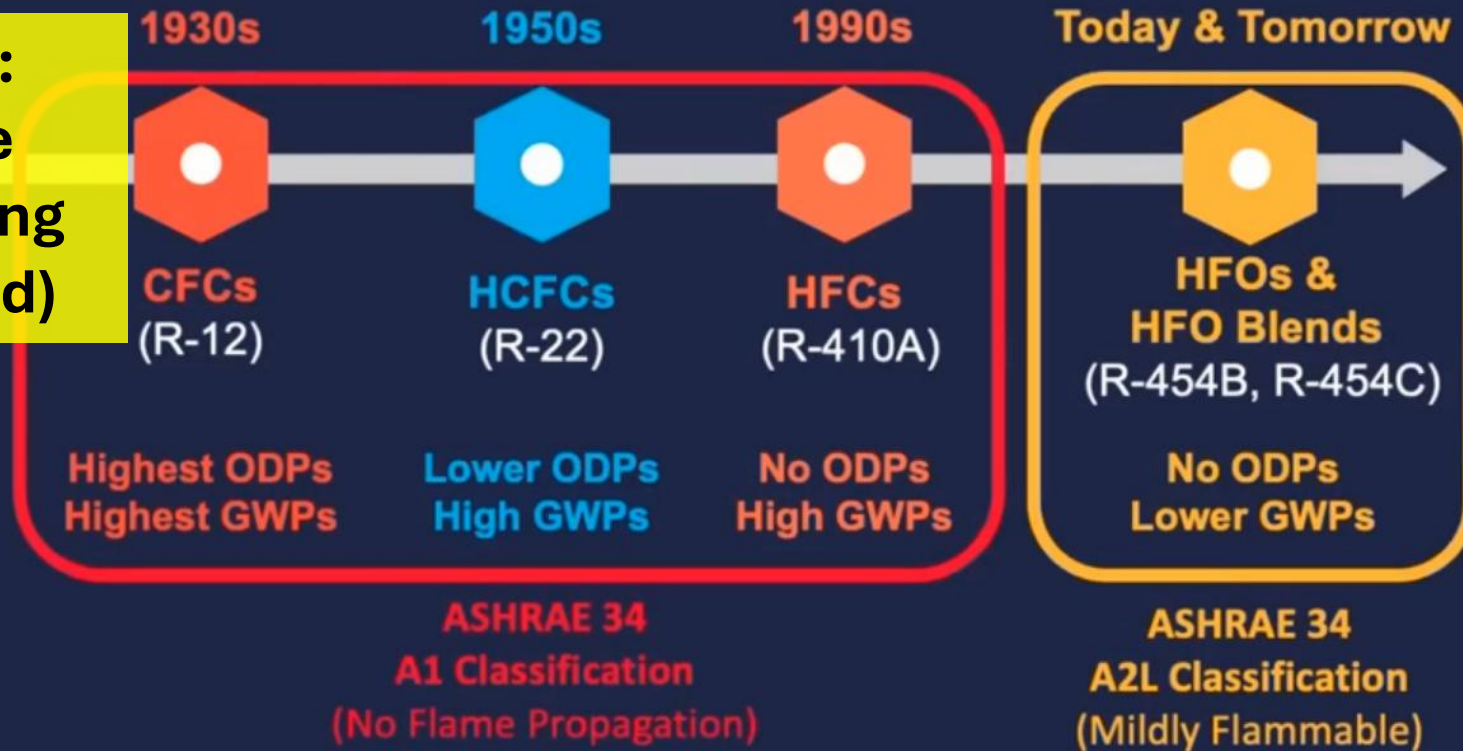
Definition: (from ASHRAE 15-2022 & 2022 Mechanical Code): *The fluid used for heat transfer in a refrigerating system; the refrigerant absorbs heat and transfers it at a higher temperature and a higher pressure, usually with a change of state.* This “phase change” allows refrigerants to **absorb and release large amounts of heat**. **Propane** and **ammonia** are common refrigerants.

Environmental Impacts (and why the “transition”):

- Popular early refrigerants (Freon and other “CFCs”) caused significant **ozone depletion** - no longer in use in residential HVAC applications.
- Newer refrigerants (HFCs) like R-410A with zero “ozone depletion potential” (ODP) had very high “**Global Warming Potential**” (GWP) – thousands of times higher than CO₂ (per unit weight). GWP20 of R-410A is 2,088.
- Refrigerants that can functionally replace HFCs (and earlier HCFCs), HFOs, have **lower GWP** but are “**mildly flammable**” – classified as **A2Ls**.

THE HISTORY OF REFRIGERANT INNOVATION

CFCs:
ozone
depleting
(banned)



Common A2Ls
in HP systems:
R454B & R32

Future?
Natural Refrigerants
(H₂O, CO₂, Ammonia?)

Primary image courtesy of
Rheem Corporation (from
on-line instructional
seminar:

[A2L Steps To Success](#)

A2L: Relative Flammability and Toxicity

- A2L is an ASHRAE safety classification that stands for:

A = non-toxic

2 = flammable

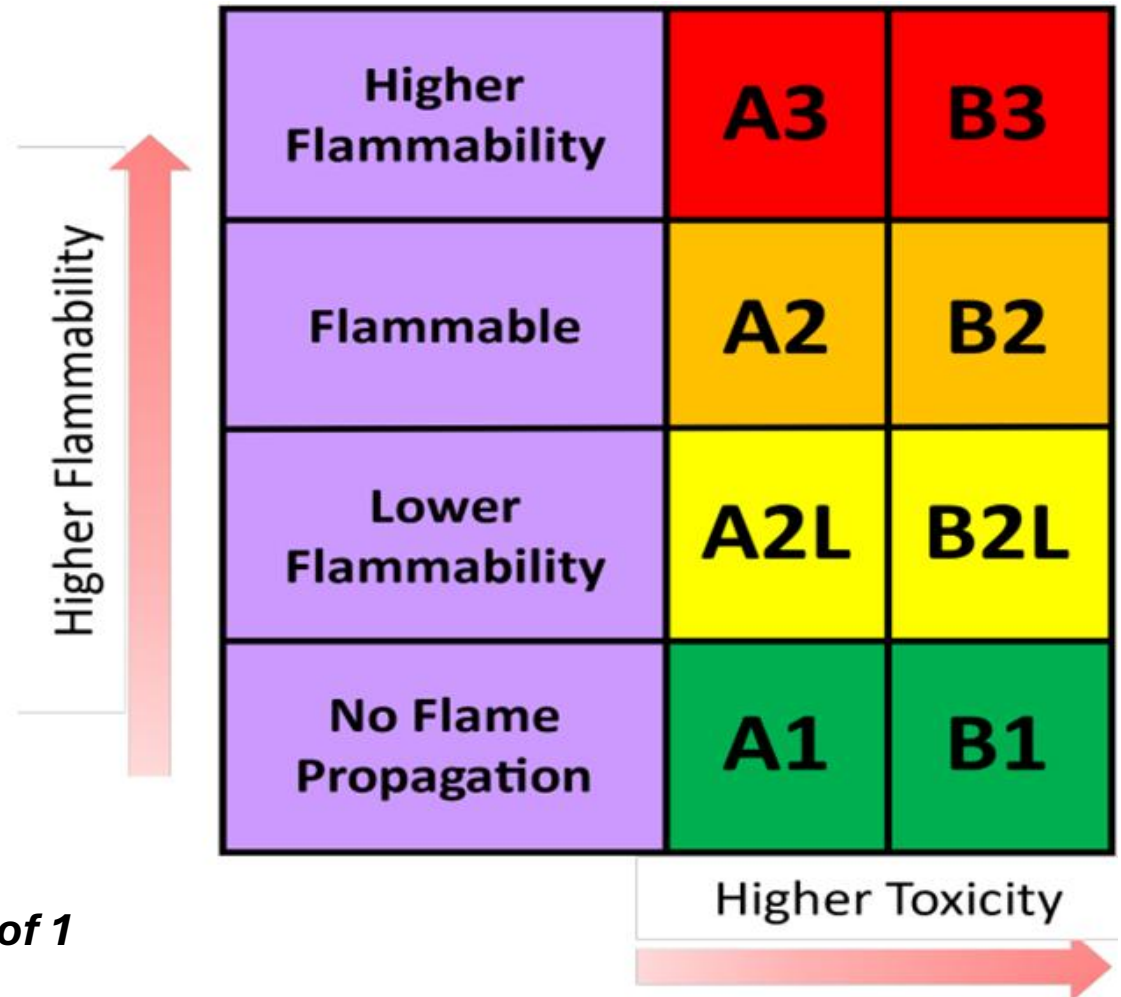
L = low burning velocity

R-410A is an A1 refrigerant with a GWP of 2088

R-744 (CO₂) is a natural A1 refrigerant with a GWP of 1

R-454B is an A2L refrigerant with a GWP of 467

R-717 (ammonia) is a natural B2L refrigerant with a GWP of 0



The diagram illustrates the ASHRAE safety classification matrix, which categorizes refrigerants based on their flammability and toxicity. A vertical red arrow on the left points upwards, labeled 'Higher Flammability', indicating that flammability increases from the bottom row (No Flame Propagation) to the top row (Higher Flammability). A horizontal red arrow at the bottom points to the right, labeled 'Higher Toxicity', indicating that toxicity increases from the left column (A) to the right column (B).

Higher Flammability	A3	B3
Flammable	A2	B2
Lower Flammability	A2L	B2L
No Flame Propagation	A1	B1

Impact and Performance Comparisons:

R-410A (phasing out)	R-32 A2L (Replacement)	R-454B A2L (Replacement)
~12% more efficient than R-22 (Freon)	~12% more efficient than R-410A	~5% more efficient than R-410A
GWP ~ 2100	GWP ~ 680	GWP ~ 470
ODP = 0	ODP = 0	ODP = 0
Non-toxic	Non-Toxic	Non-Toxic
Non-Flammable	Mildly Flammable	Mildly Flammable

GWP = Global Warming Potential (compared to CO₂) (GWP-20)

ODP = Ozone Depletion Potential

Regulatory Drivers

EPA's AIM Act

Description:

The American Innovation and Manufacturing (AIM) Act authorizes EPA to address HFCs by phasing down the production and consumption of Hydrofluorocarbons (HFCs) which are potent greenhouse gases (GHGs) and facilitating the transition over time to next-generation technologies through sector-based restrictions on HFCs.

Type	Refrigerant	GWP	Toxicity and flammability classification
HFO	R1234yf	<1	A2L
HFO	R1234ze	1	A2L
HC (natural)	R290 (propane)	3	A3
HFC	R32	675	A2L
HFC	R410A	2,088	A1
HFC	R454A	238	A2L
HFC	R454B	466	A2L
HFC	R454C	148	A2L
HFC	R513A	631	A1
(natural)	R717 (ammonia)	0	B2L
(natural)	R718 (water)	0	A1
(natural)	R744 (CO ₂)	1	A1

Toxicity and flammability classification: A= lower toxicity, B= higher toxicity; 1 = no flame propagation; 2L = lower flammability; 3 = higher flammability (See BS ISO 817 for full definitions). Grey shading indicates those refrigerants with GWP<150

Table 2: Refrigerants commonly employed in building services systems

← R410A has 3-4X the GWP as next-generation HFCs and >2,000 times the GWP as natural A1s like and H2O and CO₂.

DEC enforces EPA (Federal) air regulations in NY State

*The New York State Department of Environmental Conservation (NYSDEC) acts as the **primary state authority implementing and enforcing EPA air regulations under the Clean Air Act**. DEC develops State Implementation Plans (SIPs) to meet National Ambient Air Quality Standards (NAAQS), issues air permits (Title V, State Facility), monitors air quality, and enforces emission limits on facilities and motor vehicles, often adopting stricter standards than the federal government.*

Source: [Air - NYSDEC](#)

DEC's Timeline for the HFC Refrigerant Phase Out

- Any building **with a permit (issued in 2025) that includes R410-A** has until **1/1/2027** to be installed, charged and placed into operation.
- Buildings **without this permit** had only until 1/1/2026 to complete their project (**no longer allowed**).
- **DEC issued two variances** based on “impossibility” of compliance (exceptions):
 - **Project-Specific Variances:** Some HPD projects received extensions (2025)
 - **Manufacturer’s General Variance:** Some specific manufacturer’s products received exceptions (in 2025) that allowed:
 - Installation of specified (R410a) products manufactured before 12/31/25.
 - Projects must be completed (placed into operation) before 12/31/26.
- DEC variance process is still available (to extend deadlines, for example, for a project running long) but **no variances have been issues since the Fall of 2025**.

HPD-specific "Impossibility" Variance

One of the two approved variances applied to specific HPD Projects:

*“DEC is issuing the following variance. **For the projects identified by NYCHPD in its application dated April 7, 2025**, the prohibition on the installation of VRF systems using R-410a is suspended **until January 1, 2028** on the condition that the Compliance Plan and Mitigation Plan are implemented as presented in that application with the intent that the owners or operators of the systems limit R-410a leakage to be no more than the rate estimated in the application. DEC reserves the right to confirm that the Compliance Plan and Mitigation Plan are implemented as required.”*

DEC granted this variance in Spring 2025 based on projects expected to close in 2025. HPD does not anticipate applying for future extensions (although projects teams could). Approval conditions included adherence to HPD Technical Requirements (including refrigerant management).

Appendix A: Summary, GHG Assessment for projects included in Variance Request

GHG Impact Summary by Project										
	Dwelling Units in Project	Heat Pumps in Project	Total Cooling Tons	Sum of lbs of refrigerant	Sum of 1 BAU- GHG Tons CO2e	Sum of 2 Compliant- Tons CO2e	Sum of 3 Mitigated- Tons CO2e	GHG impact Tons CO2e (delta)	Car Year Equivalents	Tons CO2e Mitigated / Dwelling
	72	20	187	1,142	5,354	3,055	2,681	(374)	(625)	(37)
	95	17	125	643	2,685	1,532	1,386	(146)	(323)	(15)
	21	4	28	158	745	425	372	(53)	(87)	(18)
	55	12	134	475	2,217	1,265	1,111	(154)	(259)	(20)
	255	15	68	1,005	1,672	954	1,219	265	(284)	(5)
	34	5	30	183	863	492	431	(61)	(101)	(13)
	78	23	269	915	4,050	2,311	2,039	(271)	(475)	(20)
	67	13	156	620	2,923	1,668	1,462	(206)	(341)	(22)
	180	4	27	218	905	516	461	(56)	(107)	(3)
	145	13	156	875	4,126	2,354	2,063	(291)	(481)	(14)
	103	16	172	652	3,003	1,713	1,510	(203)	(352)	(15)
	453	106	764	3,369	15,764	8,994	7,897	(1,097)	(1,840)	(17)
	166	67	626	3,292	14,586	8,322	7,315	(1,006)	(1,705)	(44)
	89	9	29	179	169	96	169	72	(39)	(2)
	191	9	41	193	746	426	389	(37)	(91)	(2)
	85	26	122	1,829	7,190	4,102	3,622	(481)	(844)	(43)
	111	10	108	369	1,649	941	825	(116)	(192)	(7)
	62	5	30	145	604	345	312	(33)	(73)	(5)
Grand Total		374	3072	16,262	69,253	39,510	35,265	(4,245)	(8,217)	(239)

Manufacturer Approved Variance

A second variance was issued following an application by major VRF system suppliers:

*“DEC is issuing the following variance. The prohibition on the installation of VRF systems using R-410A is suspended **until January 1, 2027** for the VRF systems included by the Applicants in the application dated October 6, 2025, on the condition that the Compliance Plan and Mitigation Plan are implemented as presented in that application. This variance applies to the Applicant manufacturers and to any designers, owners or operators of the systems that were included in the variance application... **This variance does not cover VRF systems that were not identified in the October 6, 2025 variance application or any VRF system installed after January 1, 2027....**”*

Despite this variance, manufacturers may no longer supply new R410A products or components (after selling existing inventory). Manufacturers who were part of this variance:

Daikin, LG, Mitsubishi, and Samsung.

Could Regulations Change?



SALE: ONLY 25¢

[Sign in](#)

Lawmakers seek to claw back refrigeration mandates in Climate Act

New York lawmakers want the state Department of Environmental Conservation to claw back the refrigeration regulations imposed under the 2019 Climate Act.

By **Brendan J. Lyons**, Staff Writer

April 13, 2026



Both the EPA (which signaled it is not enforcing at least parts of AIM) and the NYSDEC may be under pressure to change the regulations (or at least the enforcement of regulations).... But that's a whole different seminar....

A2Ls: Not just Building Code Issue (FDNY Perspective)

SAFETY REMINDERS



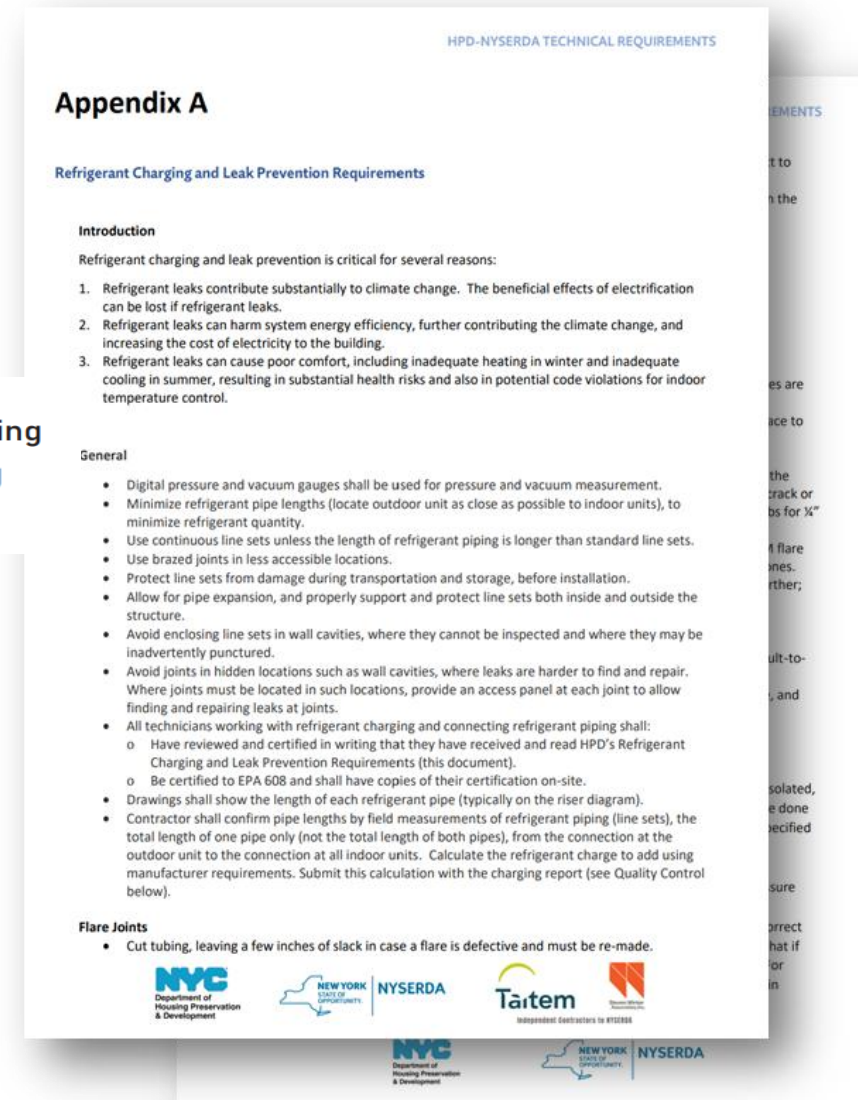
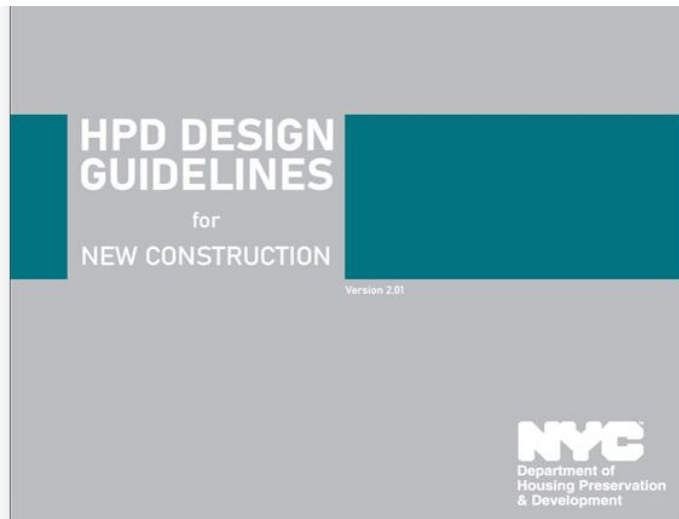
- Adequate ventilation is essential in areas where A2L refrigerants are used to prevent accumulation of flammable mixtures
- Use of sensors that can detect both refrigerant leaks and combustion risk
- Developing clear protocols for emergency situations involving A2L refrigerants
- Training personnel on emergency response procedures to handle potential fire incidents
- Class one division two electrical classification maybe required in rooms or spaces where adequate ventilation is not provided

HPD recommends ventilation to avoid this \$\$\$

HPD Refrigerant Leak Prevention Requirements

- NYC requirements from:
 - 2022 Mech Code Chapter 11
 - [ASHRAE 15-2022 9.12 Refrigerant Pipe Installation](#)

- Refrigerant leaks can greatly affect system efficiency and comfort, as well as posing significant harm to the environment. Projects must meet the Refrigerant Charging and Leak Prevention Requirements.



Reviewers and Inspectors: What to Expect (and check for)

Trying to avoid
this....

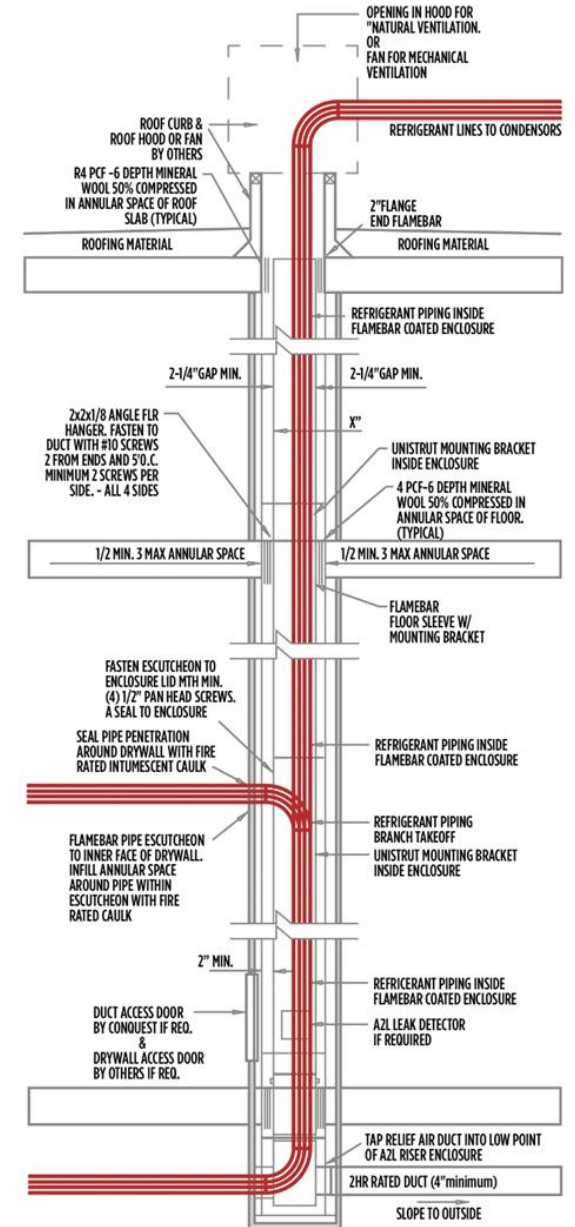


Refrigerant Lines – Shaft Enclosures or Exterior Risers?



← Exterior rises are common in residential and small commercial applications and can avoid shaft requirements -- but may impact aesthetics.

Fire rated and ventilated interior shafts can be complex, take up valuable real estate, and add heat loss and are expensive, but several projects have successfully integrated these.



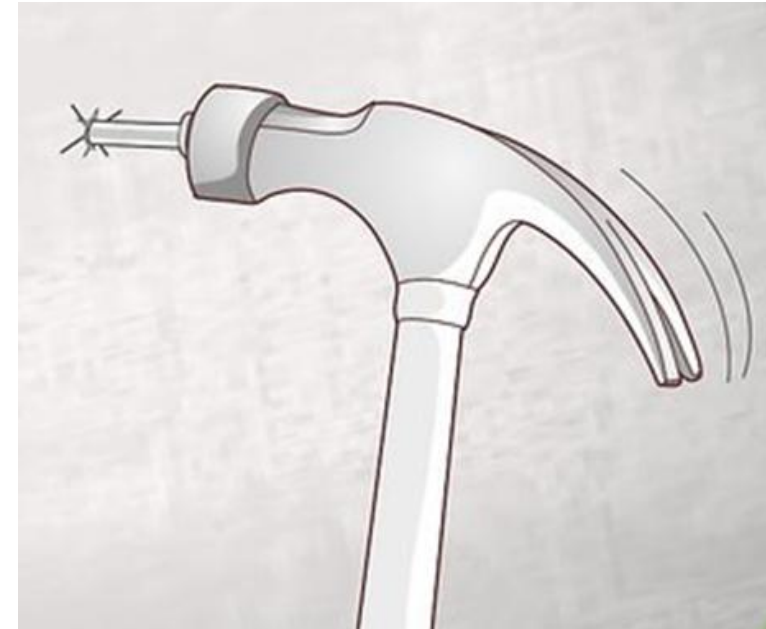
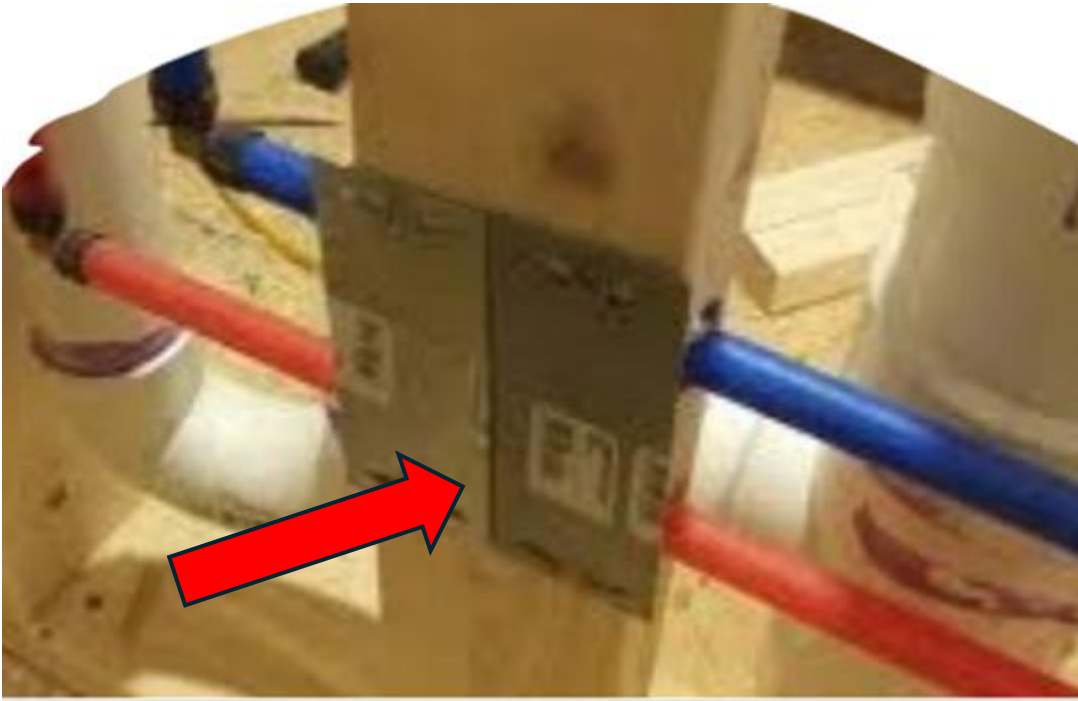
Refrigerant Lines – Shaft Enclosures

- Refrigerant lines penetrating **multiple floors require a fire-rated shaft enclosure** (1-hour rating for 2 floors, 2-hour ratings for 3+). (9.12.1.5)
- **Shafts must vent**; discharge must be 15' above ground, 20' from wall openings, and have a makeup air opening (9.7.8.2)
- Per 9.12.2.2, **natural vent shafts must have a 4" pitched (or level) exhaust pipe** (may be difficult for first floor applications given discharge distances)
- Mechanical ventilation (if used) must conform to Table 9-12, with a **refrigerant sensor at the bottom of the shaft to activate the fan** (for A2Ls that are heavier than air, like R32 and R454B).

References from ASHRAE 15 (2022). A more complete documentation of these requirements is available at: [A2L-Revised-Guidance_Rev1_2025.pdf](#)

A2L Refrigerant Line Protection

- **Pipe Protection:** Refrigerant Tubing located in studs, joists, rafters, or similar spaces located less than 1.5" from the nearest edge of a member shall be continuously protected by (min 0.0575" = 16 ga galv steel or 15 ga plain steel) shelf plates (9.12.1.2.a) to prevent accidental nail/screw penetration.



A2L Leak Detection

- Required if refrigerant charge is higher than **Refrigerant Concentration Limits (RCLs)**. RCLs are ~26% of Lower Flammable Limit (LFL) based on occupied space volume.
- RCLs of Common A2L Refrigerants (ASHRAE 34 [2022]): **~4.8 lb/1000 ft³ (R-32); 4.6 lb/1000 ft³ (R-454B)**.
- Typically required for **A2L systems other than small packaged room units** serving smaller spaces (bedrooms, residential spaces).
- **Calculations required** to approve/confirm exceptions.
- Leak detection **sensors, alarms, and/or mechanical ventilation or airflow dilution required** to mitigate risks.

A more complete documentation of these requirements is available at:
[A2L-Revised-Guidance_Rev1_2025.pdf](#)

A2L Refrigerant Systems Additional Requirements

Pipe Identification (labeling) per ASHRAE 15, 9.12.1.8

9.12.1.8 Pipe Identification

Refrigerant piping located in areas other than the room or space where the refrigerating equipment is located *shall* be identified in accordance with ANSI/ASME A13.1 ⁹. The pipe identification *shall* be located at intervals not exceeding 20 ft (6.1 m) on the *refrigerant piping* or pipe insulation. The minimum height of lettering of the identification label *shall* be 0.50 in. (12.7 mm). The identification *shall* indicate the *refrigerant designation* and safety group classification of *refrigerant* used in the *piping* system.

- a. For Group A2L and B2L *refrigerants*, the identification *shall* also include the following statement: "WARNING—Risk of Fire. Flammable Refrigerant."



Additional Requirements for Larger Systems

Per DEC (Part 494), Systems with over 50 lbs of A2L refrigerant require an Annual Refrigerant Management (compliance date varies by quantity)

- Typically: >100 feet cumulative interconnected line length, such as for a VRF system serving ~5 apartments or more). Check quantity calculations!
- >50 lbs of A2L requires dedicated Refrigerant System Operating Engineer (FC606.1.1) if not “fully automatic” -- or for any system with over 200 lbs (\$\$\$)

A2L Refrigerant Equipment (exterior HP compressors/condensors)

- Install exterior equipment with adequate clearances (to doors, windows, penetrations where refrigerants could leak into habitable spaces)
- Do not install equipment in any path of egress
- Avoid any high traffic areas

A2L VRF Design Considerations

- Relatively Low Refrigeration Concentration Limits to avoid additional requirements - calculations needed to understand requirements (including allowed leak mitigation controls)
- Advanced leak detection and annunciation
- Safety shut-off valves
- Minimize connections and avoid connections within inaccessible locations.
- Install, and thoroughly test (all) systems to reduce refrigerant leak potential and/or impacts (see Technical Requirements).

Summary: Review for A2L Code Compliance

- Request and review required **calculations**
 - **Charge size, thresholds for alarm** (based on room size – potential charge leakage)
 - **Mech room and/or shaft ventilation rates** (as appropriate)
- Verify incorporation of **special requirements**: fire-rated shafts, alarm systems, ventilation, refrigerant line protection, line labeling (HPD Technical Requirements and HPD Guidelines)
- Ensure project documents require **qualified contractors and technicians** to install and commission (HPD TRs and Guidelines)
- HPD “Technical Assistance Provider” (**TAP**) **members available to help** with questions on design or documentation.

Design to Avoid or Limit A2L Risks

1. “Packaged” systems (PTHPs or Window HPs) rather than VRF
 - Low refrigerant quantities
 - No field-installed refrigerant lines
2. Air-to-Water (hydronic distribution) systems
3. Equipment using **non-flammable**, low GHG refrigerant.
 - R-744 (CO₂) more efficient but requires much higher pressures
4. Use small “split systems” with min line length (limit refrigerant charges to avoid alarm threshold)
5. Design, install, and thoroughly test (all) systems to reduce refrigerant leak potential and/or impacts (see Technical Requirements).
6. Minimize connections and avoid connections within inaccessible locations.



Field Testing of and Line Charging of Refrigerant Lines

Leak Testing and Charging Refrigerant Lines

- A2L design practices should nearly eliminate fire risk
- Leak testing is still necessary
 - Provides extra margin of safety
 - Prevents performance loss, callbacks, premature equipment failure
 - A2L refrigerants are climate pollutants
- Tests must be performed by **trained and certified** refrigerant technicians
- Documentation is required
 - Technician certification (EPA 608)
 - Line set lengths
 - Pressure test and evacuation results
 - Refrigerant charge (total and added)

HPD **Technical Requirements:**

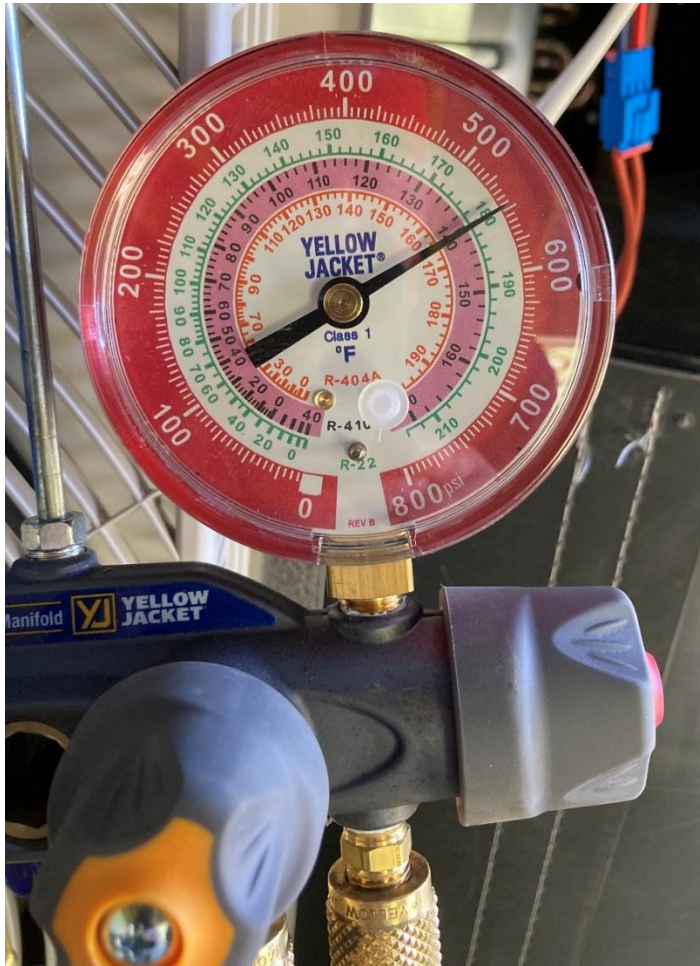
Refrigerant Charging and Leak Prevention

- Apply to ***split systems*** (not packaged or window heat pumps)
- Require **digital gauges**
- **Pressure test** (dry nitrogen)
 - 550 psi (or higher if manufacturer requires) for 1 -24 hrs depending on total line length
 - Corrections for ambient temperature
 - Bubble solution on fittings
- **Evacuation and vacuum decay test** procedures
 - Removes air and moisture and provides additional leak check
 - Evacuation target: 100 microns (0.00139 psi)
 - Decay target: <200 microns after 15 minutes to pass.
 - Longer testing (1-24 hrs) required to comply with code
- **Charging procedures**
 - Refrigerant charge must be calculated and weighed in
 - Line set lengths and charge must be recorded

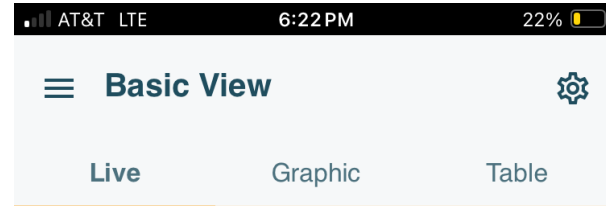
Common Testing Issues

- Contractors may attempt short-cuts.
 - Testing takes time and may interfere with other work processes – time is contractor money!
- Testing requires pre-planning and coordination
 - Walls need to stay open for visual and leak checks
 - Final testing requires a complete system
 - Testing must be observed by owner's representative
 - Challenges with schedules and sequencing
- Improper gauges.
 - Standard analog gauges not accurate enough for advanced refrigerant testing
- Specialty work: need well-trained, certified refrigerant professionals
- Don't forget the documentation! Important for future checks and charging

Analog vs. Digital Gauges



Analog Gauge



testo 605i · 176		⋮
Air Temperature	45.0 °F	
Relative Humidity	69.7 %RH	
Dew Point	35.7 °F	
Wet Bulb Temperature	40.7 °F	
Absolute Humidity	0.1553 g/cft	

testo 549i · 957		⋮
Pressure	544.4 psi	

Start



Digital Gauge

Additional Information & Links

DEC & Refrigerants:

- [Part 494 FAQ](#)
- [Part 494 Fact Sheet](#)
- [Part 494/495 Requirements for Suppliers and Owners or Operators - NYSDEC](#)
- <https://dec.ny.gov/sites/default/files/2024-12/part494expresstermsofficial.pdf>
- <https://www.aeon.com/resources/how-does-the-epa-technology-transition-rule-impact-the-hvac-industry-and-what-are-the-key-considerations-for-hvac-professionals>
- https://up.codes/viewer/new_york_city/nyc-mechanical-code-2022/chapter/11/refrigeration#1101.6
- <https://www.ashrae.org/technical-resources/standards-and-guidelines/read-only-versions-of-ashrae-standards>

HPD Electrification Resources:

- [HPD Technical & Refrigerant Management Requirements- Split System Heat Pump for Space Heating](#)
- [VRF Convening Public Summary: VRF issues for Multifamily \(conclusion: VRF last resort, not “premier”\)](#)

Qs? Ask the HPD (and TAP) for assistance. Send questions to: sustainability@hpd.nyc.gov.





Q&A