

A2L Refrigerants: Handling, Tooling & Code Rules (the 2026 Baseline)

YES Electric • Arc Workforce Academy HVAC Apprenticeship

Draft 1 (October 2026). This lesson is under review. Videos are made by other companies, not YES Electric; follow this lesson and your journeyman where they differ. Boxes marked "Shop photo coming" will get real photos from our shop in a later version.

Unit 5 • Refrigerants, EPA 608 & Charging • Appendix A Comp 14 SIGNS HERE — curriculum gap #5, closed Class time: ~4 hrs (1.5 video + 2.5 bench) — Unit 5 written exam follows

1. What you'll be able to do

- Work R-32 / R-454B equipment with the **A2L rule-set as reflex**: recovered-and-purged before flame, A2L-rated recovery machine/detector, dedicated hoses (left-hand threads), ventilation awareness, no smoking/ignition sources in the work zone.
- Explain the equipment-side safety package on new units: **leak (mitigation) sensors, dissipation boards, blower interlocks** — and wire/test one (the ACST Carrier video, hands-on).
- Apply the charge-size/room-size logic conceptually (why a big charge can't serve a tiny room — the dissipation math exists even when the table does it for you).
- Charge and diagnose A2Ls with the SAME skills as Unit 5 taught — weigh-in (5.6), subcool (5.5), the matrix (5.7) — noting the small numeric differences (454B's mild glide, 32's higher pressures).
- Translate for customers and crew: "mildly flammable" honestly framed — the hazard is real, engineered-against, and managed by procedure, not bravado or fear.

2. Tools & materials

- A2L bottle set (5.1's museum), A2L-rated recovery machine + detector (4.7/5.3 gear), dedicated hose set
- A current R-454B unit (or the dissipation-board training kit): sensor, board, wiring diagram
- The 5.x bench fleet for the charge-practice crossover
- Manufacturer install manuals (Carrier/Bryant 454B, Daikin R-32) — the rule SOURCE

3. Watch first

Order	Video	Channel	Length	Why
1	A2L R-454B & R-32 Explained — Bottles, Changes, Rules, Tools	AC Service Tech	21:31	The complete changeover briefing
2	A2L Leakage Sensor & Dissipation Board Wiring Install	AC Service Tech	20:01	The new hardware, hands-on
3	Charging R-454B Slightly Low	AC Service Tech	20:00	Your 5.5 skills on the new gas
4	Subcooling with R-454B	HVAC School	15:38	Glide handled properly
5	R-32/R-454B Charge Scenarios Practice	AC Service Tech	14:50	The quiz reel, A2L edition
6	Flammable Refrigerant Safety Basics — Kalos Meeting	HVAC School	24:09	The safety frame

4. The idea

What actually changed (and what didn't)

Didn't change: the cycle (1.1), saturation (1.3), SH/SC meaning (1.4), the charging methods (5.4–5.6), the matrix (5.7), brazing-with-nitrogen (4.4 — you were already doing the A2L-safe thing). Your craft transfers whole.

Changed:

Area	The A2L delta
Ignition discipline	No open flame/spark near a system until recovered AND nitrogen-purged (now a hard rule, not just craft); no smoking on site; A2L-rated (spark-safe) recovery machine and vacuum-rated tools per listing
Tools	A2L-rated recovery machine + leak detector; dedicated hoses (left-hand threads force it) ; bottle handling per 5.1
Equipment hardware	Factory leak sensors + dissipation boards : on refrigerant detection → blower forced ON (dilute), compressor/strips interlocked per logic — a new diagnostic layer YOU will service
Install rules	Charge-size vs room-volume tables (manual!), sensor placement specs, documented pressure tests/decay (4.5/4.6's logs now mandatory)
Numbers	R-32: ~5–10% higher pressures than 410A (its own P/T column!); R-454B: slightly lower + mild glide (charge as liquid — 5.6 already taught it; subcool against the BUBBLE point per the gauge/app's 454B setting)
Transport/storage	Quantity thresholds, ventilated van compartment, upright + capped (5.1) — our SOP card

The dissipation system (the new hardware on every install)

THE A2L SAFETY PACKAGE — NEW HARDWARE ON EVERY INSTALL

YOUR TOOL CHANGES



A2L-rated recovery machine

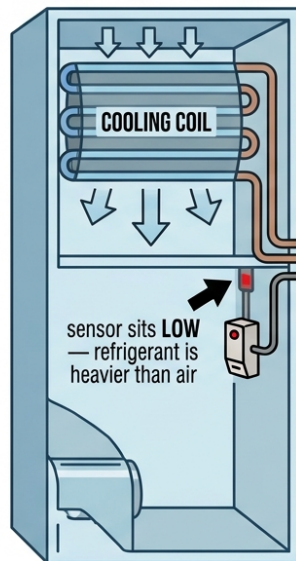


A2L-rated leak detector



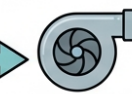
DEDICATED hoses —
left-hand threads force it

INDOOR AIR HANDLER



sensor sits **LOW**
— refrigerant is
heavier than air

DISSIPATION BOARD



BLOWER →
FORCED ON FULL
(dilute below
flammability floor)



**IGNITION-CAPABLE
LOADS** → **LOCKED OUT**

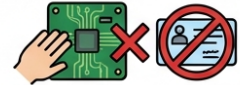


FAULT CODE →
thrown & stored

THE HARD RULES



1. NO FLAME until recovered
+ nitrogen-purged



2. NEVER bypass the
dissipation board
(license-ender)



**3. documented pressure test
+ decay** on every install

Sensor (typically at the indoor coil, low — heavier-than-air gas) watches for refrigerant → on trip, the board: forces the **blower ON full** (dilution below flammability floor), locks out ignition-capable loads per its logic, throws a code. Service realities you'll own: sensors have lifespans/ replacement intervals (manual), false trips happen (cleaners/aerosols — ask what was sprayed before condemning), interlock wiring follows the DIAGRAM (3.7 skills — and never gets bypassed; a jumped-out dissipation board is a license-ender, same category as a jumped rollout).

"Mildly flammable," said honestly

To ignite, A2L needs concentration inside a narrow band AND a high-energy sustained source — harder to light than the propane in half the garages you'll work next to, slower-burning when lit. The procedures (purge, ventilate, rated tools, sensors) hold the probability at engineering-zero. Neither the tech who fears the gas nor the one who mocks the rules is professional; **the rules ARE the safety**, same as 3.2's meter ritual.

5. Bench procedure

- 1. The changeover table drill:** from memory, whiteboard the didn't-change / changed columns. (The exam asks exactly this.)
- 2. Sensor & board lab:** wire the dissipation kit per the manual's diagram (3.7 + 6.x skills): sensor placement reasoning, interlock verification — trip it (test mode/per-manual stimulus): watch blower force on, read the code, reset properly. Then the false-trip scenario (instructor sprays the "contaminant" near the sensor): diagnose **WITHOUT** condemning hardware.

3. **A2L recovery crossover:** one full recovery (5.3 procedure) on the A2L rig with the rated machine — note what felt identical (everything) and what gated it (the machine + hoses).
4. **Charge crossover:** the quiz-reel video paused-and-verdicted; then one live subcool check on the 454B unit with the gauge app set to 454B (the bubble-point selection moment — get it wrong and every number shifts).
5. **Site-discipline walk:** the shop "job site" staged with violations (a lit torch cart near the staged unit, a non-rated detector, 410A hoses laid out): find all the violations in 5 minutes.
6. **UNIT 5 WRITTEN EXAM** (5.1–5.8) closes the unit: matrix, methods, EPA, A2L deltas.

Checkout: the violations walk (all found) + sensor lab completed + one A2L charge reading with correct app setting. **Comp 14 SIGNED.** Unit 5 complete.

6. Field gotchas

- **The old detector reads A2Ls poorly or not at all** — your 4.7 hierarchy still works, but the electronic step needs the rated tool. Check the spec sticker on YOUR detector today.
- **Glide on 454B:** small ($\sim 1.5^{\circ}\text{F}$) but real — gauges/apps with the refrigerant set correctly handle it; manual P/T cards need the bubble/dew columns read right (1.3's blend flag, cashed).
- **Mixed-tool cross-contamination:** A2L hoses stay A2L (threads help); recovery cylinders labeled per gas, never blended (5.1/5.3 rules — now with a flammability reason stacked on the purity reason).
- **Retrofit fantasy:** R-32 does NOT drop into a 410A system — pressures, listings, and the absent sensor package all say no. The unit is designed as a system (UL listing included).
- **The dissipation board in the attic in August** will get blamed for "random blower runs" — check its code memory before condemning thermostats.
- **Crew & customer language:** "new-generation refrigerant with extra safety hardware" lands; "flammable freon" panics; "it's nothing" invites complacency. Calibrated honesty, always.

7. Competency link

- **Comp 14 — SIGNED. UNIT 5 COMPLETE** (Comps 12–17 signed; 18 accrues in field repairs).
- The A2L rule-set rides along through every install capstone (7/8/9 — all on current-generation equipment).

8. Check yourself

1. Five things that did NOT change with A2Ls, five that did.
2. The hard flame rule, verbatim.
3. Walk the dissipation sequence from sensor trip to blower behavior — and the one thing you NEVER do to that board.
4. Why does the sensor sit LOW at the indoor coil?

5. R-32 vs 410A pressures — direction and rough size. R-454B's quirk?
 6. What enforces hose discipline physically?
 7. A 454B subcool reads 6°F low against plate... on a gauge set to R-410A. What happened?
 8. False sensor trip: two innocent causes and your diagnostic move.
 9. Why is "R-32 drop-in for my 410A unit" a hard no — three reasons.
 10. Deliver the customer line on A2L safety in two sentences.
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(2026-06-10) · UNIT 5 COMPLETE — written exam next session