

Recovery Hands-On: Machine, Tank, Hoses, Done Right

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 13 SIGNS HERE (requires 5.2's cert) Class time: ~4.5 hrs (1.5 video + 3 rig work)

1. What you'll be able to do

- Rig and run a **complete vapor recovery**: machine, recovery cylinder on a scale, hose strategy, purge, run to the required level (5.2's table), shut down clean.
- Compute and respect the **80% cylinder fill** by weight (tare + capacity math) — and stop a fill BEFORE the scale says you should have.
- Speed the job legitimately: **liquid recovery first then vapor**, push-pull on big charges, ice-bath/cool the cylinder, short fat hoses, cores out (4.6's tricks transfer).
- Recover from a **dead-compressor system** (the common real case) without drama.
- Finish like a professional: label the cylinder, log weights, system tagged, paperwork done (5.2's trail).

2. Tools & materials

- Recovery machines (program standard + the A2L-rated unit), spare filters/driers for them
- Recovery cylinders (empty + partials), **scales** (one per rig), ice bucket
- Hose sets w/ core tools & sight glasses; manifold; the donor systems (charged practice condensers — nitrogen/refrigerant blend per training norms)
- Log sheets; cylinder labels

3. Watch first

Order	Video	Channel	Length	Why
1	Recovery Procedure incl. Hose Vacuum + Tank Weight	AC Service Tech	18:40	The full ritual with the scale math
2	Recovery Machine, Hose, Tank & Tool Setup	AC Service Tech	17:18	Setup logic
3	Hose Setups, Strategies, A2Ls & Issues	AC Service Tech	20:52	Strategy + the A2L wrinkles
4	Recovering w/ a Working Compressor	HVAC School	3:07	The pump-down assist option
5	5 Tips for Faster Recovery	AC Service Tech	6:20	Speed, legitimately
6	Don't Overfill Recovery Cylinders the Easy Way	HVAC School	23:18	The 80% rule, lived

4. The idea

The standard vapor recovery (the backbone)

VAPOR RECOVERY — THE RIG & THE 80% MATH

'RIG DIAGRAM'

AC CONDENSER
LIQUID PORT
SIGHT GLASS
RECOVERY MACHINE
IN
OUT
VAPOR
RECOVERY CYLINDER
SCALE
30.5 LB
cool cylinder = faster

LIQUID FIRST (10× faster), then vapor finish

CYLINDER COLLAR STAMPS

TW 24 lb (tare) • **WC** 47.7 lb (water capacity)

MAX REFRIGERANT = $0.8 \times 47.7 = 38.2 \text{ lb}$

COMPUTE THE STOP WEIGHT BEFORE ANY HOSE CONNECTS — write it on the log

THE SCALE IS NOT OPTIONAL — overfilled cylinders in hot trucks are hydrostatic bombs

1. **Cylinder on the scale, ZEROED with knowledge:** read the tare (TW) and water capacity (WC) off the collar. **Max refrigerant** = $0.8 \times \text{WC} \times \text{refrigerant density factor}$ (the field shortcut: $0.8 \times \text{WC}$ for the common gases is conservative and safe —

exact factors in the manual). Compute the STOP weight before any hose connects; write it on the log.

2. **Hose strategy:** system liquid port → (sight glass) → machine IN; machine OUT → cylinder VAPOR valve initially. Short, fat, few. Purge the hoses (de minimis done right) or pre-vacuum them (the ACST method — cleaner).
3. **Liquid first:** pull liquid while it exists (10× faster than vapor); watch the sight glass go from liquid to flash to vapor.
4. **Vapor finish:** machine grinds the rest down to the required level (5.2's table — typically into vacuum for our Type II gear). Valve sequence per machine; watch the suction gauge settle and HOLD (a rising system pressure after stop = more boiling out of the oil — run again; the decay-test mindset from 4.6 in reverse).
5. **Shutdown order matters** (machine purge cycle — clears ITS heart of liquid), valves closed system→machine→cylinder, weights logged (recovered lbs = the number on every document), cylinder labeled (refrigerant, date, job).

Faster, legitimately

- **Cool the cylinder** (ice bath/shade): lower cylinder pressure = bigger pressure difference = faster flow (P/T chart working for you).
- **Push-pull** (big charges, >15–20 lb with liquid line access): cylinder vapor → machine → system vapor side push, system liquid → cylinder liquid pull — moves liquid in bulk without it passing through the machine. Set up exactly per diagram or you'll chase your tail.
- **Cores out** (VCRTs again), **short hoses, machine filter fresh** — the same physics as 4.6.
- **System assist:** compressor runs? A controlled pump-down toward the condenser before recovery shrinks the job (the 3:07 video; mind the LP cut-out bypass ethics — momentary, attended, never jumpered-and-left).

The dead-compressor reality

No pump-down assist available; liquid may pool everywhere cold. Recover liquid port first regardless; heat helps (sun, heat gun on the receiver area gently, NEVER torch); patience on the vapor tail as refrigerant boils out of cold oil. The last pound takes as long as the first ten — the law cares about the level, not your schedule.

A2L recoveries

A2L-rated machine (spark-free design), dedicated hoses (threads enforce), ventilation awareness, same levels. The habit-delta is small because our A1 habits were already clean — that's the point of teaching them clean (5.8 consolidates).

5. Rig procedure

1. **The math gate:** every student computes a STOP weight from three different cylinders' stamps (incl. one partial — current weight changes available room, not the max). No rig time until the math is automatic.

2. **Full vapor recovery #1 (narrated):** each student end-to-end on the donor system: hoses, purge/pre-vac, liquid-then-vapor, to required level, hold-watch, shutdown order, label + log. Instructor checklist, graded.
3. **Speed round (#2):** same job, apply the legit accelerators (ice bath, cores out, hose discipline). Compare times — typically 30–40% faster. Speed came from PHYSICS, not corner-cutting; say which trick bought what.
4. **Push-pull demo** (instructor + volunteers) on the big-charge rig — the hose map drawn before any connection, then run.
5. **The overfill tripwire:** instructor's rigged scenario — partial cylinder where the naive plan would pass 80% mid-job. The pass is CATCHING it during planning (swap cylinders or split the recovery).
6. **Paperwork close:** every recovery's log entered like a real job; cylinders labeled and staged "for reclaim shipment."

Checkout: unaided full recovery to level on a fresh donor — correct stop-weight math, hose strategy, liquid-first, hold verified, clean shutdown, label + log complete. **Comp 13 SIGNED** (with the 5.2 cert in the file).

6. Field gotchas

- **The scale is not optional.** Overfilled cylinders are hydrostatic bombs in hot trucks; the 80% rule has a body count. Compute, watch, stop early.
- **Recovering INTO a warm, nearly-full cylinder** can stall (pressures equalize) — swap cylinders rather than "let the machine fight it" (machines die as martyrs to laziness).
- **Liquid slugging the machine:** most recovery machines tolerate some liquid; none tolerate a career of it. Sight glass + throttle valve = machine lives.
- **Mystery/mixed gas** (5.1's fingerprint says weird): recover to the MIXED cylinder, never blend into your good recovery stock.
- **Non-condensables in your recovery cylinder** (you pulled a system that had air): that cylinder's contents are now reclaim-only — don't "reuse to top off" recovered gas anyway unless same-owner recycle rules AND quality are satisfied (when in doubt: reclaim path).
- **Tag the system you emptied** ("recovered [date], [lbs], by [name]") — the next tech (or the scrapper, or the inspector) needs to know it's legal to cut.

7. Competency link

- **Comp 13 — SIGNED** (cert 5.2 + hands-on here).
- Recovery opens every changeout/repair in Units 7–9; the scale-math habit returns in weigh-in charging (5.6 — same scale, opposite direction).

8. Check yourself

1. Stop-weight math: cylinder stamps TW 24 lb / WC 47.7 lb, currently holds 12 lb. How much MORE can it legally take? ($0.8 \times 47.7 = 38.2$ max $\rightarrow$ 26.2 more.)
 2. Why liquid-first, and what does the sight glass show at the transition?
 3. The shutdown order and what the machine's purge cycle protects.
 4. System pressure creeps back up 10 minutes after you stop. What's happening and what does the law say?
 5. Three legitimate speed tricks and the physics of each.
 6. Push-pull: when, and sketch the hose map.
 7. Dead compressor, cold morning, 12 lb charge. Your plan?
 8. What changes for A2L recovery?
 9. Why does a hot partial cylinder stall a recovery, and the professional move?
 10. What goes on the cylinder label and the system tag?
-

Arc Workforce Academy · YES Electric LLC Apprenticeship 2026-AL-141731 · Lesson 5.3 v1.0
(2026-06-10)