

EPA SECTION 608 UNIVERSAL

Klein Cooling Training Program - Master Classroom Guide | October 2026

THIS IS THE MASTER CLASSROOM VERSION. Use it throughout training, mark it up, and pair each section with current practice questions. It is intentionally more complete than a cram sheet while still focusing on EPA-tested material.

Universal = Core + Type I + Type II + Type III. Section 608 credentials do not expire. Core must be proctored to count toward Universal.

1. CORE - PURPOSE, ENVIRONMENT & THE LAW

Who is a technician?

- A person who maintains, services, repairs, or disposes of stationary refrigeration/A/C equipment when the activity can reasonably release refrigerant.
- Attaching/detaching hoses or gauges, adding/removing refrigerant, or otherwise opening the refrigerant circuit are technician activities.
- **Apprentice exception:** an uncertified apprentice may work while closely and continually supervised by a certified technician.

Ozone and climate basics

- **CFCs** contain chlorine, fluorine and carbon. UV light can release chlorine in the stratosphere; chlorine destroys ozone.
- **HCFCs** also contain chlorine but generally have lower ODP than CFCs. R-22 is the classic HVAC example.
- **HFCs** contain no chlorine, so ODP is zero, but many have significant GWP.
- **ODP** = ozone depletion potential. **GWP** = global warming potential.
- **Montreal Protocol: 1987.** International agreement addressing ozone-depleting substances.

Venting prohibition

- **July 1, 1992:** knowingly venting CFC/HCFC refrigerants during service, maintenance, repair or disposal became prohibited.
- **November 15, 1995:** the prohibition was extended to substitute refrigerants, subject to EPA exemptions for specific substitutes/end uses.
- **De minimis:** minimized releases associated with a good-faith recovery/service effort, such as hose connection/disconnection, are treated differently from intentional venting.
- Do not assume a hydrocarbon may simply be vented. EPA venting exemptions are refrigerant/end-use specific.

The Three Rs

Term	Definition
RECOVER	Remove refrigerant from an appliance and store it externally without necessarily testing or processing it.
RECYCLE	Extract and clean refrigerant for reuse, generally for equipment of the same owner, using oil separation/filtering/moisture removal.
RECLAIM	Reprocess refrigerant to the applicable AHRI 700 purity specifications and verify purity using the required analytical method.

Recover = take it out. Recycle = clean it up. Reclaim = restore and verify purity.

Same owner vs. new owner

- Recovered/recycled refrigerant can generally be returned to the same appliance or another appliance owned by the **same person** without reclamation.
- Used refrigerant sold or transferred for use by a **different owner** generally must first be reclaimed by an EPA-certified reclaimer.

2. CORE - SALES, EQUIPMENT, RECORDS & SHIPPING

Refrigerant sales restriction

- Only appropriately certified Section 608/609 technicians, or qualifying employers/authorized representatives that employ certified technicians, may purchase restricted refrigerant.
- Section 608 certification covers refrigerant intended for stationary refrigeration/A/C equipment. Certification type limits what an individual may purchase/use consistent with covered appliances.
- The sales restriction applies to refrigerant in cylinders, cans or drums; equipment/components already containing refrigerant are not treated the same as bulk refrigerant sales.

Recovery/recycling equipment certification

- Most recovery/recycling equipment must be tested to EPA requirements. EPA-approved equipment testing organizations include **AHRI and UL**.
- Certified machines carry a label stating that the equipment has been certified by AHRI/UL to meet EPA minimum requirements for the appropriate appliance category.
- Use recovery equipment according to its manufacturer instructions to achieve the required recovery level.
- Equipment manufactured/imported after January 1, 2017 uses newer Appendix B3/B4 standards depending on refrigerant flammability; the exam's classic recovery-level split still repeatedly uses the **11/15/1993** cutoff.

Technician records

- Keep proof of Section 608 certification at the technician's place of business.
- When disposing of appliances containing **5-50 lb** of refrigerant, records must cover location/date/type recovered for each appliance, monthly quantities by refrigerant type, and quantities transferred for reclamation/destruction, recipient and transfer date.
- An employer may keep those records, but the technician remains responsible for ensuring they are kept.
- For covered 50+ lb ODS appliances, technicians have additional invoice/leak-inspection/verification documentation duties.

Safe disposal

- The final disposer must obtain proper verification that refrigerant was recovered, or use an appropriate contract with a regular commercial supplier.
- EPA does not mandate a sticker as the required verification method.
- A person recovering refrigerant solely to prepare a small appliance/MVAC-like appliance for final disposal does not necessarily need technician certification, but the recovery equipment must meet applicable performance standards.

Shipping

- Refrigerant cylinders shipped in commerce require proper refrigerant identification and applicable **DOT classification/labeling**.
- Do not confuse EPA service rules with DOT transportation rules; both can apply to a recovery cylinder being transported.

3. CORE - SAFETY, CYLINDERS, GAUGES & REFRIGERATION

Cylinder safety

- **Never refill a disposable cylinder.** Use approved refillable recovery cylinders.
- **80% maximum fill.** Liquid refrigerant needs expansion space. Use a scale.
- EPA's test-topic material identifies traditional reusable recovery cylinders by the familiar **gray body/yellow top** convention; always rely on required markings/labels, not paint alone.
- Never mix different refrigerants in one recovery cylinder.
- Never use oxygen or compressed air to pressure-test a refrigeration system. Use dry nitrogen with a regulator and relief device.
- Refrigerant can cause frostbite, oxygen deprivation and other health hazards. Use gloves/goggles and appropriate ventilation/PPE.
- Extreme heat/flame can decompose refrigerants into hazardous products. Never deliberately expose refrigerant vapor to flame.

Gauges

- **Blue** conventionally identifies the low-side/compound gauge and hose; **red** identifies high side; **yellow** is the service/charging/recovery hose.
- A compound low-side gauge reads positive pressure and vacuum. The high-side gauge is a pressure gauge and is not intended to measure deep evacuation.
- **PSIA = PSIG + about 14.7** at sea level. Example: 0 psig is approximately 14.7 psia.
- **0 psig is not a vacuum.** A vacuum is below atmospheric pressure.

Basic refrigeration cycle

- **Evaporator:** absorbs heat; liquid/vapor refrigerant boils toward vapor.
- **Compressor:** takes low-pressure vapor and raises its pressure/temperature.
- **Condenser:** rejects heat and condenses vapor to liquid.
- **Metering device:** creates a pressure drop and meters refrigerant into the evaporator.
- At saturation, refrigerant pressure corresponds to saturation temperature; this is the basis of a P-T chart.

Common components and refrigerant state

- **Receiver:** high-side liquid storage downstream of condenser.
- **Accumulator:** low-side device intended to keep liquid from reaching the compressor; normally sends vapor/oil onward.
- Know whether a question is describing high-side liquid, high-side vapor, low-side mixture or low-side vapor before choosing an answer.

Leak clues

- Oil residue can indicate a refrigerant leak because oil often travels with refrigerant.
- Low charge can cause abnormal superheat/subcooling patterns; diagnose rather than assuming one symptom proves a leak.
- Leak-test and repair as appropriate before repeatedly adding refrigerant.

4. CORE - OILS, BLENDS, RECOVERY & EVACUATION

Refrigerant and lubricant compatibility

- There are **no universal drop-in replacements**. Refrigerant pressure, lubricant, materials, metering and safety requirements can differ.
- EPA's test-topic examples include **ester/POE lubricants with R-134a applications** and **alkylbenzene with HCFC applications**. Follow equipment/refrigerant manufacturer requirements.
- POE oils are hygroscopic - they readily absorb moisture. Keep systems/oil containers closed and minimize exposure.

Blends and fractionation

- Zeotropic blends can fractionate because components can leak or boil at different rates.
- Many blends are removed from the cylinder as **liquid** when charging to preserve composition; follow manufacturer instructions.

Recovery vs. evacuation

- **Recovery** removes refrigerant. **Evacuation/dehydration** removes air and moisture after refrigerant recovery/open-system work.
- Air/noncondensables can increase head pressure; moisture can freeze at restrictions, react chemically and damage a system.

Faster recovery

- Recover liquid first when practical, then vapor.
- Use short, large-diameter hoses and minimize restrictions.
- A cooler recovery cylinder lowers cylinder pressure; a warmer appliance raises appliance pressure. Use safe approved methods.
- After reaching the required level, wait and watch for pressure rise. Refrigerant can remain trapped in oil/liquid pockets.

System-dependent vs. self-contained

- **Self-contained** recovery equipment has its own means of drawing refrigerant.
- **System-dependent/passive** recovery relies on appliance pressure and/or the appliance compressor.
- **15 lb rule:** system-dependent recovery generally cannot be used on appliances containing more than 15 lb, except applicable small-appliance provisions.

NOVEMBER 15, 1993 = key recovery/recycling equipment manufacture cutoff used throughout classic Section 608 recovery requirements.

5. REFRIGERANT RECOGNITION

Refrigerant	Family	Safety	What to associate with it
R-11	CFC	A1	Classic low-pressure / Type III.
R-12	CFC	A1	Legacy medium-pressure CFC.
R-22	HCFC	A1	Legacy residential/light-commercial high-pressure refrigerant.
R-123	HCFC	B1	Low-pressure / Type III.
R-134a	HFC	A1	HFC; zero ODP; common EPA lubricant example.
R-410A	HFC blend	A1	High-pressure HFC blend; zero ODP.
R-32	HFC	A2L	Lower-GWP mildly flammable refrigerant used in new equipment.
R-454B	HFC/HFO blend	A2L	Lower-GWP A2L R-410A replacement.
R-600a	Hydrocarbon	A3	Isobutane; highly flammable; small-appliance applications.
R-290	Hydrocarbon	A3	Propane; highly flammable; approved only for specified applications.

Safety classification: A/B = lower/higher toxicity classification; 1/2L/2/3 = increasing flammability characteristics. A2L means lower toxicity with lower burning velocity/mild flammability.

Hydrocarbon retrofit trap

- EPA's test topics specifically call out that hydrocarbons are **not approved as generic retrofits** for systems designed for other refrigerants. Use only refrigerants approved for the specific equipment/end use.

R-22 milestones

- January 1, 2010:** major U.S. phaseout milestone for R-22 in new equipment/new production uses.
- January 1, 2020:** U.S. production/import of virgin R-22 for servicing ended; recovered/reclaimed supplies can still be used.

6. TYPE I - SMALL APPLIANCES

Definition: fully manufactured, charged and hermetically sealed in a factory with 5 lb or less of refrigerant. The figure refers to manufactured charge.

- Examples include household refrigerators/freezers, window A/C units, water coolers and certain dehumidifiers.

Condition	Required recovery
Post-11/15/93 equipment + compressor operates	At least 90%
Compressor does not operate	At least 80%
Pre-11/15/93 recovery equipment	At least 80%
Alternative endpoint	4 in. Hg vacuum

Working compressor = 90%. Dead compressor = 80%. Do not confuse this 80% with the recovery-cylinder 80% fill rule.

- With a dead compressor, accessing both sides improves recovery because refrigerant can remain trapped/dissolved in oil.
- Solderless piercing valves are temporary service devices and should generally be removed after service because they can leak.
- High-temperature/flame exposure can create dangerous refrigerant decomposition products.

7. TYPE II - HIGH- & VERY-HIGH-PRESSURE APPLIANCES

Major repair

- **Major repair** involves removal of the compressor, condenser, evaporator or an auxiliary heat exchanger coil.
- For certain non-major repairs not followed by evacuation, high/very-high-pressure equipment is brought to **0 psig** before opening.

Required evacuation levels

Appliance / full charge	Pre-11/15/93	Post-11/15/93
Very high-pressure	0 in. Hg	0 in. Hg
High-pressure, < 200 lb	0 in. Hg	0 in. Hg
High-pressure, >= 200 lb	4 in. Hg	10 in. Hg
Medium-pressure, < 200 lb	4 in. Hg	10 in. Hg
Medium-pressure, >= 200 lb	4 in. Hg	15 in. Hg
Low-pressure	25 mm Hg absolute	25 mm Hg absolute

Classify FIRST: pressure category -> charge size -> recovery-equipment date -> required level.

Leak repair rule - current Section 608 scope

For appliances with a full charge of **50 lb or more of ozone-depleting refrigerant**, current annualized trigger rates are:

Category	Trigger
Comfort cooling	10%
Commercial refrigeration	20%
Industrial process refrigeration	30%
Other covered appliances	10%

- Generally repair within **30 days**, or create a retrofit/retirement plan within 30 days and complete it within 1 year, subject to regulatory exceptions/extensions.
- If an industrial process shutdown is required, the normal repair period is **120 days**.

Do NOT apply 10/20/30 blindly to every HFC-only system. Section 608's current leak-repair provisions and newer AIM Act HFC management rules have different scope.

Safety and machinery rooms

- Do not energize a hermetic/reciprocating compressor while it is in a deep vacuum.
- EPA test topics reference ASHRAE 15 machinery-room safety, including oxygen-deprivation/refrigerant detection requirements where applicable.
- Use nitrogen, regulator and relief device for pressure testing - never oxygen or compressed air.

8. TYPE III - LOW-PRESSURE APPLIANCES

Think centrifugal chillers. Much of the appliance operates below atmospheric pressure, so air/moisture tend to leak **into** the system.

Purge system

- The purge removes noncondensables. It draws from the area where noncondensables collect, commonly the **top of the condenser**.
- Excessive purge operation can indicate an air leak.

Recovery

- Required recovery level: **25 mm Hg absolute** for low-pressure appliances.
- Recover liquid first, then vapor. Refrigerant can remain dissolved in oil.
- After reaching the required vacuum, wait several minutes and watch for pressure rise; remaining liquid/refrigerant in oil may boil off.
- Traditional exam material includes heating low-pressure chiller oil to about **130°F** before removal to reduce refrigerant release.

Freeze protection and recharging

- Deep evacuation lowers saturation temperature; water in chiller tubes can freeze and damage them.
- Circulate/remove water as appropriate to prevent freezing.
- When recharging from a deep vacuum, introduce **vapor before liquid** to raise pressure and reduce freezing risk.
- Centrifugal chillers are charged through the **evaporator charging valve**.

Pressurizing/leak testing

- For a non-major repair, EPA test topics emphasize controlled hot water or a built-in system heating/pressurization device as allowable/preferred ways to raise pressure.
- If nitrogen is used where appropriate, use it carefully with regulator/relief protection and never exceed manufacturer limits.
- Traditional test-prep material commonly teaches a **10 psig maximum** for low-pressure leak testing; manufacturer limits govern if lower.

Additional Type III exam items

- Know the recovery machine's **high-pressure cutout** concept: rising recovery-cylinder/recovery-machine pressure must shut the unit down before unsafe pressure develops.
- R-11, R-113 and R-123 are classic low-pressure refrigerants.
- Common study values: R-11 atmospheric boiling point about **74.7°F**; R-123 about **82°F**.
- EPA test topics reference ASHRAE 15 machinery-room refrigerant sensing requirements, including R-123.

UNIT TRAP: Type II often uses inches Hg vacuum. Type III uses mm Hg absolute. They are not interchangeable.

9. NUMBERS & DATES TO KNOW COLD

Fact	Answer
Montreal Protocol	1987
CFC/HCFC venting prohibition	July 1, 1992
Recovery-equipment cutoff	November 15, 1993
Substitute venting prohibition	November 15, 1995
Small appliance	5 lb or less manufactured charge
Recovery-cylinder max fill	80%
Type I, compressor operating	90% recovered
Type I, compressor not operating	80% recovered
Type I alternative	4 in. Hg vacuum
System-dependent recovery limit	15 lb
PSIA conversion	PSIG + ~14.7 at sea level
High-pressure <200 lb, post-1993	0 in. Hg
High-pressure >=200 lb, post-1993	10 in. Hg
Medium-pressure <200 lb, post-1993	10 in. Hg
Medium-pressure >=200 lb, post-1993	15 in. Hg
Low-pressure recovery	25 mm Hg absolute
Section 608 ODS leak-rule threshold	50 lb or more full charge
Comfort / commercial / industrial	10% / 20% / 30%
Normal repair clock	30 days
Industrial shutdown repair period	120 days
Retrofit/retirement completion	Generally within 1 year
R-22 milestones	2010 / 2020
Low-pressure oil study temperature	~130°F
Traditional low-pressure leak-test figure	10 psig max

10. COMMON EXAM TRAPS

- **5 vs. 15:** 5 lb = small appliance; 15 lb = system-dependent recovery limitation.
- **80 vs. 90:** Type I dead compressor 80%; operating compressor 90%; cylinder fill limit is also 80% but is a different rule.
- **1992 / 1993 / 1995:** venting / recovery-equipment cutoff / substitute venting.
- **0 psig:** atmospheric gauge pressure, not vacuum.
- **Recover vs. evacuate:** refrigerant removal vs. air/moisture removal.
- **Recycle vs. reclaim:** clean for same-owner reuse vs. verified purity for resale/new owner.
- **Same owner vs. new owner:** this determines whether reclamation is generally required.
- **Inches Hg vs. mm Hg absolute:** different scales; identify Type II vs. Type III.
- **10/20/30:** know both the numbers and the rule's scope.
- **Manufactured charge vs. current charge:** Type I's 5-lb definition uses manufactured charge.
- **Hydrocarbon:** do not assume 'natural refrigerant' means approved retrofit or automatically ventable.
- **Old practice tests:** 15% comfort cooling / 35% industrial process are legacy leak-rate values.

11. STUDENT MASTERY CHECKLIST

CORE - student can explain without guessing:

- CFC/HCFC/HFC, chlorine/ozone, ODP vs. GWP, Montreal Protocol.
- Venting prohibition and de minimis concept.
- Recover/recycle/reclaim and same-owner vs. new-owner reuse.
- Sales restriction, recovery-machine certification label, technician records and shipping labels.
- 80% cylinder rule, nitrogen safety, gauges, PSIG/PSIA and P-T relationship.
- Basic cycle, component states, oil compatibility, blends/fractionation.

TYPE I:

- Define small appliance; 5 lb; 90%/80%; 4 in. Hg; passive recovery and dead-compressor strategy.

TYPE II:

- Define major repair; classify appliance/charge/equipment date; use evacuation table; understand leak-rule scope and safety.

TYPE III:

- Explain inward air leaks, purge purpose/location, 25 mm Hg absolute, freeze risk, vapor-first charging, evaporator charging valve and safe pressurization.

12. HOW TO USE THIS WITH PRACTICE EXAMS

- Teach one section, then take the matching current practice section.
- Every missed question becomes a handwritten note explaining **why** the correct answer is right.
- For number questions, underline: appliance type, refrigerant/pressure category, charge size, compressor condition and recovery-machine date.
- When free study material conflicts with current EPA material, verify against EPA/eCFR rather than memorizing the legacy answer.

The goal is not to memorize 100 disconnected facts. Identify what equipment/rule the question is testing, then recall the applicable fact.

SOURCE & CURRENCY NOTES

Built around the U.S. EPA's current Section 608 **Test Topics**, Technician Certification Requirements, Stationary Refrigeration Service Practice Requirements, Recovery/Recycling Equipment Certification, Refrigerant Sales Restriction, Recordkeeping/Reporting, Safe Disposal and Refrigerant Reclamation requirements. The user-supplied free 2026 cheat sheet was used as a secondary source for useful memory hooks and exam-focused facts.

Important: EPA does not approve study guides. Regulatory requirements can change, particularly HFC management under the AIM Act. Use current EPA rules and manufacturer instructions for field compliance.

Penalty note: Clean Air Act civil penalty maximums are inflation-adjusted. Because the dollar amount can change, this master classroom guide intentionally teaches that penalties can be assessed per day/per violation without hard-coding a figure that may become stale.

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