

R-454B Puron Advance A2L

Josh Goodman

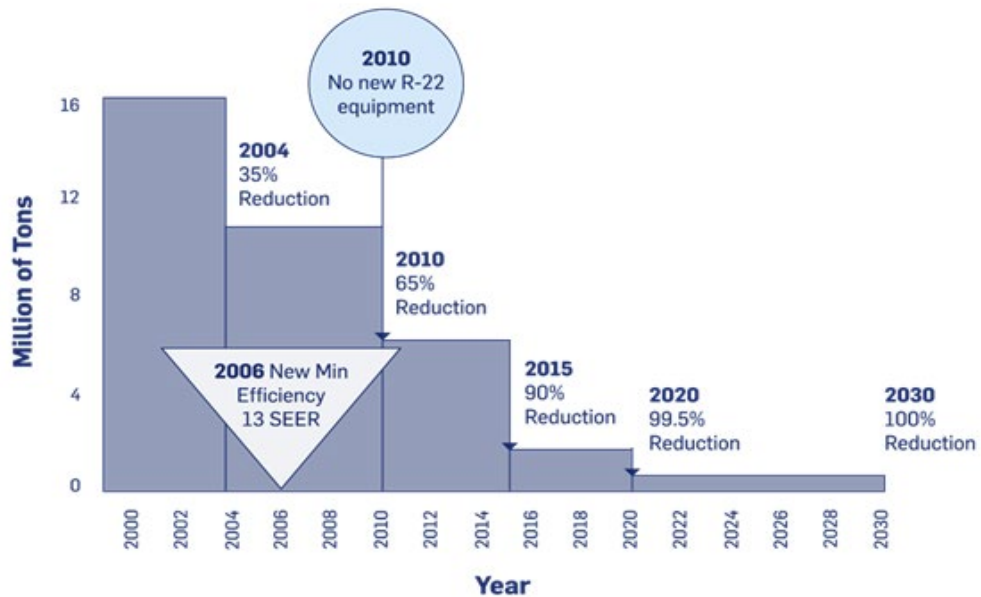


R-454B Overview

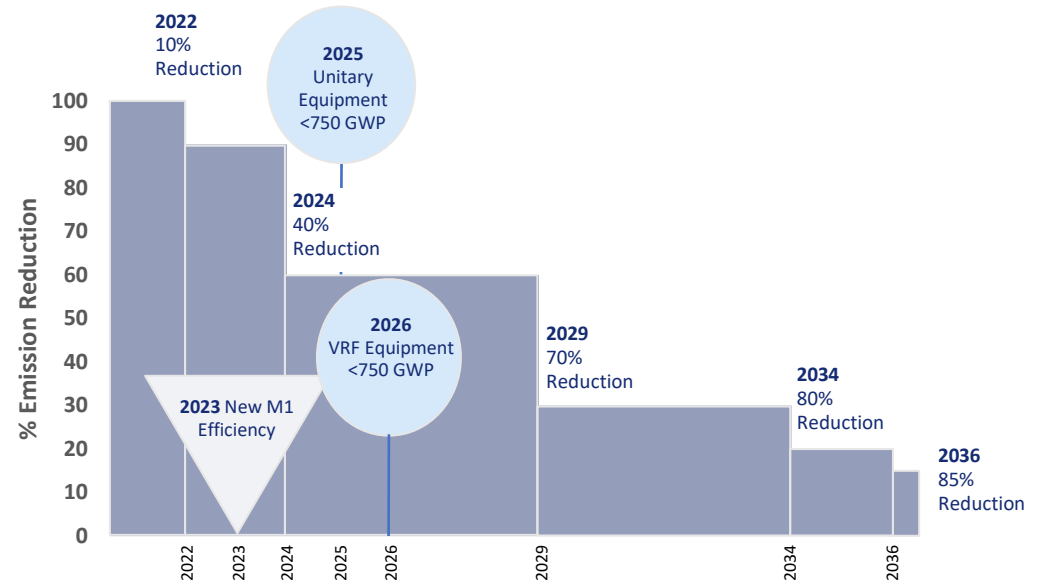
Why the change?

AIM ACT – SUPPLY WILL BE RESTRICTED

R22 Phaseout



HFC Phasedown



R-454B Overview

Why the change?

Other Impacts of AIM Act

Product Transitions

| Transition date | Equipment | Requirement | Where ⁽¹⁾ ? |
|-----------------|-------------------------------------|---|---|
| January 1, 2023 | TRU | GWP ≤ 2,200 | California National ⁽²⁾ |
| January 1, 2024 | Chillers | SNAP Rule 21 Refrigerants ban GWP ≤ 750 | 12 States - CA, CO, DE, MA, MD, ME, NJ, NY, VA, VT, WA, RI National ⁽²⁾ |
| January 1, 2025 | Res and Light CML Stationary A/C | GWP ≤ 750 | California, Washington National ⁽²⁾ |
| January 1, 2026 | VRF | GWP ≤ 750 | California, Washington National ⁽²⁾ |

Refillable Cylinders



Reclaim! Reclaim! Reclaim!

R-454B Overview

Why R-454B?

R-454B

Leader in regulatory.

Puron[®] Advance will be compliant until at least 2034

GWP

466

Lower discharge temperatures

- Fewer design changes to the compressor and fewer design changes for higher ambient temperatures
- Lower discharge temperatures are also associated with longer reliability

Little to no glide

R-32

Short term solution.

Will begin phase-out in 2029

GWP

675

Over 200 pts higher than R-45B

Higher discharge temperatures

When compared to R-454B

No glide

R-410A

Short term solution.

Anticipated changes before 2025

GWP

2088

Over 75% higher than current 410A




Equal or lower discharge temperatures

When compared to R-454B

Little to no glide

R-454B Overview

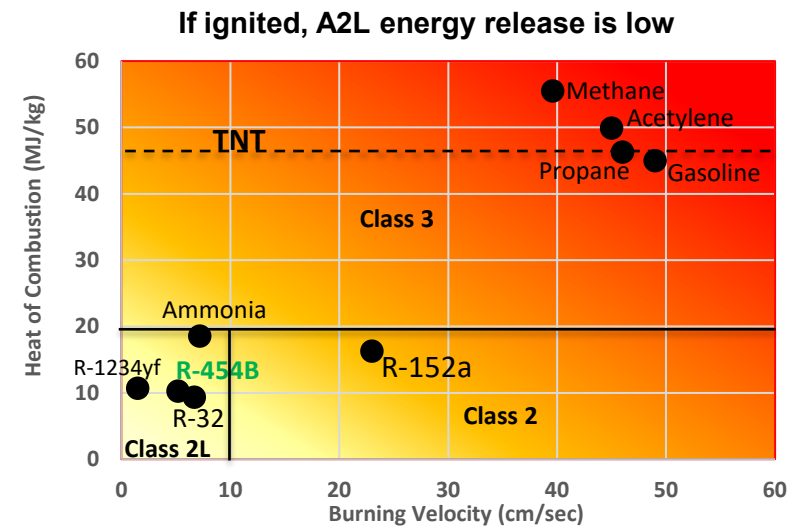
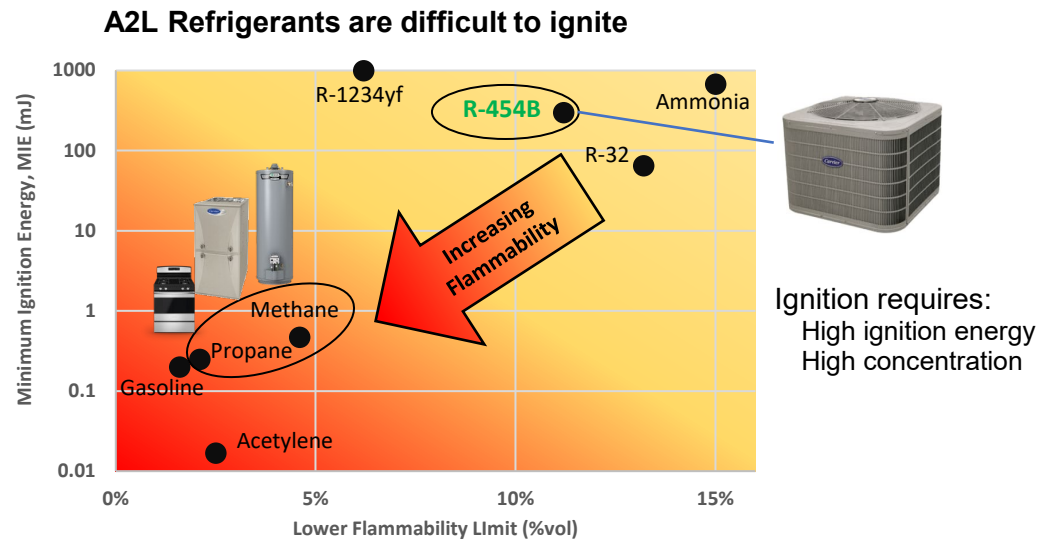
Why R-454B?

| | ASHRAE Class | Example Refrigerants | |
|---------------------------|----------------------|--|---|
| Increasing flammability ↑ | Higher Flammability | A3 Propane, Isobutane | Ignites very easily Potentially Explosive  |
| | Lower Flammability | A2 | Ignites Easily Relatively High Energy Release  |
| | | A2L | R-454B, R-32, R-454A, R-455A “Mildly Flammable” Difficult to Ignite Relatively Low Energy Release Low Flame Speed  Low Grade Coal |
| | No Flame Propagation | A1 R-410A, R-404A, R-134a, R-452A Equinox Blends | No Flame Propagation |

R-454B Overview

Why R-454B?

- A2L refrigerant is a low risk... it is just a new issue:



Most Household Objects are NOT A2L ignition sources:



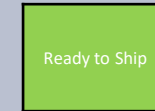
Potential A2L Ignition Sources:



R-454B Overview

Carriers projected release plan

| Product | Description | 2023 | | | | 2024 | | | | 2025 | | | |
|--------------|---|---|----|----|----|------|----|----|----|------|----|----|----|
| | | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| AC | <u>Greenspeed / Extreme VS AC (C / B)</u> | | | | | | | | | | | | |
| | VS AC (C / B) | | | | | | | | | | | | |
| | 2stg AC | | | | | | | | | | | | |
| | South 1stg AC | | | | | | | | | | | | |
| | North 1stg AC | | | | | | | | | | | | |
| | 3ph 1stg AC | | | | | | | | | | | | |
| | <u>Horiz. AC</u> | | | | | | | | | | | | |
| Furnace Coil | V-Coil Vert | | | | | | | | | | | | |
| | V-Coil MP | | | | | | | | | | | | |
| | A-Coil MP | | | | | | | | | | | | |
| | Slab-Coil MP | | | | | | | | | | | | |
| HP | <u>Greenspeed / Extreme VS HP (C / B)</u> | | | | | | | | | | | | |
| | VS HP (C / B) | | | | | | | | | | | | |
| | 2stg HP | | | | | | | | | | | | |
| | 3ph 1stg HP | | | | | | | | | | | | |
| | 1stg HP | | | | | | | | | | | | |
| Fan Coils | MF (3rd party) 454B | | | | | | | | | | | | |
| | Entry Tier 454B | | | | | | | | | | | | |
| | Mid Tier 2-stage 454B (<u>IntelliSense</u>) | | | | | | | | | | | | |
| | High Tier Var Spd 454B | | | | | | | | | | | | |
| Gas Furnace | Entry - GF | Separate kit to connect into G terminal | | | | | | | | | | | |
| | Mid - GF | Separate kit to connect into G or ABCD terminal | | | | | | | | | | | |
| | Dlx - GF | Separate kit to connect into G or ABCD terminal | | | | | | | | | | | |
| SPP | Entry MH | | | | | | | | | | | | |
| | Entry G | | | | | | | | | | | | |
| | Mid G | | | | | | | | | | | | |



- Dates indicate readiness to ship Puron Advance® product. These are not hard cutover timelines.
- Evaluating allocation model to drive early shipment of Puron Advance® products
- Speed of phase out of R410a will depend on a factors such as demand, availability and price of R410a, state codes, etc.

R-454B Overview

- Equipment covered in this presentation is residential split ducted equipment.
- Does not apply to Ductless, VRF or Commercial

R-454B Overview

Safety, Storage & Transportation



Go Above.
Think Beyond.

R-454B Overview

Safety, Storage & Transportation

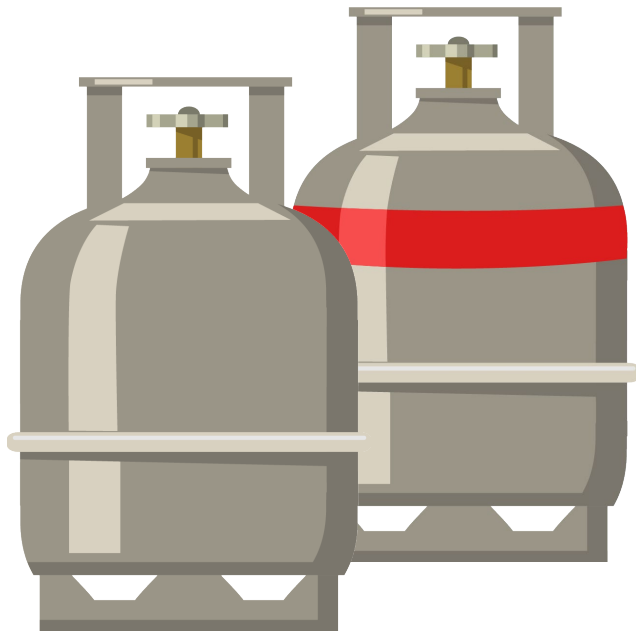
- How do we store the refrigerant safely in a warehouse?
- Do I need to make changes to my truck to carry this new refrigerant?
- Will my equipment be different when working with A2L refrigerant?
- Do any processes change when I charge or braze on an A2L system?



R-454B Overview

Safety, Storage & Transportation

Cylinders for A2L Refrigerants



Service cylinder requirements

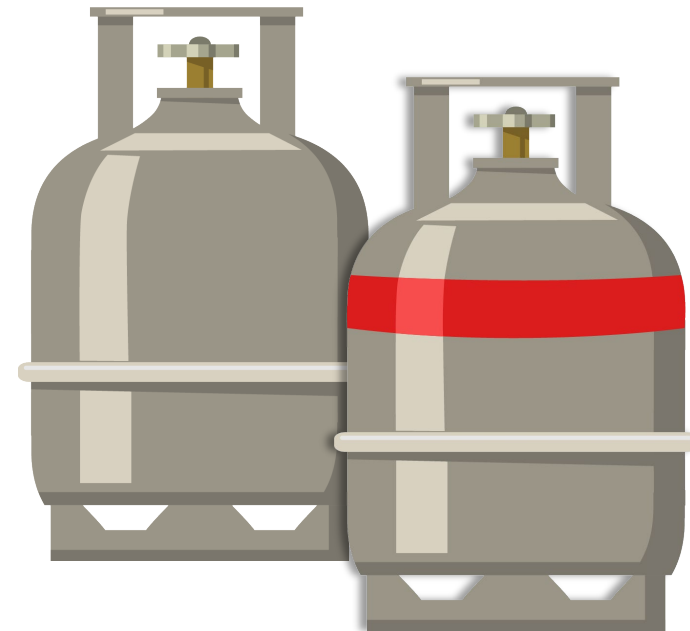
- Same?
- Different?

R-454B Overview

Safety, Storage & Transportation

Color

- A1: Light green gray
- A2L: Light green gray with red top
- Type of refrigerant is marked on cylinder and/or tag



R-454B Overview

Safety, Storage & Transportation



Threads (connections)

- A1: RH thread
- A2L: LH thread

R-454B Overview

Safety, Storage & Transportation

Pressure safety design features

A1: Rupture disc



A2L: Pressure relief valve



R-454B Overview

Safety, Storage & Transportation

Two warning labels are required for cylinders that contain A2L refrigerants.

Flammable

- Potentially flammable contents



Compressed Gas

- High pressure gas that could explode when heated

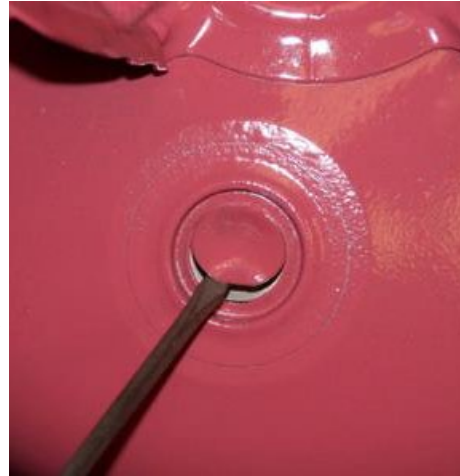


R-454B Overview

Safety, Storage & Transportation

Cylinder end of life handling

- A1: Remove or puncture rupture disc



- A2L: Puncture side of cylinder



Source: https://www.ahrinet.org/sites/default/files/2022-11/AHRI_Guideline_Q_2016.pdf

R-454B Overview

Safety, Storage & Transportation

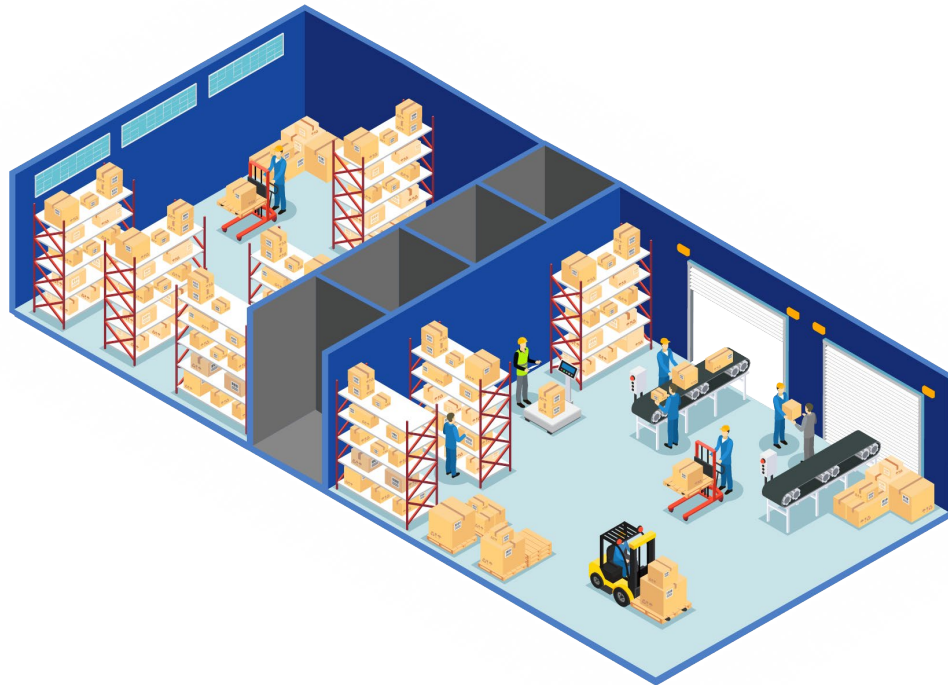


Recovery cylinders

- Yellow Top – A1 and A2L
- Yellow top with Red band – A2L

R-454B Overview

Safety, Storage & Transportation



How are cylinders of A2L refrigerants stored and transported safely?

R-454B Overview

Safety, Storage & Transportation

Follow all standards & codes from IFC & NFPA



R-454B Overview

Safety, Storage & Transportation

Maximum allowable quantity (MAQ)

- Used to evaluate storage capacity

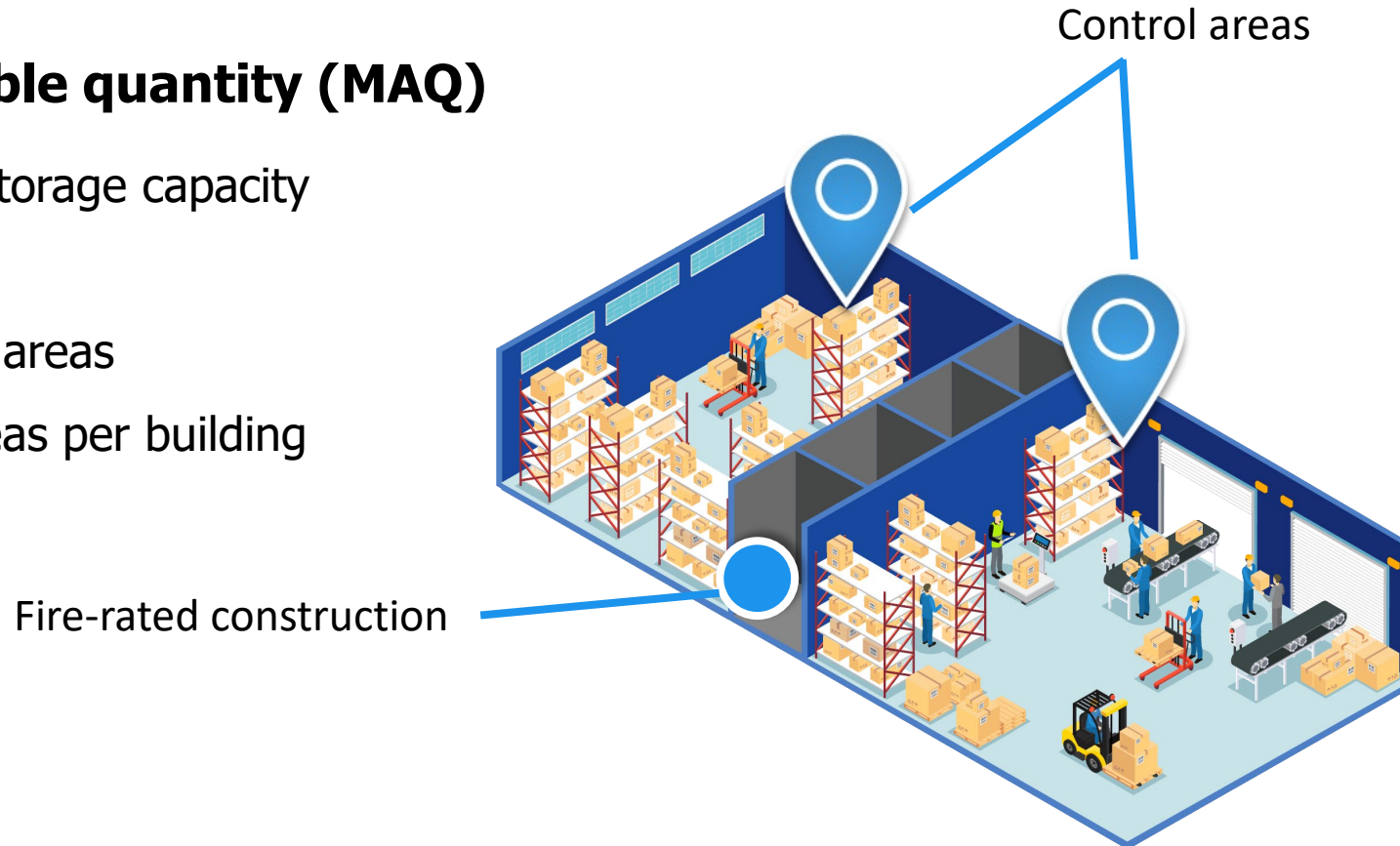
| Maximum Allowable Quantity (MAQ) in a Single Control Area | | |
|---|----------------------------|----------------------------|
| Occupancy Classification | Non-sprinklered | Sprinklered |
| | Liquefied gas in cylinders | Liquefied gas in cylinders |
| M – Mercantile | 20,000 lbs. | 40,000 lbs. |
| S – Storage/Warehouse | 20,000 lbs. | 40,000 lbs. |
| F – Factory/Filling facility | 10,000 lbs. | 20,000 lbs. |

R-454B Overview

Safety, Storage & Transportation

Maximum allowable quantity (MAQ)

- Used to evaluate storage capacity
- Type of occupancy
- Number of control areas
- Up to 4 control areas per building



R-454B Overview

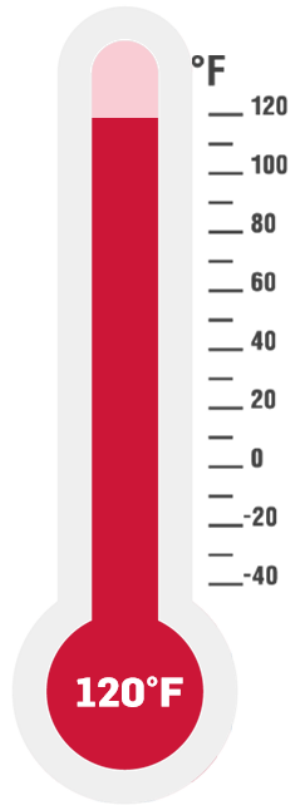
Safety, Storage & Transportation

How are containers stored within control areas?

| Characteristic | Shelf Storage | Rack Storage | Solid Pile |
|--|--|---|---|
| Storage design | Shelf cannot exceed 30" from front to back | Each level designed to hold pallet loads | Pallets stacked one upon another |
| Construction materials | Steel shelves | Steel rack | N/A |
| Storage height | Maximum 6' to top of product | Can exceed 6' (limited by sprinkler design) | Can exceed 6' (limited by sprinkler design) |
| Sprinkler system design | Ordinary Hazard Group 2 | Extra Hazard Group 1 | Extra Hazard Group 1 |
| Separation from flammable liquids | Required | Required | Required |
| Storage of other flammable or combustible products above A2L refrigerants | Prohibited | Prohibited | Prohibited |
| Storage of flammable liquids adjacent to A2L refrigerants | 20' separation | 20' separation | 20' separation |
| Storage of flammable liquids with secondary containment adjacent to A2L refrigerants | 10' separation to containment area | 10' separation to containment area | 10' separation to containment area |

R-454B Overview

Safety, Storage & Transportation



Ambient temperature \leq 125° F

R-454B Overview

Safety, Storage & Transportation

NFPA-required signage & documentation



Local fire code
permit



HAZMAT
management
plan



HAZMAT
Inventory
Statement



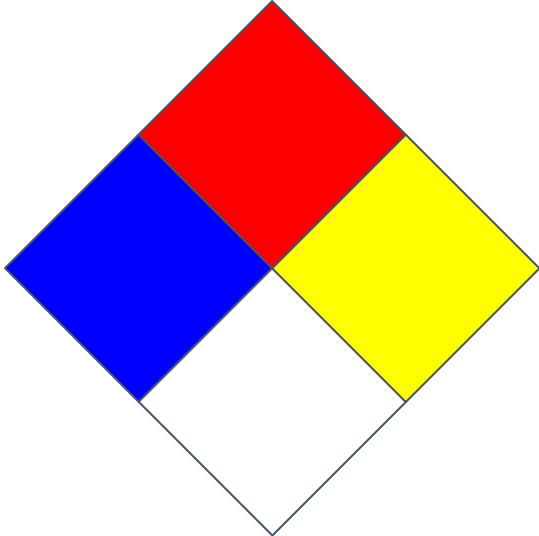
No Smoking
signage

R-454B Overview

Safety, Storage & Transportation

NFPA 704 placard:

| | |
|---------------|----------------------------|
| BLUE | HEALTH |
| RED | FLAMMABILITY |
| YELLOW | CHEMICAL REACTIVITY |
| WHITE | SPECIAL HAZARDS |

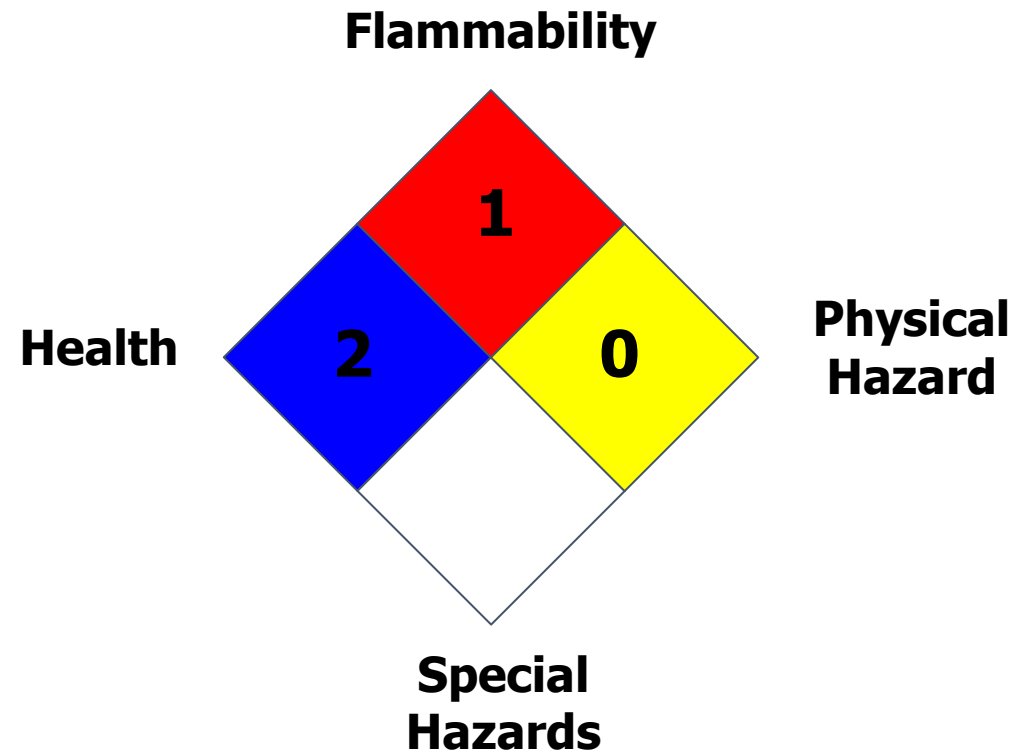


R-454B Overview

Safety, Storage & Transportation

NFPA 704 placard for R454-B

- Information can be found on the SDS



R-454B Overview

Safety, Storage & Transportation



How are cylinders of A2L refrigerants stored and transported safely?

R-454B Overview

Safety, Storage & Transportation

HAZMAT protocols not needed if \leq 26.4 lbs (12 kg) of finished goods containing A2L refrigerant

- Per US DOT
- No limit to number of A2L cylinders that can be transported



R-454B Overview

Safety, Storage & Transportation

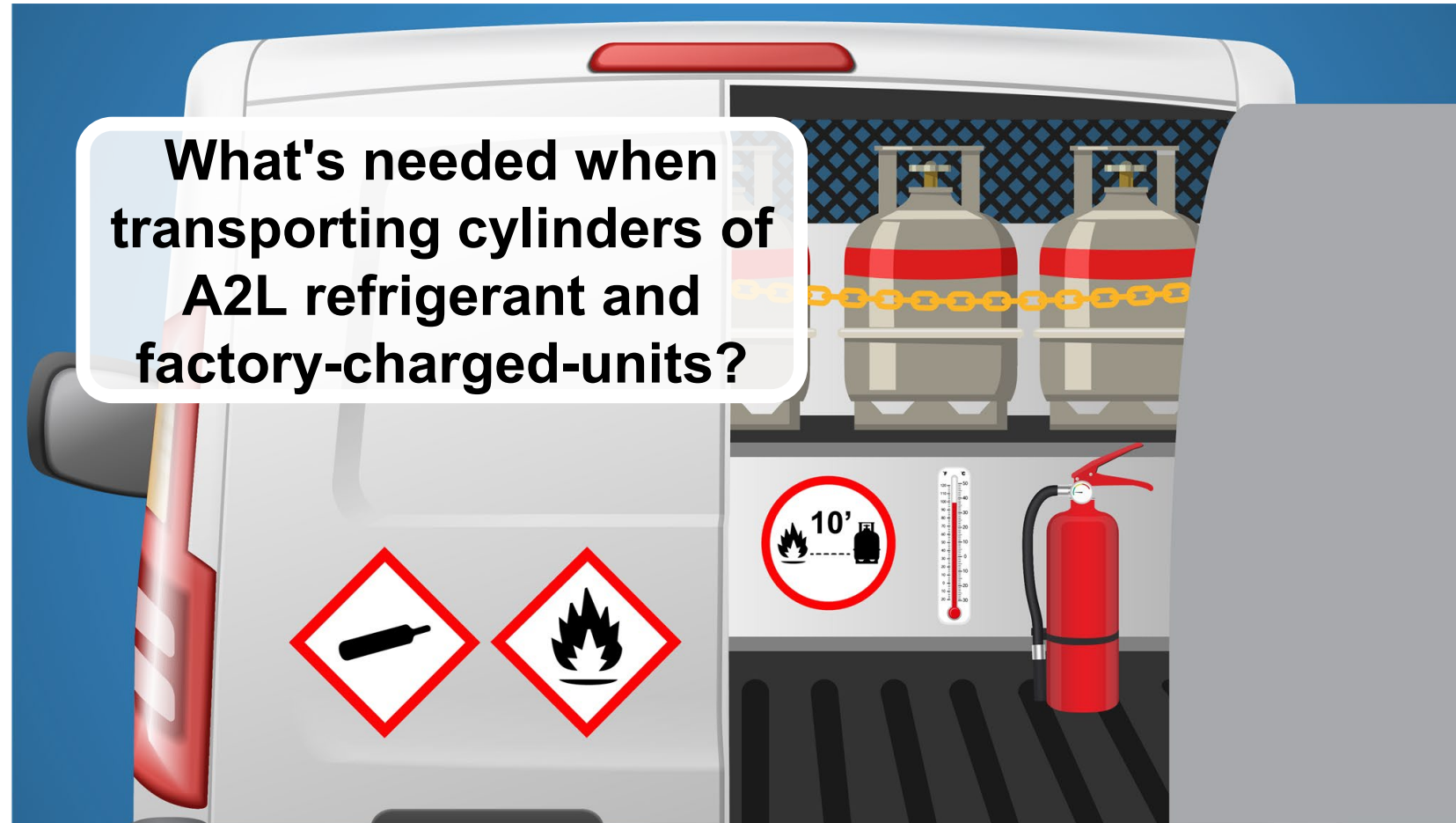
You already transport flammable gasses:

- Oxygen
- Acetylene
- Propane
- Mapp Gas



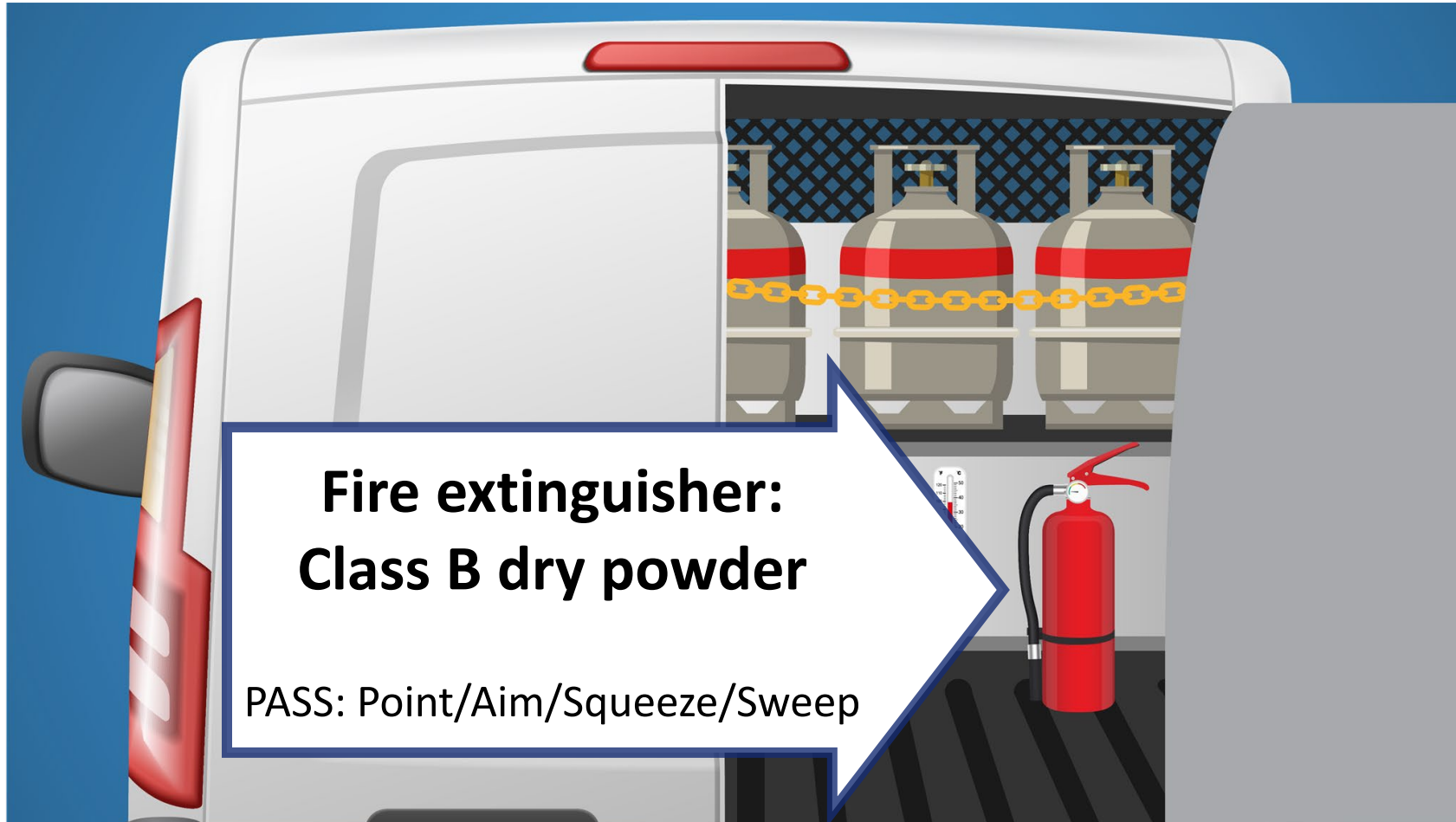
R-454B Overview

Safety, Storage & Transportation



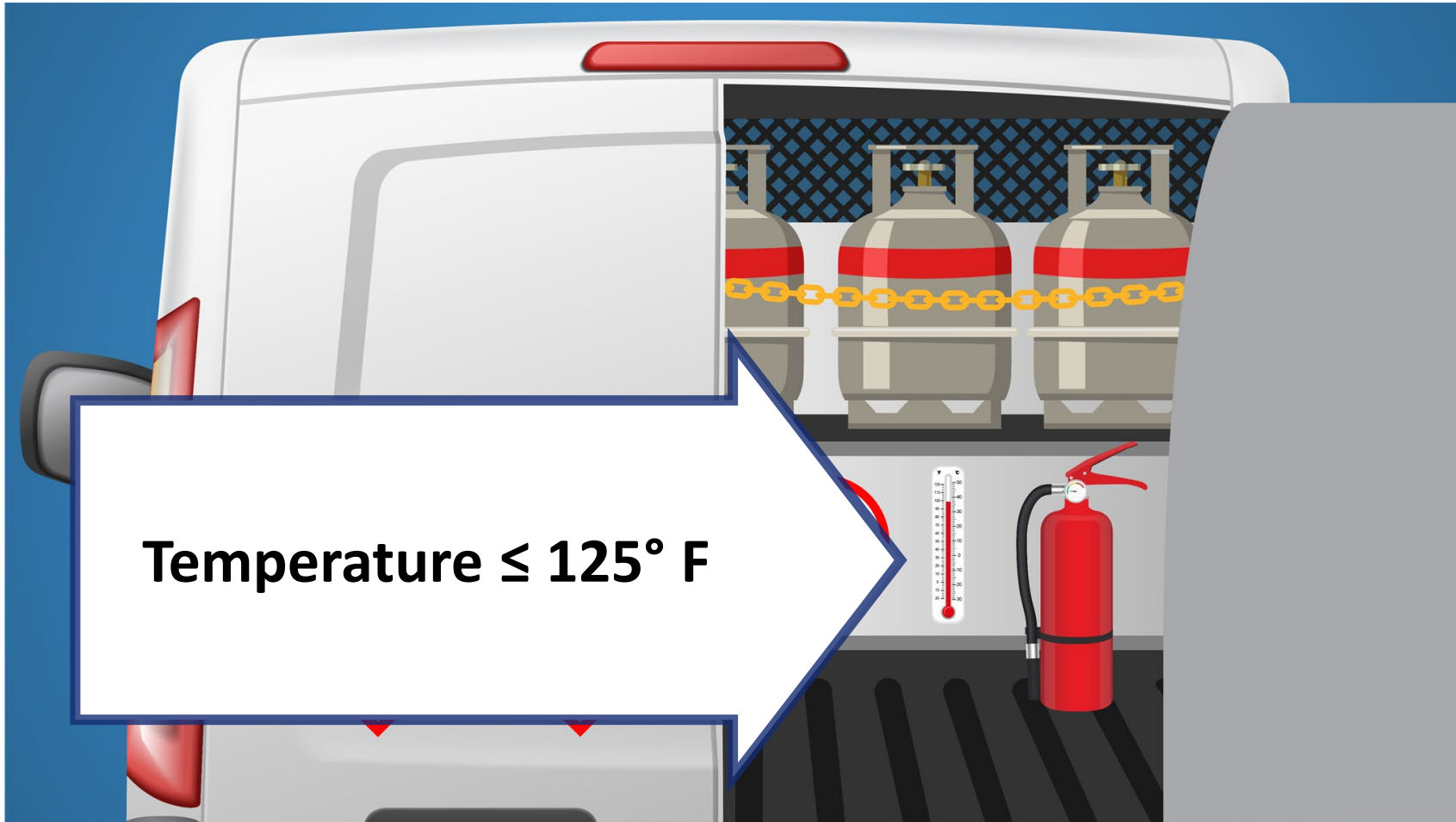
R-454B Overview

Safety, Storage & Transportation



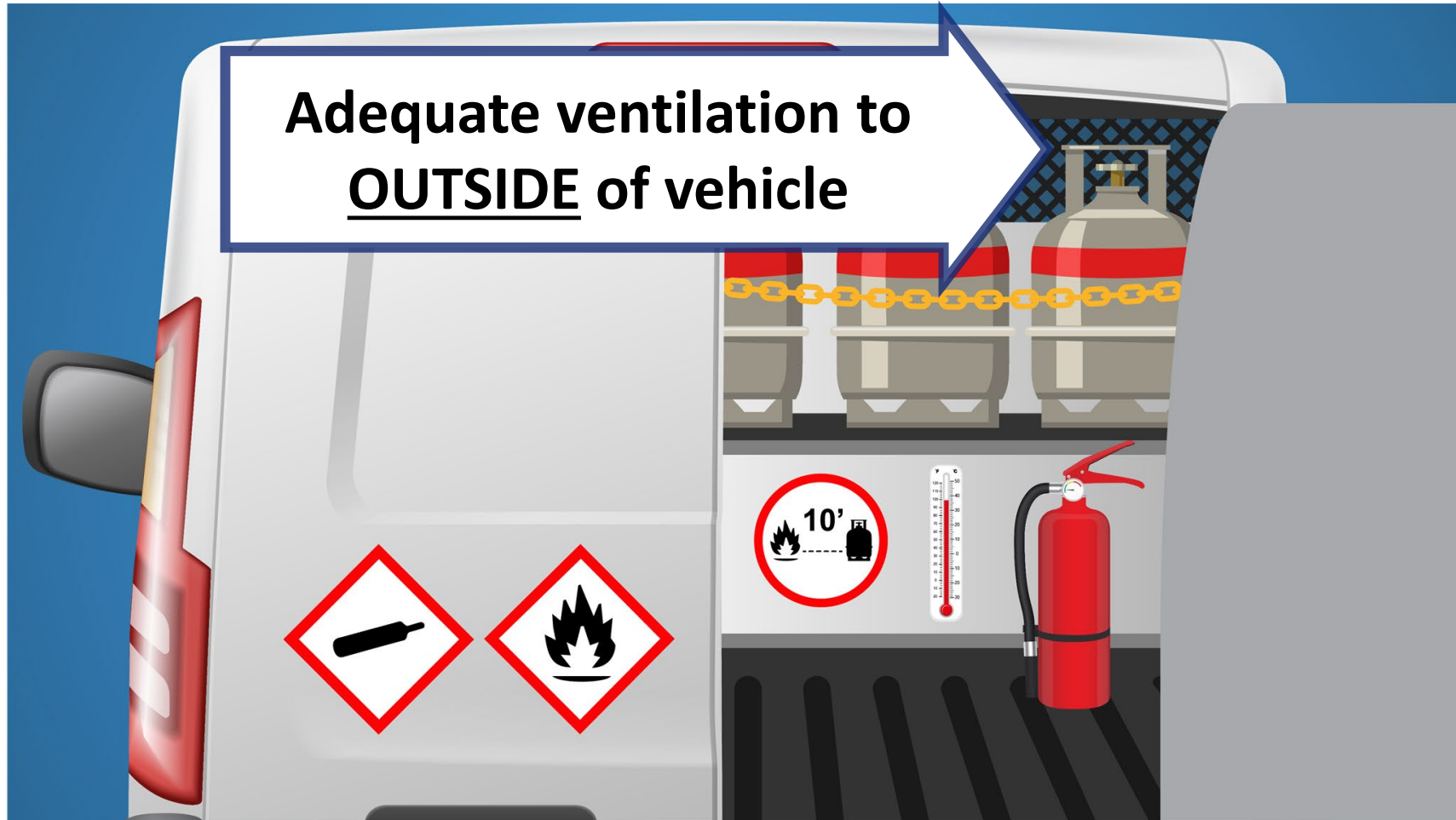
R-454B Overview

Safety, Storage & Transportation



R-454B Overview

Safety, Storage & Transportation

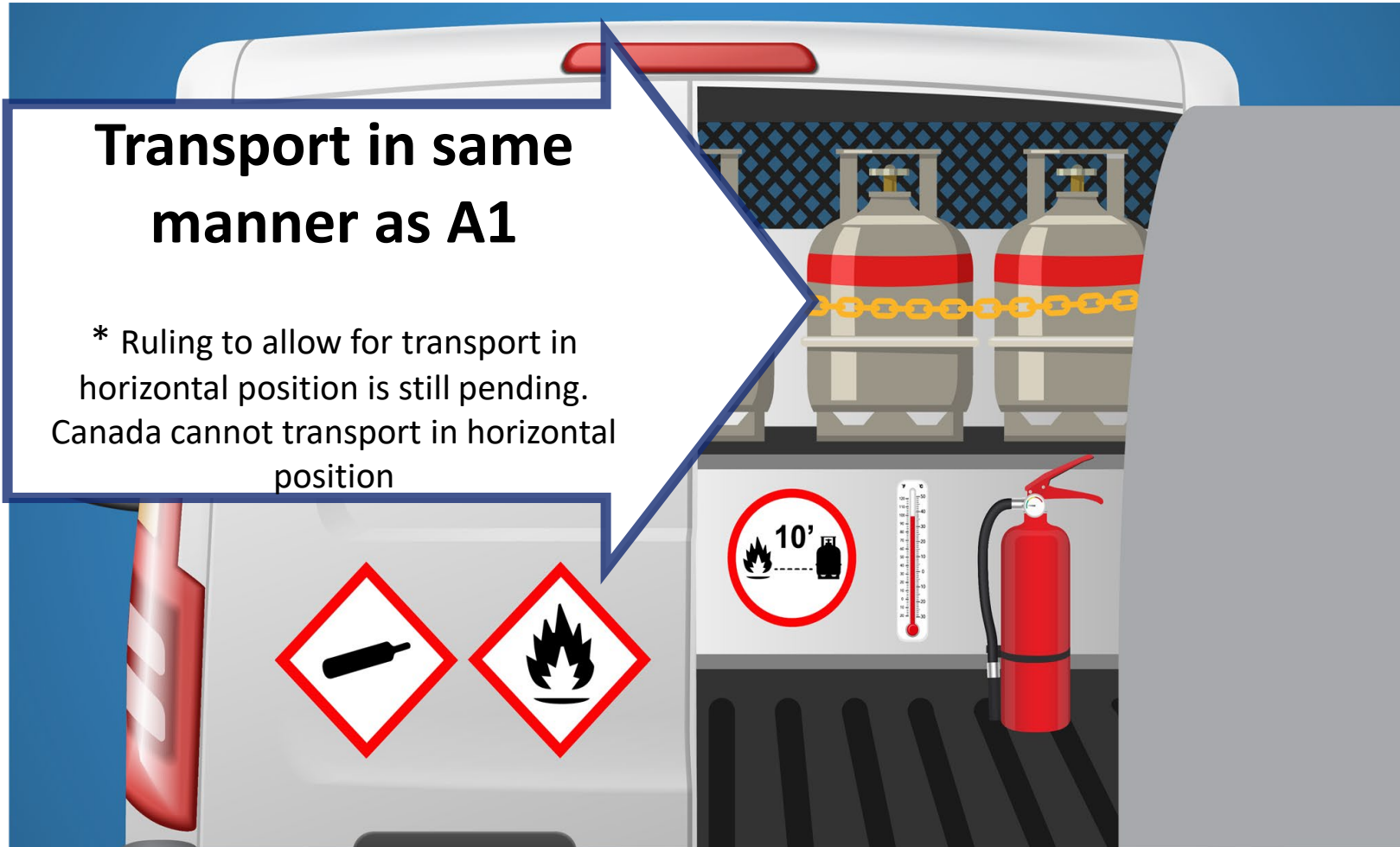


R-454B Overview

Safety, Storage & Transportation

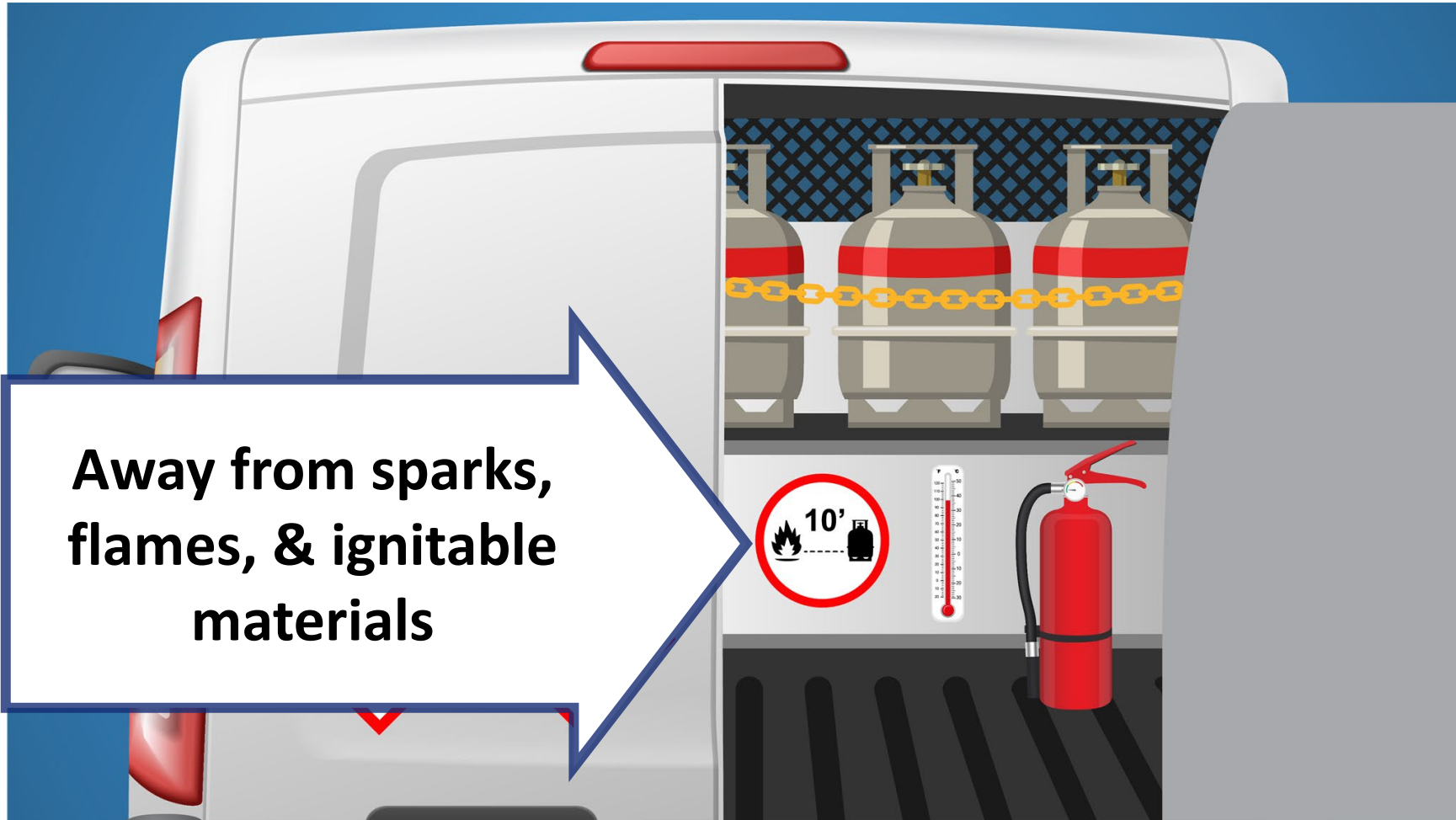
Transport in same manner as A1

* Ruling to allow for transport in horizontal position is still pending.
Canada cannot transport in horizontal position



R-454B Overview

Safety, Storage & Transportation



R-454B Overview

Safety, Storage & Transportation



Restrain cylinders to
prevent shifting

Inspect restraints **FREQUENTLY**

R-454B Overview

Safe Service Practices

Safety considerations to be aware of when installing & servicing equipment with A2L refrigerants



R-454B Overview

Safe Service Practices



Go Above.
Think Beyond.

R-454B Overview

Safe Service Practices



BEFORE starting work:

- Ensure clear escape route

R-454B Overview

Safe Service Practices

BEFORE starting work:

- Adequate ventilation
- Refrigerant leak detector as a personal alarm



R-454B Overview

Safe Service Practices



Fire risk **SLIGHTLY HIGHER** with A2L than with A1

- Fire extinguisher (type B) must suppress chemical fires

R-454B Overview

Safe Service Practices

WEAR proper PPE



R-454B Overview

Safe Service Practices

PROTECT from frostbite



R-454B Overview

Safe Service Practices

**Combustion of refrigerant
==> HF ==>
Hydrofluoric acid
(corrosive: **DANGER**)**

- Protect skin & eyes
- Can cause chemical burns



R-454B Overview

Safe Service Practices



SAFELY TRANSFER tank to job site

R-454B Overview

Safe Service Practices

- ✓ **Common sense**
- ✓ **Basic safety principles**



R-454B Overview

Safe Service Practices

- Inspect service tools & equipment for compatibility
- Verify compatibility with manufacturers or AHRI

www.ahrinet.org/saferefrigerant



R-454B Overview

Safe Service Practices

Gauge manifold & charging hoses

- Dedicated set for R454-B prevents cross-contamination

| Service Item (versus R410A) | R454b |
|-----------------------------|------------|
| Gauge Manifold | No Changes |
| Charging Hoses | No Changes |



Remember, cylinders for A2L refrigerants like R454-B have a left-handed thread, so adapters may be needed.

R-454B Overview

Safe Service Practices

Refrigerant leak detector

| Service Item (versus R410A) | R454b |
|-----------------------------|------------------------|
| Refrigerant Leak Detector | Move to A2L Compatible |

- A2L refrigerants have no stenching(no smell) agents
- Ventilation and air circulation are required
- Use of a leak detector as a personal alarm is strongly recommended
- Ensure leak detector is approved for R454-B



R-454B Overview

Safe Service Practices

Electrical hand tools

| Service Item (versus R410A) | R454b |
|-----------------------------|------------------------------------|
| Electrical Hand Tools | Non-sparking available (AHRI-8017) |

- Spark-proof
- Check with tool manufacturer



R-454B Overview

Safe Service Practices

Ventilation fans / additional ventilation

| Service Item (versus R410A) | R454b |
|-----------------------------|---|
| Ventilation Fan | Similar (May be differences in machine rooms) |

- Spark-proof

R-454B Overview

Safe Service Practices

| Service Item (versus R410A) | R454b |
|--|---|
| Gauge Manifold | No Changes |
| Charging Hoses | No Changes |
| Refrigerant Leak Detector | Move to A2L Compatible |
| Electrical Hand Tools | Non-sparking available (AHRI-8017) |
| Ventilation Fan | Similar (May be differences in machine rooms) |
| Dry Chemical/CO ₂ Fire Extinguisher | Chemical Compatible |
| Scales | No Changes |
| Gas Detector | Move to A2L Compatible |
| Vacuum Pump | Check with Manufacturer |
| Recovery Machine | Move to A2L Compatible |
| Refrigerant Recovery Cylinder | Flammable (GHS label; left-handed threads) |

If unsure, check the AHRI website or contact the manufacturer

R-454B Overview

Safe Service Practices

| Requirement | R410a | R454b |
|--|----------------------|------------|
| Remove refrigerant safely following local & national codes | Required | Required |
| Purge circuit with inert gas (nitrogen) | Best Practice | |
| Evacuate | Best Practice | |
| Purge with inert gas for 5 min. | Best Practice | |
| Evacuate again | Best Practice | |
| Open the circuit by cutting or brazing | Final Step | Final Step |
| For repairs, purge with nitrogen during brazing | Required | Required |
| Pressure test | Best Practice | |
| Leak test | Best Practice | |
| Evacuate system again after service | Required | Required |
| Charge system | Required | Required |

With the new refrigerant ... Best practice? Required? Optional?

R-454B Overview

Safe Service Practices

| Requirement | R410a | R454b |
|--|---------------|-------------------|
| Remove refrigerant safely following local & national codes | Required | Required |
| Purge circuit with inert gas (nitrogen) | Best Practice | Required ✓ |
| Evacuate | Best Practice | Required ✓ |
| Purge with inert gas for 5 min. | Best Practice | Required ✓ |
| Evacuate again | Best Practice | Required ✓ |
| Open the circuit by cutting or brazing | Final Step | Final Step |
| For repairs, purge with nitrogen during brazing | Required | Required |
| Pressure test | Best Practice | Required ✓ |
| Leak test | Best Practice | Required ✓ |
| Evacuate system again after service | Required | Required |
| Charge system | Required | Required |

Ensure **ALL** refrigerant is out of the system prior to opening for repair or replacement service

R-454B Overview

Safe Service Practices



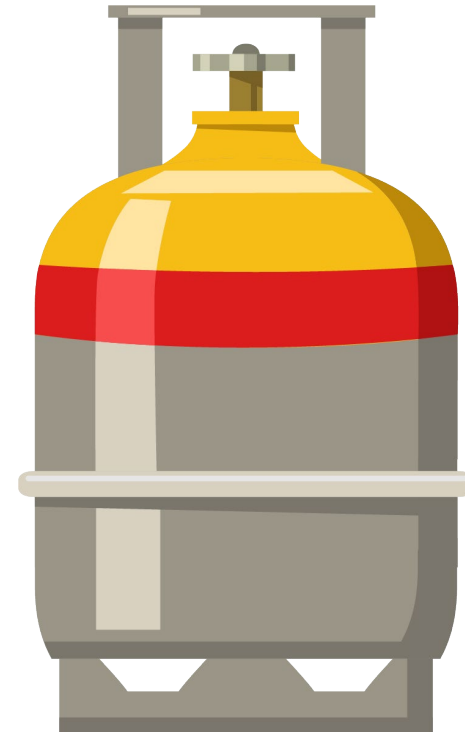
Always refer to the installation manual for procedures that may have changed with R454-B

R-454B Overview

Safe Service Practices

Recovery

- Always recover refrigerants into an approved container
- Clearly mark the container for refrigerant type
- Never mix refrigerant types



R-454B Overview

Safe Service Practices



Inert gas purge

- Sweep system with inert gas to help release any trapped refrigerant
- What changed with R454-B inert gas purge?
 - Previously best practice – now required with R454-B
 - Additional inert gas purge required after 1st evacuation to ensure trapped refrigerant can be pulled out

R-454B Overview

Safe Service Practices

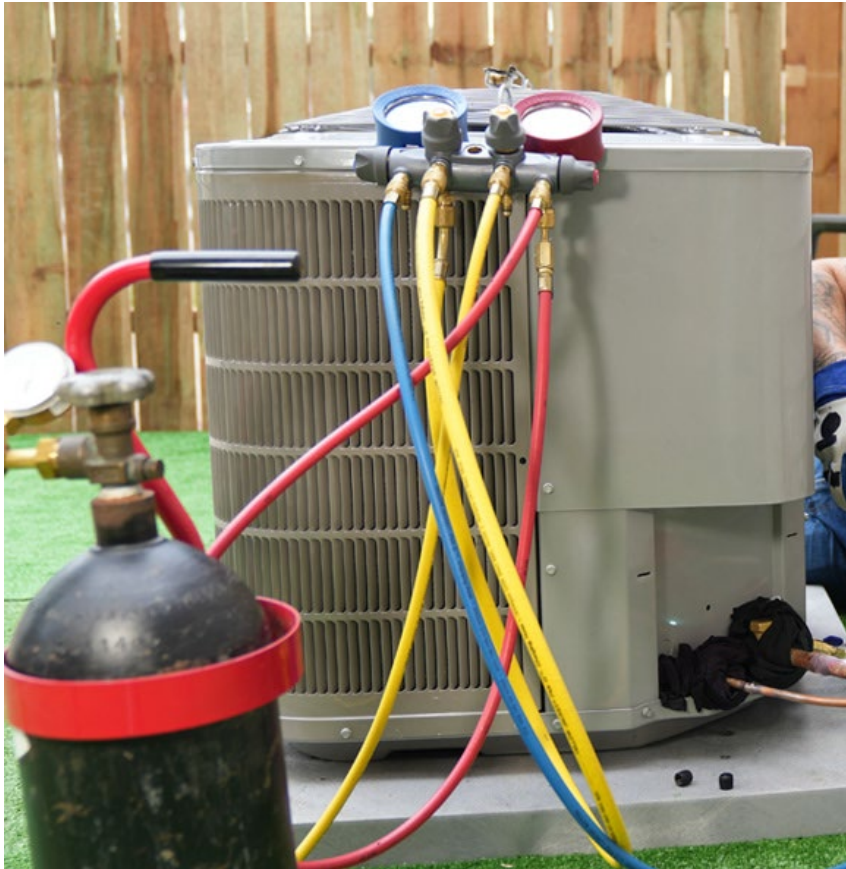
Evacuation

- Double evacuation PRIOR to service to ensure all refrigerant is out
- Triple evacuation AFTER service, prior to charging



R-454B Overview

Safe Service Practices



Pressure testing

- Pressure test with nitrogen
- Hold for 1 hour with no drop in pressure
- Required

R-454B Overview

Safe Service Practices

Leak test

- Required after repairs
- Trace gas test for leaks in hard-to-find locations
- Leak test prior to evacuations



R-454B Overview

Safe Service Practices



Charging

- NEVER exceed maximum allowable charge weight
- Always charge as liquid
- Never mix refrigerants
- Always charge by subcool/superheat
- Weigh in charge during winter as necessary
- Verify charge when temperature exceeds 60° F outside and 70° F inside

R-454B Overview

Safe Service Practices



Install considerations

- A2L not a “drop-in” refrigerant
- Systems & equipment must be designed for R454-B

R-454B Overview

Equipment & Manufactures



Go Above.
Think Beyond.

R-454B Overview

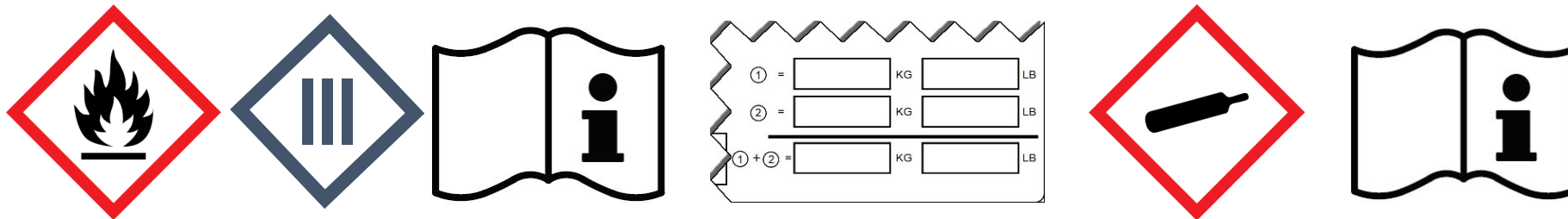
Agency Requirements on Manufactures & Dealers

- **Equipment/Refrigerant Charge Limits**
 - 3.9 lbs to 33.9 lbs requires a dissipation system
- **Tracking and Verification of Total Unit Charge**
- **Provide guidance in measuring the total system charge compared to the home's occupied space**
- **Detect, Circulate and Dilute**
- **Labels**

R-454B Overview

Labels

- Ensure A2L labels are located in obvious locations
 - Clearly draw attention to components and procedural changes related to R454-B
 - 5 labels:



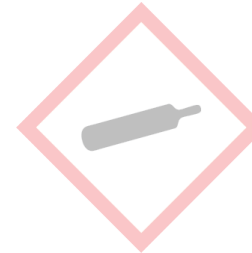
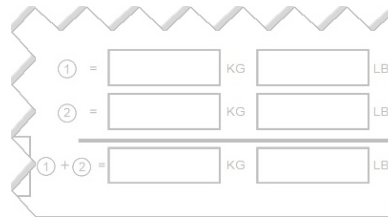
R-454B Overview

Labels



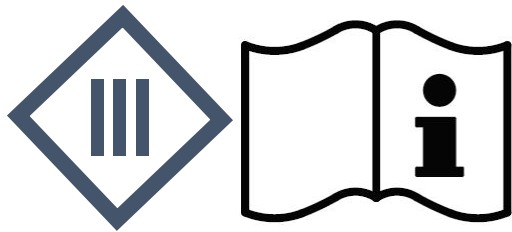
Flammable pictogram

- Warns of potential flammable content
- Appears on all cylinders and equipment containing A2L refrigerants
- May be used in transportation (placarding)
- May be on units (indoor and outdoor) and/or packaging



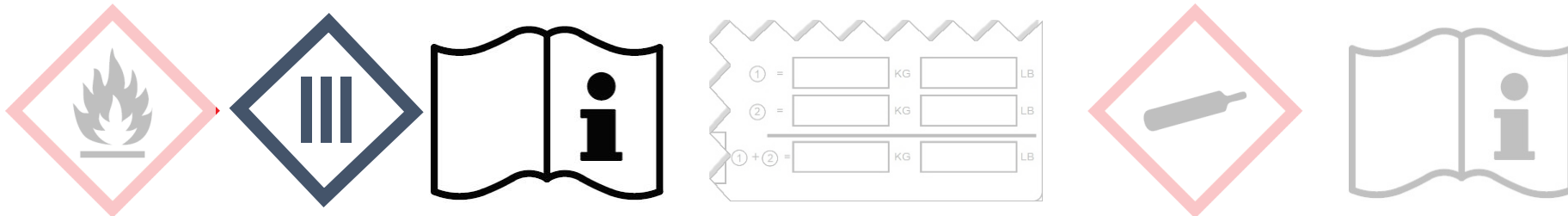
R-454B Overview

Labels



Low voltage wire label

- May be found near low voltage connection on the equipment
- Visually instruct technician to refer to wiring diagrams and instructions
- May address care needed to prevent pinch points on wires and/or arcing



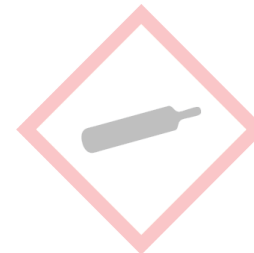
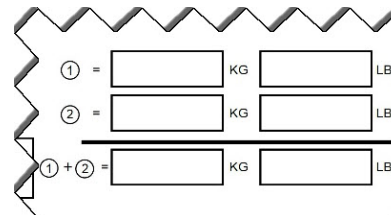
R-454B Overview

Labels

① = KG LB
② = KG LB
① + ② = KG LB

Charging label

- Shows tracking and verification of unit total charge on installed equipment containing A2L refrigerants
- Located on equipment and/or sent with equipment
- Completed by technicians
- Indicates amount of refrigerant in unit, lines, and overall system



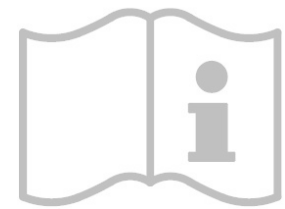
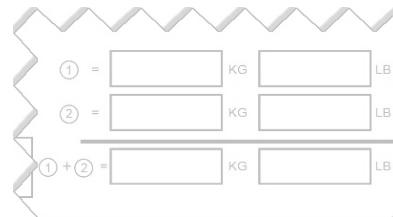
R-454B Overview

Labels



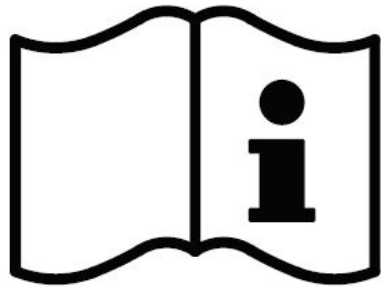
Compressed gas pictogram

- Warns of high-pressure gas that could explode when heated
- May be used in storage and transportation of cylinders and equipment containing A2L refrigerants



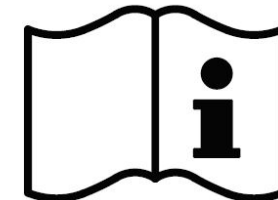
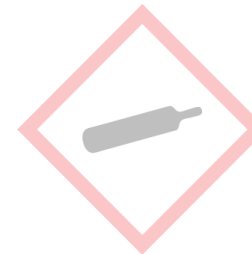
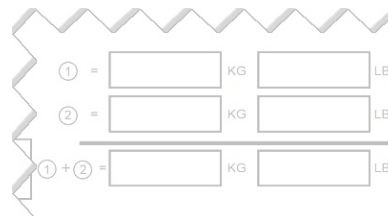
R-454B Overview

Labels



Operator's manual symbol

- Visually notify technician to refer to instruction manuals
- Components may be new
- Require attention to understanding
- Placed on equipment near component or wiring



R-454B Overview

Compliance

- **Equipment Charge Limits**

- 3.9 lbs to 33.9 lbs requires a dissipation system (m2)

✓ All Systems comply with the m2 requirement

Dissipation system: Leak detector activates unit fan; controlled via mitigation board

| Refrigerant Charge Limits: Mitigation | | |
|---------------------------------------|------------|--|
| m1 | 3.9 lbs. | Dissipation system not required |
| m2 | 33.9 lbs. | Dissipation system required |
| m3 | 169.3 lbs. | Dissipation system in addition to other requirements |

Dissipation system can use:

- Continuous fan
- Leak detection-activation system
- Other

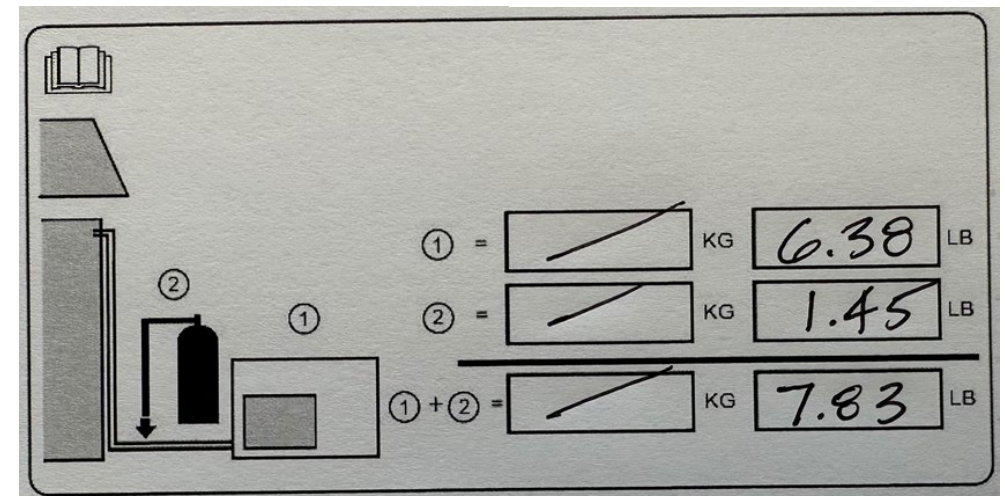
R-454B Overview

Compliance

- Tracking and Verification of Total Unit Charge
 - What the dealer must DO!
- ✓Charging Label
- ✓Documents how much refrigerant a system contains
 - ✓Completed by installing technician

1 = Unit Charge
2 = Additional Charge For
The Line Set Beyond 15ft
3 = (1+2) = Total Charge

| | | |
|------------------------------|------------------|---------------|
| SERIAL NUMBER | | |
| 4719E11865 | | |
| PRODUCT NUMBER | | |
| 25VNA836A0031050 | | |
| MODEL NUMBER | | |
| 25VNA836A310 | | |
| METERING DEVICE | TXU INDOOR | EXU OUTDOOR |
| FACTORY CHARGED | 6.38 LBS | R454B 2.89 KG |
| INDOOR TXU SUB COOLING LABEL | | |
| POWER SUPPLY | 208-230 VOLTS AC | |
| 1 PH | 60 HZ | |
| PERMISSIBLE VOLTAGE AT UNIT | | |
| 253 MAX | 197 MIN | |
| SUITABLE FOR OUTDOOR USE | | |
| COMPRESSOR | 220-410 VOLTS | |
| 3 PH | DC | |
| 18.3 RLA | | LRA |



R-454B Overview

Compliance

- **Provide guidance in measuring the total system charge compared to the home's occupied space**
- ✓ Minimum Area Check
 - ✓ Total System Charge amounts consider the home square footage
 - ✓ Total System Charge calculates the unit charge amount and the complete line set charge amount that is added on site
 - ✓ Ensures that a home's minimum area is correct, allowing for dilution of a refrigerant leak

3,500sqft House – 5-ton system = ~ 10.58lbs

| Total System Charge (lbs.) | Minimum Floor Area (sq.ft.) |
|----------------------------|-----------------------------|
| 4 | 59 |
| 5 | 74 |
| 6 | 89 |
| 7 | 103 |
| 8 | 118 |
| 9 | 133 |
| 10 | 148 |
| 11 | 163 |
| 12 | 177 |
| 13 | 192 |
| 14 | 207 |
| 15 | 222 |
| 16 | 236 |
| 17 | 251 |
| 18 | 266 |
| 19 | 281 |
| 20 | 296 |
| 21 | 310 |
| 22 | 325 |
| 23 | 340 |
| 24 | 355 |
| 25 | 369 |

R-454B Overview

Compliance

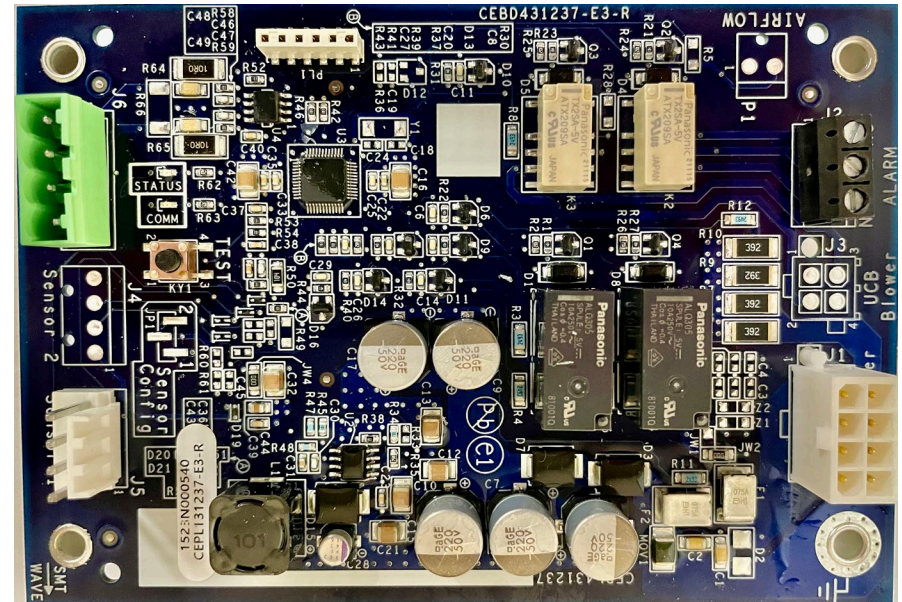
- Detect, Circulate and Dilute
- ✓ Dissipation System:
 - ✓ Leak sensor in indoor coil cabinet
 - ✓ Mitigation circuit board
 - ✓ Unit blower
 - ✓ Factory or field installed



R-454B Overview

Indoor Equipment

- Factory-Installed Leak Detection must do:
 - UL-approved design
 - Factory calibrated
 - Automatic self-test
 - Fail-safe mode
 - Allow field inspection



R-454B Overview

Indoor Equipment

- Unit installed leak detection:
 - UL approved
 - Continually scans for R454-B leak
 - Mitigation threshold = 20% LFL
 - Located in lower area of coil cabinet
 - Adjustment may be required for horizontal install



LFL = Lower Flammability Limit

R-454B Overview

Indoor Equipment

- Fan coil
 - Mitigation board will come factory installed
 - Sensor will be mounted to the coil for vertical application
 - Horizontal application may require sensor re-location to factory marked location

R-454B Overview

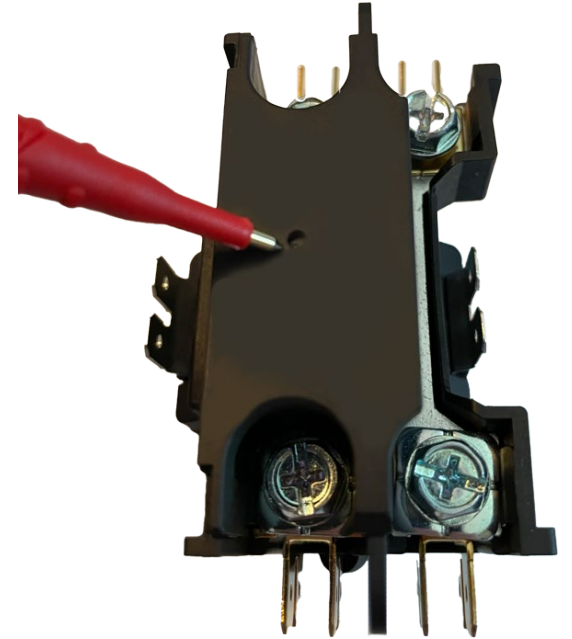
Indoor Equipment

- Furnace
 - Mitigation board will be supplied with furnace coil to be mounted in the field (at this time 3rd party coils will not be allowed)
- Furnace Coil
 - Sensor will be mounted to the coil for vertical application
 - Horizontal application may require re-location

R-454B Overview

Outdoor Equipment

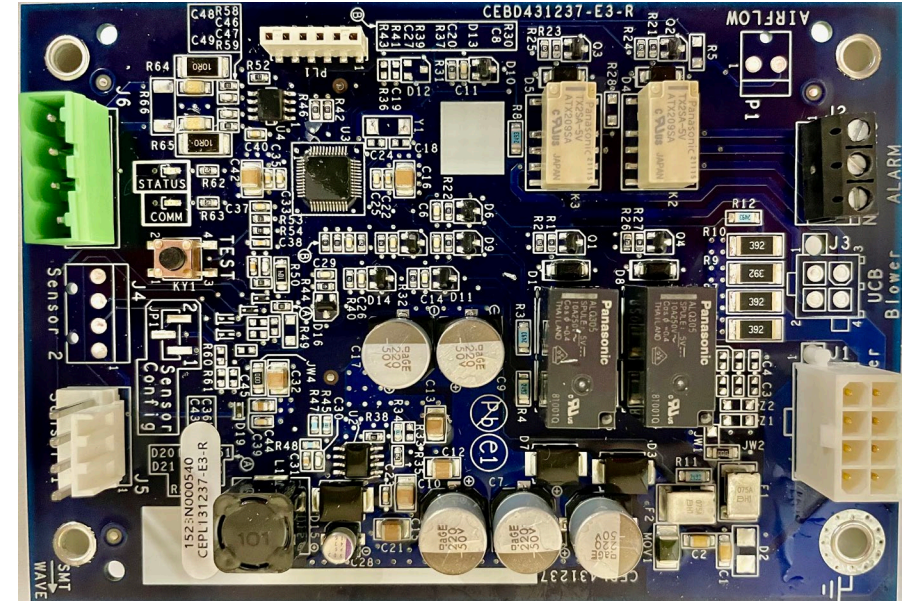
- Ignition source isolation
 - Compressor plug
 - Enclosed plugs provide necessary protection
- Electrical ignition points
 - Wire sleeves on compressor and crankcase heater wiring
- Contactor
 - Patented top cover eliminates gap
 - Manual operation still available



R-454B Overview

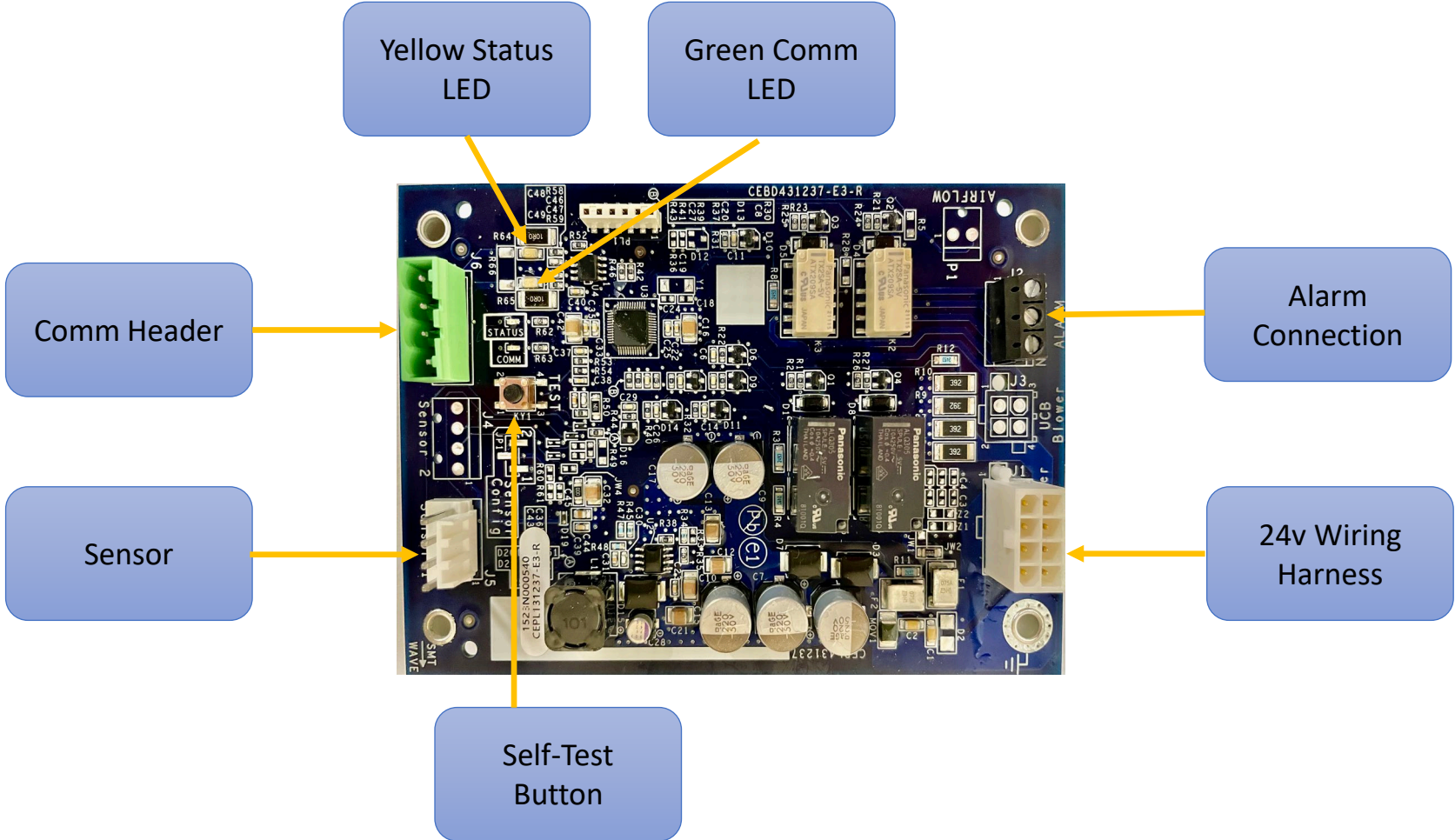
Mitigation Board

- Power up – 10s sensor warm up delay
- Self test button (60s mode)
- Mitigation threshold 20% LFL (Lower Flammability Level)
- **Green LED** indicates communication with wall control (communicating equipment)
- **Yellow LED** indicates communication with the sensor and flashes for mitigation mode / fault code



R-454B Overview

Mitigation Board



R-454B Overview

Mitigation Board

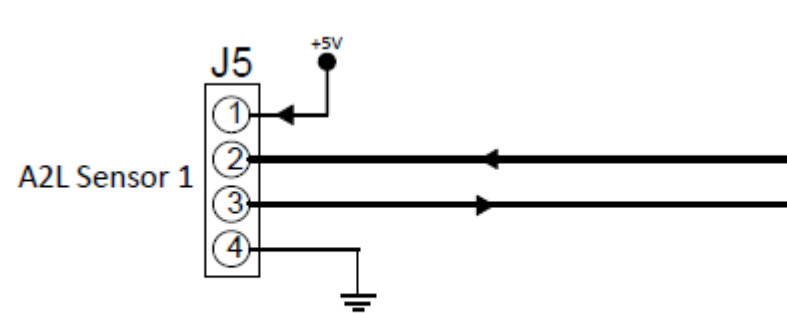
- Mitigation Board Yellow LED (Mitigation active for all faults)

| Flash | Description | Wall Control Display |
|-------|--|---|
| 1 | Mitigation in progress | Sensor 1 R454B Leak |
| 2 | Sensor 1 open | Sensor 1 Open |
| 3 | 15min minimum Mitigation or 5min blower off delay | Mitigation off delay |
| 4 | 0 VAC sensed on G output | Blower output not operating |
| 5 | Fault with A2L digital sensor | Sensor 1 fault (Heat allowed after 10min) |
| 6 | Self-test button stuck (more than 30sec) | Test button stuck |
| 7 | Y out switched with Y in or W out switched with w in | Y or W wiring inverted |
| 8 | Y or W shorted | Y or W output shorted to Y or W input |

R-454B Overview

Mitigation Board

- Sensor wiring



R-454B Overview

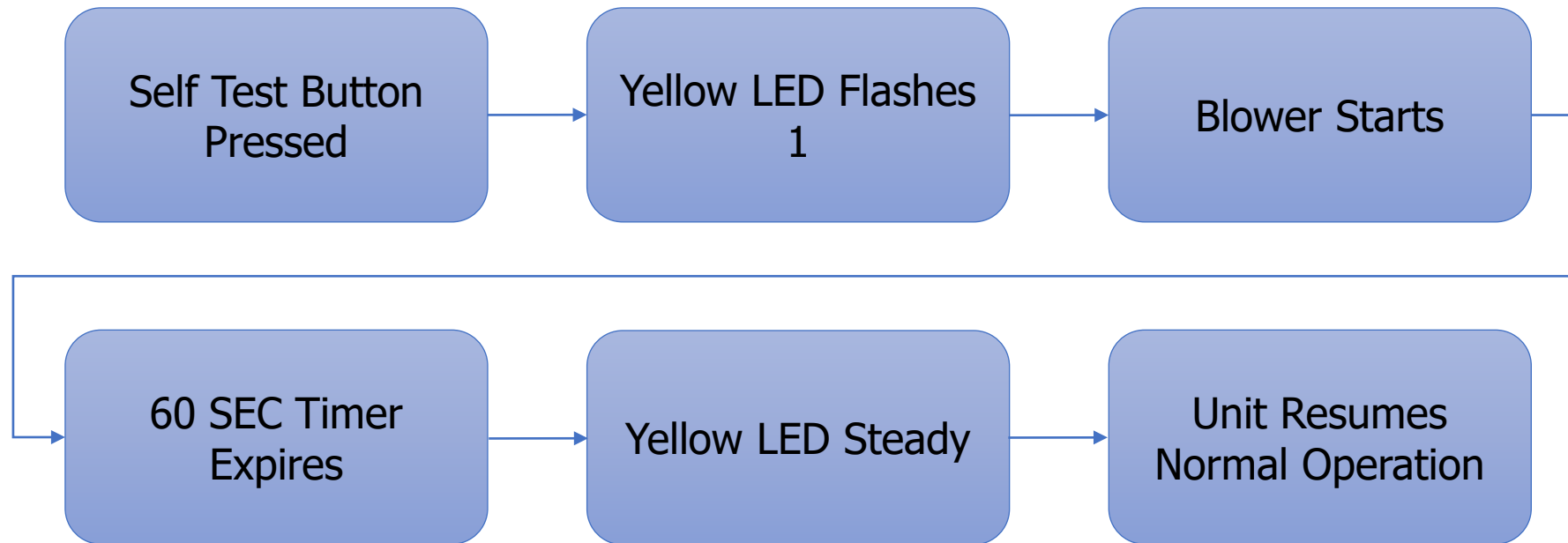
Mitigation Board

- A2L Sensor Testing
 - Power up with sensor connected – Wait for 10s sensor warm up delay
 - Ensure the Yellow status LED is on steady (no flashes)
 - Shows the sensor is communicating
 - Disconnect the sensor from the Mitigation board
 - Verify that within 5sec the relays click and the yellow status LED begins flashing 2
 - This shows sensor is no longer communicating

R-454B Overview

Mitigation Mode

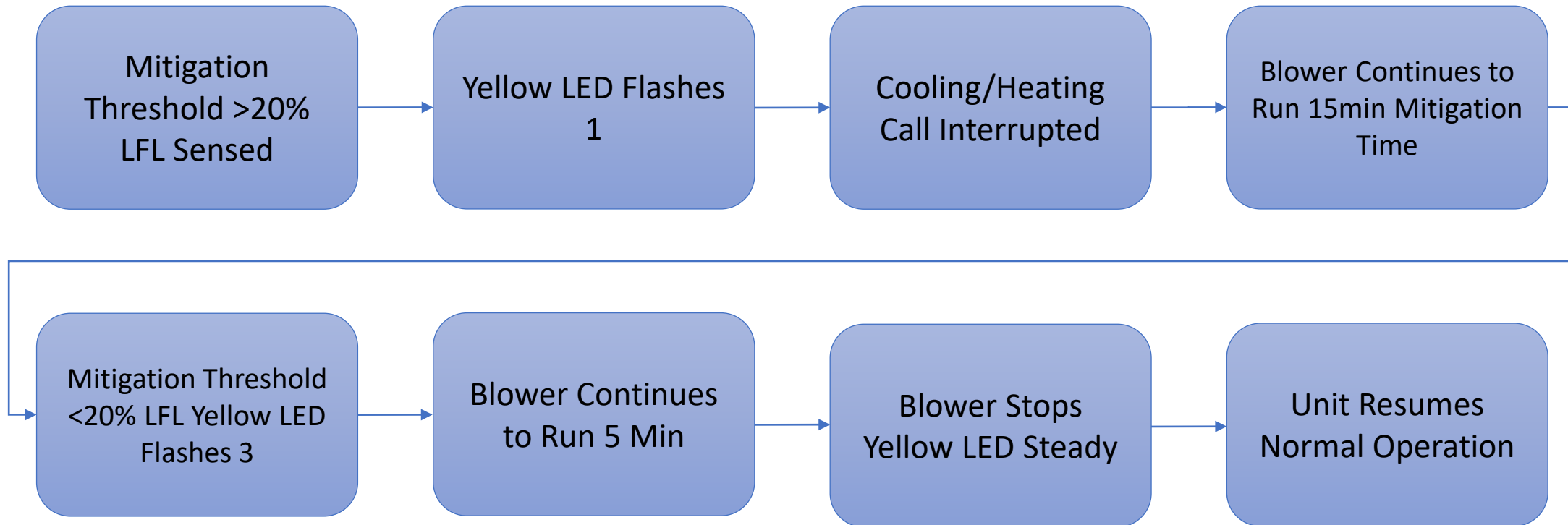
- Self Test



R-454B Overview

Mitigation Mode

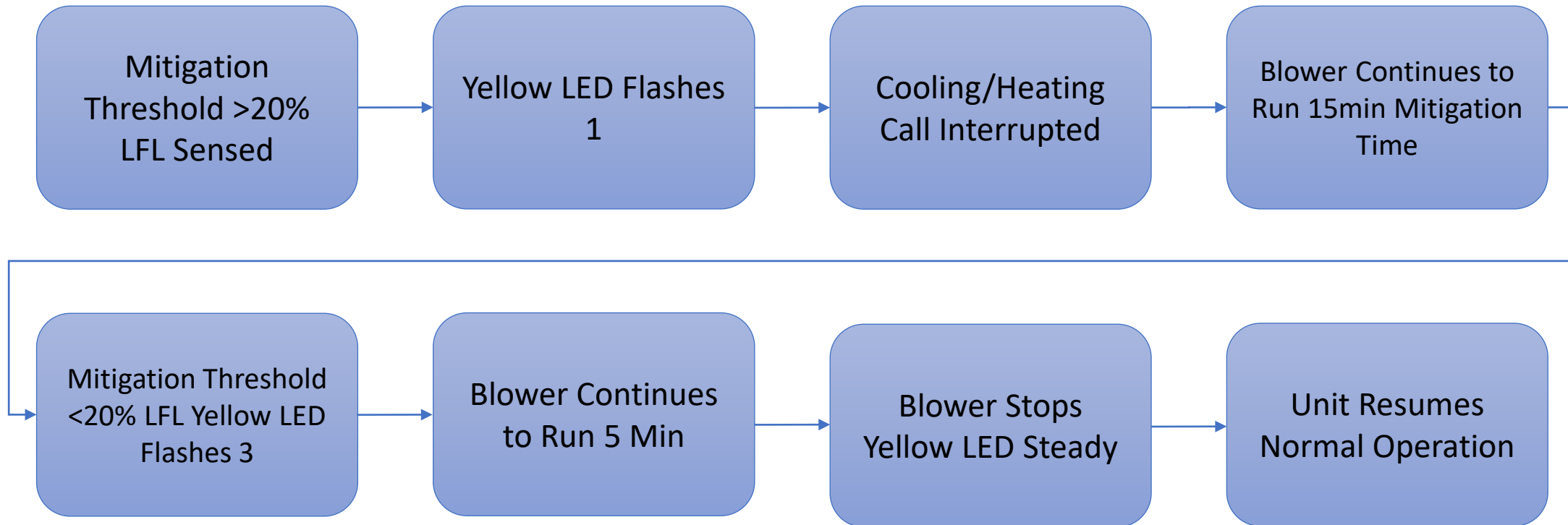
- Cooling



R-454B Overview

Mitigation Mode

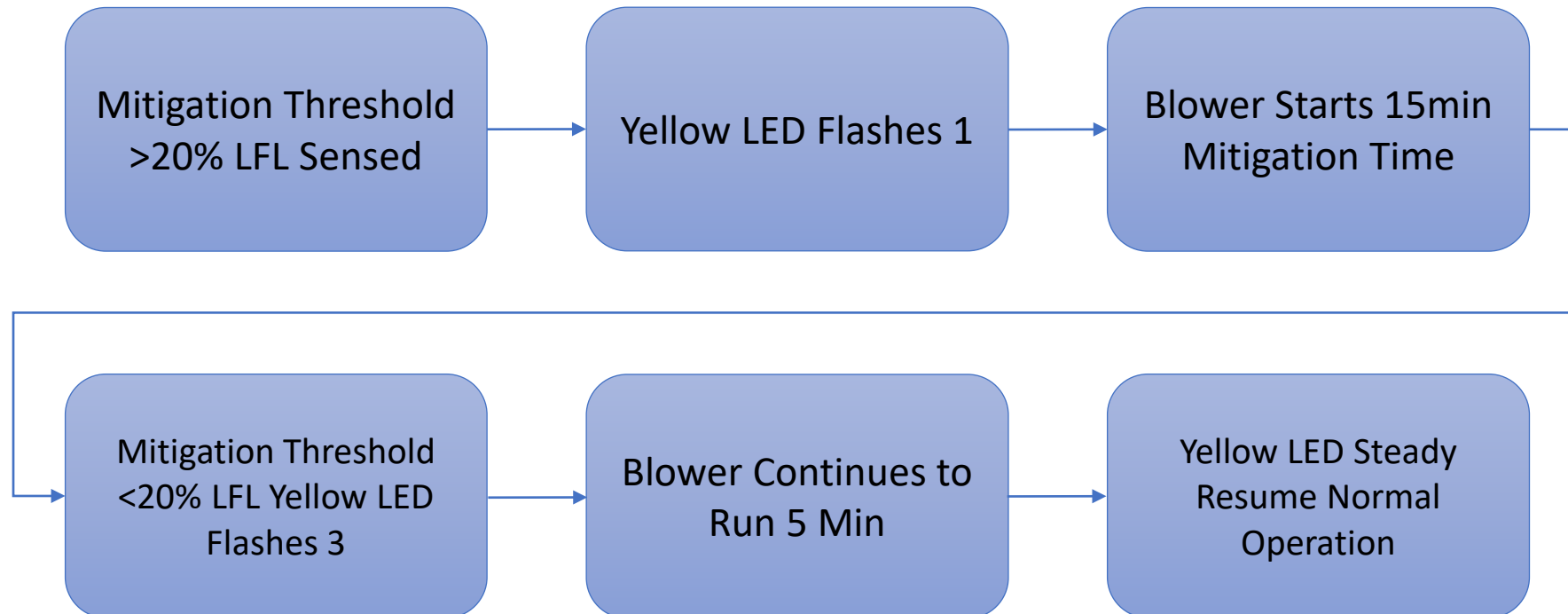
- Heating



R-454B Overview

Mitigation Mode

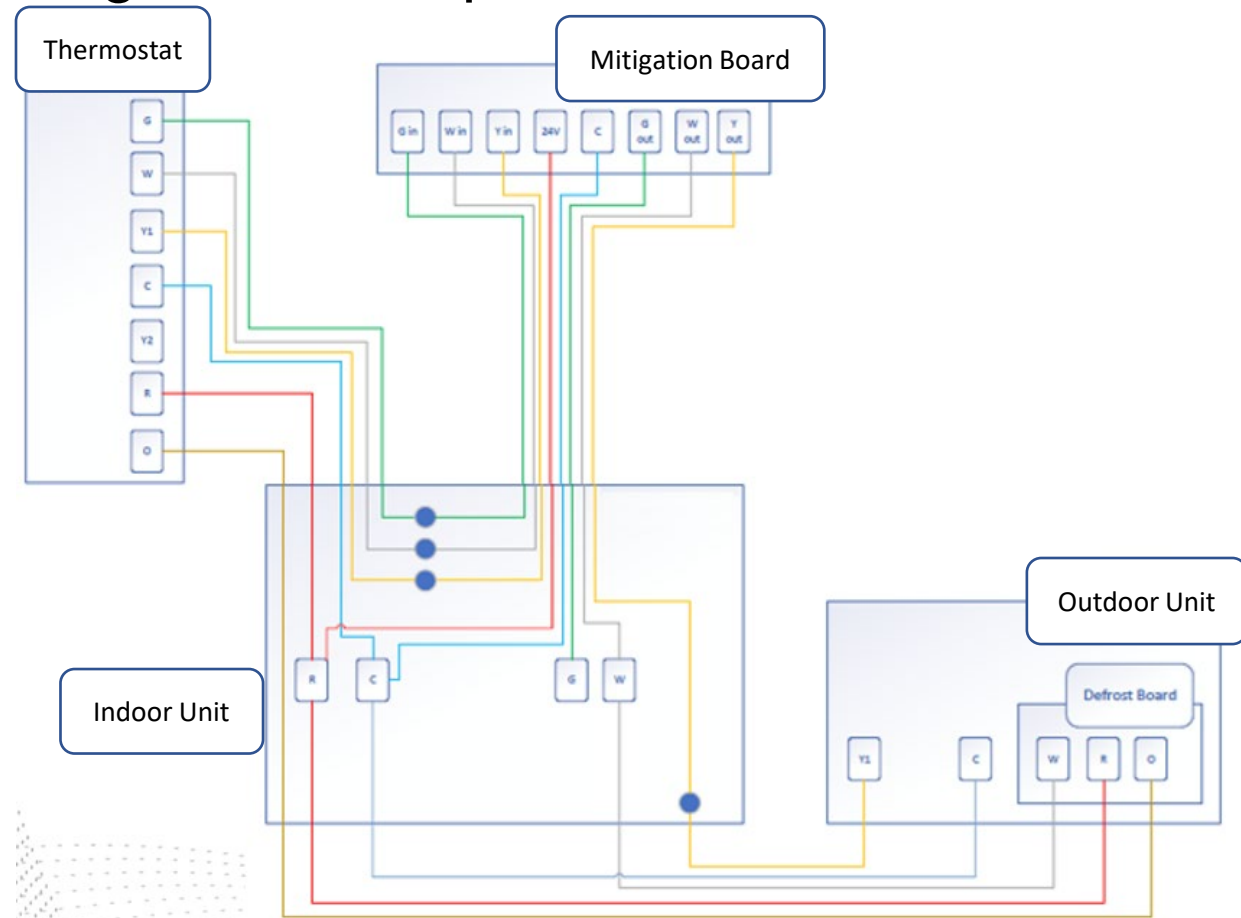
- Stand-by No Call for Cooling or Heating



R-454B Overview

Mitigation Board Wiring

- Standard furnace wiring diagram will be provided in installation instructions



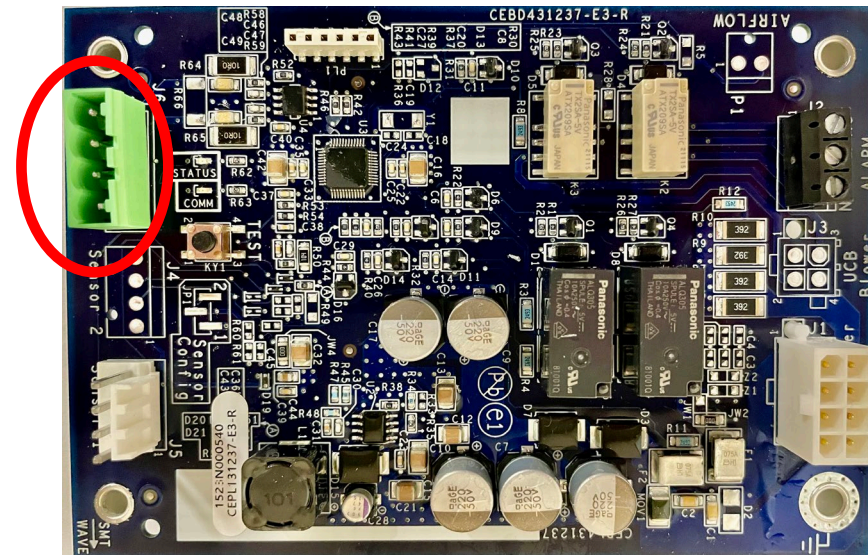
J1 connection

G, W and Y1 will be routed through the mitigation board
R and C provide power to the board

R-454B Overview

Mitigation Board Wiring

- Mitigation Board is Communicating for Deluxe Models
 - J12 ABCD header will be used
 - Function remains the same



R-454B Overview

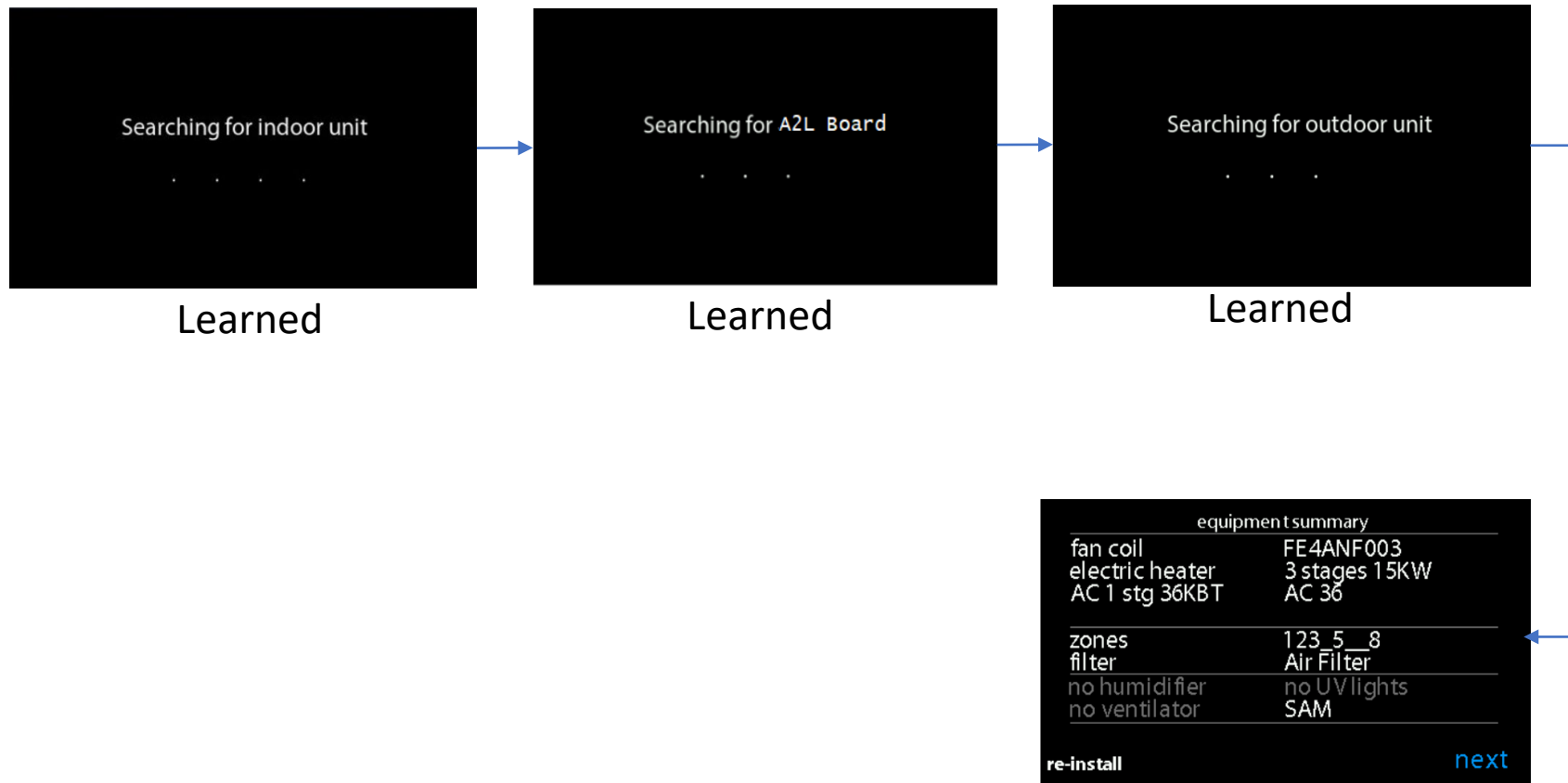
Mitigation Board Communicating System

- Mitigation Board is Communicating for Deluxe Models
 - Mitigation board will be discovered by the wall control during Installation process
 - Puron Advance™ outdoor equipment will not be allowed without the mitigation board present

R-454B Overview

Mitigation Board Communicating System

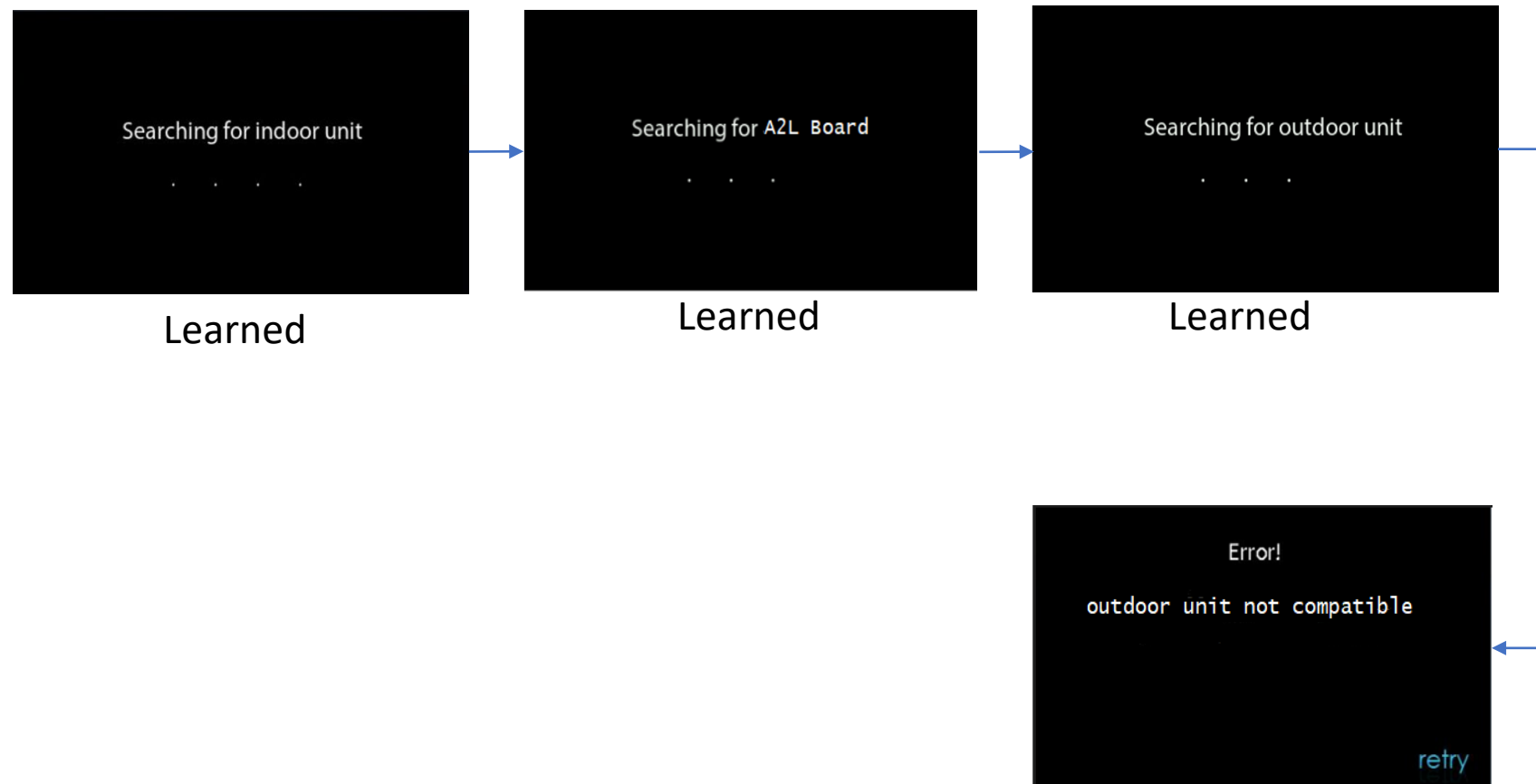
- Wall Control Installation Process - Compatible



R-454B Overview

Mitigation Board Communicating System

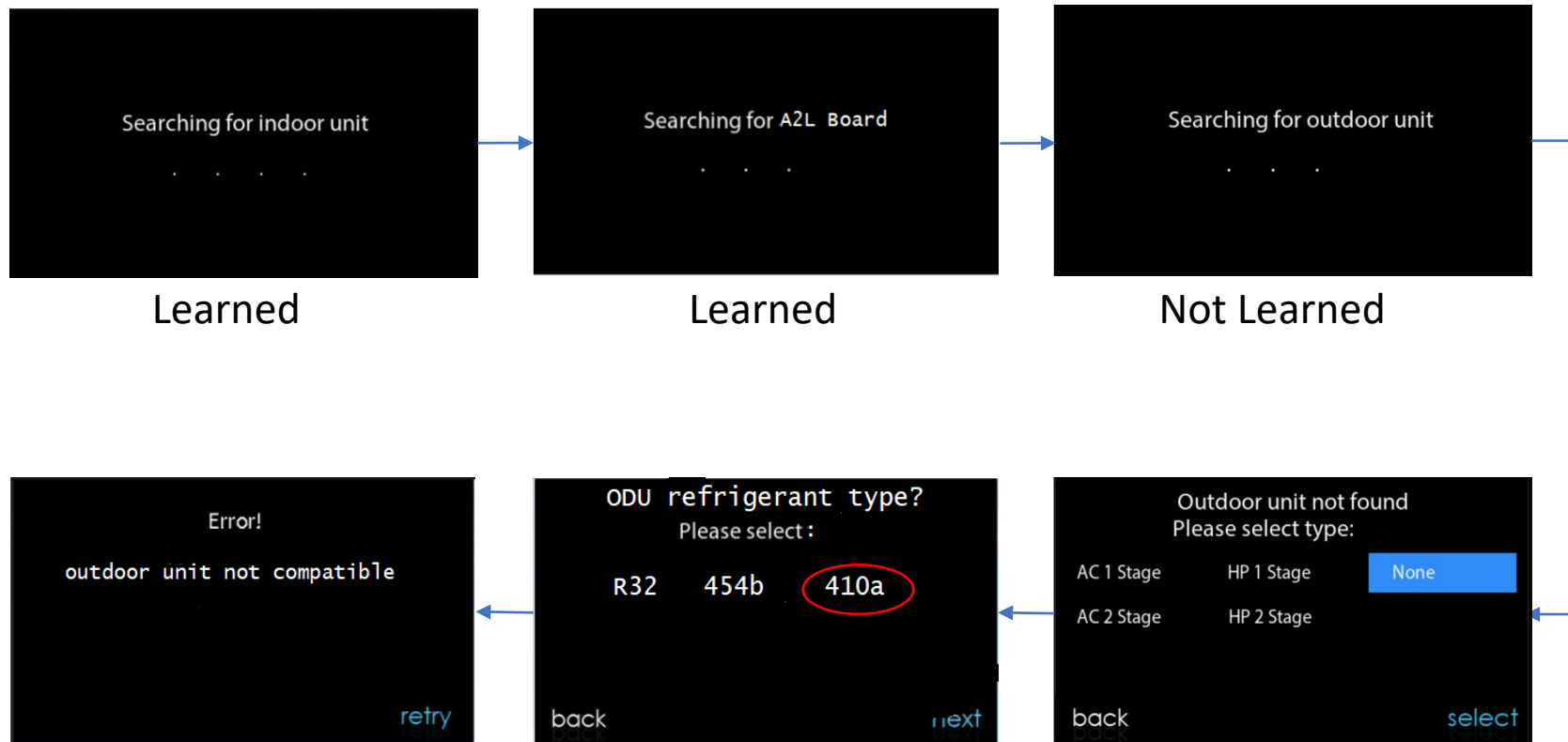
- Wall Control Installation Process – Non-Compatible ODU



R-454B Overview

Mitigation Board Communicating System

- Wall Control Installation Process – Non-Com 410a ODU



R-454B Overview

Approved Accessories

Some accessories Carrier has reviewed for competent ignition for R454-B

| | | Voltage | FLA |
|----------------------|-----------------------|---------------|------|
| Air Purifiers | Infinity Air Purifier | 110 | 0.3 |
| Humidifiers | HUMCRLFP | 120 | 0.7 |
| | HUMCRSTM | 120 & 208/240 | 16.0 |
| Dehumidifiers | DEHCRCDB1070 | 120 | 6.3 |
| | DEHCRCDB1095 | 120 | 8.0 |
| UVC Lamps | 1LP | 115 | 0.6 |
| | 2LP | 115 | 1.1 |
| | 1LP | 208/230 | 0.3 |
| | 2LP | 208/230 | 0.6 |
| Ventilators | FAVCRR6C2100-B01 | 22-30 | 2.0 |
| | ERVCRSVB1100 | 120 | 1.0 |
| | HRVCRSVB1100 | 120 | 0.9 |
| | ERVCRSLHB1200 | 120 | 2.1 |
| | HRVCRSLHB1150 | 120 | 1.5 |
| | HRVCRSLHB1250 | 120 | 2.1 |
| | HRVCRSVU1157 | 120 | 1.0 |
| | ERVCRNVA1090 | 120 | 1.3 |
| | FSFXAOA1180 | 120 | 0.7 |

R-454B Overview

Third party accessories

| Refrigerant | SU | Three phase | | | | | Single phase | | | |
|-------------|--------|-------------|------------|-------------|-------------|-------------|--------------|------------|-------------|-------------|
| | cm/sec | KVA | amps (24V) | amps (110V) | amps (220V) | amps (480V) | KVA | amps (24V) | amps (110V) | amps (230V) |
| R1234ze(E) | 1.2 | 4859 | 161966 | 40157 | 19205 | 9603 | 2429 | 80983 | 20078 | 9603 |
| R1234yf | 1.5 | 1990 | 66341 | 16448 | 7867 | 3933 | 995 | 33171 | 8224 | 3933 |
| R452B | 3.3 | 85 | 2832 | 702 | 336 | 168 | 42 | 1416 | 351 | 168 |
| R447A | 3.8 | 48 | 1611 | 399 | 191 | 95 | 24 | 805 | 200 | 95 |
| R454b | 5.2 | 13.8 | 459 | 114 | 54 | 27 | 6.9 | 230 | 57 | 27 |
| R32 | 6.7 | 5.0 | 167 | 41 | 20 | 10 | 2.5 | 83 | 21 | 10 |

The amps in the table are the maximum threshold

R-454B Overview

FAQ's

Limited warranty

THIS WARRANTY DOES NOT COVER:

1. Labor or other costs incurred for diagnosing, repairing, removing, installing, shipping, servicing, or handling of either defective parts, or replacement parts, or new units.
2. Any product not installed pursuant to applicable regional efficiency standards issued by the Department of Energy.
3. Any product purchased over the Internet.

Item 2; means that the installed system must be an AHRI matched system.

We can not retrofit a system from 1 class of system to another, from an A1 refrigerant(R-410A) to a A2L.

WITH R454-B THERE WILL BE
NO RETROFIT KIT'S
NO PISTON CONVERSION CHARTS
NO TXV CROSS REFERENCE CHARTS

The days of taking just an outdoor unit and converting the indoor unit are GONE!!!

Thank you

Questions

