



R454-B TRANSITION

Mingledorff's Technical Services / SE

03/19/2025

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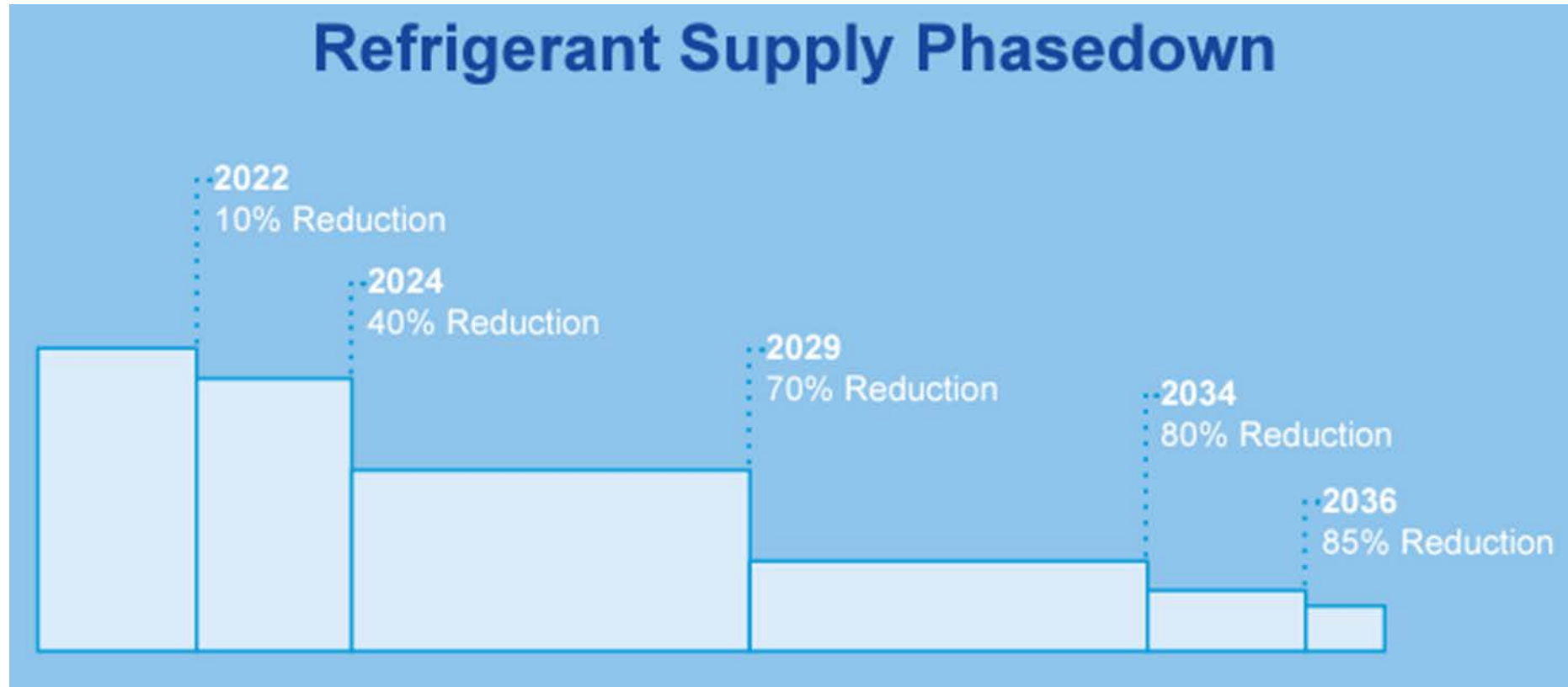


A2L Refrigerants: Industry Safe Application

R454-B OVERVIEW VIDEO



410A PHASE DOWN



454B

- 454B Makeup
 - 68.9% R32 & 31.1% R1234YF, POE oil
- NO PROPANE or BUTANE
- 454B classification
 - A2L
- Currently no additional testing requirements for existing EPA certifications
- A2L
 - A= low toxicity / 2L= mild flammability



R32 reached top of cylinder in 0.233 seconds (Note stopper release at top)

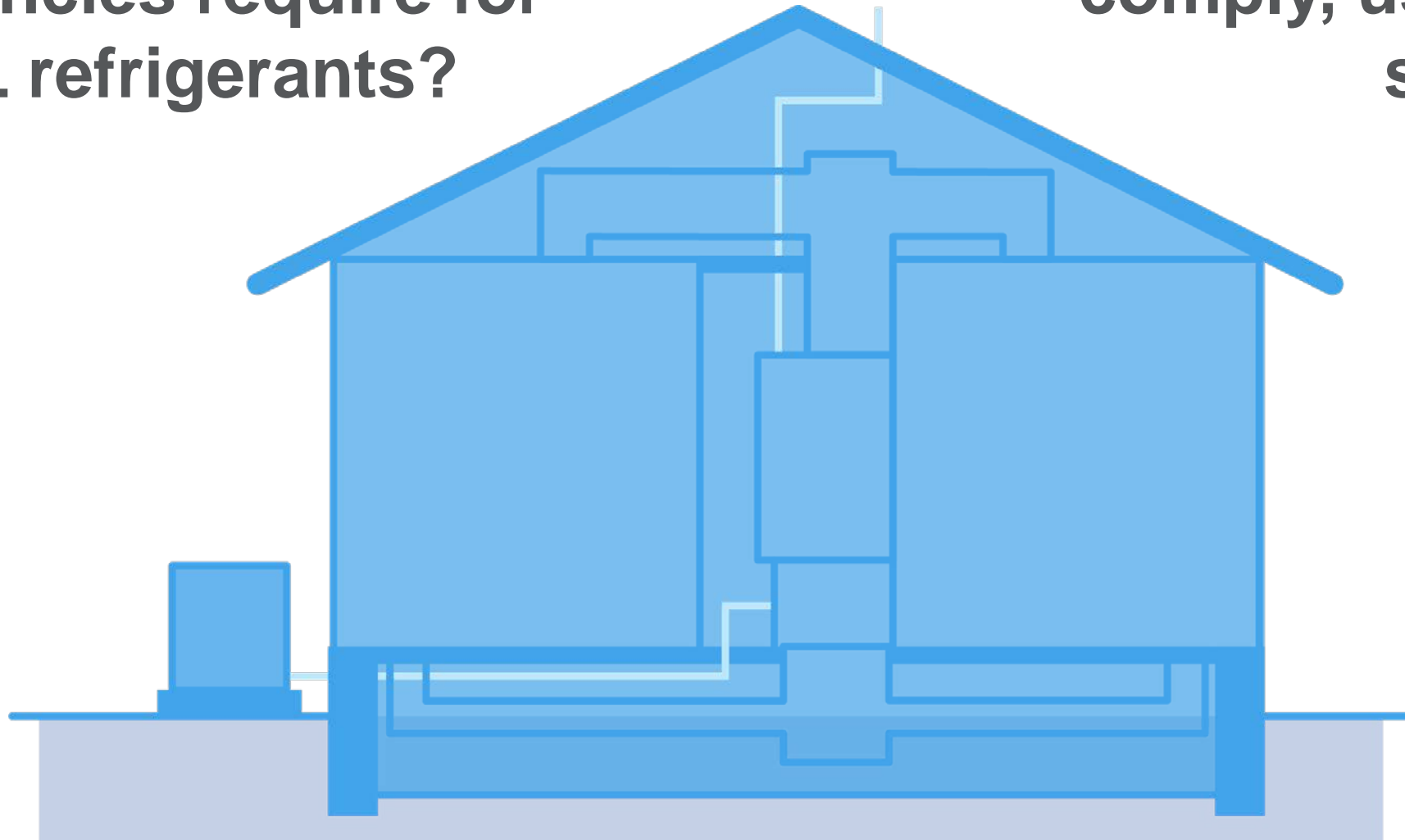
A technician in a blue polo shirt and khaki pants is kneeling on the ground, working on the wiring of a large, grey outdoor HVAC unit. The unit is mounted on a concrete pad next to a white building with horizontal siding. To the left of the technician is a large, tall green plant, and in the foreground, there are some yellow and orange flowers. The technician is focused on the task, with his hands near the electrical connections of the unit.

Next steps to transition to R454-B

How R454-B COMPLIES WITH AGENCY REQUIREMENTS

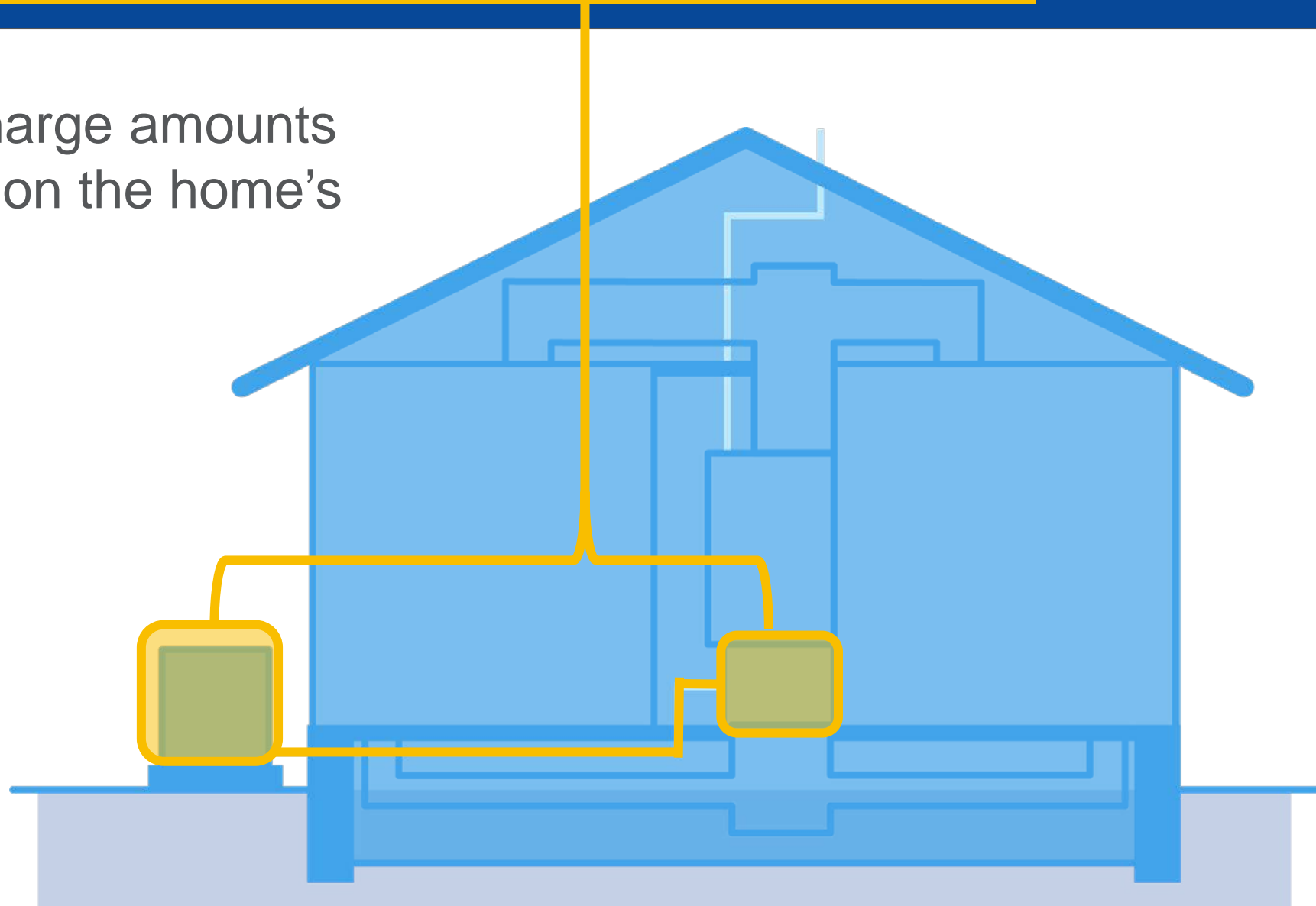
**What do the
agencies require for
A2L refrigerants?**

**What did we do to
comply, using R454-B
specifically?**



REFRIGERANT CHARGE LIMITS

Total system charge amounts must be based on the home's square footage



REFRIGERANT CHARGE LIMITS

What the UL states that manufacturers must do:

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

REFRIGERANT CHARGE LIMITS

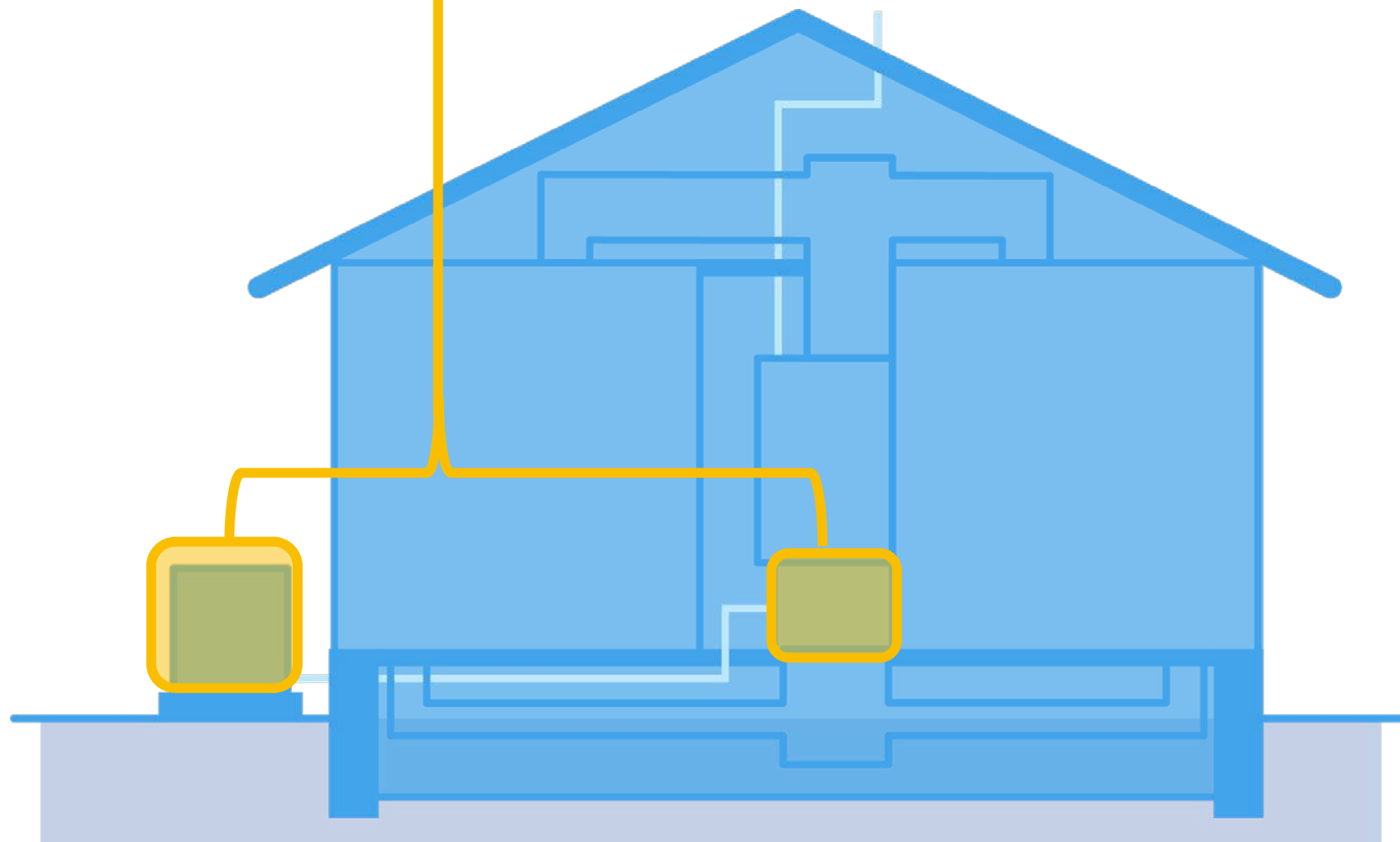
WHAT WE DID TO COMPLY:

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

- All systems comply with m2 requirement
- Dissipation system: Leak detector activates unit fan; controlled via mitigation board

ALL of our units have safety measures in the design

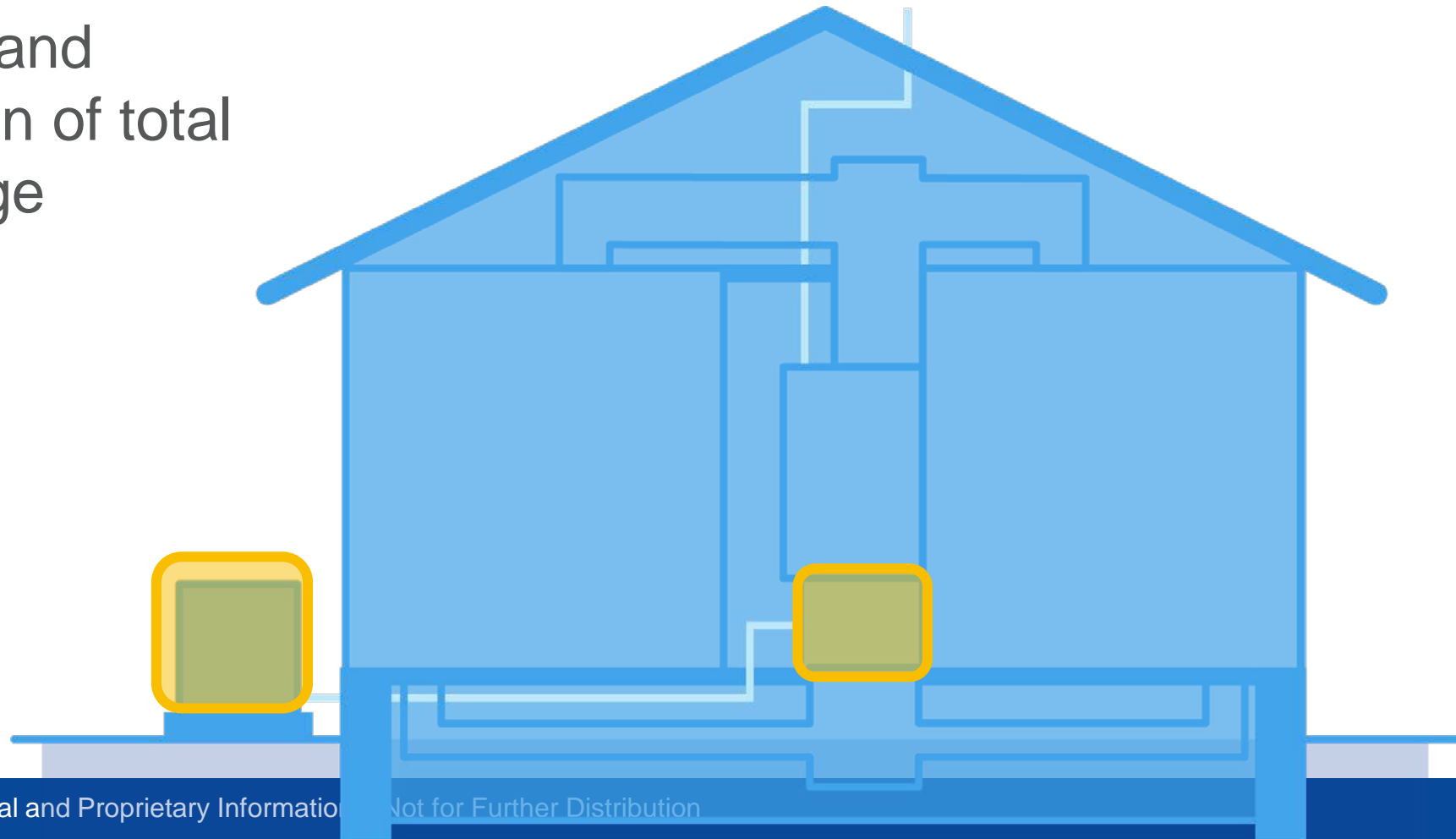
CHARGING LABEL



CHARGING LABEL

What agencies state that manufacturers must do:

- Tracking and verification of total unit charge



CHARGING LABEL

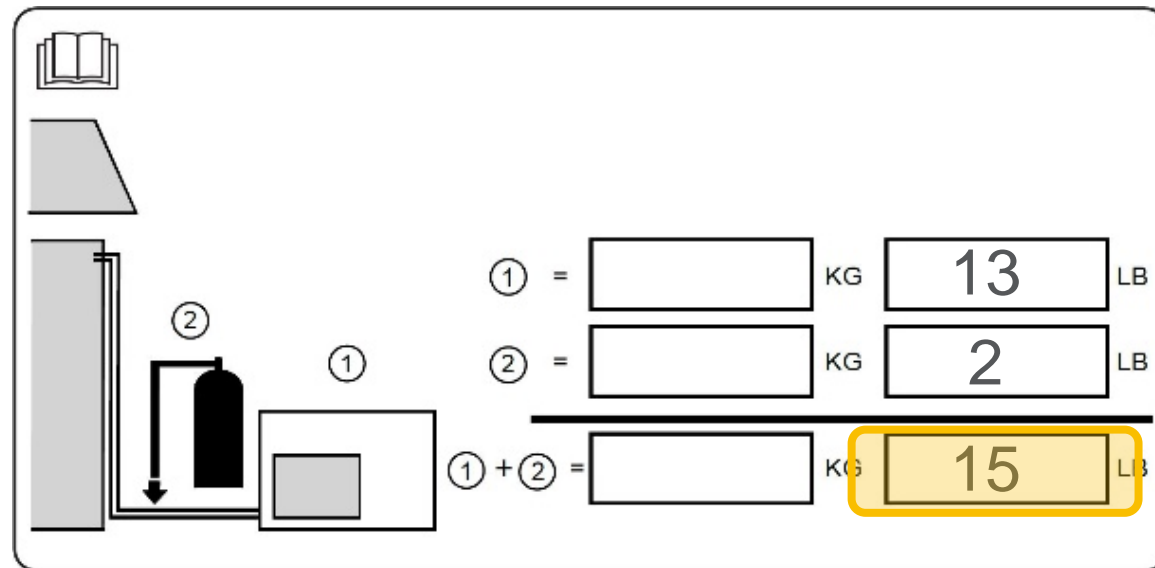
WHAT WE DID TO COMPLY:

- Documents how much refrigerant a system contains
- Completed by installing technician

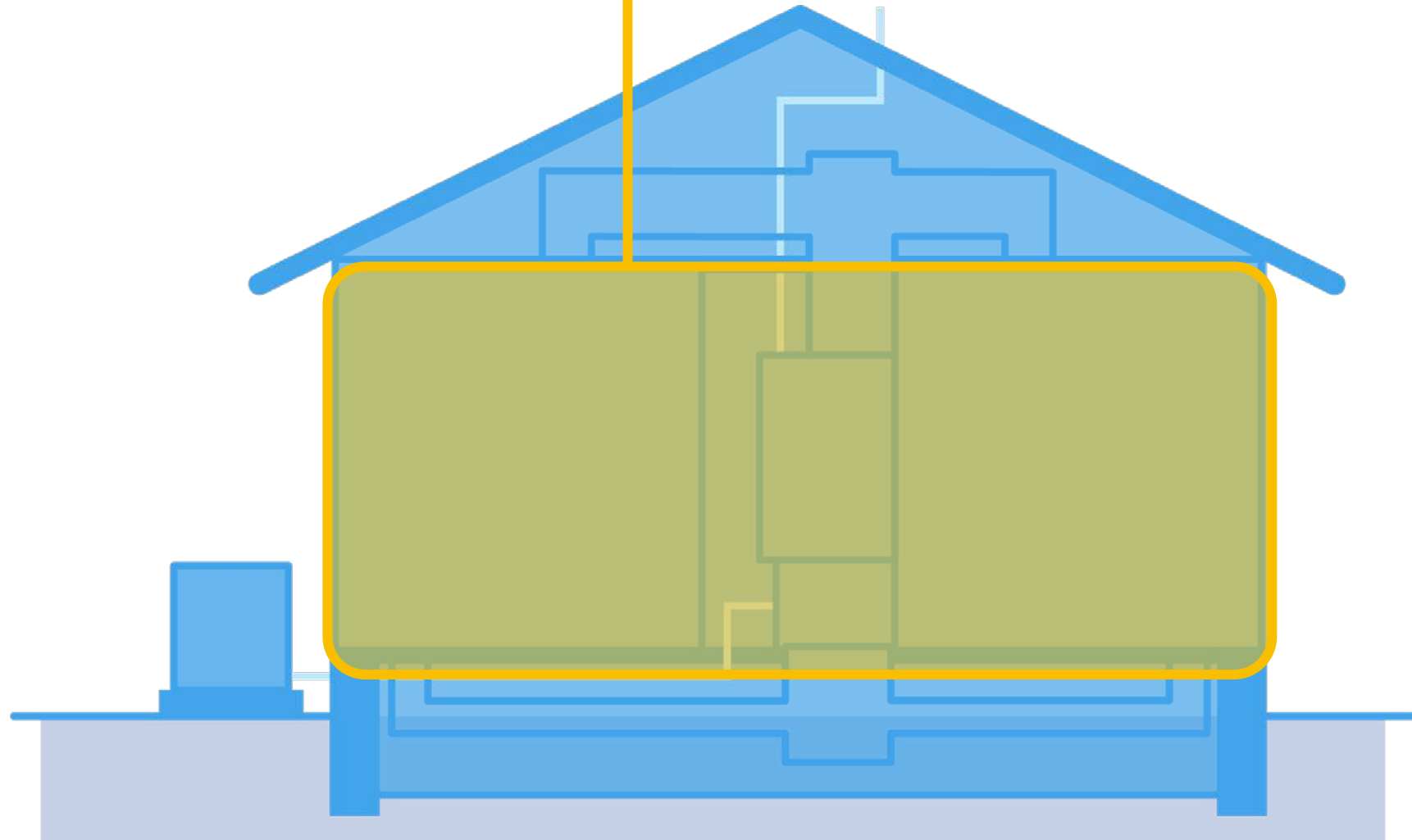
1 = Unit Charge

2 = Line Set Charge

3 = (1+2) = Total Charge



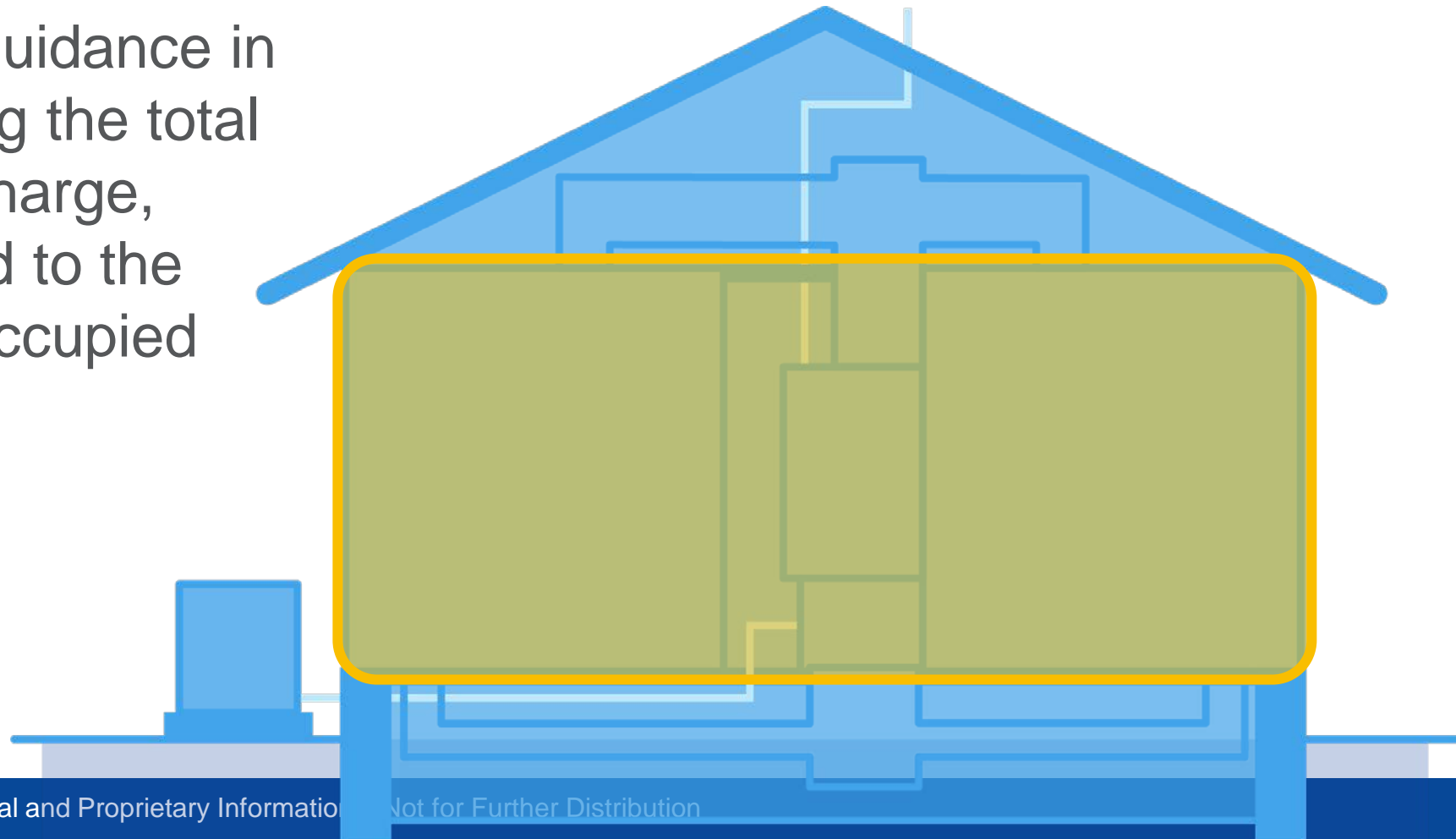
MINIMUM AREA (A_{MIN}) CHECK



MINIMUM AREA (A_{MIN}) CHECK

What agencies state that manufacturers must do:

- Provide guidance in measuring the total system charge, compared to the home's occupied space
- “ A_{min} ”



MINIMUM AREA (A_{MIN}) CHECK

WHAT WE DID TO COMPLY:

- 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

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

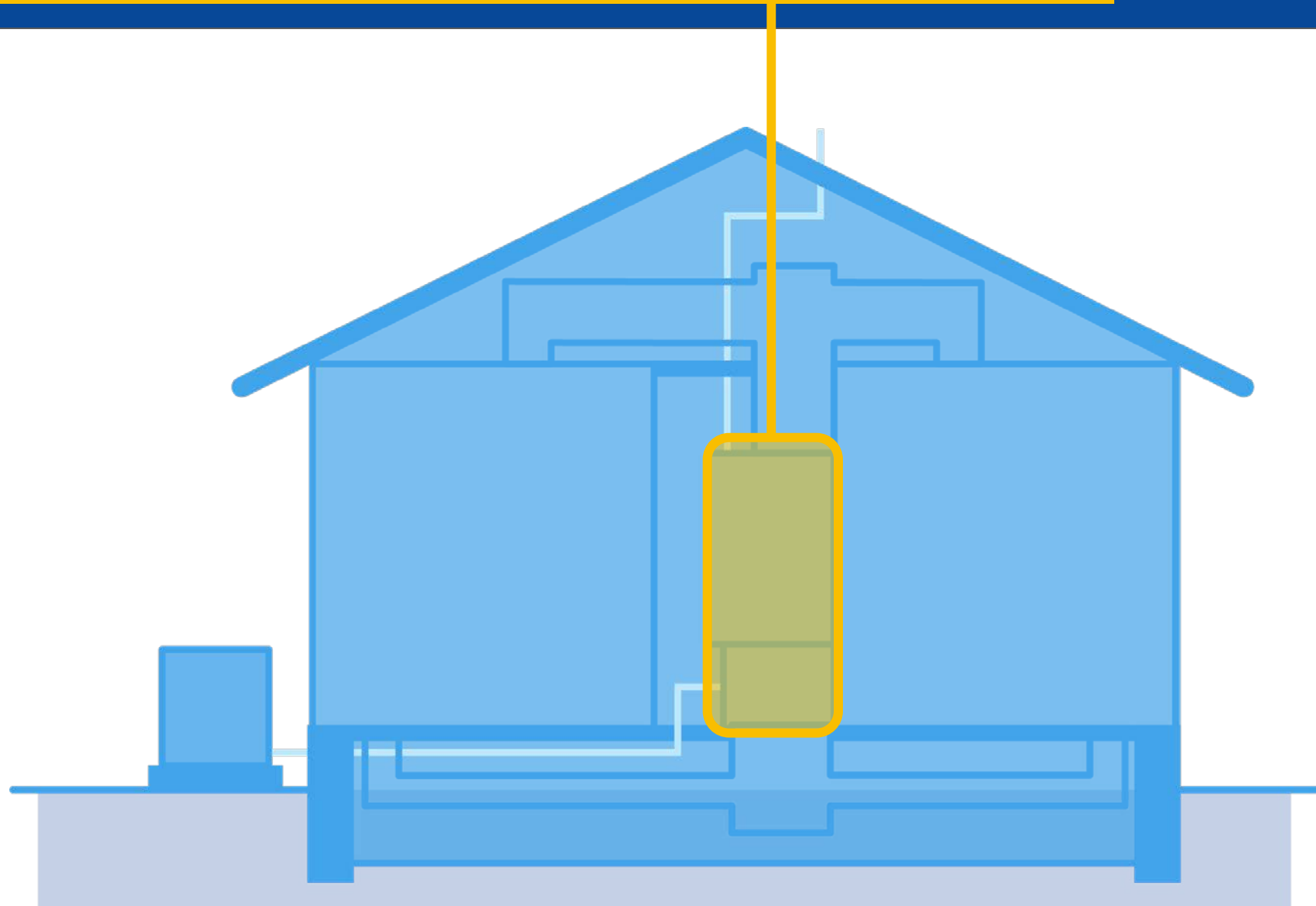
MINIMUM AREA (A_{MIN}) CHECK

For applications that do not pass the A_{min} check:

- Review system design for opportunities to reduce charge amounts without operational affect
- Refer to relevant national and local building codes re: A2L equipment with large amounts of refrigerant

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

ACTIVE MITIGATION FOR LEAKS

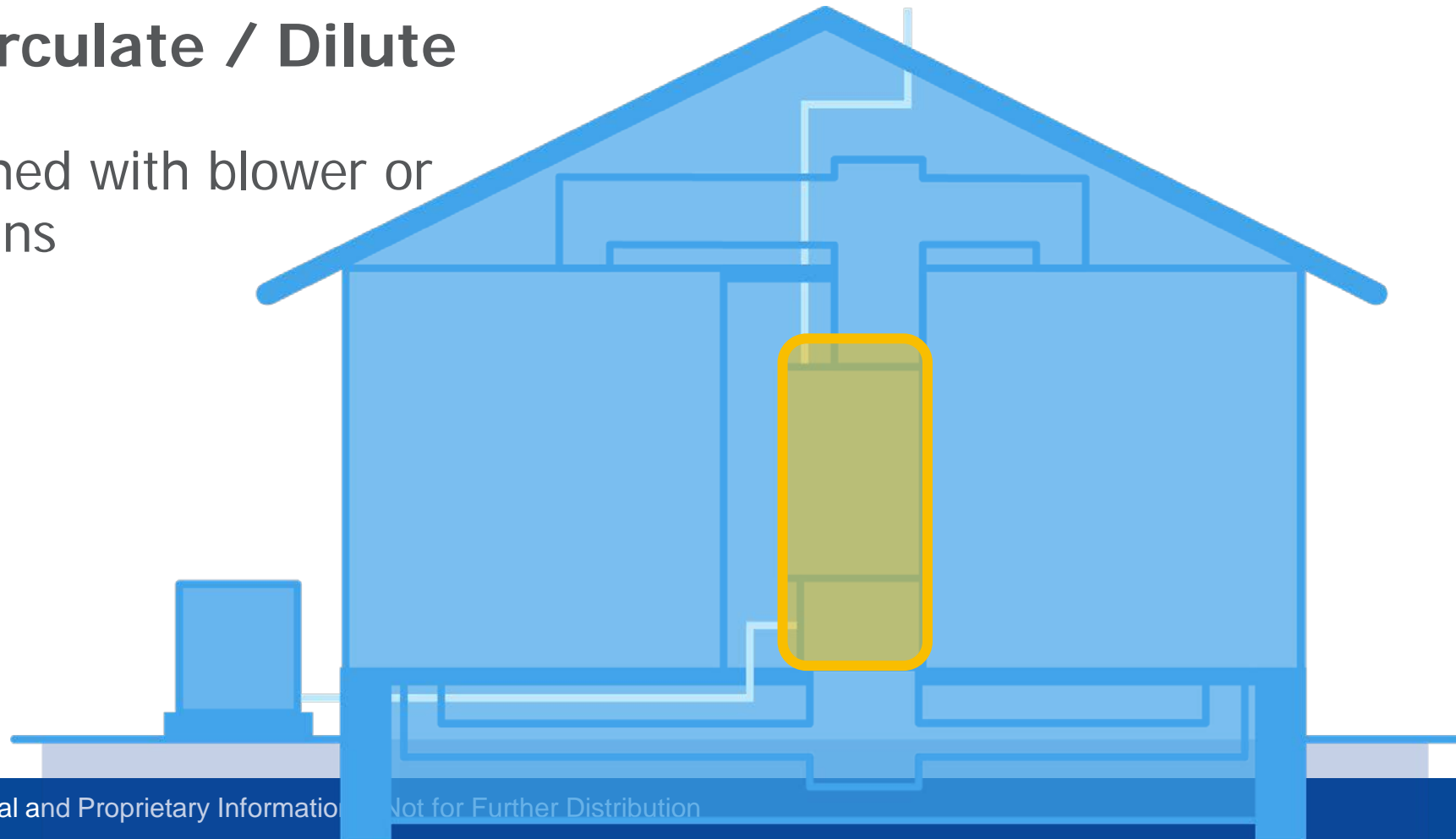


ACTIVE MITIGATION FOR LEAKS

What agencies state that manufacturers must do:

Detect / Circulate / Dilute

- Accomplished with blower or external fans



ACTIVE MITIGATION FOR LEAKS

WHAT WE DID TO COMPLY:

Dissipation System:

- Leak sensor in indoor coil cabinet
- +
 - Mitigation circuit board
- +
 - Unit blower

May be:

- Factory-installed
- Field-installed (kit)

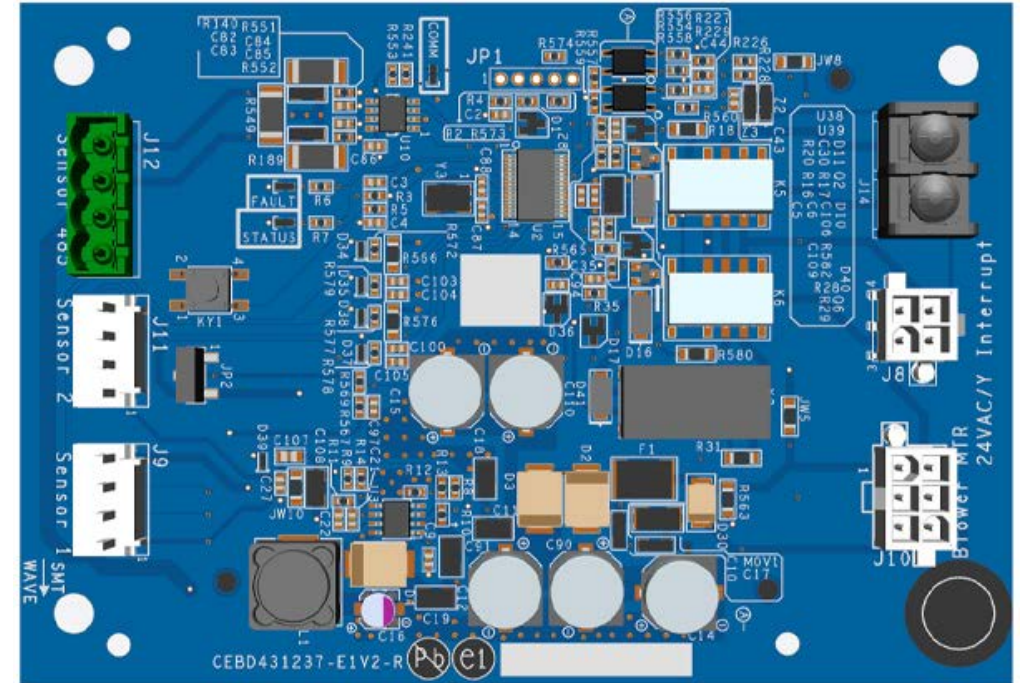


* Actual part design and location may vary

ACTIVE MITIGATION FOR LEAKS

Dissipation System: Mitigation board

- **Green** LED = Normal operation
- **Red** LED = Mitigation mode
- **Flashing LED**: Refer to installation manual

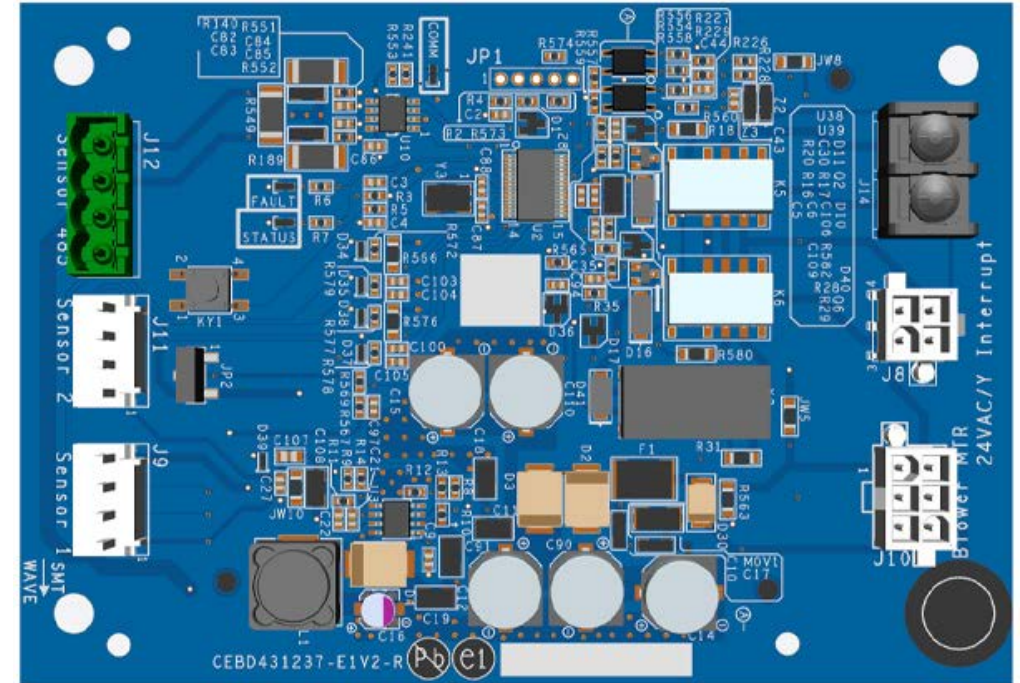
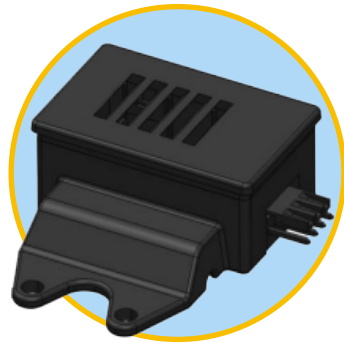


** Subject to change*

ACTIVE MITIGATION FOR LEAKS

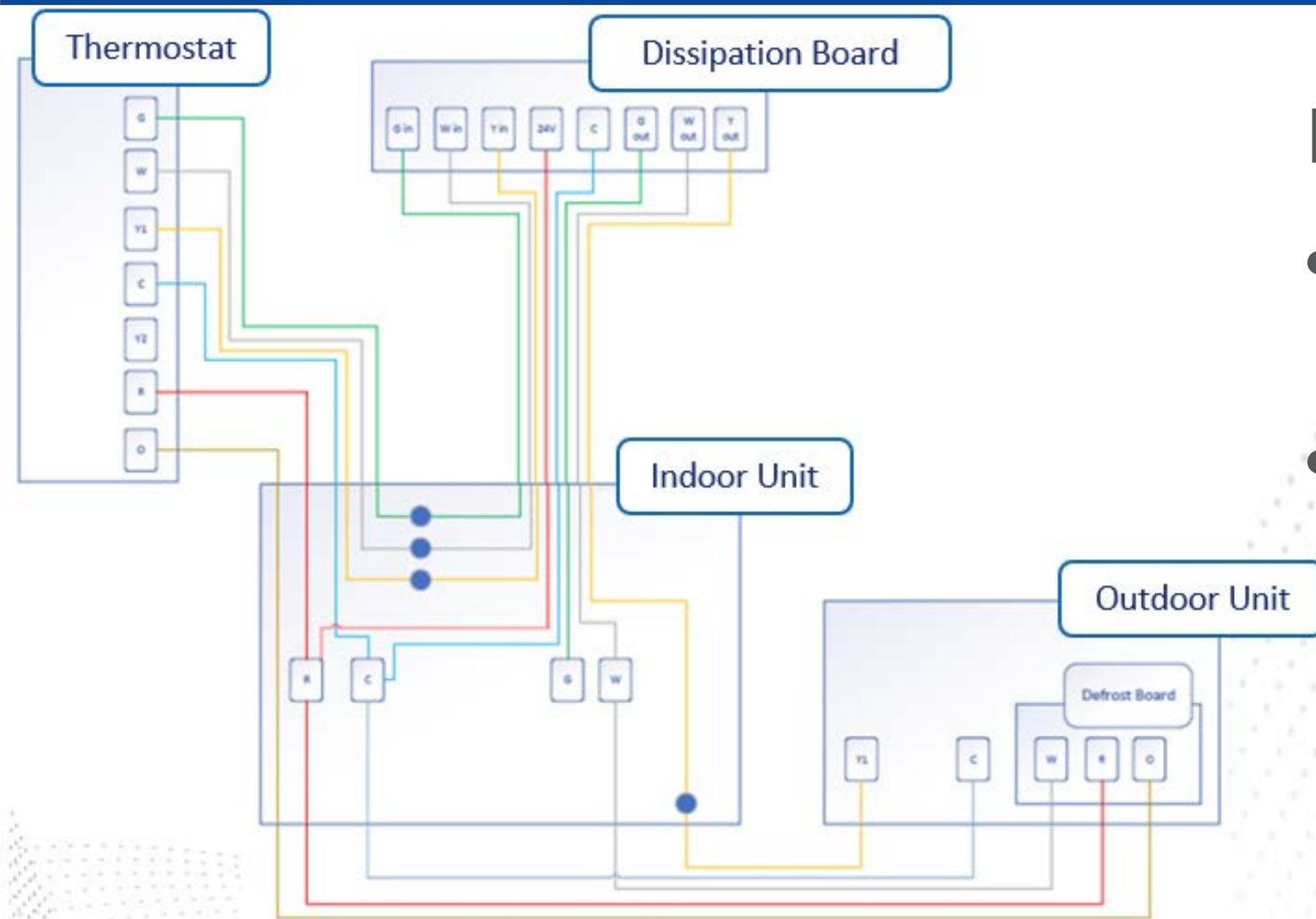
Dissipation System

- Blower always on in mitigation mode



** Subject to change*

ACTIVE MITIGATION FOR LEAKS



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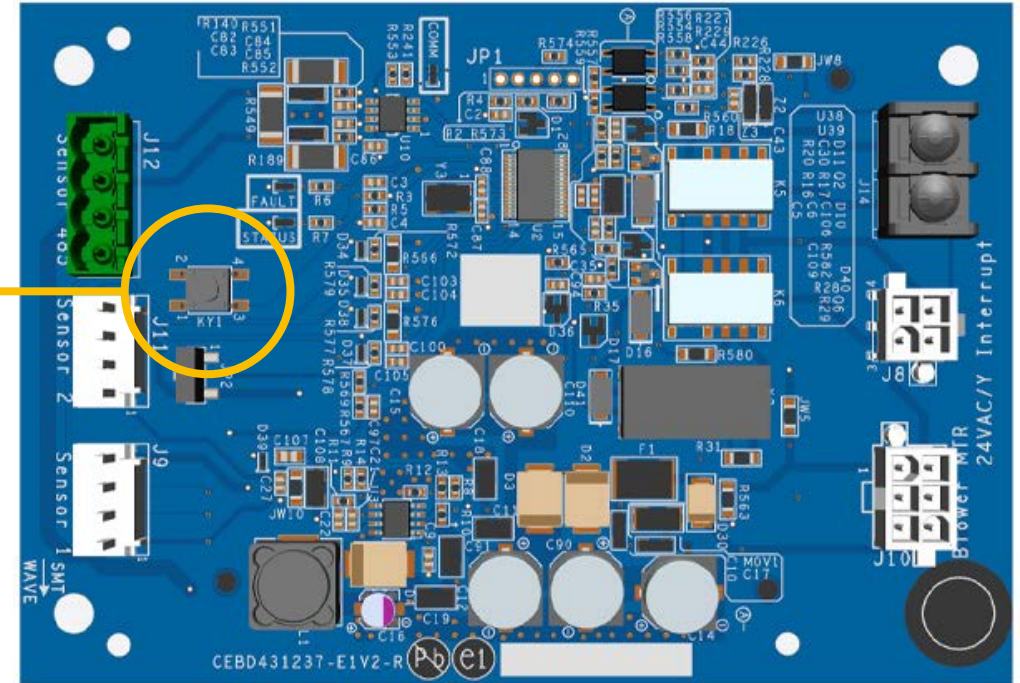
Dissipation System

- Wiring diagrams provided
- **IMPORTANT:** If sensor is not factory-mounted, refer to manufacturer's instruction for correct location

ACTIVE MITIGATION FOR LEAKS

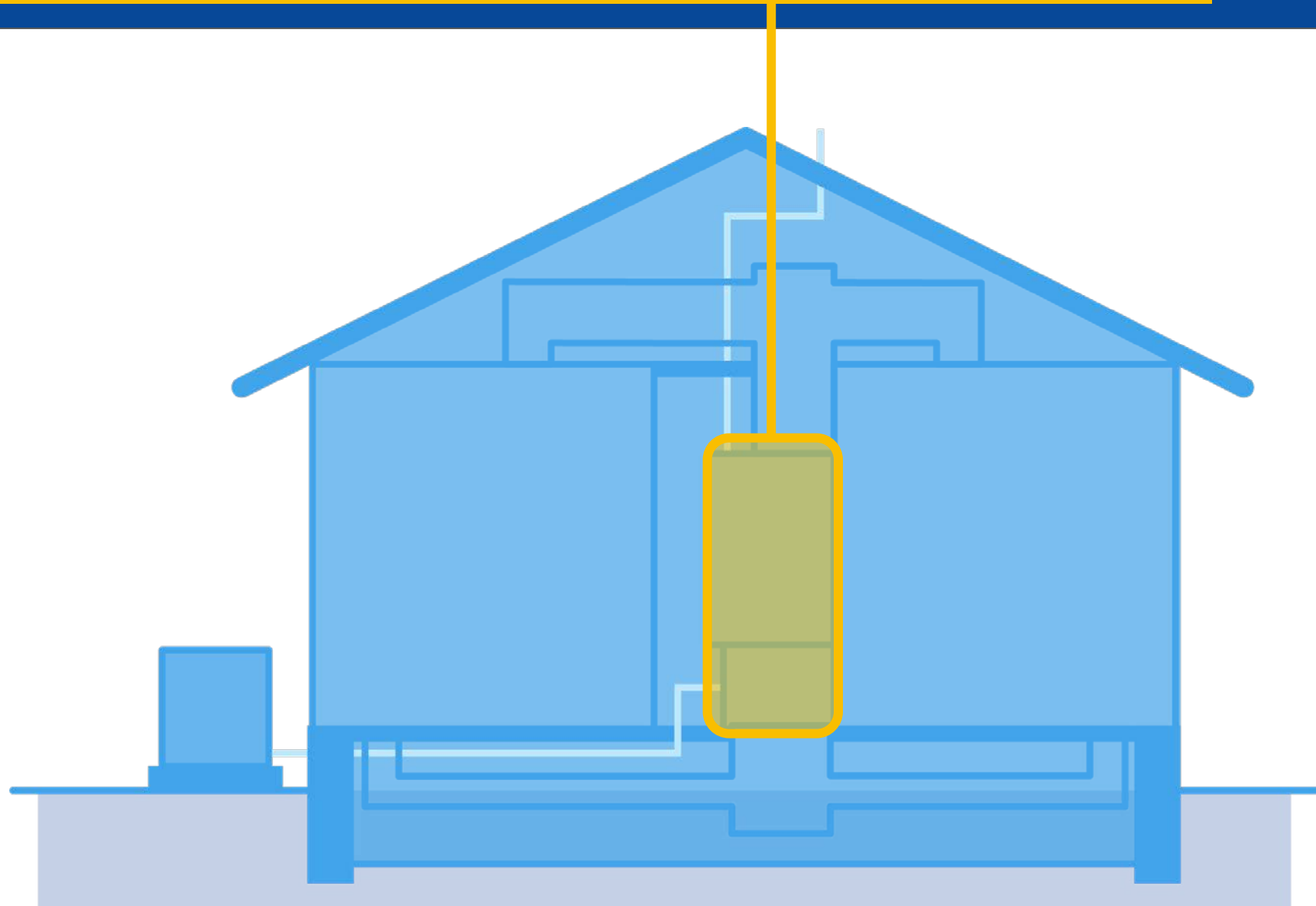
Dissipation System

- Self-test button



** Subject to change*

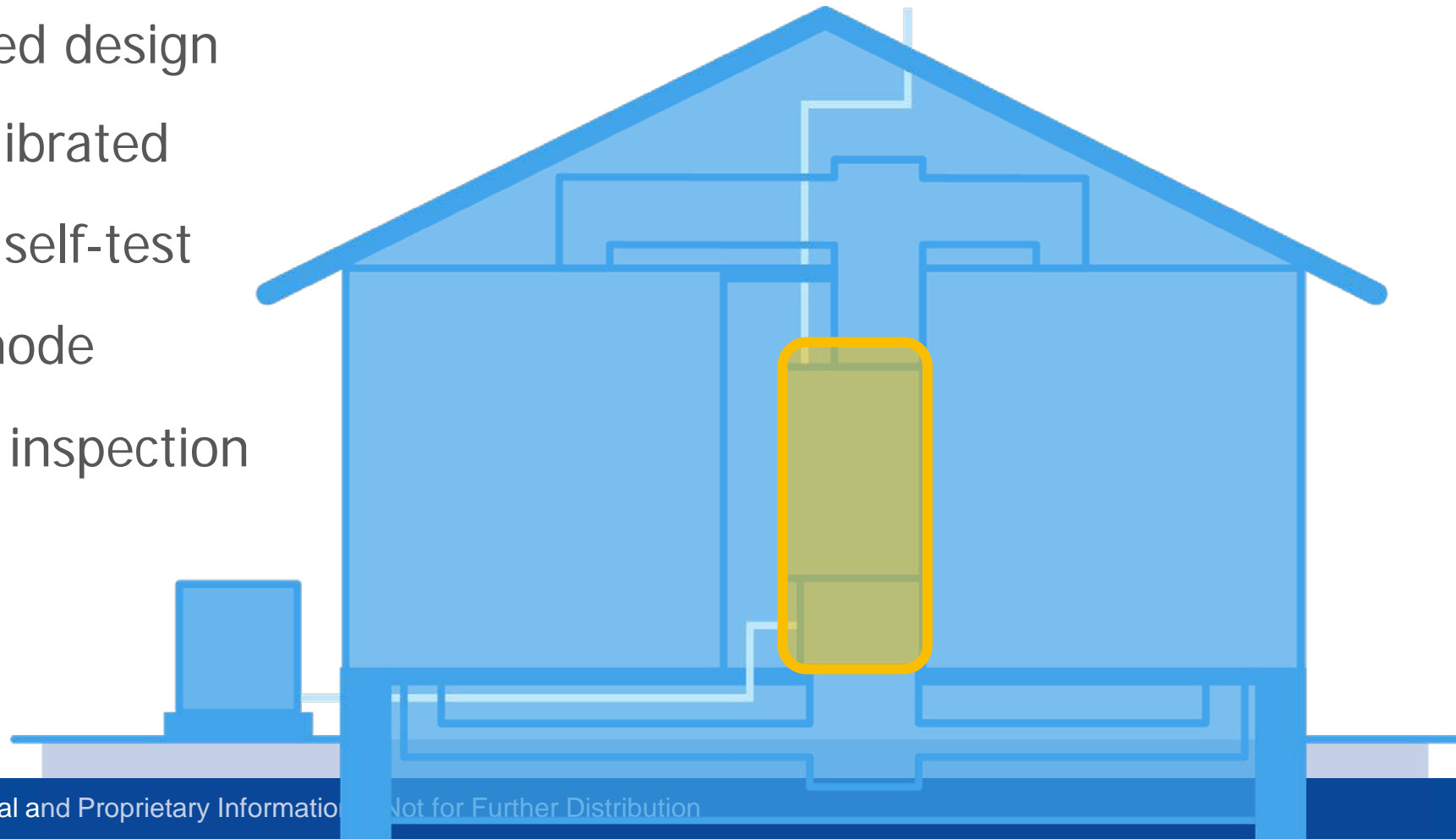
FACTORY-INSTALLED LEAK DETECTION



FACTORY-INSTALLED LEAK DETECTION

What agencies state that manufacturers must do:

- UL-approved design
- Factory calibrated
- Automatic self-test
- Fail-safe mode
- Allow field inspection



FACTORY-INSTALLED LEAK DETECTION

WH

Unit-

- Co B leak
- M FL
- Lo

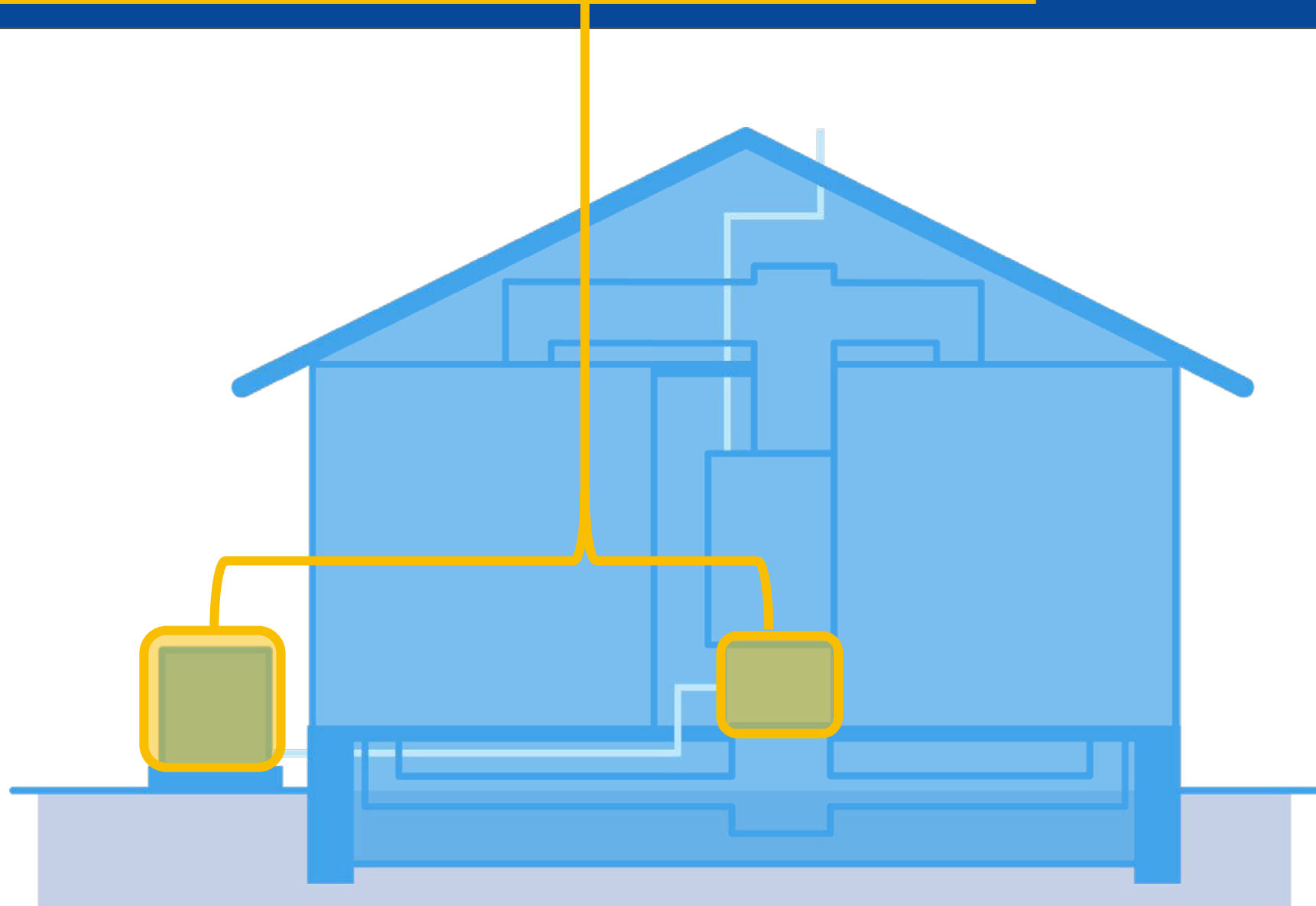


install



* Actual part design and location may vary

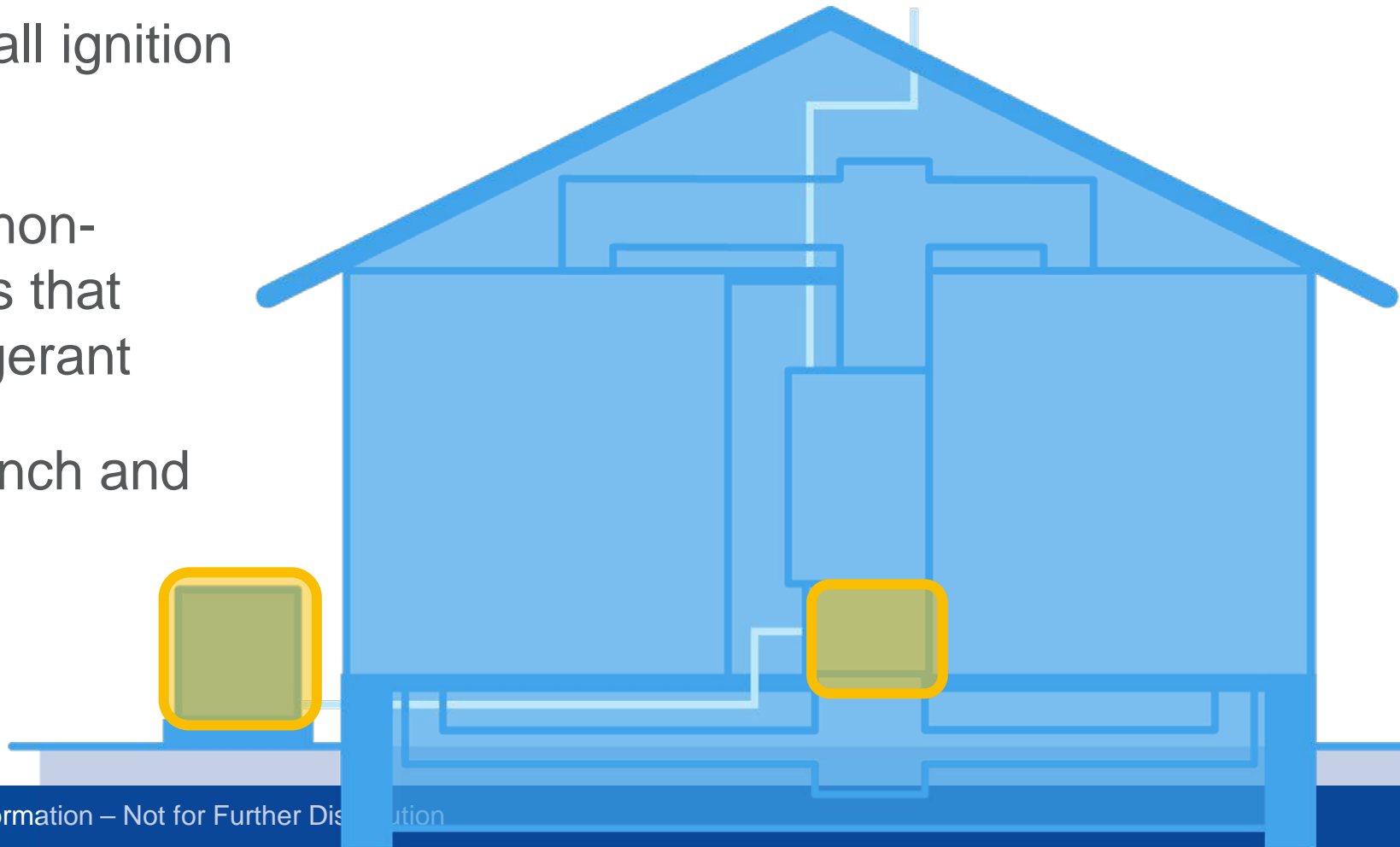
IGNITION SOURCE ISOLATION



IGNITION SOURCE ISOLATION

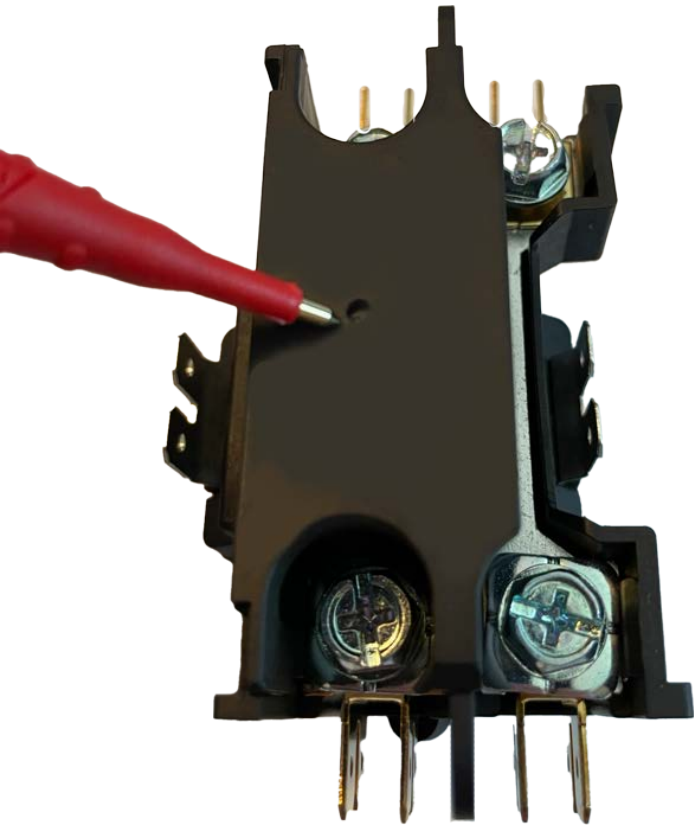
What agencies state that manufacturers must do:

- Review and mitigate all ignition sources
- Identify and mitigate non-enclosed components that could ignite A2L refrigerant
- Protect wiring from pinch and arc



IGNITION SOURCE ISOLATION

WHAT WE DID TO COMPLY:



Outdoor unit

- Compressor plug
 - Enclosed plugs provide necessary protection
- Electrical ignition points
 - Wire sleeves on compressor and crankcase heater wiring*
- Contactor
 - Patented top cover eliminates gap / small gap acts as flame arrestor
 - Manual operation still available
 - Minimal air gaps = flame arrestor

* Subject to change

IGNITION SOURCE ISOLATION

WHAT WE DID TO COMPLY:



Indoor unit

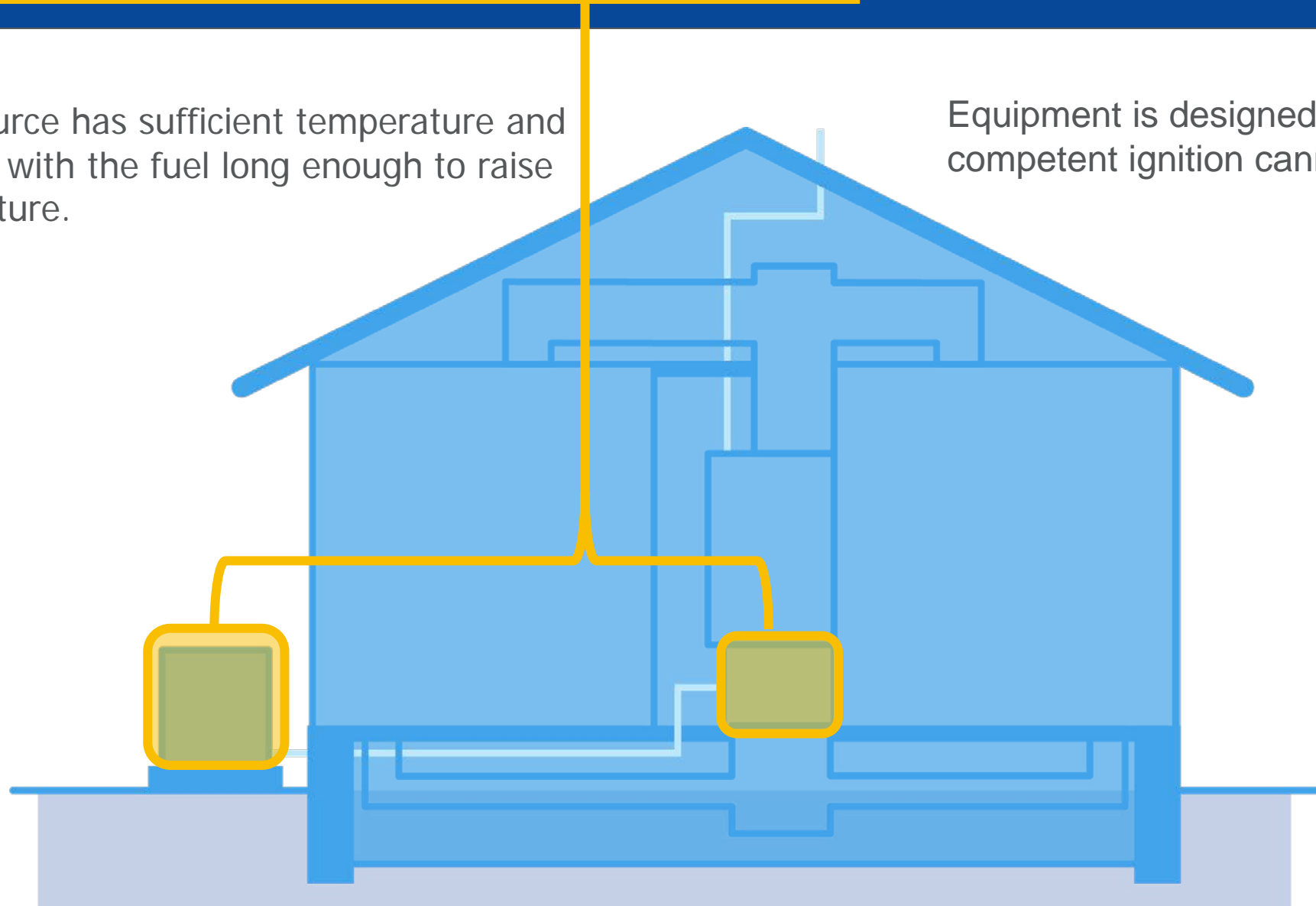
- Electrical ignition points
 - All potential ignition sources assessed at factory
 - Protection installed on wiring
 - Electric heaters on units are not an ignition source

** Subject to change*

NO COMPETENT IGNITION

A competent ignition source has sufficient temperature and energy and is in contact with the fuel long enough to raise it to its ignition temperature.

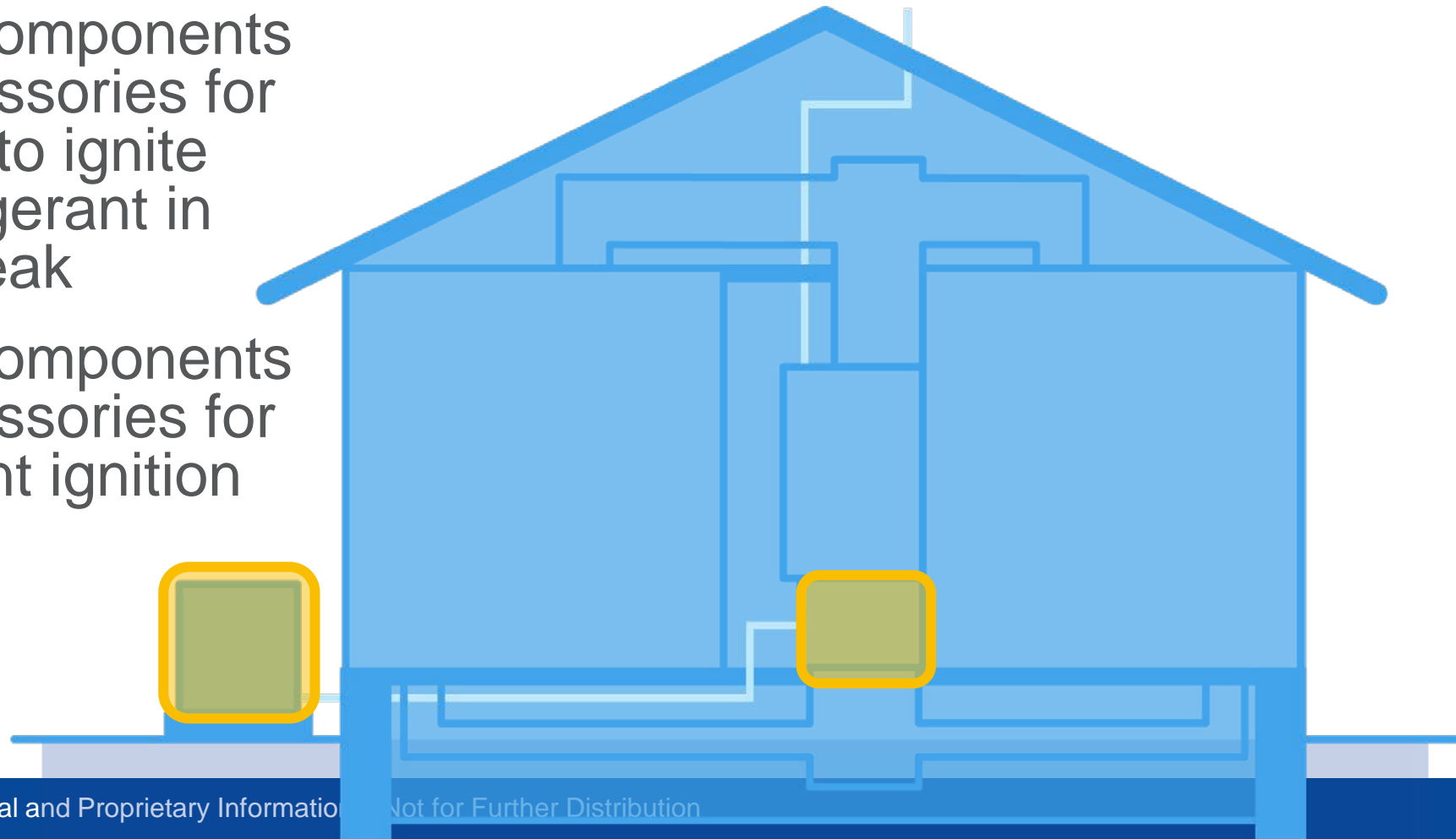
Equipment is designed so that competent ignition cannot occur



NO COMPETENT IGNITION

What agencies state that manufacturers must do:

- Assess components and accessories for potential to ignite A2L refrigerant in case of leak
- Assess components and accessories for competent ignition



NO COMPETENT IGNITION

WHAT WE DID TO COMPLY:

Some accessories we have 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
	ERVCRLHB1200	120	2.1
	HRVCRLHB1150	120	1.5
	HRVCRLHB1250	120	2.1
	HRVCRSVU1157	120	1.0
	ERVCRNVA1090	120	1.3
	FSFXXAOA1180	120	0.7

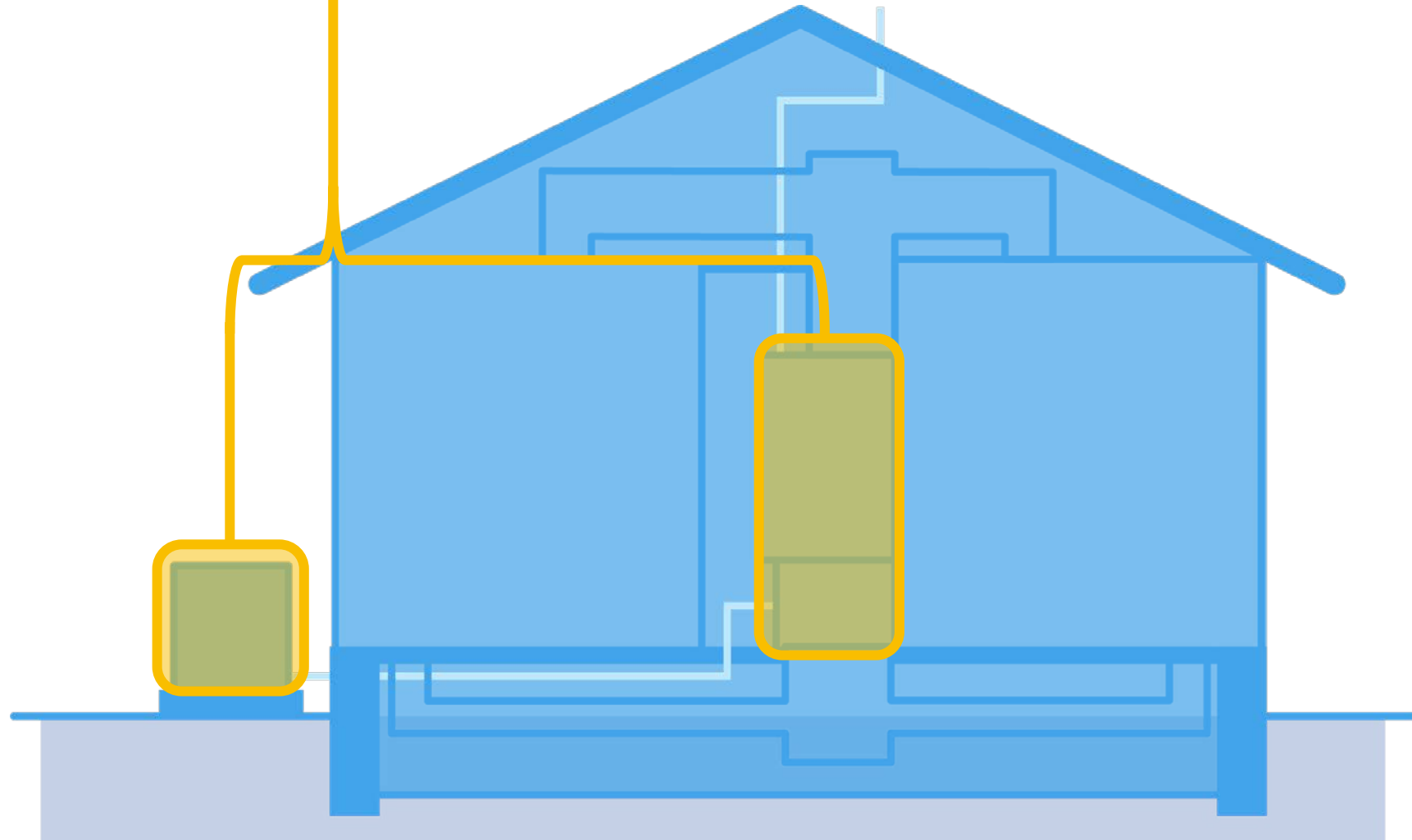
NO COMPETENT IGNITION

To check 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

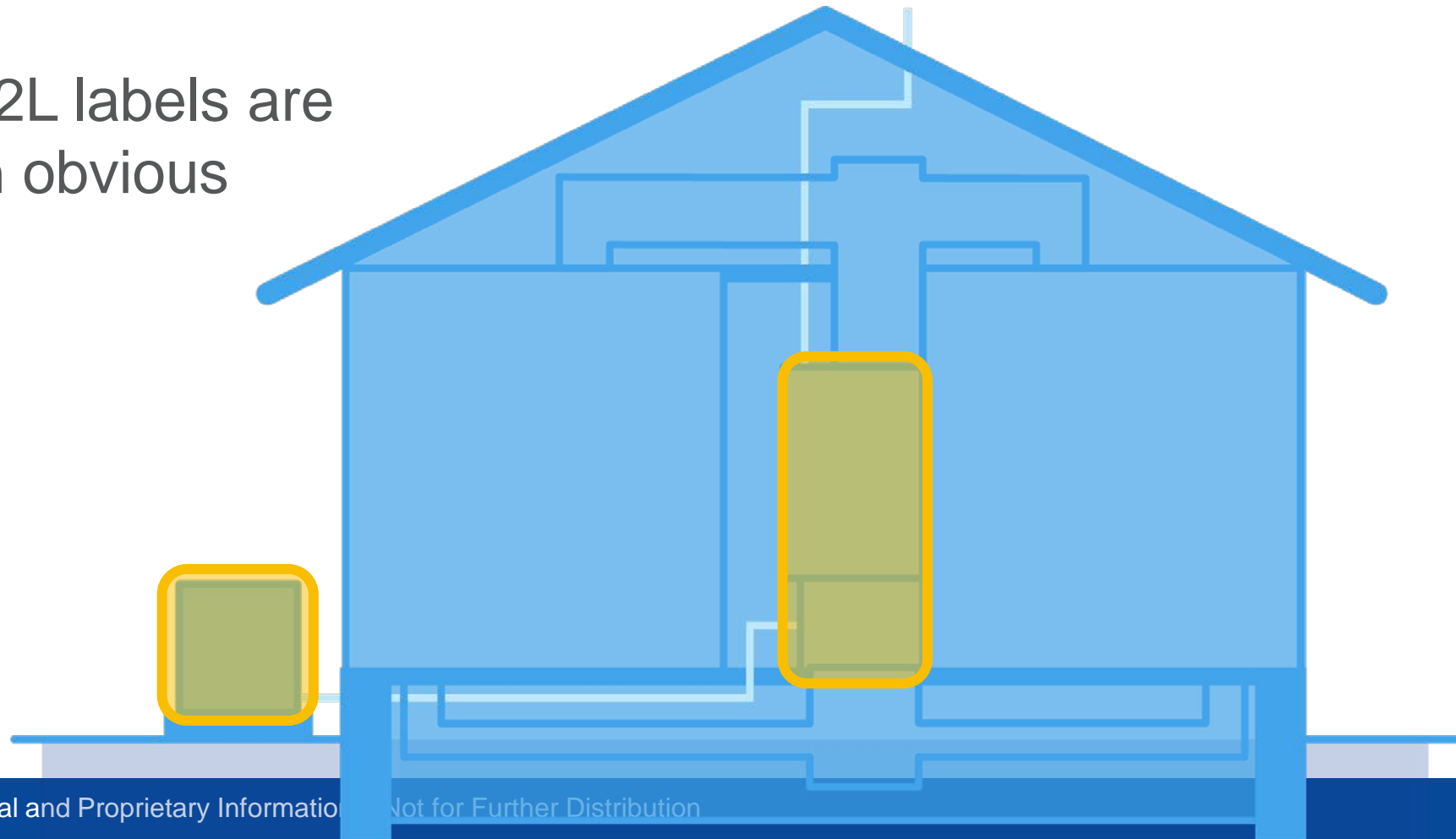
LABELS



LABELS

What agencies state that manufacturers must do:

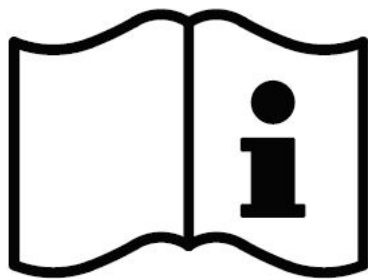
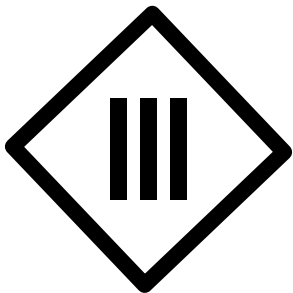
- Ensure A2L labels are located in obvious locations



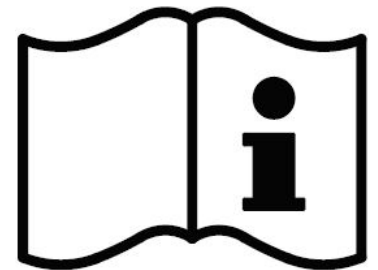
LABELS

WHAT WE DID TO COMPLY:

- Clearly draw attention to components and procedural changes related to R454-B
- 5 labels:



① =	<input type="text"/>	KG	<input type="text"/>	LB
② =	<input type="text"/>	KG	<input type="text"/>	LB
① + ② =	<input type="text"/>	KG	<input type="text"/>	LB



LABELS



Flammable pictogram

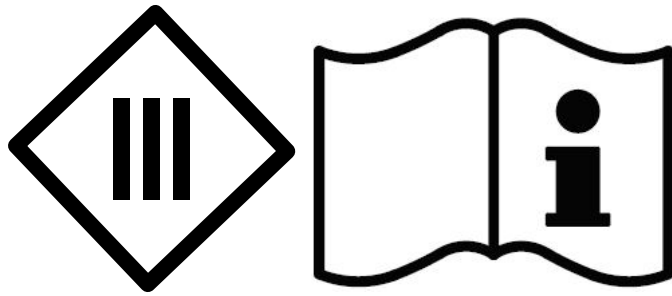
- Warns of potential flammable content
- Appears on all cylinders and equipment containing A2L refrigerants
- May be used in transportation (placarding)
- May be on units (indoor and outdoor) and/or packaging



① =	<input type="text"/>	KG	<input type="text"/>	LB
② =	<input type="text"/>	KG	<input type="text"/>	LB
① + ② =	<input type="text"/>	KG	<input type="text"/>	LB

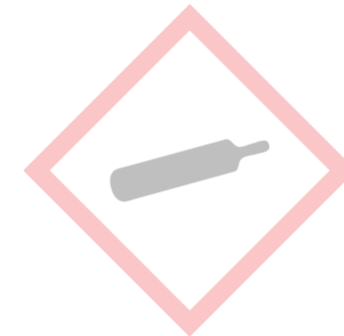
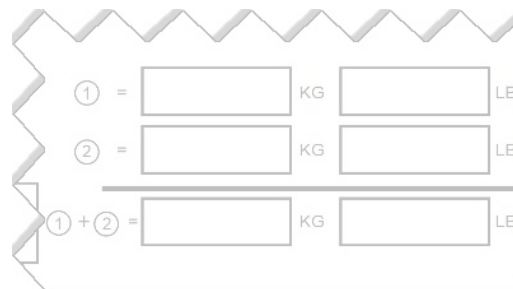
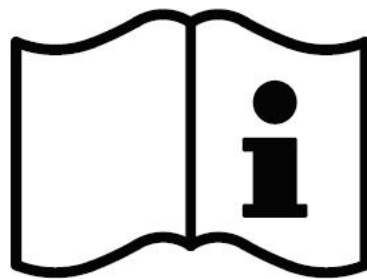
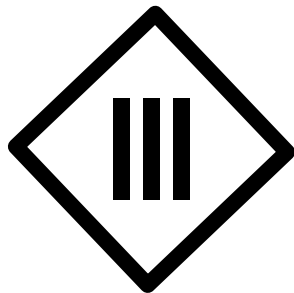


LABELS



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

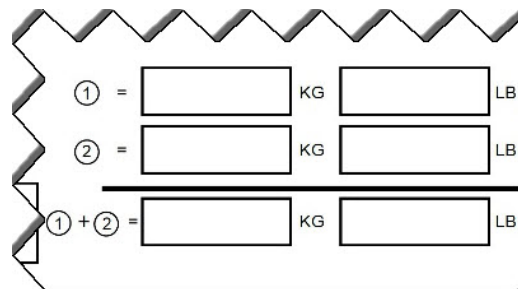


LABELS

Charging label

① = KG LB
② = KG LB
① + ② = KG LB

- 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



LABELS



Compressed gas pictogram

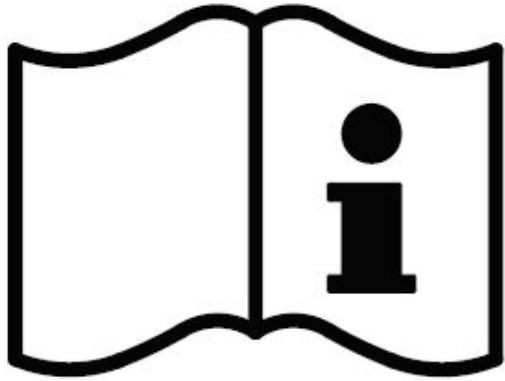
- Warns of high pressure gas that could explode when heated
- May be used in storage and transportation of cylinders and equipment containing A2L refrigerants



① =	<input type="text"/>	KG	<input type="text"/>	LB
② =	<input type="text"/>	KG	<input type="text"/>	LB
① + ② =	<input type="text"/>	KG	<input type="text"/>	LB

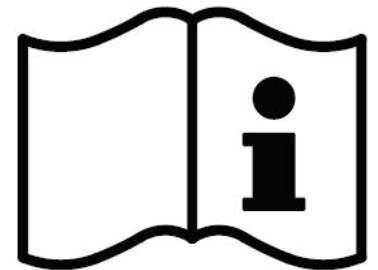
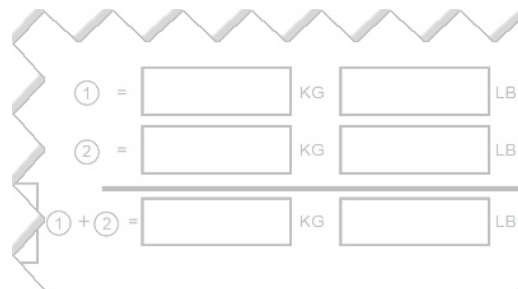


LABELS



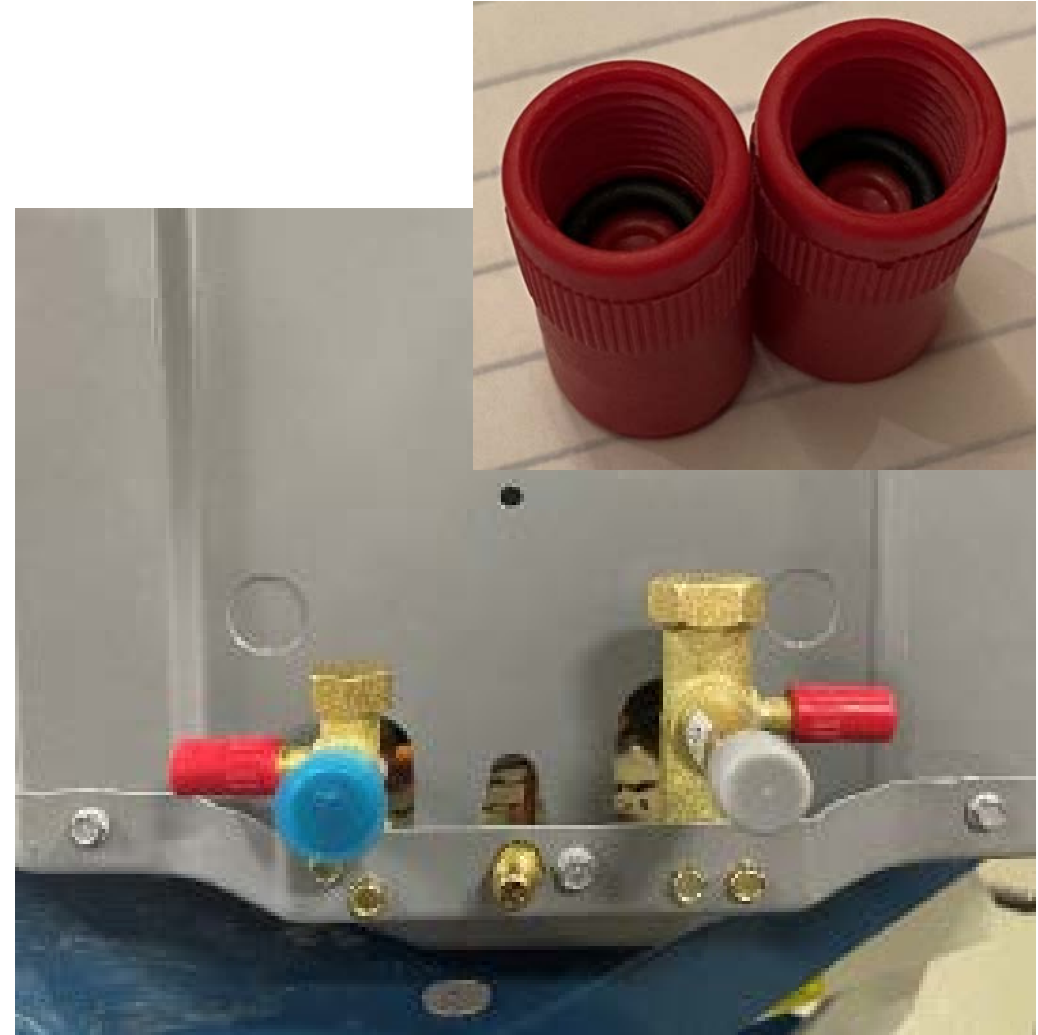
Operator's manual symbol

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



LABELS

Service Valve Hang Tag & Red Caps




LABELS

Sticker & Data Plate

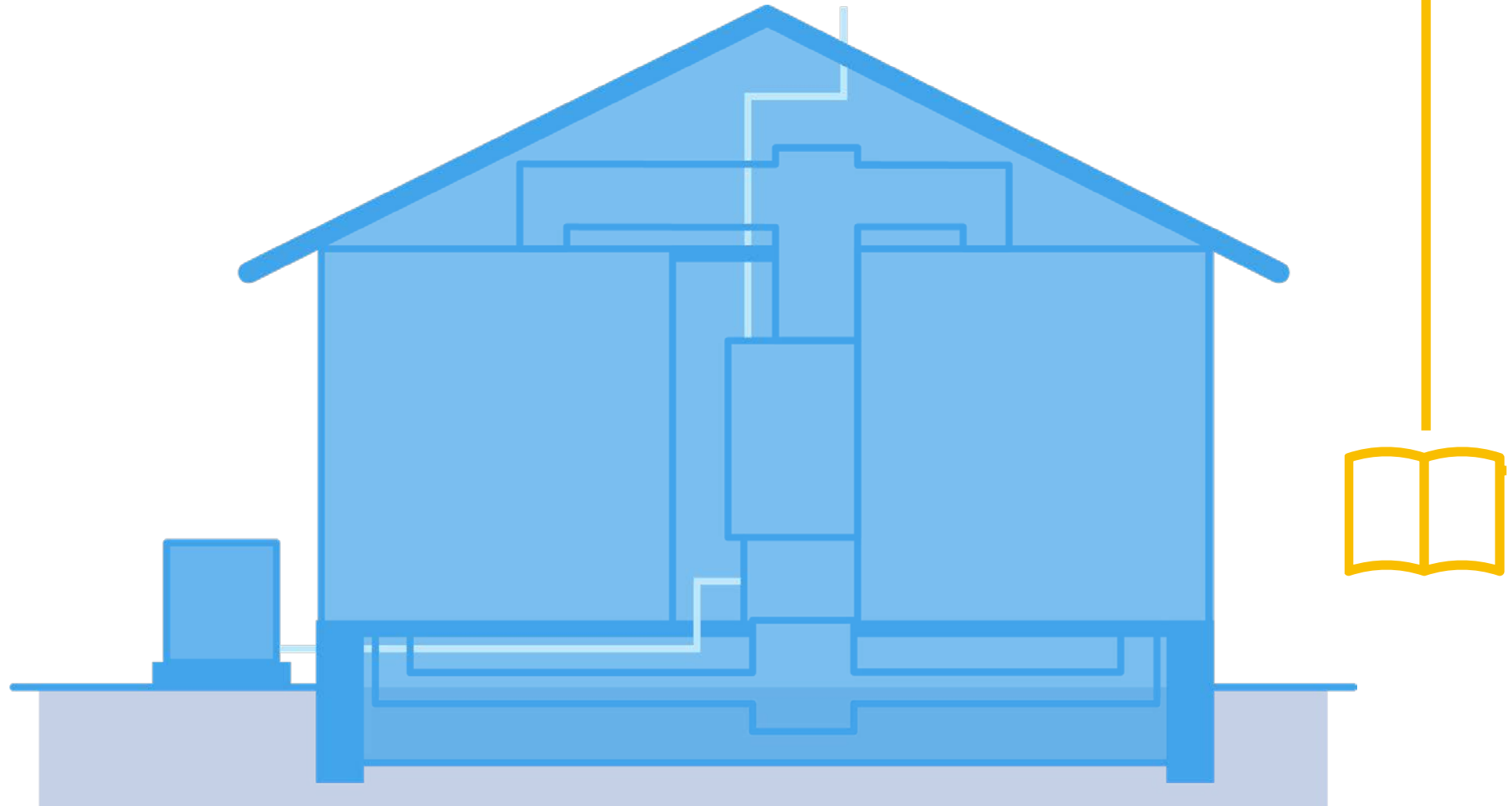
Puron
ADVANCE™

This system contains R-454B Refrigerant.
Refer to product literature before
installing OR servicing this unit.

Ce système contient du réfrigérant R-454B.
Référer à la littérature pour ce produit avant l'installation
ou l'entretien de cette unité.

SERIAL NUMBER / NUMERO DE SERIE		
X200538335		
PRODUCT NUMBER / NUMERO DE PRODUIT		
27SCA524003		
MODEL NUMBER / NUMERO DE MODELE		
27SCA524003		
METERING DEVICE	INDOOR	SP POSITION OUTDOOR
FACTORY CHARGED		R-454B
7.67	LBS	3.48 KG
INDOOR TON	SUB COOLING	18 F° C°
POWER SUPPLY	208-230	VOLTS AC
1	PH	60 HZ
PERMISSIBLE VOLTAGE AT UNIT		
253	MAX	197 MIN
SUITABLE FOR OUTDOOR USE		IP10A
COMPRESSOR	208/230	VOLTS AC
1	PH	60 HZ
15.18	ALA	75.0 LBA
FAN MOTOR	208/230	VOLTS AC
1	PH	60 HZ
1/5	HP	1.14 FLA
DESIGN / TEST PRESSURE GAGE		
HI	450 PSI	31X3 KPA
LO	250 PSI	1724 KPA
MAX DESIGN / WORKING PRESSURE		
700	PSI	4826 KPA
ABSOLUTE / MAXIMUM PRESSURE		
1470	PSI	10138 KPA

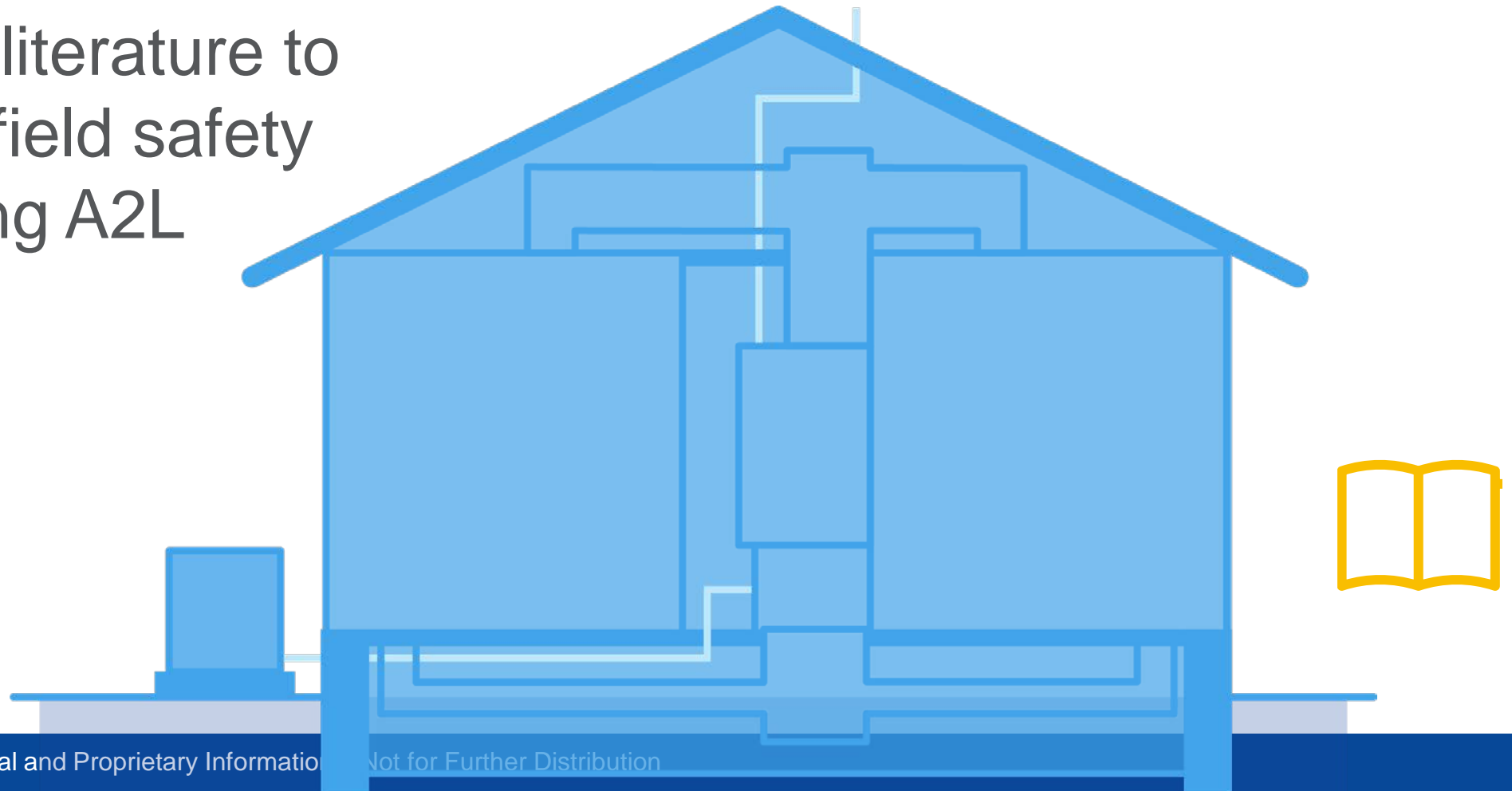
LITERATURE



LITERATURE

What agencies state that manufacturers must do:

- Update literature to ensure field safety regarding A2L



LITERATURE

WHAT WE DID TO COMPLY:

Single Stage Heat Pump 1-1/2 To 5 Nominal Tons

Installation Instructions

NOTE: Read the entire instruction manual before starting the installation.

SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock, or other conditions which may cause death, personal injury, or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses, protective clothing, and work gloves. Use quenching cloth for heating operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit. Consult local building codes and current editions of the National Electrical Code (NEC) NFPA 70. In Canada, refer to current editions of the Canadian electrical code CSA 22.1.

Recognize safety information. This is the safety-alert symbol. ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand these signal words: DANGER, WARNING, and CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which will result in severe personal injury or death. WARNING identifies hazards which could result in personal injury or death. CAUTION is used to identify unsafe practices which may result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which will result in enhanced installation, reliability, or operation.

INSTALLATION RECOMMENDATIONS

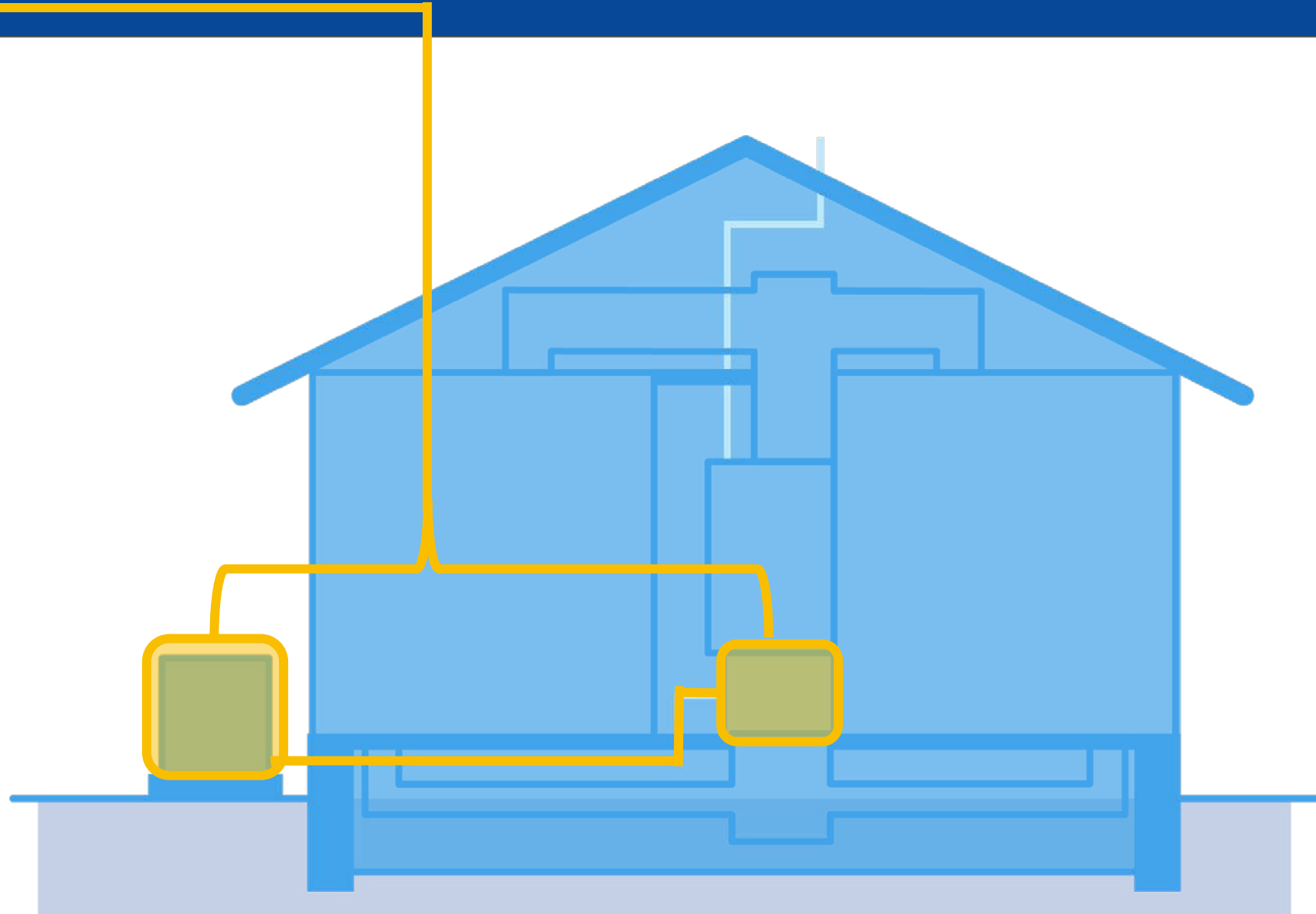
In some cases noise in the living area has been traced to gas pulsations from improper installation of equipment.

1. This unit is intended to be installed in a location that is 10,000 feet (3000 meters) above sea level or lower.
2. Locate unit away from windows, patios, decks, etc. where unit operation sound may disturb customer.
3. Ensure that vapor and liquid tube diameters are appropriate for unit capacity.
4. Run refrigerant tubes with no bends with centerline bend radius less than 2.5 times the external pipe diameter.
5. Leave some slack between structure and unit to absorb vibration.
6. When passing refrigerant tubes through the wall, seal opening with RTV or other pliable silicon-based caulk. (See Fig. 1.)
7. Avoid direct tubing contact with water pipes, duct work, floor joists, wall studs, floors, and walls.
8. Do not suspend refrigerant tubing from joists and studs with a rigid wire or strap which causes in direct contact with tubing (see Fig. 1).
9. Ensure that tubing insulation is pliable and completely surrounds vapor tube.
10. When necessary, use hanger straps which are 1 in. (25 mm) wide and conform to shape of tubing insulation. (See Fig. 1.)
11. Isolate hanger straps from insulation by using metal sleeves bent to conform to shape of insulation.
12. Provision shall be made for expansion and contraction of long runs of piping.
13. Piping and fittings shall be protected as far as possible against adverse environmental effects. For example, the accumulation of dirt and debris.

Updated to include operational details on:

- Leak mitigation
- Charging procedures
- Required evacuation procedures

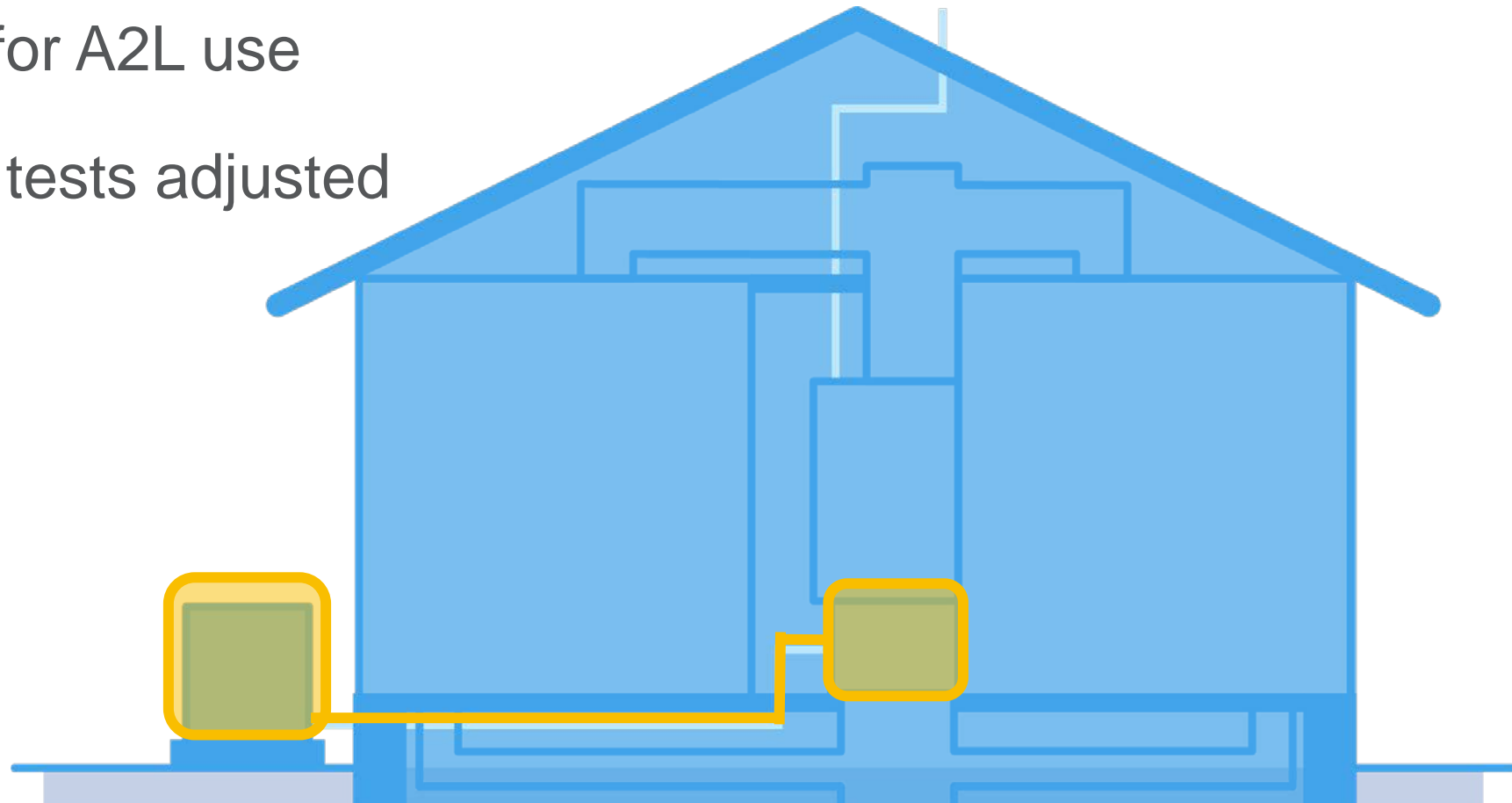
PIPING



PIPING

What agencies state that manufacturers must do:

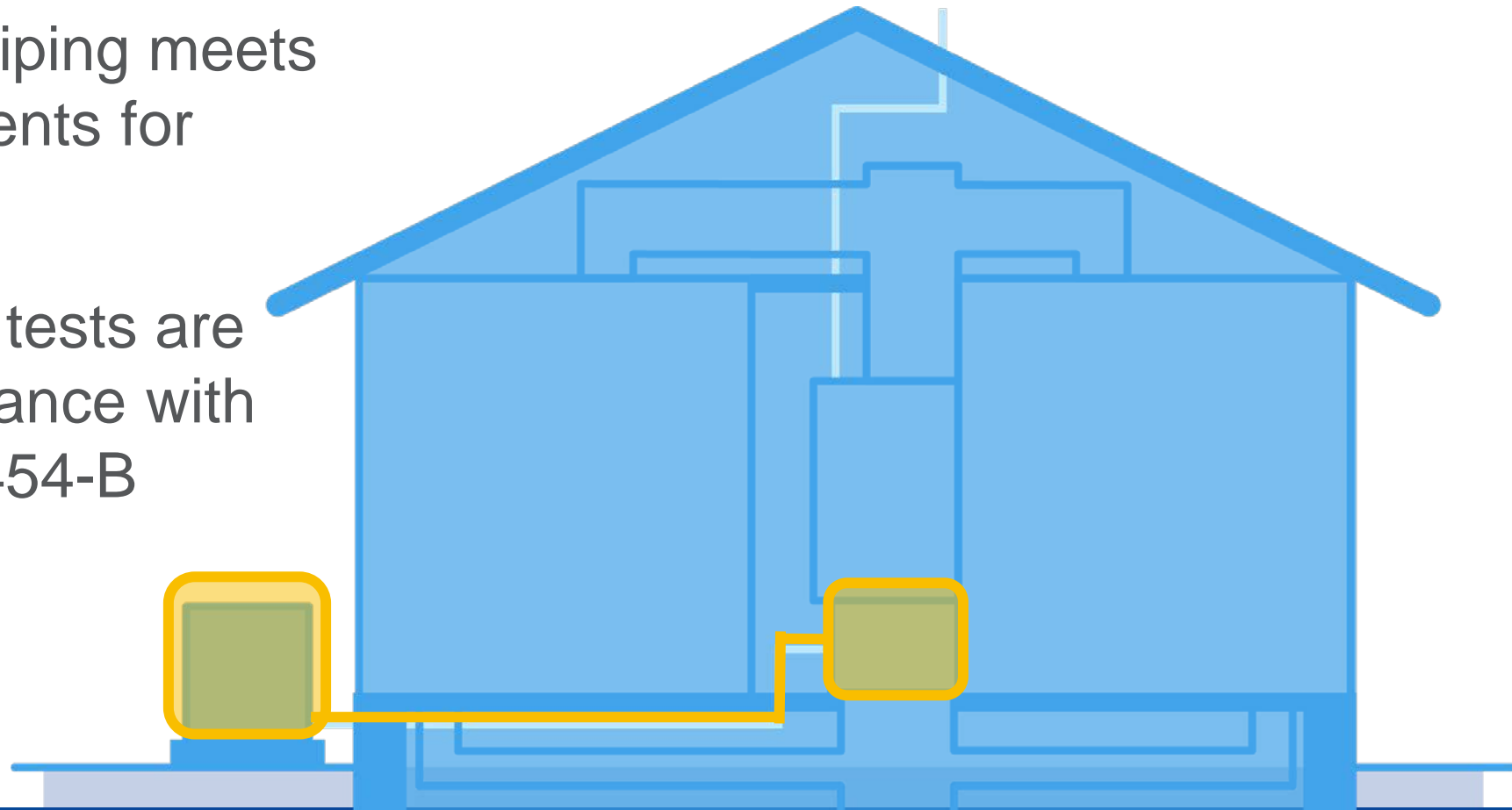
- Certified for A2L use
- Pressure tests adjusted



PIPING

WHAT WE DID TO COMPLY:

- Factory piping meets requirements for R454-B
- Pressure tests are in accordance with use of R454-B



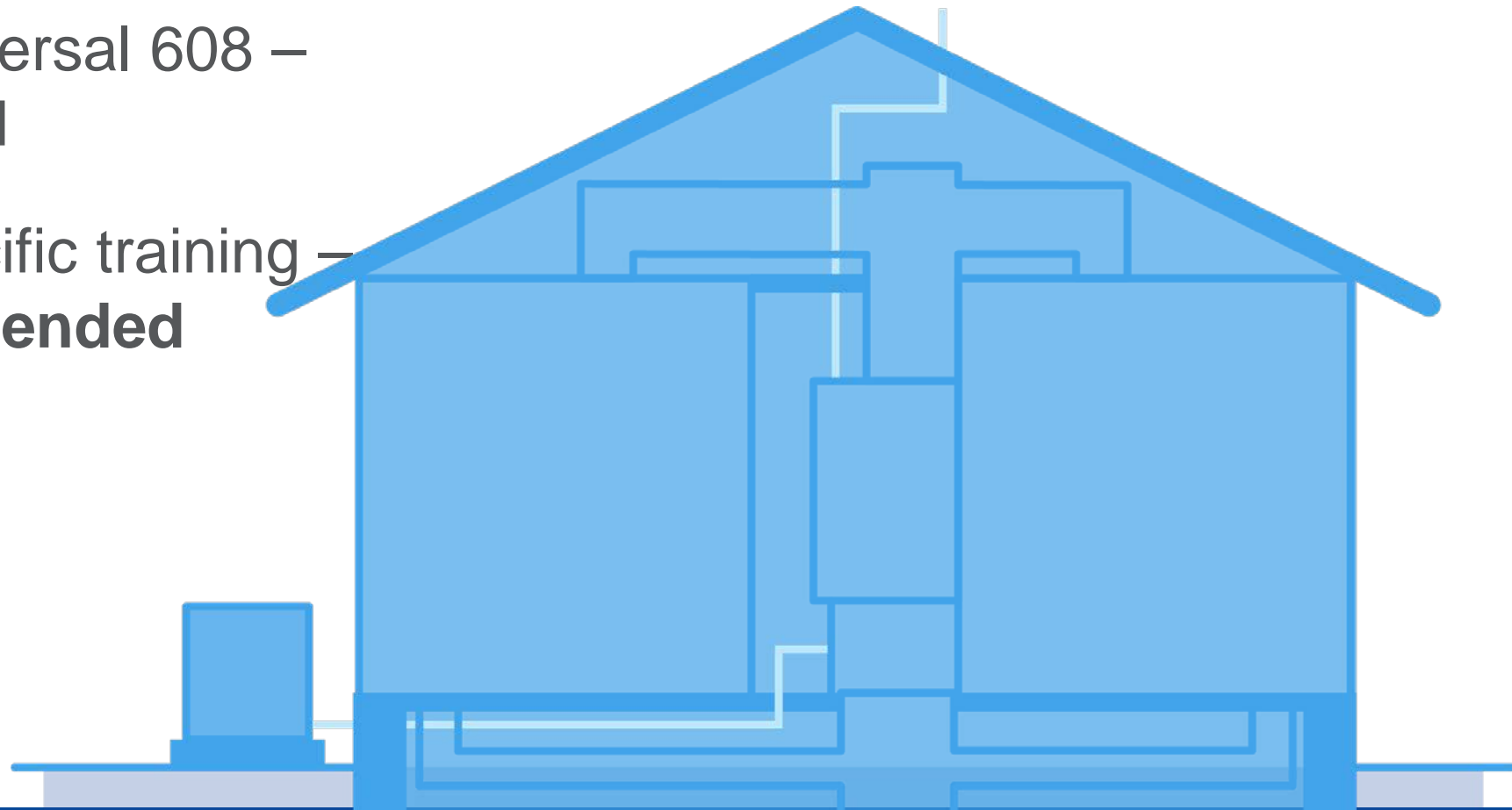
SERVICE TRAINING



SERVICE TRAINING

What agencies state that manufacturers must do:

- EPA Universal 608 – **Required**
- A2L-specific training – **Recommended**





THANK YOU