

QUICK REFERENCE

ANSI/ASHRAE® Standard 15-2022



As the industry transitions to low GWP refrigerants, one of the most affected systems will be Variable Refrigerant Flow (VRF). This document is a quick reference sheet to help you effectively design to the updated safety standards when using A2L refrigerants. For more detail, see the Refrigeration Systems and Machinery Rooms application manual (APP-APM001*-EN).

Section 7.6.2.3¹

Is a Refrigerant Detection System Required?

An integral refrigerant detection system IS REQUIRED if:

- Ducted HVAC system that has a releasable refrigerant charge (m_{rel}) > 4.0 lbs and has any duct openings < 5.9 ft above the finished floor
- Ducted HVAC system in which "connected spaces" served by the same supply air duct are used to calculate the effective dispersal volume (V_{eff}) per Section 7.2
- Refrigeration system installed where occupancy classification is institutional

Section 7.6.1.1, Equation 7-8¹

EDVC for Systems with Air Circulation

$$EDVC = V_{eff} \times LFL \times 0.50 \times F_{occ}$$

where:

- V_{eff} = effective dispersal volume per Sections 7.2.1 – 7.2.3
- LFL = lower flammability limit published in ASHRAE 34, Tables 4-1 and 4-2
- F_{occ} = occupancy adjustment factor

Section 7.6.1.2, Equation 7-9¹

EDVC for Systems without Air Circulation

$$EDVC = M_{def} \times F_{LFL} \times F_{occ}$$

where:

- M_{def} = refrigerant charge limit from Table 7-1
- F_{LFL} = LFL conversion factor from Table 7-3 ($F_{LFL} = 0.96$ for R-454B)
- F_{occ} = occupancy adjustment factor (0.5 for institutional; 1.0 for all others)

¹Excerpts from *Safety Standard for Refrigeration Systems*
ANSI/ASHRAE Standard 15-2022
(Supersedes ANSI/ASHRAE Standard 15-2019)
Includes ANSI/ASHRAE addenda listed in Appendix G



Section 7.2.3.2.2, Equation 7-2a¹

Natural Ventilation Opening for Group A2L Refrigerants

$$A_{vent} = \frac{m_{rel} - m_{room}}{LFL \times 0.417} \times \sqrt{\frac{A}{g \times m_{room}}} \times \frac{M}{M - 29}$$

- A_{vent} : minimum area of permanent opening
- m_{room} : allowable refrigerant charge of an individual room (EDVC)
- A : actual area of the individual room
- g : acceleration of gravity (32.2 ft/s²)
- M : relative molar mass of the refrigerant ($M=62.6$ for R-454B)

Section 7.6.4, Equation 7-11a¹

Required Mechanical Ventilation Rate

$$Q_{req} = 2 \times (m_s - EDVC) / (4 \times LFL)$$

where:

- m_s = largest system refrigerant charge from independent circuit
- $EDVC$ = effective dispersal volume charge calculated per Section 7.6.1
- LFL = lower flammability limit published in ASHRAE 34

Terminology

EDVC: (Effective Dispersal Volume Charge) the maximum refrigerant charge permitted for an effective dispersal volume.

F_{occ}: Occupancy Adjustment Factor

- Institutional Occupancies: $F_{occ} = 0.5$
- All Other Occupancies: $F_{occ} = 1.0$

Institutional occupancy is defined as a premise or that portion of a premise from which, because they are disabled, debilitated, or confined, occupants cannot readily leave without the assistance of others. Institutional occupancies include, among others, hospitals, nursing homes, asylums, and spaces containing locked cells.

m_s: the system refrigerant charge of the largest independent circuit.

m_{rel}: a portion of the system refrigerant charge that can be released into a space as a result of a single point of failure.

- m_{rel} must be less than or equal to EDVC for system charge to be in compliance

V_{eff} Clarification:

- With A2L refrigerants, both the occupied AND unoccupied spaces need to be accounted for.
- Connected spaces: connected by permanent “natural ventilation” openings, a ducted air distribution system, or mechanical ventilation system ductwork.
- Spaces connected by natural ventilation openings must be on the same floor of a building.
- When different stories connect through an open atrium or mezzanine, the effective dispersal volume is calculated by multiplying the area of the lowest floor by 8.2 ft.

• **Permanent Natural Ventilation Openings:**

- The lower edge of a natural ventilation opening must be less than or equal to 12 in. above the finished floor. Any area 12 in. or more above the floor cannot be considered.
- Cumulative openings smaller than 0.8 in² and openings with a single dimension of not more than 0.004 in. cannot be considered.

Air Circulation: mechanically inducing airflow within a space or spaces connected by air ducts.

- It is by the equipment, not by a secondary piece of equipment (e.g. DOAS).
- It can be either (1) initiated by a refrigerant detector or (2) continuous (literally 24/7/365, except short maintenance periods).
- The minimum air circulation rate is established in the product safety standard and does not require the fan to operate at full speed.

Mechanical Ventilation: removal of air and leaked refrigerant from a space in the event of a refrigerant leak. Not the same as defined in Standard 62.1.

Release Mitigation Controls:

- Used to limit the releasable refrigerant charge (m_{rel}).
- Shall be activated by a refrigerant detection system.
- Both the detector and the safety shutoff valve must be listed with the equipment.

Reference Sections for Further Information¹

7.6.3: Ignition Sources in Ductwork

7.6.4: Mechanical Ventilation

9.12: Refrigerant Pipe Installation

9.12.1: Piping Location

9.12.1.1: Minimum Height

9.12.1.2: Piping Protection

9.12.1.3: Prohibited Locations

9.12.1.5: Refrigerant Pipe Shafts

9.12.2: Installation Requirements

9.12.2.2: Shaft Ventilation

9.13: Refrigerating System Testing

9.13.2: Expose Piping for Visual Inspection and Testing

9.13.5: Strength Test

9.13.6: Leak Test

9.13.7: Contractor or Engineer Declaration (for systems with > 55lbs of charge)

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