INTERPRETATION IC 15-2022-1 OF
ANSI/ASHRAE STANDARD 15-2022
SAFETY STANDARD FOR REFRIGERATION SYSTEMS

Date Approved: July 28, 2023

Request from: John Murphy, Trane Technologies, 2213 20th Street South, La Crosse, WI 54601.

Reference: This request for interpretation refers to the requirements presented in ANSI/ASHRAE Standard 15-2022, Section 7.6.4, regarding Equation 7-11.

Background: When a Group A2L refrigerant is used in a high-probability system for human comfort, Equation 7-11 (or Table 7-4) is used to determine the required mechanical ventilation airflow rate. This equation and table were implemented as part of Addendum m to Standard 15-2019. The approved version of Addendum m, as posted on the ASHRAE web site, displays this equation as shown below. It uses the variable name Mvol, which is calculated using an equation (also shown below) that is identical to Equation 7-3 in Section 7.3.1 (which is used to calculate EDVC).

When the refrigerant charge necessary to be removed by ventilation is known, in order to be compliant with Section 7.2, an alternative method to determine Qreq uses the following equations. This alternative method shall be used for all A2L refrigerants not listed in Table 7-2.

\[
\frac{Q_{\text{req}}}{(I-P)} = \frac{M - M_{\text{vol}}}{4 \times LFL \times \text{SF}_{\text{vent}}} \\
\frac{Q_{\text{req}}}{(SI)} = \frac{M - M_{\text{vol}}}{4 \times LFL \times \text{SF}_{\text{vent}} \times 60}
\]

\[
M_{\text{vol}} = RCL \times V \times F_{\text{occ}}
\]

where
- \(Q_{\text{req}}\) = required minimum mechanical ventilation airflow rate, \(\text{ft}^3/\text{min}\) (\(\text{m}^3/\text{h}\))
- \(M\) = refrigerant charge of the largest independent circuit of the system, lb (kg)
- \(M_{\text{vol}}\) = refrigerant charge permitted in the space
- \(RCL\) = refrigerant concentration limit, lb/\(\text{ft}^3\) (kg/\(\text{m}^3\))
- \(V\) = volume of space established in accordance with Section 7.3, \(\text{ft}^3\) (\(\text{m}^3\))
- \(F_{\text{occ}}\) = occupancy adjustment factor. (For all occupancies other than institutional, \(F_{\text{occ}}\) has a value of 1. For institutional occupancies, \(F_{\text{occ}}\) has a value of 0.5.
- \(LFL\) = lower flammability limit, lb/\(\text{ft}^3\) (kg/\(\text{m}^3\))
- 4 = assumed leak time (4 minutes)
- \(\text{SF}_{\text{vent}}\) = safety factor, value of 2
- 60 = conversion of minutes to hours

However, in the published 2022 version of Standard 15, the variable “Mvol” in Equation 7-11 was changed to read “EDVC” as shown below.
When the refrigerant charge necessary to be removed by ventilation is known, in order to be compliant with Section 7.3, an alternative method to determine $Q_{\text{req}}$ uses Equation 7-11a or 7-11b. This alternative method shall be used for all A2L refrigerants not listed in Table 7-5.

$$Q_{\text{req}} = \frac{m_s - EDVC}{4 \times LFL} \times SF_{\text{vent}} \quad (7-11a \ [\text{I-P}])$$

$$Q_{\text{req}} = \frac{m_s - EDVC}{4 \times LFL} \times SF_{\text{vent}} \times 60 \quad (7-11b \ [\text{SI}])$$

where

$Q_{\text{req}}$ = required minimum mechanical ventilation airflow rate, ft$^3$/min (m$^3$/h)
$m_s$ = largest system refrigerant charge from independent circuit, lb (kg)
$EDVC$ = effective dispersal volume charge, lb (kg)
$LFL$ = lower flammability limit, lb/ft$^3$ (kg/m$^3$)
4 = assumed leak time (4 minutes)
$SF_{\text{vent}}$ = safety factor, value of 2
60 = conversion of minutes to hours

Apparently this was an editorial decision meant to improve clarity. However, another editorial change to a variable in Equation 7-8 has now resulted in confusion, rather than clarity.

Equation 7-8 is used to calculate the maximum charge when a Group A2L refrigerant is used in a high-probability system (that has air circulation) for human comfort. This equation was implemented as part of Addendum p to Standard 15-2019. The approved version of Addendum p, as posted on the ASHRAE web site, displays this equation as shown below. It uses the variable name M for the “maximum refrigerant charge of the largest independent circuit of the refrigeration system.”

©2023 ASHRAE. All Rights reserved.
7.6.1.1* Refrigeration Systems with Air Circulation. Where a high-probability system for human comfort using Group A2L refrigerants has either

a. air circulation initiated by a refrigerant detector in compliance with Section 7.6.2.4 or
b. continuous air circulation.

the refrigerant charge quantity shall be limited per the following equation. Control of continuous air circulation shall be performed by the listed equipment, and shall operate continuously, other than short periods for maintenance and service:

\[ M = V \times LFL \times CF \times F_{occ} \]

where

- \( M \) = maximum refrigerant charge of the largest independent circuit of the refrigeration system, lb (kg)
- \( V \) = volume of space established in accordance with Section 7.3, ft³ (m³)
- \( LFL \) = lower flammability limit, lb/ft³ (kg/m³)
- \( CF \) = concentration factor, value of 0.5
- \( F_{occ} \) = occupancy adjustment factor. For all occupancies other than institutional occupancies, \( F_{occ} \) has a value of 1. For institutional occupancies, \( F_{occ} \) has a value of 0.5.

However, in the published 2022 version of Standard 15, the variable “M” in Equation 7-8 was changed to read “EDVC” as shown below.

7.6.1.1* Refrigeration Systems with Air Circulation. Where a high-probability system for human comfort using Group A2L refrigerants has either

a. air circulation initiated by a refrigerant detector in compliance with Section 7.6.2.4 or
b. continuous air circulation.

the refrigerant charge quantity shall be limited per Equation 7-8. Control of continuous air circulation shall be performed by the listed equipment and shall operate continuously other than short periods for maintenance and service:

\[ EDVC = V_{eff} \times LFL \times CF \times F_{occ} \]  (7-8)

where

- \( EDVC \) = effective dispersal volume charge, lb (kg)
- \( V_{eff} \) = effective dispersal volume, ft³ (m³)
- \( LFL \) = lower flammability limit, lb/ft³ (kg/m³)
- \( CF \) = concentration factor, value of 0.5
- \( F_{occ} \) = occupancy adjustment factor. (For all occupancies other than institutional occupancies, \( F_{occ} \) has a value of 1. For institutional occupancies, \( F_{occ} \) has a value of 0.5.)

The problem created by this second editorial change is that the standard now includes two different equations for \( EDVC \) (Equation 7-3 and Equation 7-8).

The calculation for mechanical ventilation airflow rate (in Section 7.6.4) needs to clarify that the \( EDVC \) used in Equation 7-11 (and in Table 7-4) is supposed to be the value of \( EDVC \) calculated using Equation 7-3 (the equation that matches the \( M_{vol} \) equation included in approved Addendum m), not Equation 7-8.
Interpretation: The value of EDVC used in Equation 7-11 and Table 7-4 should be the value of $EDVC$ calculated using Equation 7-3.

Question: Is this Interpretation correct?

Answer: No

Comments: The intention of the committee is for the value of EDVC in Equation 7-11 and Table 7-4 to be the value of EDVC calculated using Equations 7-8 or 7-9, as applicable.