ANSI/ASHRAE Addendum q to
ANSI/ASHRAE Standard 15-2019

Safety Standard for Refrigeration Systems


This addendum was approved by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. Instructions for how to submit a change can be found on the ASHRAE® website (www.ashrae.org/continuous-maintenance).

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Addendum q modifies requirements for mechanical ventilation in machinery rooms with equipment using one or more Class 2L flammable refrigerants but not containing any Class 2 or Class 3 flammable refrigerants.

This change updates the graphical method for determining required ventilation rates and adds a detailed calculation method as an alternate compliance path.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and strikethrough (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Modify Section 7 as shown. The remainder of Section 7 remains unchanged.

7.4 Location in a Machinery Room or Outdoors. All components containing refrigerant shall be located either in machinery room or outdoors, where the quantity of refrigerant needed exceeds the limits defined by Sections 7.2 and 7.3 or where direct-fired absorption equipment is used. Refrigeration systems located outdoors shall comply with Section 8.14.

[...]

7.4.2 Nonflammable Refrigerants. Machinery rooms required by Section 7.4 and containing only Group A1 or B1 refrigerants shall be constructed and maintained in accordance with Section 8.11 for Group A1 and B1 refrigerants.

7.4.3 Flammable Refrigerants. Machinery rooms required by Section 7.4 based on flammability and containing any Group A2, A3, B2, or B3 flammable refrigerants shall be constructed and maintained in accordance with Sections 8.11 and 8.12 for Group A2, A3, B2, and B3 refrigerants. Machinery rooms required by Section 7.4 based on flammability and containing any Group A2L or B2L flammable refrigerants, and containing no Group A2, A3, B2, or B3 flammable refrigerants, shall be constructed and maintained in accordance with Sections 8.11.1 through 8.11.4 and Section 8.13 for Group A2L and B2L refrigerants other than R-717 (ammonia).

Modify Section 8 as shown. The remainder of Section 8 remains unchanged.

[...]

Exceptions to 8.11.5:

1. Detectors are not required when only systems using R-718 (water) are located in the refrigerating machinery room.
2. For Group A2L and B2L other than ammonia, refer to Section 8.13.

[...]

8.11.8 Ventilation Airflow. For Group A1, A2, A3, B1, B2, and B3 the airflow shall comply with Section 8.11.8.1. For Group A2L and B2L other than R-717 (ammonia) the airflow shall comply with Section 8.11.8.2.

8.11.8.1 The mechanical ventilation required to exhaust an accumulation of refrigerant due to leaks or a rupture of the refrigeration system shall be capable of removing air from the machinery room in not less than the following quantity:

\[ Q = 100 \times G^{0.5} \]  
\[ Q = 0.070 \times G^{0.5} \]  
\[ Q = 70 \times G^{0.5} \]  

where

\[ Q = \text{airflow, ft}^3/\text{min (m}^3/\text{s) cfm (L/s)} \]
\[ G = \text{mass of refrigerant in the largest refrigeration system (independent circuit), any part of which is located in the machinery room, lb (kg)} \]

A part of the refrigerating machinery room mechanical ventilation shall be

a. operated, when occupied, to supply at least 0.5 ft\(^3\)/min per ft\(^2\) (0.00254 m\(^3\)/s per m\(^2\)) of machinery room area or 20 ft\(^3\)/min (0.00944 m\(^3\)/s) cfm (9.44 L/s) per person and

...]

8.13 Machinery Room, Special Requirements, A2L and B2L Other than R-717 (Ammonia). When a refrigeration system is located indoors, and a machinery room is required by Section 7.4.2, machinery rooms shall comply with Sections 8.13.1 through 8.13.6.

...]

Table 8-2 Level 1 Ventilation Rate for Class 2L Refrigerants

<table>
<thead>
<tr>
<th>Status</th>
<th>Airflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operated when occupied, and operated when activated in accordance with Section 8.13.9(c) and Table 8-1</td>
<td>The greater of a. 0.5 ft(^3)/min per ft(^2) (0.00254 m(^3)/s per m(^2)) of machinery room area or b. 20 ft(^3)/min (0.00944 m(^3)/s) cfm (9.44 L/s) per person</td>
</tr>
<tr>
<td>Operable when occupied</td>
<td>With or without mechanical cooling of the machinery room, the greater of a. the airflow rate required to not exceed a temperature rise of 18°F (10°C) above inlet air temperature or b. the airflow rate required to not exceed a maximum air temperature of 122°F (50°C) in the machinery room</td>
</tr>
</tbody>
</table>

8.13.11.4 Safety Group A2L, B2L Other than Ammonia. When required by Section 8.13.11.3, the total airflow for Level 2 ventilation shall be not less than the airflow rate determined by either the graphical method of Figure 8-1 (I-P) or the calculation method using the equations in Table 8-3. The total airflow rate for Level 2 ventilation shall not be less than Level 1 ventilation. The airflow rate \( Q \) per the calculation method shall be rounded up to the nearest value to two significant figures.
Table 8-3 Calculation Method Equations

<table>
<thead>
<tr>
<th>Charge Quantity</th>
<th>Airflow</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>$G &lt; 0.1 \times G^*$</td>
<td>$Q \geq Q^* \times 0.102$ and $Q \geq Q_1$</td>
<td>8-1</td>
</tr>
<tr>
<td>$0.1 \times G^* \leq G \leq G^*$</td>
<td>$Q \geq Q^* \times [1 + 0.39 \times \ln(G/G^*)]$ and $Q \geq Q_1$</td>
<td>8-2</td>
</tr>
<tr>
<td>$G &gt; G^*$</td>
<td>$Q \geq Q^*$</td>
<td>8-3</td>
</tr>
</tbody>
</table>

\begin{align*}
Q^* &= 646 \times P^{0.62} \\
Q^* &= 0.400 \times P^{0.62} \\
G^* &= 21200 \times P^{-0.72} \\
G^* &= 267 \times P^{-0.72} \\
P &= DP + 14.70 \\
P &= DP + 0.1013
\end{align*}

where

$G^*$ = mass of refrigerant in the largest refrigeration system (independent circuit), any part of which is located in the machinery room, lb (kg)

$G^*$ = a threshold value where the airflow requirement changes, lb (kg)

$Q^*$ = airflow rate independent of charge quantity, ft$^3$/min (m$^3$/s)

$Q_1$ = Level 1 Ventilation in accordance with 8.13.11.2, ft$^3$/min (m$^3$/s)

$P$ = refrigerant pressure (absolute), psia (MPa)

$DP$ = design pressure (gage) of the refrigeration system highside, psi (MPa)

a. The natural logarithm of $x$ is written as $\ln(x)$. 
Delete Figures 8-1 and 8-2 and replace them with the following.

**Figure 8-1** (a) Level 2 ventilation rate for Class 2L refrigerants (I-P) with (b) detail.

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Figure 8-2  (a) Level 2 ventilation rate for Class 2L refrigerants (SI) with (b) detail.
Modify Informative Appendix A as follows. The remainder of Informative Appendix A remains unchanged. (Note: Standard 15-2019 was previously modified by published Addenda f and o, which can be downloaded from the ASHRAE website at https://www.ashrae.org/technical-resources/standards-and-guidelines/standards-addenda.)

(This appendix is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

INFORMATIVE APPENDIX A
EXPLANATORY MATERIAL

Sections of the standard with associated explanatory information in this appendix are marked with an asterisk “*” after the section number.

[ . . . ]

Section 7.4.3
Use of any Class 2 or Class 3 flammable refrigerants in a machinery room will trigger the special requirements of Section 8.12 in addition to the general requirements of Section 8.11, regardless of whether or not the machinery room also makes use of any Class 2L flammable refrigerants or any Class 1 refrigerants with no flame propagation. Use of Class 2L flammable refrigerants in a machinery room will trigger the special requirements of Section 8.13 in addition to the general requirements of Sections 8.11.1 through 8.11.4, regardless of whether the machinery room also makes use of any Class 1 refrigerants.

[ . . . ]

Section 8.13.11.4
For the graphical method, where the design pressure falls into the range of the inequality, the line above that region of the chart applies.

Example 1:
For $DP = 150$ psi ($DP = 1.0$ MPa) gage pressure, the line for $DP \leq 200$ psi ($DP \leq 1.4$ MPa) applies to determine the minimum Level 2 ventilation airflow rate. The graphical method does not apply when the design pressure exceeds 700 psi (4.8 MPa) gage pressure.

Example 2:
For $DP = 600$ psi ($DP = 4.1$ MPa) gage pressure, the line for $550$ psi $\leq DP \leq 700$ psi (3.8 MPa $\leq DP \leq 4.8$ MPa) applies to determine the minimum Level 2 ventilation airflow rate.

For both the graphical method and the calculation method, check that the Level 2 ventilation airflow rate is not less than the Level 1 ventilation airflow rate determined per Section 8.13.11.2. Where the applicable charge quantity $G$ is relatively low (lower left corners of Figure 8-1 or Figure 8-2), the Level 1 ventilation airflow rate may determine the Level 2 ventilation airflow rate (i.e., for a relatively small refrigeration system in a sufficiently large machinery room, when Level 2 ventilation is triggered the airflow rate may not need to increase above the Level 1 ventilation airflow rate).
ASHRAE is concerned with the impact of its members’ activities on both the indoor and outdoor environment. ASHRAE’s members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE’s short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its Handbook, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system’s intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE’s primary concern for environmental impact will be at the site where equipment within ASHRAE’s scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.
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