

ADDENDA

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

Safety Standard for Refrigeration Systems

Approved by ASHRAE and the American National Standards Institute on May 31, 2022.

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FOREWORD

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 <u>underlining</u> (for additions) and strikethrough (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum q to Standard 15-2019

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 a *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<u>*</u> **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<u>.</u> 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 <u>8.11.4</u>8.11.5 and Section 8.13<u>.</u> 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 8.13.

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

$$Q = 100 \times G^{0.5} \tag{I-P}$$

$$\underline{O} = 0.070 \times \underline{G}^{0.5} \, \underline{O} = 70 \times \underline{G}^{0.5} \tag{SI}$$

where

 $Q = \operatorname{airflow}, \operatorname{\underline{ft}^3}/\operatorname{\underline{min}}(\operatorname{\underline{m}^3/s}) \operatorname{\underline{efm}}(\operatorname{\underline{L/s}})$

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

A part of the refrigerating machinery room mechanical ventilation shall be

a. operated, when occupied, to supply at least 0.5 <u>ft³/min per ft² (0.00254 m³/s per m²)</u> cfm/ft² (2.54 L/s/m²) of *machinery room* area or 20 <u>ft³/min (0.00944 m³/s)</u> cfm (9.44 L/s) per person and

[...]

8.13 *Machinery Room*, <u>Special Requirements</u>, A2L and B2L Other than R-717 (Ammonia). When a refrigeration system is located indoors, and a *machinery room* is required by Section <u>7.4.37.4.2</u>, *machinery rooms shall* comply with Sections 8.13.1 through 8.13.6.

[...]

Table 8-2 Level 1 Ventilation	n Rate for Class	2L Refrigerants
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Status	Airflow
Operated when occupied, and operated when activated in accordance with Section 8.13.9(c) and Table 8-1	The greater of a. 0.5 ft ³ /min per ft ² (<u>0.00254 m³/s per m²2.54 L/s per m²</u>) of <i>machinery room</i> area or b. 20 ft ³ /min (<u>0.00944 m³/s</u> 9.44 L/s) per person
Operable when occupied	 With or without mechanical cooling of the <i>machinery room</i>, 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 <i>machinery room</i>

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 and Figure 8-2 (SI) 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.

Change Quantity	Ainflow	Equation
<u>Charge Quantity</u>	AIFIIOW	Equation
$G < 0.1 \times G^*$	$\underline{Q} \ge \underline{Q^*} \times 0.102$	<u>8-1</u>
	and	
	$Q \ge Q_{\underline{l}}$	
$0.1 \times G^* \leq G \leq G^*$	$\underline{Q} \ge \underline{Q}^* \times [1 + 0.39 \times \ln(G/G^*)]$	<u>8-2</u>
	and	
	$Q \ge Q_1$	
$\underline{G > G^*}$	$\underline{O} \ge \underline{O^*}$	<u>8-3</u>
	$Q^* = 646 \times P^{0.62}$	<u>(I-P)</u>
	$Q^* = 0.400 \times P^{0.62}$	<u>(SI)</u>
	$G^* = 21200 \times P^{-0.72}$	<u>(I-P)</u>
	$G^* = 267 \times P^{-0.72}$	<u>(SI)</u>
	P = DP + 14.70(<u>(I-P)</u>
	$\underline{P} = \mathbf{DP} + 0.1013$	<u>(SI)</u>
1		

Table 8-3 Calculation Method Equations^a

where

 $\underline{G} = \underline{\text{mass of refrigerant in the largest refrigeration system (independent circuit), any part of which is located in the machinery room, lb (kg)$

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

 $\underline{Q} = \text{airflow rate, conversion to other units of measure is permitted, <math>\frac{\text{ft}^2}{\text{min}(\text{m}^2/\text{s})}$

 $Q^* \equiv$ an airflow rate independent of charge quantity, ft²/min (m²/s)

 $Q_1 =$ Level 1 Ventilation in accordance with 8.13.11.2, ft²/min (m²/s)

<u>P</u> = <u>refrigerant</u> pressure (absolute), psia (MPa)

<u>DP</u> = <u>design pressure (gage) of the refrigeration system highside</u>, 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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5 ≤ 3.8 4 80 20 2 Level 2 Ventilation Rate (m³/s) 4 2.8 < DP VI 2.1 < DP. 4 < Dp $_{\infty}^{\nu}$ 3 V 0 2 1.9 L/s, 8.5 kg s 1 0.88 L/s, 19 kg 0 1 10 G (kg) (b)

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/technicalresources/standards-and-guidelines/standards-addenda.)

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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 Section 8.14. The special requirements of Section 8.15 in a machinery room also makes use of any 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 $DP \le 200 \text{ psi}$ ($DP \le 1.4 \text{ MPa}$) 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 $\leq DP \leq 700 \text{ psi}$ (3.8 MPa $\leq DP \leq 4.8 \text{ MPa}$) 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).

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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.

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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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