ADDENDA

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

Safety Standard for Refrigeration Systems

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

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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FOREWORD

Addendum p to Standard 15-2019 makes a modification to refrigerant charge quantity limits for A2L human comfort systems, which aligns Standard 15 with the outcome of the AHRTI-9015, Assessment of Refrigerant Leakage Mitigation Effectiveness for Air-Conditioning and Refrigeration Equipment *research project. This modification will also make the requirements in Standard 15 more consistent with the requirements of the product safety standard.*

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.

Addendum p to Standard 15-2019

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

7. RESTRICTIONS ON REFRIGERANT USE

[. . .]

7.6 Group A2L *Refrigerants* for Human Comfort. *High-probability systems* using Group A2L *refrigerants* for human comfort applications *shall* comply with this section.

~~**7.6.1 Refrigerant Concentration Limits**~~

~~**7.6.1.1** *Occupied spaces shall* comply with Section 7.2.~~

~~**7.6.1.2** Unoccupied spaces with *refrigerant* containing equipment, including but not limited to *piping* or tubing, *shall* comply with Section 7.2 except as permitted by Section 7.6.4.~~

7.6.1 *Refrigerant* Quantity Limits. The maximum *refrigerant* charge of any *independent circuit* of each refrigeration system *shall* be as *specified* in Sections 7.6.1.1 and 7.6.1.2.

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:

$$M = V \times \text{LFL} \times \text{CF} \times F_{occ}$$

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, ft^3 (m^3)

LFL = *lower flammability limit*, lb/ft^3 (kg/m^3)

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.

7.6.1.2* Other Refrigeration Systems. For any refrigeration system not meeting the requirements of Section 7.6.1.1, the *refrigerant* charge of the largest *independent circuit* of the system *M shall not* exceed the value from the following equation:

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

where

M = *refrigerant* charge of the largest *independent circuit* of the refrigeration system, lb (kg)

M_{def} = *refrigerant* charge from Table 7-1 (lb) or Table 7-2 (kg)

F_{LFL} = *LFL* conversion factor from Table 7-3

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.

When determining M_{def}, the floor area *shall* be the floor area of the volume of space established in accordance with Section 7.3, ft^3 (m^3). The height *shall* be the lowest point of any opening in the supply *air duct*, the return *air duct*, or the equipment providing *air circulation*. Heights below 2.0 ft (0.6 m) *shall* use the first height column. Heights greater than 9.0 ft (2.75 m) *shall* use the last height column. For floor areas or heights in between the values listed, linear interpolation or the next lower value *shall* be used. For spaces with varying floor elevations, the highest floor level relative to an opening *shall* be used to determine height. For floor areas less than 50 ft^2 (5 m^2), use 4.0 lb (1.8 kg).

Table 7-1 *Refrigerant* Charge Limit M_{def}, lb (I-P)

	Height, ft							
Floor Area, ft²	**≤2.0**	**3.3**	**4.6**	**5.9**	**6.6**	**7.2**	**8.0**	**≥9.0**
50	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.3
100	4.0	4.0	4.4	5.6	6.3	6.9	7.7	8.6
125	4.0	4.0	5.5	7.0	7.8	8.6	9.6	10.7
150	4.0	4.7	6.5	8.4	9.3	10.3	11.4	12.8
175	4.0	5.0	7.1	9.1	10.1	11.1	12.4	13.8
200	4.0	5.4	7.6	9.7	10.8	11.9	13.2	14.8
225	4.0	5.7	8.0	10.3	11.4	12.6	14.0	15.7
250	4.0	6.0	8.4	10.9	12.1	13.3	14.8	16.5
300	4.0	6.6	9.3	11.9	13.2	14.5	16.2	18.1
350	4.3	7.1	10.0	12.8	14.3	15.7	17.5	19.6
400	4.6	7.6	10.7	13.7	15.3	16.8	18.7	20.9
450	4.9	8.1	11.3	14.6	16.2	17.8	19.8	22.2
500	5.1	8.5	11.9	15.4	17.1	18.8	20.9	23.4
600	5.6	9.3	13.1	16.8	18.7	20.6	22.9	25.6
700	6.1	10.1	14.1	18.2	20.2	22.2	24.7	27.7
800	6.5	10.8	15.1	19.4	21.6	23.7	26.4	29.6
900	6.9	11.4	16.0	20.6	22.9	25.2	28.0	31.4
1000	7.2	12.1	16.9	21.7	24.1	26.5	29.6	33.1
1200	7.9	13.2	18.5	23.8	26.4	29.1	32.4	36.3
1400	8.6	14.3	20.0	25.7	28.6	31.4	35.0	39.2
1600	9.2	15.3	21.4	27.5	30.5	33.6	37.4	41.9
1800	9.7	16.2	22.7	29.1	32.4	35.6	39.7	44.4
2000	10.2	17.1	23.9	30.7	34.1	37.5	41.8	46.8
2250	10.9	18.1	25.3	32.6	36.2	39.8	44.3	49.6
2500	11.4	19.1	26.7	34.3	38.2	42.0	46.7	52.3
2750	12.0	20.0	28.0	36.0	40.0	44.0	49.0	54.9
3000	12.5	20.9	29.3	37.6	41.8	46.0	51.2	57.3
3500	13.5	22.6	31.6	40.6	45.1	49.7	55.3	61.9
4000	14.5	24.1	33.8	43.4	48.3	53.1	59.1	66.2
4500	15.4	25.6	35.8	46.1	51.2	56.3	62.7	70.2
5000	16.2	27.0	37.8	48.6	54.0	59.4	66.1	74.0
6000	17.7	29.6	41.4	53.2	59.1	65.0	72.4	81.1
7000	19.2	31.9	44.7	57.5	63.8	70.2	78.2	87.6
8000	20.5	34.1	47.8	61.4	68.3	75.1	83.6	93.6
9000	21.7	36.2	50.7	65.2	72.4	79.6	88.7	99.3
10000	22.9	38.2	53.4	68.7	76.3	83.9	93.5	104.7

Table 7-1 *Refrigerant* Charge Limit M_{def}, lb (I-P) *(Continued)*

	Height, ft							
Floor Area, ft^2	≤2.0	3.3	4.6	5.9	6.6	7.2	8.0	≥9.0
15000	28.0	46.7	65.4	84.1	93.5	102.8	114.5	128.2
20000	32.4	54.0	75.5	97.1	107.9	118.7	132.2	148.0
25000	36.2	60.3	84.5	108.6	120.7	132.7	147.8	165.5
28000	38.3	63.8	89.4	114.9	127.7	140.5	156.4	175.1

Table 7-2 *Refrigerant* Charge Limit M_{def}, kg (SI)

	Height, m							
Floor Area, m^2	≤0.60	1.00	1.40	1.80	2.00	2.20	2.45	≥2.74
5	1.8	1.8	1.8	18	1.8	1.8	1.9	2.1
10	1.8	1.8	2.1	2.8	3.1	3.4	3.7	4.2
15	1.8	2.2	3.1	4.0	4.4	4.8	5.4	6.0
20	1.8	2.5	3.6	4.6	5.1	5.6	6.2	7.0
25	1.8	2.8	4.0	5.1	5.7	6.3	7.0	7.8
30	1.9	3.1	4.4	5.6	6.2	6.9	7.6	8.5
35	2.0	3.4	4.7	6.1	6.7	7.4	8.2	9.2
40	2.2	3.6	5.0	6.5	7.2	7.9	8.8	9.9
45	2.3	3.8	5.3	6.9	7.6	8.4	9.4	10.5
50	2.4	4.0	5.6	7.2	8.0	8.9	9.9	11.0
60	2.6	4.4	6.2	7.9	8.8	9.7	10.8	12.1
70	2.9	4.8	6.7	8.6	9.5	10.5	11.7	13.1
80	3.1	5.1	7.1	9.2	10.2	11.2	12.5	14.0
90	3.2	5.4	7.6	9.7	10.8	11.9	13.2	14.8
100	3.4	5.7	8.0	10.2	11.4	12.5	13.9	15.6
125	3.8	6.4	8.9	11.5	12.7	14.0	15.6	17.4
150	4.2	7.0	9.8	12.5	13.9	15.3	17.1	19.1
175	4.5	7.5	10.5	13.5	15.1	16.6	18.4	20.6
200	4.8	8.0	11.3	14.5	16.1	17.7	19.7	22.1
225	5.1	8.5	11.9	15.4	17.1	18.8	20.9	23.4
250	5.4	9.0	12.6	16.2	18.0	19.8	22.0	24.7
300	5.9	9.9	13.8	17.7	19.7	21.7	24.1	27.0
350	6.4	10.6	14.9	19.2	21.3	23.4	26.1	29.2
400	6.8	11.4	15.9	20.5	22.8	25.0	27.9	31.2
450	7.2	12.1	16.9	21.7	24.1	26.6	29.6	33.1
500	7.6	12.7	17.8	22.9	25.4	28.0	31.2	34.9
600	8.4	13.9	19.5	25.1	27.9	30.7	34.1	38.2
700	9.0	15.1	21.1	27.1	30.1	33.1	36.9	41.3
800	9.7	16.1	22.5	29.0	32.2	35.4	39.4	44.1
900	10.2	17.1	23.9	30.7	34.1	37.6	41.8	46.8
1000	10.8	18.0	25.2	32.4	36.0	39.6	44.1	49.4
1200	11.8	19.7	27.6	35.5	39.4	43.4	48.3	54.1

Table 7-2 *Refrigerant* Charge Limit M_{def}, kg (SI) *(Continued)*

	Height, m							
Floor Area, m^2	≤0.60	1.00	1.40	1.80	2.00	2.20	2.45	≥2.74
1400	12.8	21.3	29.8	38.3	42.6	46.8	52.2	58.4
1600	13.7	22.8	31.9	41.0	45.5	50.1	55.8	62.4
1800	14.5	24.1	33.8	43.5	48.3	53.1	59.1	66.2
2000	15.3	25.4	35.6	45.8	50.9	56.0	62.3	69.8
2200	16.0	26.7	37.4	48.0	53.4	58.7	65.4	73.2
2400	16.7	27.9	39.0	50.2	55.7	61.3	68.3	76.5
2600	17.4	29.0	40.6	52.2	58.0	63.8	71.1	79.6

Table 7-3 *LFL* Conversion Factor

Refrigerant	E_{LFL}
R-32	1.00
R-452B	1.02
R-454A	0.92
R-454B	0.97
R-454C	0.95
R-457A	0.71

Modify Informative Appendix A as shown. The remainder of Informative Appendix A remains unchanged.

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.

[. . .]

7.6.1.1

Equation: In the equation, *LFL* is specified as pounds per cubic foot (kilograms per cubic metre), while ANSI/ASHRAE Standard 34, *Designation and Safety Classification of Refrigerants*, specifies *LFL* in Table 4-1 and Table 4-2 as pounds per 1000 cubic feet [lb/1000 ft^3] (grams per cubic metre [g/m^3]). Appropriate conversion is necessary. The user should refer to addenda to the most recent published edition of ANSI/ASHRAE Standard 34 for the most current values of *LFL*.

Continuous *Air Circulation*: Continuous *air circulation* will be performed by the *listed* equipment. The airflow will be detected continuously or monitored continuously. As *specified* by the product safety standard, within ten seconds of the event that the airflow is reduced below a certain quantity, the user is warned and *compressor* operation may be disabled. Continuous *air circulation* by means other than the *listed* equipment is not acceptable. The minimum continuous *air circulation* airflow rate is established in the product safety standard and does not require the fan to operate at full speed.

7.6.1.2

Opening: Cumulative openings smaller than 0.8 $in.^2$ (5 cm^2) and openings with a single dimension of not more than 0.004 in. (0.1 mm) are not considered as openings from where leaking *refrigerant* can escape.

Table 7.6.1.2: The numbers in this table are derived from the product safety standards UL 60335-2-40/CSA C22.2 No. 60335-2-40. For R-32, this is the maximum of 4.0 lb (1.8 kg), which is "m_1" refrigerant quantity, and the dispersal volume calculated refrigerant quantity. The dispersal volume calculated refrigerant quantity is the lower of a fixed percentage of total dispersal volume and the quadratic equation of Clause GG.2 of the product safety standard.

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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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