



**BSR/ASHRAE Addendum t
to ANSI/ASHRAE Standard 15-2019**

First Public Review Draft

Proposed Addendum t to Standard 15-2019, Safety Standard for Refrigeration Systems

**First Public Review (September 2022)
(Draft shows Proposed Changes to Current Standard)**

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ASHRAE, 180 Technology Parkway NW, Peachtree Corners, GA 30092

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FOREWORD

Many of the proposed changes to ASHRAE 15 since 2015 have been associated with the impending refrigerant changes due to global warming and climate change, beginning with addendum d and addendum h to ASHRAE 15-2016, which addressed specific applications for A2L refrigerants. Several addenda to ASHRAE 15-2019 continued with addenda c addressing A3 refrigerant charge in self-contained equipment, addendum e addressing piping related changes, addendum l specifically focused on commercial refrigeration equipment using flammable refrigerants, addendum g addressing the concept of releasable charge, as well as a flurry of other addenda in the last year.

This proposed addendum t addresses changes for application of cooling equipment specific to information technology equipment (ITE) and data center installations. The same mitigation principles (refrigerant charge size restrictions, refrigerant detection, air circulation and product listing) are the same as other applications using flammable refrigerants. One significant difference in ITE applications, due to the sensitive nature of electronic equipment to cleanliness, is that emergency ventilation of outside air is not an acceptable mitigation strategy.

Further, this proposed addendum t is written in light of the addendum g (as noted above), which also makes major revisions to Sections 7.2 and 7.3, as well as several other addenda. The below definitions have been approved by other published addenda, and are used in this proposed addendum. As these defined terms are proposed for use in addendum t, they are included but not open for comment.

connected spaces: two or more spaces connected by natural ventilation, a ducted air distribution system, or mechanical ventilation

effective dispersal volume: the volume of a space or *connected spaces* in which leaked *refrigerant* will disperse

effective dispersal volume charge (EDVC): the maximum *refrigerant* charge permitted for an *effective dispersal volume*.

independent circuit: a closed refrigeration circuit that is arranged in such a manner that, in the event of a single point failure, the release of *refrigerant* is limited to only the quantity contained within the refrigeration circuit.

releasable refrigerant charge (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.

system refrigerant charge (m_s): Actual *refrigerant charge* of a single *refrigerating system*

Note: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and ~~striking through~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.

Addendum t to Standard 15-2019

Modify Section 3 as follows. The remainder of Section 3 remains unchanged.

3. DEFINITIONS

3.1 Defined Terms

[...]

computer room: a room or portions of a building serving an *ITE* load less than or equal to 10 kW or 20 W/ft² (215 W/m²) or less of conditioned floor area.

data center: a room or building, or portions thereof, including *computer rooms* being served by the data center systems, serving a total *ITE* load greater than 10 kW and 20 W/ft² (215 W/m²) of conditioned floor area.

group controller: *An electrical or electronic control system that monitors and responds to multiple distinct inputs from more than one appliance or unit.*

information technology equipment (ITE): *ITE includes computers, data storage, servers, and network/communication equipment.*

information technology equipment facilities (ITEF): *Data centers and computer rooms used primarily to house ITE.*

ITE area: An area of a building where the *ITE room* is located, including support rooms served by the same special air-conditioning or air handling equipment as the *ITE room*.

ITE cooling appliance: *An appliance or equipment designed specifically for the cooling of ITE, ITE rooms, and ITE areas such as data centers or computer rooms.*

ITE room: A room within the *ITE area* that contains the *ITE*.

maximum refrigerant charge, m_{max}: *maximum refrigerant charge for a single refrigerating system resulting from a calculation for room volume.*

safety shut-off valve (SSOV): *an automatically controlled refrigerant valve for the purpose of limiting the amount of refrigerant released into a space when a refrigerant leak is detected.*

[...]

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

7. RESTRICTIONS ON REFRIGERANT USE

7.2 Refrigerant Concentration Limits.

[...]

Note to reviewer: The refrigerant charge restrictions of addendum g new Section 7.3 (formerly Section 7.2) will be applicable to *ITE* applications. The exception noted below to the published Section 7.2 will become Section 7.3.1.1 of the new addendum g.

Exceptions to 7.2:

[...]

3. Listed *ITE cooling appliances* installed per Section 7.9 with volume calculations per Section 7.3.3.

[...]

7.3 Volume Calculations. ...

[...]

Note to reviewer: addendum g makes extensive revisions to Sections 7.2 and 7.3. The new proposed Section 7.3.3 below will become section 7.2.3.5 of the new addendum g Section 7.2. The referenced Sections 7.3.1 and 7.3.2 of the published ASHRAE 15-2019 will become Sections 7.2.1 and 7.2.3 of the new addendum g.

***7.3.3 ITE Room Volume Calculations.** The effective dispersal volume (EDV) of an ITE room shall comply with Sections 7.3.1 and 7.3.2, except as modified by Section 7.3.3. The maximum height permitted to be included in the EDV shall be 4.0 ft (1.22 m) above the highest duct opening. Underfloor spaces utilized in airflow movement shall be permitted to be included in the EDV.

[...]

7.9 Information Technology Equipment (ITE) Applications Using Group A2L Refrigerants. High-probability systems using Group A2L refrigerants in ITEF shall comply with this section.

7.9.1 Listing and Installation Requirements. ITE cooling appliances shall be listed in accordance with UL 60335-2-40¹⁷ or CSA C22.2 No. 60335-2-40^{xx}. The ITE cooling appliance shall be installed in accordance with the listing, the manufacturer's instructions, and manufacturer's markings on the equipment restricting the installation.

7.9.2 Location and Access. Access to the ITE cooling appliances, ITE, ITE room(s) and ITE area(s) shall be restricted to authorized personnel. Doors shall be clearly marked, or permanent signs shall be posted at each entrance to indicate this restriction.

7.9.3 Maximum Refrigerant Charge. The permissible releasable refrigerant charge, m_{rel} , for listed ITE cooling appliances shall be determined using the requirements specified in 7.9.3.1 and 7.9.3.2, when system refrigerant charge, m_s , is adjusted per manufacturer's instructions.

7.9.3.1 The releasable refrigerant charge, m_{rel} , shall not exceed the quantity determined by the following equation. If release mitigation controls per Section 7.9.5 are not used, then m_{rel} is equal to m_s .

$$m_{rel} = 0.50 \times LFL \times EDV$$

where

m_{rel} = releasable refrigerant charge, lb (kg)

LFL = lower flammability limit as specified in ASHRAE 34, lb/1000 ft³, (kg/m³)

EDV = effective dispersal volume, as specified in 7.9.3.2.

7.9.3.2 The effective dispersal volume, EDV, used shall be as specified in Section 7.3.3.

7.9.3.2.1 Ventilation. Spaces of the ITE area which are connected by ventilation shall be permitted to be included in EDV, provided that ventilation airflow meets the requirements of Section 7.6.4. Ventilation airflow shall either be continuous or initiated by a refrigerant detection system meeting the requirement of Section 7.9.4.

Note to reviewer: The Section 7.6.4 referenced in 7.9.3.2.1 above is Section 7.6.4 of addendum m.

7.9.4 Refrigerant Detection System Requirements. When a refrigerant detection system is utilized or required to meet the requirements of Section 7.9.5, Section 7.9.6, or Section 7.9.7, the refrigerant detection system shall meet the requirements of Section 7.6.5. When a group controller is utilized for multiple ITE cooling appliances, Sections 7.9.4.1 through 7.9.4.3 shall apply.

7.9.4.1 The refrigerant detection system of each ITE cooling appliance shall provide an output signal for use in notifying the group controller or user that mitigation actions have been activated.

7.9.4.2 If a group controller is capable of determining an output signal comes from one or more specific ITE cooling appliance(s), it shall be permissible for only that (those) ITE cooling appliance(s) to perform mitigation actions. If a group controller is not capable of determining the source of an output signal, the group controller shall command all appliances under its command to perform mitigation actions of 7.9.4.

7.9.4.3 A group controller shall require the use of administrative controls.

7.9.5 Release Mitigation Controls. Sections 7.9.5.1 and Section 7.9.5.2 shall apply when safety shut-off valves (SSOV) are installed in refrigeration system.

7.9.5.1 Location. SSOV shall be positioned to enable access for service and maintenance by authorized personnel.

7.9.5.2 Standby or Redundant ITE Cooling Appliances. When applied to standby or redundant refrigeration systems, SSOV shall be in the closed position for both standby mode and off-mode.

7.9.6 Circulation Airflow. Circulation airflow shall either be provided continuously or initiated by a refrigerant detection system meeting the requirement of Section 7.9.4. The circulation airflow shall be of a minimum quantity per the equations below.

$$Q_{min} = 500 \times m_c \div LFL \quad \text{(I-P)}$$

$$Q_{min} = 30 \times m_c \div LFL \quad \text{(SI)}$$

where

Q_{min} = minimum circulation airflow rate, ft³/min (m³/h)

m_c = system refrigerant charge, lb (kg)

LFL = lower flammability limit, lb/1000 ft³ (kg/m³)

500 = conversion factor

30 = conversion factor

7.9.7 Notification. When a refrigerant detection system is used, the notification signal from the refrigerant detection system shall initiate an alarm, which shall annunciate visual and audible alarms inside the ITE area and outside each entrance to the ITE area.

INFORMATIVE APPENDIX HEADER

A7.3.3. The figure below is one example of an ITE room and the application of ITE cooling appliance. ITE room orientation of hot aisle containment, suspended ceiling, and raised floor, as well as their presence, may differ from that shown in the figure. Direction of airflow may differ from that shown in the figure. The ITE cooling appliance may be located within the ITE room or outside the ITE room and ducted to the space.

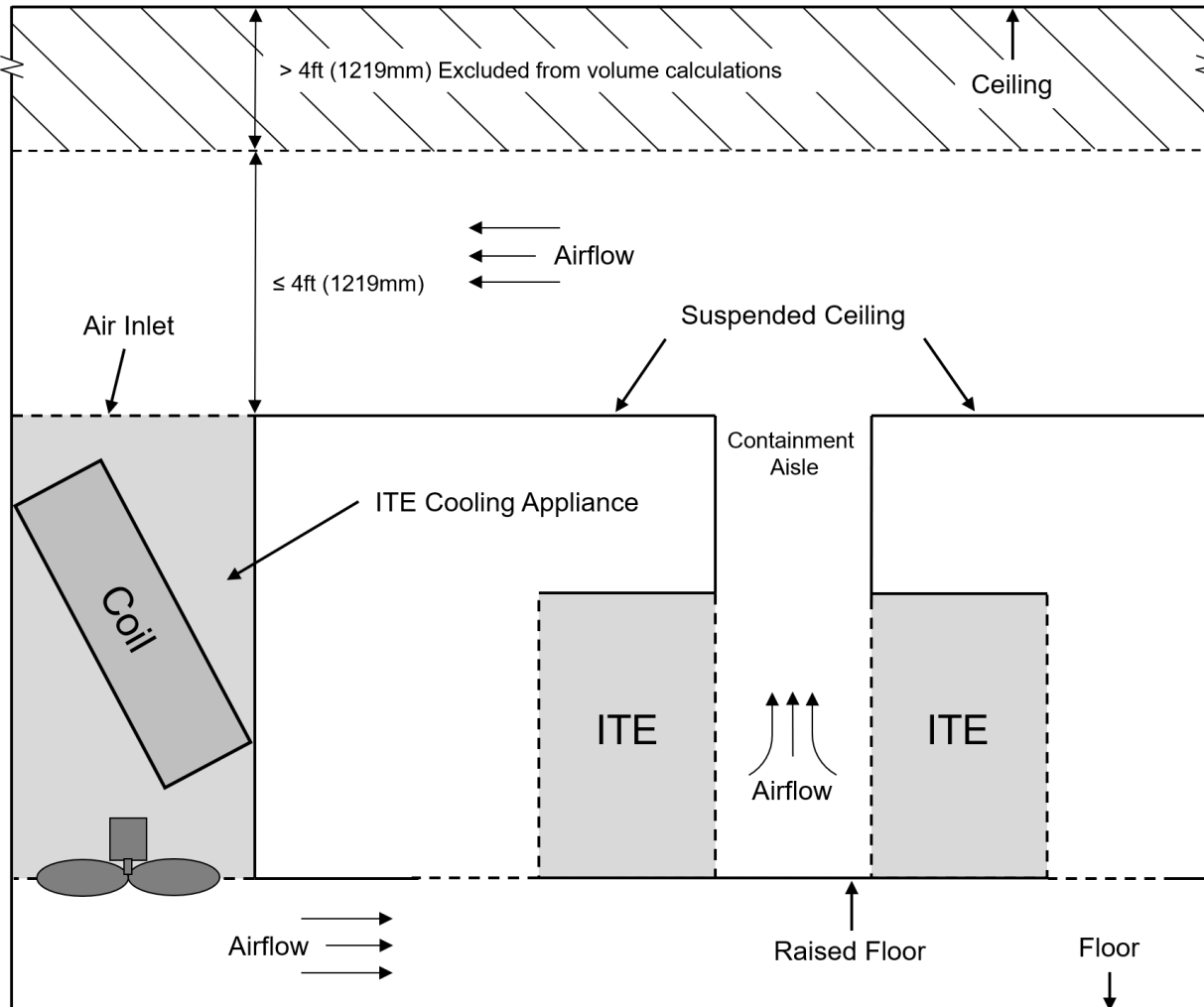


Figure 7-1

Example elevation view of an ITE Room for determination of the *effective dispersal volume (EDV)*.