ADDENDA

ANSI/ASHRAE Addendum c to
ANSI/ASHRAE Standard 147-2019

Reducing the Release of Halogenated Refrigerants from Refrigerating and Air-Conditioning Equipment and Systems

Approved by ASHRAE and the American National Standards Institute on September 30, 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 (https://www.ashrae.org/continuous-maintenance).

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 ISSN 1041-2336

Approved American National Standard
ANSI
www.ansi.org

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b. participation in the next review of the Standard,
c. offering constructive criticism for improving the Standard, or
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FOREWORD

Addendum c makes additions to Section 3, "Definitions"; 7.2, "Field Leak Testing"; 7.3, "Field Evacuation"; and A5.3, "Leak Testing." Changes redefine deep vacuum *and the procedures for leak and vacuum testing. With the increasing availability of A2L refrigerants, these changes are necessary to harmonize Standard 147 with ASHRAE Standard 15 and UL 60335-2-40.*

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 c to Standard 147-2019

Revise Section 3 as shown.

vacuum, deep (high vacuum): a vacuum of ~~1000 µm Hg (130 Pa)~~ 500 µm Hg (65 Pa) or less of absolute pressure.

Revise Sections 7.2 through 7.5 as shown. Renumber remaining sections accordingly.

7.2 Field Leak Testing. Equipment Types 6, 8, 9, and 10 shall be leak tested as an Equipment Type 8 per Section 6.2.1 to ensure system integrity and minimize refrigerant leakage.

~~***Informative Note:*** See Informative Appendix A, Section A5.3, for recommended procedures.~~

Once the system is erected, separate tests for isolated portions of the system are permitted provided that all required portions are tested at least once. A passing pressure test shall not rupture or damage any components rated greater than the test pressure. If necessary, pressure relief devices may be removed and plugged for the duration of the test. Corrections of the pressure differential due to change in ambient temperature shall be permitted. If a leak is indicated, repair and repeat tests until pass. Leak detection and dehydration for Equipment Types 8, 9, and 10 shall require steps (a), (b), and (c). Leak detection and dehydration for Equipment Type 6 shall only require (a) and (c):

a. With the system under dry nitrogen pressure equal to the design pressure as detailed on the equipment nameplate, or the lowest value of the set pressure for any pressure relief devices in the system, but not exceeding 500 psi (3450 kPa). Once the system reaches equilibrium, hold pressure for the minimum period of test specified in Table 7-1, apply soap solution to all likely leak locations, and observe; bubble formation indicates a likely large leak.
b. The test pressure shall not decay more than 5 psi (34 kPa) in the minimum period of test specified in Table 7-1, accounting for temperature change. With a trace halocarbon gas mixed with nitrogen at pressure as indicated in step (a), check probable leak locations with an electronic halogen leak detector.
c. After removing pressurization gas, perform a triple evacuation with nitrogen purges in between. Draw first vacuum to 1500 µm Hg (195 Pa), then purge with nitrogen. Draw second vacuum to 1000 µm Hg (130 Pa), then purge with nitrogen. Draw third deep vacuum to 500 µm Hg (65 Pa). Valve-off the system from the vacuum pump and ensure that the vacuum gage is measuring system vacuum. The gage shall hold per Table 7-1. Monitor the system to determine if it holds the vacuum, thus indicating acceptable dehydration. A successful test shall not rise above 1500 µm Hg (195 Pa) for the minimum period of test indicated in Table 7-1.

~~**7.3 Field Evacuation.** After it is determined that there are no refrigerant leaks, Equipment Types 6, 8, 9, and 10 shall be evacuated to 1000 µg or less and held long enough to remove moisture.~~

Revise Section A5.3 as shown.

A5.3 Leak Testing

A5.3.1 Initial Leak Testing of Uncharged Systems of Type 6, 8, 9, and 10. For field-erected systems, ~~L~~leak detection and dehydration may be performed in three steps: with the system under pressure apply a soap bubble solution and observe leaks, next use pressurize nitrogen with a trace

Table 7-1 Duration of Pressure and Leak Test

Leak Test	Pipe Length, *L*		Maximum Nominal Pipe Size		Minimum Period of Test
	ft	m	NPS (in.)	DN (mm)	h
Pressure test	$L \le 100$	$L \le 30$	NPS ≤ 3/4	DN ≤ 20	0.25
			3/4 < NPS ≤ 3	20 < DN ≤ 75	1.0
			3 < NPS	75 < DN	24
	$100 < L \le 200$	$30 < L \le 61$	NPS ≤ 3	DN ≤ 75	1.0
			3 < NPS	75 < DN	24
	$200 < L$	$61 < L$	Any	Any	24
Vacuum test	$L \le 100$	$L \le 30$	NPS ≤ 3/4	DN ≤ 20	1.0
			3/4 < NPS ≤ 3	20 < DN ≤ 75	8.0
			3 < NPS	75 < DN	24
	$100 < L \le 200$	$30 < L \le 61$	NPS ≤ 3	DN ≤ 75	8.0
			3 < NPS	75 < DN	24
	$200 < L$	$61 < L$	Any	Any	24

Notes:

a. The maximum nominal pipe size is the largest interconnected field piping installed. The vacuum test shall start from a *deep vacuum.*

b. Field leak testing shall be complete when the system is fully charged and assembled and all field joints and pressure relief devices have been probed with an electronic halogen leak detector finding no detectable leakage (with demonstrated capability to detect leaks of the refrigerant in use to a sensitivity of 0.1 oz/year/joint).

gas and refrigerant detector, and finally draw a vacuum to demonstrate all major leaks have been located.

~~a. With the system under nitrogen pressure, apply soap solution to all likely leak spots and observe; bubble formation indicates a likely large leak. This test should not be the only leak detection performed; steps (b) and/or (c) should also be performed.~~

~~b. With a trace halocarbon gas mixed with nitrogen at pressure, check probable leak spots with an electronic halogen leak detector.~~

~~c. After removing pressurization gas, perform a triple evacuation with nitrogen purges in between. Draw first vacuum to 1500 microns (1500×10^{-6} m·Hg), hold for one hour, then purge with nitrogen. Draw second vacuum to 1000 microns (1000×10^{-6} m·Hg), hold for one hour, then purge with nitrogen. Draw third vacuum to 500 microns (500×10^{-6} m·Hg). Valve off the system from the vacuum pump. Monitor the system to determine if it holds the vacuum, thus indicating acceptable dehydration. If step (c) fails, the system is not dehydrated, the system oil may still be outgassing refrigerant or moisture, or a large leak that should have been found in step (a) or (b) is still present. Successfully completing step (c) fulfills the minimum requirement of Section 7.3.~~

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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.

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.

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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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