BSR/ASHRAE Standard 173-2012 (RA 202X)

Public Review Draft

Method of Test to Determine the Performance of Halocarbon Refrigerant Leak Detectors

First Public Review (September 2025)

THIS DOCUMENT IS OUT FOR REAFFIRMATION PUBLICATION PUBLIC REVIEW. THERE ARE NO CHANGES TO THE STANDARD. ANY COMMENTS RECEIVED THAT ARE TECHNICAL IN NATURE WILL BE FORWARDED TO THE REVISION PROJECT COMMITTEE.

This draft has been recommended for public review by the responsible project committee. To submit a comment on this proposed standard, go to the ASHRAE website at www.ashrae.org/standards-research--technology/public-review-drafts and access the online comment database. The draft is subject to modification until it is approved for publication by the Board of Directors and ANSI. Until this time, the current edition of the standard (as modified by any published addenda on the ASHRAE website) remains in effect. The current edition of any standard may be purchased from the ASHRAE Online Store at www.ashrae.org/bookstore or by calling 404-636-8400 or 1-800-727-4723 (for orders in the U.S. or Canada).

The appearance of any technical data or editorial material in this public review document does not constitute endorsement, warranty, or guaranty by ASHRAE of any product, service, process, procedure, or design, and ASHARE expressly disclaims such.

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

Insert Next Page.

SPECIAL NOTE

This American National Standard (ANS) is a national voluntary consensus standard developed under the auspices of ASHRAE. *Consensus* is defined by the American National Standards Institute (ANSI), of which ASHRAE is a member and which has approved this standard as an ANS, as "substantial agreement reached by directly and materially affected interest categories. This signifies the concurrence of more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that an effort be made toward their resolution." Compliance with this standard is voluntary until and unless a legal jurisdiction makes compliance mandatory through legislation.

ASHRAE obtains consensus through participation of its national and international members, associated societies, and public review.

ASHRAE Standards are prepared by a Project Committee appointed specifically for the purpose of writing the Standard. The Project Committee Chair and Vice-Chair must be members of ASHRAE; while other committee members may or may not be ASHRAE members, all must be technically qualified in the subject area of the Standard. Every effort is made to balance the concerned interests on all Project Committees.

The Manager of Standards of ASHRAE should be contacted for:

a. interpretation of the contents of this Standard,
b. participation in the next review of the Standard,
c. offering constructive criticism for improving the Standard, or
d. permission to reprint portions of the Standard.

DISCLAIMER

ASHRAE uses its best efforts to promulgate Standards and Guidelines for the benefit of the public in light of available information and accepted industry practices. However, ASHRAE does not guarantee, certify, or assure the safety or performance of any products, components, or systems tested, installed, or operated in accordance with ASHRAE's Standards or Guidelines or that any tests conducted under its Standards or Guidelines will be nonhazardous or free from risk.

ASHRAE INDUSTRIAL ADVERTISING POLICY ON STANDARDS

ASHRAE Standards and Guidelines are established to assist industry and the public by offering a uniform method of testing for rating purposes, by suggesting safe practices in designing and installing equipment, by providing proper definitions of this equipment, and by providing other information that may serve to guide the industry. The creation of ASHRAE Standards and Guidelines is determined by the need for them, and conformance to them is completely voluntary.

In referring to this Standard or Guideline and in marking of equipment and in advertising, no claim shall be made, either stated or implied, that the product has been approved by ASHRAE.

CONTENTS

BSR ~~ANSI~~/ASHRAE Standard 173-2012 (RA ~~2016)~~, 202X
Method of Test to Determine the Performance of Halocarbon Refrigerant Leak Detectors

SECTION **PAGE**

NOTE

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE Web site at www.ashrae.org/technology.

(This foreword 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.)

FOREWORD

Since 1996, ASHRAE Technical Committee 3.8, Refrigerant Containment, has defined several objectives for improving refrigerant containment and leak detection. Standard 173 has gathered practitioners and highly informed experts in order to define a practical method capable of verifying how a leak detector can properly detect small and very small leak flow rates. Leak detection is necessary for all types of refrigerants and is part of the quality management of air-conditioning and refrigeration systems.

(RA 2016)

This is a reaffirmation of Standard 173-2012. This standard was prepared under the auspices of ASHRAE. It may be used, in whole or in part, by an association or government agency with due credit to ASHRAE. Adherence is strictly on a voluntary basis and merely in the interests of obtaining uniform guidelines throughout the industry. This version of the reaffirmation has no changes.

1. PURPOSE

The purpose of this standard is to establish a method of test for qualifying the performance of portable leak detectors designed for the detection of chlorofluorocarbon (CFC), hydrochlorofluorocarbon (HCFC), hydrofluorocarbon (HFC), and perfluorocarbon (PFC) halogenated gases.

2. SCOPE

The practices and procedures in this standard cover the testing of refrigerant leak detectors intended for use in the leak testing of refrigerating, air-conditioning, and heat pump systems and their components.

3. DEFINITIONS

Although the following terms have broader interpretations elsewhere, their specific meanings as used in this standard are as follows.

background: the refrigerant in the ambient air. The ambient environment where a leak detector is used is often contaminated with some concentration of refrigerant. A leak detector can adjust to this background concentration as the new reference zero point and retain its sensitivity for leaks in a contaminated environment.

calibrated leak: a device with a defined leak rate of a given gas under defined pressure and temperature conditions. These conditions are defined upstream and downstream of the leak element. Calibrated leaks are to be traceable to National Institute of Standards and Technology (NIST) or an equivalent recognized organization.

CFC: chlorofluorocarbon; a fully halogenated (no hydrogen remaining) halocarbon containing chlorine, fluorine, and carbon atoms.

HCFC: hydrofluorocarbon; a halocarbon that contains fluorine, chlorine, carbon, and hydrogen.

HFC: hydrofluorocarbon; a halocarbon that contains only fluorine, carbon, and hydrogen.

indicating leak detector: a leak detector indicating one or several levels of concentration, but with no numerical value of these concentrations or leak rates. The concentration or leak rate is indicated to the user through a visual and/or audible means.

leak rate: gas mass flow rate through a fissure, an orifice, or any other type of leakage path. The usual leak rate units are gram per year (g/yr) or ounce per year (oz/yr).

measuring leak detector: a leak detector that measures gas concentration and displays the value of the gas concentration or leak rate in a numerical form.

PFC: perfluorocarbon; a halocarbon composed only of fluorine and carbon.

ppm(m): parts per million gas concentration of a given gas to the total mass of the gas mixture. The units are in a "mass per mass" ratio.

ppm(V): parts per million gas concentration of a given gas to the total volume of the gas mixture. The units are in a "volume per volume" ratio.

recovery time: the time required for the output of a leak detector to return to the minimum detection threshold after the detector has been exposed to a leak flow rate of 50 g/yr for 5 s.

response time: in the moving tests described here, the time that elapses from the point at which the probe passes directly in front of the leak until the initial response of the detector occurs.

4. APPARATUS

4.1 Calibrated Leak Standard. The calibrated leak standard can be either adjustable or fixed flow rate. Testing will require calibrated leak flow rates of 1±0.15 g/yr, 50±7.5 g/yr, and any number of calibrated leaks with flow rates between the nominal 1 and 50 g/yr leaks. The number and variety of calibrated leaks available between 1 and 50 g/yr will impact the resolution attainable in the tests as described below. The calibrated leaks used in this testing shall be calibrated by methods and instruments traceable to NIST or an equivalent recognized organization with a measurement uncertainty of ±15% or less. To mitigate testing inconsistency from possible air turbulence caused by the moving probe, the leak standards can be equipped (as a certification test option) with a shroud around the orifice port. The shroud protrusion from the orifice port shall be no more than 6 mm, and a vent means for ambient air to be drawn through the shroud by the leak detector shall be provided. A view of a sample shroud configuration as allowed here is shown in

Figure 1. R-134a is the refrigerant used for all tests unless otherwise stated.

4.2 Test Stand. The test stand will have a mobile platform to which the leak detector can be attached. The test stand will have a means for moving this platform laterally ±200 mm at a controlled, constant speed over at least ±180 mm of the travel (i.e., 1 cm at each end of travel is available for deceleration and acceleration). The test stand will include a support for positioning the calibrated leak standard so that the outlet is at least 20 cm above the base of the test stand. The calibrated leak support will be positioned such that the outlet of the calibrated leak is positioned at the midpoint of the mobile platform's lateral travel. The calibrated leak will rest on this support so that the outlet of the leak hangs over the edge of the support by a distance of at least 3 mm. The distance *d* between the outlet of the leak and the tip of the leak detector probe will be adjustable. Under varying conditions of motion as specified below, the leak detector shall be tested at distance *d* of 1 mm and 3 mm between the outlet of the calibrated leak and the tip of the leak detector probe.

5. AMBIENT CONDITIONS

Unless otherwise indicated, the testing is done in air with a concentration of less than 5 ppm(V) of the refrigerant. The air shall be still, with velocity no greater than 0.15 m/s. The temperature shall be constant at 21°C ± 2°C. The absolute pressure shall be 101±5 kPa.

6. TEST PROCEDURES

6.1 Test Number 1—Sensitivity Threshold when the Leak Detector is Stationary. The stationary test involves a series of 10 repeat trials, starting with the 1 g/yr leak, followed by another series of 10 repeat trials with an increase in the leak rate (if needed) until the detector minimum sensitivity threshold is established. For each test in the series, the calibrated leak is mounted on the support and adjusted for proper distance from the probe tip. The minimum distance *d* between the probe tip and the outlet of the calibrated leak is 1 mm. Traveling on the mobile platform from one extent of the range of travel, the leak detector probe tip is brought into position in front of the outlet of the leak and the platform is stopped. During a 5 s dwell, the indication given by the leak detector is monitored. Following the 5 s dwell, the mobile platform moves the leak detector back to its starting point. After the leak detector returns to its minimum reading, the next trial is run following this same procedure. The procedure for the stationary test is as follows:.

6.1.1 The leak detector is switched off and attached to the mobile platform of the test stand.

6.1.2 The 1 g/yr calibrated leak is installed on the calibrated leak support.

6.1.3 The mobile platform is moved to a position directly in front of the calibrated leak, and the distance *d* between the outlet of the calibrated leak and the probe tip is set to 1 mm.

6.1.4 The leak detector/mobile platform is moved to the end of its travel.

6.1.5 The leak detector is turned on, allowed to warm up, and adjusted according to the manufacturer's instructions.

6.1.6 The leak detector/mobile platform is moved to a position directly in front of the calibrated leak at an average speed of 50±5 mm/s and stops. The leak detector samples the calibrated leak for a period of 5 s from a distance of 1 mm. During the 5 s dwell, the maximum signal and the time at which the signal occurs is recorded.

6.1.7 The leak detector/mobile platform is moved back to its starting point and sits idle until the indication given by the leak detector returns to its minimum reading.

6.1.8 Repeat the procedure outlined in Sections 6.1.6 and 6.1.7 until 10 consecutive trials have been completed.

6.1.9 Turn off the leak detector.

6.1.10 If the leak detector registers a signal during each of the 10 consecutive trials with the 1 g/yr leak installed on the

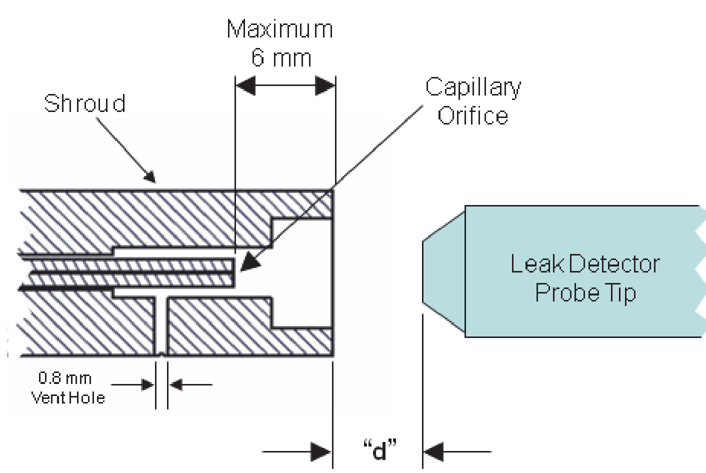

Figure 1 Calibrated leak outlet with shroud and detector probe.

calibrated leak support, the test is completed, the minimum sensitivity threshold is 1 g/yr, and the results are recorded per Section 6.1.13. Otherwise, install a calibrated leak with a greater flow rate on the calibrated leak support and repeat the procedure outlined in Sections 6.1.3 through 6.1.9.

6.1.11 The test procedure outlined in Sections 6.1.3 through 6.1.9 is repeated with progressively larger calibrated leaks until the leak detector registers a signal during each of the 10 consecutive trials. When the leak detector registers a signal during each of the 10 consecutive trials, the minimum sensitivity threshold is established as the flow rate of the calibrated leak on the test stand, and the results are recorded per Section 6.1.13.

6.1.12 If the leak detector fails to register a signal during each of the 10 consecutive trials with the 50 g/yr leak installed on the calibrated leak support, the test is completed, the minimum sensitivity threshold is greater than 50 g/yr and the results are recorded per Section 6.1.13.

6.1.13 Record the Test Results. A sample test report for Test Number 1 appears in Section 7.

6.2 Test Number 2—Sensitivity Threshold When the Leak Detector is Moving. The moving test involves a series of repeat trials, starting with the 1 g/yr calibrated leak, followed by another series of repeat trials with an increase in the leak rate (if needed) until the detector minimum sensitivity threshold is established. Moving leak detector tests are performed under two different conditions:

a. Moving slow, probe tip 3 mm from the leak
b. Moving fast, probe tip 3 mm from the leak

For the slow test, the minimum distance between the probe tip and the outlet of the calibrated leak is 3 mm, and the average speed of travel is 3±0.3 mm/s. For the fast test, the minimum distance between the probe tip and the outlet of the calibrated leak is 3 mm, and the average speed of travel is 50±5 mm/s.

For each test in the series, the calibrated leak is mounted on the support and adjusted for proper distance from the probe tip. Traveling on the mobile platform, the leak detector is moved back and forth five times over the extent of travel (–10 cm to +10 cm for the slow test and –20 cm to +20 cm for the fast test), passing in front of the outlet of the leak a total of 10 times. Each time the leak detector passes the calibrated leak, the indication given by the leak detector is recorded, and the response time is noted. The procedure for the moving tests is as follows.

6.2.1 The leak detector is switched off and attached to the mobile platform of the test stand.

6.2.2 The 1 g/yr calibrated leak is installed on the calibrated leak support positioned at the midpoint of travel as shown in Figures 2 and 3.

6.2.3 The mobile platform is moved to the midpoint of its travel, and the distance *d* between the outlet of the calibrated leak and the probe tip is set to 3 mm.

6.2.4 The leak detector/mobile platform is moved to the end of its travel.

6.2.5 The leak detector is turned on, allowed to warm up, and adjusted according to the manufacturer's instructions.

6.2.6 The leak detector/mobile platform is set in motion at the "slow" average speed of 3 mm/s and traverses back and forth over the –10 cm to +10 cm range of travel five times (the leak detector passes in front of the leak 10 times).

Note: Traversing the range of travel back and forth five times results in a total distance traveled of 2000 mm. The average speed of the mobile platform is defined as the distance traveled divided by the duration of the test. At the maximum allowable average speed of 3.3 mm/s, the slow test duration will be 606 s (10 min and 6 s). At the minimum allowable average speed of 2.7 mm/s, the slow test duration will be 740 s (12 min and 20 s).

6.2.7 Each time the leak detector probe tip passes in front of the calibrated leak outlet, the indication given by the leak detector is recorded, and the response time is noted.

6.2.8 At the conclusion of the fifth traverse, the mobile platform is stopped, and the leak detector is turned off.

6.2.9 If the leak detector registers a signal each of the 10 times that the probe tip passes in front of the calibrated leak outlet with the 1 g/yr leak installed on the calibrated leak support, the slow test is completed, and the minimum sensitivity threshold is 1 g/yr and the results are recorded per Section 6.2.22. Otherwise, install a calibrated leak with a greater flow rate on the calibrated leak support and repeat the procedure outlined in Sections 6.2.3 through 6.2.8.

6.2.10 The test procedure outlined in Sections 6.2.3 through 6.2.8 is repeated with progressively larger calibrated leaks until the leak detector registers a signal each of the 10 times that the probe tip passes in front of the calibrated leak outlet. When the leak detector registers a signal during each of the 10 times that the probe tip passes in front of the calibrated leak outlet, the minimum sensitivity threshold is established as the flow rate of the calibrated leak on the test stand, and the slow test results are recorded per Section 6.2.22.

6.2.11 If the leak detector fails to register a signal during each of the 10 times that the probe tip passes in front of the calibrated leak outlet with the 50 g/yr leak installed on the calibrated leak support, the slow test is completed, and the minimum sensitivity threshold is greater than 50 g/yr and the results are recorded per Section 6.2.22.

6.2.12 The 1 g/yr calibrated leak is installed on the calibrated leak support positioned at the midpoint of travel as shown in Figures 2 and 3.

6.2.13 The mobile platform is moved to the midpoint of its travel, and the distance *d* between the outlet of the calibrated leak and the probe tip is set to 3 mm.

6.2.14 The leak detector/mobile platform is moved to the end of its travel.

6.2.15 The leak detector is turned on, allowed to warm up, and adjusted according to the manufacturer's instructions.

6.2.16 The leak detector/mobile platform is set in motion at the "fast" speed of 50 mm/sec and traverses back and forth over the –20 cm to +20 cm range of travel five times (the leak detector passes in front of the leak 10 times).

Note: At the maximum allowable average speed of 55 mm/s, the fast test duration will be 73 s (1 min and 13 s). At the minimum allowable average speed of 45 mm/s, the fast test duration will be 88 s (1 min and 28 s).

6.2.17 Each time the leak detector probe tip passes in front of the calibrated leak outlet, the indication given by the leak detector is recorded, and the response time is noted.

6.2.18 At the conclusion of the fifth traverse, the mobile platform is stopped, and the leak detector is turned off.

6.2.19 If the leak detector registers a signal each of the 10 times that the probe tip passes in front of the calibrated leak outlet with the 1 g/yr leak installed on the calibrated leak support, the fast test is completed, and the minimum sensitivity threshold is 1 g/yr and the results are recorded per Section 6.2.22. Otherwise, install a calibrated leak with a greater flow rate on the calibrated leak support, and repeat the procedure outlined in Sections 6.2.13 through 6.2.18.

6.2.20 The test procedure outlined in Sections 6.2.13 through 6.2.18 is repeated with progressively larger calibrated leaks until the leak detector registers a signal each of the 10 times that the probe tip passes in front of the calibrated leak outlet. When the leak detector registers a signal during each of the 10 times that the probe tip passes in front of the calibrated leak outlet, the minimum sensitivity threshold is established as the flow rate of the calibrated leak on the test stand, and the fast test results are recorded per Section 6.2.22.

6.2.21 If the leak detector fails to register a signal during each of the 10 times that the probe tip passes in front of the calibrated leak outlet with the 50 g/yr leak installed on the calibrated leak support, the fast test is completed, and the minimum sensitivity threshold is greater than 50 g/yr and the results are recorded per Section 6.2.22.

6.2.22 Record the Test Results. A sample test report for Test Number 2 appears in Section 7.

6.3 Test Number 3—Recovery Time Test. When a leak detector is exposed to a large leak, the sensor can become saturated by the refrigerant. After removing the leak detector

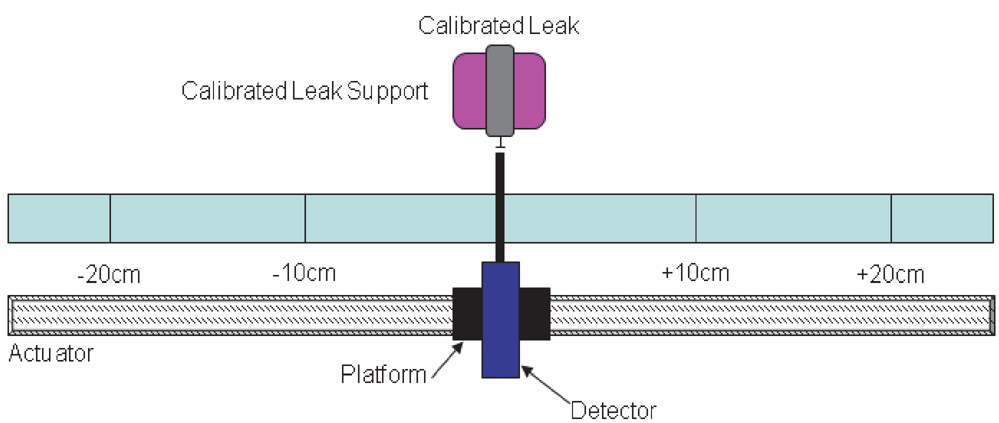

Figure 2 Test apparatus, top view.

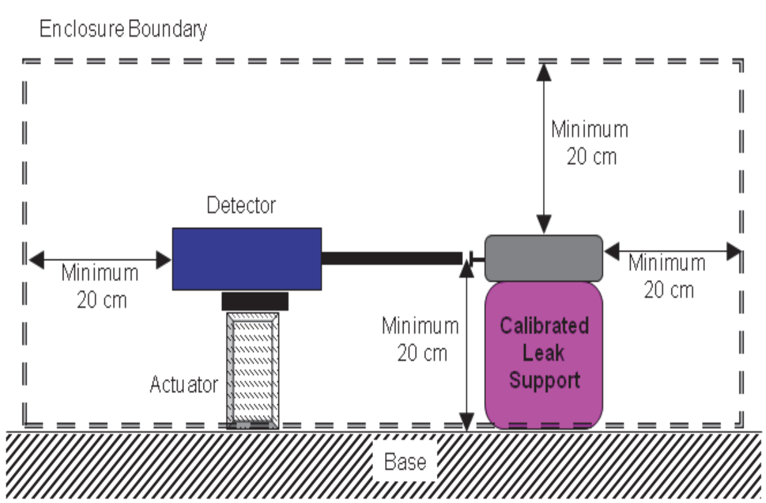

Figure 3 Test apparatus, side view.

from the leak site, the signal will return to zero after a period of time. This period of time is defined as the *recovery time*. This test will determine the recovery time using a 50 g/yr leak source. If the leak detector is equipped with a manually activated zeroing feature, it is not to be used during the measurement of recovery time.

6.3.1 The 50 g/yr calibrated leak is installed on the calibrated leak support.

6.3.2 The mobile platform is moved to a position directly in front of the calibrated leak, and the distance *d* between the outlet of the calibrated leak and the probe tip is set to 1 mm.

6.3.3 The leak detector/mobile platform is moved to the end of its travel.

6.3.4 The leak detector is turned on, allowed to warm up, and adjusted according to the manufacturer's instructions. Record the initial reading of the leak detector.

6.3.5 The leak detector/mobile platform is moved at an average speed of 50±5 mm/s to a position directly in front of the calibrated leak and stops. The leak detector samples the calibrated leak for a period of 5 s from a distance of 1 mm.

6.3.6 The leak detector/mobile platform is moved back to its starting point at an average speed of 50±5 mm/s and sits idle until the indication given by the leak detector returns to its minimum reading. Record the time elapsed starting from when the mobile platform starts to move away from the calibrated leak until the leak detector returns to its initial reading. This elapsed time is the leak detector's recovery time.

6.3.7 Repeat the procedure outlined in Sections 6.3.5 and 6.3.6 until five trials have been completed, and record the results.

A sample test report for Test Number 3 appears in Section 7.

6.4 Test Number 4—Sensitivity Threshold after Exposure to a Large Leak. When a leak detector is exposed to a large leak, the sensor can lose sensitivity after the recovery time even though the indication might lead the operator to believe otherwise. This test will determine if the leak detector sensitivity is adversely affected by exposure to a large leak after the recovery time has elapsed.

6.4.1 Two calibrated leak standards are used in this test, as depicted in Figure 4. Calibrated Leak #1, positioned at one end of travel, is the 50 g/yr leak. Calibrated Leak #2, positioned at the +10cm position, is the leak that was identified as the minimum sensitivity threshold with the leak detector moving fast as determined in Test Number 2.

6.4.2 With the leak detector switched off, the mobile platform is moved to the –20 cm position, and the distance *d* between the outlet of Calibrated Leak #1 and the probe tip is set to 1 mm. The mobile platform is moved to the +10 cm position, and the distance *d* between the outlet of Calibrated Leak #2 and the probe tip is set to 3 mm.

6.4.3 The leak detector is positioned at 0, turned on, allowed to warm up, and adjusted according to the manufacturer's instructions.

6.4.4 The leak detector is moved at an average speed of 50±5 mm/s to position –20cm and samples the 50 g/yr calibrated leak for 5 s. The recovery time was measured in Section 6.3.6. After exposing the leak detector to the 50 g/yr leak for 5 s, it is pulled away at an average speed of 50±5 mm/s to the 0 position and stopped for the recovery time.

6.4.5 If the leak detector is equipped with a manually activated zeroing function, it can be activated after the recovery time has elapsed.

6.4.6 Immediately at the end of the recovery time, the leak detector/mobile platform is set in motion at the "fast" average speed of 50±5 mm/s and traverses back and forth between the 0 position and the +20 cm position.

6.4.7 Each time the leak detector probe tip passes in front of the calibrated leak outlet, it is noted whether or not the leak detector registers a signal. Continue the test until a signal is registered five times in a row. Record the total time elapsed starting from when the leak detector was pulled away from the 50 g/yr leak (Section 6.4.4) until the leak detector registered

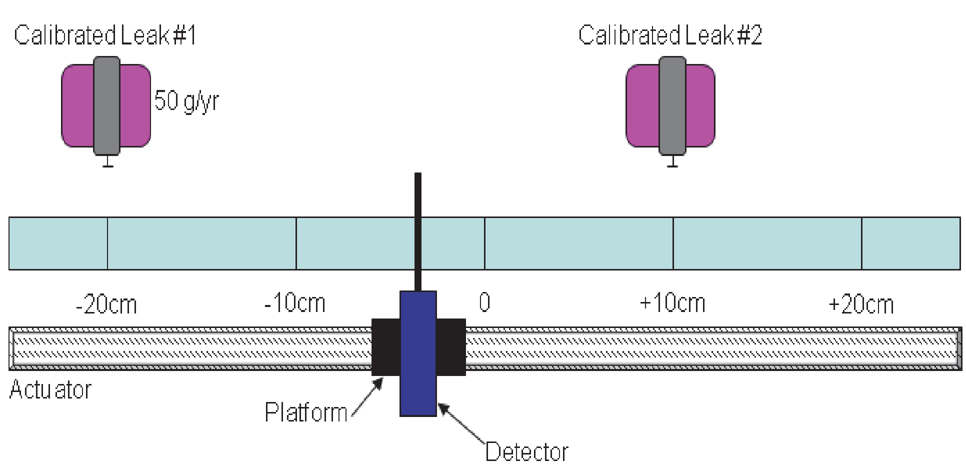

Figure 4 Test apparatus configured for Test Number 4.

the first of the five consecutive signals. This time is the sensitivity recovery time. If the leak detector has not registered five consecutive signals after 10 min, terminate the test, and record this result.

6.4.8 Power off the leak detector and repeat the steps in Sections 6.4.3 through 6.4.7 four additional times, and record the results.

A sample test report for Test Number 4 appears in Section 7.

6.5 Test Number 5—Sensitivity Threshold in an Elevated Background. When a leak detector is being used in the vicinity of a large leak, it can lose sensitivity due to the elevated background. This test will determine if the leak detector sensitivity is adversely affected by an elevated background.

6.5.1 The calibrated leak standard and the leak detector are placed in an enclosure filled with air contaminated with a uniform concentration of R-134a equal to 500±50 ppm(V) as shown in Figures 5 and 6. A "glove box" type enclosure is ideally suited for this purpose. A minimum clearance of 20 cm shall exist between the test apparatus and the front and rear walls of the enclosure. A minimum clearance of 10 cm shall exist between the test apparatus and the side walls of the enclosure, and a minimum 20 cm clearance shall exist between the top of the test apparatus and the top of the enclosure. The concentration of R-134a is elevated by injecting the proper quantity of refrigerant directly into the enclosure. A gastight injection syringe can be used, or a balloon filled with R-134a vapor can be punctured inside the enclosure. Other suitable methods can be used to inject the refrigerant.

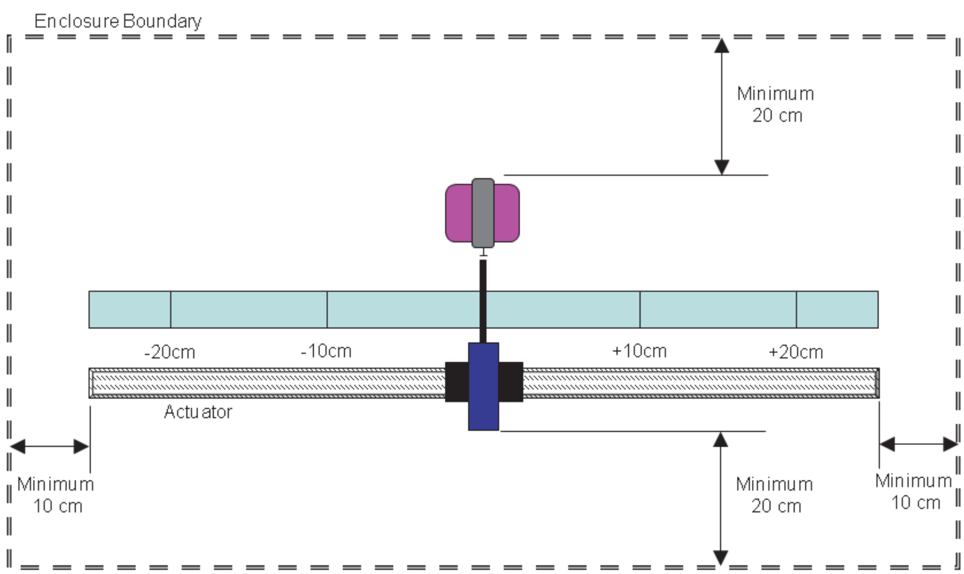

Figure 5 Test apparatus configured for Test Number 5, top view.

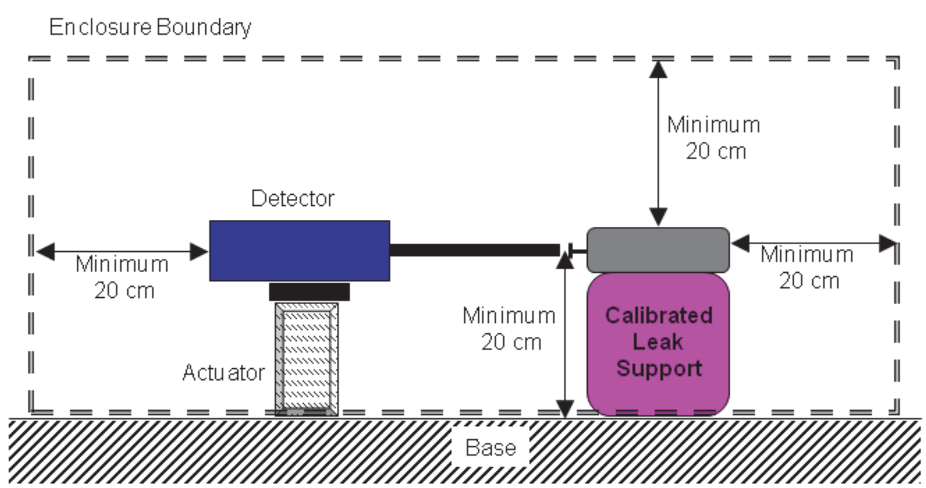

Figure 6 Test apparatus configured for Test Number 5, side view.

A fan (or other mixing device) is used to mix the refrigerant and air inside the enclosure to ensure a homogeneous mixture. A concentration-sensing device is to be placed inside the enclosure to verify that the background concentration is within the acceptable limits. The concentration sensor shall have an accuracy of ±10% (or less) at 500 ppm(V) as rated by the manufacturer. The fan (or other mixing device) is to be turned off for the test, as this test is to be conducted in still air. Another possible option to the configuration described above and depicted in Figures 5 and 6 is to have only the tip of the detector within the enclosure through an opening and the test apparatus outside the enclosure provided that the concentration inside the enclosure is maintained at 500 ppm(V) ±10% throughout the duration of the test.

6.5.2 The leak detector is turned on, allowed to warm up, and adjusted or zeroed according to the manufacturer's instructions.

6.5.3 Install the calibrated leak that flows at the minimum sensitivity threshold for the leak detector in the fast test as determined in Section 6.2.20 on the calibrated leak support positioned at the midpoint of travel as shown in Figure 5.

6.5.4 Repeat the setup and testing sequence as described in Sections 6.2.13 through 6.2.20 to determine the sensitivity threshold in an elevated background. During this testing, continue to monitor the background concentration to ensure it stays within the acceptable limits.

6.5.5 If the leak detector fails to register a signal during each of the 10 times that the probe tip passes in front of the calibrated leak outlet with the 50 g/yr leak installed on the calibrated leak support, the elevated background test is completed, and the minimum sensitivity threshold is greater than 50 g/yr and the results are recorded per Section 6.5.6.

6.5.6 Record the Test Results. A sample test report for Test Number 5 appears in Section 7.

7. PRESENTATION OF TEST RESULTS

The results of the testing are to be reported in a quantitative manner. The performance data is to be summarized as shown in the form below.

In addition, sample test report forms for each of the five tests are included in the Informative Annex. Detailed data such as that presented in the annex is to be made available to the manufacturer by the entity performing the tests.

Summary Data

Test Number 1—Sensitivity Threshold When the Leak Detector is Stationary

Minimum Sensitivity Threshold _________________ g/yr

(Detector sensing for 5 s at a distance of 1 mm from leak outlet.)

Test Number 2—Sensitivity Threshold When the Leak Detector is Moving

Slow Test Minimum Sensitivity Threshold ___________ g/yr

Slow Test Average Response Time _________________ s

(Detector moving at 3 mm/s at a distance of 3 mm from leak outlet.)

Fast Test Minimum Sensitivity Threshold ___________ g/yr

Fast Test Average Response Time _________________ s

(Detector moving at 50 mm/s at a distance of 3 mm from leak outlet.)

Test Number 3—Recovery Time Test

Leak Detector Recovery Time _________________ s

(Return to initial reading after sampling 50 g/yr for 5 s at a distance of 1 mm from leak outlet.)

Test Number 4—Sensitivity Threshold after Exposure to a Large Leak

Leak Detector Sensitivity Recovery Time _________________ s

(Detector moving at 50 mm/s after sampling 50 g/yr for 5 s at a distance of 1 mm from leak outlet.)

Test Number 5—Sensitivity Threshold in an Elevated Background

Minimum Sensitivity Threshold in an Elevated Background ________________ g/yr

(Detector in 500 ppm moving at 50 mm/s at a distance of 3 mm from leak outlet.)

(This annex 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 ANNEX: TEST REPORT FORMS—DETERMINATION OF THE PERFORMANCE OF HALOCARBON REFRIGERANT LEAK DETECTORS IN ACCORDANCE WITH ASHRAE STANDARD PROJECT COMMITTEE 173

Test Report For for Test Number 1—Sensitivity Threshold when the Leak Detector is Stationary

- Sampling the calibrated leak for a period of 5 s from a distance of 1 mm -

Detector Manufacturer ______________________________

Detector Model Number ______________________________

Detector Serial Number ______________________________

Testing with Nominal 1 g/yr Leak per Sections 6.1.2 through 6.1.8

Calibrated Leak Flow Rate ______________ g/yr

Calibrated Leak Serial No. ____________
Calibration Date ____________

Trial #1	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #2	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #3	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #4	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #5	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #6	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #7	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #8	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #9	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #10	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s

Testing with Larger Leak to Establish Minimum Sensitivity Threshold per Section 6.1.11 (if necessary)

Calibrated Leak Flow Rate ______________ g/yr

Calibrated Leak Serial No. ____________
Calibration Date ____________

Trial #1	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #2	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #3	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #4	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #5	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #6	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #7	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #8	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #9	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s
Trial #10	Maximum Signal ______________	Maximum Occurred at Time	1 s	2 s	3 s	4 s	5 s

Result:

Minimum Sensitivity Threshold ___________________ g/yr

Test Date ______________

Test Report for Test Number 2—Sensitivity Threshold When the Leak Detector is Moving

- Moving slow and close to the leak (3 mm/s at 3mm) and fast and close to the leak (50 mm/s at 3mm) -

Detector Manufacturer ____

Detector Model Number ____

Detector Serial Number ____

Slow Test with Nominal 1 g/yr Leak per Sections 6.2.3 through 6.2.8

Calibrated Leak Flow Rate ______________ g/yr

Calibrated Leak Serial No. ____________
Calibration Date ____________

	Signal Registered?		Response Time					
1st Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
2nd Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
3rd Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
4th Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
5th Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
6th Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
7th Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
8th Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
9th Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
10th Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________

Slow Test with Larger Leak to Establish Minimum Sensitivity Threshold per Section 6.2.10 (if necessary)

Calibrated Leak Flow Rate ______________ g/yr

Calibrated Leak Serial No. ____________
Calibration Date ____________

	Signal Registered?		Response Time					
1st Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
2nd Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
3rd Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
4th Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
5th Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
6th Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
7th Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
8th Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
9th Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________
10th Pass of Detector in Front of Leak	___ Yes	___ No	1 s	2 s	3 s	4 s	5 s	Other _________

Result:

Slow Test Minimum Sensitivity Threshold ___________________ g/yr

Average Response Time ___________________ s
(Detector moving at 3 mm/s at a distance of 3 mm from leak outlet.)

Test Date ______________

Test Report for Test Number 3—Recovery Time Test

- The time necessary to recover to the detector's initial reading after sampling a 50 g/yr leak for 5 s from 1 mm distance -

Detector Manufacturer ____

Detector Model Number ____

Detector Serial Number ____

Nominal 50 g/yr Calibrated Leak Data

Calibrated Leak Flow Rate _____________ g/yr

Calibrated Leak Serial No. ___________

Calibration Date ___________

Leak Detector Initial Signal ________________________ (per Section 6.3.4)

Trial #1—Leak Detector Recovery Time _______________s (per Section 6.3.6)

Trial #2—Leak Detector Recovery Time _______________s (per Section 6.3.6)

Trial #3—Leak Detector Recovery Time _______________s (per Section 6.3.6)

Trial #4—Leak Detector Recovery Time _______________s (per Section 6.3.6)

Trial #5—Leak Detector Recovery Time _______________s (per Section 6.3.6)

Result:

Leak Detector Recovery Time ________________ s

Report the result as the average of the times measured in the five trials.

Test Date _____________

Test Report for Test Number 4—Sensitivity Threshold After Exposure to a Large Leak

- Sample a 50 g/yr leak for 5 s from 1 mm distance and then check the sensitivity moving at 50 mm/s from 3 mm -

Detector Manufacturer ____
Detector Model Number ____
Detector Serial Number ____
Detector Recovery Time as Measured in Test Number 3: _______________ s

Nominal 50 g/yr Calibrated Leak Data (Calibrated Leak #1 in Figure 4)

Calibrated Leak Flow Rate ______________ g/yr

Calibrated Leak Serial No. ____________
Calibration Date ____________

Calibrated Leak Data used to Determine Fast Test Minimum Sensitivity Threshold as Measured in Test Number 2 (Calibrated Leak #2 in Figure 4)

Calibrated Leak Flow Rate ______________ g/yr

Calibrated Leak Serial No. ____________
Calibration Date ____________

Trial #1 Sensitivity Recovery Time ______________ s (per Section 6.4.7)
If the leak detector failed to register five consecutive signals after 10 min, record the value as "> 600" in the space above.

Trial #2 Sensitivity Recovery Time ______________ s (per Section 6.4.7)
If the leak detector failed to register five consecutive signals after 10 min, record the value as "> 600" in the space above.

Trial #3 Sensitivity Recovery Time ______________ s (per Section 6.4.7)
If the leak detector failed to register five consecutive signals after 10 min, record the value as "> 600" in the space above.

Trial #4 Sensitivity Recovery Time ______________ s (per Section 6.4.7)
If the leak detector failed to register five consecutive signals after 10 min, record the value as "> 600" in the space above.

Trial #5 Sensitivity Recovery Time ______________ s (per Section 6.4.7)
If the leak detector failed to register five consecutive signals after 10 min, record the value as "> 600" in the space above.

Result:

Leak Detector Sensitivity Recovery Time ___________________ s

If the leak detector failed to register five consecutive signals after 10 min in any of the five trials, the Leak Detector Sensitivity Recovery Time is to be reported as "> 600." Otherwise, report the result as the average of the times measured in the five trials.

Test Date ______________

Test Report for Test Number 5—Sensitivity Threshold in an Elevated Background

- In a 500 ppm background, determine the sensitivity threshold moving at 50 mm/s at a distance of 3 mm -

Detector Manufacturer ____

Detector Model Number ____

Detector Serial Number ____

Calibrated Leak Data used to Determine Fast Test Minimum Sensitivity Threshold as Measured in Test Number 2

Calibrated Leak Flow Rate ______________ g/yr Calibrated Leak Serial No. ____________

Measured Concentration at Start ______________ ppm Calibration Date ____________

1st Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
2nd Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
3rd Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
4th Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
5th Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
6th Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
7th Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
8th Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
9th Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
10th Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No

Measured Concentration at End __________________ ppm

Fast Test with Larger Leak to Establish Minimum Sensitivity Threshold in an Elevated Background per Section 6.5.4 (if necessary)

Calibrated Leak Flow Rate ______________ g/yr Calibrated Leak Serial No. ____________

Measured Concentration at Start ______________ ppm Calibration Date ____________

1st Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
2nd Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
3rd Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
4th Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
5th Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
6th Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
7th Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
8th Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
9th Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No
10th Pass of Leak Detector in Front of Calibrated Leak	Signal Registered?	______ Yes	______ No

Measured Concentration at End __________________ ppm

Result:

Minimum Sensitivity Threshold in an Elevated Background __________________ g/yr
(Detector moving at 50 mm/s at a distance of 3 mm from leak outlet.)

Test Date ______________

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

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.

About ASHRAE

ASHRAE, founded in 1894, is a global society advancing human well-being through sustainable technology for the built environment. The Society and its members focus on building systems, energy efficiency, indoor air quality, refrigeration, and sustainability. Through research, Standards writing, publishing, certification and continuing education, ASHRAE shapes tomorrow's built environment today.

For more information or to become a member of ASHRAE, visit www.ashrae.org.

To stay current with this and other ASHRAE Standards and Guidelines, visit www.ashrae.org/standards.

Visit the ASHRAE Bookstore

ASHRAE offers its Standards and Guidelines in print, as immediately downloadable PDFs, on CD-ROM, and via ASHRAE Digital Collections, which provides online access with automatic updates as well as historical versions of publications. Selected Standards and Guidelines are also offered in redline versions that indicate the changes made between the active Standard or Guideline and its previous version. For more information, visit the Standards and Guidelines section of the ASHRAE Bookstore at www.ashrae.org/bookstore.

IMPORTANT NOTICES ABOUT THIS STANDARD

To ensure that you have all of the approved addenda, errata, and interpretations for this Standard, visit www.ashrae.org/standards to download them free of charge.

Addenda, errata, and interpretations for ASHRAE Standards and Guidelines are no longer distributed with copies of the Standards and Guidelines. ASHRAE provides these addenda, errata, and interpretations only in electronic form to promote more sustainable use of resources.

Product code: 86761 1/16