Standard for the Design of High-Performance Green Buildings
Except Low-Rise Residential Buildings

The Complete Technical Content of the International Green Construction Code®

Approved by the ASHRAE Standards Committee on June 26, 2020; by the ASHRAE Board of Directors on July 1, 2020; by the International Code Council on June 1, 2020; by the U.S. Green Building Council on June 3, 2020; by the Illuminating Engineering Society on July 1, 2020; and by the American National Standards Institute on July 31, 2020.

These addenda were 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).

The latest edition of an ASHRAE Standard may be purchased on the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305, telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in the United States and Canada), or e-mail: orders@ashrae.org. For reprint permission, go to www.ashrae.org/permissions.

© 2020 ASHRAE
ISSN 1041-2336
ASHRAE STANDARDS COMMITTEE 2019–2020

Connor Barbaree, Senior Manager of Standards

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 Senior Manager of Standards of ASHRAE should be contacted for:
- interpretation of the contents of this Standard,
- participation in the next review of the Standard,
- offering constructive criticism for improving the Standard, or
- 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.
FOREWORD

Addendum m adds new provisions to enable right-sized tubing for efficient delivery of water through hot-water distribution systems. The new requirement balances health, energy, and plumbing code intents with energy and water efficiency strategies. The addendum is based in part on research by the California Energy Commission on the energy implications of hot-water supply. The volume of water in a pipe is the primary determinant of how long a user must wait for hot water to be delivered at a fixture. This has significant implications for both energy use to heat the water and the volume of water wasted before delivery. Similar provisions are currently included in the 2018 IECC (Section C404.5) and the 2015 IgCC (Section 702.8.)

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 m to Standard 189.1-2017

Modify Section 6 as shown (I-P and SI units).

6.3.3 Hot-Water Distribution. Hot-water distribution pipes shall be in accordance with Section 6.3.3.1 and Section 6.3.3.2.

6.3.3.1 Maximum Allowable Pipe Volume. The maximum volume of water in the pipes between the source of hot or tempered water and the fixtures shall be 64 oz (1.9 L) where the source of hot or tempered water is a water heater, and shall be 24 oz (0.71 L) where the source of hot or tempered water is a circulation loop pipe or an electrically heat-traced pipe. For the purpose of Section 6.3.3, the source of hot or tempered water shall be the point of connection to a water heater, heat-traced pipe, or a circulation loop.

The volume shall be the sum of the internal volumes of pipe, fittings, valves, meters, and manifolds between the source of hot or tempered water and the termination of the fixture supply pipe. The volume shall be determined using Table 6.3.3.1. The volume contained within fixture shutoff valves, flexible water supply connectors to a fixture fitting, or within a fixture fitting shall not be included in the water volume determination. Where the source of hot or tempered water is a circulation loop pipe or an electrically heat-traced pipe, the volume shall include the portion of the fitting on the source pipe that supplies water to the fixture. Where the type of pipe is unknown or not specifically included in the table, the generic pipe column shall be used to determine the volume.

Exception to 6.3.3.1: Public lavatory fixtures.
6.3.3.2 Maximum Length. The maximum pipe length from the source of hot or tempered water to the termination of the fixture supply pipe serving any plumbing fixture or appliance shall not exceed 50 ft (15 m) of developed length.

<table>
<thead>
<tr>
<th>Nominal Size, in. (Dimension Nominal [DN], mm)</th>
<th>Generic Pipe</th>
<th>Copper Type L</th>
<th>CPVC CTS SDR 11</th>
<th>PEX CTS SDR 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4 (8)</td>
<td>0.33 (0.03)</td>
<td>0.52 (0.05)</td>
<td>0.37 (0.04)</td>
<td>0.33 (0.03)</td>
</tr>
<tr>
<td>5/16 (9)</td>
<td>0.5 (0.05)</td>
<td>NA (NA)</td>
<td>NA (NA)</td>
<td>0.48 (0.05)</td>
</tr>
<tr>
<td>3/8 (10)</td>
<td>0.75 (0.07)</td>
<td>0.97 (0.09)</td>
<td>0.75 (0.07)</td>
<td>0.68 (0.07)</td>
</tr>
<tr>
<td>1/2 (15)</td>
<td>1.5 (0.15)</td>
<td>1.55 (0.15)</td>
<td>1.25 (0.12)</td>
<td>1.18 (0.11)</td>
</tr>
<tr>
<td>5/8 (18)</td>
<td>2 (0.19)</td>
<td>2.23 (0.22)</td>
<td>NA (NA)</td>
<td>1.78 (0.17)</td>
</tr>
<tr>
<td>3/4 (20)</td>
<td>3 (0.29)</td>
<td>3.22 (0.31)</td>
<td>2.67 (0.26)</td>
<td>2.35 (0.23)</td>
</tr>
<tr>
<td>1 (25)</td>
<td>5 (0.49)</td>
<td>5.47 (0.53)</td>
<td>4.43 (0.43)</td>
<td>3.91 (0.38)</td>
</tr>
<tr>
<td>1 1/4 (32)</td>
<td>8 (0.78)</td>
<td>8.36 (0.81)</td>
<td>6.61 (0.64)</td>
<td>5.81 (0.56)</td>
</tr>
<tr>
<td>1 1/2 (40)</td>
<td>11 (1.07)</td>
<td>11.83 (1.15)</td>
<td>9.22 (0.89)</td>
<td>8.09 (0.78)</td>
</tr>
<tr>
<td>2 (50)</td>
<td>18 (1.75)</td>
<td>20.58 (2.00)</td>
<td>15.79 (1.53)</td>
<td>13.86 (1.34)</td>
</tr>
</tbody>
</table>

NA = No value provided based on lack of availability of pipe in this size.
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.
Standard 189.1 and the International Green Construction Code

Standard 189.1 serves as the complete technical content of the International Green Construction Code® (IgCC). The IgCC creates a regulatory framework for new and existing buildings, establishing minimum green requirements for buildings and complementing voluntary rating systems. For more information, visit www.iccsafe.org.

About ASHRAE

Founded in 1894, ASHRAE is a global professional society committed to serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration, and their allied fields.

As an industry leader in research, standards writing, publishing, certification, and continuing education, ASHRAE and its members are dedicated to promoting a healthy and sustainable built environment for all, through strategic partnerships with organizations in the HVAC&R community and across related industries.

To stay current with this and other ASHRAE Standards and Guidelines, visit www.ashrae.org/standards, and connect on LinkedIn, Facebook, Twitter, and YouTube.

Visit the ASHRAE Bookstore

ASHRAE offers its Standards and Guidelines in print, as immediately downloadable PDFs, 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 edition. 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.