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 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.
ASHRAE STANDARDS COMMITTEE 2012–2013

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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:

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

ANSI/ASHRAE/IES Standard 90.1-2013,  

<table>
<thead>
<tr>
<th>SECTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td>2</td>
</tr>
<tr>
<td>1 Purpose</td>
<td>2</td>
</tr>
<tr>
<td>2 Scope</td>
<td>3</td>
</tr>
<tr>
<td>3 Definitions, Abbreviations, and Acronyms</td>
<td>3</td>
</tr>
<tr>
<td>4 Administration and Enforcement</td>
<td>22</td>
</tr>
<tr>
<td>5 Building Envelope</td>
<td>24</td>
</tr>
<tr>
<td>6 Heating, Ventilating, and Air Conditioning</td>
<td>41</td>
</tr>
<tr>
<td>7 Service Water Heating</td>
<td>82</td>
</tr>
<tr>
<td>8 Power</td>
<td>85</td>
</tr>
<tr>
<td>9 Lighting</td>
<td>87</td>
</tr>
<tr>
<td>10 Other Equipment</td>
<td>104</td>
</tr>
<tr>
<td>11 Energy Cost Budget Method</td>
<td>110</td>
</tr>
<tr>
<td>12 Normative References</td>
<td>120</td>
</tr>
<tr>
<td>Normative Appendix A—Rated R-Value of Insulation and Assembly U-Factor, C-Factor, and F-Factor Determinations</td>
<td>124</td>
</tr>
<tr>
<td>Normative Appendix B—Building Envelope Climate Criteria</td>
<td>163</td>
</tr>
<tr>
<td>Normative Appendix C—Methodology for Building Envelope Trade-Off Option in Section 5.6</td>
<td>185</td>
</tr>
<tr>
<td>Normative Appendix D—Climatic Data</td>
<td>189</td>
</tr>
<tr>
<td>Informative Appendix E—Informative References</td>
<td>241</td>
</tr>
<tr>
<td>Informative Appendix F—Addenda Description Information</td>
<td>243</td>
</tr>
<tr>
<td>Normative Appendix G—Performance Rating Method</td>
<td>254</td>
</tr>
</tbody>
</table>

**NOTE**

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE website 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 objections on informative material are not offered the right to appeal at ASHRAE or ANSI.)

FOREWORD

The original Standard 90.1 was published in 1975, and revised editions were published in 1980, 1989, and 1999 using the ANSI and ASHRAE periodic maintenance procedures. Based upon these procedures, the entire standard was publicly reviewed and published in its entirety each time. As energy prices and technology began changing more rapidly, the ASHRAE Board of Directors voted in 1999 to place the standard on continuous maintenance, permitting the standard to be updated several times each year through the publication of approved addenda to the standard. As of the 2001 edition, the standard is now published in its entirety in the fall of every third year. This schedule allows the standard to be submitted and proposed by the deadline for inclusion or reference in model building and energy codes. All approved addenda and errata are included in the new edition issued every three years. This procedure allows users to have some certainty of the timing of publication of new editions.

The 2013 edition of the standard includes numerous energy-saving measures resulting from continuous maintenance proposals from the public and from volunteers on the committee. The Project Committee welcomes suggestions for improvement, and users are encouraged to use the continuous maintenance proposal (CMP) form included in the back of this standard to submit recommended changes. The committee takes formal action on every CMP received.

More than 110 addenda were processed by the committee and approved by the ASHRAE and IES Boards of Directors and are included in this edition. This edition also corrects all known typographical errors in the 2010 standard. Appendix F gives brief descriptions and publication dates of the addenda to Standard 90.1-2010 that are incorporated into this new edition.

The most significant changes included are as follows:

a. Building Envelope. Opaque elements and fenestration requirements have been revised to increase stringency while maintaining a reasonable level of cost-effectiveness. Opaque and fenestration assemblies in Tables 5.5-1 through 5.5-8 are revised in most climates. These changes include:

1. criteria requiring double-glazed fenestration in many climates;
2. minimum VT/SHGC ratio to enable good daylighting with minimum solar gain, while not restricting triple and quadruple glazing; and
3. simplification of the daylighting criteria.

b. Lighting. These changes include improvements to daylighting and daylighting controls, space-by-space light-

ing power density limits, thresholds for toplighting, and revised controls requirements and format.

c. Mechanical. Equipment efficiencies were revised upward for heat pumps, packaged terminal air conditioners (PTAC), single-package vertical heat pumps and air conditioners (SPVHP and SPVAC), and evaporative condensers. Also, fan efficiency requirements were introduced for the first time. Additional provisions that have been included address commercial refrigeration equipment, improved controls on heat rejection and boiler equipment, requirements for expanded use of energy recovery, small motor efficiencies, and fan power control and credits. Control revision requirements were added to the standard, such as DDC controls in many applications. Finally, the 2013 edition completes the work that was begun on equipment efficiencies for chillers in the 2010 edition.

d. Energy Cost Budget (ECB) and Modeling. Improvements were made to the ECB and Appendix G provisions in the standard to clarify the use of the prescriptive provisions when performing building-energy-use modeling. In addition, these sections were revised to enhance capturing daylighting when performing the modeling calculations.

Another important change for the 2013 edition is the first alternate compliance path in Section 6. Section 6.6 was added to the 2010 edition to provide a location for alternate methods of compliance with the standard. The first such alternate path has been developed for computer room systems and was formulated with the assistance of the data center technical committee (TC9.9). This path uses the PUE (Power Usage Effectiveness) metric that was established by that industry. This alternate efficiency path format provides a framework that could be considered for other energy-using facets of buildings not easily covered in the prescriptive provisions of the standard. Also new to the standard are requirements for operating escalators and moving walkways at minimum speed, per ASME A17.1, when not conveying passengers.

Standard 90.1 is a fluid document. As technology evolves, the project committee is continually considering new changes and proposing addenda for public review. When addenda are approved, notices will be published on the ASHRAE and IES websites. Users are encouraged to sign up for the free ASHRAE and IES Internet listserv for this standard to receive notice of all public reviews and approved and published addenda and errata.

The Chair and Vice-Chairs extend grateful thanks to the committee volunteers, public review commenters, and all involved throughout the open, consensus-building process.

1. PURPOSE

To establish the minimum energy efficiency requirements of buildings other than low-rise residential buildings for

a. design, construction, and a plan for operation and maintenance; and
b. utilization of on-site, renewable energy resources.