

STANDARD

ANSI/ASHRAE/IES Standard 100-2018

(Supersedes ANSI/ASHRAE/IES Standard 100-2015)

Includes ANSI/ASHRAE/IES addenda listed in Annex N

Energy Efficiency in Existing Buildings

See Annex N for approval dates.

This Standard is under continuous maintenance 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. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE website (www.ashrae.org) or in paper form from the Senior Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

© 2018 ASHRAE

ISSN 1041-2336



Illuminating
ENGINEERING SOCIETY



ASHRAE Standing Standard Project Committee 100

Cognizant TC: 7.6, Building Energy Performance

SPLS Liaison: Larry Kouma (2017–2018)

SPLS Liaison: Keith I. Emerson (2015–2017)

IES Staff Liaison: Mark Lien

ASHRAE Staff Liaison: Ryan Shanley (2017–2018)

ASHRAE Staff Liaison: Mark Weber (2015–2017)

Wayne H. Stoppelmoor, Jr.*, *Chair*
Gordon V.R. Holness, *Vice-Chair* (2014–2017)
Glenn Friedman*, *Secretary*
Robert E. Chase
Joseph T. Firrantello*
Charles R. Foster, III
Michele Friedrich
Kyle W. Hasenkox*

Michael Jouaneh*
Jim M. Kelsey
Dennis R. Landsberg*
Toby K.W. Lau*
Neil P. Leslie*
Richard J. Liesen*
Jean T. Piecuch*
Steven Rosenstock*

Daniel G. Salinas*
Richard S. Sweetser
Adrienne G. Thomle*
Cedric S. Trueman*
Ayman Youssef*
Alexander M. Zhivov

* Denotes members of voting status when the document was approved for publication

This edition of Standard 100 is dedicated to the memory of Michele Friedrich for her devotion and commitment of many years to ASHRAE and to this standard, and to Jeff Park for his steadfast contribution to the previous edition of this standard.

ASHRAE STANDARDS COMMITTEE 2017–2018

Steven J. Emmerich, *Chair*
Donald M. Brundage, *Vice-Chair*
Niels Bidstrup
Michael D. Corbat
Drury B. Crawley
Julie M. Ferguson
Michael W. Gallagher
Walter T. Grondzik
Vinod P. Gupta
Susanna S. Hanson

Roger L. Hedrick
Rick M. Heiden
Jonathan Humble
Srinivas Katipamula
Kwang Woo Kim
Larry Kouma
Arsen K. Melikov
R. Lee Millies, Jr.
Karl L. Peterman
Erick A. Phelps

David Robin
Peter Simmonds
Dennis A. Stanke
Wayne H. Stoppelmoor, Jr.
Richard T. Swierczynna
Jack H. Zarour
Lawrence C. Markel, *BOD ExO*
M. Ginger Scoggins, *CO*

Steven C. Ferguson, *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.

CONTENTS

ANSI/ASHRAE/IES Standard 100-2018 Energy Efficiency in Existing Buildings

SECTION	PAGE
Foreword	2
1 Purpose	2
2 Scope	2
3 Definitions	2
4 Compliance Requirements	4
5 Energy Management Plan	6
6 Operations and Maintenance Requirements	8
7 Energy-Use Analysis and Target Requirements	9
8 Energy Audit Requirements	28
9 Implementation and Verification Requirements	30
10 Residential Buildings and Dwelling Units	30
11 References	34
Normative Annex A: Alternative Energy Intensity Targets	35
Informative Annex B: Timeline	52
Normative Annex C: Forms	54
Informative Annex D: Operations and Maintenance Requirements for Building Systems and Elements	62
Informative Annex E: Energy Efficiency Measures	68
Informative Annex F: Standard 100 Compliance Flow Chart	75
Informative Annex G: Climate Zones	76
Informative Annex H: Simple Payback and Life-Cycle Cost Analysis	77
Informative Annex I: Building Energy Modeling	78
Informative Annex J: Derivation of Energy Intensity Targets for Standard 100	79
Informative Annex K: Fuel Heat Content Conversion Values—"Other" Fuels	93
Normative Annex L: Operations and Maintenance Implementation	95
Informative Annex M: Guidance on Building Type Definitions	97
Informative Annex N: Addenda Description Information	100

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.

© 2018 ASHRAE

1791 Tullie Circle NE · Atlanta, GA 30329 · www.ashrae.org · All rights reserved.

ASHRAE is a registered trademark of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
ANSI is a registered trademark of the American National Standards Institute.

(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

With the publication of the 2015 edition, Standard 100 was placed on continuous maintenance, which allowed it to be revised periodically via approved addenda. This 2018 edition of the standard includes the following changes:

- The Purpose of the standard more clearly indicates the overall goal, which is to reduce energy use in existing buildings while recognizing the importance of both energy efficiency and actual performance.
- Normative primary energy EUI target tables are provided in Sections 7 and 10 and in Normative Annex A, along with a primary energy EUI calculation option in Annex A, to add an alternative compliance path for the qualified person seeking compliance with the standard.
- Energy audit requirements for buildings without energy targets are clarified by qualifying when a Level 1 audit can be used to comply with the standard.
- New Informative Annex M provides additional guidance on selecting the appropriate building type.

1. PURPOSE

1.1 This standard provides criteria that will result in reduced energy consumption through improved energy efficiency and performance in existing buildings.

1.2 This standard is directed toward providing procedures and programs essential to energy efficient operation, maintenance, management, and monitoring; increasing the energy efficiency of the energy-using systems and components; and upgrading the thermal performance of the building envelope.

2. SCOPE

This standard applies to existing buildings, portions of buildings, and building complexes, including the envelope and all systems in the building. This standard excludes industrial and agricultural processes in buildings for which the energy targets do not include those processes.

3. DEFINITIONS

3.1 General. Certain terms, abbreviations, and acronyms are defined in this section for the purposes of this standard. These definitions are applicable to all sections of this standard.

Terms that are not defined herein, but that are defined in standards that are referenced herein, shall have the meanings as defined in those standards.

Other terms that are not defined shall have their ordinarily accepted meanings within the context in which they are used. Ordinarily accepted meanings shall be based on American Standard English language use, as documented in an

unabridged dictionary accepted by the authority having jurisdiction.

analog control: a control loop in which data is expressed or measured by means of one or more physical properties that can express any value along a continuous scale. All types of control systems may provide analog control.

authority having jurisdiction (AHJ): the agency or agent responsible for enforcing this standard.

baseline: the first-year energy-use intensity for the building at the beginning of the compliance determination process.

binary control: a control loop in which there are only two states, such as on-off or open-closed.

building: a structure, including mobile homes, manufactured homes, and other factory-built buildings, wholly or partially enclosed within exterior walls, or within exterior and party walls, and a roof, that affords shelter to persons, animals, or property.

building manager: the person responsible for maintaining the building, its envelope, and its energy-using systems. The building manager may also be the person responsible for expending funds on capital improvements to the building.

building operator: the person or persons who have responsibility to inspect, operate, and maintain the building systems and components that fall within the scope of this standard. The building operator may be an employee of the building owner, the building manager, or a contractor.

building owner: the holder of the property title for the building and/or the land upon which the building sits.

capital management plan: a financial plan to set aside capital to replace or upgrade building systems at the end of their useful life and/or to improve performance and energy efficiency.

complex: a group of individual or interconnected buildings on contiguous property.

conditional compliance: a compliance level between the completion of implementation in Section 9.1 and verification of compliance in Section 9.2. Conditional compliance expires 15 months following the completion of implementation.

conditioned space: a space that is provided with heating and/or cooling capable of maintaining the temperature of the space between 50°F (10°C) and 86°F (30°C)

crawl spaces: a shallow, unfinished space beneath the first floor or under the roof of a building.

daylight harvesting: the automatic control of electric light levels in response to the amount of daylight in the space.

daylight hours: the period from 30 minutes after sunrise to 30 minutes before sunset.

dimmer: a device that varies the current through an electric light in order to control its level of illumination and energy usage.

direct digital control (DDC): a control system consisting of microprocessor-based controllers that monitor and control building systems equipment through input devices (such as