

CONTENTS
ANSI/ASHRAE/IES Standard 90.2-2018
Energy-Efficient Design of Low-Rise Residential Buildings

SECTION	PAGE
Foreword	2
1 Purpose	3
2 Scope	3
3 Definitions, Abbreviations, and Acronyms.....	3
4 Administration and Enforcement	6
5 Additions and Alterations	7
6 Performance Requirements	8
7 Requirements.....	8
8 Verification	15
9 Reporting Requirements	16
10 Normative References	18
Normative Appendix A: Software Requirements	20
Normative Appendix B: Modeling Rule Set	21
Normative Appendix C: Air Leakage Testing	23
Normative Appendix D: Installation Requirements.....	24
Informative Appendix E: Procedures for Generating Prescriptive Paths.....	25
Informative Appendix F: Example of NAECA Prescriptive Path.....	27
Informative Appendix G: Ducts in Conditioned Space	29
Informative Appendix H: Step-by-Step Approach for Calculating Lighting Energy Using the Performance Path.....	33
Informative Appendix I: Plan Review Inspection Checklist.....	34
Informative Appendix J: Site Inspection Checklist.....	35
Informative Appendix K: Framing Factors	37
Annex 1: Reference Standard Reproduction Annex—ASHRAE Standard 169	38

NOTE

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

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FOREWORD

This 2018 revision of ASHRAE Standard 90.2 presents a completely new approach to delivered residential building energy performance. This new leadership standard seeks to deliver residential building energy performance that is at least 50% more efficient than the energy efficiency defined by the 2006 IECC. Key to accomplishing this objective is delivery of an accurate, flexible, performance-based tool to enable user creativity in meeting performance objectives. Cost effectiveness was a critical consideration during the standard's development. Changes from the 2007 edition include the following:

- **Definitions.** Numerous clarifications were made to existing definitions, and new definitions were added that are essential to proper performance modeling, energy analyses, and use of the standard.
- **Administration and Enforcement.** Clarifications were added regarding which elements of the standard apply to new construction as well as to additions and alterations. Requirements for additions and alterations were moved in to a new Section 5. Guidance is provided on the use of international climate data from Standard 169 when employing this standard in climates outside of the U.S.
- **Envelope.** Clarifications were added to prescriptive tables of envelope performance data that are to be used when including on-site power generation (Section 6) and for compliance modeling (Section 7). These clarifications address mass wall requirements in warm, humid climates. Clarifications were also added to the requirements for heated slabs.
- **Mechanical.** Performance specifications for ground-source heat pumps were added. Clarifications were added regarding the use of referenced HVAC sizing and equipment selection standards, required air leakage and systems performance testing, and assurance of indoor environmental quality.
- **Lighting.** Clarification was added that addresses the minimum lighting efficiency provisions for single-family, large single-family, and multifamily homes. Clarification was added to address lighting schedules and controls for all occupancies covered under the standard.
- **Other Systems.** Clarifications were added regarding pool heater pilot lights and pump motor efficiency and addressing roof and gutter de-icing systems.
- **Verification.** Clarification was added regarding compliance verification authority in locations outside of the U.S. Additional guidance is provided regarding verification of envelope airtightness, mechanical ventilation in single-family and multifamily structures, and on-site power systems.

- **Compliance Reporting.** Section 9.1 was revised to emphasize key building data and reports necessary for compliance determination. These reports include energy modeling, load calculations, on-site power systems performance, envelope, mechanical, lighting and water systems components, and appliance loads.
- **Software Requirements.** Because energy modeling is a key component of compliance with this performance-based standard, requirements for modeling software are highly prioritized. The standard seeks to encourage software providers to develop and deliver software that has accurate, repeatable, and comparable results. Additional clarifications to software requirements were added.
- **Modeling Rules.** Clarifications were added to address lighting modeling requirements.
- **Air Leakage Testing.** Clarifications were added to address multizonal building air-leakage testing procedures.
- **Material and Systems Installation.** A new normative appendix was added that addresses proper installation techniques for critical components of buildings that provide thermal resistance. Proper installation of insulation and air barrier systems is addressed.

Background

The 2018 revision began with an ASHRAE Standards Advisory Panel (SAP) that developed a set of recommendations to create a new Standard 90.2. The goal was to develop a version of the standard that was fundamentally different and better than previous versions, and different from other codes and performance modeling tools currently in use. The SSPC used the recommendations of the SAP as their starting point.

Performance-based energy calculation tools have long been elements of building code compliance and beyond-code programs. However, these building energy modeling tools are often varied and inconsistent in their default assumptions, modeling rule sets, and calculation approaches.

To address these concerns, the SSPC developed detailed rules governing the energy modeling, analysis, and verification necessary to determine compliance with the performance objectives of this revised standard. The rule-set is based on ANSI/ICC/RESNET 301, with a few specific technical modifications that address ceiling area, fenestration solar heat gain, adjustments for building size, and lighting requirements.

More importantly, this revised standard provides a mechanism by which any residential building design can be evaluated against these performance objectives. By establishing a clearly defined rule set for energy performance modeling, users such as designers and home builders can easily assess various designs, material options, orientations, and other variables to evaluate predicted energy performance. This analytical flexibility also enables users such as utilities and beyond-code program developers to have a reliable and repeatable tool for helping to establish program targets and ensure program compliance.

While this standard focuses on performance as the primary objective, it also includes some system-level minimum pre-

scriptive provisions. These prescriptive provisions are provided to enable compliance and protect against analytical gaming.

Another key difference in the structure of this performance-based Standard is that it allows users to develop multiple prescriptions—recipes of construction, systems, and equipment—that will deliver the targeted performance. As such, states, utility programs, product manufacturers, and others may seek to assemble prescriptive solutions to assist builders with locally focused, performance-based compliance options.

This standard was developed with a keen understanding of federal minimum equipment standards and the need to deliver at least one prescriptive option that uses this minimum-efficiency equipment. One federal minimum equipment option is shown in an informative appendix. While informative, this appendix is written in normative language to assist users that seek a prescriptive compliance path based on minimum equipment efficiencies.

Because this new standard is performance based and focuses on whole-building energy performance, the full array of new building envelope, HVAC, lighting and, equipment technologies can be evaluated to meet the performance target.

The standard recognizes that certain elements of residential buildings have different life cycles. Some building product and energy performance decisions last 100 years while others last 10 to 15. The rule set in the standard provides some protection against inequitable trading of items that have dramatically different life expectancies.

Key additional features include the following:

- **Scope.** The scope of the standard was revised to cover manufactured housing, which was omitted from the 2007 version. It also now addresses renewable and nonrenewable forms of energy.
- **Building Envelope.** The standard recognizes that long-lived building envelope decisions play a critical role in achieving targeted building performance. Certified performance of insulation, fenestration, and envelope air sealing are prioritized. Testing and verification of envelope air leakage is mandatory. The standard addresses several problems not previously addressed by existing residential performance techniques. One major difference is the adjustment of building modeling techniques to address energy use implications of building size.
- **Mechanical Systems.** The standard recognizes HVAC and water-heating system performance as essential to achieving overall building performance targets. Proper sizing and verification of duct system performance and the location of all ductwork within the conditioned space are fundamental to these objectives. Plumbing system design, insulation levels, and controls are prioritized. Requirements for HVAC system design, installation, commissioning, and verification are integral to the standard.
- **Lighting Systems.** The standard builds on many recent cost-effective and life-extending advances in lighting technology, from lamps to control systems, to help deliver even greater levels of lighting energy savings than are required by current minimum code. Key improvements include revised modeling rules for quantifying residential lighting

energy; credits for the use of vacancy sensors, dimmers, and other control devices; and revised lighting allowances for interior, exterior, garage, and other residential lighting.

- **On-Site Power Systems.** The standard recognizes the important role of renewable energy and on-site power systems to help reach the building performance targets. It emphasizes load minimization and HVAC performance strategies first so that any on-site power systems used can have maximum impact toward the overall building performance goals.

1. PURPOSE

The purpose of this standard is to establish the minimum whole-building energy performance requirements for energy efficient residential buildings.

2. SCOPE

This standard provides the minimum design, construction, and verification requirements for new residential buildings and their systems and new portions of existing residential buildings and their systems that use renewable and nonrenewable forms of energy.

2.1 Buildings and Portions of Buildings Covered

- a. One- and two-family dwelling units
- b. Multifamily structures of three stories or fewer above grade
- c. Outbuildings

2.2 Systems Covered

- a. Building envelope
- b. HVAC and mechanical systems
- c. Service hot-water systems
- d. Major appliances
- e. Lighting systems
- f. Snow and ice melt systems
- g. Pools and spas

2.3 Exemptions. This standard does not apply to the following:

- a. Specific procedures for the operation, maintenance, and use of residential buildings
- b. Transient housing, such as hotels, motels, nursing homes, jails, dormitories, and barracks

2.4 Health, Safety, and Welfare. This standard shall not be used to abridge any safety, health, or environmental requirements.

3. DEFINITIONS, ABBREVIATIONS, AND ACRONYMS

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 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 usage as documented in an unabridged dictionary accepted by the authority having jurisdiction (AHJ).