Standard 90.2: The Path to Performance

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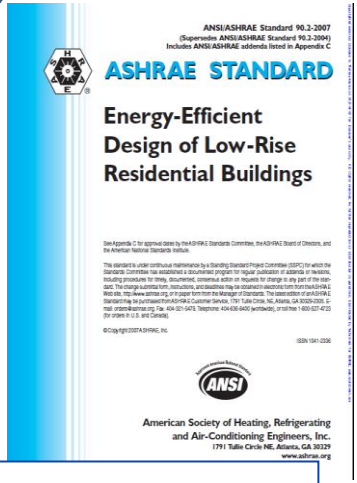
90.2 2007 Energy-Efficient Design of Low-Rise Residential Buildings

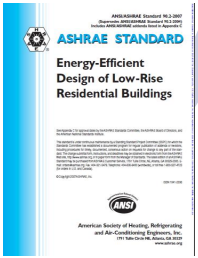
1. Purpose
2. Scope
3. Definitions, Abbreviations, and Acronyms
4. Compliance
5. Building Envelope Requirements
6. Heating, Ventilating and Air-Conditioning (HVAC) Systems and Equipment
7. Service Water Heating
8. Annual Energy Cost Method
9. Climatic Data
10. Normative References

- Normative Appendix A: Envelope Performance Path Trade-Off Method
- Informative Appendix B: Informative References
- Informative Appendix C: Addenda Description Information



4. COMPLIANCE

4.1 General. This standard provides different methods by which compliance can be determined for low-rise residential buildings—prescriptive or performance path methods (Sections 5, 6, and 7) or an annual energy cost method (Section 8).



May 2011 Advisory
Public Review

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Standards
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Recommendations

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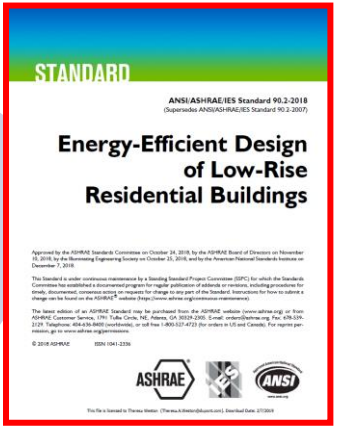


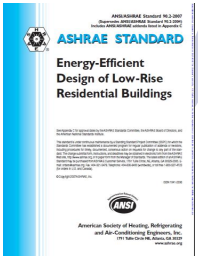
Dec 2018
Publication

Standard 90.2 Standards Advisory Panel Report to Technology Council
November 16, 2011

"The recommendations by the 90.2 SAP are based on the following guiding principle: At the low end, 90.2 could simply echo the IECC minimum energy efficiency levels. This is of questionable value and does not address the concern of the lack of relevancy of 90.2 in the industry. At the high end, 90.2 could become a higher performance residential building standard similar to ASHRAE Standard 189.1 (which addresses broader aspects of sustainability). In part due to the need of organizations like DOE and NFPA to have a "minimum" energy efficiency standard suitable for code adoption, this was perceived as too far of a stretch for 90.2. Therefore, 90.2 should be in between these two degrees. This entails defining the "minimum" energy efficiency as more stringent than the IECC minimums, expanding the focus to include the energy aspects of providing comfort and indoor environmental quality, and striving to take appropriate steps toward the long-term (in the 2030 time frame) goals of higher performance and net-zero or near zero energy buildings."

Standards Advisory Panel Recommendations

1. International leadership standard
2. On the path of supporting the ASHRAE Board of Directors vision for net zero or near zero energy buildings (NZEB) by 2030 → current revision 50% improvement relative to a 2006 IECC baseline
3. Address the energy aspects related to indoor environmental quality including comfort, moisture control, and indoor air quality
4. Should not generally address the broad subject of sustainability.
5. Consider the energy aspects of meeting residential water needs
6. Incorporate requirements that use cost effectiveness as a significant criterion
7. Incorporate appropriate field performance metrics to measure compliance during construction
8. Easy to use and easy to enforce
9. Evaluate an alternate compliance path that considers the application of energy use intensity (EUI) as the energy criteria
10. Evaluate the inclusion of plug and process loads
11. Evaluate the use of renewable energy alternatives



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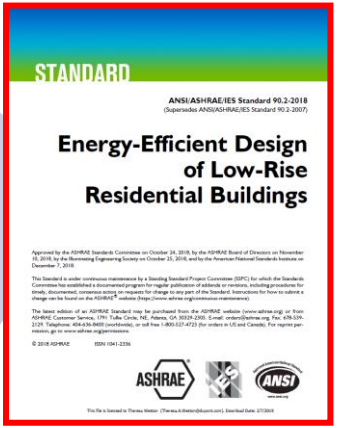

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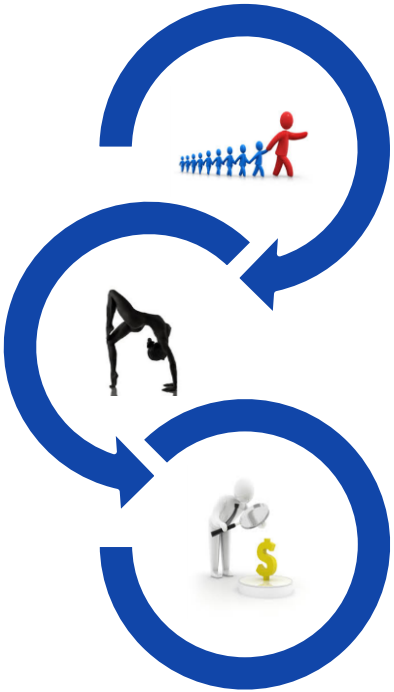

STANDARD

ANSI/ASHRAE/IES Standard 90.2-2018
(Supersedes ANSI/ASHRAE/IES Standard 90.2-2007)

Energy-Efficient Design of Low-Rise Residential Buildings

Approved by the ASHRAE Standards Committee on October 24, 2018, by the ASHRAE Board of Directors on November 10, 2018, by the Illuminating Engineering Society on October 25, 2018, and by the American National Standards Institute on December 7, 2018.

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. Instructions for how to submit a change can be found on the ASHRAE® website (https://www.ashrae.org/continuous-maintenance).

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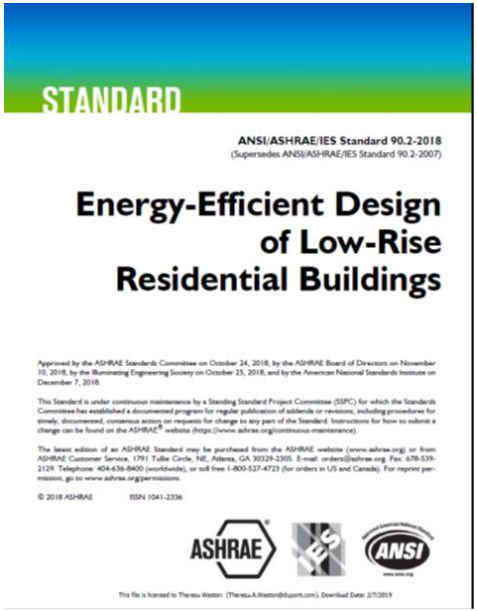

- Purpose
- Scope
- Definitions, Abbreviations, and Acronyms
- Administration and Enforcement
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- Performance Requirements
- Requirements
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- Reporting Requirements
- Normative References
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- Annex 1: Reference Standard Reproduction Annex—ASHRAE Standard 169

90.2-2018 Energy-Efficient Design of Low-Rise Residential Buildings

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

Manufactured Housing no longer exempted

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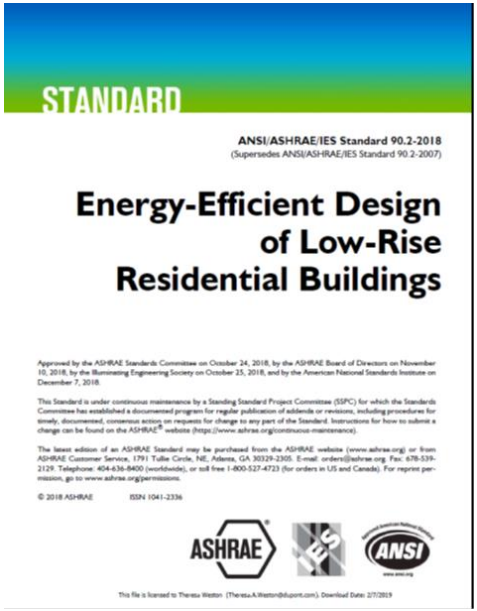

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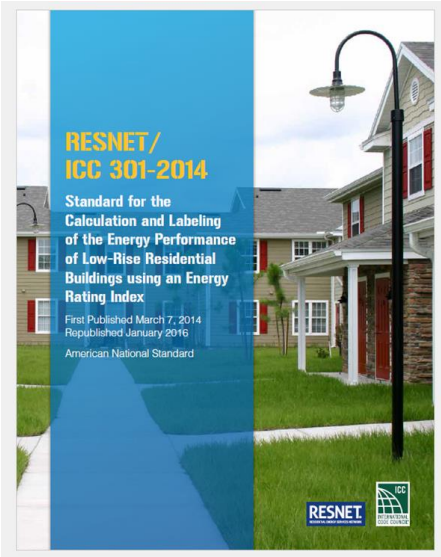
90.2-2018 Energy-Efficient Design of Low-Rise Residential Buildings

- Residential building energy performance that is at least 50% more efficient than the energy efficiency defined by the 2006 IECC.
- Performance based on ERI:
  - ANSI/RESNET/ICC Standard 301-2014, with Addenda A-2015 & Addenda E-2018 modified by requirements included in Normative Appendices A and B.



90.2-2018 Energy-Efficient Design of Low-Rise Residential Buildings

- *This Standard recognizes the important role of renewable energy and on-site power systems to help achieve 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.*
  - *When on-site power production is used to meet the ERI requirements there are building thermal envelope and envelope air leakage backstops.*

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Climate Zone	90.2 Energy Rating Index - - Proposed	2015 IECC	2018 IECC
0	43	--	--
1	43	52	57
2	45	52	57
3	47	51	57
4	47	54	62
5	47	55	61
6	46	54	61
7	46	53	58
8	45	53	58

90.2-2018 Energy-Efficient Design of Low-Rise Residential Buildings

Flexibility & Customization provided by the generating prescriptive paths

- Informative Appendix E: Procedures for Generating Prescriptive Paths
- Informative Appendix F: Example of NAECA Prescriptive Path

90.2-2018 Energy-Efficient Design of Low-Rise Residential Buildings

- **Building Envelope**
  - **Minimum building thermal envelope and air leakage performance**
  - **Verification of installation**
  - **Verified air leakage**

- Normative Appendix C: Air Leakage Testing
  - ASTM E779-10 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
  - ASTM E1827-2011 Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
  - ANSI/RESNET/ICC 380-2016 Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems, including Addendum A-2018
- Normative Appendix D: Installation Requirements

90.2-2018 Energy-Efficient Design of Low-Rise Residential Buildings

- **Mechanical Systems**
  - **Proper sizing and verification of duct system performance,**
  - **All ductwork within conditioned space (buried duct allowance)**
  - **Requirements for HVAC system design, installation, commissioning and verification.**

- ANSI/RESNET/ICC 380-2016 Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems, including Addendum A-2018ANSI/ACCA 5 QI-2015 HVAC Quality Installation Specification
- ANSI/ACCA 9 QIVP-2016 HVAC Quality Installation Verification Protocols
- ANSI/ACCA 1 Manual D-2016 Residential Duct Systems
- ANSI/ACCA 2 Manual J-2016 ACCA Manual J, HVAC Residential Load Calculations, 8th Edition
- ANSI/ACCA 3 Manual S-2014 ACCA Manual S, Residential Heating and Cooling Equipment Selection
- ANSI/ACCA 11 Manual Zr-2012 Residential Zoning 2012

90.2-2018 Energy-Efficient Design of Low-Rise Residential Buildings

- **Plumbing system design, insulation levels and controls**
  - 7.4.3.1 Design. The piping system shall be designed and installed to minimize pipe lengths from the water heater to discharge points. Pipe diameters shall be the minimum size that meets the fixture load in accordance with the applicable plumbing code.
  - 8.5.1 Water heating systems shall be verified to match the proposed design and to be installed according to manufacturer instructions.

Table 7-3 Maximum Branch Length (I-P)

Nominal Pipe Size, in.	Volume, fl oz/ft of length	Maximum Pipe Length, ft
1/4[a]	0.33	48
5/16[b]	0.5	32
3/8[c]	0.75	21
½	1.5	11
5/8	2	8
3/4	3	5
7/8	4	4
1	5	3
1-1/4	8	2
1-1/2	11	1
2 or larger	18	1

a. The flow rate through 1/4 in. piping shall not exceed 0.5 gpm.
b. The flow rate through 5/16 in. piping shall not exceed 1.5 gpm.
c. The flow rate through 3/8 in. piping shall not exceed 1 gpm.

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- **7.3 Indoor Environmental Quality**
  - 7.3.1 Buildings shall be thermally conditioned in accordance with ANSI/ASHRAE Standard 55.
  - 7.3.2 Dwelling units shall be mechanically ventilated in accordance with ANSI/ASHRAE Standard 62.2. Common spaces of multifamily residential buildings shall be mechanically ventilated in accordance with ANSI/ASHRAE Standard 62.1.
  - 7.3.3 Buildings shall be illuminated in accordance with Section 7.5.

90.2-2018 Energy-Efficient Design of Low-Rise Residential Buildings

- **Lighting systems –**
  - Revised modeling rules for quantifying residential lighting energy,
  - Credits for the use of vacancy sensors, dimmers and other control devices
  - Revised lighting allowances for interior, exterior, garage and other residential lighting.

Standards Advisory Panel Recommendations

- ✓ International leadership standard
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- ✓ Address the energy aspects related to indoor environmental quality including comfort, moisture control, and indoor air quality
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Thank you for your attention.