



## ANSI/ASHRAE/IES Standard 90.1-2016: Overview

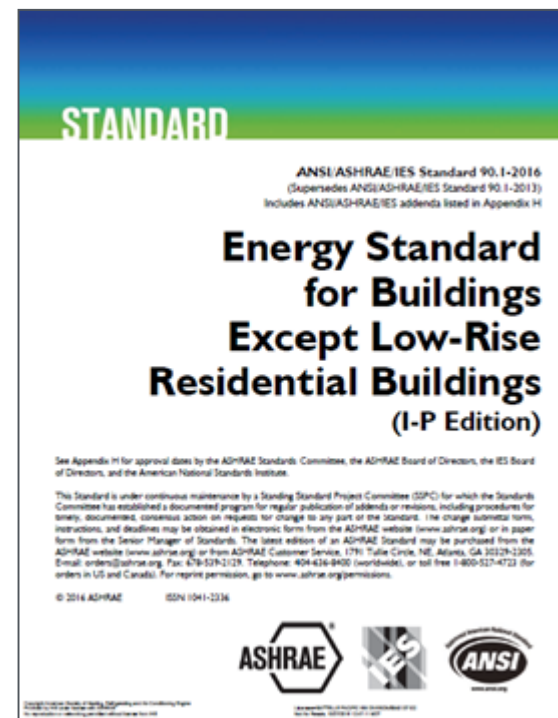
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Department of Energy

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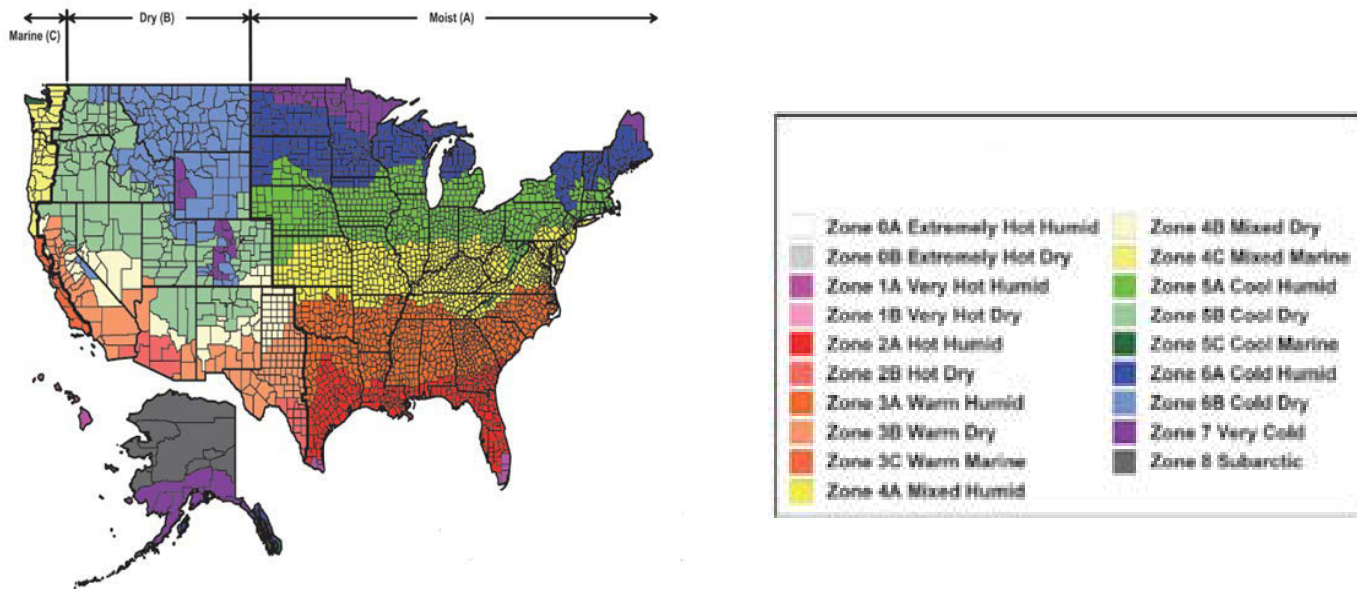
# Structure of Standard 90.1-2016

- 1 Purpose
- 2 Scope
- 3 Definitions, Abbreviations, and Acronyms
- 4 Administration and Enforcement
- 5 Building Envelope
- 6 Heating, Ventilating, and Air Conditioning
- 7 Service Water Heating
- 8 Power
- 9 Lighting
- 10 Other Equipment
- 11 Energy Cost Budget Method
- 12 Normative References
- Normative Appendices A-H



# Summary of Changes

- Total of 121 addenda
- Major format changes for ease of use
- New climate maps aligning with ASHRAE Standard 169



- New performance-based compliance path
- Significant whole building energy savings

## Defined terms normal font

| TABLE 6.4.3.4.3 Maximum Damper Leakage, cfm per ft <sup>2</sup> at 1.0 in. wc |                            |           |                            |           |
|---|----------------------------|-----------|----------------------------|-----------|
| Climate Zone  | Ventilation Air Intake     |           | Exhaust/Relief             |           |
|   | Non-motorized <sup>a</sup> | Motorized | Non-motorized <sup>a</sup> | Motorized |
| 1, 2  | —                          | —         | —                          | —         |
| Any height  | 20                         | 4         | 20                         | 4         |
| 3   | —                          | —         | —                          | —         |
| Any height  | 20                         | 10        | 20                         | 10        |
| 4, 5b, 5c   | —                          | —         | —                          | —         |
| Fewer than three stories  | NA                         | 10        | 20                         | 10        |
| Three or more stories   | NA                         | 10        | NA                         | 10        |
| 5a, 6, 7, 8   | —                          | —         | —                          | —         |
| Fewer than three stories  | NA                         | 4         | 20                         | 4         |
| Three or more stories   | NA                         | 4         | NA                         | 4         |

1. Back draft gravity (nonmotorized) dampers are acceptable for exhaust and relief in buildings less than three stories in height and for ventilation air intakes and exhaust and relief dampers in buildings of any height located in Climate Zones 1, 2, and 3. Back draft dampers for ventilation air intakes must be protected from direct exposure to wind.
2. Back draft gravity (nonmotorized) dampers are acceptable in systems with a design outdoor air intake or exhaust capacity of 300 cfm or less.
3. Dampers are not required in ventilation or exhaust systems serving unconditioned spaces.
4. Dampers are not required in exhaust systems serving Type I kitchen exhaust hoods.

## Defined terms italicized

| Climate Zone             | Ventilation Air Intake |           | Exhaust/Relief |           |
|--------------------------|------------------------|-----------|----------------|-----------|
|                          | NormmotORIZED*         | MotORIZED | NormmotORIZED* | MotORIZED |
| 3, 1, 2                  |                        |           |                |           |
| Any height               | 20                     | 4         | 20             | 4         |
| 3                        |                        |           |                |           |
| Any height               | 20                     | 10        | 20             | 10        |
| 4, 5B, 5C                |                        |           |                |           |
| Fewer than three stories | NA                     | 10        | 20             | 10        |
| Three or more stories    | NA                     | 10        | NA             | 10        |
| 5A, 6, 7, 8              |                        |           |                |           |
| Fewer than three stories | NA                     | 4         | 20             | 4         |
| Three or more stories    | NA                     | 4         | NA             | 4         |

# Section 2 – Scope

## 2.1 – 2.4

- Applies to:
  - New *buildings* and their *systems*
  - New portions of *buildings* and their *systems*
  - New *systems* and *equipment* in *existing buildings*, and
  - New *equipment* or *building systems* specifically identified in the standard that are part of industrial or manufacturing processes
  - Criteria for determining compliance with requirements
- Does not apply to:
  - Single-family houses, low-rise multi-family  $\leq 3$  stories above *grade*, manufactured houses (mobile or modular)
  - *Buildings* that use neither electricity nor *fossil* fuel
- Certain other buildings or elements may be exempt
- Does not circumvent any safety, health, or environmental requirements



### General (*Section 4.1*)

- Scope
  - New *Buildings*
  - Additions to *Existing Buildings*
  - *Alterations* to *Existing Buildings*
  - Replacement of Portions of *Existing Buildings*
  - Changes in *Space Conditioning*
- Administrative Requirements
- Alternative Materials, Methods of Construction, or Design
- Validity
- Other Laws
- Reference Standards
- Normative Appendices
- Informative Appendices
- Reference Standard Reproduction Annexes

### Compliance Paths and Documentation (*Section 4.2*)

# Compliance Paths

## Building System

## Compliance Options

Envelope

HVAC

SWH

Power

Lighting

Other

**Mandatory Provisions**  
(required for all compliance options)

**Prescriptive Option**

**Trade Off Option**

**Energy Cost Budget**

**Performance Rating Method**

**Energy Code Compliance**



## Compliance Paths for 2016

1. Prescriptive
2. Energy Cost Budget
- 3. Appendix G (New)**

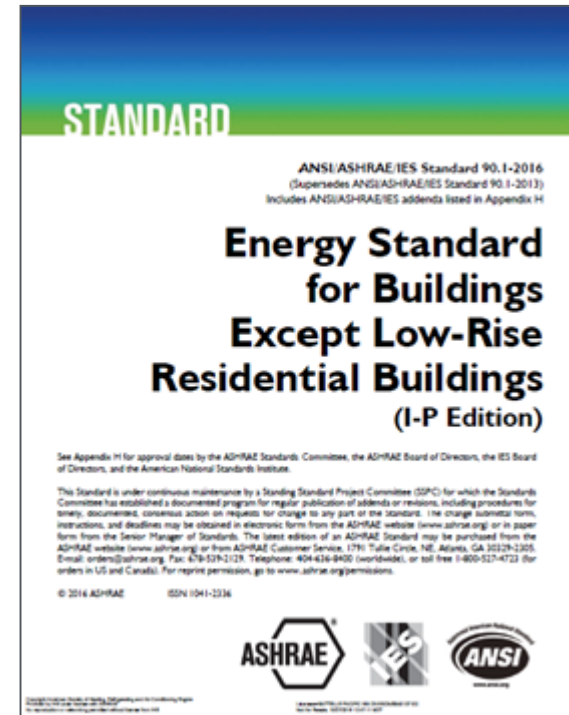
### 4.2 Compliance

#### 4.2.1 Compliance Paths

##### 4.2.1.1 New Buildings

New buildings shall comply with either the provisions of

- a. Section 5, “Building Envelope”; Section 6, Heating, Ventilating, and Air Conditioning”; Section 7, “Service Water Heating”; Section 8, “Power”; Section 9, “Lighting”; and Section 10, “Other Equipment,” or
- b. Section 11, “Energy Cost Budget Method,” or
- c. Appendix G, “Performance Rating Method.”**

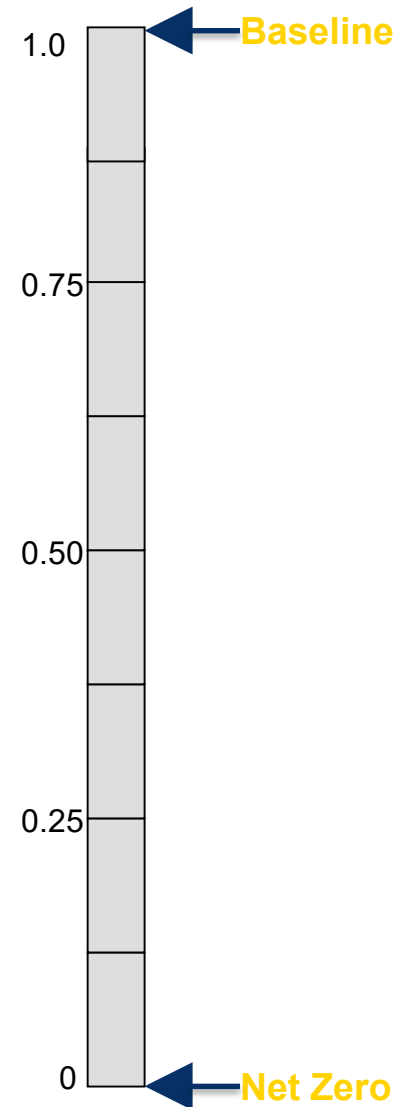


# Compliance Path

- Requires a Performance Cost Index (PCI) specific to building type and climate zone

$$PCI = \frac{\text{Proposed Building Performance}}{\text{Baseline Building Performance}}$$

- PCI of 1.0 = baseline building
- PCI of 0.0 = zero net energy
- For compliance,  $PCI < PCI_t$
- $PCI_t$  specified in Standard, and varies by building type, climate zone, and proportion of regulated to unregulated load



- Building type and climate zone adjustment by Building Performance Factor

Table 4.2.1.1 *Building Performance Factor (BPF)*

| Building Area Type <sup>a</sup> | Climate Zone |           |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|---------------------------------|--------------|-----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|                                 | 0A and 1A    | 0B and 1B | 2A   | 2B   | 3A   | 3B   | 3C   | 4A   | 4B   | 4C   | 5A   | 5B   | 5C   | 6A   | 6B   | 7    | 8    |
| Multifamily                     | 0.73         | 0.73      | 0.71 | 0.69 | 0.74 | 0.73 | 0.68 | 0.78 | 0.81 | 0.81 | 0.76 | 0.80 | 0.81 | 0.76 | 0.79 | 0.74 | 0.80 |
| Healthcare/hospital             | 0.64         | 0.56      | 0.60 | 0.56 | 0.60 | 0.56 | 0.54 | 0.57 | 0.53 | 0.55 | 0.59 | 0.52 | 0.55 | 0.57 | 0.52 | 0.56 | 0.56 |
| Hotel/motel                     | 0.64         | 0.65      | 0.62 | 0.60 | 0.63 | 0.65 | 0.64 | 0.62 | 0.64 | 0.62 | 0.60 | 0.61 | 0.60 | 0.59 | 0.61 | 0.57 | 0.58 |
| Office                          | 0.58         | 0.62      | 0.57 | 0.62 | 0.60 | 0.64 | 0.54 | 0.58 | 0.60 | 0.58 | 0.60 | 0.61 | 0.58 | 0.61 | 0.61 | 0.57 | 0.61 |
| Restaurant                      | 0.62         | 0.62      | 0.58 | 0.61 | 0.60 | 0.60 | 0.61 | 0.58 | 0.55 | 0.60 | 0.62 | 0.58 | 0.60 | 0.63 | 0.60 | 0.65 | 0.68 |
| Retail                          | 0.52         | 0.58      | 0.53 | 0.58 | 0.54 | 0.62 | 0.60 | 0.55 | 0.60 | 0.60 | 0.55 | 0.59 | 0.61 | 0.55 | 0.58 | 0.53 | 0.53 |
| School                          | 0.46         | 0.53      | 0.47 | 0.53 | 0.49 | 0.52 | 0.50 | 0.49 | 0.50 | 0.49 | 0.50 | 0.50 | 0.50 | 0.49 | 0.50 | 0.47 | 0.51 |
| Warehouse                       | 0.51         | 0.52      | 0.56 | 0.58 | 0.57 | 0.59 | 0.63 | 0.58 | 0.60 | 0.63 | 0.60 | 0.61 | 0.65 | 0.66 | 0.66 | 0.67 | 0.67 |
| All others                      | 0.62         | 0.61      | 0.55 | 0.57 | 0.56 | 0.61 | 0.59 | 0.58 | 0.57 | 0.61 | 0.57 | 0.57 | 0.61 | 0.56 | 0.56 | 0.53 | 0.52 |

Slide decks are also available detailing the Envelope, HVAC, and Power and Lighting requirements of Standard 90.1-2016, accessible at

<https://www.energycodes.gov/training>