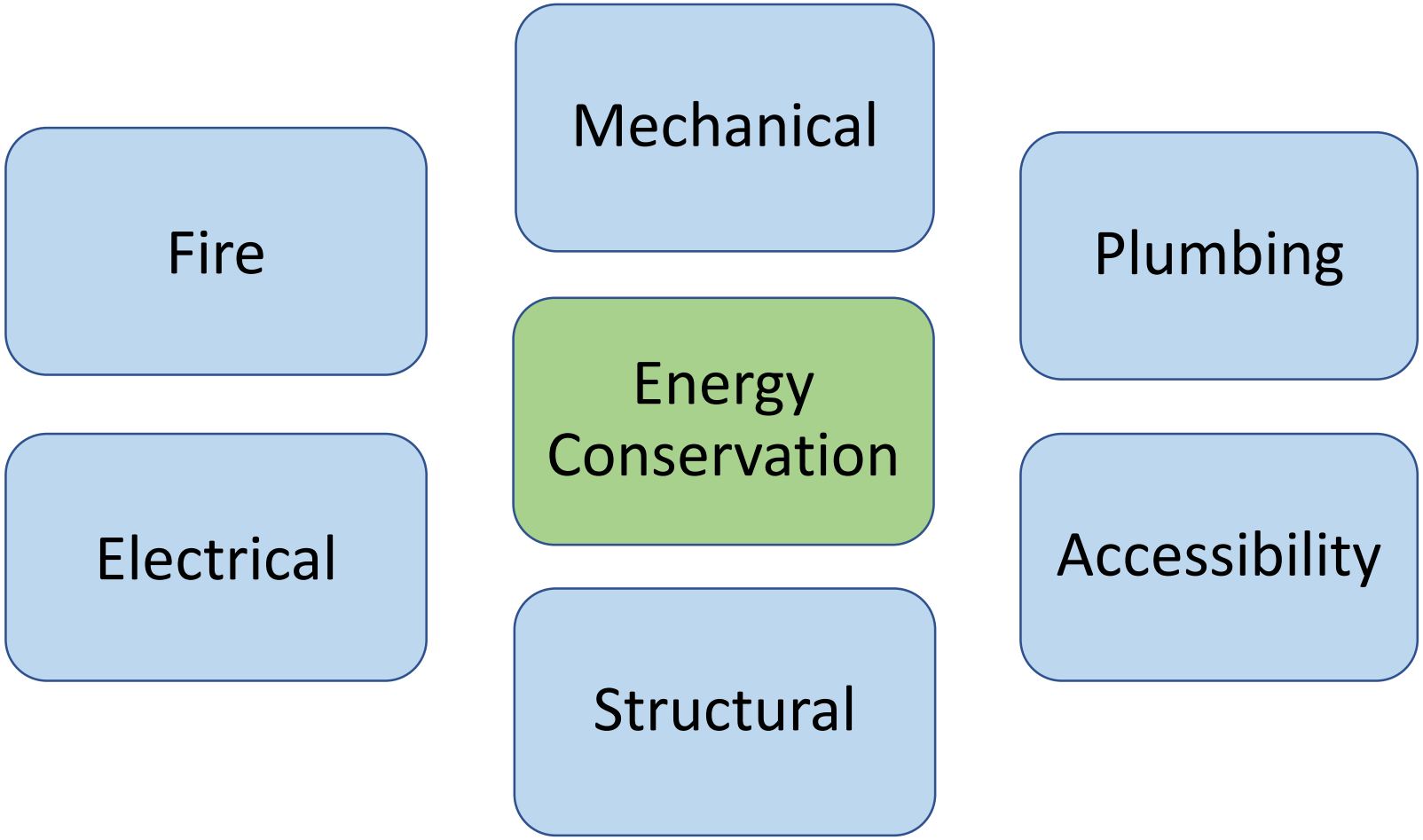
An introduction to energy codes

Energy conservation code:
One of many codes & standards



Codes & standards to make buildings safe, healthy & accessible:

- Fire
- Mechanical
- Plumbing
- Electrical
- Structural
- Zoning
- Accessibility
- More…

Codes & standards to save energy and money:

Energy Conservation

What are (building) energy (conservation) codes?

- The Energy Code establishes minimum requirements for design and construction of energy efficient buildings.
- The Energy Code is not intended to prevent the installation of any material or to prohibit any design or method of construction.

Energy codes and standards apply to residential and commercial buildings

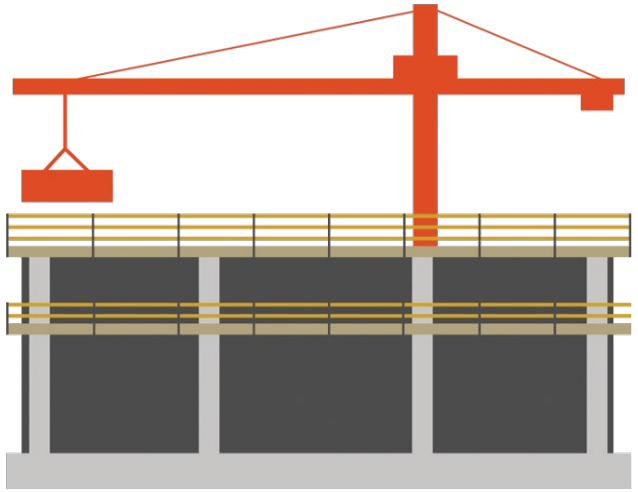
Residential

- A detached 1-2 family dwelling
- Multi-family housing 3 stories or less (some codes differ)

Commercial

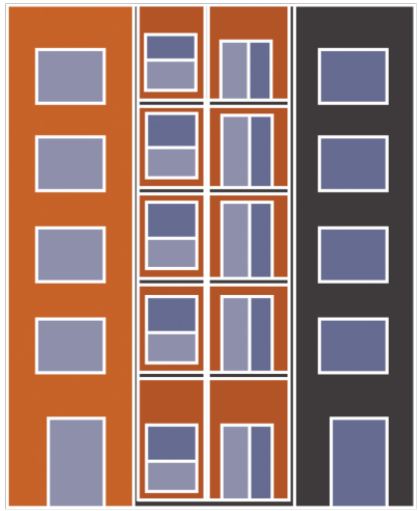
- Any commercial or public sector building
- Multi-family housing units 4 stories or higher (some codes differ)

Energy codes & standards apply to both new and existing buildings



New Buildings

- Anything requiring a permit



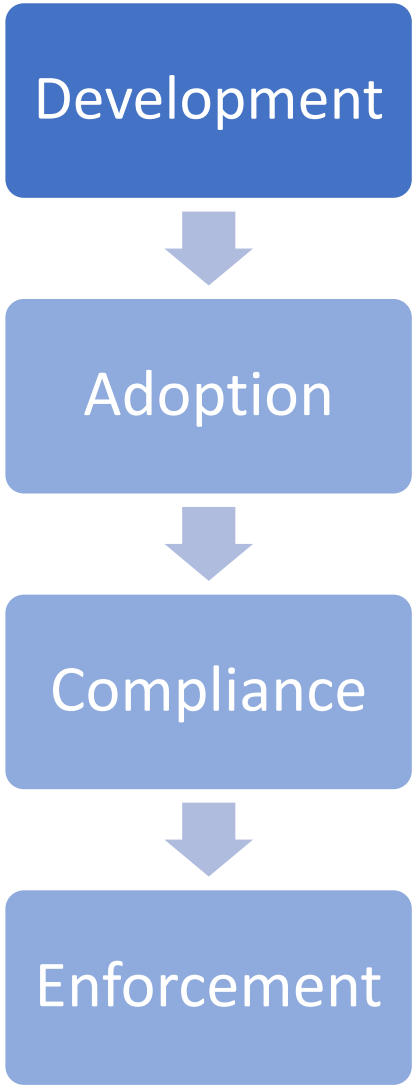
Existing Buildings

- Any additions, alterations requiring a permit

Energy codes & standards make allowances for different climate zones that impact buildings

versus

Energy code development



- Model Energy Codes & Standards are typically developed by a few national organizations

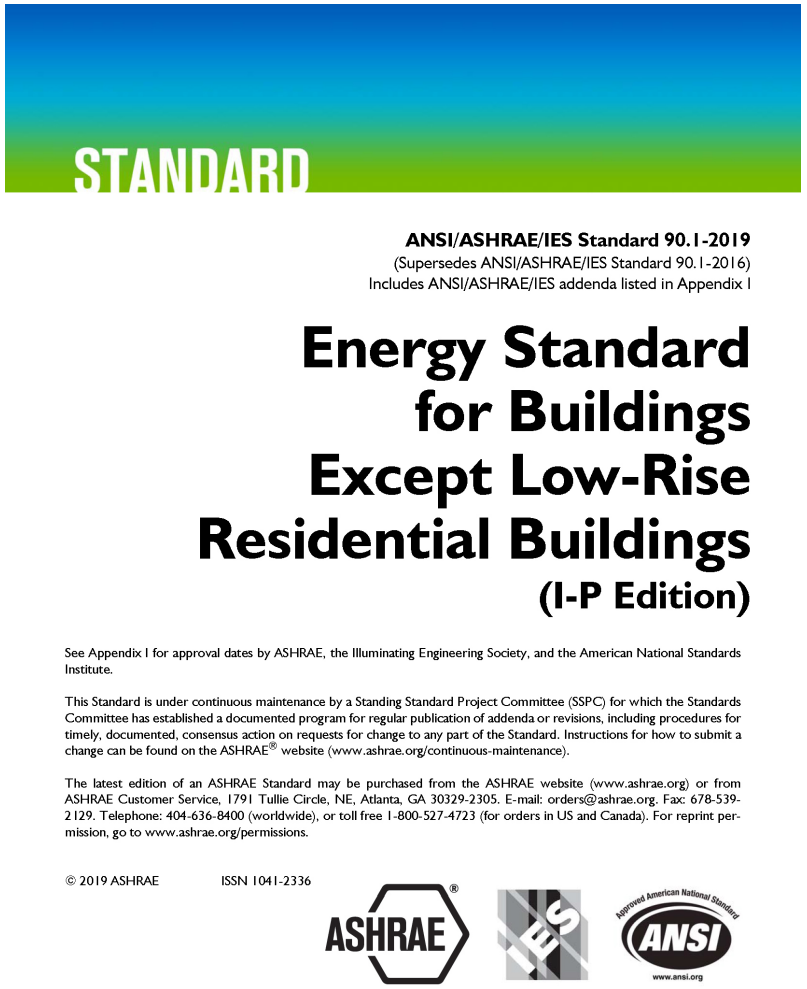
Example of model energy code

The International Energy Conservation Code (IECC) is published by the International Code Council (ICC)

Contains both Residential and Commercial provisions

New version is updated every 3 years (ex. 2015, 2018, 2021…)

Example of model energy standard



STANDARD

ANSI/ASHRAE/IES Standard 90.1-2019
(Supersedes ANSI/ASHRAE/IES Standard 90.1-2016)
Includes ANSI/ASHRAE/IES addenda listed in Appendix I

Energy Standard for Buildings Except Low-Rise Residential Buildings
(I-P Edition)

See Appendix I for approval dates by ASHRAE, the Illuminating Engineering Society, and the American National Standards Institute.

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 (www.ashrae.org/continuous-maintenance).

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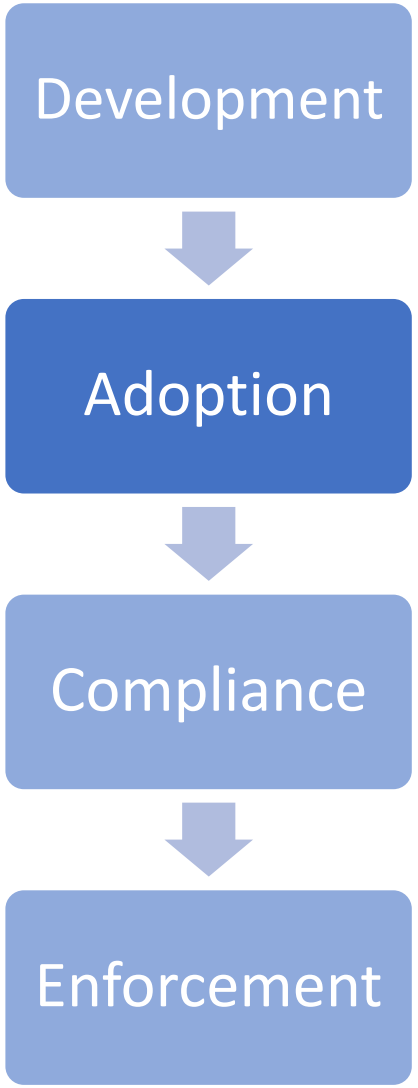
ANSI/ASHRAE/IES Standard 90.1 Energy Standard for Buildings Except for Low-Rise Residential Buildings (ASHRAE 90.1) published by ASHRAE, IES & ANSI

Contains only Commercial provisions

New version is updated every 3 years (ex. 2016, 2019, 2022…)

Energy code adoption



- Energy Codes are adopted at the state and local government level.
- Some jurisdictions adopt the model energy code as is.
- Some jurisdictions adopt the model energy code with amendments

Examples of energy codes with amendments

CHAPTER 1 [CE]
SCOPE AND ADMINSTRATION

SECTION C101
SCOPE AND GENERAL REQUIREMENTS

C101.1 Title. This code shall be known as the ~~*International Energy Conservation Code* of **[NAME OF JURISDICTION]** and shall be cited as such.~~ *Illinois Energy Conservation Code* or "this Code" and shall mean:

With respect to the State facilities covered by 71 Ill. Adm. Code 600.Subpart B:

This Part, all additional requirements incorporated within Subpart B (including the 2018 International Energy Conservation Code, including all published errata but excluding published supplements that encompass ASHRAE 90.1-2016), and any statutorily authorized adaptations to the incorporated standards adopted by CDB are effective July 1, 2019.

With respect to the privately funded commercial facilities covered by 71 Ill. Adm. Code 600.Subpart C:

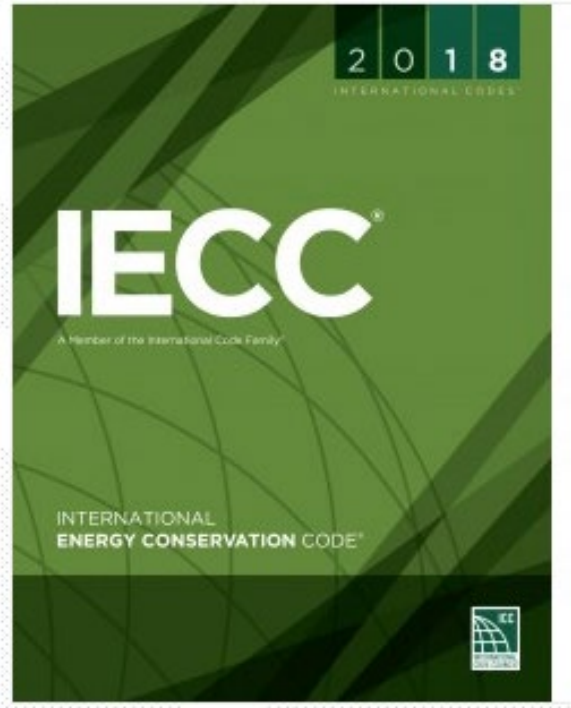
This Part, all additional requirements incorporated within Subpart C (including the 2018 International Energy Conservation

C101.1.3 Adaptation. The Board may appropriately adapt the International Energy Conservation Code to apply to the particular economy, population, distribution, geography and climate of the Sate and construction within the State, consistent with the public policy objectives of the EEB Act.

C101.5 Compliance. ~~*Residential buildings* shall meet the provisions of IECC – Residential Provisions.~~ *Commercial buildings* shall meet the provisions of ~~IECC Commercial Provisions~~ the *Illinois Energy Conservation Code* covered by 71 Ill. Adm. Code 600.Subpart C. The local authority having jurisdiction (AHJ) shall establish its own procedures for enforcement of the Illinois Energy Conservation Code. Minimum compliance shall be demonstrated by submission of:

1. Compliance forms published in the ASHRAE 90.1 User's Manual; or
2. Compliance Certificates generated by the U.S. Department of Energy's COMcheck™ Code compliance tool; or
3. Other comparable compliance materials that meet or exceed, as determined by the AHJ, the compliance forms published in the ASHRAE 90.1 User's Manual or the U.S. Department of Energy's COMcheck™ Code compliance tool; or

The current (as of 2021) Illinois Energy Code is based on 2018 IECC with Illinois Amendments.



Examples of energy codes with amendments

The 2006 Energy Conservation Code of the State of Hawaii shall be deleted in its entirety and replaced by the 2015 International Energy Conservation Code with the proposed amendments.

AMENDMENTS TO THE 2015+ ICC *INTERNATIONAL ENERGY CONSERVATION CODE*

§3-181-6 Title. IECC section 101.1 is amended to read as follows:

"**101.1 Title.** This code shall be known as the [~~International~~] Energy Conservation Code of the State of Hawaii, and shall be cited as such. It is referred to herein as "this code"." [Eff] (Auth: HRS §107-29) (Imp: HRS §§107-24, 107-25)

Reason:

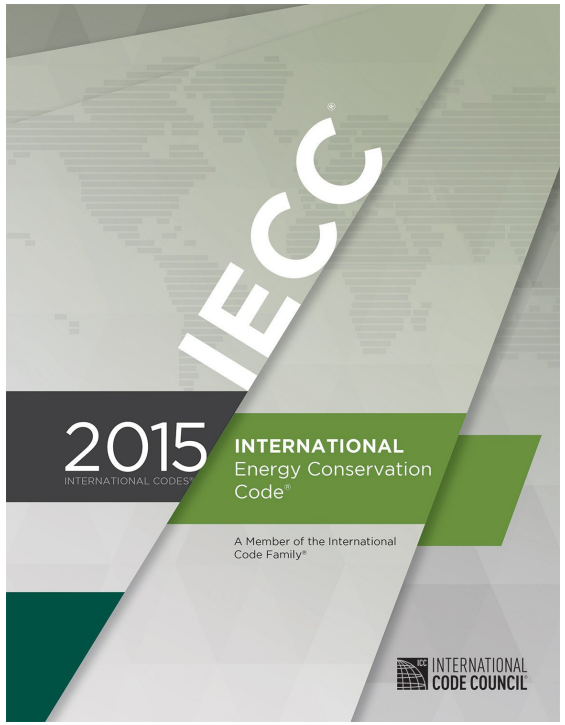
Standard administrative code language.

§3-181-7 General. IECC section C103.1 is deleted in its entirety and replaced with the following:

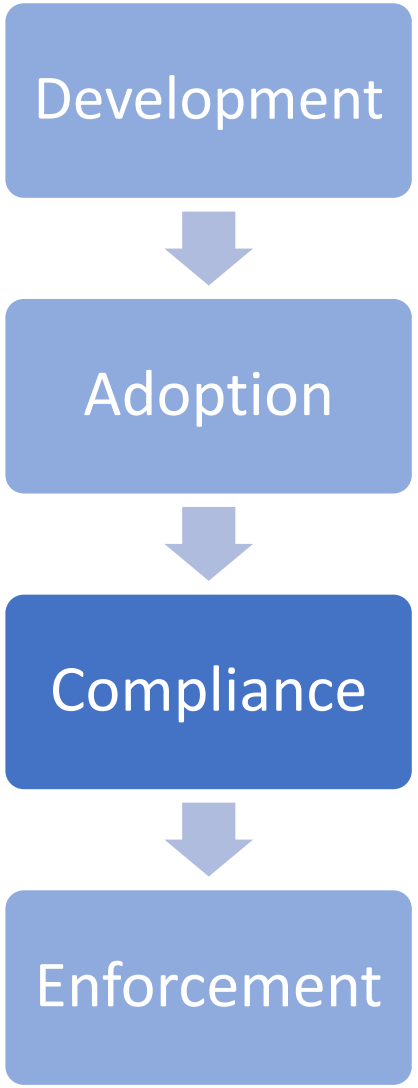
"**103.1 General.** When the requirements in this code apply to a building as specified in Section C101.4, plans, specifications or other construction documents submitted for a building, electrical or plumbing permit required by the jurisdiction shall comply with this code and shall be prepared, designed, approved and observed by a design professional. The responsible design professional shall provide on the plans a signed statement certifying that the project is in compliance with this code.

Exception: Any building, electrical or plumbing work that is not required to be prepared, designed, approved or observed by a licensed professional architect or engineer pursuant to chapter 464 Hawaii Revised Statutes." [Eff] (Auth: HRS §107-29) (Imp: HRS §§107-24, 107-25)

The current (as of 2021) Hawaii Energy Code is based on 2015 IECC with Hawaii Amendments.



Energy code compliance

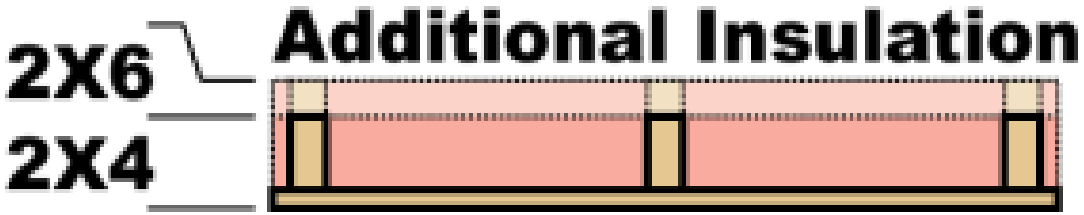


- Building design and construction professionals are required to comply with the energy code.

Energy codes affect design & construction

- Wall, floor, ceiling
- Doors, windows
- Heating, ventilating & cooling systems and equipment
- Lighting systems & equipment
- Water-heating systems & equipment

How energy codes affect design & construction: Envelope (walls)



- **Example:** Home builders may use 2 x 6 studs instead of 2 x 4 for walls so higher levels of insulation can be installed to meet the energy code.

How energy codes affect design & construction: HVAC

- Energy codes provide criteria for size and efficiency of HVAC system & equipment

How energy codes affect design & construction: Lighting

- Energy codes provide criteria to support efficient lighting and controls

How energy codes affect design & construction: Hot water

Energy codes provide criteria to efficiently heat and deliver hot water

Design, construction professionals must demonstrate energy code compliance

REScheck Software Version 4.6.5

Compliance Certificate

Project

Energy Code:	**2015 IECC**
Location:	**Moorestown, New Jersey**
Construction Type:	**Single-family**
Project Type:	**New Construction**
Conditioned Floor Area:	**2,503 ft2**
Glazing Area	**17%**
Climate Zone:	**4 (5010 HDD)**
Permit Date:	
Permit Number:	

Construction Site:

Owner/Agent:
Buildy Builderson

Designer/Contractor:
Builder's Building Plans

Compliance: Passes using UA trade-off

Compliance: **4.5% Better Than Code** Maximum UA: **529** Your UA: **505** Maximum SHGC: **0.40** Your SHGC: **0.25**

The % Better or Worse Than Code Index reflects how close to compliance the house is based on code trade-off rules.
It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

Envelope Assemblies

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	U-Factor	UA
Ceiling area of home forming top of insulation envelope: Flat Ceiling or Scissor Truss	2,352	38.0	0.0	0.030	71
Wall area of home forming sides of insulation envelope: Wood Frame, 16" o.c.	631	19.0	0.0	0.060	9
Window area of home using energy efficient units: Vinyl/Fiberglass Frame:Double Pane with Low-E SHGC: 0.25	367			0.290	106

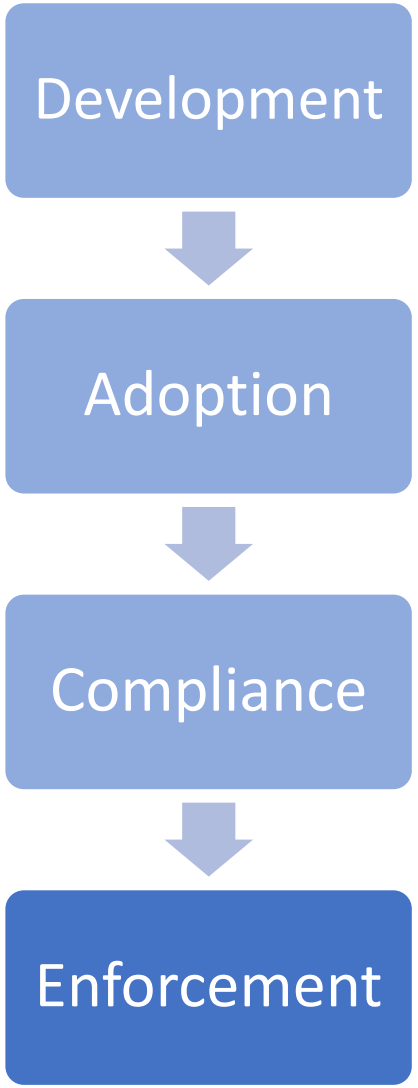
Software developed by DOE is widely used by design professionals (architects and engineers) to prove energy code compliance

U.S. DEPARTMENT OF ENERGY

REScheck™ — Residential Buildings

COMcheck™ — Commercial Buildings

Energy code enforcement



Building code officials enforce building codes, including the energy code

Code officials

- Review design plans
- Inspect construction work
- Issue building & occupancy permits