

# Cracking the Code: An Update on Iowa's Building Requirements



**David Ruffcorn, AIA, Construction/Energy Engineer, Iowa Department of Public Safety—Building Code Bureau for the State of Iowa**

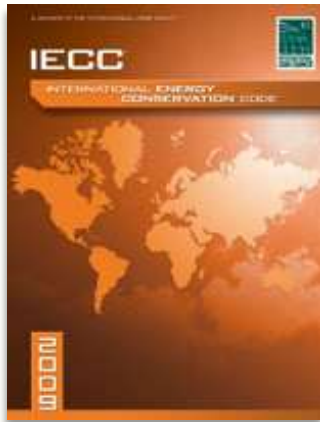
*Dave Ruffcorn is a life-long Iowa resident that has worked as an architect and energy code official after graduating from Iowa State University. Dave holds a Professional Bachelor of Architecture degree, an Iowa Architectural registration, and a NCARB certificate. Dave has over 22 years of architectural experience and has worked for a number of Central Iowa architectural firms as well as running his own firm. Last year Dave agreed to become the first State of Iowa Energy Code plans examiner and building energy inspector. Dave is charged with reviewing all state-owned and state-funded buildings for adherence to the International Energy Conservation Code 2009.*

*Dave has attended numerous US Department of Energy training events and has certificates in IECC fundamentals, IECC Residential Code for Builders, IECC Residential Code for Inspectors, IECC plans examiner for Residential and Commercial, IECC inspector for Residential and Commercial and "IECC and ASHRAE Train the Trainer." Dave is also part of the Iowa Utilities Energy Efficiency Collaborative, The State of Iowa Energy Council, Mid Iowa Construction Code Council, Iowa Building Officials and The American Institute of Architects.*

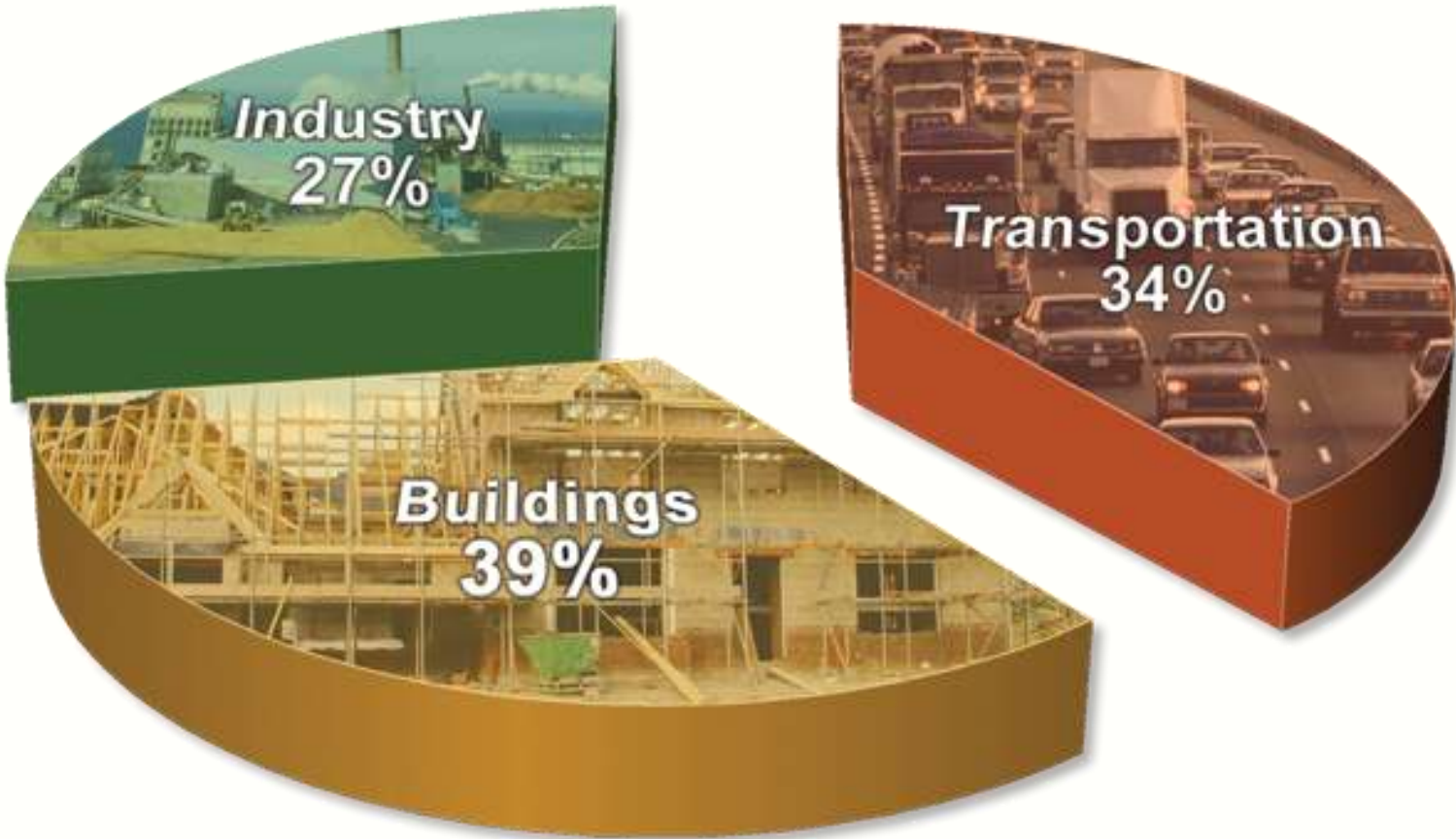


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## *U.S. Energy Use*



## ENERGY CONSERVATION CODE

**Reduced energy consumption**  
by approximately 0.5-quadrillion  
Btu per year by 2015,  
and 3.5-quadrillion  
Btu per year  
by 2030.

**Reduced CO<sub>2</sub> emissions**  
by roughly 3 percent in terms of  
the projected national CO<sub>2</sub>  
emissions in 2030.

**Savings**

**Consumption**

**Emissions**

**Rising cost savings**  
more than \$4 billion  
per year back in  
homeowners' pockets by 2015,  
a figure that could rise to over  
\$30 billion per year by 2030

## International Energy Conservation Code 2009



- Authority: Iowa Code 103A.10A
  
- State Energy Code applies to all construction in the State of Iowa with the exclusion of renovations to 1 & 2 family dwellings and non human habitable buildings.
  - Applicable Codes: 2009 International Energy Conservation Code & By Reference ASHRAE 90.1 2007.
  - Adopted State wide January 1st 2010

## Review required by an Architect or Engineer

Review Required. The plans and specifications for all buildings to be constructed which exceed a total volume of 100,000 cubic feet of enclosed space that is heated or cooled shall be reviewed by a registered architect or licensed professional engineer for compliance with applicable energy efficiency standards.



## ASHRAE Standard 90.1



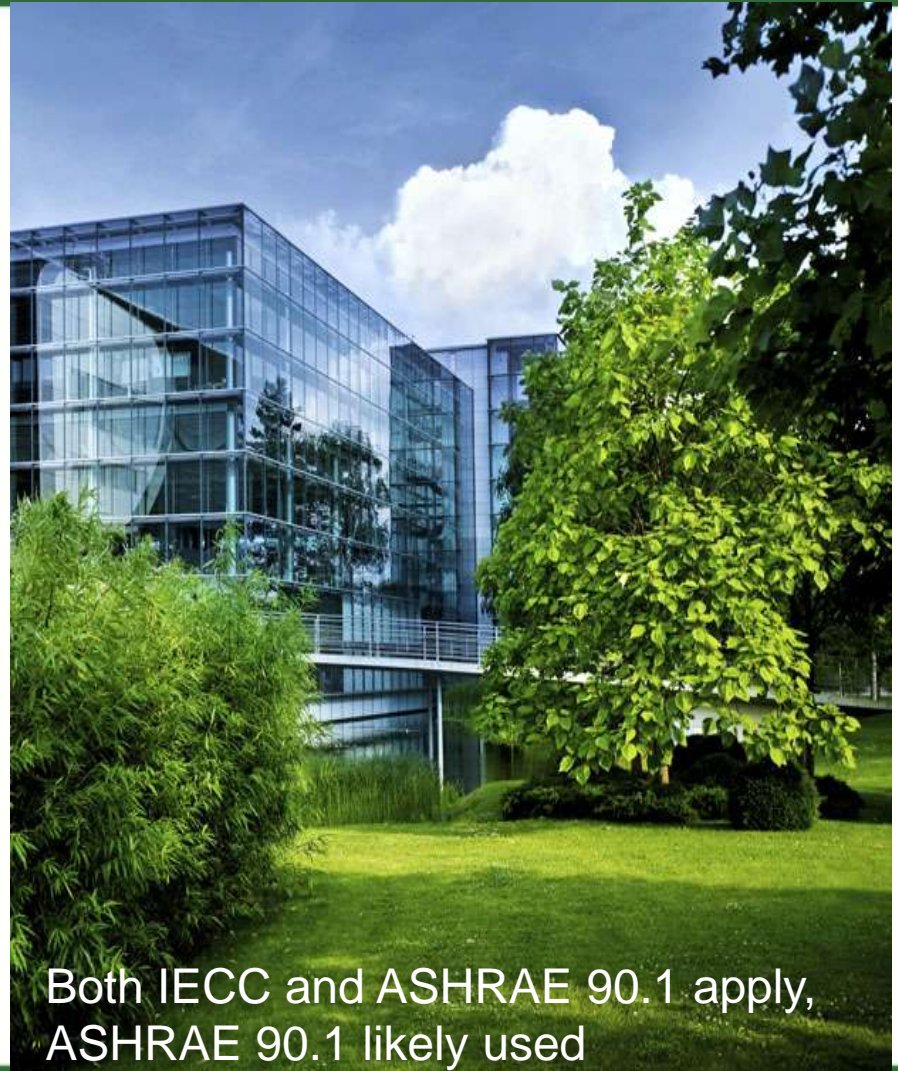
## International Energy Conservation Code



IECC applies

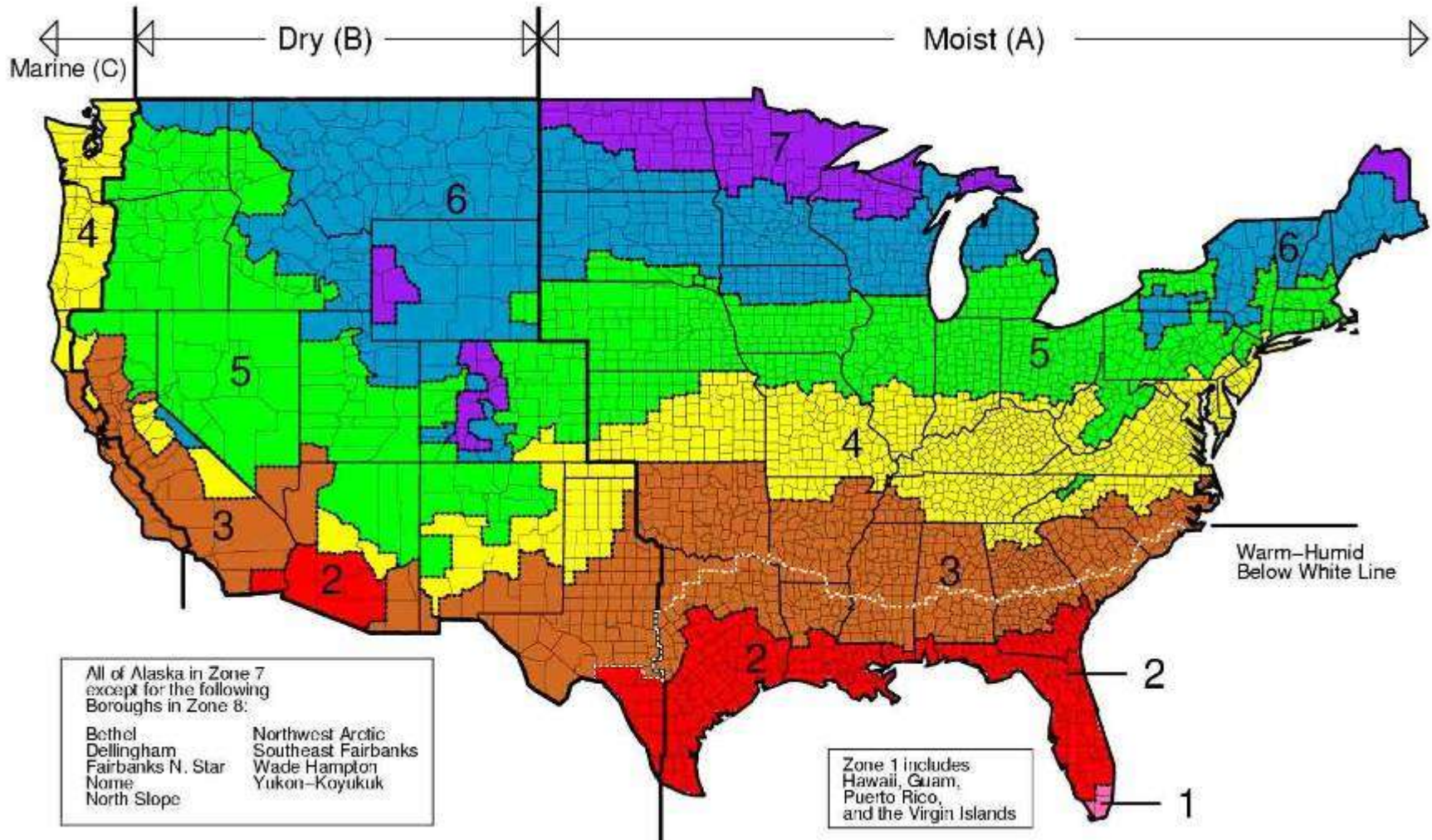


Both IECC and ASHRAE 90.1 apply,  
either used to comply

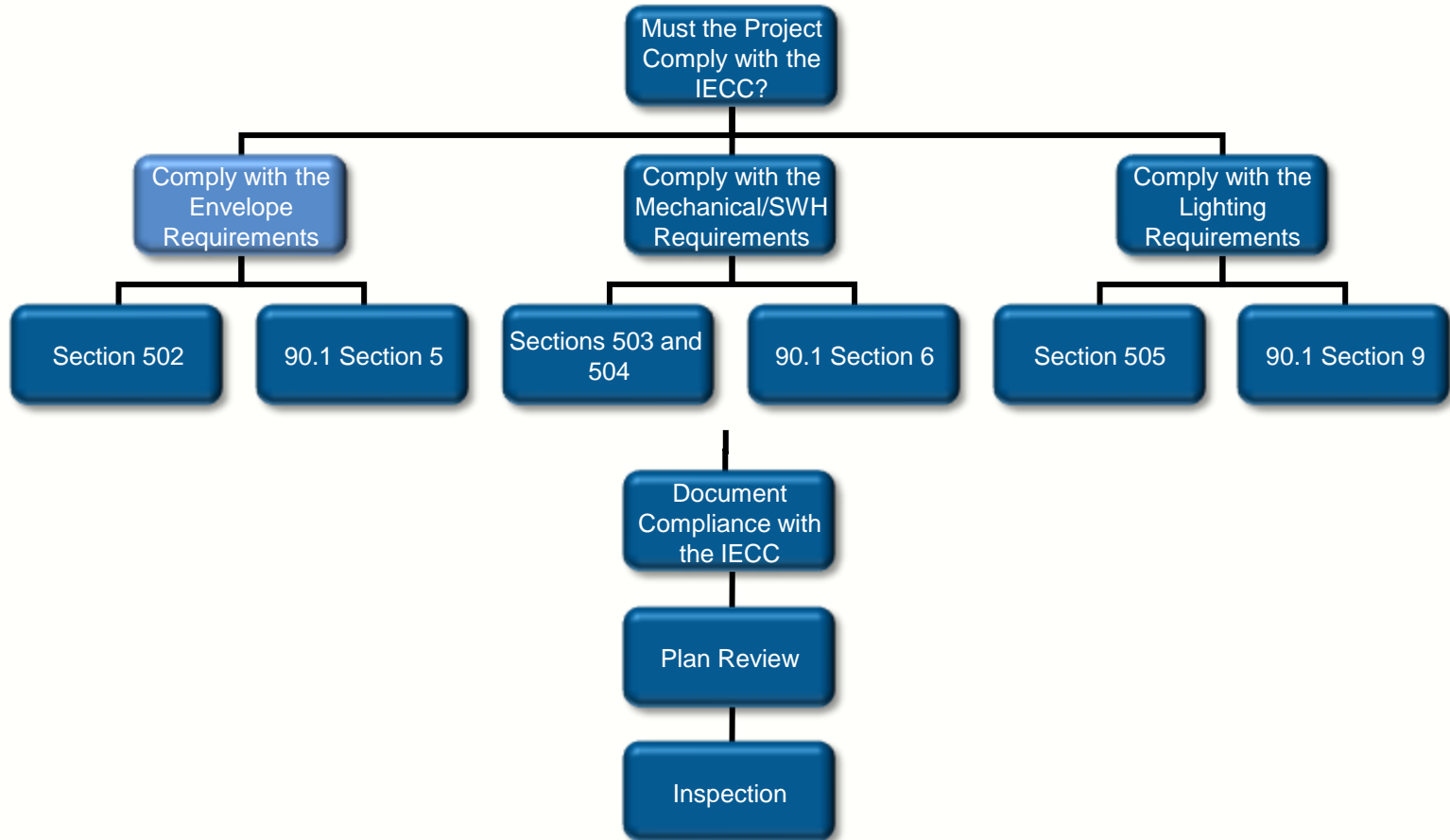


Both IECC and ASHRAE 90.1 apply,  
ASHRAE 90.1 likely used

# Energy Code Climate Zones



# Introduction to the Energy Code Compliance Process



**Section 501.2 Application requires 90.1 to be used in its entirety (Envelope, Lighting, Mechanical) if used as an alternate compliance path**



## Chapter 5 of the IECC General Prescriptive Approach

- ✓ Use for  $\leq 40\%$  of gross wall area in vertical fenestration
- ✓ Use for  $\leq 3\%$  of gross roof area in skylights

## Trade-off Alternative Approach

- ✓ COMcheck & REScheck

## Section 506 Total Building Performance Approach



A yellow hard hat is positioned in the bottom left corner. A white ruler with black markings is placed vertically, showing measurements from 1 to 8 inches. A black square tool is partially visible at the top left. The background is a light-colored wooden surface.

# What Do Building Energy Codes and Standards Cover?

**For both residential and commercial:**

- **Building Envelope**
- **Mechanical**
- **Service Water Heating**
- **Lighting**
- **Electrical Power**

## How Energy Codes Affect Building Design and Construction

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



# Building Envelope

The energy code specifies the insulation levels in the floor, ceiling, and walls and requirements intended to seal the building against air leakage and moisture migration.



# Heating, ventilating, and cooling



Energy codes provide  
**criteria for the  
size and efficiency of HVAC systems  
and equipment.**

### Provisions Applicable to ALL Mechanical Systems

- ✓ HVAC Load Calculations
- ✓ Equipment and System Sizing
- ✓ HVAC Equipment Performance Requirements
- ✓ HVAC System Controls
- ✓ Ventilation
- ✓ Energy Recovery Ventilation Systems
- ✓ Duct and Plenum Insulation and Sealing
- ✓ Piping Insulation
- ✓ HVAC System Completion
- ✓ Air System Design and Control
- ✓ Motor Nameplate Horsepower
- ✓ Heating Outside a Building



# Lighting and Electrical

*The energy codes provide minimum criteria to support **efficient, effective lighting**—and in commercial spaces—**lighting controls.***



## When do the Lighting and Power Requirements Apply?

- ✓ Original Installed Lighting System in a New Building, Addition, or Tenant Build-out
- ✓ Existing Lighting System that is Altered
- ✓ Change in Occupancy that Increases Energy
- ✓ Change in Occupancy that requires less LPD as shown in table 505.3.2

### Exceptions:

- Historic buildings
  - State or National listing
  - Eligible to be listed
- Alterations where less than 50% of the luminaires in a space are replaced and installed interior power lighting is not increased
- Lighting within dwelling units
  - Where  $\geq 50\%$  of permanently installed fixtures include high-efficacy lamps



## Mandatory Interior Lighting requirements

- ✓ Required Controls
- ✓ Wattage/Efficiency Limits

## Interior Lighting Power Allowances (watts/ft<sup>2</sup>)

## Exterior Lighting Controls

- ✓ Required Controls
- ✓ Lamp Efficiency

## Exterior Lighting Power Allowances (watts/ft<sup>2</sup>)

## Electric Metering



Independent Lighting Control  
required for each space surrounded  
by floor-to-ceiling partitions

- ✓ Must be located in the space served,                   **- OR -**
- ✓ Switched from a remote location
  - Must have indicator that identifies the lights served and their status (off or on)

Light Reduction Controls must  
allow the occupant to reduce  
connected lighting

- ✓ By at least 50%
- ✓ In a reasonably uniform illumination pattern



### Connected Exterior Lighting Power must not exceed Exterior Lighting Power Allowance

1. Calculate exterior lighting power allowance
  - Lighting power densities by exterior function and by applicable lighting zone
2. Calculate proposed connected lighting power
  - Wattage calculation “rules”
  - Exempted lighting
3. Compare values: proposed wattage must be less than or equal to allowed wattage



# Water Heating



Energy codes provide minimum criteria to **effectively heat and deliver hot water.**

## Table 504.2 Minimum Performance of Water-Heating Equipment

### ✓ Water Heater Types Covered

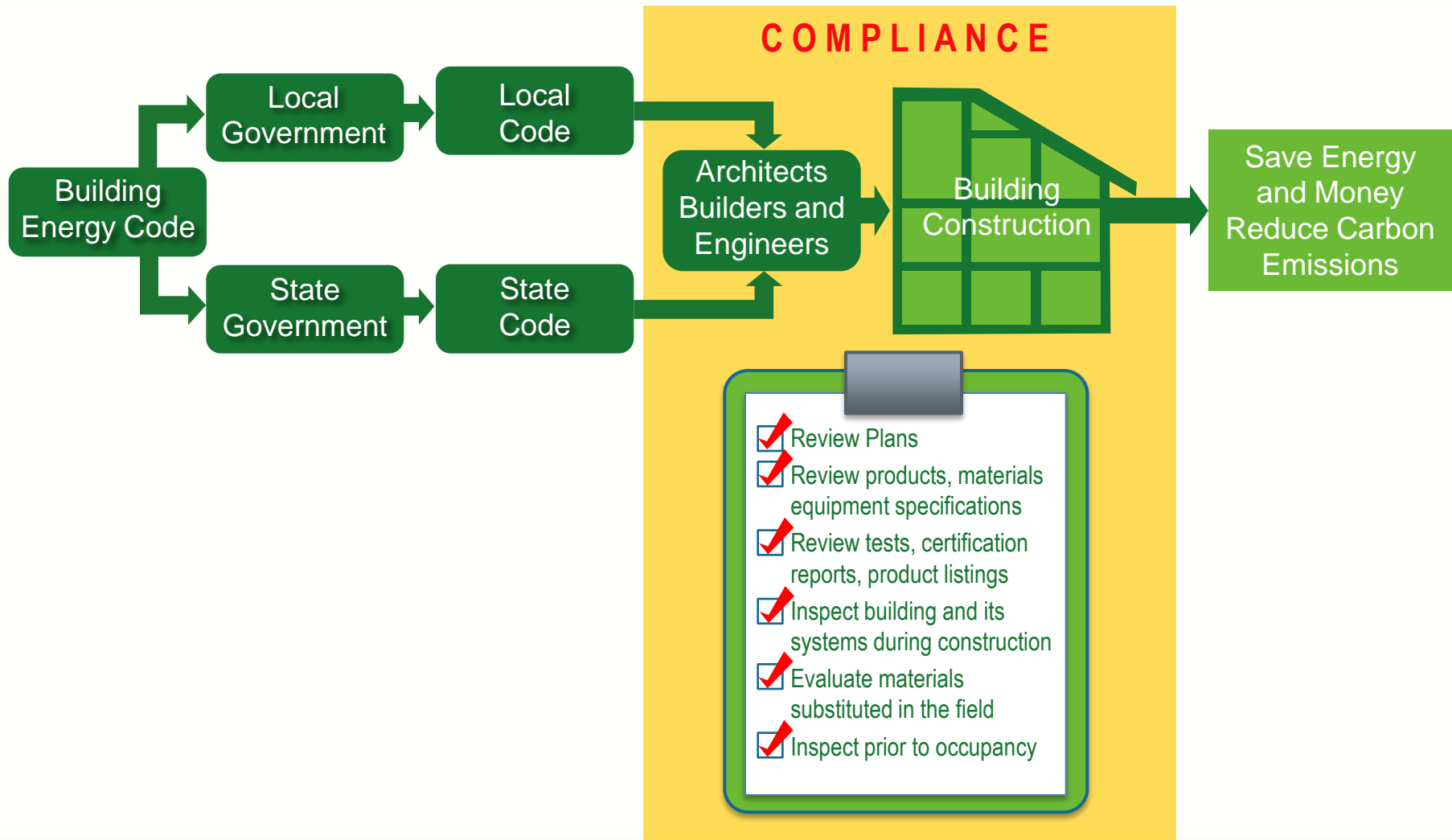
- Electric Storage
- Gas and Oil Storage
- Instantaneous Water Heaters – Gas and Oil
- Hot water boilers – gas and oil
- Pool heaters
- Unfired storage tanks

Temperature Controls (504.3)

Heat Traps (504.4)



# Codes and the Building Process



Desktop Software Tools



(Windows or Mac version)

Desktop Software Tools



(Windows or Mac version)

**No-cost, easy-to-use software  
that will demonstrate compliance.**  
[www.energycodes.gov/software.stm](http://www.energycodes.gov/software.stm)

## 2012 IECC History

DOE and several others submitted “comprehensive proposals,” all purporting to save 30% (relative to 2006)

Differences in format, flavor, accounting, etc.

Differences in level of savings



## State Adoption Process

Starting review process for adopting by January 1<sup>st</sup> 2013

- **Lighting Residential**

- A minimum of 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps or 75% of permanently installed lighting fixtures to contain only high efficacy lamps

**Exception:**

- ✓ Low-voltage lighting

- **Lighting Commercial**

- Whole building LPD's consistent with ASHRAE 90.1-2010
- No additional lighting allowed for retail lighting
- Daylighting controls option for retail and office lighting
- 70% daylit floor area for warehouse occupancies

# Implementation- Resources

U.S. DEPARTMENT OF **ENERGY** | Energy Efficiency & Renewable Energy

**Building Energy Codes Program**

ABOUT BECP | WHY BUILDING ENERGY CODES | RELATED LINKS

Search [energycodes.gov](http://energycodes.gov)

Less Energy. Less Cost. Less Carbon.

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- Publications
- Events Calendar
- Job/Internship Opportunities

**QUICKLINKS FOR...**

- Architects/Engineers /Designers
- Builders/Contractors
- Code Enforcement Officials
- State & Local Code Adopters
- Codes Advocates
- Students

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RESIDENTIAL Energy Codes

COMMERCIAL Energy Codes

**BECP WEBCASTS with Live Q&A**

Registration is Open!

Learn More

**POWER TOOLS**

- REScheck
- Status
- COMcheck
- Helpine

**RECENT UPDATES**

- Building Energy Codes Program Website Gets a Facelift
- Energy Codes 2010 location and promotional opportunities announced

**CODES IN THE NEWS**

- New IFT Green Building Codes Launched
- State Building Code Council Adopts New Rules Promoting Energy Conservation And Building Safety
- North Carolina Home Guide to Energy Code Compliance

**AROUND THE WEB**

- ECC Compliance Guide for New Homes in Maine

[www.energycodes.gov](http://www.energycodes.gov)

# Questions

