Energy Code Basics

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Energy Code and MemBrain Review

Meeting Agenda

- Energy Code Review
- Code Compliance Maps
- Code Resources
- MemBrain & Smart R

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Building Energy Codes

from the U.S Department of Energy

Prescriptive Packages User's Guide
1998 and 2000 International Energy Conservation Code
Version 3.5
April 2003

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Why Are Building Energy Codes Important?

Building energy codes are important because they set meaningful thresholds for all new construction and existing buildings such as:

- Windows: maximum U-factors and SHGCs for windows, doors and skylights.
- Insulation: minimum levels of insulation for walls, ceilings, floors, foundations and ducts.
- Infiltration: require proper sealing.
- Equipment: require proper HVAC equipment sizing.

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The Current National Model Residential Energy Code

The International Energy Conservation Code®

- It is referred to as a “model” code because it was developed through a public hearing process by national experts
- The code contains minimum energy efficiency provisions for residential and commercial buildings
- The code offers both prescriptive and performance-based approaches
- The code also contains building envelope requirements for thermal performance and air leakage

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According to the International Code Council®, the intent of the IECC® is to establish an energy conservation code that:

- Effectively conserves energy
- Minimizes increases in construction costs
- Allows the use of new materials, products or methods of construction
- Eliminates preferential treatment for particular industries or types or classes of materials, products or methods of construction

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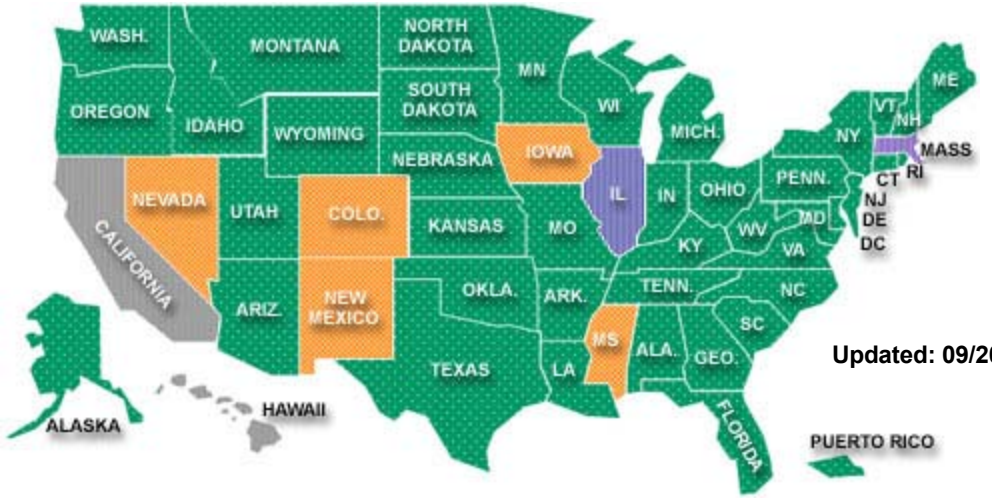
International Code Adoptions

44 states and the Department of Defense use the *International Building Code*
43 states plus Washington, D.C. use the *International Residential Code*
32 states use the International Fire Code



Updated: 09/20/04

ICC makes every effort to provide current, accurate code adoption information, but in some cases jurisdictions do not notify ICC of adoptions, amendments or changes to their codes. To ensure you have accurate information, please contact the jurisdiction directly.

One or more International Codes® currently enforced statewide

One or more International Codes® enforced within state at local level

One or more International Codes® adopted statewide with future enforcement date

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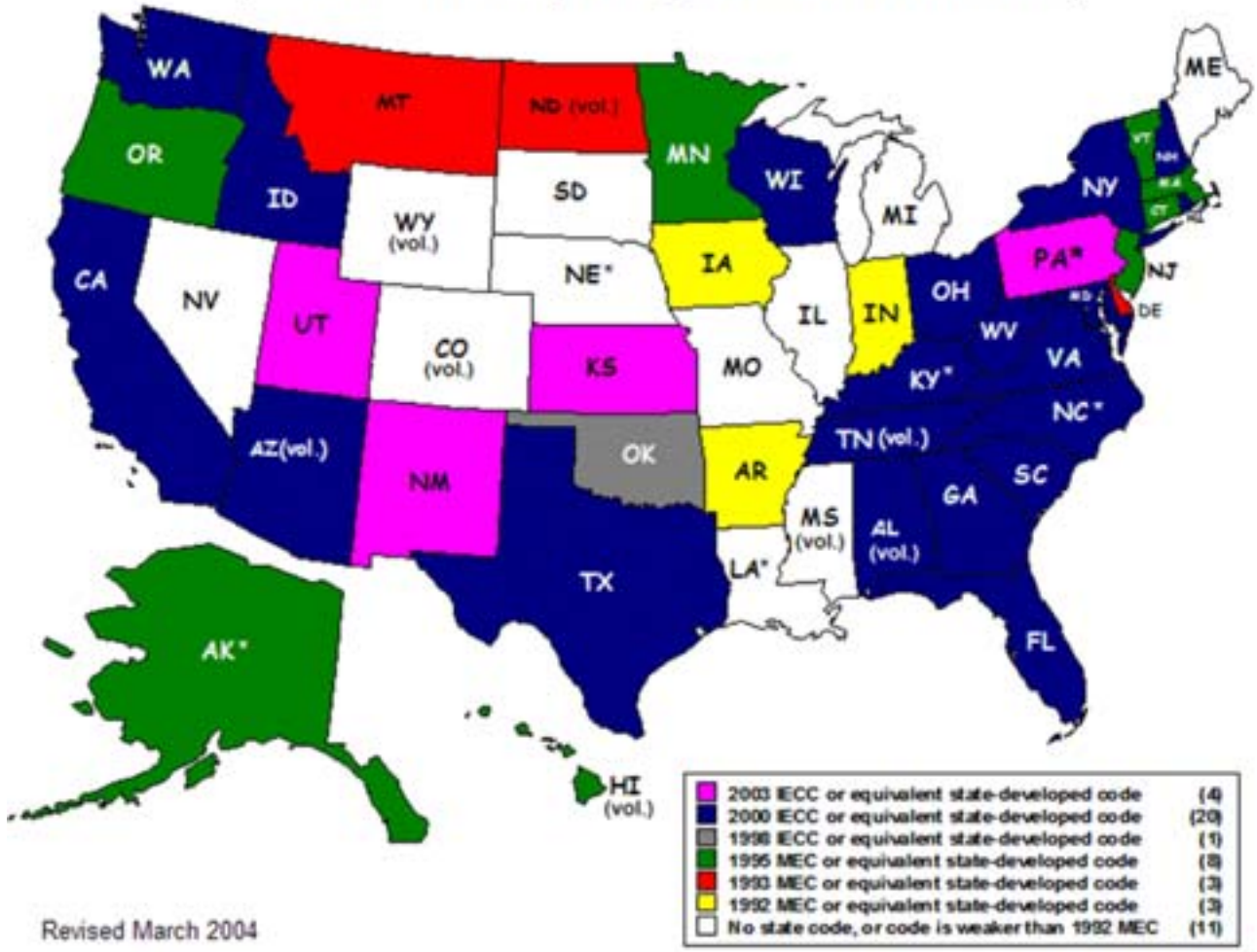
States Adopting the MEC/IECC



Revised March 2004

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2003 Prescriptive Packages

IECC Compliance Guide for New Homes in Pennsylvania

Code: 2000 International Energy Conservation Code (IECC) — First Edition

How to Use This Guide

This pamphlet contains six generic packages designed to simplify compliance with the IECC as it relates to Pennsylvania. Each county is assigned to one of the six packages (A through F), which vary according to the different climate zones in Pennsylvania.

Step-by-Step Instructions

1. Use the color-coded map to locate the county in which construction is taking place and find the package, A through F, associated with that county.
2. Use the "Table of IECC Building Envelope Requirements for Pennsylvania" (on the back of this sheet) to find the set of construction options or "path" associated with the package selected above.
3. Construct the building according to the corresponding path and comply with certain basic code requirements, which include:
   a. providing preventative maintenance manuals
   b. installing temperature controls
   c. limiting window and door leakage
   d. caulking or sealing joints and penetrations
   e. installing vapor retarders
   f. sealing and insulating ducts

Example:
If you are constructing a home in Bucks County, you will comply with the IECC in Pennsylvania if you follow the path listed in Package B.

Obtaining the IECC

The IECC is the national model energy standard certified by the US Department of Energy pursuant to the Energy Policy Act (EPAct). EPAct requires that all states review and consider adopting the IECC as the state building energy code.

The IECC is published by the International Code Council (ICC). For additional details on the IECC, contact the ICC by phone at (703) 931-4533 or visit their website at www.iccsafe.org.

Limitations

This guide is an energy code (IECC based) compliance aid for Pennsylvania. It does not provide a guarantee for meeting the IECC. The guide has not been customized to reflect any state-specific amendments to the IECC that Pennsylvania may adopt or has adopted, and does not, therefore, provide a guarantee for meeting the state energy code. For additional details on Pennsylvania's energy code, please contact your local building code official.

Pennsylvania Counties by Package

A — 4,500 - 4,999 HDD

Delaware	Philadelphia

B — 5,000 - 5,499 HDD

Adams	Franklin	York
Bucks	Lancaster	
Chester	Montgomery	

C — 5,500 - 5,999 HDD

Allegheny	Fulton	Mifflin
Beaver	Greene	Northampton
Berks	Huntingdon	Perry
Cumberland	Juniata	Washington
Dauphin	Lebanon	
Fayette	Lehigh	

D — 6,000 - 6,499 HDD

Armstrong	Columbia	Pike
Bedford	Indiana	Schuylkill
Blair	Luzerne	Snyder
Cambria	Lycoming	Somerset
Carbon	Monroe	Union
Centre	Montour	Westmoreland
Clinton	Northumberland	

E — 6,500 - 6,999 HDD

Butler	Lackawanna	Venango
Clarion	Lawrence	Warren
Crawford	Mercer	Wyoming
Erie	Sullivan	

F — 7,000 - 8,499 HDD

Bradford	Forest	Susquehanna
Cameron	Jefferson	Tioga
Clearfield	Mckean	Wayne
Elk	Potter	

HDD = Heating Degree Days

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2003 Prescriptive Packages

Table of IECC Building Envelope Requirements for Pennsylvania

Simplified Prescriptive Paths for Compliance with the IECC in Pennsylvania

		GLAZING AND INSULATION			FOUNDATION TYPE			
Package		Window U-factor	Ceiling	Wall	Floor	Basement Wall	Slab Perimeter	Crawl Space Wall
A	4,500-4,999 HDD	0.45	R-38	R-16	R-19	R-9	R-6, 2 ft.	R-17
B	5,000-5,499 HDD	0.45	R-38	R-18	R-19	R-9	R-6, 2 ft.	R-17
C	5,500-5,999 HDD	0.40	R-38	R-18	R-21	R-10	R-9, 2 ft.	R-19
D	6,000-6,499 HDD	0.35	R-38	R-18	R-21	R-10	R-9, 4 ft.	R-20
E	6,500-6,999 HDD	0.35	R-49	R-21	R-21	R-11	R-11, 4 ft.	R-20
F	7,000-8,499 HDD	0.35	R-49	R-21	R-21	R-11	R-13, 4 ft.	R-20

* This table of prescriptive requirements is applicable to homes in which the ratio of the rough opening of windows to the gross wall area, expressed as a percentage, is 15%. For homes with glazing areas that are greater than 15%, please refer to Tables 502.2.4(4) - (8) in the IECC.

HDD = Heating Degree Days

NOTES:

1. This table is based upon the 2000 International Energy Conservation Code (IECC), published by the International Code Council, and does not reflect any state-specific amendments to the IECC.
2. Source of requirements for the Table: 2000 IECC, Ch. 5, Prescriptive Packages for Climate Zones 10-15. Alternate compliance approaches must be used for glazing areas over 25%.
3. Window area % and U-factors are maximum acceptable levels.
4. Insulation R-values are minimum acceptable levels.
5. This table applies to single-family, wood-frame residential construction. For steel-framed wall construction or high-mass wall construction refer to Chapter 5 of the IECC.
6. "Window" refers to any translucent or transparent material (i.e., glazing) in exterior openings of buildings, including skylights, sliding glass doors, the glass areas of opaque doors, and glass block.
7. Window U-factor must be determined from a National Fenestration Rating Council (NFRC) label on the product or from a limited table of product "default" values in the IECC.
8. Window area % is the ratio of the rough opening of windows to the gross wall area, expressed as a percentage. Up to one percent of the total window area may be exempt from the U-factor requirement.
9. Opaque doors must have a maximum U-factor of 0.35. One exempt door allowed.
10. The code requires that windows be labeled in a manner to determine that they meet the IECC's air infiltration requirements; specifically, equal to or better than 0.30 cfm per square foot of window area (swinging doors below 0.50 cfm) as determined in accordance with AAMA/WDMA 101/I.S.2 (ASTM E 283).
11. R-2 shall be added to the requirements for heated slabs.
12. Floors over outside air must meet ceiling requirements.
13. R-values for walls represent the sum of cavity insulation plus insulated sheathing, if any. Crawl space wall R-value shall only apply to unventilated crawl spaces.
14. Prescriptive packages are based upon normal HVAC equipment efficiencies (see Chapter 5 of the IECC). The code also requires the HVAC system to be properly sized using a computational procedure like ACCA Manual J.

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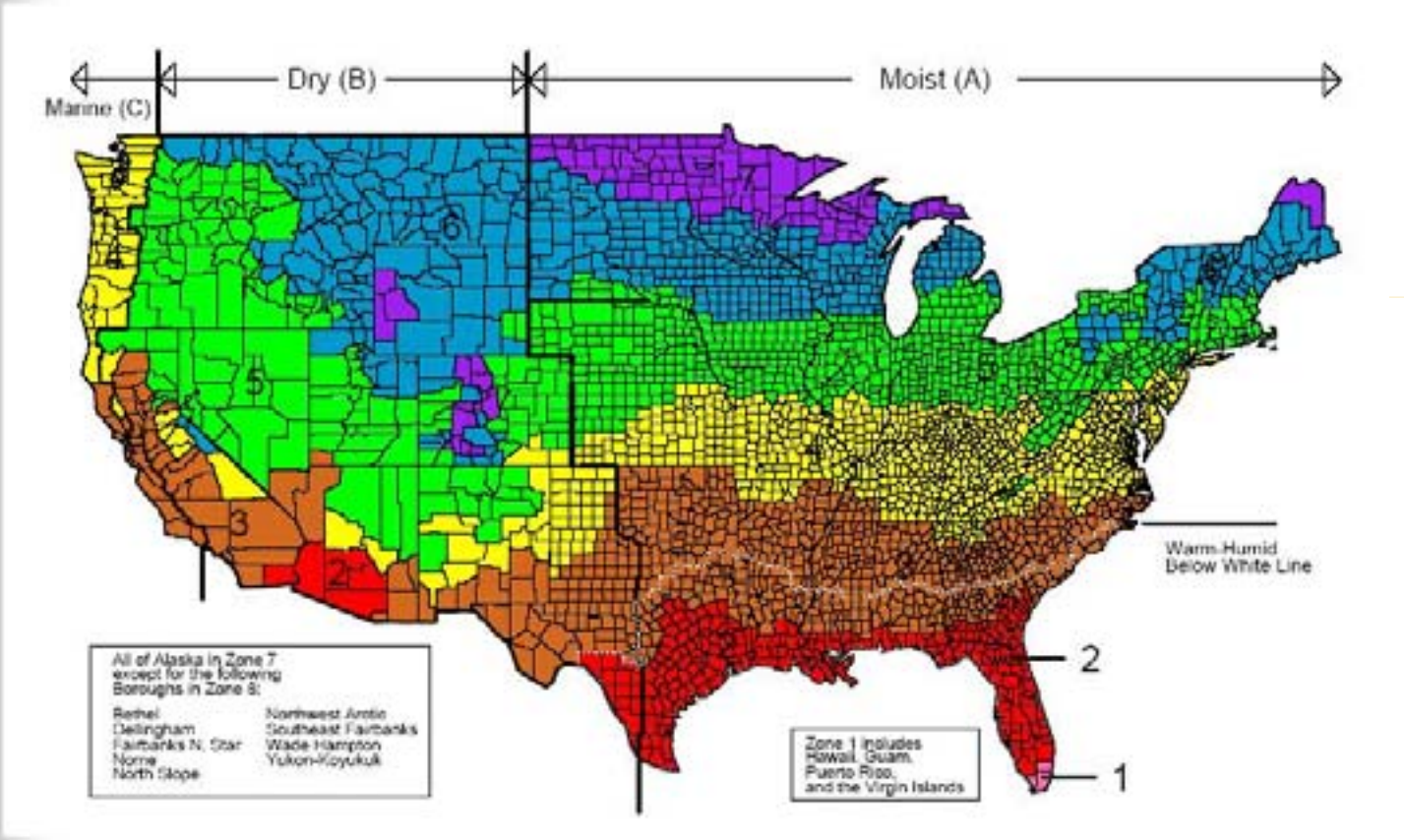
2003-4 IECC Revisions



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2003-4 IECC Revisions

Table 402.1.
Insulation and Fenestration Requirements by Component[a]

Climate Zone	Fenestration U-Factor	Skylight[b] U-Factor	Glazed Fenestration SHGC	Ceiling R-Value	Wood Frame Wall R-Value	Mass Wall R-Value	Floor R-Value	Basement[c] Wall R-Value	Slab[d] R-Value & Depth	Crawl Space[c] Wall R-Value
1	1.20	0.75	0.40	30	13	3	13	0	0	0
2	0.75	0.75	0.40	30	13	4	13	0	0	0
3	0.65	0.65	0.40[e]	30	15	5	19	~~5~~ 0	0	5/13
4 except Marine	0.40	0.60	NR	38	15	5	19	10 / 13	10, 2 ft	10 / 13
5 and Marine 4	0.35	0.60	NR	38	21 or 15+5[g]	13	~~25~~30[f]	10 / 13	10, 2 ft	10 / 13
6	0.35	0.60	NR	49	21 or 15+5[g]	15	30[f]	10 / 13	10, 4 ft	10 / 13
7 and 8	0.35	0.60	NR	49	21	19	30[f]	~~15~~10 / ~~21~~13	~~15~~10, 4 ft	10 / 13

(a) R-values are minimums. U-factors and SHGC are maximums. R-19 shall be permitted to be compressed into a 2x6 cavity.
(b) The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
(c) The first R-value applies to continuous insulation, the second to framing cavity insulation; either insulation meets the requirement.
(d) R-5 shall be added to the required slab edge R-values for heated slabs.
(e) There are no SHGC requirements in the Marine zone.
(f) Or insulation sufficient to fill the framing cavity, R-19 minimum.
(g) "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25% or less of the exterior, R-5 sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25% of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.

Code Resources

- http://www.energycodes.gov
- http://www.bcap-energy.org
- http://www.naseo.org
- http://www.eere.energy.gov
- http://bldgcode.pnl.gov/REScheckWeb
- http://www.natresnet.org/default.htm
- http://www.iccsafe.org