How to administer and enforce Pennsylvania's Energy Code

Lessons from the field

How to administer and enforce Pennsylvania's Energy Code

Lessons form the field

Presenters

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Pennsylvania Housing Research Center

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Program Developed By:

Pennsylvania Housing
Research/Resource Center

With Support from:

P ennsylvania

H ousing

R esearch / Resource

C enter

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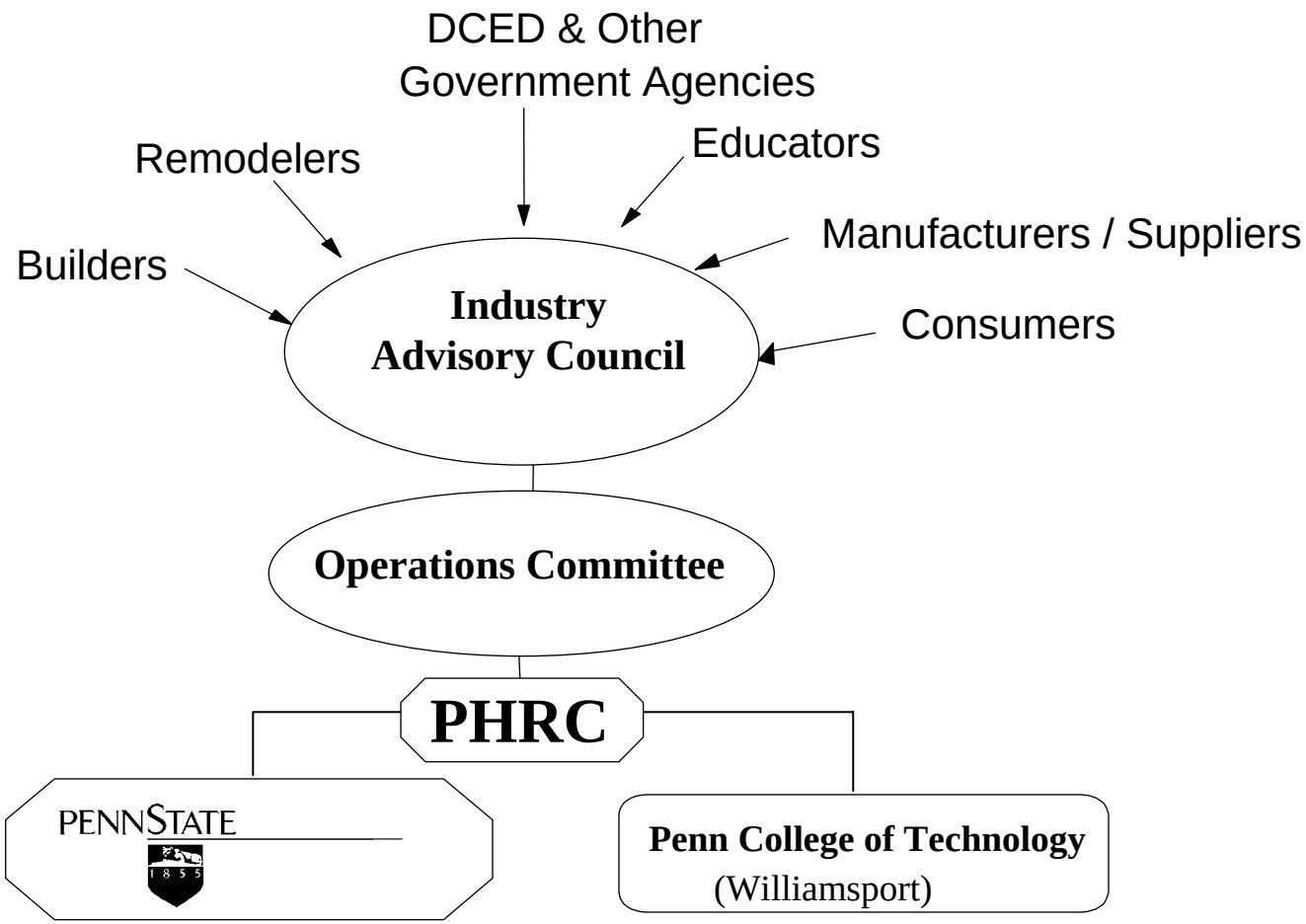
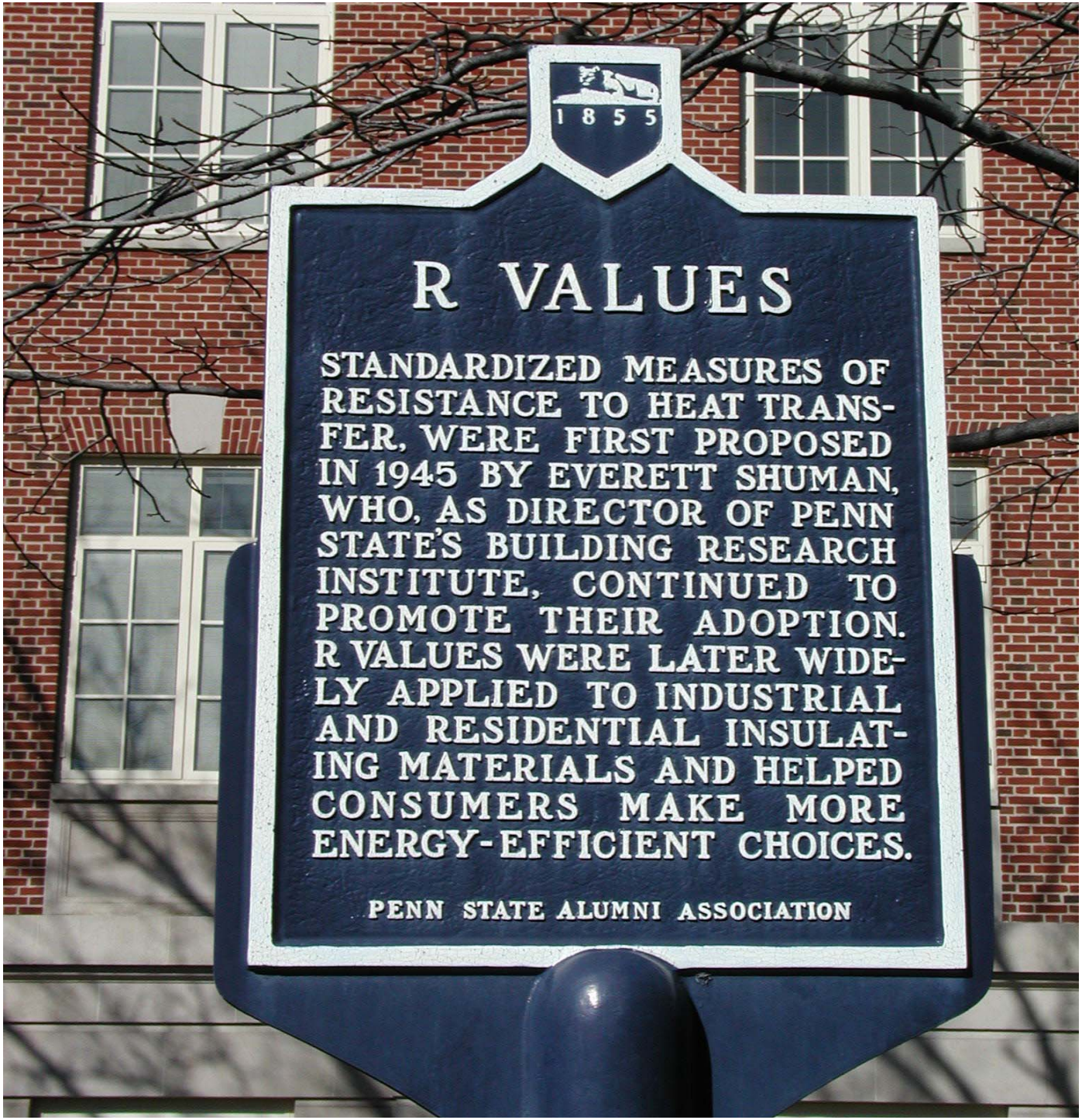
Mission

- To serve the housing industry and the housing consumer in PA.
- To improve the quality and affordability of housing.
- To provide information, training and education.
- To conduct research, development and demonstration.

PHRC organization




1855
R VALUES
STANDARDIZED MEASURES OF RESISTANCE TO HEAT TRANSFER, WERE FIRST PROPOSED IN 1945 BY EVERETT SHUMAN, WHO, AS DIRECTOR OF PENN STATE'S BUILDING RESEARCH INSTITUTE, CONTINUED TO PROMOTE THEIR ADOPTION. R VALUES WERE LATER WIDELY APPLIED TO INDUSTRIAL AND RESIDENTIAL INSULATING MATERIALS AND HELPED CONSUMERS MAKE MORE ENERGY-EFFICIENT CHOICES.
PENN STATE ALUMNI ASSOCIATION

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Program Overview

Program Objectives

- Increase the general understanding of the energy related requirements

- Identify and discuss some **easy** things that can be done at plan review and during inspections to increase the energy efficiency of housing in PA. (15 minutes)

Program outline

1. Overview of field findings
2. Quick code review
3. Plan review
4. Inspections
5. Summary

Housekeeping

- Introductions
- Handouts
- Questions
- Cell phones & Pagers
- Breaks & lunch

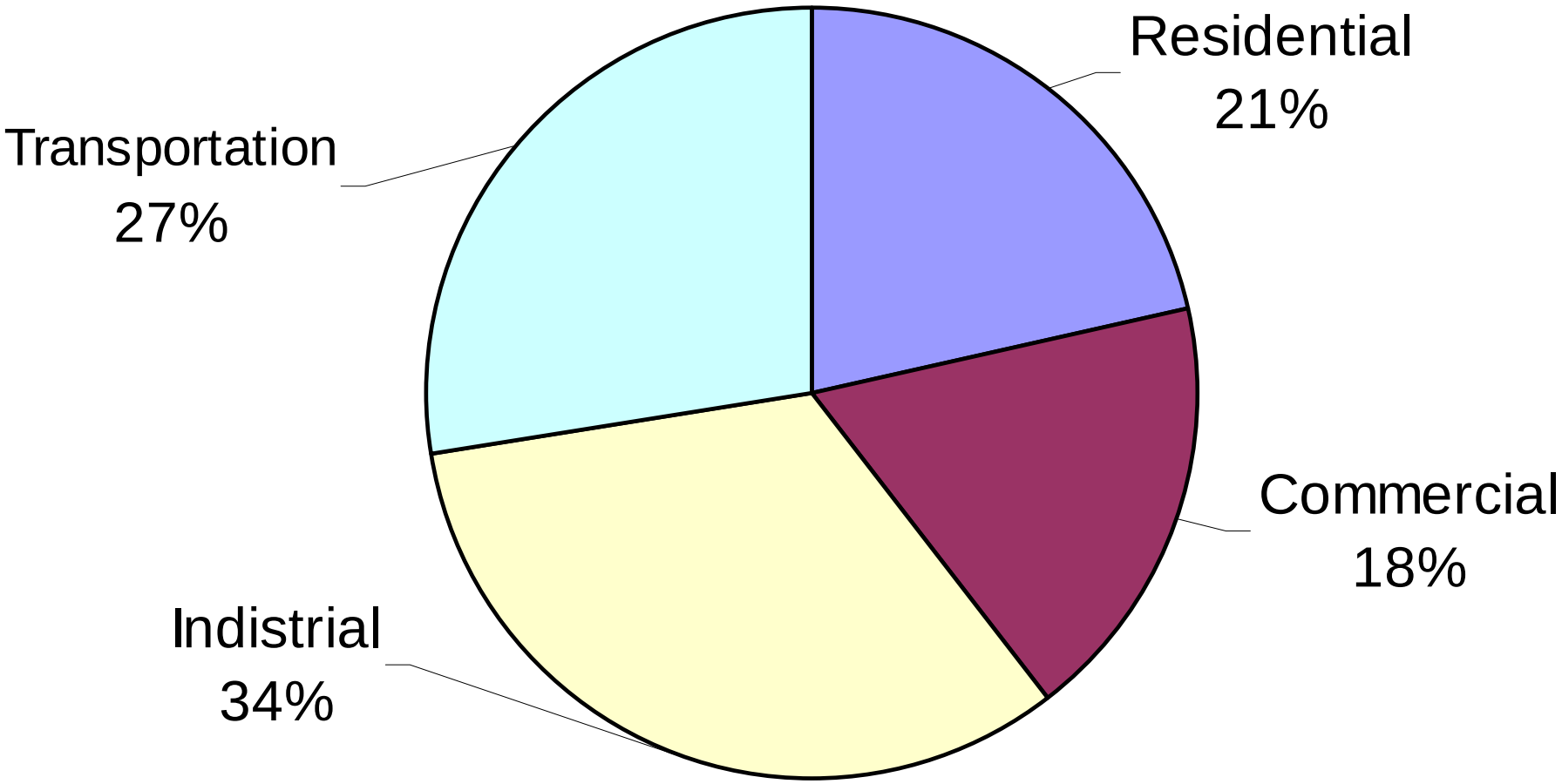
Program scope

Limited to <u>residential</u> construction

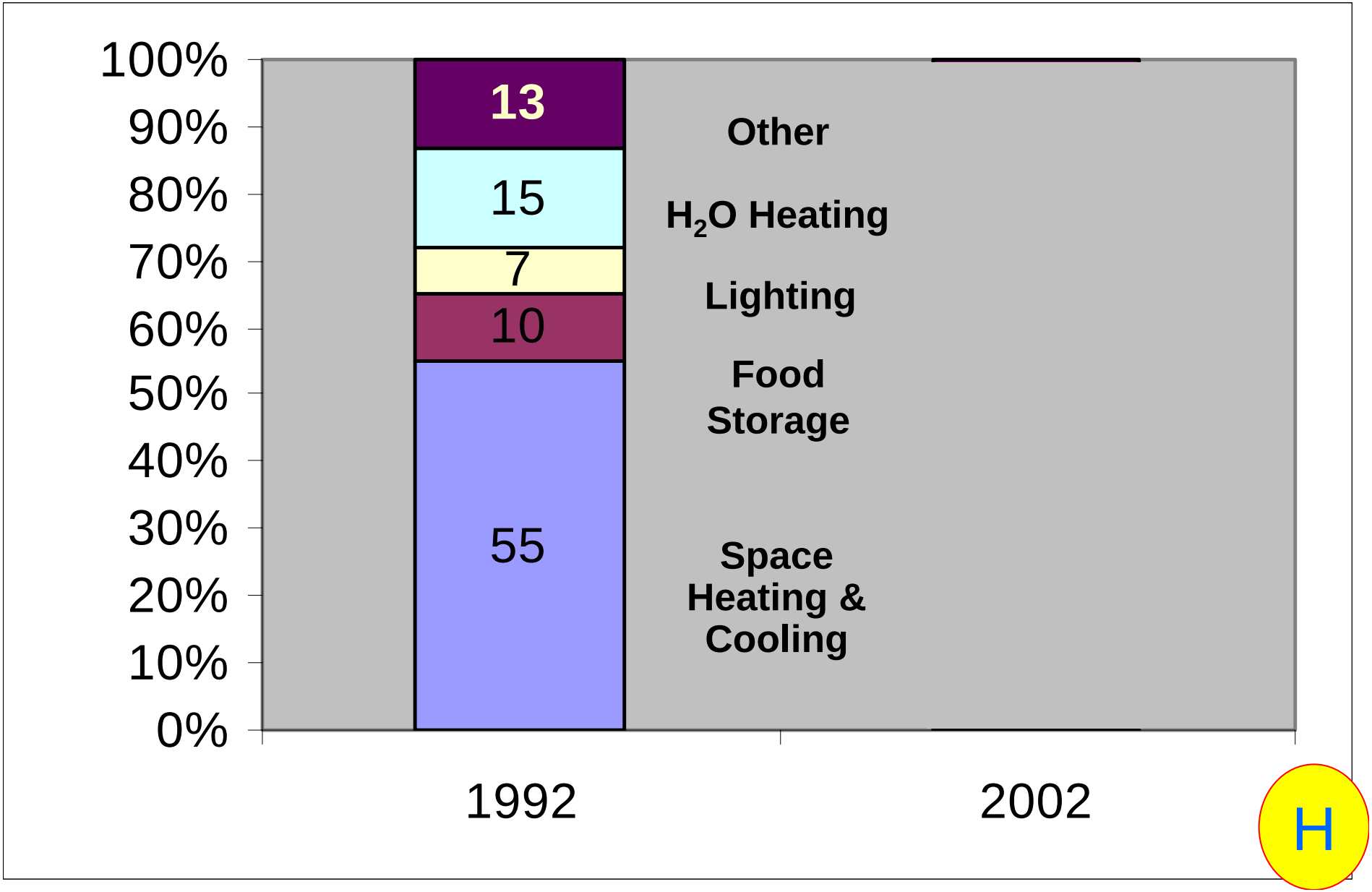
- **Detached one and two-family dwellings**
- **Townhouses**
- **R-2 Occupancies**
- **R-4 Occupancies**

IRC limited to 1 & 2 family / townhouses

Energy use by Sector



Changing Household Energy Consumption



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caglecartoons.com
tabtoons@telos.net
GAS
IF YOU NEED TO ASK YOU CAN'T AFFORD IT..
MART

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PA Energy Code Evaluation & Technical Assistance Program

PA Energy Code Evaluation

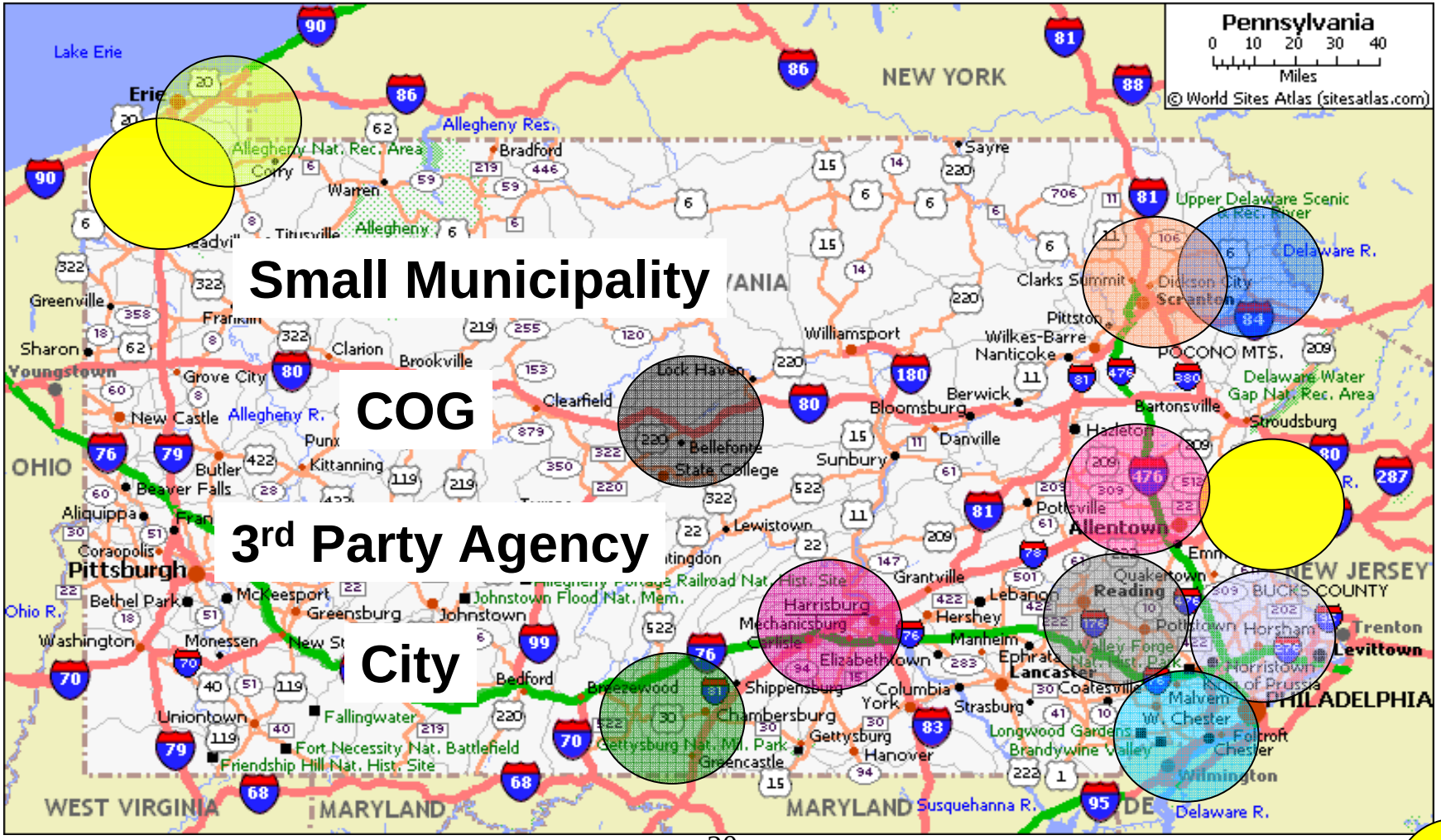
- Primary
  - Technical assistance to municipalities & 3rd party agencies.
- Secondary
  - Determine how the energy code is being enforced. (common compliance problems and how to avoid them).
  - Quantify actual home performance vs. code.

PA Energy Code Evaluation

Worked with code groups to market program.

- Pennsylvania Construction Code Academy
- Pennsylvania Association of Building Code Officials
- Pennsylvania Building Officials Council
- Pennsylvania Association of Code Officials
- Lancaster Association of Code Officials

PA Energy Code Evaluation



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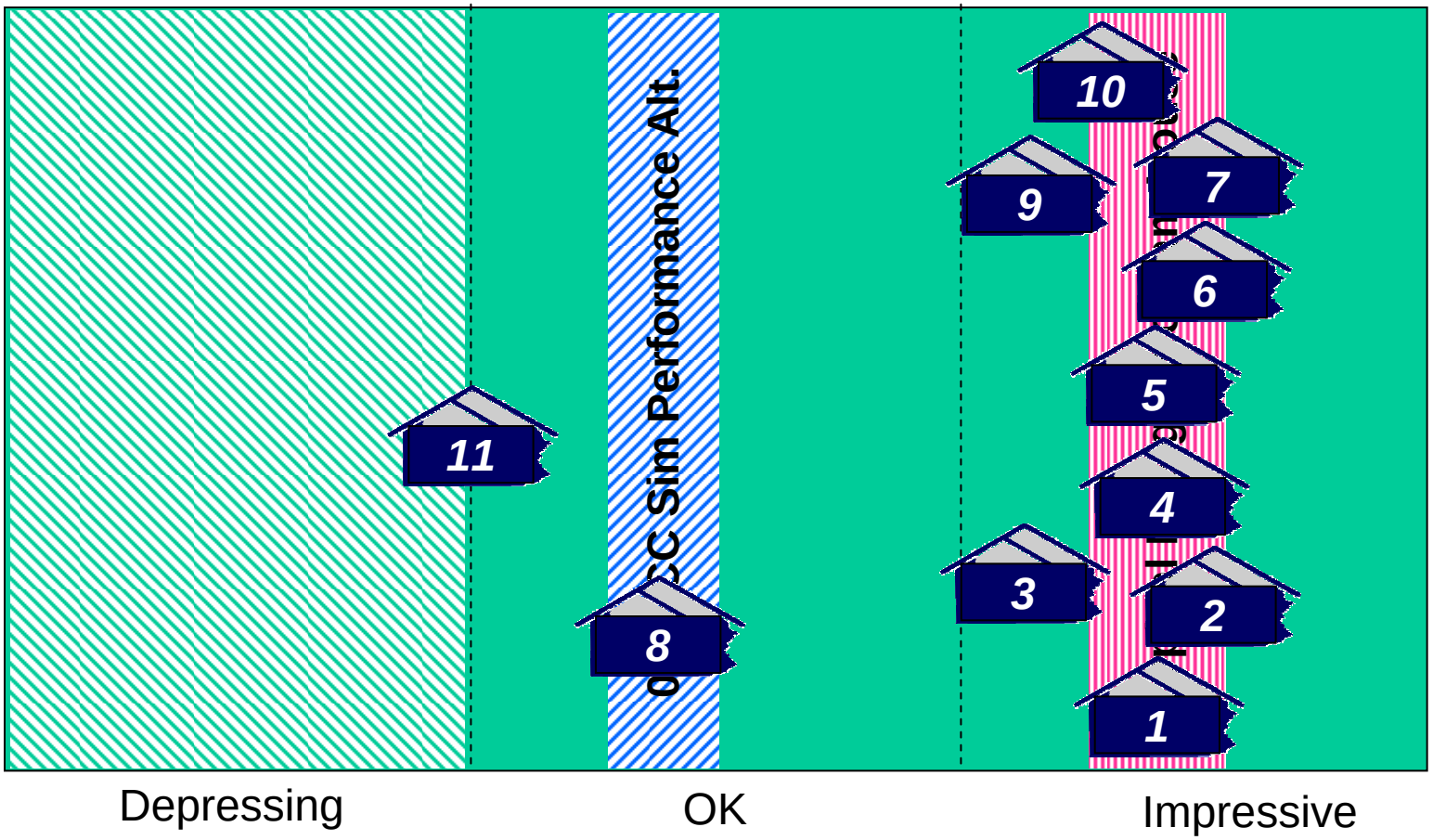
PA Energy Code Evaluation

Provided the following:

- Detailed Plan review
  - Reviewed plan submittal forms and plan review checklists
- In-house meeting to discuss
  - Overview of plan review and inspection process
  - Experience and certifications of staff
- In-field rough framing inspection
- In-field insulation inspection (if they do one)
- Final Inspection
- Detailed performance review of house
  - Blower door, duct blaster, IR scan, computer simulation, etc.
- Report to participants with recommendations
- Report to DOE & Public

House Performance Findings



Air Leakage

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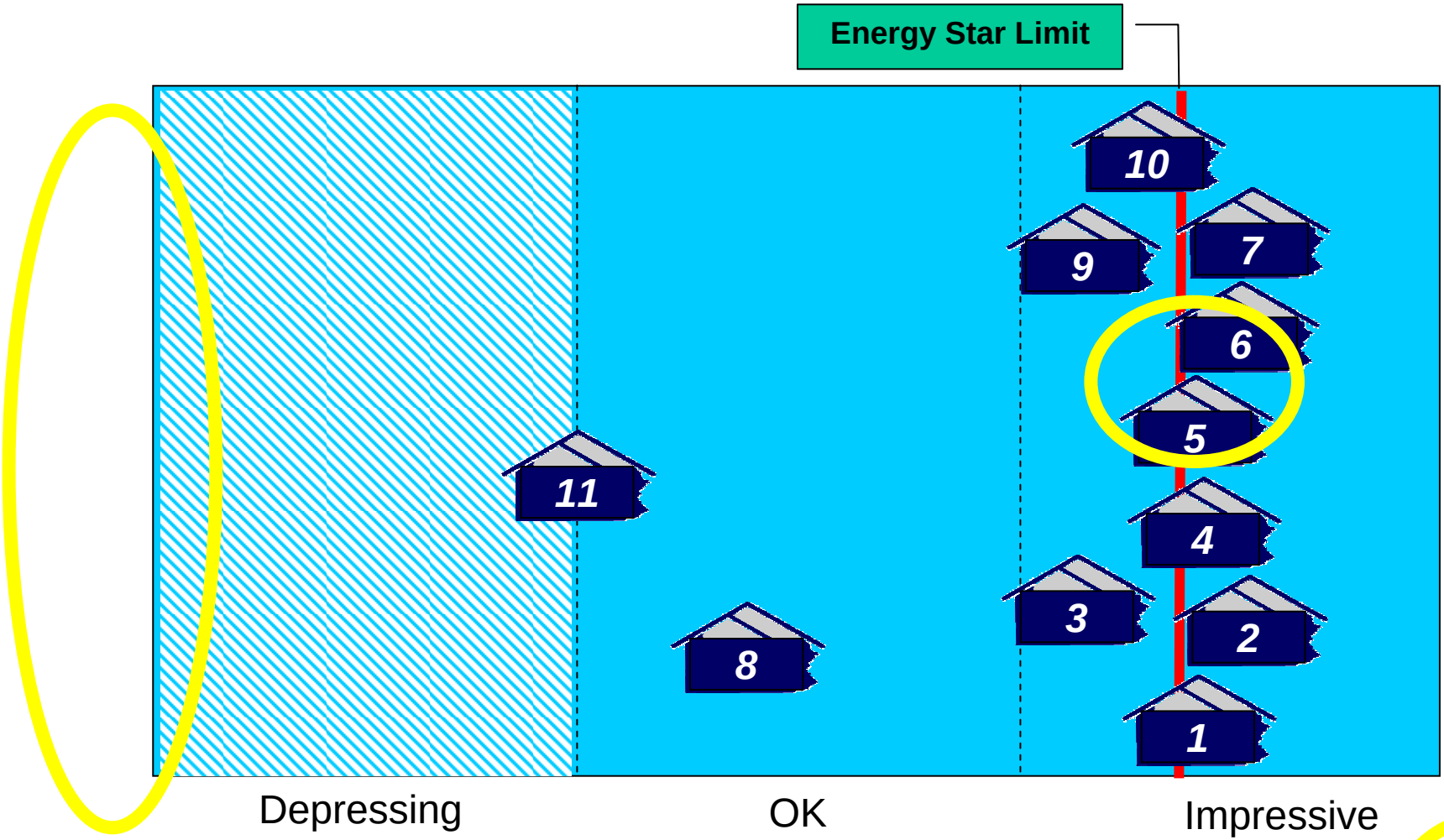
House Performance Findings



Duct Tightness

Big Issues

1. Continuous thermal envelope.
2. Conditioned vs. un-conditioned basement.
3. Above grade vs. basement wall?
4. Slab insulation.
5. Air sealing.
6. Ducts – substantially airtight?

Administrative Summary

40% of participants provided plan submittal requirements with building permit application.

40% of the time that the plan reviewers were the same as the inspector.

40% of participants used inspection checklists.

83% of participants did separate insulation inspection.

Average experience of code officials was **4.5** years.

Reality Check
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PA - UCC
Energy Codes

3 Options

Energy Conservation

UCC 403.21(e)

Permit applicants may choose one of these methods to comply with energy conservation requirements:

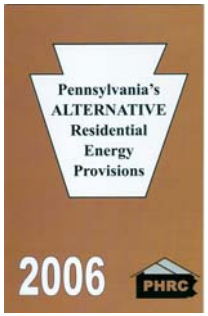
- The International Energy Conservation Code (IECC)
- IECC Compliance Guide, prescriptive energy packages and related software published by USDOE
  - » RES*check* for Residential
  - » COM*check* for Commercial
- PA's Alternative Residential Energy Provisions
- IRC Chapter 11

Detached 1- and 2- Family Dwellings and Townhouses

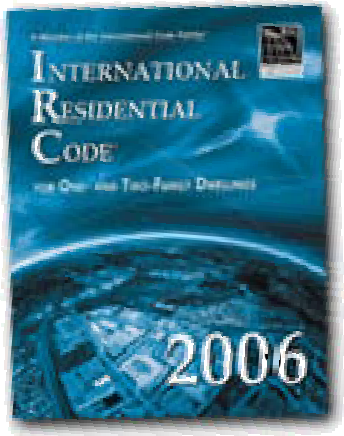
UCC 403.21(e)

PA UCC

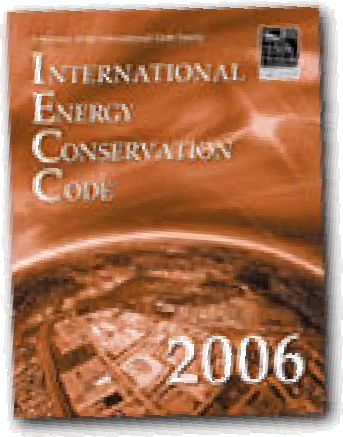
Pennsylvania Alternative Residential Energy Provisions



ICC – IRC Chapter 11



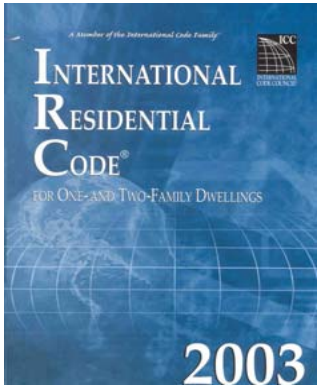
ICC – IECC

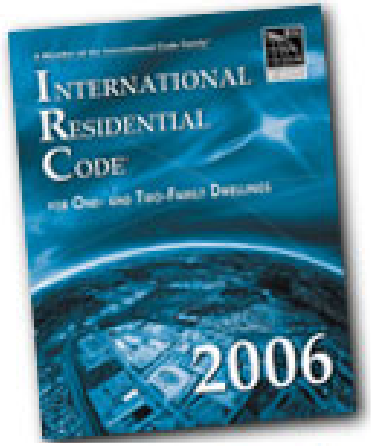


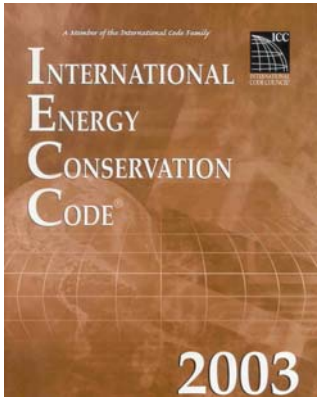
PHRC

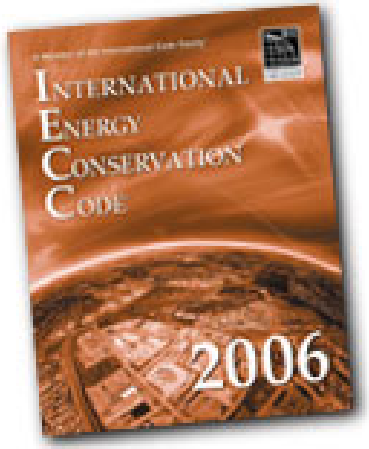
January 1, 2007

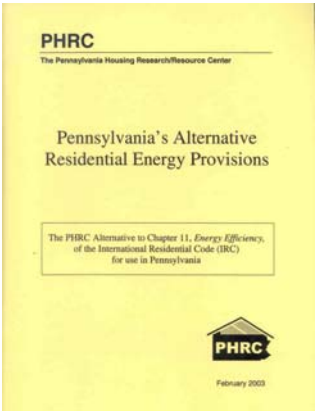
3 year cycle

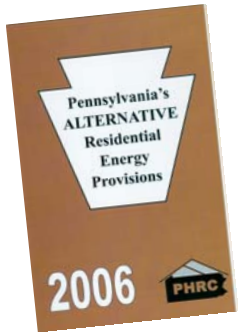












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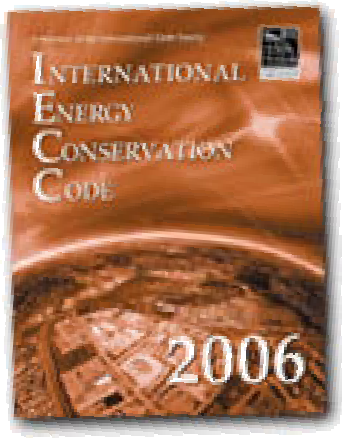
PATH 1

Detached 1- and 2- Family Dwellings and Townhouses

PA UCC

- **Pennsylvania Alternative Residential Energy Provisions**
- **ICC – IRC Chapter 11**
- **ICC – IECC**



Structure of the IECC - 2006

Chapter 1	Administrative
Chapter 2	Definitions
Chapter 3	Climate Zones
Chapter 4	Residential Compliance Options
~~Chapter 5~~	~~Commercial Compliance Options~~
~~Chapter 6~~	~~Referenced Standards~~

IECC

Chapter 1

Administration

Goal of building codes

Protection of occupants and property

- Implies:
  - Occupant Health & Safety
  - Building Durability

Energy Codes are subordinate to building codes

- Intended to CONSERVE ENERGY

Residential Buildings - IECC

E202

- Detached one and two-family dwellings
- Townhouses (Multiple single family)
- **R-2 Occupancies**
- **R-4 Occupancies**

How is this different than the IRC??

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Applicability

E101.4

Existing Buildings (E101.4.1)

- Changes not required if legally existing

Historic Buildings - Exempt from IECC (E101.4.2)

Additions, Alterations & Repairs (E101.4.3)

- Must comply with requirements for new construction

Change in Occupancy (E101.4.4)

- Must comply if energy demand increases

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Thermal Envelope Insulation

E102.1.1

Labeling of Insulation

- Each piece ≥ 12″ in width must be labeled & readily observable
- Certificate from insulation installer:
  - Type, manufacturer & R-value of all insulation
  - If blown in or sprayed on, certificate must show:
    - Initial & settled thickness
    - R-value
    - Density
    - Coverage area
    - # of bags installed

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This Attic Has Been Insulated To

R-

By A Professional Insulation Contractor

The insulation in this attic was installed by a qualified professional Contractor to the R-value stated above

Certificate of Insulation

BUILDING ADDRESS:

_____

_____

_____

Installation Date: _____

CONTRACTOR:

_____

_____

_____

License #: _____

Area Insulated	R-Value	Installed Thickness	Settled Thickness	Installed Density	No. Bags	Sq. Ft.
Attic						
Walls						
Floors						

I, _____, (print name) certify that this residence/building has been insulated to the stated R-value and that the installation is in conformance with all applicable codes, standards, regulations and specifications.

Authorized Signature: _____ Date:_____

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E102.1.1

THERMAL PLUS INSULATION OF STATE COLLEGE
GREEN FIBER (COCOON) www.us-gf.com
CERTAINTEED www.certainteed.com
KNAUF www.KnaufUSA.com
NAHB RESEARCH CENTER
This attic has been insulated to: R: 38/19
with Knauf insulation
Residence Address: 165 steams
Builder: GEM Const
R-Value
Thickness
Bags
Sq Ft
Main Ceiling 38 13 33 1576
Garage Ceiling 19 6.75 4 528
Ceiling
Ceiling
Certification:
I certify that the residence identified was insulated as specified and the installation was conducted to conform to applicable codes, material standards and regulations.
Installer's Authorized Signature
10/16/06
Date
WHITE - THERMAL PLUS • CANARY - BUILDER • PINK - STAYS IN ATTIC
H

Roof /Ceiling Insulation

E102.1.1.1

If blown in or sprayed on:

- Besides Certificate from insulation installer
  - Thickness displayed on markers
    - Every 300 ft^2
    - Minimum installed thickness
    - Numbers $\geq$ 1″ high
    - Must face attic access opening

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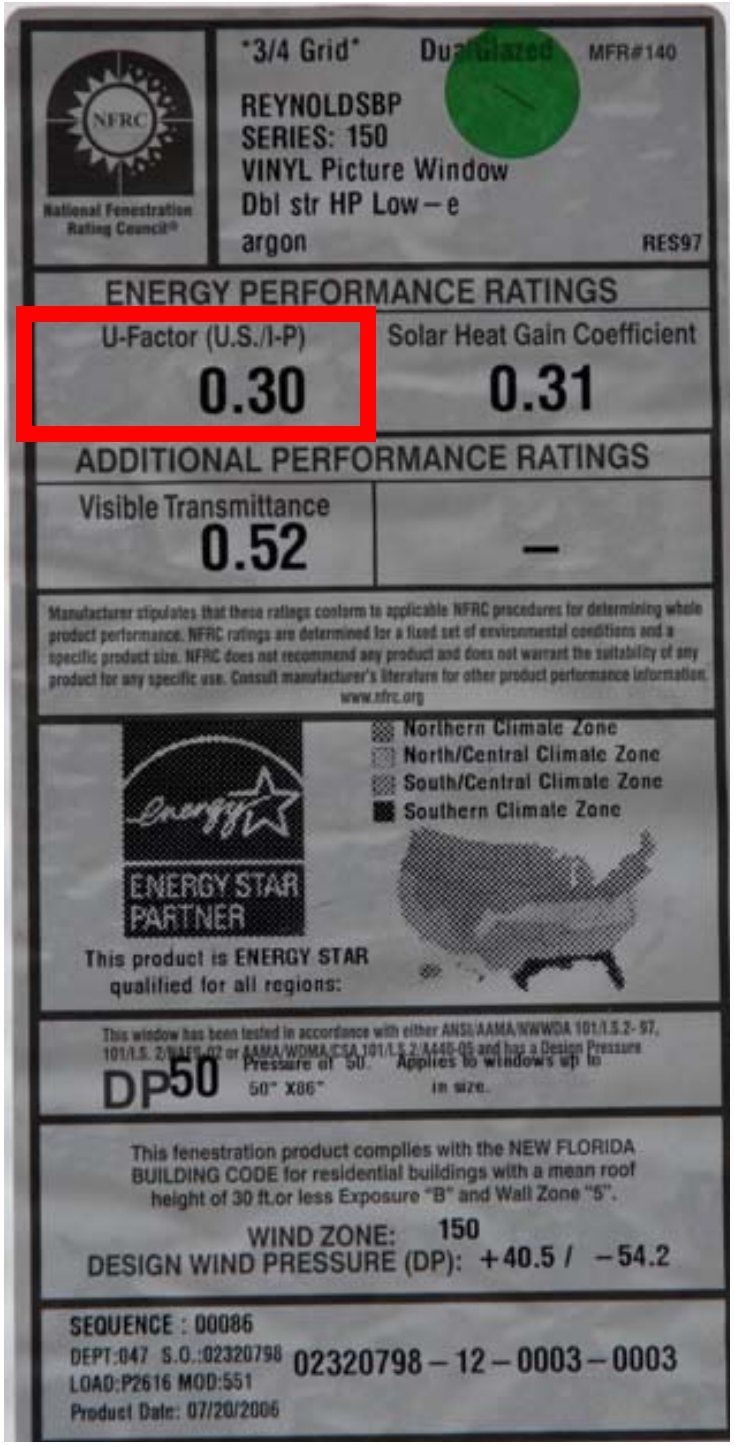
Fenestration rating & labeling

E102.1.3

- **U-factors** of all fenestration must be certified & labeled by manufacturer in accordance with NFRC 100
- Windows lacking NFRC 100 label:
  - Must comply with Default Table 102.1.3(1)
- Doors lacking NFRC 100 label:
  - Must comply with Default Table 102.1.3.(2)

PHRC



"3/4 Grid" Dual Glazed MFR#140

REYNOLDSBP
SERIES: 150
VINYL Picture Window
Dbl str HP Low-e
argon

RES97

National Fenestration Rating Council®

ENERGY PERFORMANCE RATINGS

U-Factor (U.S./I-P)	Solar Heat Gain Coefficient
0.30	0.31

ADDITIONAL PERFORMANCE RATINGS

Visible Transmittance	
0.52	—

Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information.
www.nfrc.org

ENERGY STAR PARTNER

This product is ENERGY STAR qualified for all regions:

Northern Climate Zone
North/Central Climate Zone
South/Central Climate Zone
Southern Climate Zone

This window has been tested in accordance with either ANSI/AAMA/NWWDA 101/I.S.2- 97, 101/I.S. 2/NAFS-02 or AAMA/WDMA/CSA 101/I.S.2/A440-05 and has a Design Pressure of 50. Applies to windows up to 50" X86" in size.

DP50

This fenestration product complies with the NEW FLORIDA BUILDING CODE for residential buildings with a mean roof height of 30 ft.or less Exposure "B" and Wall Zone "5".

WIND ZONE: 150
DESIGN WIND PRESSURE (DP): +40.5 / -54.2

SEQUENCE : 00086
DEPT:047 S.O.:02320798
LOAD:P2616 MOD:551
Product Date: 07/20/2006

02320798 – 12 – 0003 – 0003

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Above code programs

E103.1.1

- Code official may accept documentation from an approved energy efficiency program as proof of compliance with the IECC
- These may be local, state or national programs that exceed the IECC requirements when complied with properly

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Above code programs

Examples of above code programs that could be considered

- US EPA Energy Star
- US DOE Building America
- Masco – Environments for Living

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Construction documents

E104.2

- Design Criteria (Compliance Path)
- Nature & extent of proposed work
- Envelope Component Materials
- U-factors of Envelope System and Fenestration Products
- R-values of insulation materials
- Equipment Sizing, Efficiencies and Controls
- Duct location, sealing & insulation
- Air sealing details

PHRC

IECC

Chapter 2

Definitions

Chapter 2 of IECC – *Important Definitions*

REVIEW KEY DEFINITIONS: **E202**

- Above Grade Wall
- Basement Wall
- Building Thermal Envelope
- Conditioned Space (IECC – IRC – PA Alt)
- Exterior Wall
- Fenestration

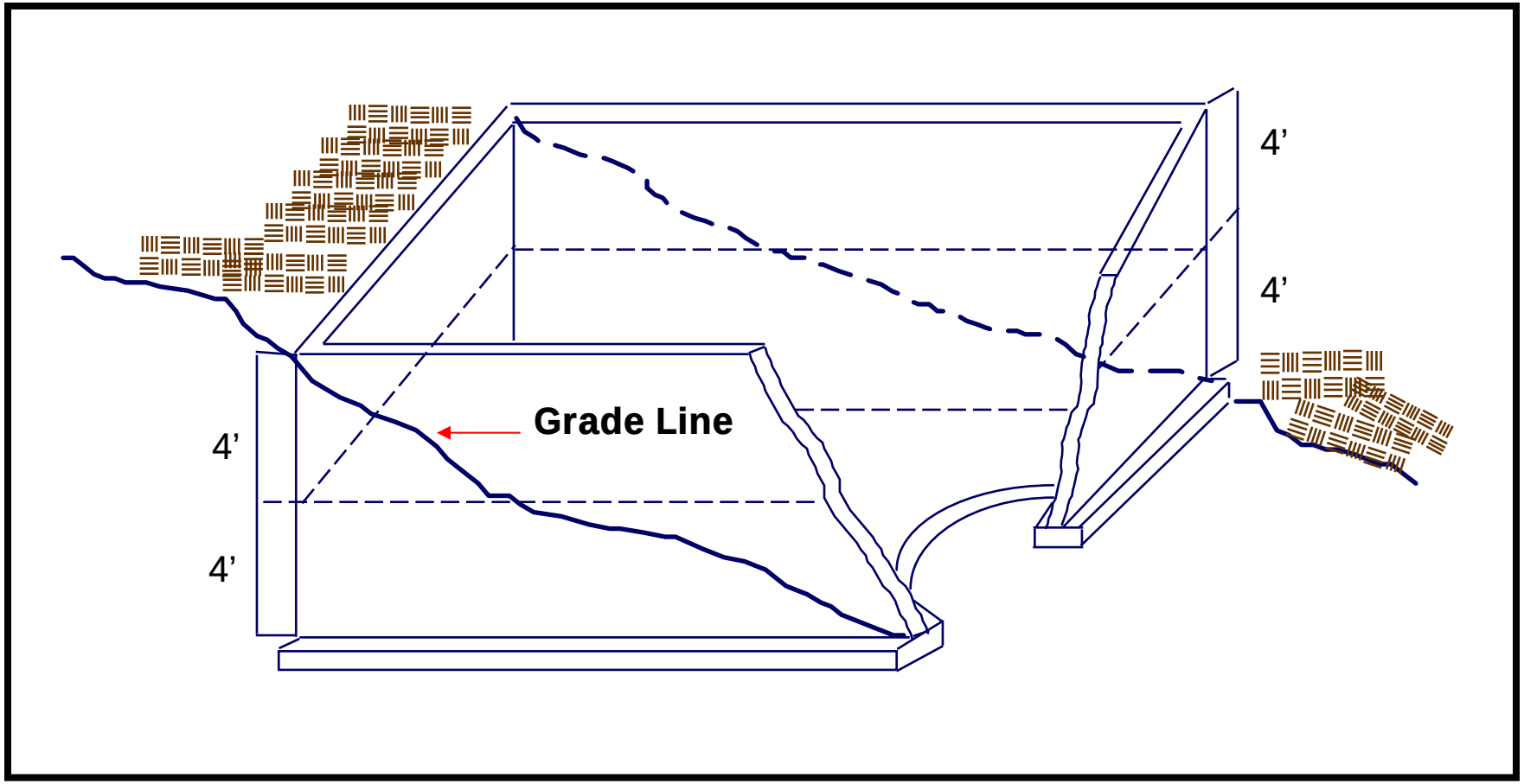
Chapter 2 of IECC – *Important Definitions*

REVIEW KEY DEFINITIONS:

E202

- Heated Slab
- R-Value / U-value
- Sunroom
- Thermal Isolation

Which of these walls are considered Basement walls? Above-grade walls?



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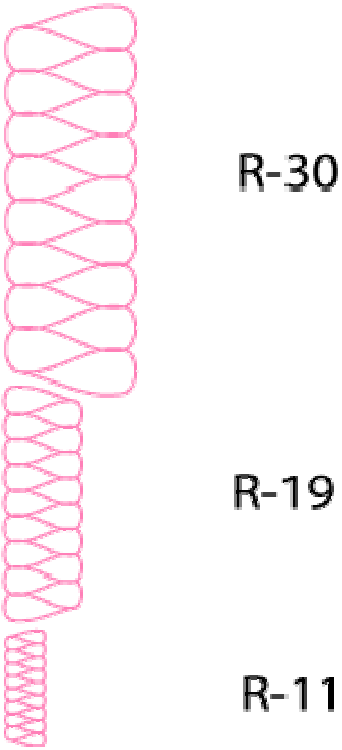
R-Values

E202

- Thermal resistance to heat flow
- The larger the number the better



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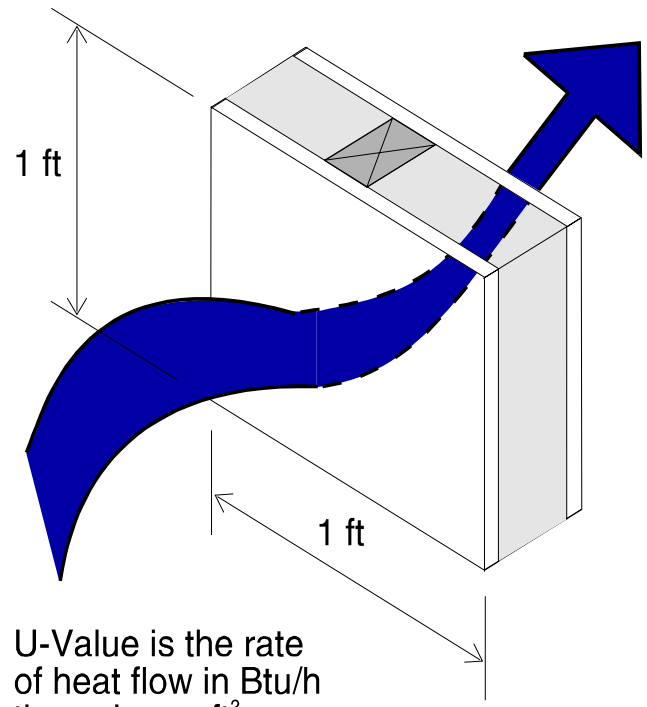
U-Factors

- Thermal Transmittance
- The amount of heat in Btu (British thermal units) that flows each hour through o square foot, when there is 1ºF temperature differenc across the surface
- The smaller the number th better

$$U\text{-}Factor = \frac{1}{R\text{-}Value}$$

E202



U-Value is the rate of heat flow in Btu/h through one ft^2 area when one side is 1° F warmer

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R–Values & U-factors

R - values

5	10	15	20	25	30	35	40
0.200	0.100	0.067	0.050	0.040	0.033	0.029	0.025

U - factors

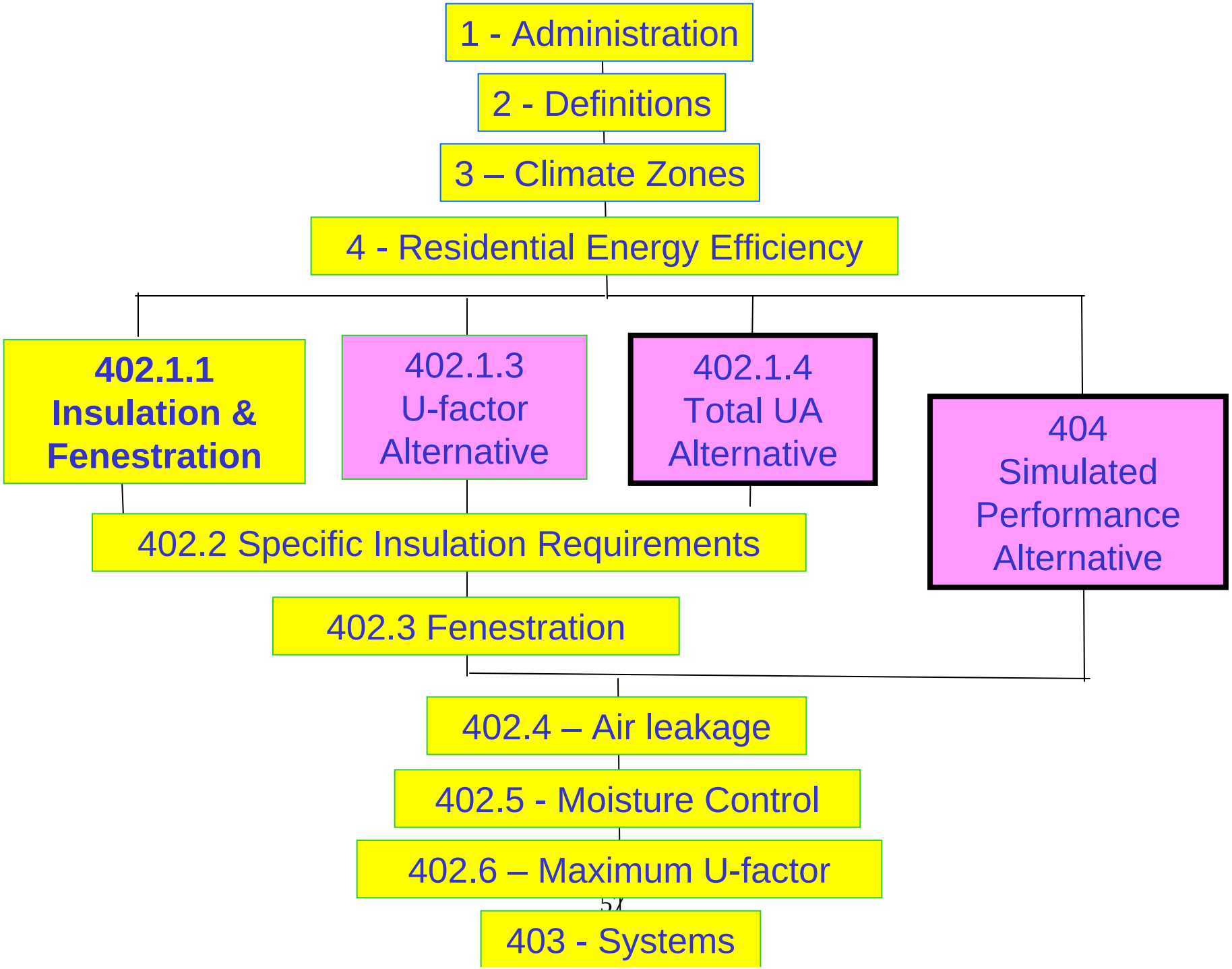
R - values

1	2	3	4	5
1.000	0.500	0.333	0.250	0.200

U - factors

IECC Chapter 4

Compliance Options


1 - Administration
2 - Definitions
3 – Climate Zones
4 - Residential Energy Efficiency
402.1.1 Insulation & Fenestration
402.1.3 U-factor Alternative
402.1.4 Total UA Alternative
404 Simulated Performance Alternative
402.2 Specific Insulation Requirements
402.3 Fenestration
402.4 – Air leakage
402.5 - Moisture Control
402.6 – Maximum U-factor
403 - Systems

Certificate

Permanent certificate required on or in electrical panel listing installed:

- Roof/ceiling R-value
- Wall R-value
- Foundation (wall, slab, crawlspace floor)
- Ducts outside conditioned spaces
- Fenestration U-value/ SHGC

E401.3

If more than one value is used for a component, the predominant value should be listed.

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2006 IECC Energy Efficiency Certificate

Insulation Rating	R-Value	
Ceiling / Roof	38.00	
Wall	19.00	
Floor / Foundation	30.00	
Ductwork (unconditioned spaces):	_____	
Glass & Door Rating	**U-Factor**	**SHGC**
Window	0.35	0.60
Door	0.23	NA
Heating & Cooling Equipment	**Efficiency**	
Forced Hot Air Furnace	90 AFUE	
Water Heater:_____	_____	

Name: _____ Date: _____

Comments:

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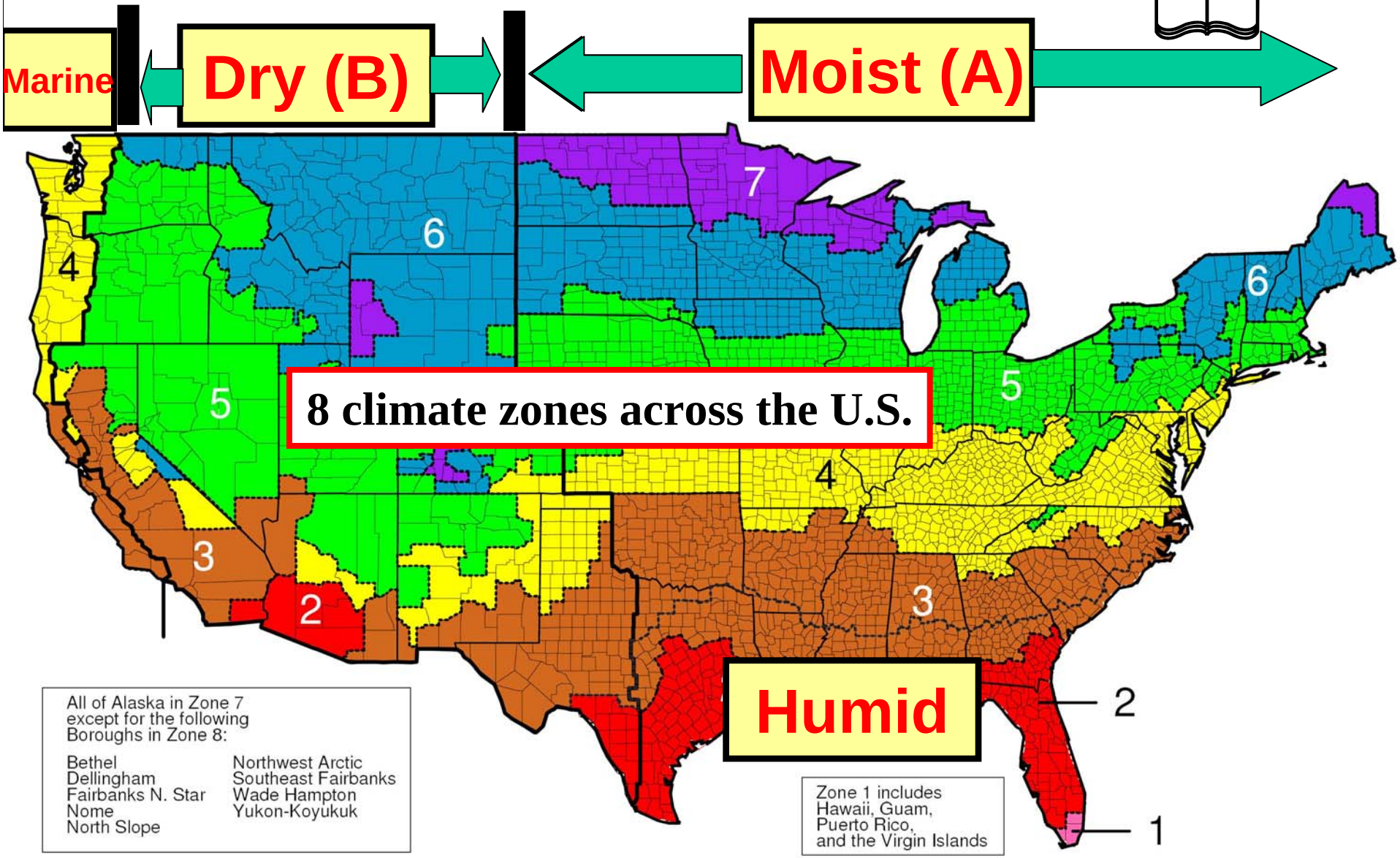
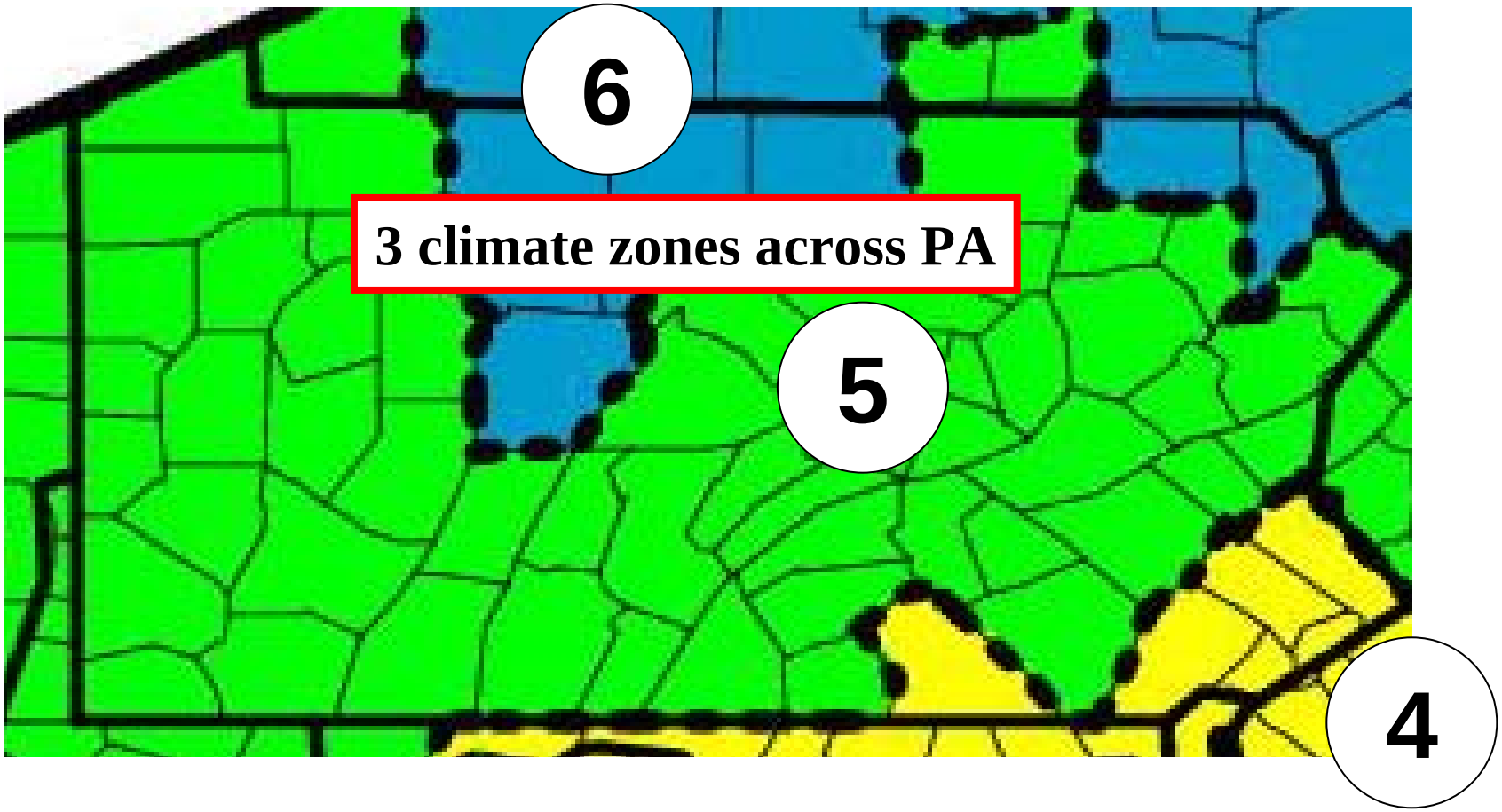
Building Thermal Envelope

2006 ICC National Climate Zones

Figure/Table E301.3.1



2006 ICC PA Climate Zones



Prescriptive component approach

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Table 402.1.1

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	13	5	19	0	0	5 / 13
4 except Marine	0.40	0.60	NR	38	13	5	19	10 / 13	10, 2 ft	10 / 13
5 and Marine 4	0.35	0.60	NR	38	19 or 13+5[g]	13	30[f]	10 / 13	10, 2 ft	10 / 13
6	0.35	0.60	NR	49	19 or 13+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]	10 / 13	10, 4 ft	10 / 13

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Thermal envelope summary - Pennsylvania

	2006 IECC		
	Zone 4	Zone 5	Zone 6
Wall (R-value)	R-13	19, 13+5	19, 13+5
Windows (U-factor)	**0.40** [5,6]	**0.35** [5,6]	0.35 [5,6]
Skylights (U-factor)	0.60	0.60	0.60
Doors (U-factor)	0.40 [7]	0.35 [7]	0.35 [7]
Ceiling – open attic (R-value)	38/30	38/30	49/38
Ceiling – cathedral R-value)	30 [1]	30 [1]	30 [1]
Floor (R-value)	19	30 [2]	30 [2]
Slab (R-value)	**10@2ft** [8]	10@2ft [8]	10@4ft [8]
Basement wall (R-value)	10 [3]/13 [4]	10 [3]/13 [4]	10 [3]/13 [4]
Crawlspace wall (R-value)	10 [3]/13 [4]	10 [3]/13 [4]	10 [3]/13 [4]

1. Limited to 500 ft²
2. Can be reduced to depth of joist – R-19 minimum.
3. Continuous insulation
4. Stud bay insulation
5. Area weighted average U-factor
6. Allowable exception of 15ft²
7. One door is exempt
8. Add R-5 for heated slab.

Values from: Table E402.1.1

Computation of R-values

E402.1.2

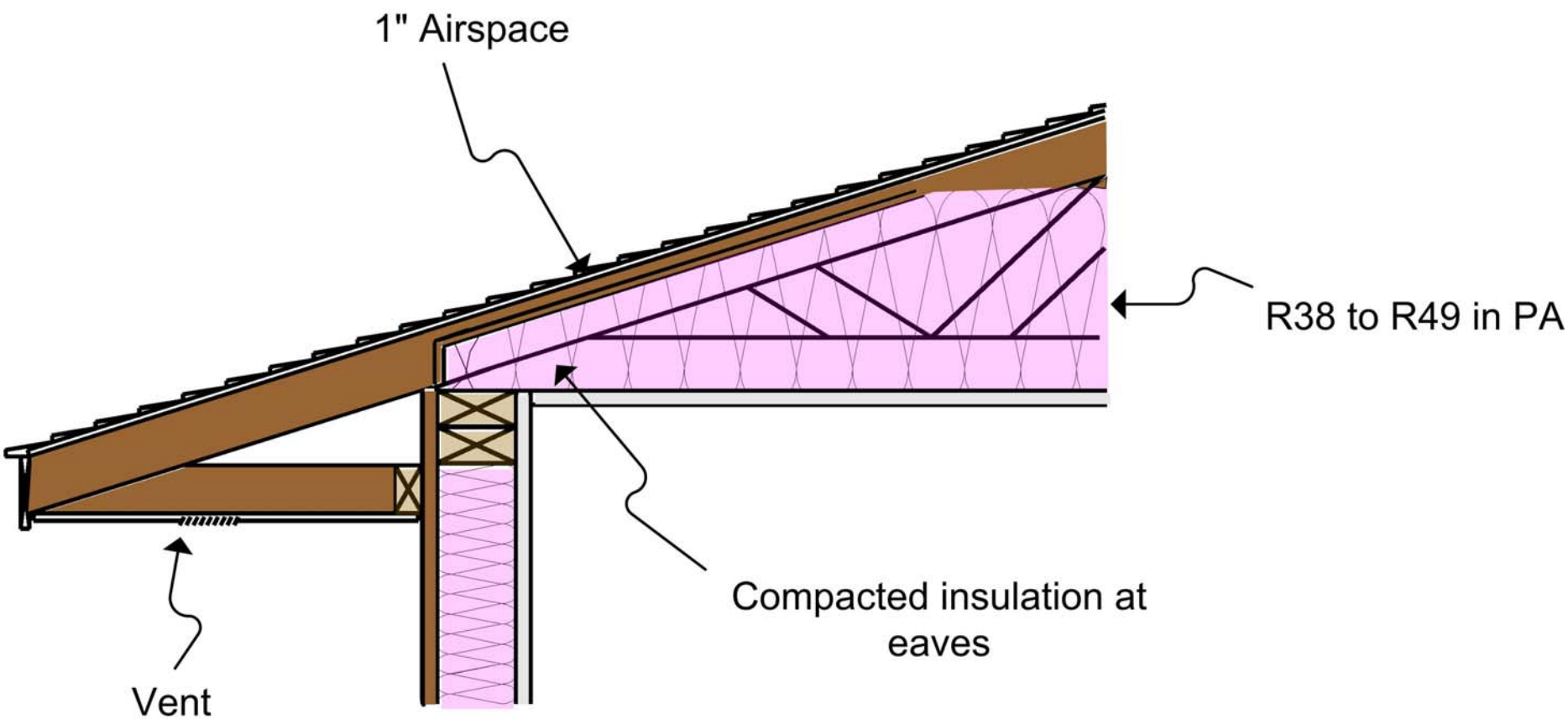
- Layered insulation can be summed to find the total

  Example: Cavity insulation & insulating sheathing

- Manufacturer's settled R-value for blown in insulation

- Other building materials and air films shall **NOT** be used in computing R-values of building assemblies

Typical insulation practice on low-slope roofs



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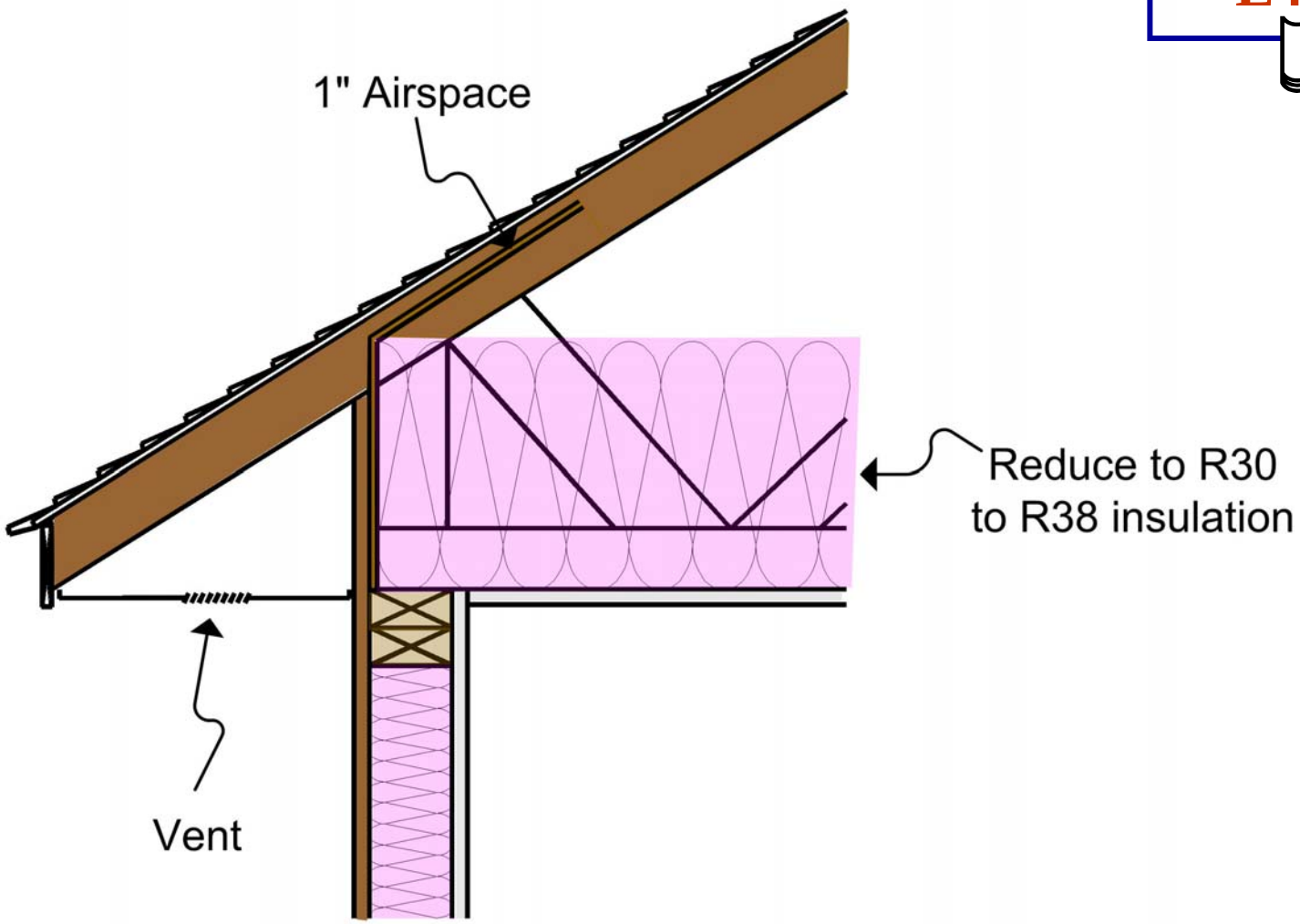
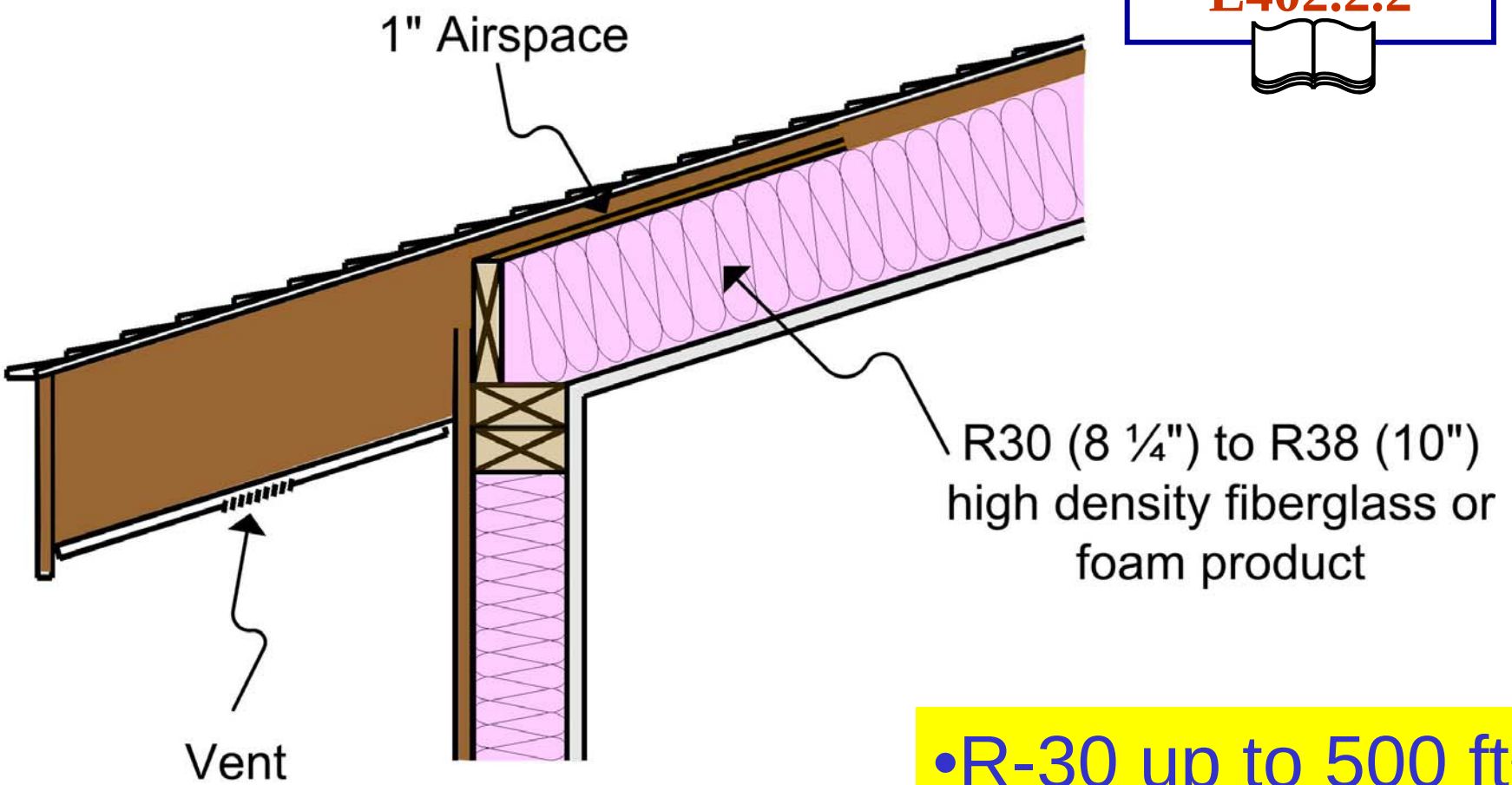
Reduced insulation is full depth over top plate

E402.2.1



Cathedral ceiling

E402.2.2



- R-30 up to 500 ft^2
- PA-Alt R-30.

Mass Wall R-value

E402.2.3

Where should the insulation be placed?

- ≥ 50% of insulation R-value must be placed on the exterior of or integral to the mass wall

Mass shall systems that cannot meet this requirement

- Must meet the wood frame wall R-value requirement

Mass Wall - Examples

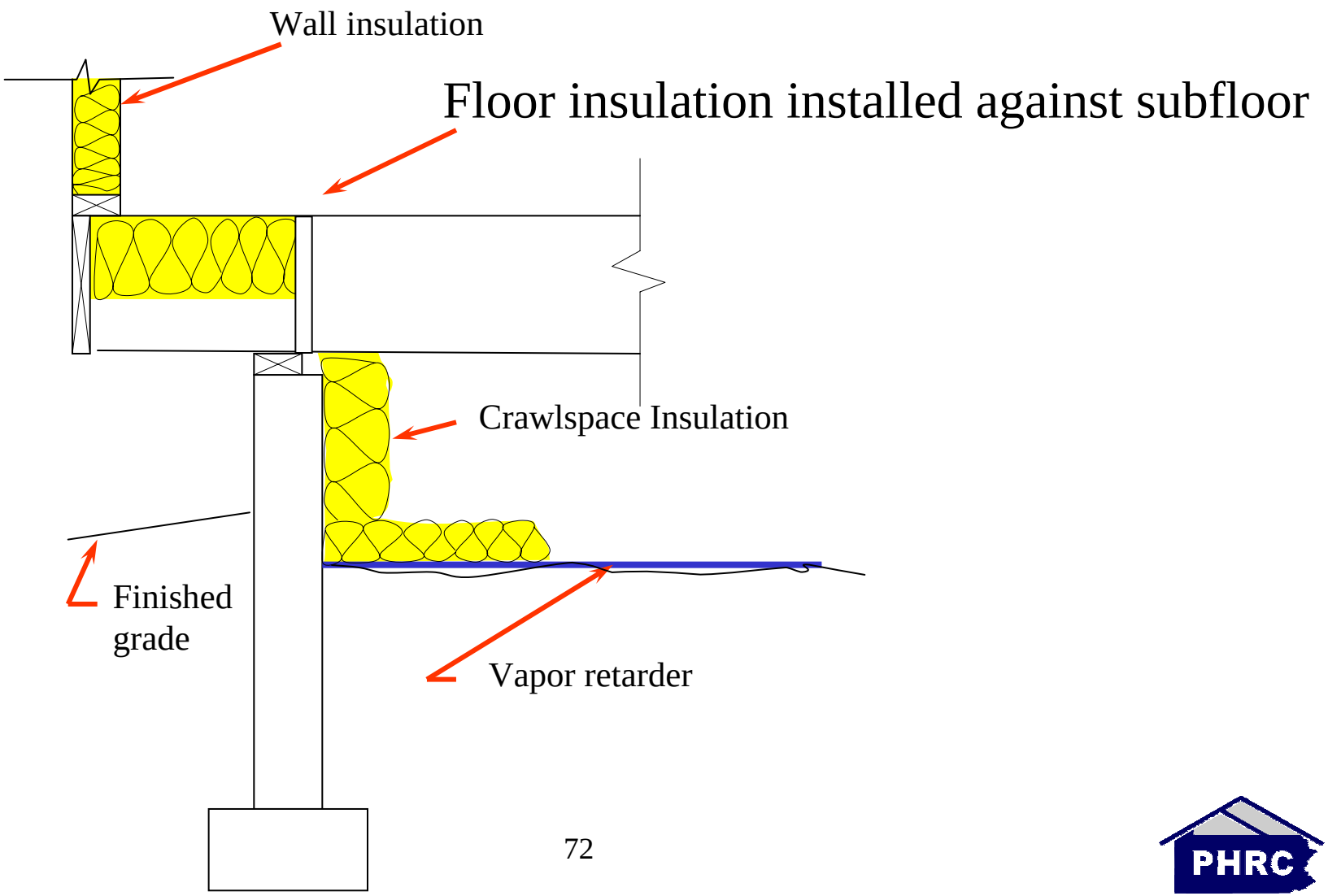
E402.2.3

Above-grade walls constructed of:

- Concrete block
- Concrete
- Insulated concrete forms (ICF)
- Masonry cavity
- Brick
- Earth (e.g. rammed earth, adobe)
- **Solid logs/timber**

Insulation of floor overhang

H



PHRC

Basement walls

- If basement is **conditioned**, walls must insulate to Table 402.1.1

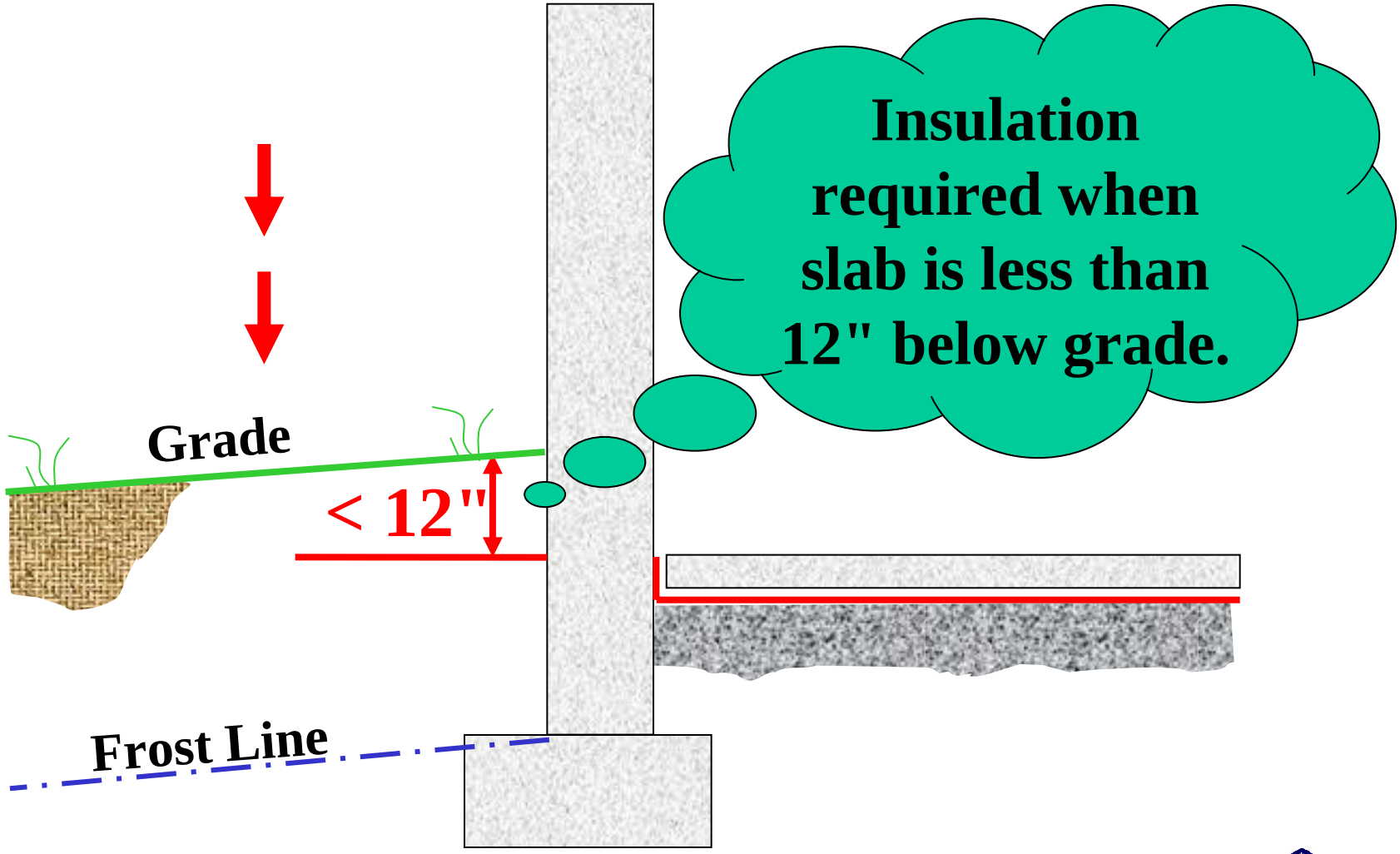
E402.2.5

- If basement is **unconditioned**, walls or floor above and stair walls must be insulated to Table 402.1.1

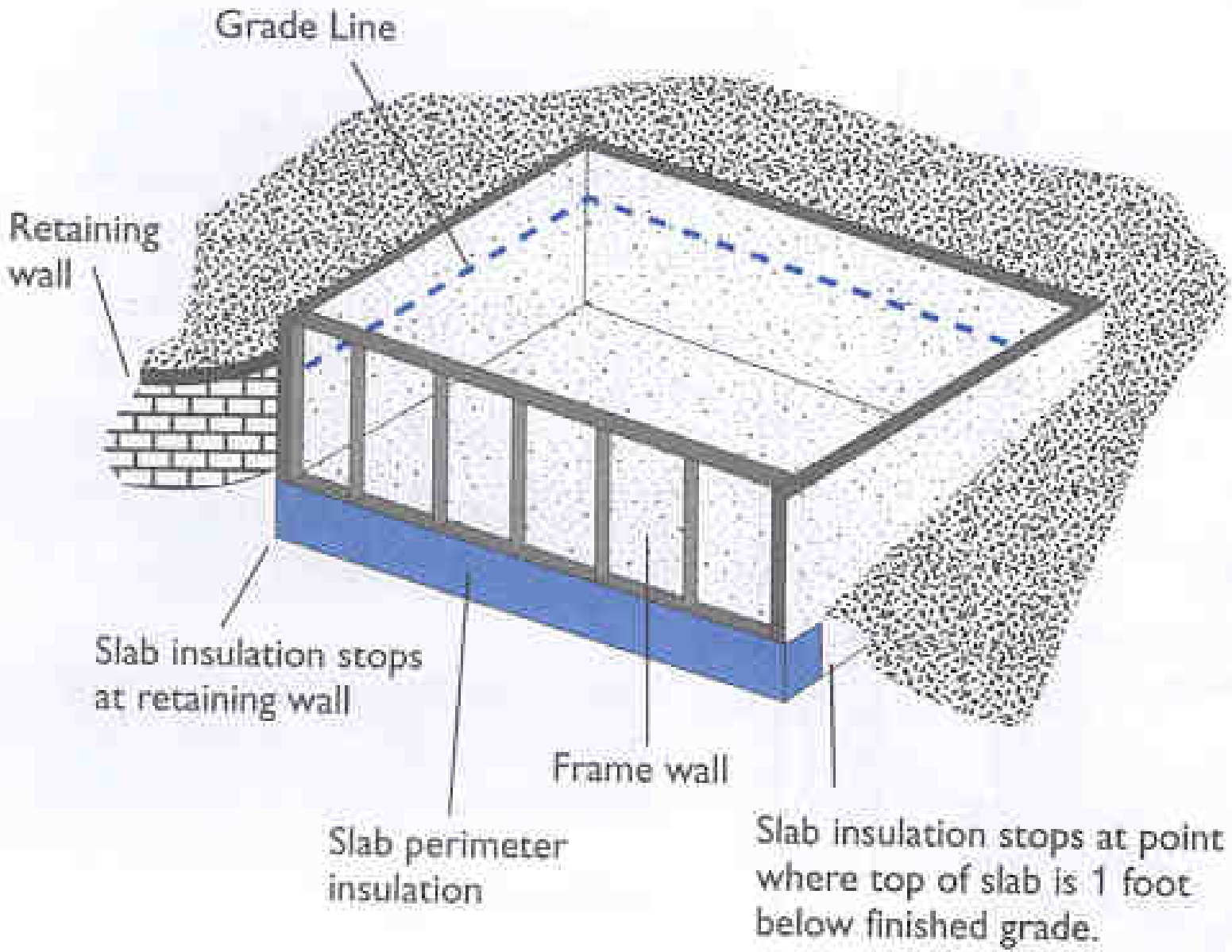
Where basement walls are insulated, the insulation must be applied from the top of the wall to a depth of 10 feet or the basement floor, whichever is less

PHRC

Slabs – When is insulation required?

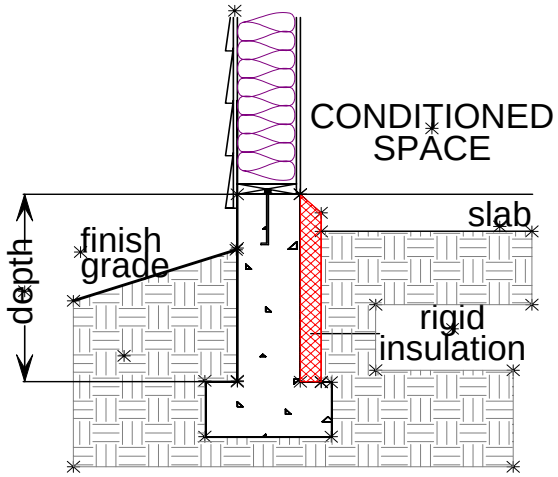


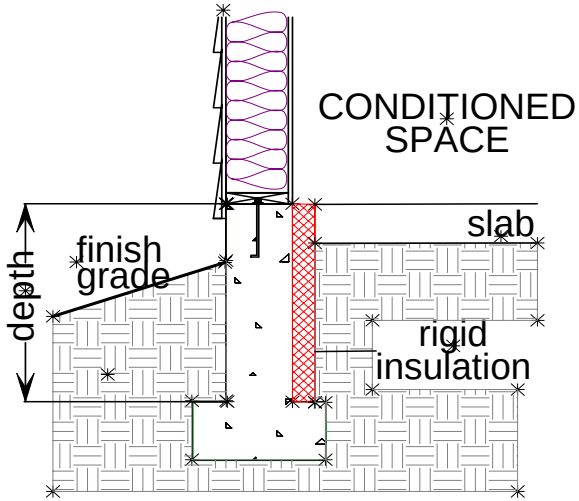
Slabs – When is insulation required?

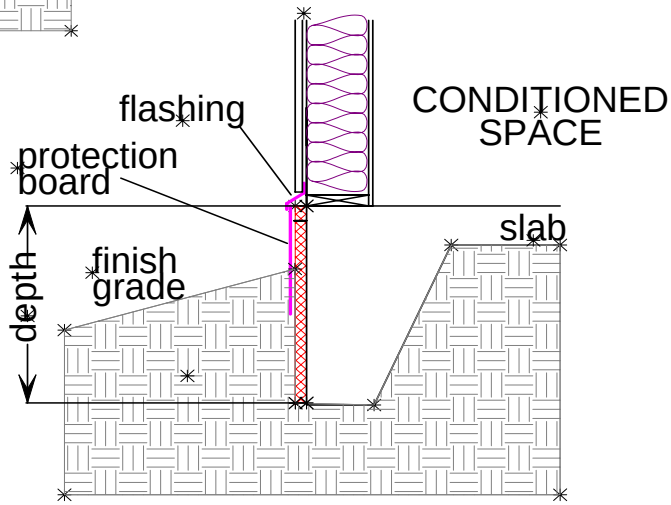


Slab-edge insulation examples

E402.2.7







Crawl Space
H

Thermally isolated sunroom insulation

E402.2.10

- Sunrooms that cannot meet requirements in Table 402.1.1 must be thermally isolated
  - Ceiling Insulation
    - Minimum R-19 Zones 1-4
    - Minimum R-24 Zones 5-8
  - Wall Insulation
    - Minimum R-13 All zones
  - New walls separating sunroom from conditioned space must meet building envelope requirements

PHRC

Sunrooms

E402.3.5

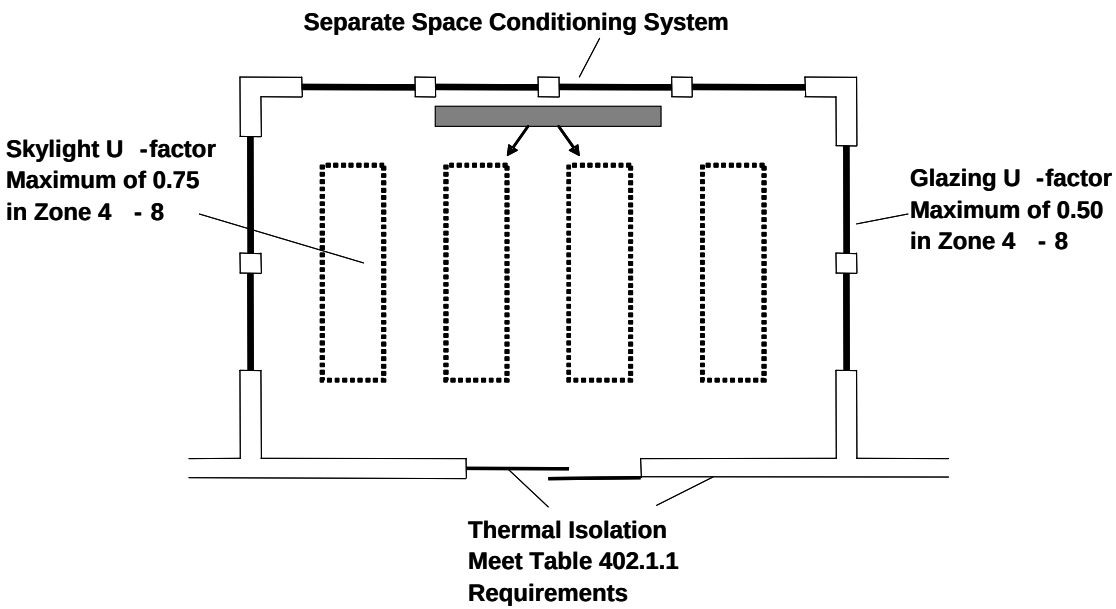
What is a Sunroom?

- One story attached structure
- >40% of gross wall and roof area in glazing

- Two options for sunroom compliance
  - **Compliance Option 1**: Meet all of the requirements applicable to the structure from Table 402.1.1
  - Includes window U-factor and SHGC

Sunrooms

E402.3.5



Compliance Option 2:
Meet the requirements for thermal isolation and thermally isolated sunroom U-factor

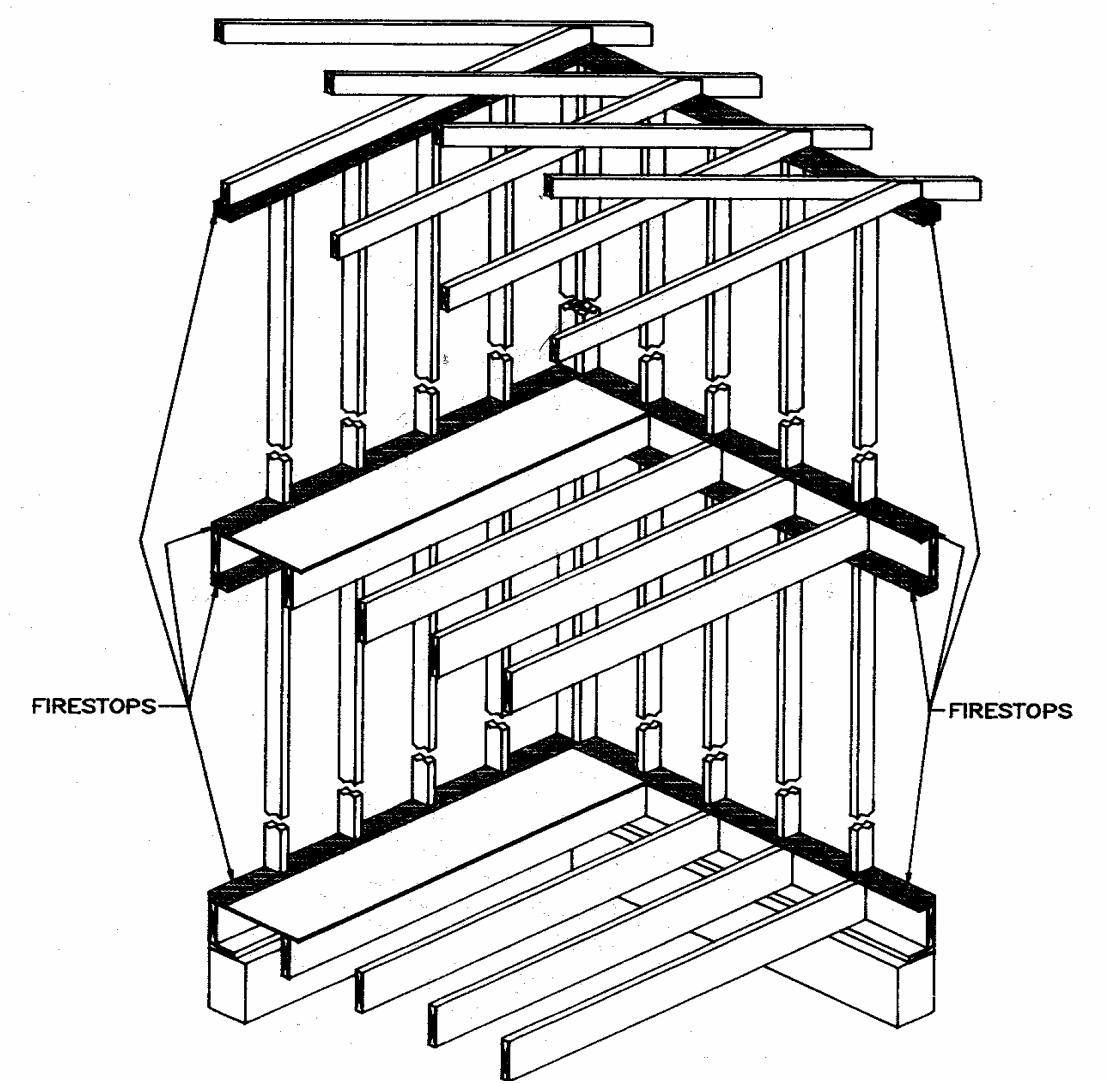
- **Thermal isolation** – condition the sunspace by separate space conditioning equipment or on separate zone
- New windows and doors separating sunroom from conditioned space must meet Table 402.1.1 requirements
- Vertical fenestration U-factor ≤ 0.50 in Zones 4 through 8
- Skylight U-factor ≤ 0.75 in Zones 4 through 8

Air Leakage

The Link Between Air Sealing and Fireblocking…

…the idea is the same, but the MATERIALS are different

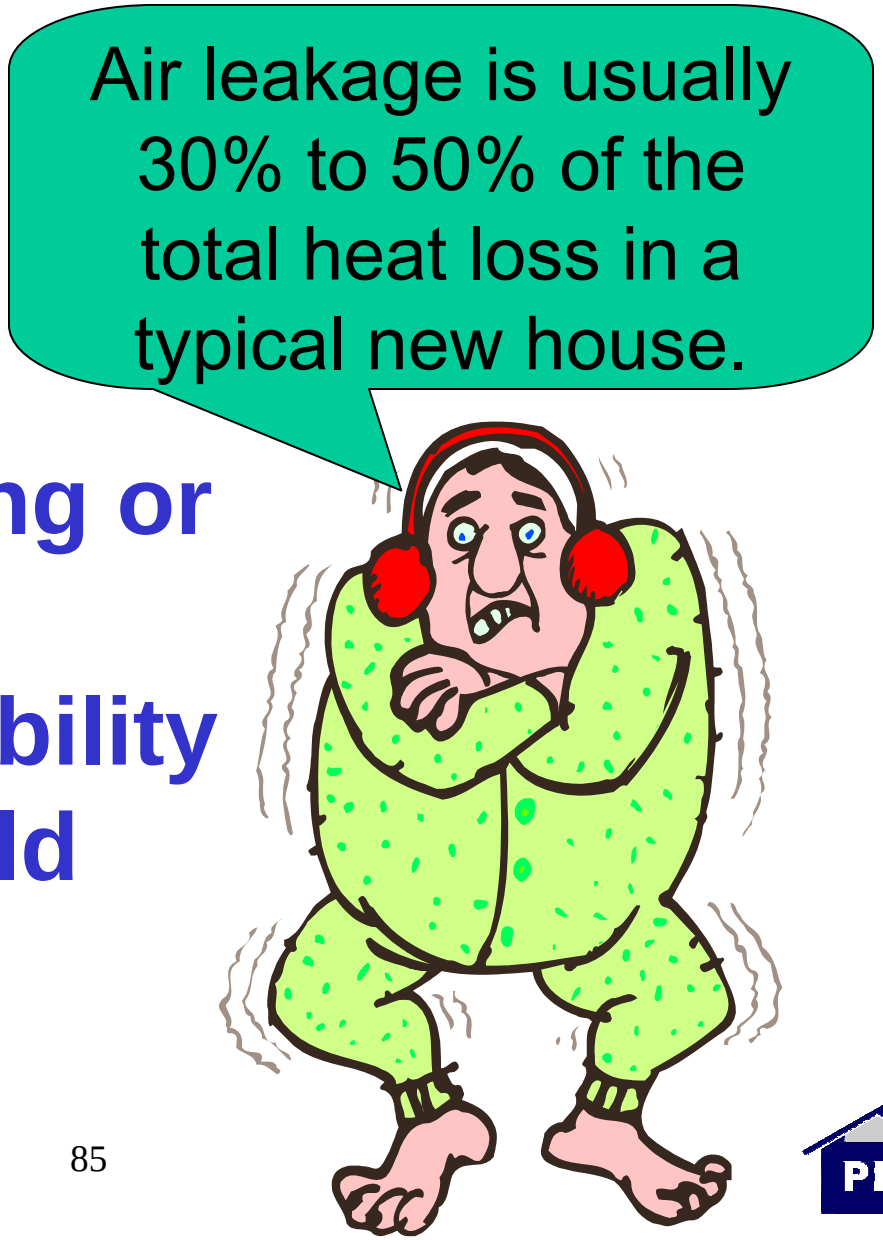
Fireblocking details



*A good job of **fireblocking** will take care of **80%** of the **air sealing!***

What makes a home uncomfortable?

- **Drafts**
- **Cold Surface Temperatures**
- **Uneven Heating or Cooling**
- **Building Durability**
- **Moisture - mold**



Air Sealing - Building Envelope

Air Leakage Controls

E402.4.1

- Building envelope shall be durably sealed to **limit infiltration**

- Air sealant materials must allow for differential expansion and contraction between dissimilar materials

Air sealant materials / methods – Building Envelope

E402.4.1

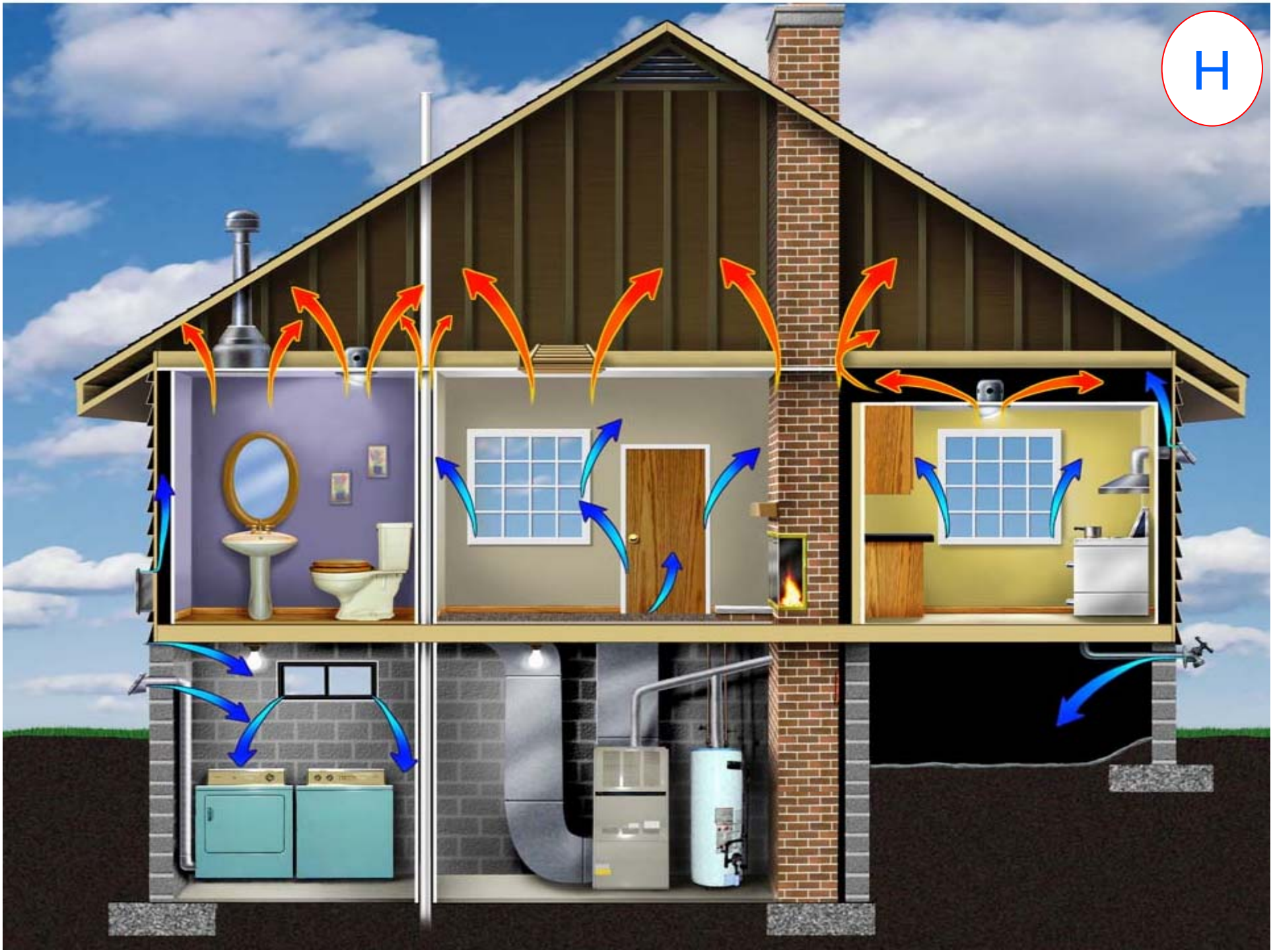
- Caulking
- Gasketing
- Weatherstripping
- Sealed with an air barrier material, suitable film or solid material
- Self sealing continuous materials - examples
  - Concrete
  - Spray Foam
  - SIPS
  - ICF

Air sealing locations – Building Envelope

E402.4.1

1. Joints, seams, penetrations
2. Site built windows & skylights
3. Between window/door assemblies & their jambs and framing
4. Utility penetrations
5. Dropped ceilings or chases adjacent to thermal envelope
6. **Knee walls**
7. **Walls / ceilings that separate a garage from conditioned spaces**
8. **Behind tubs / showers on exterior walls**
9. Common walls between dwelling units

PHRC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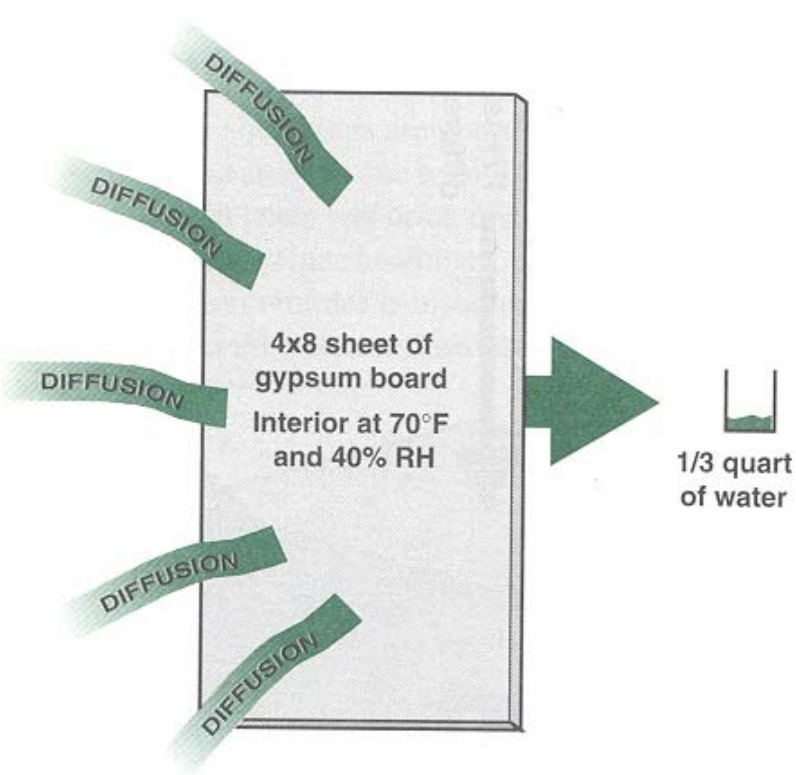
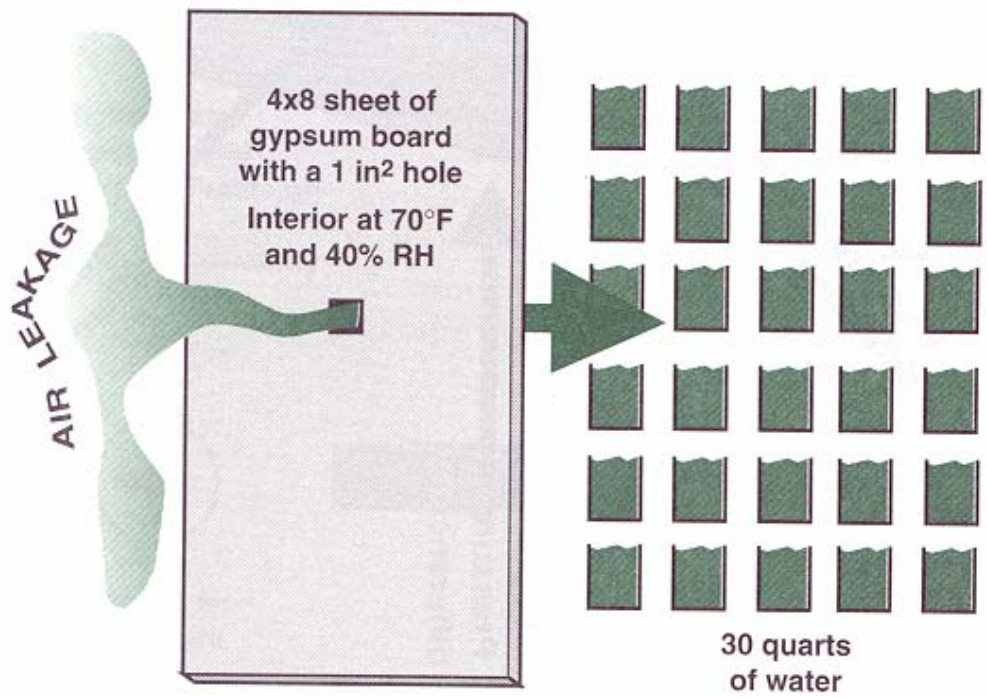
Vapor Diffusion vs. Air Leakage





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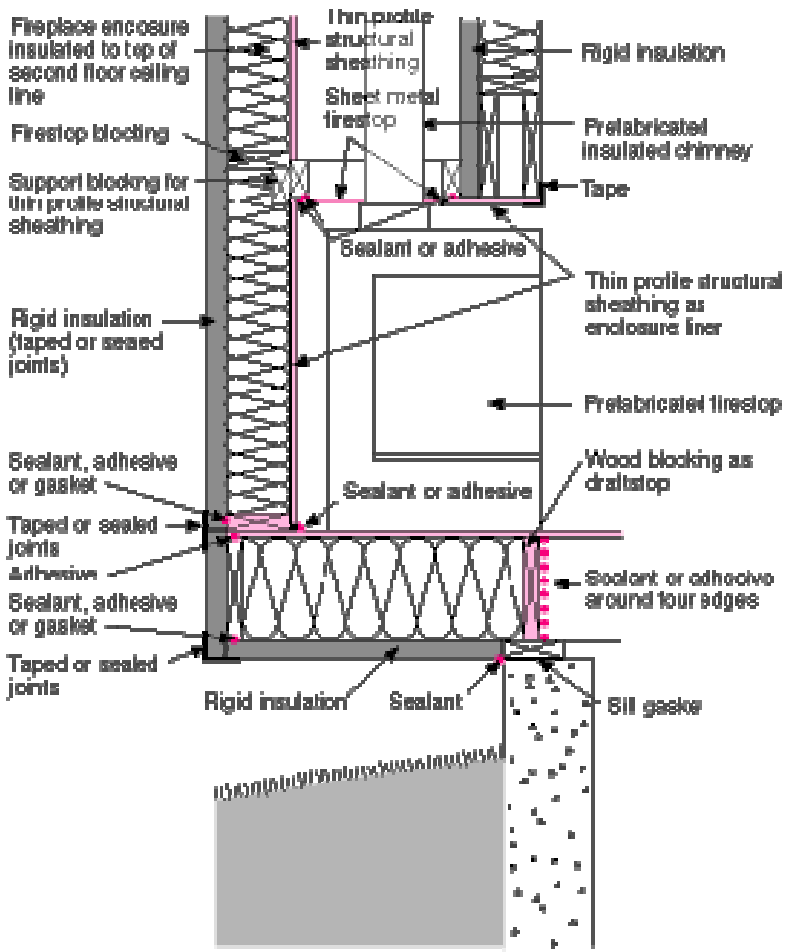
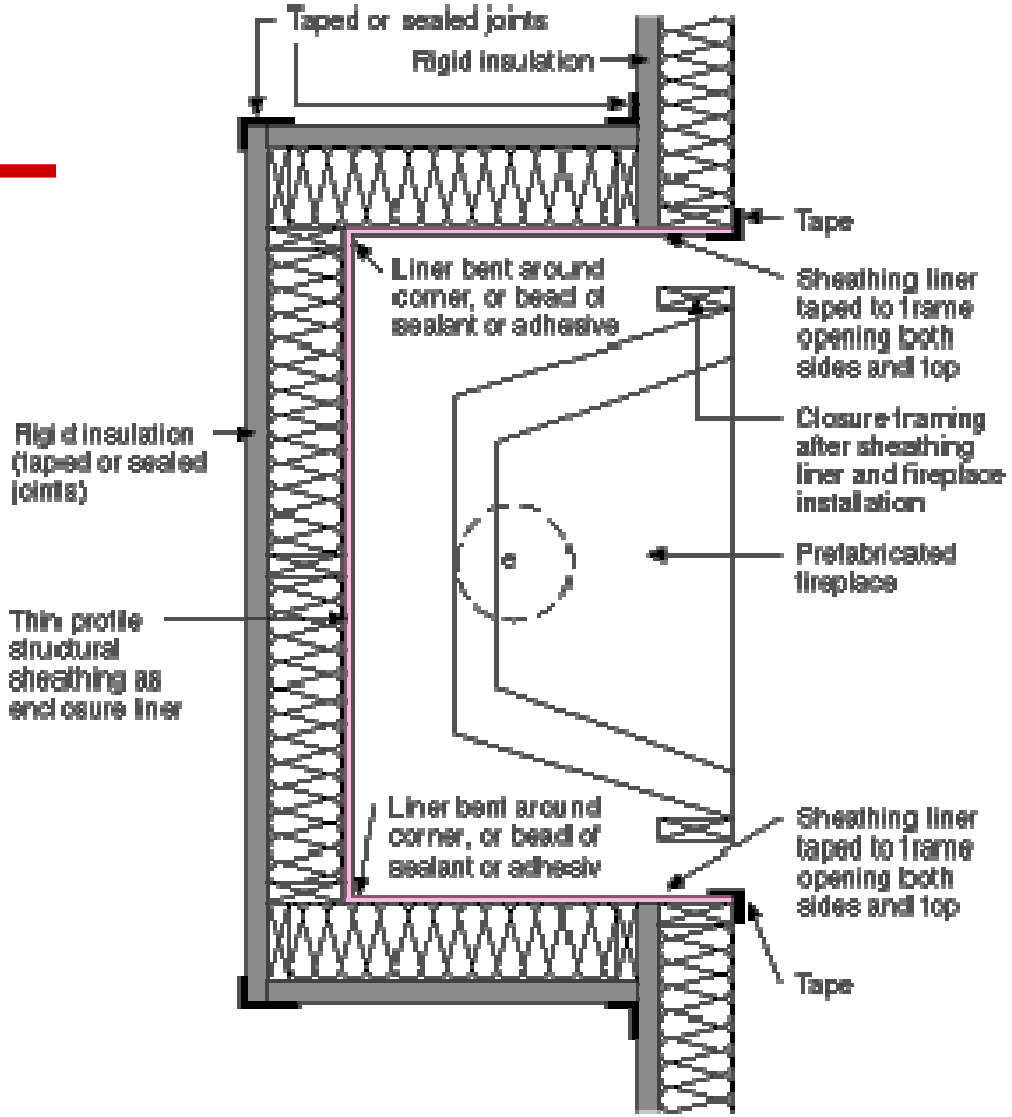
Air leakage & condensation

Ice dams

Fireplaces



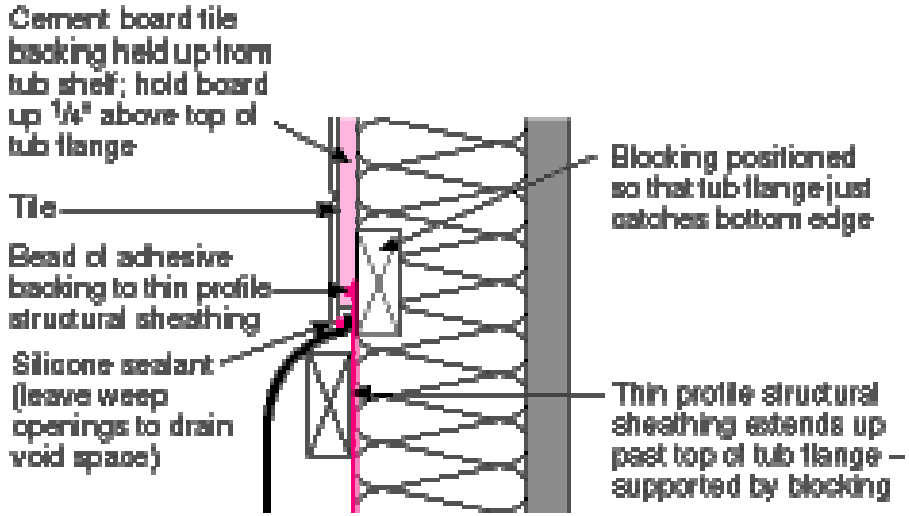


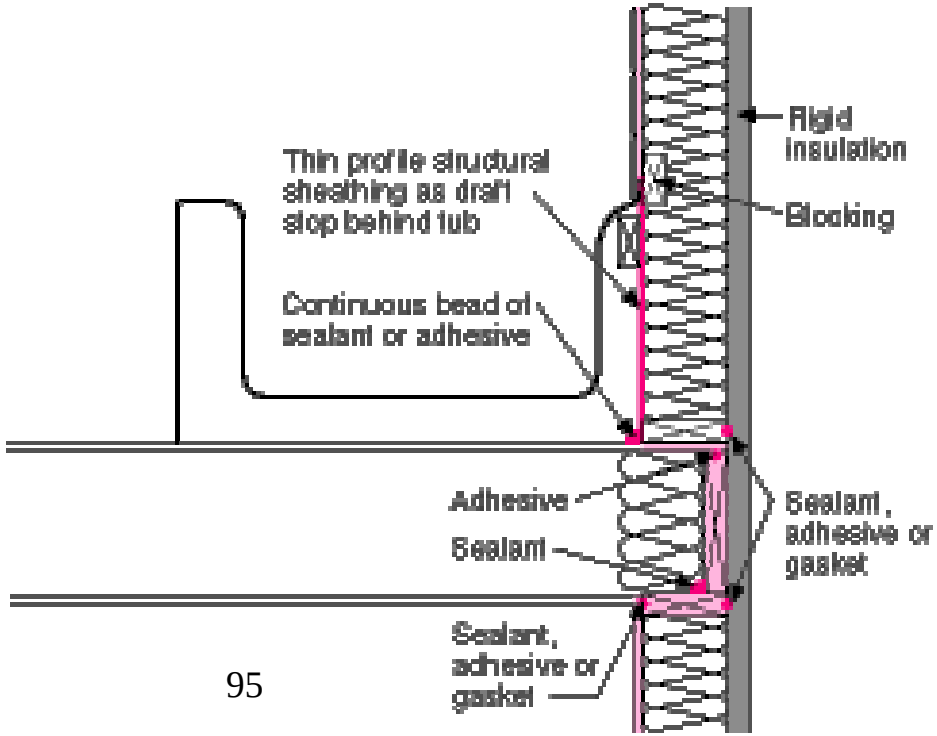
Source: www.buildingscienc.org

Fireplaces

H
LENNOX
HEARTH PRODUCTS
CAUTION : GLASS THIS SIDE
NO STANDING ON CARTON
NE PAS MONTER SUR LE CARTON
STANDING ON CARTON
AS MONTER SUR LE CARTON

Bathtubs





Source: www.buildingscienc.org

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Air barrier on the back side of a kneewall
H

Recessed lighting (Luminaires)

E402.4.3

3 Options:

1. IC-Rated and enclosed in a sealed assembly
2. IC-Rated and meeting ASTM E 283 $\leq$ 2.0 CFM leakage *(Air Tight)*
3. Non IC-Rated and located in a sealed assembly with ½" clearance from combustible assemblies and 3" from insulation

PHRC

Recessed luminaries

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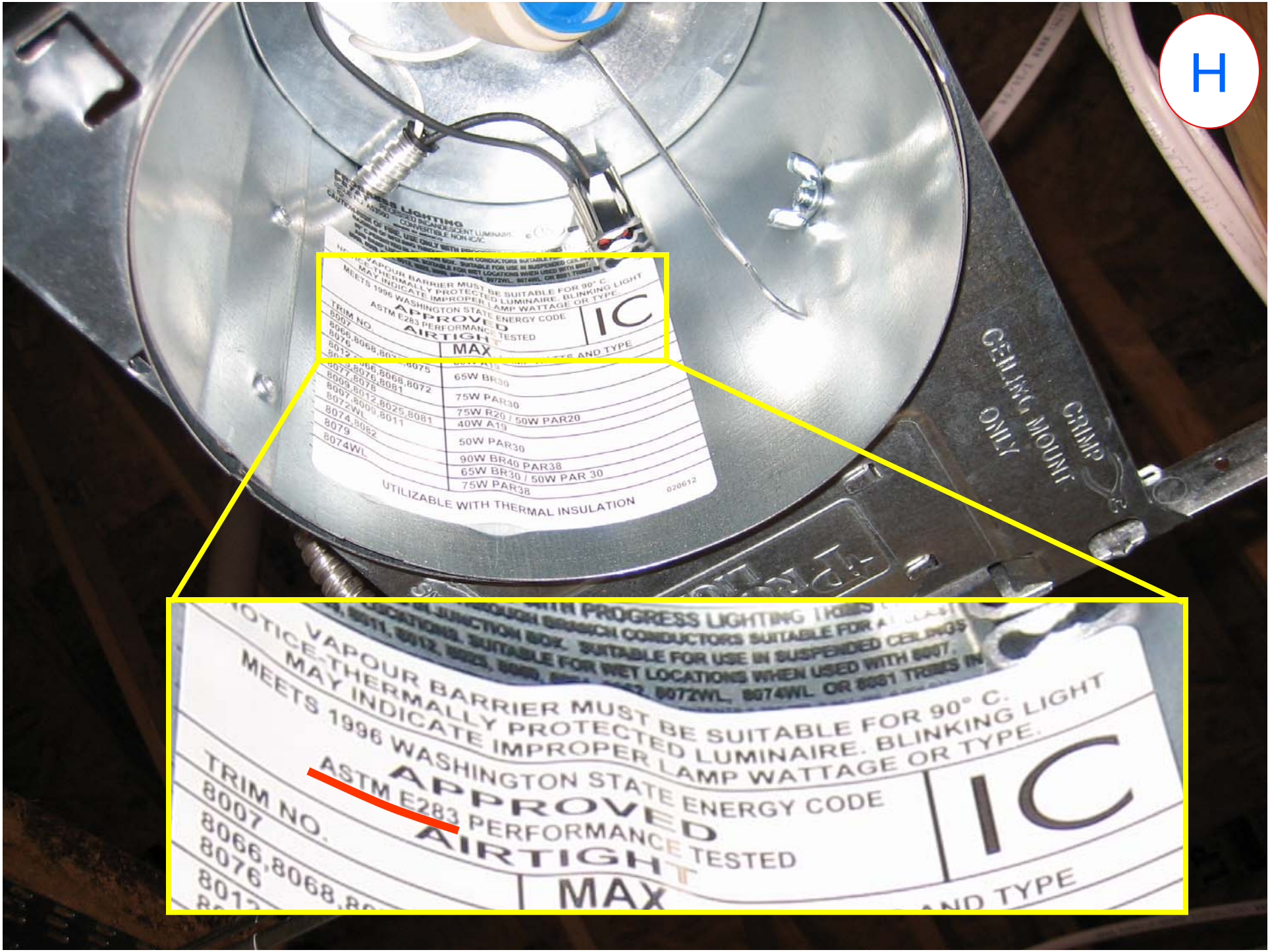
H
CRIMP
CEILING MOUNT
ONLY
VAPOUR BARRIER MUST BE SUITABLE FOR 90° C.
MAY INDICATE IMPROPER LAMP WATTAGE OR TYPE.
MEETS 1996 WASHINGTON STATE ENERGY CODE
APPROVED
ASTM E283 PERFORMANCE TESTED
AIRTIGHT
IC
TRIM NO.
8007
8066,8068,8076
MAX
65W BR30
75W PAR30
75W R20 / 50W PAR20
40W A19
50W PAR30
90W BR40 PAR38
65W BR30 / 50W PAR 30
75W PAR38
UTILIZABLE WITH THERMAL INSULATION
020612

Section 403

Mechanical and Water Heating

Duct insulation

E403.2.1

- Supply and return ducts **R-8**
- Ducts in floor trusses can be insulated to an **R-6**
- Ducts **inside the building thermal envelope** are exempt (conditioned space)

HVAC Duct Insulation

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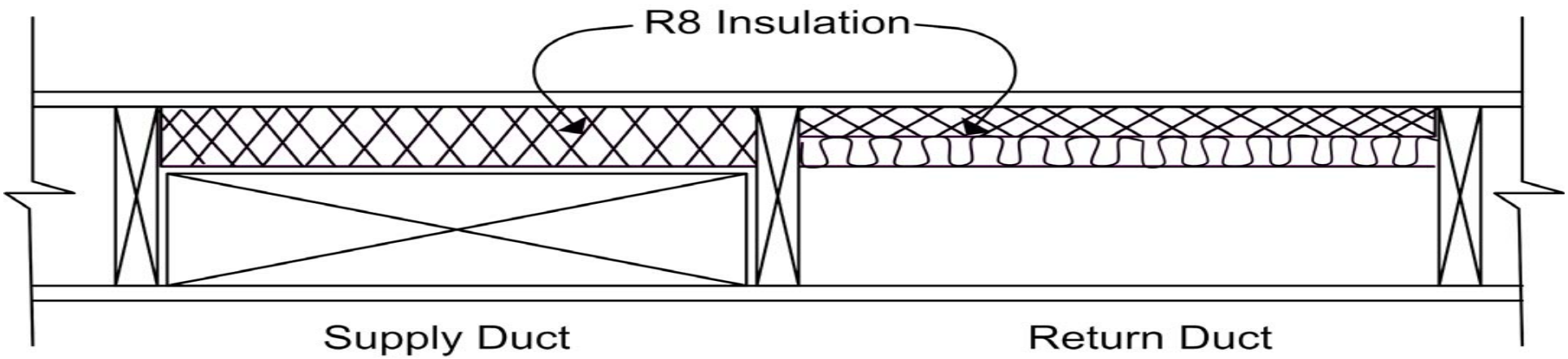
Exterior Wall Duct Detail



Duct sealing

E403.2.2

Must seal:

- Ducts
- Air Handlers
- Filter boxes
- Cavities used as return air ducts

Sealing of joints & seams must comply with

IRC 1601.3

Duct sealing

R1601.3

- Can seal with tapes, mastics, gasketing and other approved closure devices

- Rigid fibrous glass ducts
  - Pressure sensitive tapes UL 181 A “181 A-P”
  - Mastic UL 181 A “181 A-M”
  - Heat sensitive tape UL 181 A “181 A-H”

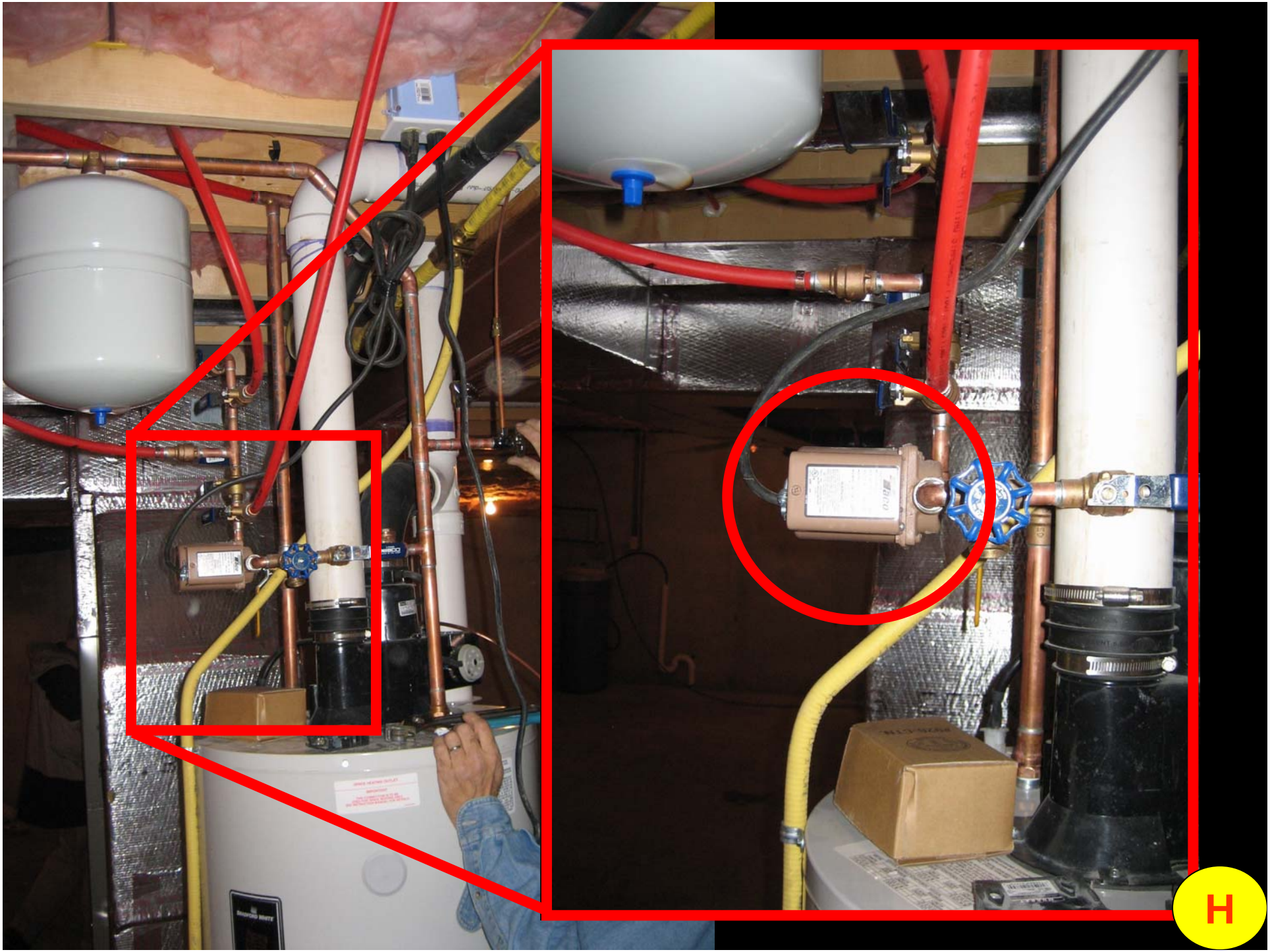
- Flexible air duct
  - Pressure sensitive tape UL 181B “181B-FX”
  - Mastic UL 181B “181B-M”

Pipe Insulation

E403.3
E403.4

Minimum R-2 required on:

1. HVAC systems (Piping with fluids <**55°F or >105°F**
2. All **circulating** domestic hot water systems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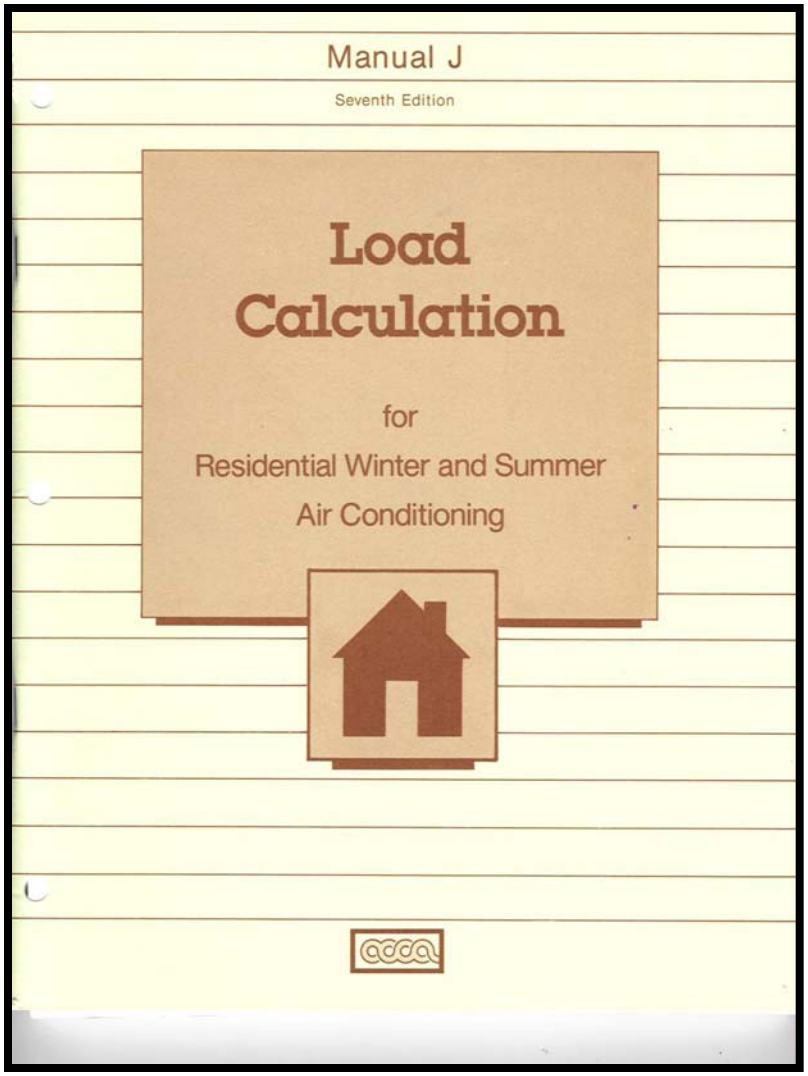
Equipment Sizing

E403.5

- Load Calculations
  - Use design conditions specified in 302.1
  - Sizing in compliance with R1401.3
  - Systems shall be sized to meet the load
  - Calculations shall be performed in accordance with ASHRAE *Handbook of Fundamentals* or other equivalent method.

PHRC

Equipment sizing



IRC-M1401.3

Heating and Cooling Equipment Shall Be Sized in Accordance With ACCA <u>Manual J</u> or Other Approved Calculation Methodologies

Section 404

Simulated Performance Alternative

Simulated Performance Alternative

E404

- Simulates the Energy Use of a Proposed Residence and Determines the Cost to Operate Annually
- Most Flexible Energy Code Compliance Approach, Accounts for:
  - House tightness
  - Heating and cooling efficiency
  - Service water heating efficiency
  - Building orientation
  - Thermal mass
  - Duct leakage

PHRC

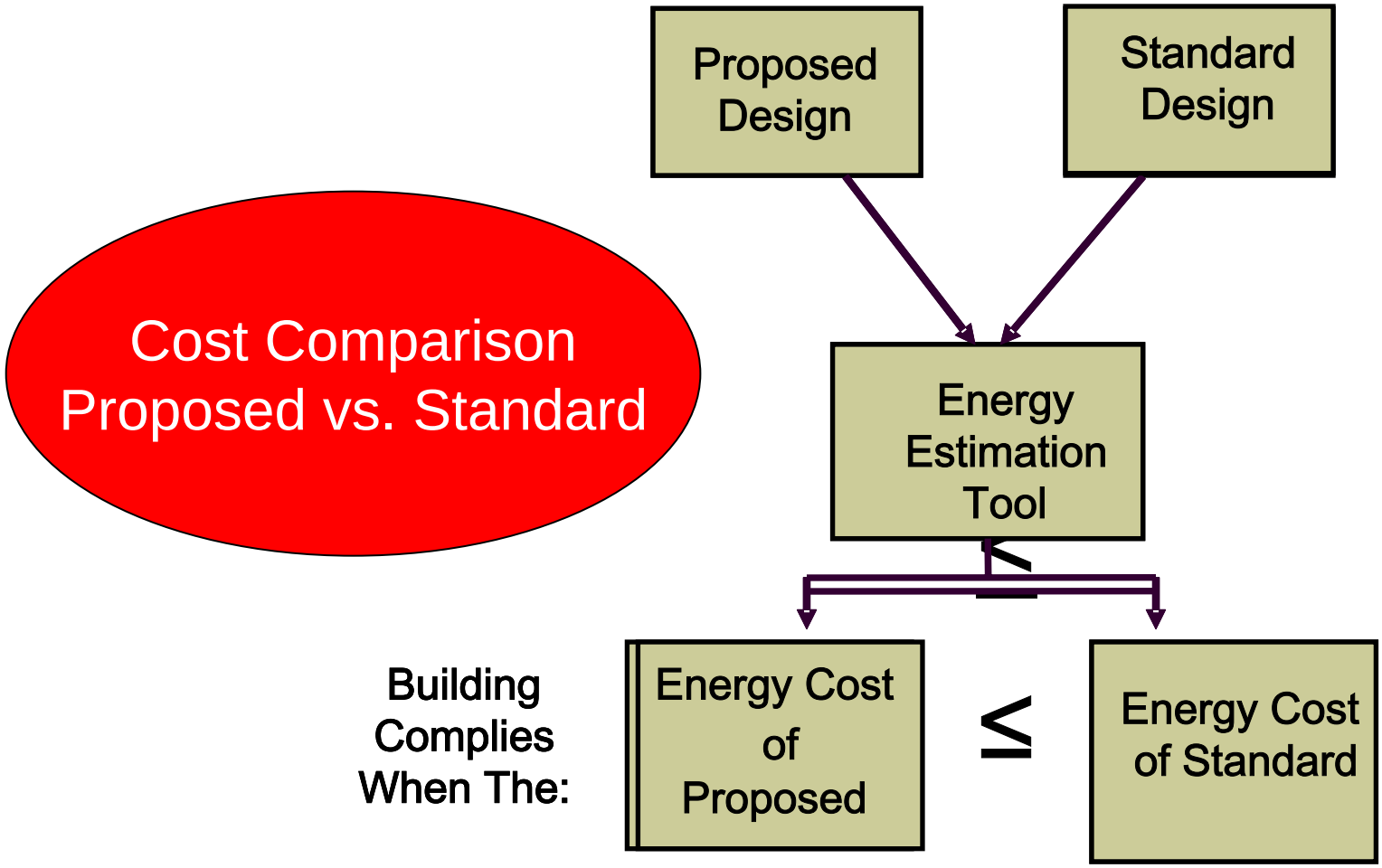
Simulated Performance Alternative

E404.1

- Simulated Energy Performance Analysis
- Analysis includes energy used for ***only:***
  - Heating
  - Cooling
  - Service Water Heating

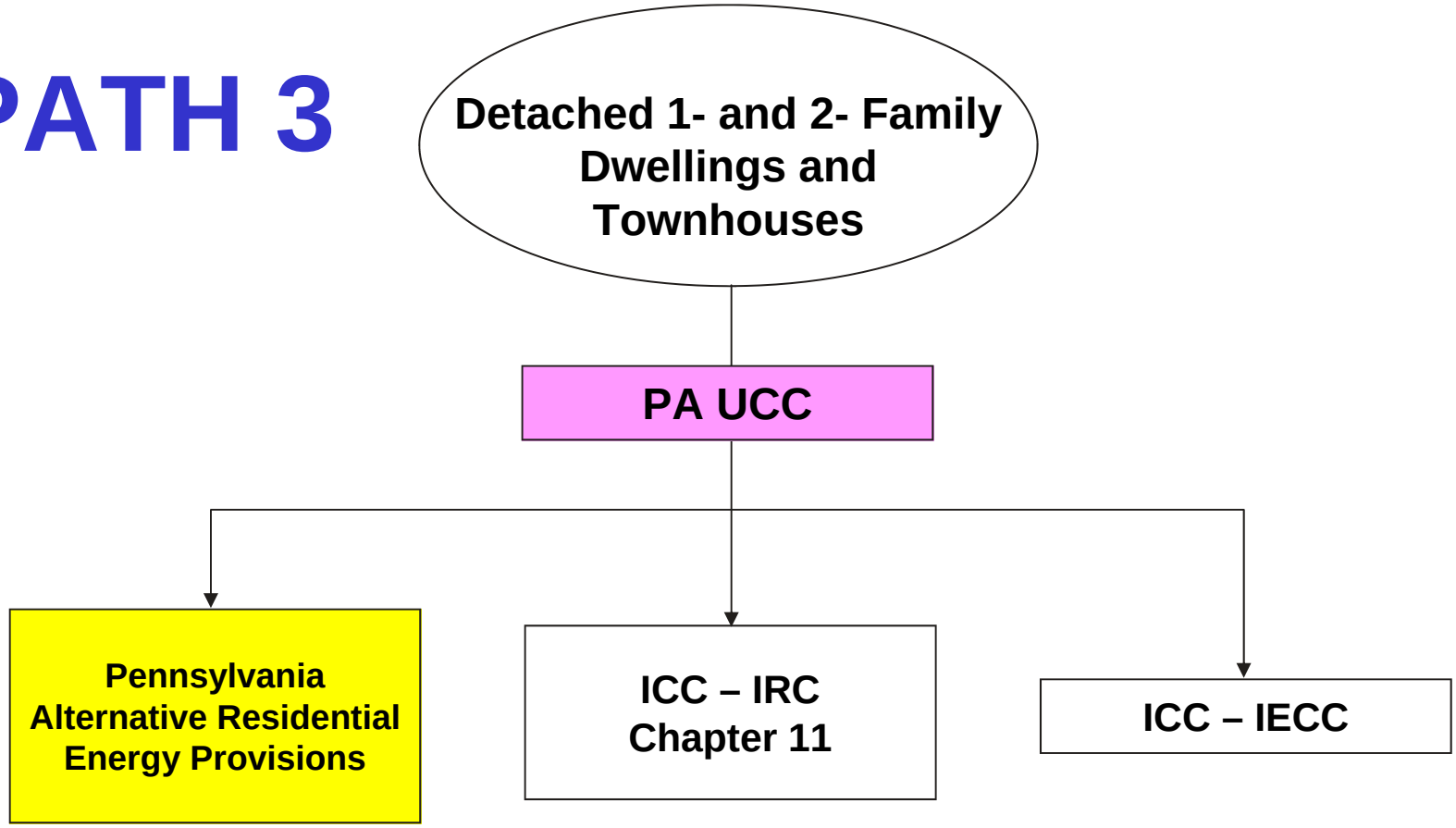
Simulated Performance Alternative

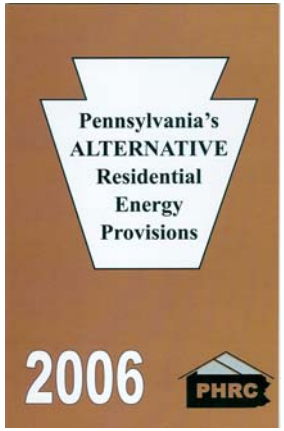
E404.3



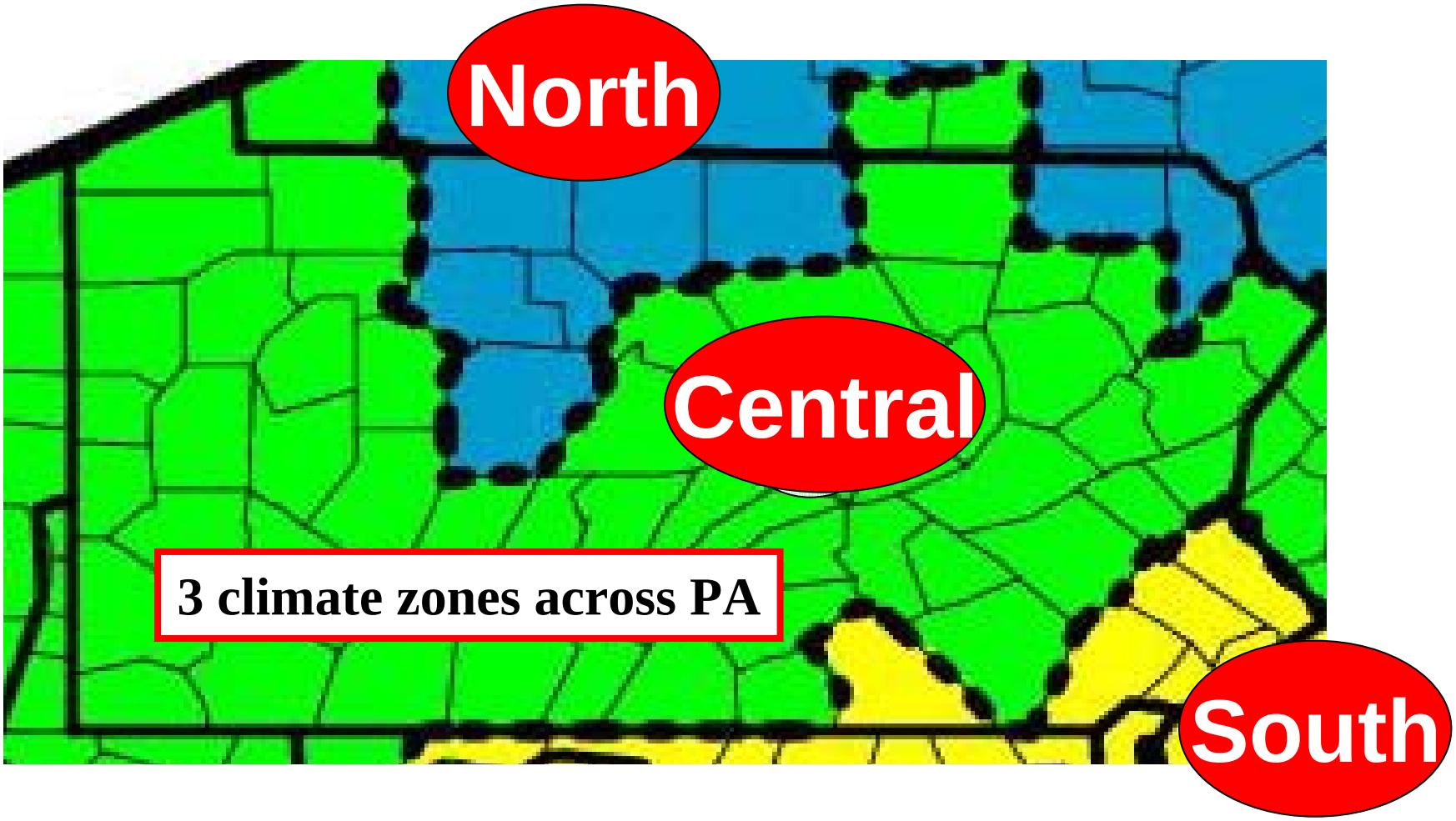
Pennsylvania Alternative Residential Energy Provisions

PATH 3


Detached 1- and 2- Family Dwellings and Townhouses
PA UCC
Pennsylvania Alternative Residential Energy Provisions
ICC – IRC Chapter 11
ICC – IECC


Pennsylvania's ALTERNATIVE Residential Energy Provisions
2006
PHRC

2006 PA Alternative Climate Zones



The 2006 PA-Alternative

- Is consistent with 2006 IECC & IRC
- Most 2003 PA-Alternative provisions have been incorporated in 2006 IECC/IRC
- No SHGC requirements – does not apply in PA
- No steel framing section
- Kept 2003 Alternative language for interior slab insulation – thermal break designed for durability and unlimited area for R-30 cathedral ceilings.
- Allows R-6 duct insulation in unconditioned basements
- Trade-off table for High Efficiency Equipment

The 2006 PA-Alternative

Table PA502

High efficiency equipment trade-offs

A. Walls between conditioned/unconditioned space
   Floors over unconditioned basements

B. Duct Insulation (attic, exterior walls, unconditioned basement)

C. Both A and B (highest efficiencies)

PHRC

Efficiency Tradeoffs

Tradeoffs	Component		Reduced R-value	Minimum Equipment Efficiency[c,d]					
				South		Central		North	
				AFUE[a]	HSPF[b]	AFUE[a]	HSPF[b]	AFUE[a]	HSPF[b]
A	Walls between conditioned and unconditioned spaces[e]		R-13	NA	NA	83	8.3	84	9.0
	Floors over unconditioned basements		R-19						
B	Duct insulation	Unconditioned Basement	R-4	83[g]	8.6	84[g]	9.1	85[g]	10.6
		Attic & Exterior Walls[f]	R-6	81	8.6[g]	83[g]	9.0[g]	83	10.0[g]
C	Walls between conditioned and unconditioned spaces[e]		R-13	NA	NA	89	9.8	91	12.2
	Floors over unconditioned basements		R-19						
	Duct insulation[g]	Unconditioned Basement	R-4						
		Attic & Exterior Walls[f]	R-6						

a. Annual Fuel Utilization Efficiency (AFUE) applies to oil and gas furnaces and boilers.
b. Heating Seasonal Performance Factor (HSPF) applies to heat pumps.
c. Any Seasonal Energy Efficiency Ratio (SEER) may be used for air conditioning equipment.
d. For buildings with multiple furnaces, boilers or heat pumps having different AFUE or HSPF values, use the capacity weighted average of the efficiency ratings of the installed equipment to determine whether the building complies with the minimum equipment performance requirement.
e. Examples include, but are not limited to, walls between the house and garage, and basement stairway walls and ceiling when the floorabove an unconditioned basement is insulated.
f. Ducts in exterior walls with insulated sheathing of R-5 or more do not need to be insulated.
g. If ducts are located in both the attic and unconditioned basement, R-6 can be used for the attic ducts and R-4 can be used for the unconditioned basement ducts.

H

A quick review

H
YND-8137

4 STORIES

H

Log Homes

H

Additions

H

Additions

H

Compliance options for additions

- Treat as a stand-alone building
- Bring entire building into compliance

Sunrooms

H

H

Option 1: Non-Heated

Option 2: Heated – Thermally isolated

Option 3: Heated – Not isolated

Lets push on with the rest of the program