Code Compliance via Tools and Resources

Getting Out of the Book and Into the Real World!

So much code, so little time

Building

Fire

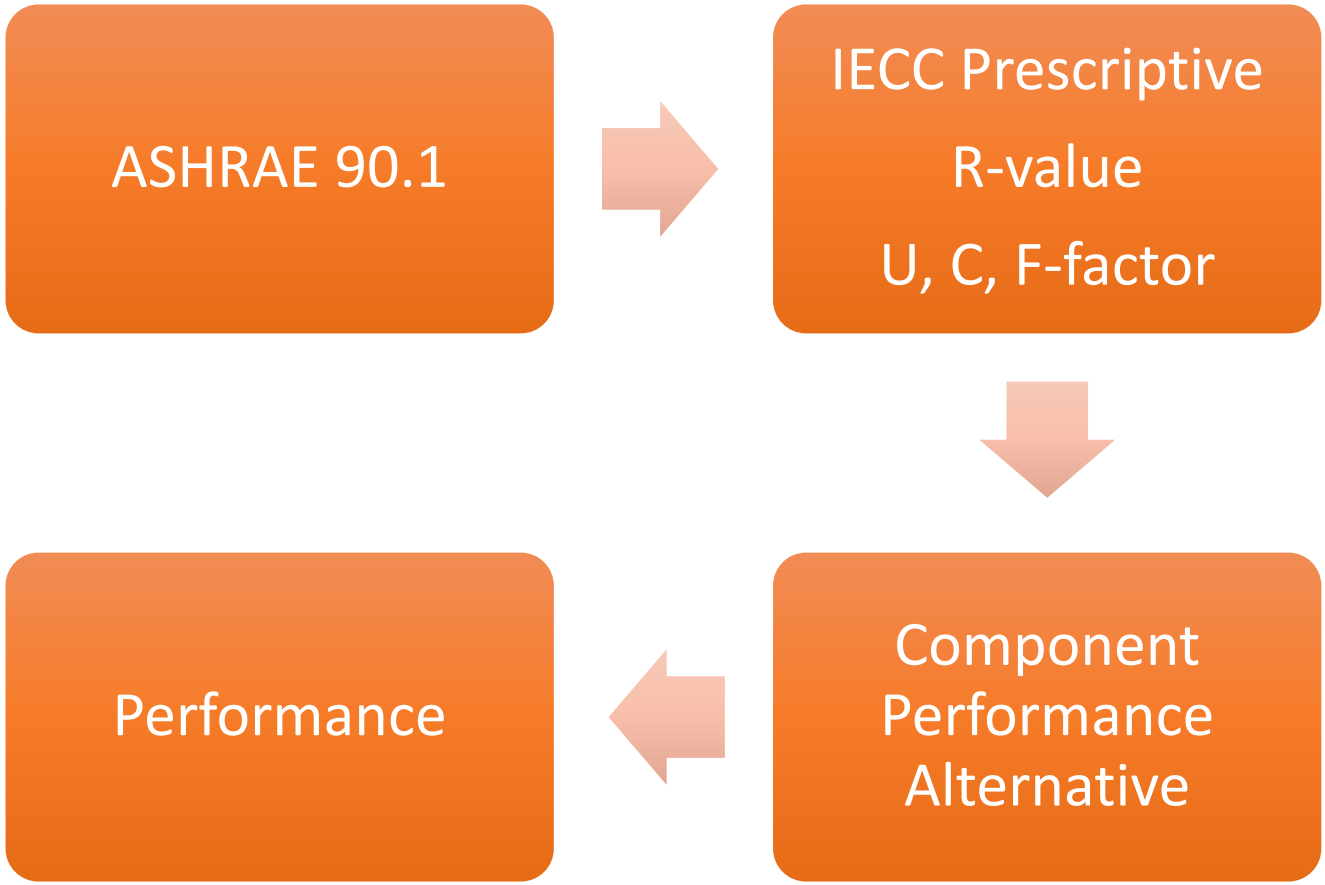
MEP

Accessibility

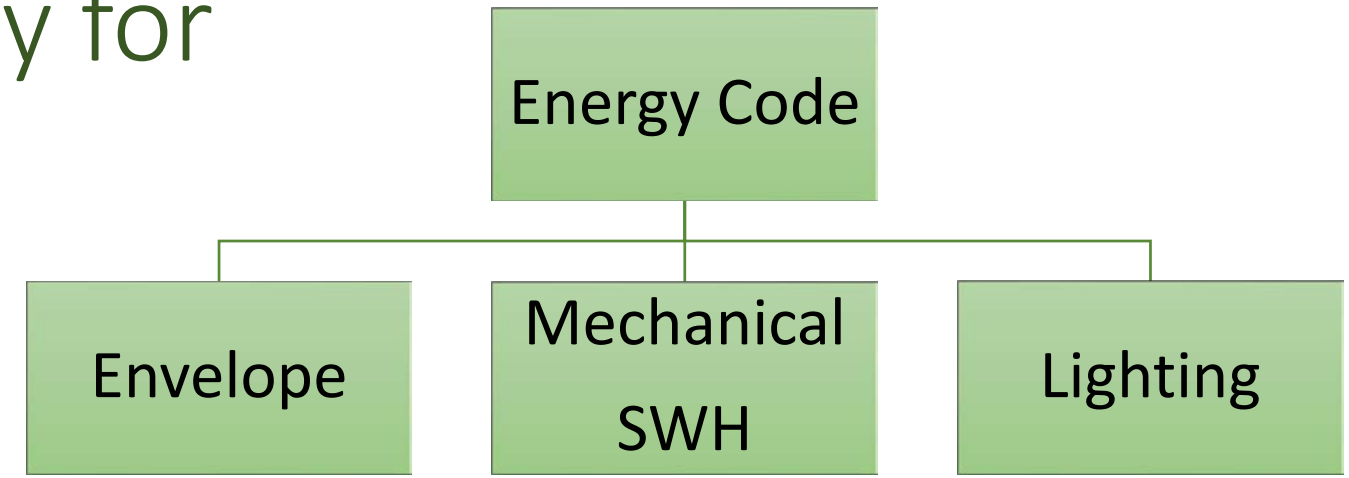
Energy

So much code, so little time

So many options



No energy for ENERGY



es and fenestration areas determined in accordance with Equation 4-2 shall be permitted in lieu of compliance with the U-, F- and C-factors in Tables C402.1.3 and C40
nestration areas in Section C402.4.1.

r operation at AHRI Standard 550/590 test conditions of 44°F (7°C) leaving chilled-water temperature and 2.4 gpm/ton evaporator fluid flow and 85°F (29°C) entering condenser water temp
water flow shall have maximum full-load kW/ton (FL) and part-load ratings requirements adjusted using Equations 4-6 and 4-7.

uation 4-6)

uation 4-7)

/ton value as specified in Table C403.2.3(7).

ll-load kW/ton rating, adjusted for nonstandard conditions.

ecified in Table C403.2.3(7).

PLV rating, adjusted for nonstandard conditions.

$$592 \cdot (LIFT)^4 - 0.0000346496 \cdot (LIFT)^3 + 0.00314196 \cdot (LIFT)^2 - 0.147199 \cdot (LIFT) + 3.9302$$

$$E_{vap} + 0.934$$

$$E_{vg} \; E_{vap}$$

ndenser leaving fluid temperature (°F).

aporator leaving temperature (°F).

es are only applicable for centrifugal chillers meeting all of the following full-load design ranges:

r leaving temperature: 36°F.

r leaving temperature: 115°F.

eighted average U-value of all roof assemblies.
the (UA Proposed) values for each skylight assembly.
otal skylight area.

What happens to a code book that you don’t understand?

Leaving us with efficiency on paper only

$$\text{efficiency} = \frac{\text{useful energy out}}{\text{total energy in}}$$

Keep it simple

Don’t tell me what the code says…

Help me do my job!!!

We tell them that…

ENERGY CODES ARE LIFE-SAFETY CODES

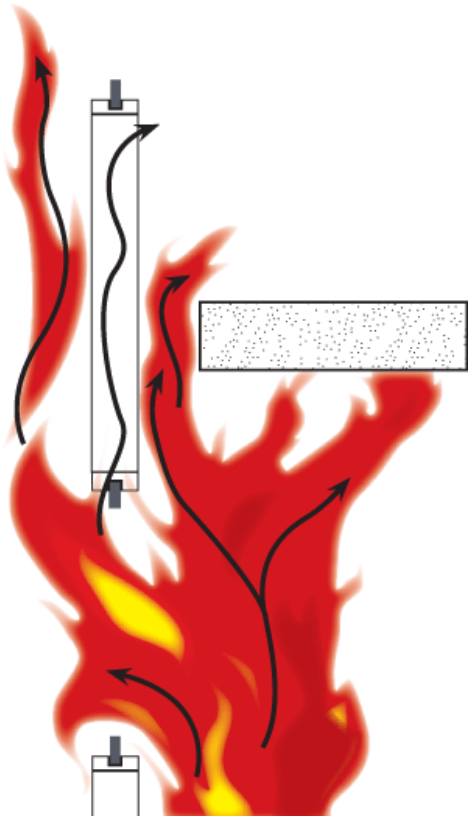
The Building Science Proves It!

SHAUNNA MOZINGO
THE MOZINGO CODE GROUP

CHRISTINE BRINKER
SOUTHWEST ENERGY EFFICIENCY PROJECT

Show Them…

THIS DIAGRAM HIGHLIGHTS THE PATHS OF FIRE PROPAGATION THROUGH IMPROPERLY SEALED WALL PENETRATIONS. COURTESY OF IFC



Don’t just tell them to build tight, show them why!!!

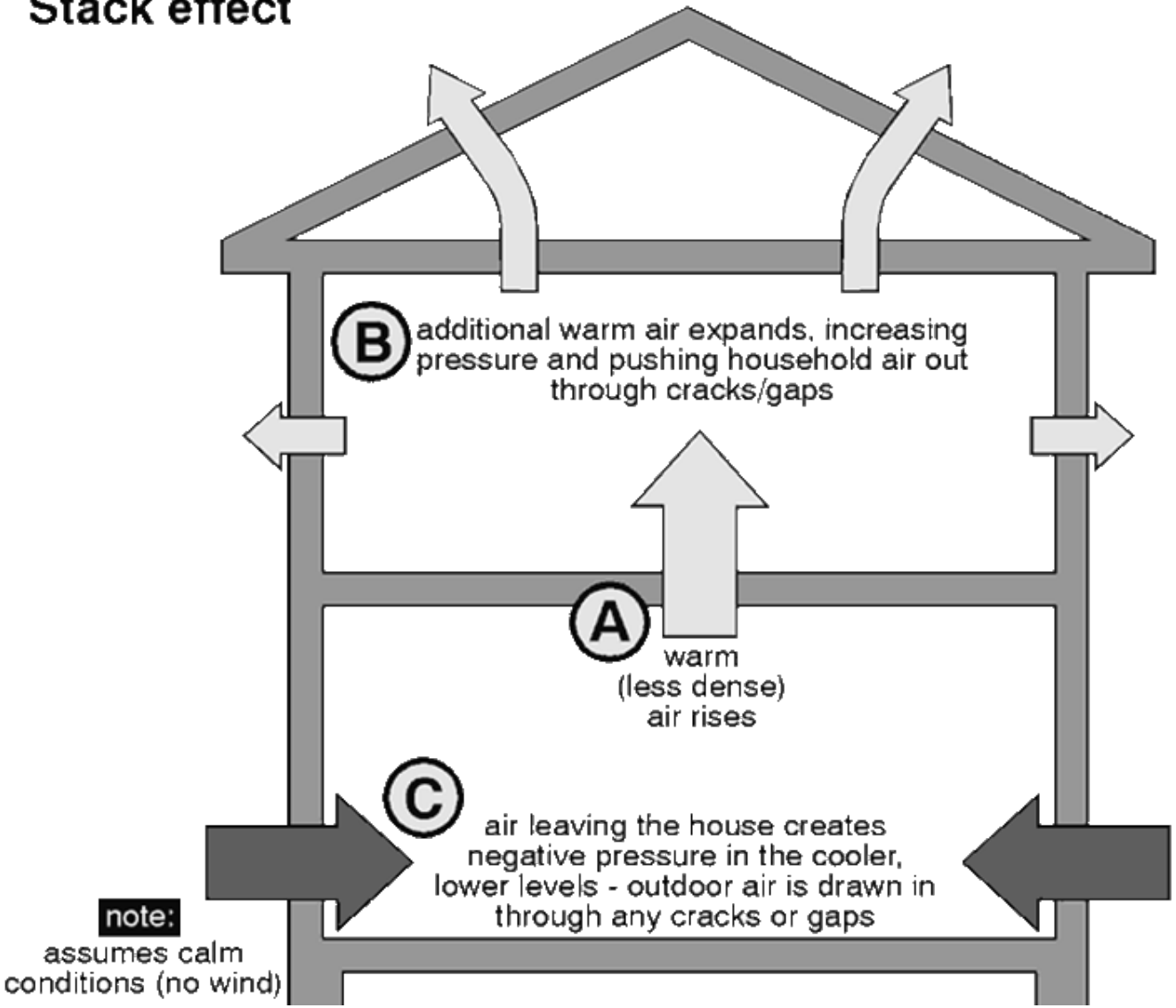
Look how houses have changed

Transport Mechanism

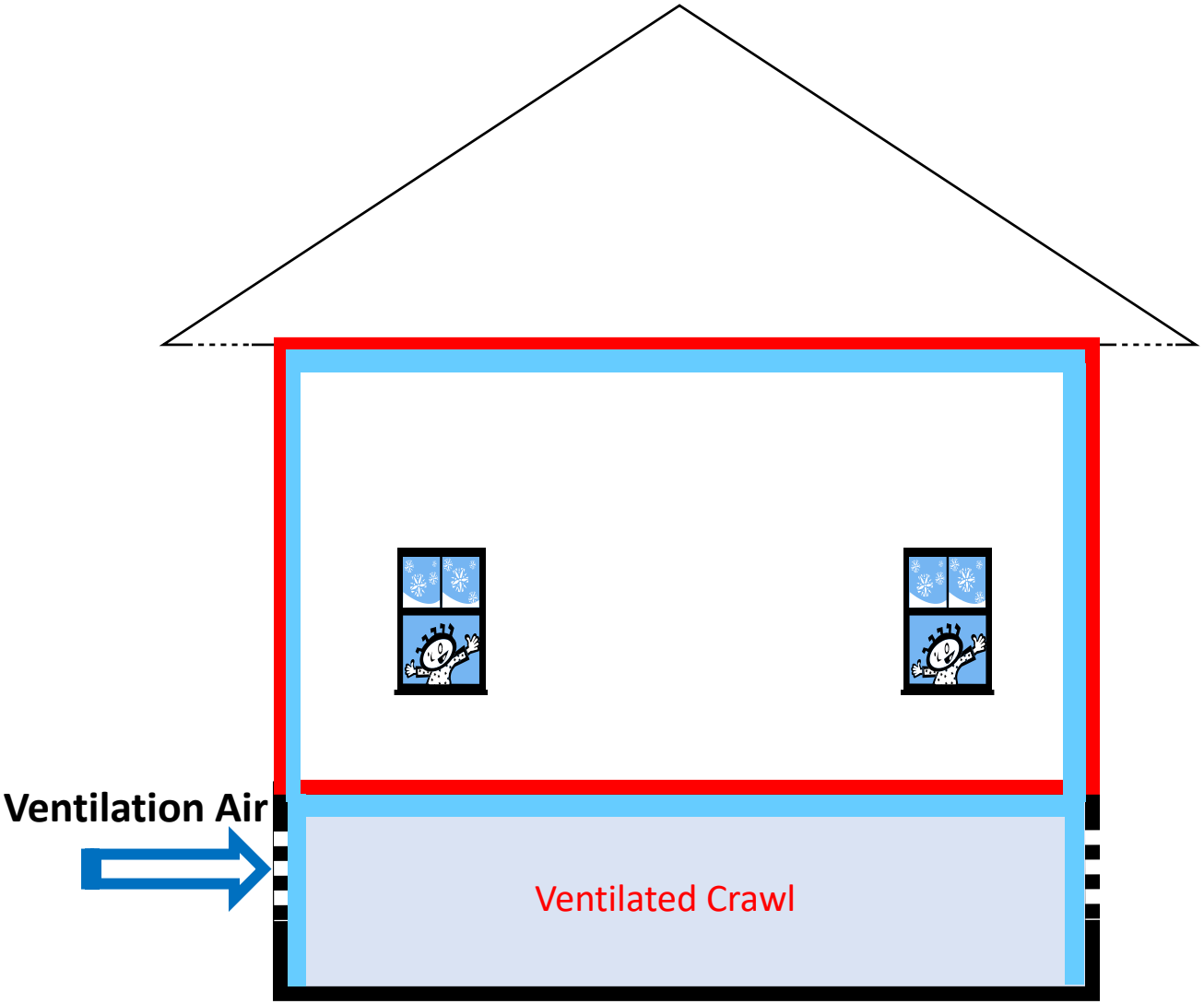
Air flow basics

- Air is a fluid – like water
- Two requirements for air flow
  - Hole or path
  - Driving force = pressure difference

Stack effect



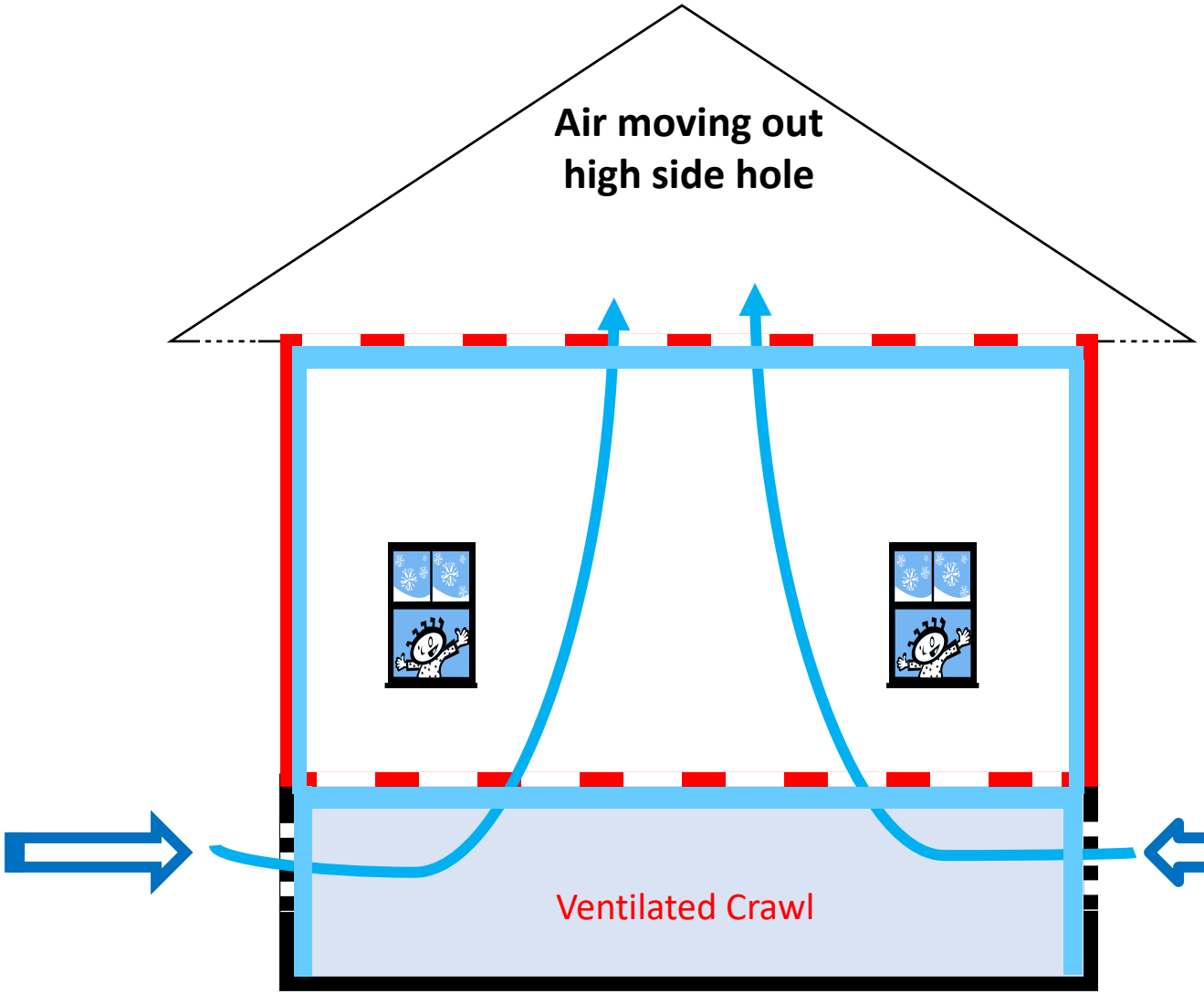
Vented Crawl Space



How we thought it worked

Moisture removed from house

Vented Crawl Space



How it really works

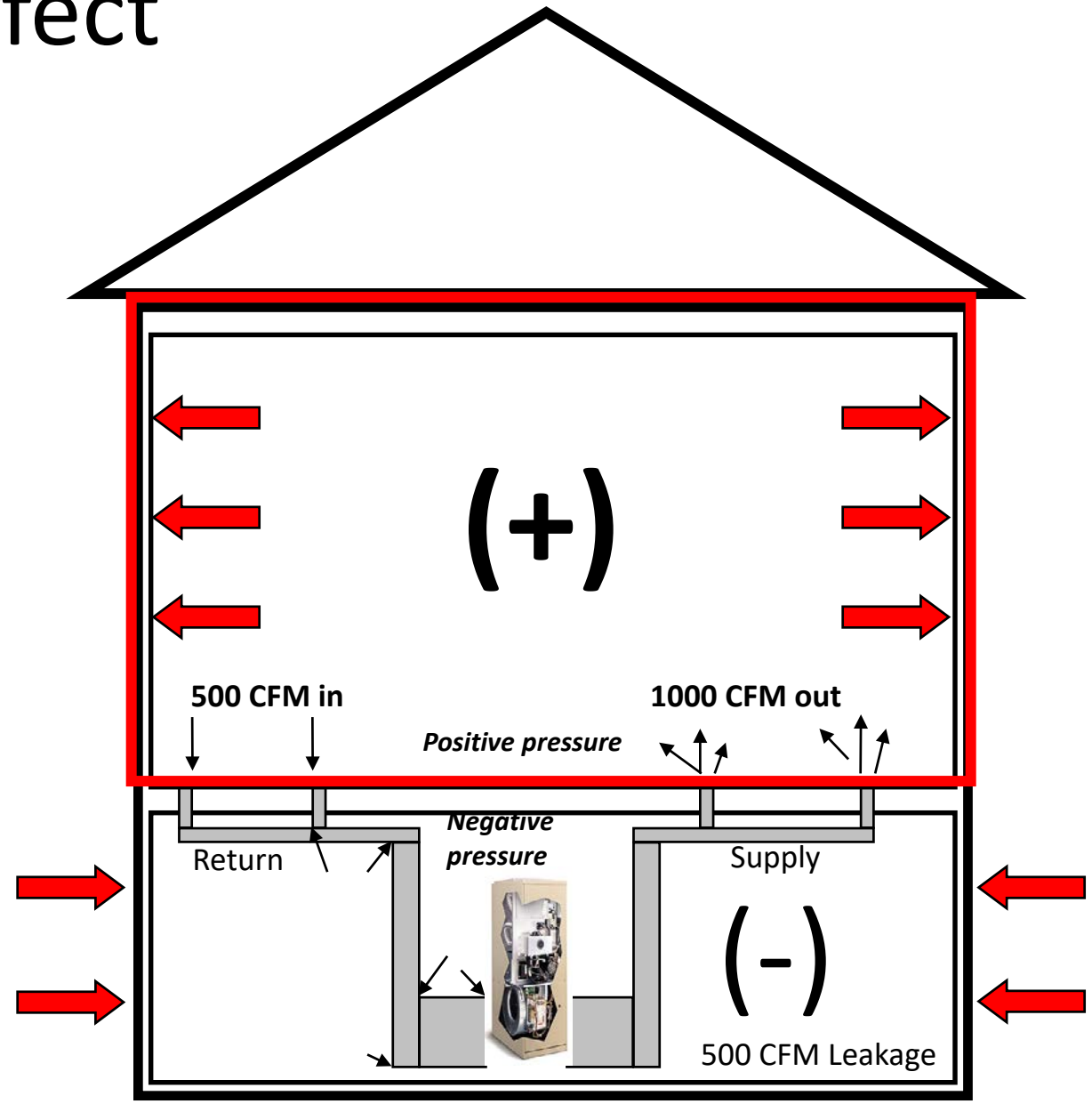
Moisture transported into house &/or attic

Air moving through low side hole

System Effect

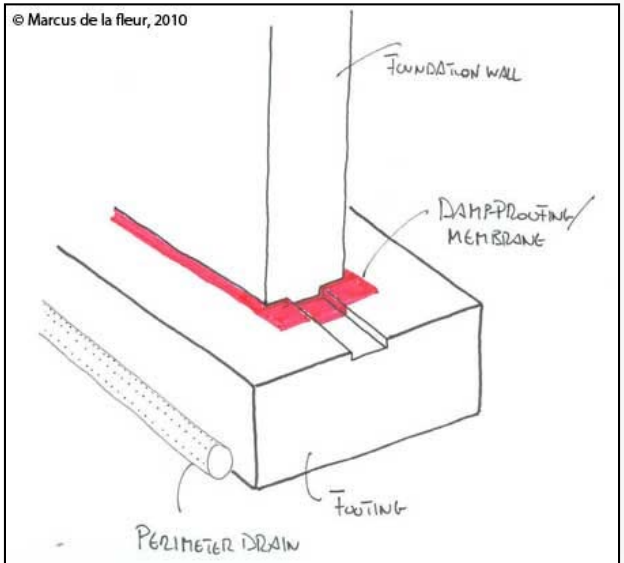
Having supply and return air not equal or dominant leakage on the ducts

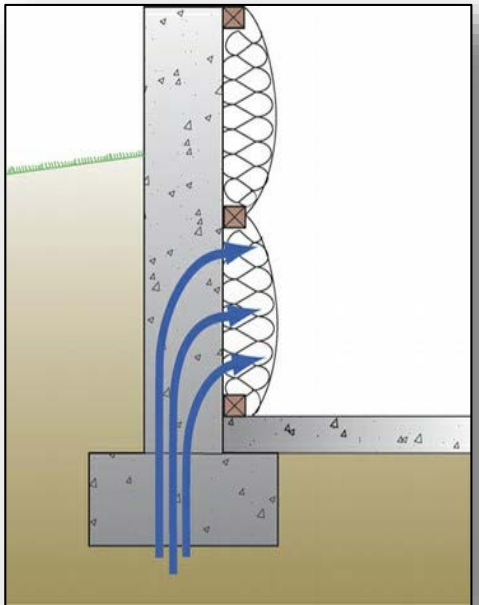
Sends basement negative



Bulk Water

- **Finds path of least resistance**
- **Generally follows gravity**
- **Can be drawn upward or sideways**
  - **Capillary action**
  - **Best practice**

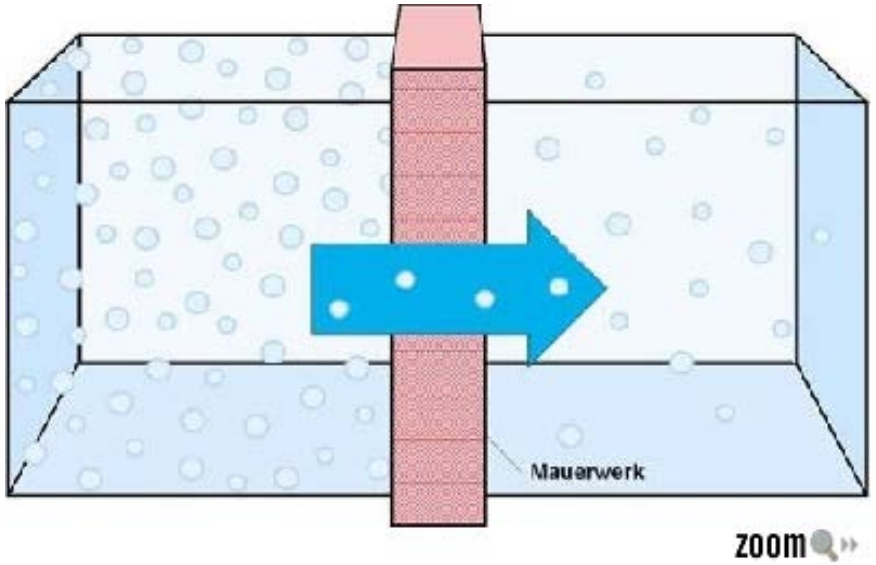


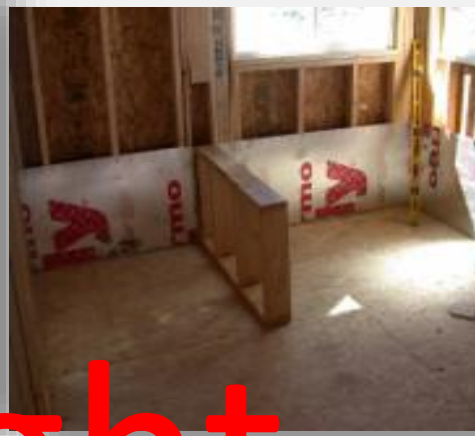


Vapor Diffusion

- Moisture moving directly through a material
  - From More to Less
  - Vapor pressure pushes water at a microscopic level through a material

- Function of
  - Temperature
  - Relative humidity





Build Tight

Ventilate

Right

Moisture

One of the main reasons for producing an airtight building is to protect the structure against dampness originating from air leakages.

Photo: passivehousesystems.co.uk


CONDEMNATION

Make sure they know there are options!!

Paths of compliance Options- Commercial

ASHRAE 90.1

IECC

- Prescriptive
  - R-Value Method
  - U, C and F Factor Alternative
- Component Performance Alternative
- Performance
- Above Code

Options, People, Options!!!

Paths of Compliance Options- Residential

Prescriptive

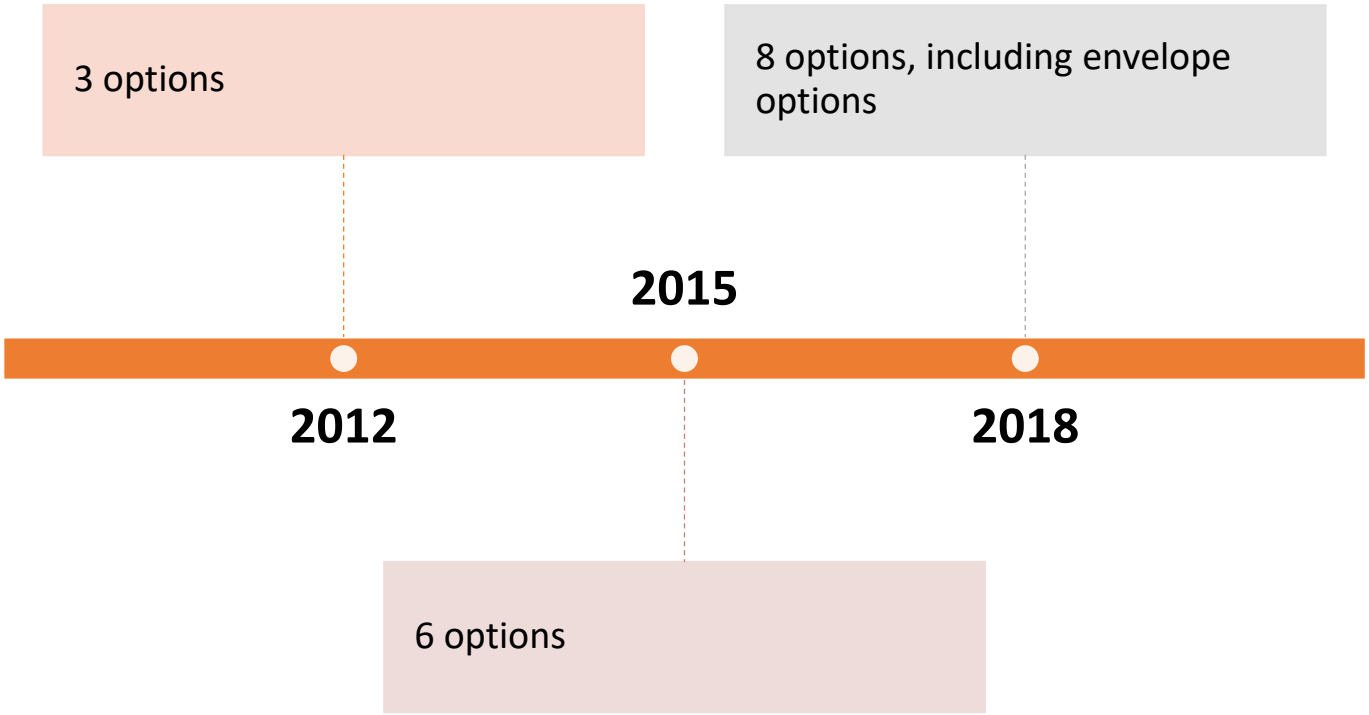
- R-Value Method
- U-Factor Alternative
- Total UA Alternative

Simulated Performance Alternative

Energy Rating Index

Above Code Options

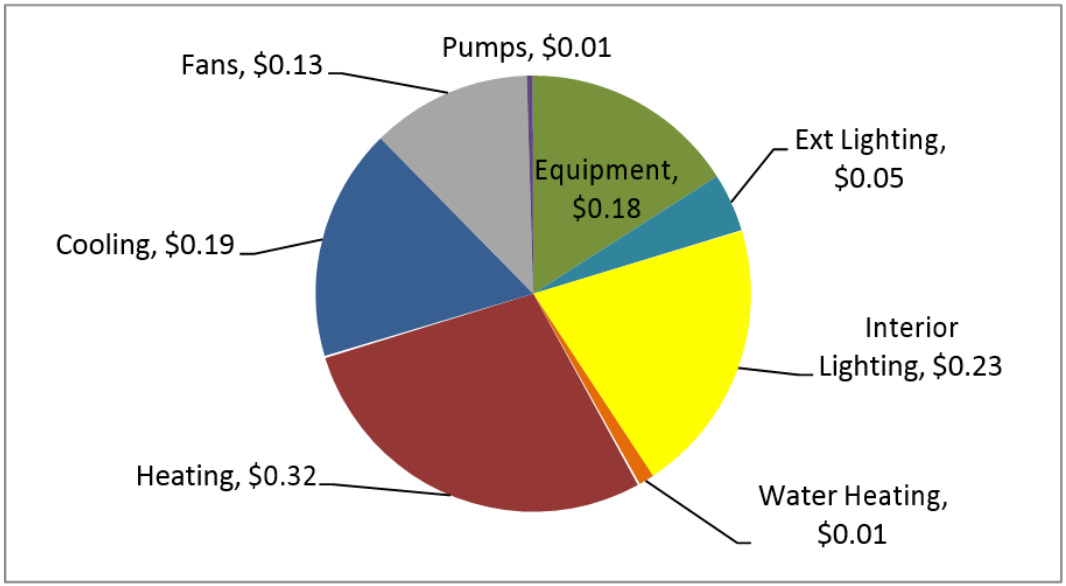
Did I mention OPTIONS?



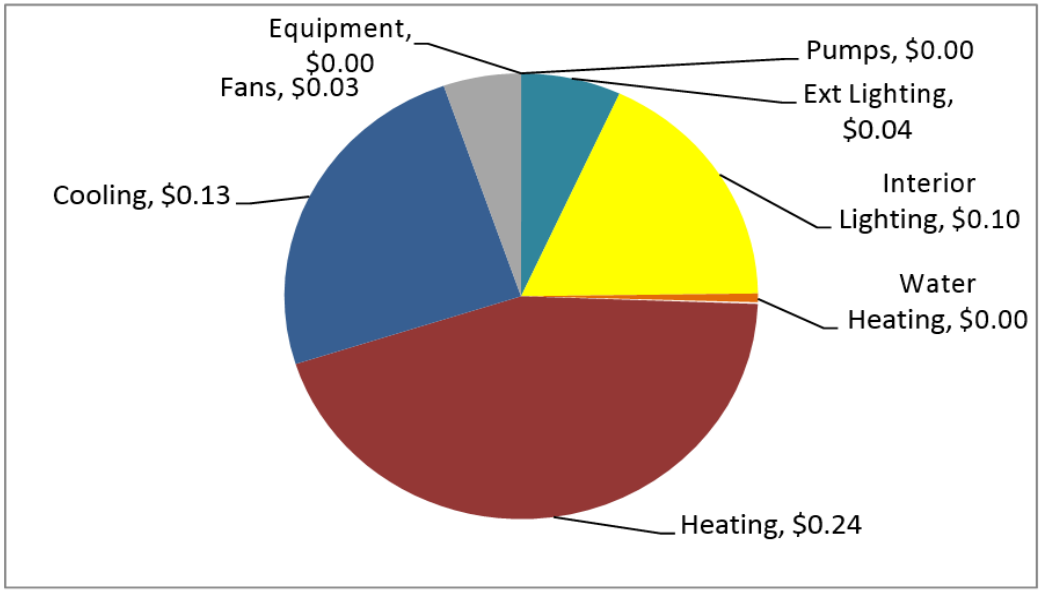
C406 Additional Efficiency Packages

E D U C A T I O N

Energy Use Breakdown, $/SF



Energy Savings Breakdown, $/SF



Show Them The Money$$

Then help them do their job!

COMPLIANCE CHECKLIST

2009 IECC Section #	Mechanical Rough-In Inspection	Plans Verified Value	Field Verified Value	Complies?	Comments I Assumptions
503.2.3 [ME1]2	HVAC equipment cooling efficiency verified **Efficiency:**			□Complies □Does Not Comply □Not Observable □Not Applicable	
503.2.4.4 [ME4]3	Outdoor air and exhaust systems have motorized dampers that automatically shut when not in use and meet maximum leakage rates. Check gravity dampers where allowed.			□Complies □Does Not Comply □Not Observable □Not Applicable	
503.2.5.1	Demand control ventilation provided for spaces > 500 ft2 and > 40 people/1000 ft2 occupant density and served by systems with air side economizer, auto modulating outside air damper control or design airflow > 3,000 cfm			□Complies □Does Not Comply □Not Observable □Not Applicable	
503.3.1, 503.41 [ME12]1	Air economizers provided where required, meet the requirements for design capacity, control signal, and high-limit shut-off and integrated economizer control.			□Complies □Does Not Comply □Not Observable □Not Applicable	
503.4.2 [ME22]2	VAV fan motors > = 10 hp to be driven by variable speed drive, have a vane-axial fan with variable pitch blades, or have controls or devices to limit fan motor demand.	□VSD □Vane axial fan □Other	□VSD □Vane axial fan □Other	□Complies □Does Not Comply □Not Observable □Not Applicable	
503.2.6 [ME30]1	Exhaust air energy recovery on systems > = 5,000 cfm and 70% of design supply air.			□Complies □Does Not Comply □Not Observable □Not Applicable	

2009 IECC Section #	Rough-In Electrical Inspection			Complies?	Comments I Assumptions
505.2.2.2 [EL1]2	Automatic lighting control to shut off all building lighting installed in buildings > 5,000 ft2.			□Complies □Does Not Comply □Not Observable □Not Applicable	
505.2.2.1 [EL10iecc]1	Lighting controls installed to uniformly reduce the lighting load by at least 50%.	% area in compliance:		□Complies □Does Not Comply □Not Observable □Not Applicable	

The Checklist

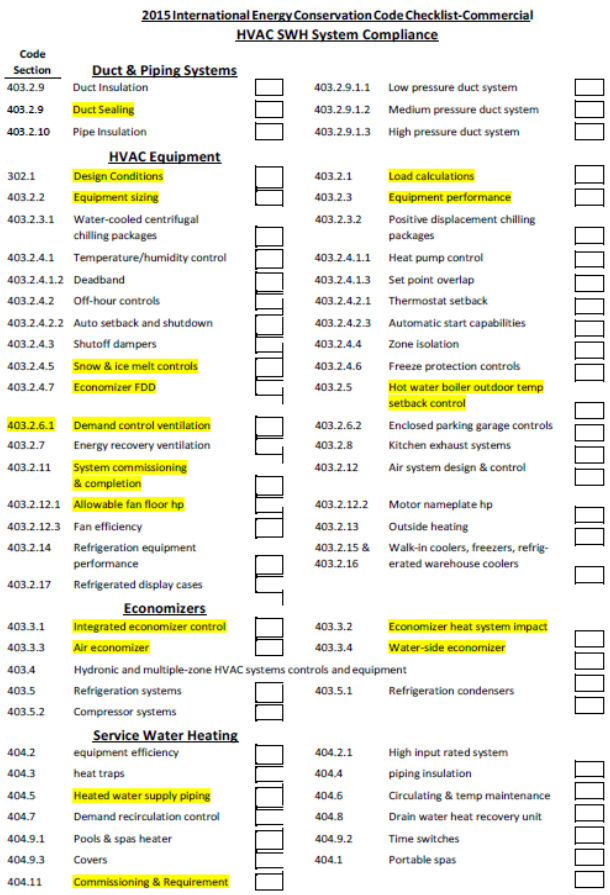
2009 International Energy Conservation Code Plan Review Checklist -Commercial

Project Information Sheet

Plan Review/Permit #			Date		
Project Address					
Project Contact Info	Name		Phone		
	email				
Building Type	Retail/Mercantile		Office		Edcuation/School	
	Restaurant/Dining/Fast Food		Healthcare		Assembly/Religious	
	Lodging/Hotel/Motel		Warehouse/Storage		High Rise Residential	
					Other	
	New Construction		Addition		Renovation	
Compliance Approach	Prescriptive		UA Trade Off		Performance	
	Glazing < 40%		Compliance with IECC		Compliance w/ ASHRAE 90.1	
Plan Review Contact Info	Name		Phone		
	email				
Jurisdiction Name/Address					
County			**Climate Zone**		
Substantiating Data		Mechanical Load Calculations			
		Duct design			
		Lighting Plan			
		Compliance Path documentation			

Some Other Resources

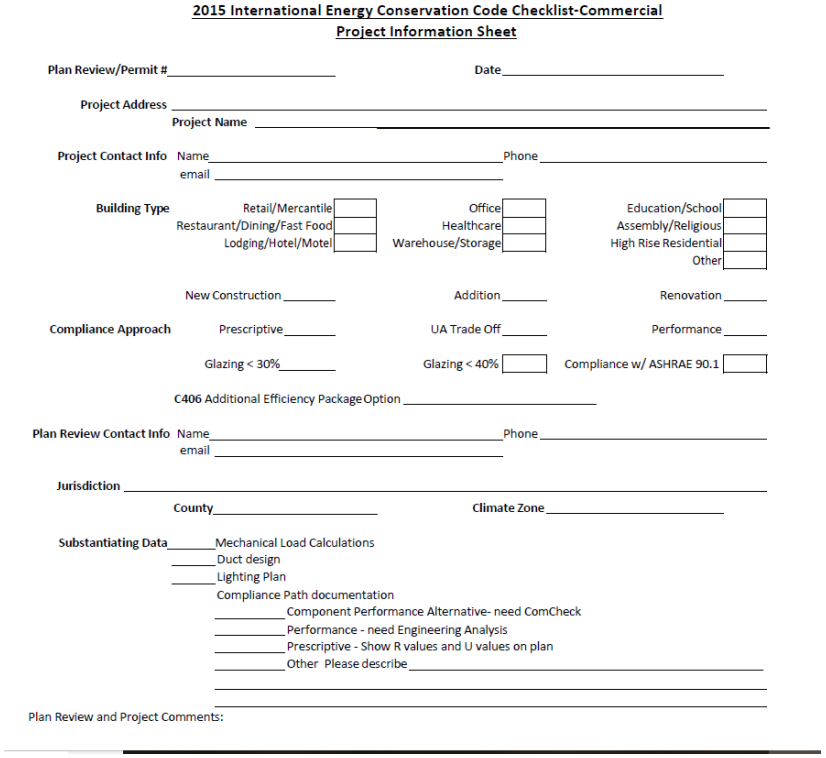
Top Items for Energy Code Plan Review



2015 International Energy Conservation Code Checklist-Commercial
HVAC SWH System Compliance

Code Section				
	Duct & Piping Systems			
403.2.9	Duct Insulation	☐	403.2.9.1.1	Low pressure duct system ☐
403.2.9	Duct Sealing	☐	403.2.9.1.2	Medium pressure duct system ☐
403.2.10	Pipe Insulation	☐	403.2.9.1.3	High pressure duct system ☐
	HVAC Equipment			
302.1	Design Conditions	☐	403.2.1	Load calculations ☐
403.2.2	Equipment sizing	☐	403.2.3	Equipment performance ☐
403.2.3.1	Water-cooled centrifugal chilling packages	☐	403.2.3.2	Positive displacement chilling packages ☐
403.2.4.1	Temperature/humidity control	☐	403.2.4.1.1	Heat pump control ☐
403.2.4.1.2	Deadband	☐	403.2.4.1.3	Set point overlap ☐
403.2.4.2	Off-hour controls	☐	403.2.4.2.1	Thermostat setback ☐
403.2.4.2.2	Auto setback and shutdown	☐	403.2.4.2.3	Automatic start capabilities ☐
403.2.4.3	Shutoff dampers	☐	403.2.4.4	Zone isolation ☐
403.2.4.5	Snow & ice melt controls	☐	403.2.4.6	Freeze protection controls ☐
403.2.4.7	Economizer FDD	☐	403.2.5	Hot water boiler outdoor temp setback control ☐
403.2.6.1	Demand control ventilation	☐	403.2.6.2	Enclosed parking garage controls ☐
403.2.7	Energy recovery ventilation	☐	403.2.8	Kitchen exhaust systems ☐
403.2.11	System commissioning & completion	☐	403.2.12	Air system design & control ☐
403.2.12.1	Allowable fan floor hp	☐	403.2.12.2	Motor nameplate hp ☐
403.2.12.3	Fan efficiency	☐	403.2.13	Outside heating ☐
403.2.14	Refrigeration equipment performance	☐	403.2.15 & 403.2.16	Walk-in coolers, freezers, refrig-erated warehouse coolers ☐
403.2.17	Refrigerated display cases	☐		
	Economizers			
403.3.1	Integrated economizer control	☐	403.3.2	Economizer heat system impact ☐
403.3.3	Air economizer	☐	403.3.4	Water-side economizer ☐
403.4	Hydronic and multiple-zone HVAC systems controls and equipment			☐
403.5	Refrigeration systems	☐		☐
403.5.2	Compressor systems	☐	403.5.1	Refrigeration condensers ☐
	Service Water Heating			
404.2	equipment efficiency	☐	404.2.1	High input rated system ☐
404.3	heat traps	☐	404.4	piping insulation ☐
404.5	Heated water supply piping	☐	404.6	Circulating & temp maintenance ☐
404.7	Demand recirculation control	☐	404.8	Drain water heat recovery unit ☐
404.9.1	Pools & spas heater	☐	404.9.2	Time switches ☐
404.9.3	Covers	☐	404.1	Portable spas ☐
404.11	Commissioning & Requirement	☐		☐

Full Energy Code Checklist



2015 International Energy Conservation Code Checklist-Commercial
Project Information Sheet

Plan Review/Permit # _____ Date _____

Project Address _____

Project Name _____

Project Contact Info Name _____ Phone _____
email _____

Building Type
Retail/Mercantile ☐ Office ☐ Education/School ☐
Restaurant/Dining/Fast Food ☐ Healthcare ☐ Assembly/Religious ☐
Lodging/Hotel/Motel ☐ Warehouse/Storage ☐ High Rise Residential ☐
Other ☐

New Construction _____ Addition _____ Renovation _____

Compliance Approach Prescriptive _____ UA Trade Off _____ Performance _____

Glazing < 30% _____ Glazing < 40% ☐ Compliance w/ ASHRAE 90.1 ☐

C406 Additional Efficiency Package Option _____

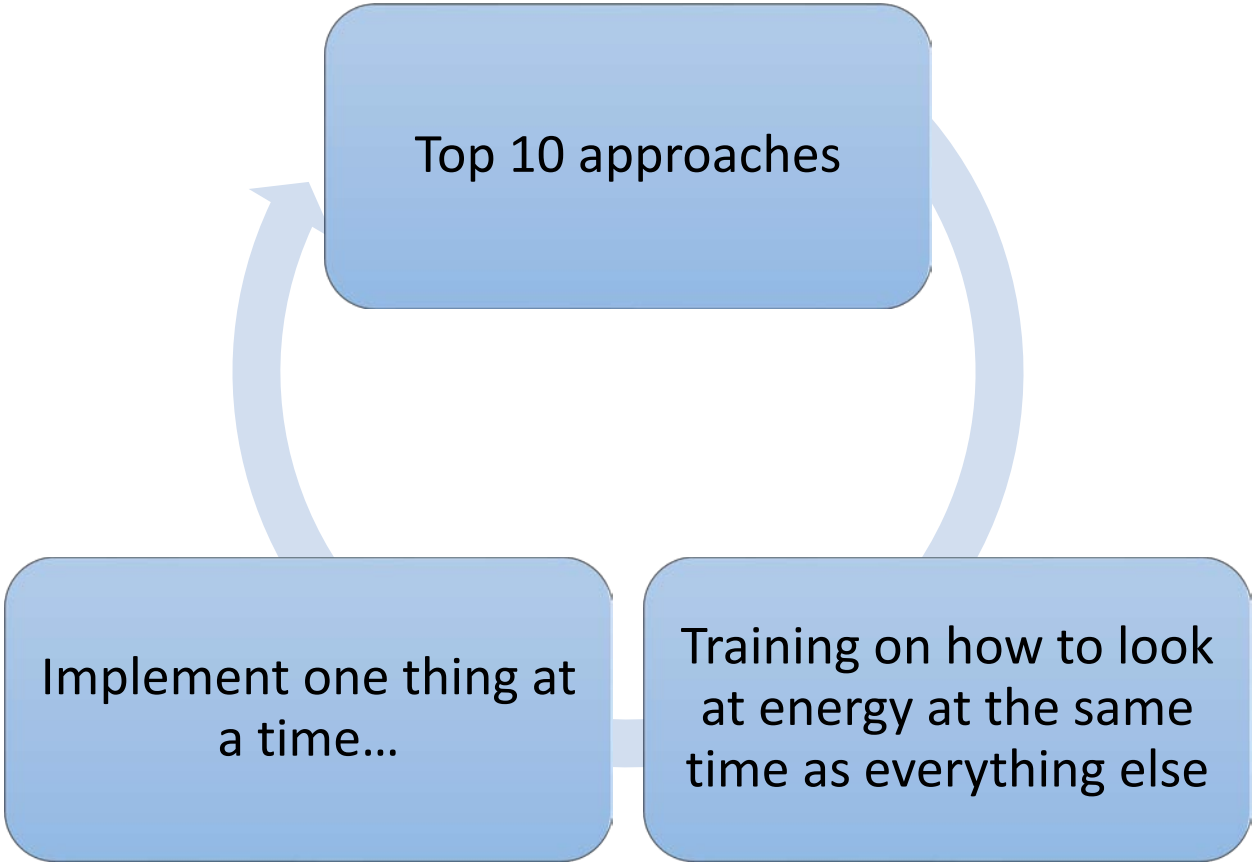
Plan Review Contact Info Name _____ Phone _____
email _____

Jurisdiction _____

County _____ Climate Zone _____

Substantiating Data
_____ Mechanical Load Calculations
_____ Duct design
_____ Lighting Plan
Compliance Path documentation
_____ Component Performance Alternative- need ComCheck
_____ Performance - need Engineering Analysis
_____ Prescriptive - Show R values and U values on plan
_____ Other Please describe _____

Plan Review and Project Comments:



How do I fit Energy Code enforcement into my already busy routine?

This approach: One small step for man…

HOW = IMPLEMENTATION PLANS

Town of Parker 8 Steps to Implementation

1. Early Code Training
2. Inclusive Training
3. Relate Energy Code to Building Science
4. Energy Ratings
5. Internal Champion
6. Phased Roll-Out
7. Field Inspection
8. Outreach

A foot in the door to full code compliance

www.Colorado.gov/energycodes

NAHB 2018 IRC cost study

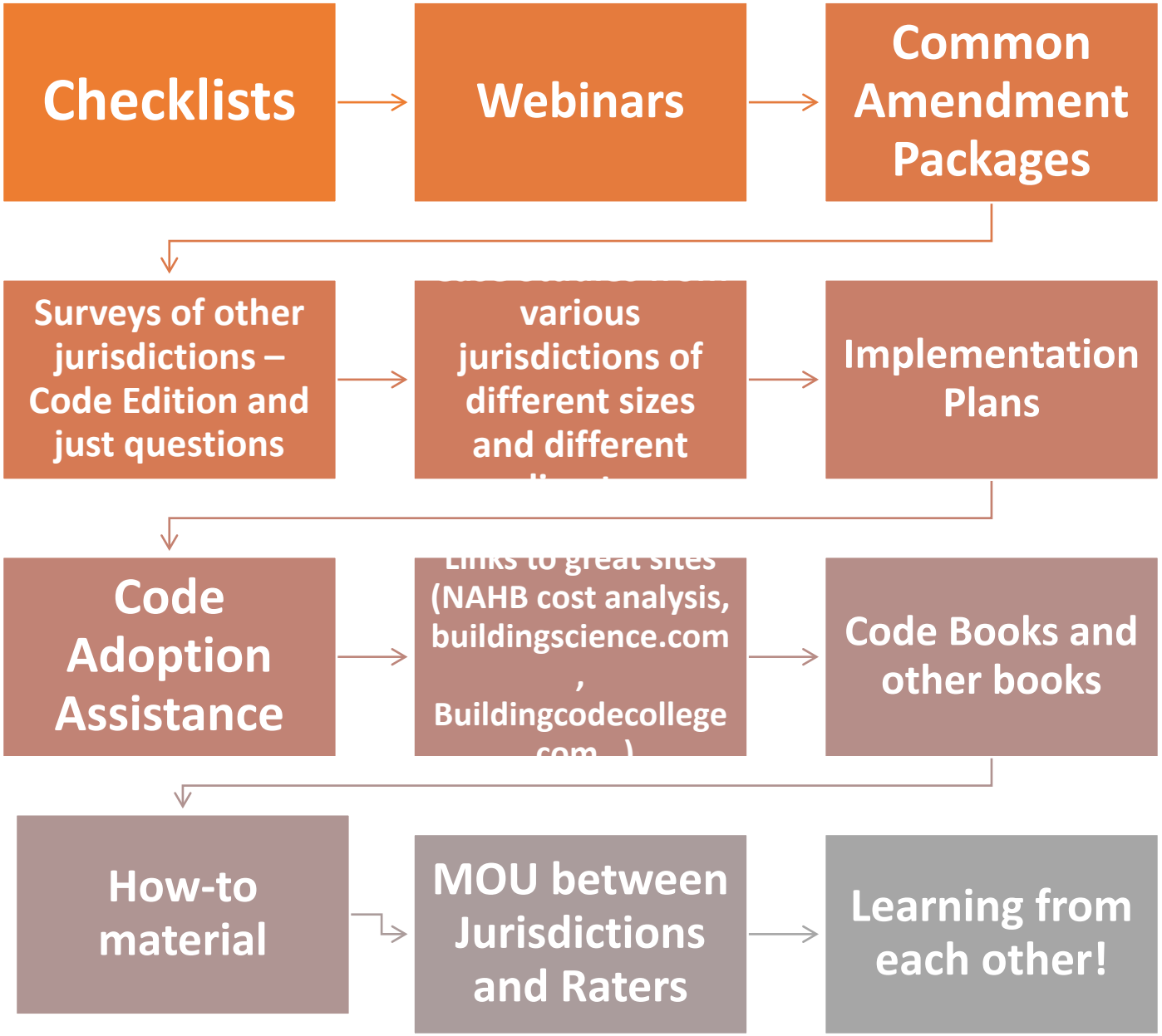
Table 6. Estimated Cost to Consumer of 2018 Code Compliance

		Selected Cities		Miami, Los Angeles		Dallas, Seattle, New York		Chicago		Fairbanks		
		Climate Zones		1 & 2		3 & 4		5 - 7		8		
		Reference Houses		1 & 2		1, 2, 3, & 4		3 & 4		3 & 4		
Ref #	Code Change	2018 IRC Chapter	2018 IRC Reference	Cost Range ($) High	Low	High	Low	High	Low	High	Low	
R-8 (RB229)	Support for headers: revises table for minimum number of king studs; now only requires 1 or 2 for low-wind urban and suburban conditions.	Wall Construction	R602.7.5	(493)	(516)	0	(210)	0	(90)	0	(90)	House openin than 3
R-11 (RB303)	Masonry veneer: adds new provisions for brick tie attachment over foam sheathing and direct to 7/16" sheathing.	Wall Covering	R703.8.4	N/R	N/R	N/R	N/R	325	(73)	325	(73)	House brick v contin insulat
E-1 (RE31)	Reduces the maximum window U-factor requirement in Climate Zones 3-8.	Energy Efficiency	Table N1102.1.2	N/A	N/A	85	74	85	78	85	78	House Climat 3-8
E-6 (RE127)	Lighting efficiency: increases the percent of permanently installed lighting fixtures that must contain high-efficacy lamps from 75% to 90%.	Energy Efficiency	N1104.1	8	8	8	8	8	8	8	8	House climat
M-1 (RM36)	Duct sealing: eliminates the requirement for sealing longitudinal seams of snap-lock and button-lock types of HVAC ducts located inside conditioned space	Duct Systems	M1601.4.1	0	(129)	0	(471)	(348)	(471)	(348)	(471)	House metal ducts inside condit space
	Total to Consumer			(485)	(637)	93	(599)	70	(548)	70	(548)	

Is it cheaper to build to the 2018 IRC?

https://www.nahb.org/nahb-priorities/construction-codes-and-standards/research.aspx

Decoding the Code – AKA: Resources and Tools



Parting words:

Don't tell me what the code says, tell me how to make it work; tell me how to use it! Help me understand WHY!

Code adoption assistance, code training, research, code development, plan review, compliance studies, code resources

THANK YOU!!!

Presented by:

Shaunna Mozingo

President

The Mozingo Code Group LLC

sdmozingo@shaunnamozingo.com

THE Mozingo CODE GROUP LLC