Trends & Potential Disruptions

For Insulation Contractors

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Trends & Potential Disruptions

Impacting Insulation Contractors

1. Residential Codes, Enforcement, RESNET/HERS
2. Regulation
3. Legislation
4. Market Issues
5. So What?

What's Not Covered Today

Issues Impacting Entire Construction Industry

- Limited Labor Pool + Hiring Issues
- Tax Code, Health, OSHA, Workman's Comp, etc
- Multi-Family Plateaus and Declines
- Housing Forecasts
- Possible Market Corrections & Timing

1. Codes, Enforcement, RESNET

Negative Drag on Insulation Contractor

1. Hold the Line States - 2009 IECC
2. Weakening Envelope Leakage (ACH)
3. HVAC trade off coming back
4. Solar & Battery: CA, NV, FL, MA, VT
5. No Plan Review / Field Inspections
6. Removing Noise Control from IBC/IRC
7. Removing Sprinklers from IRC/IBC
8. HERS & Balanced Software Outputs
9. Emerging Carbon Codes (- or + ???)

Positive Lift for Insulation Contractor

1. Sprinklers / Floor I-Joist Protection
2. R23 Wall Cavity Option to “ci” in CZ6*
3. Stretch Codes (CA, MA, NY)
4. CA: Shift to 2x6 Walls in 2019 Energy Code*
5. CA: Solar/Battery; HP Attics; Wildland+Energy
6. Tight & Buried Ducts in Attics
7. Adoption of Noise Control in IBC/IRC
8. BOPs + Leakage Testing for Code Compliance*
9. Emerging Carbon Codes (- or + ???)

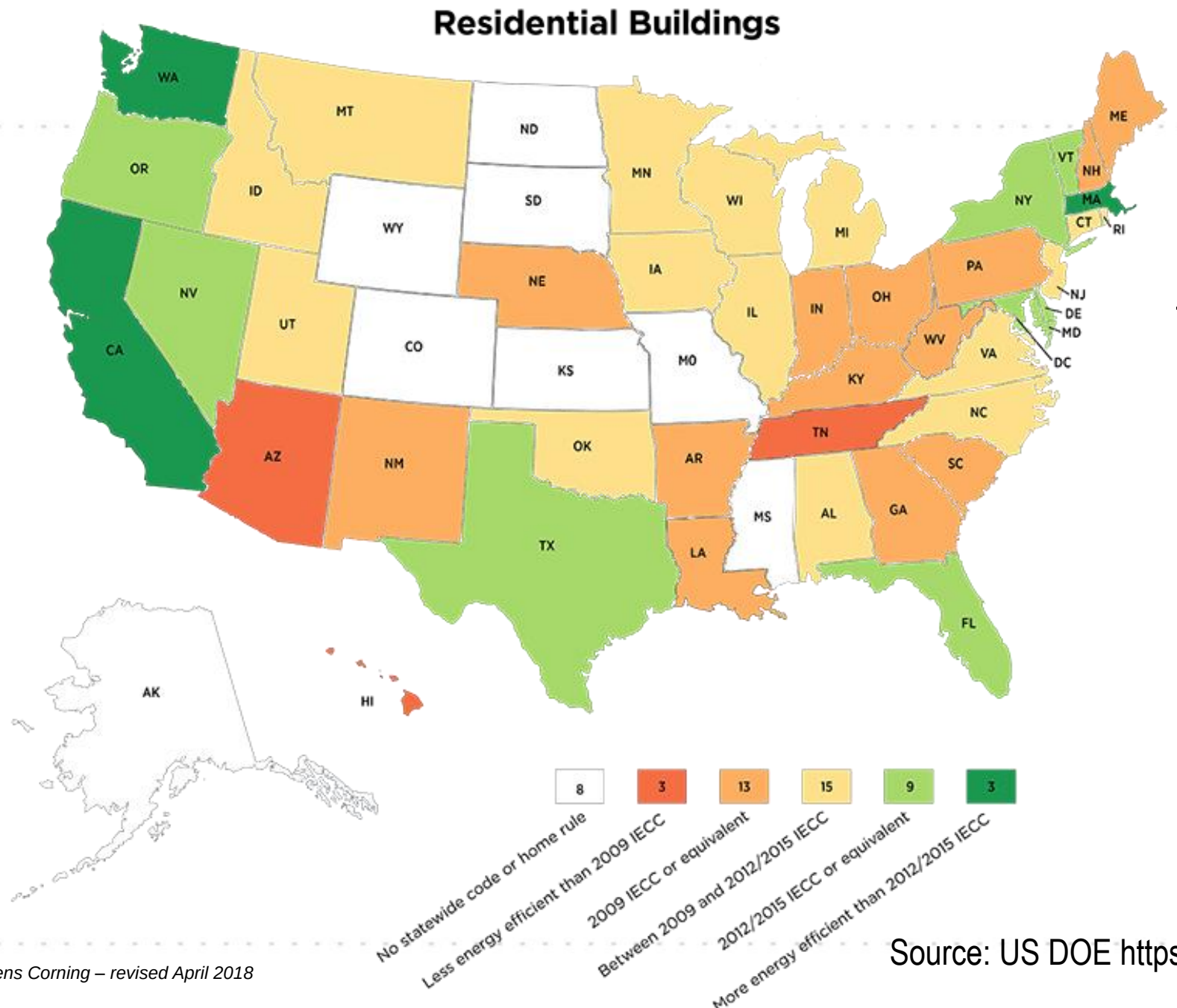
Major Differences: 2009, 2012, 2015, 2018 IECC

Residential – Single Family

- **Fact**: Big change, on paper, was between the 2009 & 2012 IECC
- 2015 & 2018 IECC had minor changes in energy efficiency

Here's What's New on Paper: (Moving from the 2009 to 2018 IECC)

- **New Compliance Path**: Energy Rating Index (2015 IECC; *weakened in 2018 IECC*)
- **Envelope Requirements Improved** (2012 IECC)
- **Envelope Air Leakage Improved** (2012 IECC)
- **Solar Introduced** but with Conditions (2018 IECC)
- **Tight & Buried Ducts** Accepted (2018 IECC)
- **IRC: Floor I-Joist Protection / Sprinklers in Concealed Spaces** ***(only if adopted locally)***



Note: US DOE Map looks at the overall level of energy efficiency of a State energy code.

This is not a good barometer for the insulation contractor

Source: US DOE https://www.energycodes.gov/adoption/states

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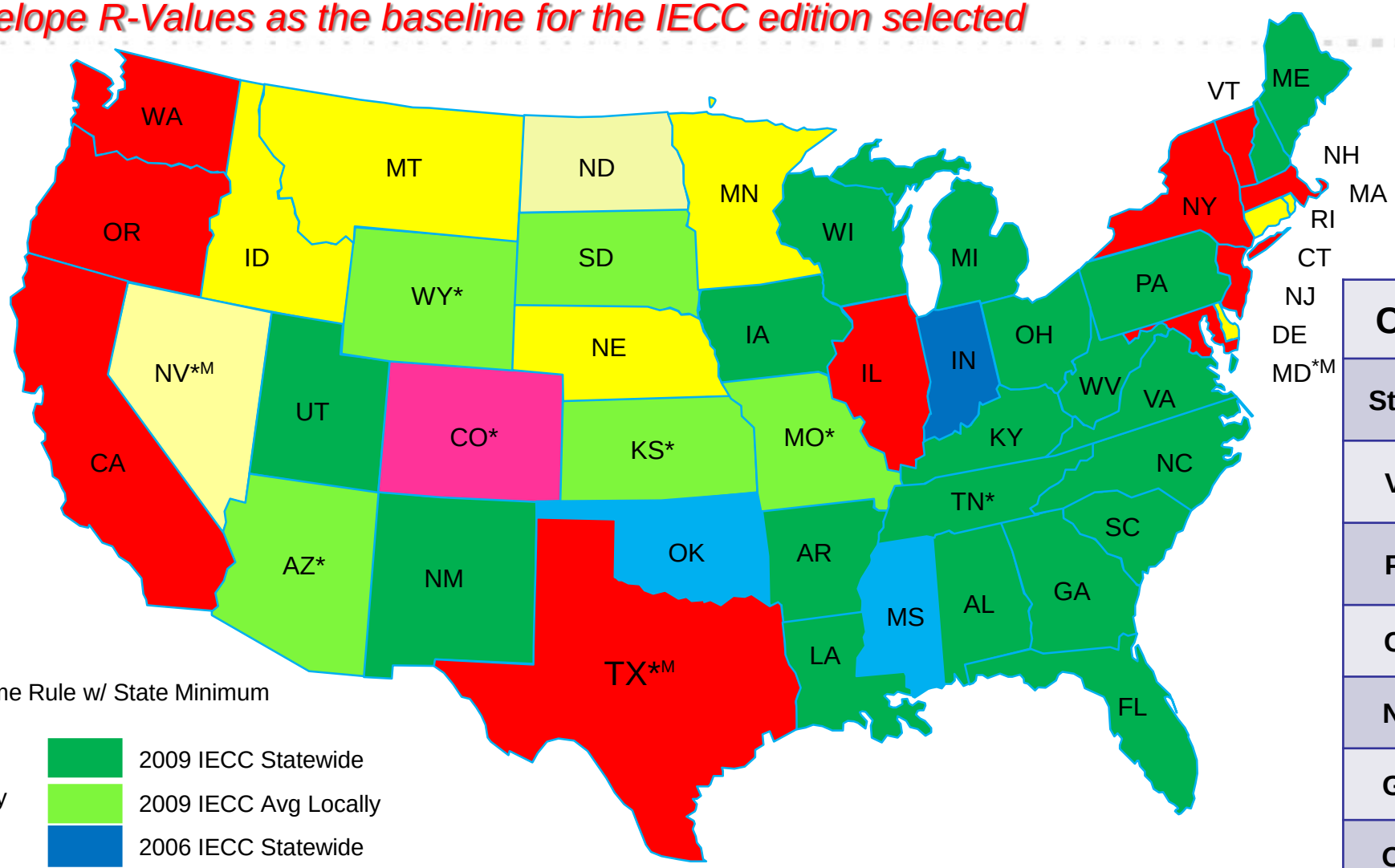
Residential Energy Code Status

with only the Envelope R-Values as the baseline for the IECC edition selected



* = Home Rule *M = Home Rule w/ State Minimum

- 2015 IECC Statewide
- 2015 IECC Avg Locally
- 2012 IECC Statewide
- 2012 IECC Avg Locally
- 2009 IECC Statewide
- 2009 IECC Avg Locally
- 2006 IECC Statewide
- 2006 IECC Avg Locally

State abbreviation ("TX") = hyperlink to DOE code info

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Coming Updates

State	IECC used	Date
VA	2012a	9/18 (+6)
PA	2015a	10/18 (+6)
CT	2012a	10/18
NC	2015a	1/19
GA	2015a	1/20
OH	2015a	2019
NV	2018a	2019

Envelope R-values Have Plateaued in the IECC

Climate Zone	Ceiling								Wall							
	2006	2009	2012	2015	2018	2021	2024	NZE	2006	2009	2012	2015	2018	2021	2024	NZE
1	30	30	30	30	30	30	30	30	13	13	13	13	13	13	13	19/13+5
HERS/ERI	*97*	*79*	*74*	*52*	*57*	*?*	*?*	*?*	*97*	*79*	*74*	*52*	*57*	*?*	*?*	*?*
2	30	30	38	38	38	38	38	38	13	13	13	13	13	13	13	19/13+5
HERS/ERI	*96*	*79*	*73*	*52*	*57*	*?*	*?*	*?*	*96*	*79*	*73*	*52*	*57*	*?*	*?*	*?*
3	**30**	**30**	**38**	**38**	**38**	**38**	**38**	**38**	**13**	**13**	**20/13+5**	**20/13+5**	**20/13+5**	**20/13+5**	**20/13+5**	**21/13+7.5**
HERS/ERI	***94***	***78***	***71***	***51***	***57***	***?***	***?***	***?***	***94***	***78***	***71***	***51***	***57***	***?***	***?***	***?***
4 (ex Marine)	38	38	49	49	49	49	49	60	13	13	20/13+5	20/13+5	20/13+5	20/13+5	20/13+5	21/13+7.5
HERS/ERI	*92*	*82*	*76*	*54*	*62*	*?*	*?*	*?*	*92*	*82*	*76*	*54*	*62*	*?*	*?*	*?*
4 Marine & 5	38	38	49	49	49	49	49	60	19/13+5	20/13+5	20/13+5	20/13+5	20/13+5	20/13+5	20/13+5	30 dbl wall / 19+10
HERS/ERI	*91*	*82*	*80*	*55*	*61*	*?*	*?*	*?*	*91*	*82*	*80*	*55*	*61*	*?*	*?*	*?*
6	49	49	49	49	49	49	49	60	19/13+5	20/13+5	20+5 / 13+10	20+5 / 13+10	20+5 / 13+10	20+5 / 13+10	20+5 / 13+10	40 dbl wall / 19+20
HERS/ERI	*92*	*83*	*79*	*54*	*61*	*?*	*?*	*?*	*92*	*83*	*79*	*54*	*61*	*?*	*?*	*?*
7 & 8	49	49	49	49	49	49	49	60	21	21	20+5 / 13+10	20+5 / 13+10	20+5 / 13+10	20+5 / 13+10	20+5 / 13+10	40 dbl wall / 19+20
CZ7 HERS/ERI	*93*	*85*	*78*	*53*	*58*	*?*	*?*	*?*	*93*	*85*	*78*	*53*	*58*	*?*	*?*	*?*
CZ8 HERS/ERI	*96*	*86*	*79*	*53*	*58*	*?*	*?*	*?*	*96*	*86*	*79*	*53*	*58*	*?*	*?*	*?*

Air Leakage Requirements by Code, Standard, Program

Climate Zone	Air Leakage Requirements expressed in Air Changes per Hour/50 Pascal (ACH50)										
	2006 IECC	2009[1] IECC	2012-2018 IECC[2, 3, 4]	ASHRAE 90.2	Energy Star v3	Energy Star v3.1	LEEDv4 1 Point	LEEDv4 2 Points	DOE ZERH	OC NZE	PHIUS 2015[5]
1-2	Visual	<7	≤5	n/a	≤6	≤3	4.25	3	≤3	≤5	0.6
3-4	Visual	<7	≤3	n/a	≤5	≤2.5	3.5	2.5	≤2.5	≤2	0.6
5-7	Visual	<7	≤3	n/a	≤4	≤2	2.75	2	≤2	≤0.6	0.6
8	Visual	<7	≤3	n/a	≤3	≤1.5	2	1.5	≤1.5	≤0.6	0.6

1. verify by either visual inspection or testing 2. 2015 IECC test stds.: ASTM E779 or ASTM 1827 3. 2018 IECC: RESNET/ICC 380, ASTM E779 or ASTM 1827
4. NGBS/ICC 700 = 2015 IECC 5. Passive House spec

Like Envelope Rs, ACH is often weakened in Code State/Local Adoptions

OC NZE: Owens Corning Builder Guide, Net Zero Energy spec

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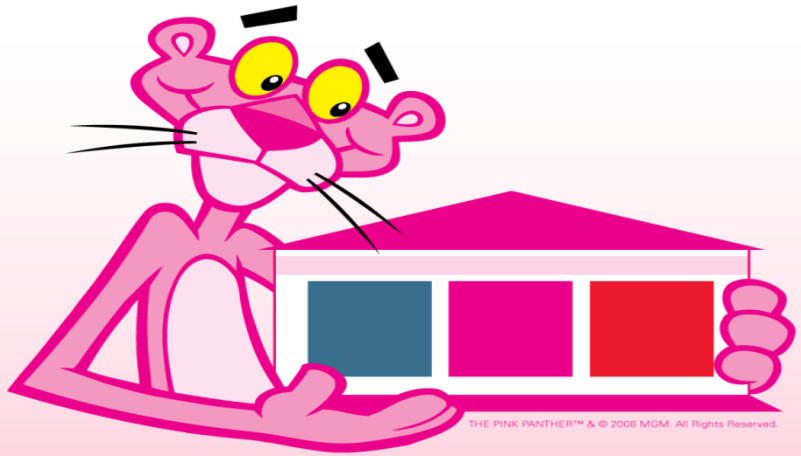
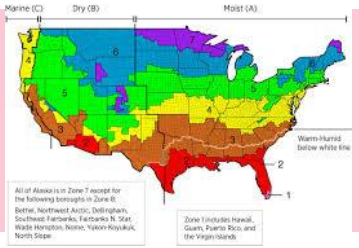
Major Change!
Solar in the Energy Code
with Battery in the Pipeline



New Kid in the Sandbox: Solar
(with Battery as Fast Follower)



	2015 IECC Prescriptive (*Subject to trade-off*)	
Climate Zone	**Ceiling**	**Wall**
1	**30**	**13**
2	**38**	**13**
3	**38**	**20/13+5**
4	**49**	**20/13+5**
4 Marine & 5	**49**	**20/13+5**
6, 7, 8	**49**	**20+5 / 13+10**

For the 1st time, solar is included in the 2018 IECC (in the ERI path only) as an optional energy conservation measure just like HVAC equipment, hot water heaters, windows, insulation and air sealing. Solar is not permitted in the other paths.

Context

Requirements in underline represent an increase from the 2009 IECC.

Examples:

- R38 was R30 under the 2009 IECC
- R20 was R13 under the 2009 IECC

Flat Envelope R-Values: The 2012, 2015, and 2018 IECC Envelope Rs are identical and will likely remain the same in the 2021 IECC.

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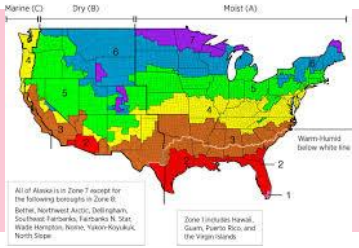
Solar as Trade-Off with a Backstop of the 2009 IECC Envelope Requirements



	2015 IECC Prescriptive (*Subject to trade-off*)		IECC with Solar PV with 2009 IECC Back-Stop	
Climate Zone	**Ceiling**	**Wall**	**Ceiling**	**Wall**
1	30	13	30	13
2	38	13	30	13
3	38	20/13+5	30	13
4	49	20/13+5	38	13
4 Marine & 5	49	20/13+5	38	20/13+5
6, 7, 8	49	20+5 / 13+10	49	20/13+5

Initial Proposal: Allow solar to be used as a trade-off against envelope insulation – BUT with the 2009 IECC as a backstop.

Example: In Climate Zone 4, ceilings could go from R49 to R38, and walls from R20 to R13 if solar is used to meet the energy code.

Attractiveness to Builders: In a Builder's cost-to-build metric, rather than the consumers cost-to-operate metric, leveraging 1) federal, state, and local tax credits, 2) utility incentives, and 3) creative financing for solar drives the builders cost-to-build to meet the energy code down – to nearly zero or cash positive in some markets. *Plus, Solar & Batteries are sexy to consumers,,, attic insulation isn't*

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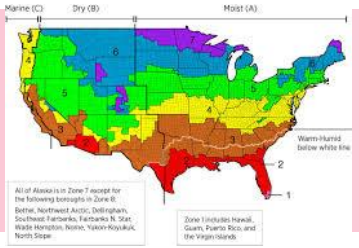
What Unrestrained Solar with No Backstop Looks Like



	2015 IECC Prescriptive (*Subject to trade-off*)		IECC with Solar PV with 2009 IECC Back-Stop		IECC with Solar PV* Unconstrained (*no* 2009 IECC Back-Stop)	
Climate Zone	**Ceiling**	**Wall**	Ceiling	Wall	**Ceiling**	**Wall**
1	30	13	30	13	<30	<13
2	38	13	30	13	<30	<13
3	38	20/13+5	30	13	<30	<13
4	49	20/13+5	38	13	<38	<13
4 Marine & 5	49	20/13+5	38	20/13+5	<38	<20/13+5
6, 7, 8	49	20+5 / 13+10	49	20/13+5	<49	<20/13+5

Another Proposal: Allow solar into the code with ***no limits***.

Trade-Off Example

In Florida (CZ2), it's feasible through software modeling to reduce walls to R-7 and attics to R-18 with unrestrained solar and no backstops for the envelope, ACH, or other baseline energy savings measures. The added impact of battery storage was not modeled.

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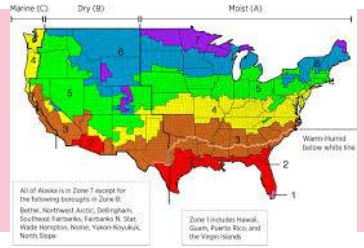
* Hypothetical reductions are possible with unrestrained solar but may be unlikely due to potential comfort issues.

Grand Compromise: Permit Solar in ERI Path with Conditions



	2015 IECC Prescriptive (*Subject to trade-off*)	
Climate Zone	**Ceiling**	**Wall**
1	**30**	**13**
2	**38**	**13**
3	**38**	**20/13+5**
4	**49**	**20/13+5**
4 Marine & 5	**49**	**20/13+5**
6, 7, 8	**49**	**20+5 / 13+10**

What's in the 2018 IECC:

1. Solar may only be used in the Energy Rating Index (ERI) path
2. Solar is not permitted in the Prescriptive or other Performance paths.
3. If solar is used, then the 2015 IECC prescriptive envelope requirements must be met as a ***mandatory minimums***
4. No trade-offs are permitted against the envelope

2018 IECC with Solar *2015 IECC Prescribed R-Values are Mandatory*	
Ceiling	**Wall**
30	**13**
38	**13**
38	**20/13+5**
49	**20/13+5**
49	**20/13+5**
49	**20+5 / 13+10**

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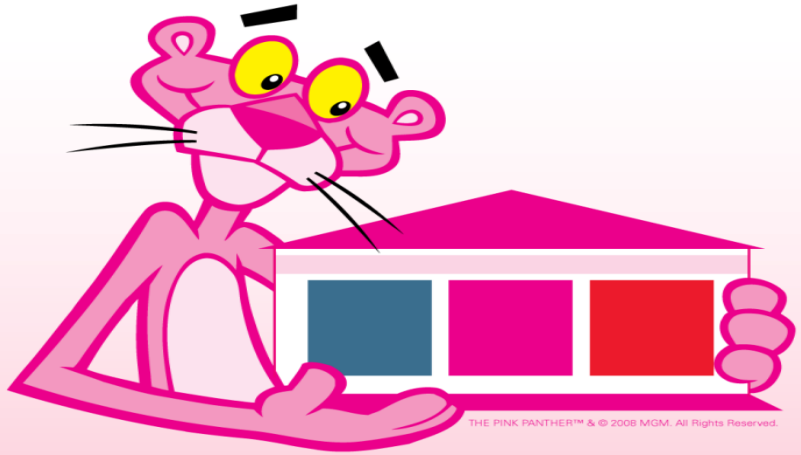
Tight & Buried Ducts

Equal to Ducts in Conditioned Space
Equals Low Cost HERS Points
(NAHB Proposal)

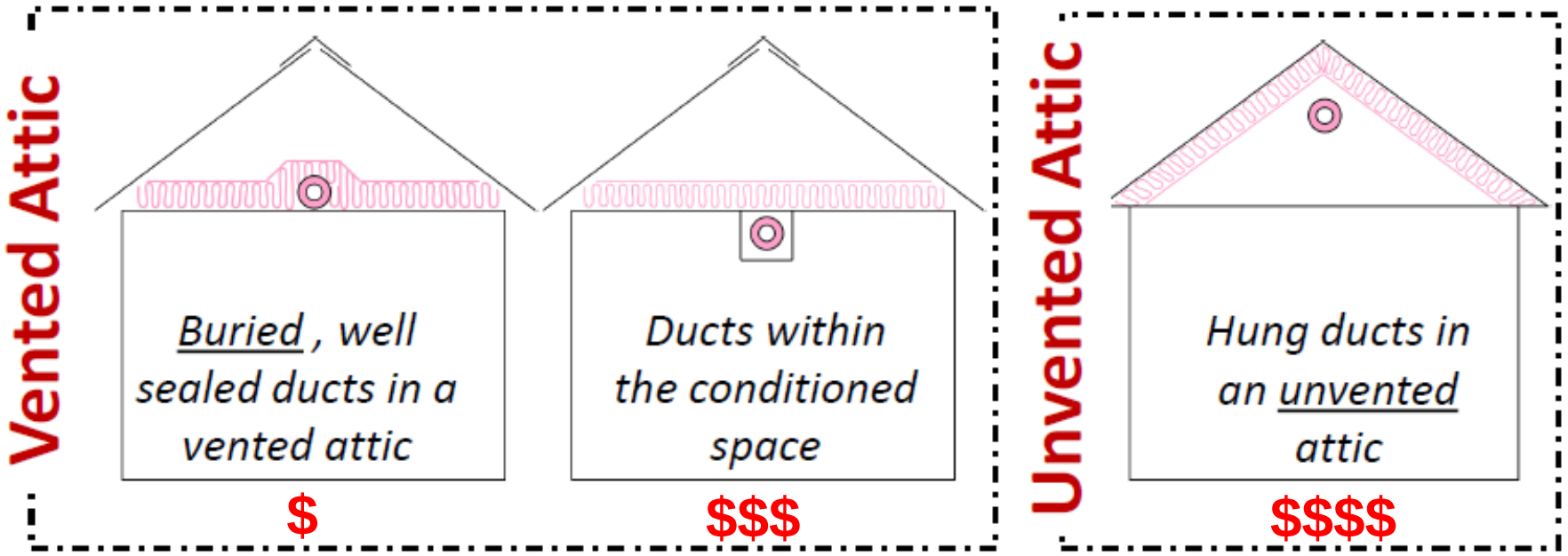
New in 2018 IECC
But Being Adopted in States Now!



Cost-Effective Option for Builders

How to get energy savings/HERS points and meet/exceed the energy code at low cost?

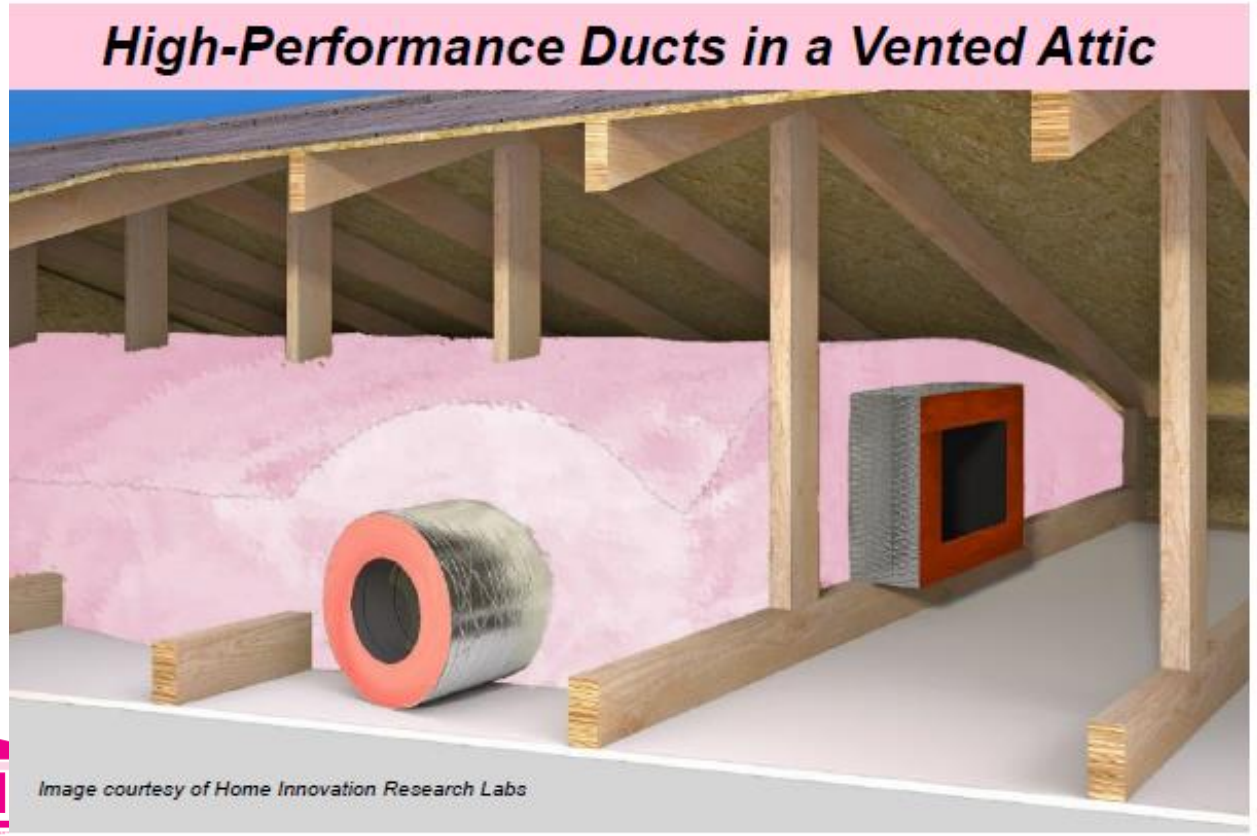
Goal: reduce energy consumption associated with HVAC systems in residential applications (thermal losses, duct leakage)



Negative Aesthetics

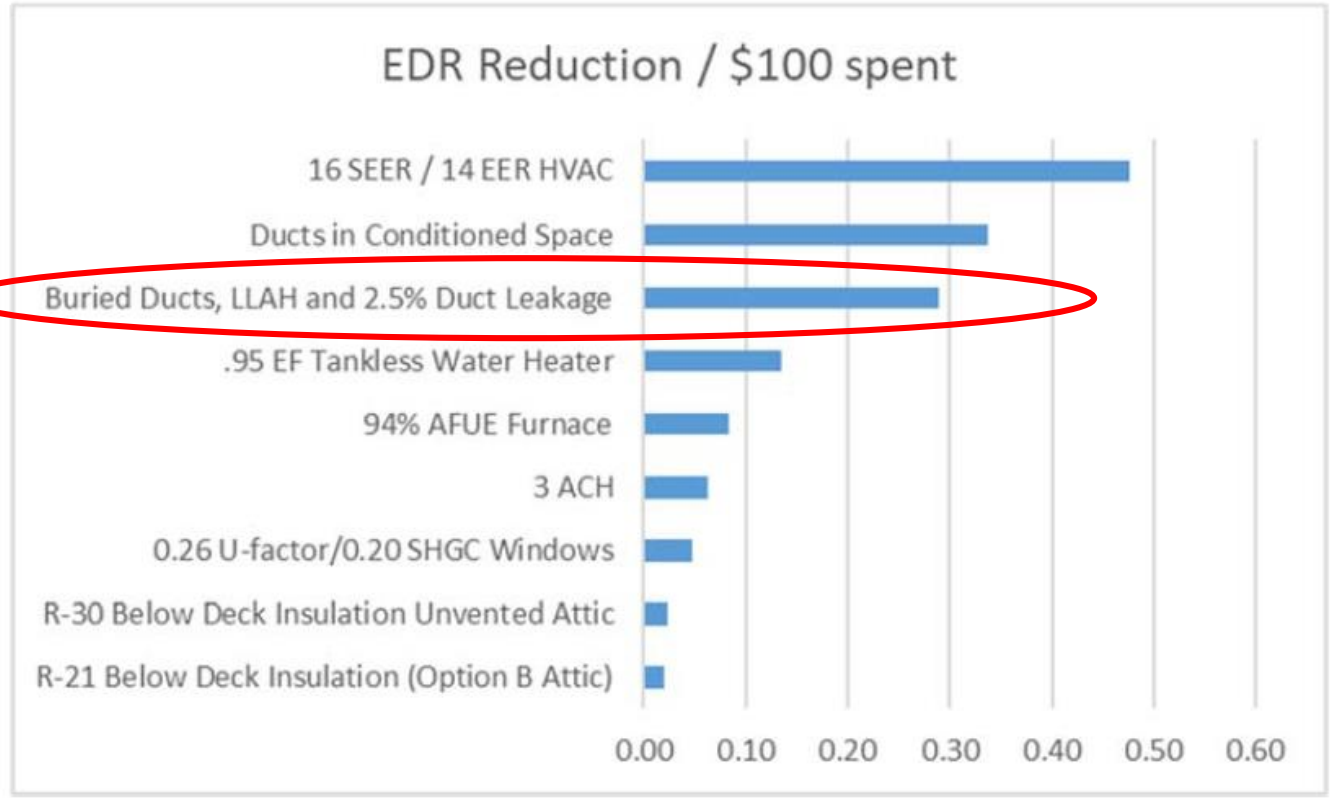
Tight & Buried Ducts

Get points for ducts in conditioned space at lower cost!

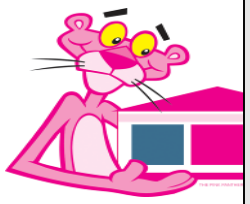


- Ducts placed on the ceiling drywall or over the bottom truss chords.
- Attic insulation covers (buries) the ducts.
- Reduces thermal losses from ducts located in vented attics.

ROI of Tight & Buried Ducts – even in California's Net Zero Energy Code



Completed by ConSol using the 2019 research CBECC-Res software, CEC's 2-story 2,700ft² prototype home in CZ12 (Sacramento). Cost analysis used ConSol's estimated material and labor cost database.



- **Based on California Energy Code**
- **Buried ducts provide a reduction in EDR at reasonable cost**
- ***Buried ducts ranks 3rd in list of features based on EDR/$100 spent*** **falling below 16 SEER/14 EER HVAC (1st) and Ducts in Conditioned Space (2nd).**

Builder Value Proposition: Buried Ducts

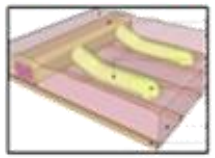
Builder Costs (Steve Winter Assoc Report)

	Partially Buried	Fully Buried	Deeply Buried	Unvented ccSPF	Encap-sulated	Partially Buried and Encap-sulated	Fully Buried and Encap-sulated	Deeply Buried and Encap-sulated	Interior Ducts
R-30 ccSPF Roof Deck[a]				$8,363					
Encapsulated ducts[a,b]					$1,678	$1,678	$1,678	$1,678	
Partially Buried (R-33 Fiberglass)[c]	$95								
Fully Buried (R-42 Fiberglass)[c]		$380							
Deeply Buried (R-51 Fiberglass)[c]			$665						
Partially Buried and Encapsulated (R-37 Fiberglass)[c]						$222			
Fully Buried and Encapsulated (R-46 Fiberglass)[c]							$507		
Deeply Buried and Encapsulated (R-54 Fiberglass)[c]								$760	
Interior Ducts[d]									$1,680
Total Cost	$95	$380	$665	$8,363	$1,678	$1,900	$2,185	$2,439	$1,680

Incremental Cost over traditional attic →

$380

$8,363 *



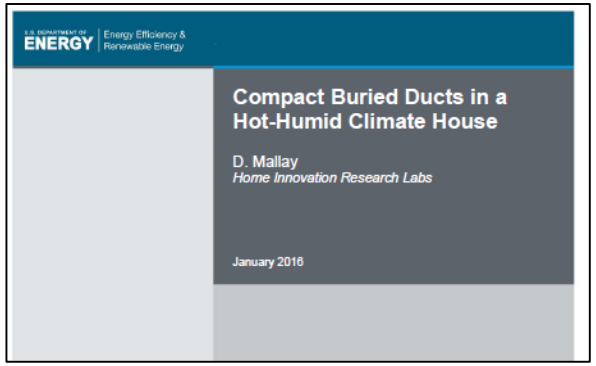
$2,050

$1,680

*This is based on ccSPF. Most attics today are using ocSPF, so cost is <$5,000

Steven Winter Associates

Home Innovation Lab

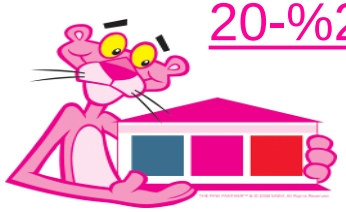


Home Innovation Lab

"If cost savings from monetizing the reduced duct area and smaller capacity systems are included, the proposed solution [Buried Ducts] could realistically be a no-cost option."

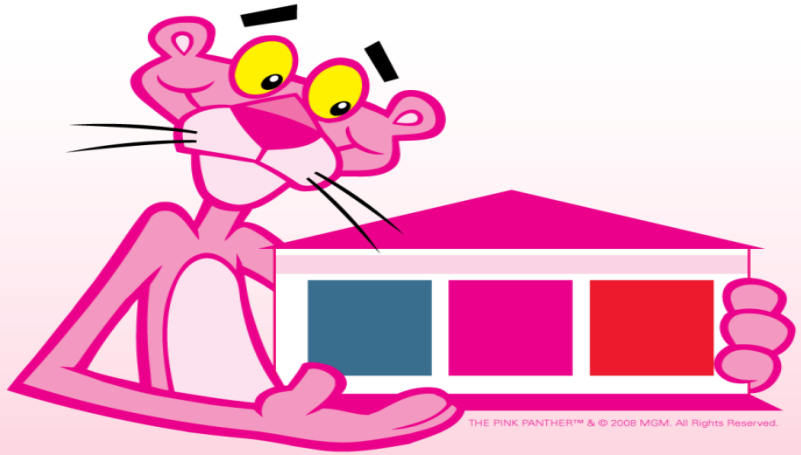
Builder Resources – Buried Ducts

1. **Home Innovation Lab TechSpec (How To):** http://information.insulationinstitute.org/buried-ducts/buried-ducts-installion-guide
2. **Home Innovation Lab Builder Value Proposition:** http://information.insulationinstitute.org/buried-ducts/buried-ducts-brochure
3. **Home Innovation Lab YouTube (Understanding Code):** http://information.insulationinstitute.org/buried-ducts/buried-duct-system-benefits
4. **US DOE Building America Solution Center:** https://basc.pnnl.gov/resource-guides/ducts-buried-attic-insulation#quicktabs-guides=0
5. **RESNET Conference Presentation:** http://conference2018.resnet.us/data/energymeetings/presentations/Buried%20Ducts%20-%20RESNET%20Conference%202018%20-%20Final.pdf



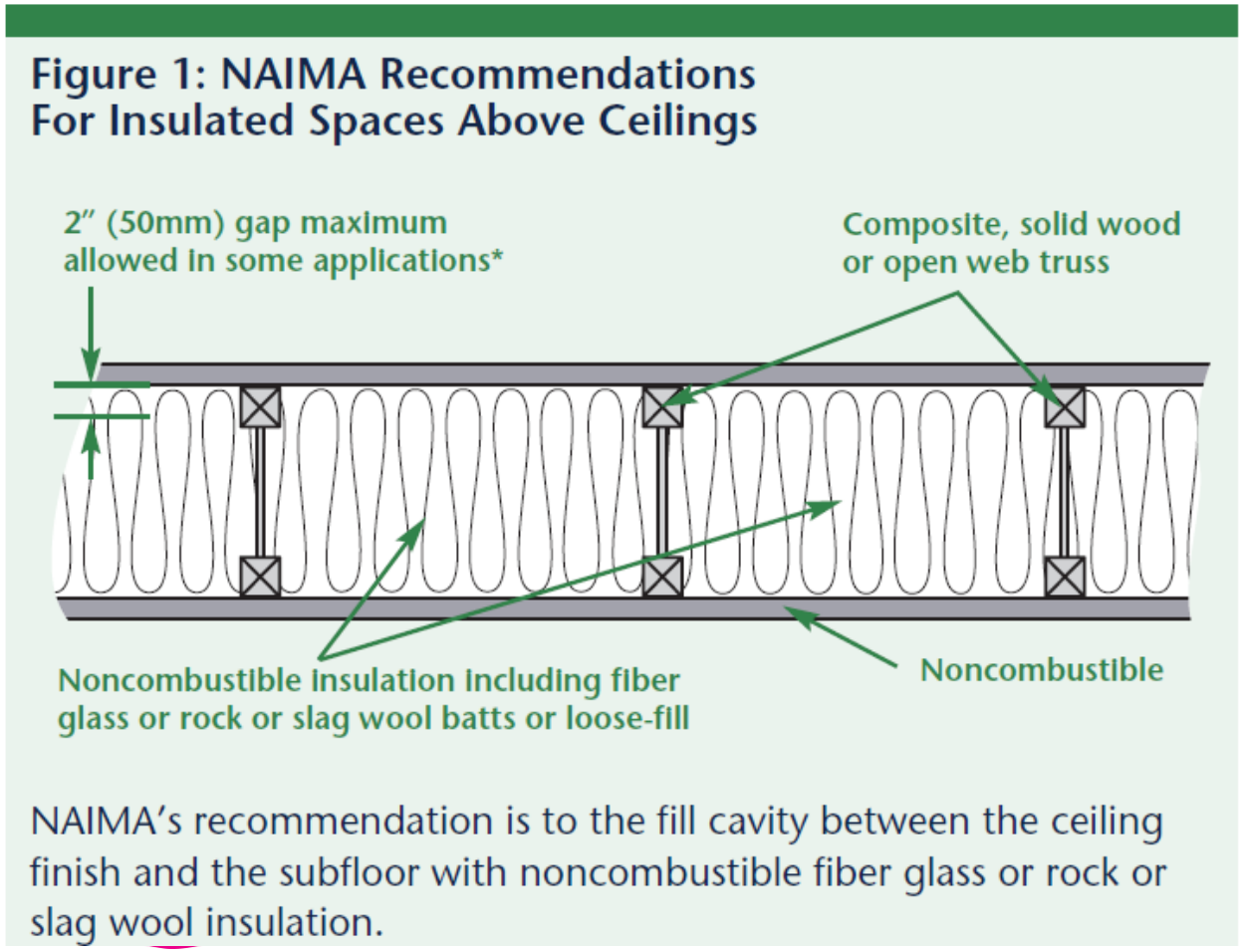
The IRC and NFPA 13

Sprinklers & Concealed Spaces



NPFA 13 – Sprinkler Exception for Concealed Spaces

Chapter 8 (8.15.1.2): Concealed spaces not requiring sprinkler protection



- ***Insulate concealed cavities instead of sprinklering them***
- Cost Savings option to fully sprinklered spaces
- Dependent on IRC & IBC adoptions
- ***Builders remove sprinkler requirements in local code adoptions***


INSULATION FACTS #86

NAIMA

Fiber Glass and Mineral Wool Insulation as an Alternative to Sprinkler Systems

Reduce Construction Costs Using Fiber Glass and Mineral Wool Insulation to Omit Sprinklers in Concealed Spaces

There are three basic approaches used in building codes to provide fire safety – detection, suppression, and containment. No single measure guarantees protection in a fire event. Balanced fire protection design blends detection (e.g. fire notification and safe egress. Passive fire protection systems, including fireblocking material, are installed to resist the free passage of flames and smoke to other areas of the building through concealed spaces. Fiber glass, rock and slag wool insulation materials are ideally

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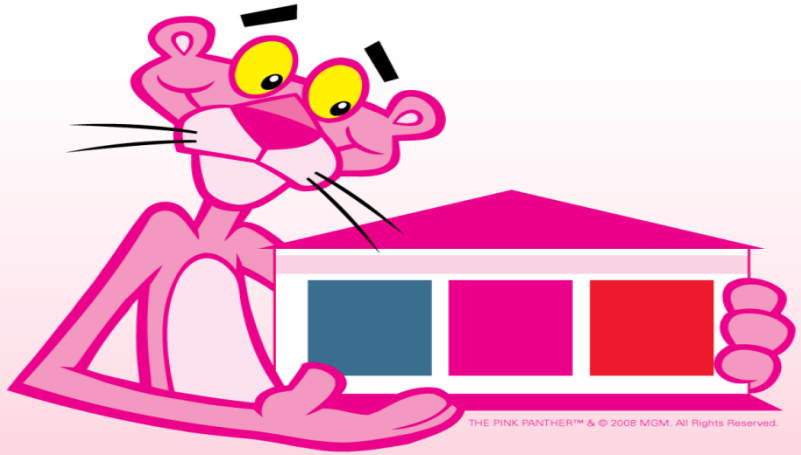
https://insulationinstitute.org/wp-content/uploads/2015/12/BI504.pdf

The IRC and Wood I-Joist Protection



IRC – Fire Protection of Floors

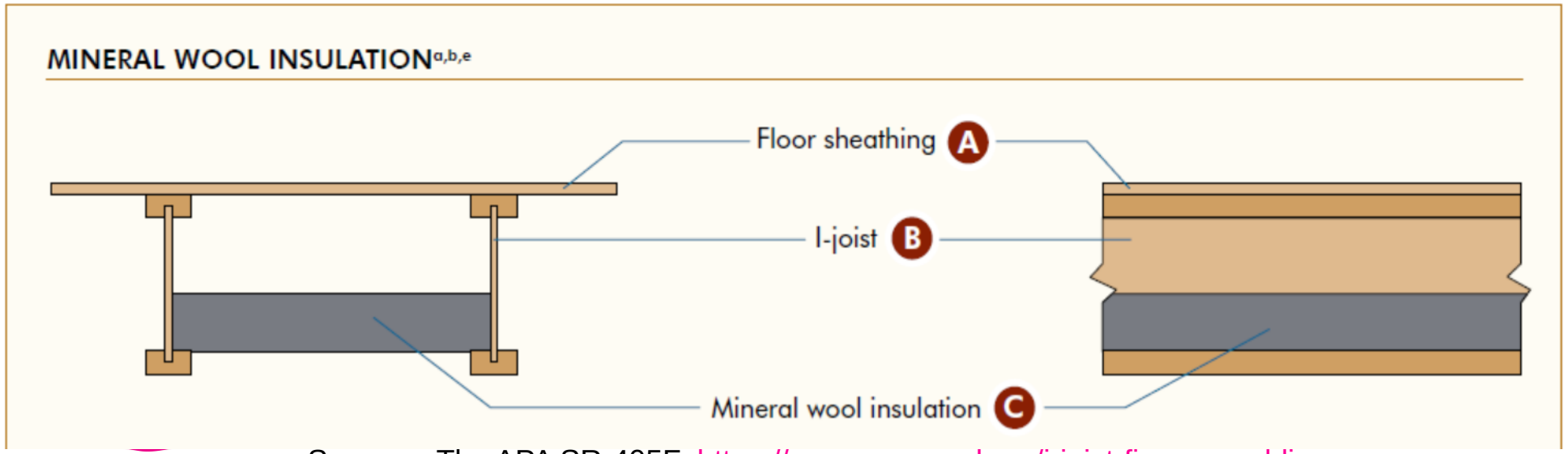
IRC R302.13 - Mineral Wool as Option to Dimensional Lumber or Equal

- Equivalency option: ICC-ES Acceptance Criteria 14 - Prefabricated Wood I-joists

FIRE PROTECTION OF FLOORS FP-04

Fire Protection: Mineral Wool Insulation

The following fire resistance design is an alternative to the 2-by-10 dimensional lumber prescribed in Exception 4 of 2012 IRC Section R501.3 and 2015 IRC Section R302.13 with demonstrated equivalent fire performance.



AC-14 Covers

- Fire Test E119
- Durability
- Corrosion Test
- Impact on I-Joists

jay.murdoch@owenscorning.com Source – The APA SR-405F: https://www.apawood.org/i-joist-fire-assemblies

2. State & Local Regulation

1. REGGI States (MD-New England) driving energy efficiency (R-PACE)
2. CA + PacNW Climate Policy (+CA SB100) with New England Copy Cats
3. CALGreen Adoption by Cities/Counties exceeding Energy Code
4. Multi-Family: Affordable Housing Embrace of EE/Green/Passive House
5. Regulatory Stall Processes to Delay/Limit Code Updates
6. Ratepayer Waste: Utility New/Existing Home Programs that Don't Work
7. Utility & Tax Incentives for Solar & Battery (shift builder spec/paths)
8. Neglected: Utility Rate Case Interventions by Insulation Industry

3. State & Federal Legislation

1. **Codes**: 6 Year Cycle; Unbalanced Code Councils; Cost Tests; Limit Home Rule
2. **Solar + Battery**: Legislative mandates; efforts to amend code to allow unrestrained use
3. **Progressive States**: Stretch, Net Zero, Low Carbon Codes. Possibly Retrofit (R-PACE)
4. **Less Progressive States**: Hold the Line or Roll Back on Codes
5. **CA Existing Homes**: Post 2020 Election – Tax Credit & R-PACE Expansion
6. **Federal Message Bills**: planting seeds for post 2020 elections
7. **Federal 45L/25e**: Watch RESNET & ACEEE proposals. Limits compliance to ERI path
8. **Federal (SAVE Act)**: Legislation or via Administrative Executive Order

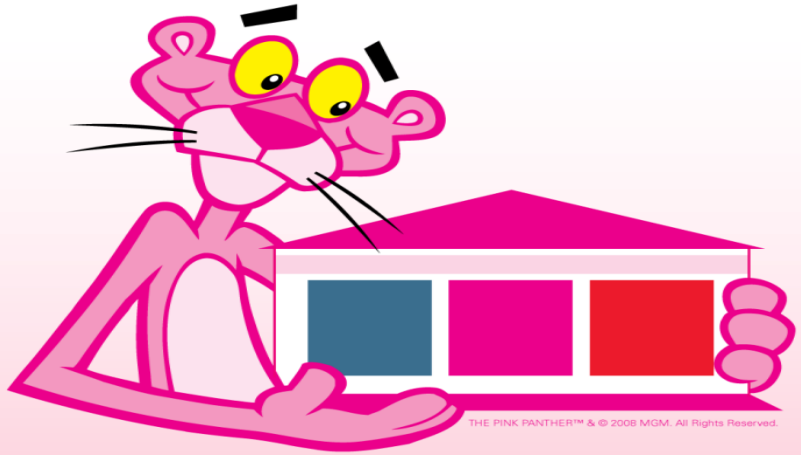
4. Market Issues

1. **Indoor Air/Environmental Quality** in Homes: on Builder's Radar*
2. **Mineral Wool Batts**: watch New England per penetration
3. **Commercial GCs Bringing Insulation In-House** per Cycle Time Demands*
4. **EE Modeling Software** and HERS Scores & Market Inconsistency
5. **Multi-Family**: Sound & Noise Control; Green/Passive in Affordable Housing*
6. **Next Gen Product Specs**: Focus on EPDs, Embodied Energy & Carbon*
7. **Watch Passive House Trend** (Multi-Family will lead Single-Family)
8. **Components** / Panelization / Modular / Off-Site
9. **No Insulation Industry PR Campaign** like Wood & Concrete/Masonry Industries*

Looming Trend: Zero Energy Homes

Far Off Trend: Passive House

by Early Adopters



Passive House: Sample Envelope R-Values

Zone	Example City	Wall	Ceiling
1	Miami	R19 - 27	R44 - 60
2	Phoenix	R19 - 27	R30 - 70
3	Sacramento	R13 - 31	R30 - 60
3 Marine	San Francisco	R19 - 23	R30 - 38
4	Baltimore	R31 - 51	R49 - 80
4 Marine	Seattle	R31 - 43	R60 - 70
5	Providence RI	R31 - 43	R60 - 70
6	Burlington VT	R39 - 51	R70 - 90
7	Duluth MN	R49 - 65	R80 - 90
8	Fairbanks	R89	R120

Passive House Trend

Multifamily & Commercial

- First to Adopt in Volume
- Affordable/Low Income Housing
- Baked into State QAPs
- NYC & Washington DC Leading
- Ripe for Panelized & Modular
- Bleed over to Private MF Specs

Single Family - will Lag MF

- “Heat Home with a Hair Dryer”
- Early Adopters are Young Turks
- Not Traditional NAHB Members
- New England, CA/NW are Ripe
- NY Stretch Code
- Perceived Threat to Some

5. “So What” - What Might Really Impact You

1. **Codes** – Envelope Reductions & Trade-Offs; Envelope Leakage Weakened; Solar & Battery; Noise Control; Sprinkler Adoption; Floor I-Joist Protection; Stretch Codes; Tight & Buried Ducts; Unvented Attics with Air Permeable Insulation; Enforcement Wild-Card
2. **Regulation** – 6 year Code Cycles; Unbalanced Code Councils; Cost Tests
3. **Legislation** – CA Solar/Battery Mandates; Stretch Codes; Climate; CA Existing Homes Retrofit post 2020+; Residential PACE (retrofit); A Real SAVE Act or Exec Order
4. **Market Issues** – Environmental/IAQ; Compliance choices due to limited labor; Components/Panelizing; Mineral Wool; Sound Control; No Industry PR Campaign

Discussion

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Appendix

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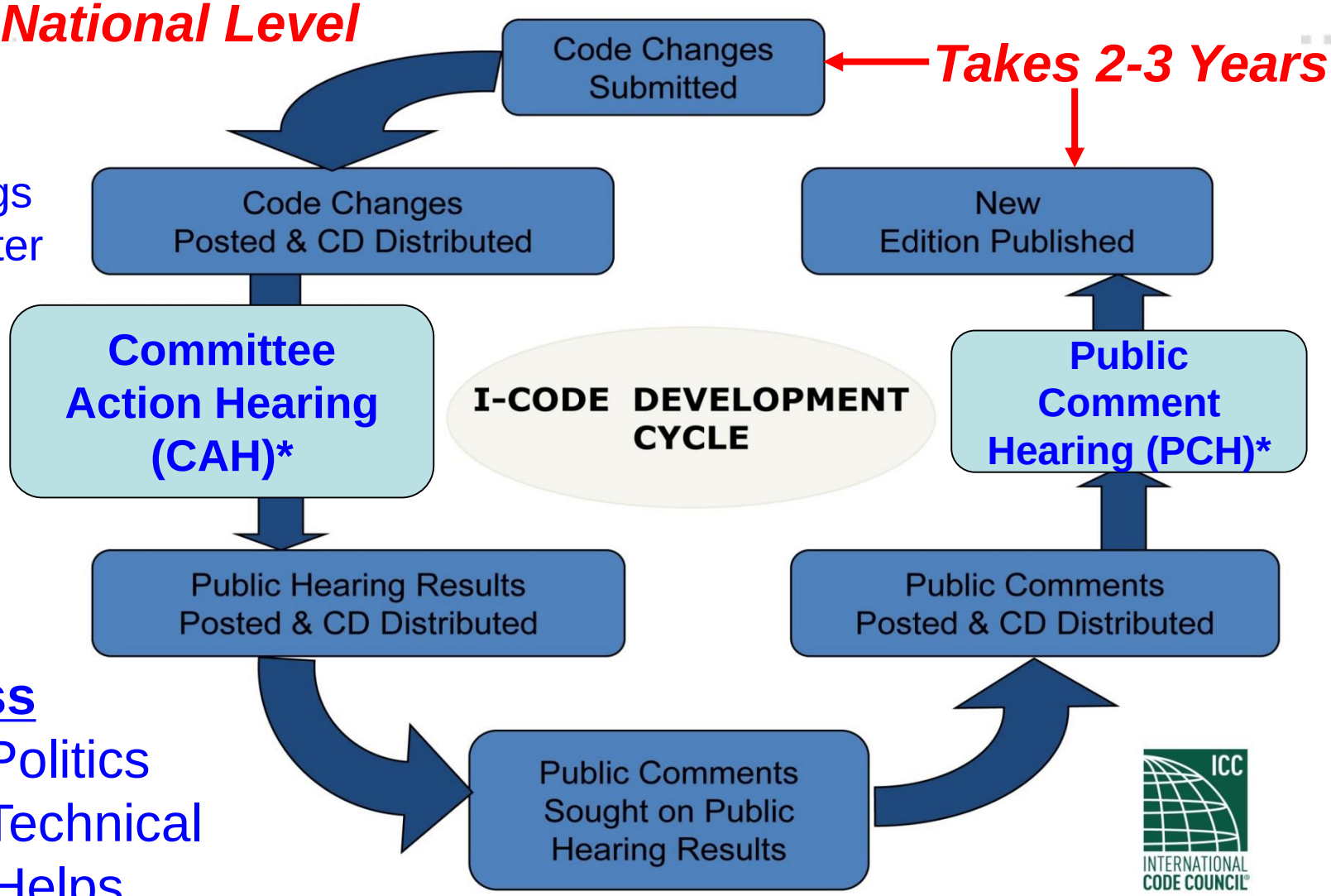
ICC Code Development Process

At the National Level



* Hearings are Theater

Process

- 90% Politics
- 10% Technical
- Luck Helps

Process Repeats at State Level

Source: http://www.iccsafe.org

Being the Advisor to the Builder

Insulation Contractor as Builder Advisor

The Builder's Advisor

- Today: HERS Rater is the Builder's Advisor on Code, Specs, Incentives
- Rater does Energy Modeling & Provides Solution Options
- Rater is the On-Site Traffic Cop – Inspecting & Testing Your Work
- The Spectators? HVAC, Plumbing, Framing, and Insulation Contractors

Design Phase: Energy Code, Energy Star, Utility Compliance

1. Goal: Develop compliance paths that feature your offering (not other trades) & builder metric
2. Tools: ResCheck, RemRate, EnergyGauge, or Builder Option Packages (BOPs) by OC
3. Out Source 1st: test a partnership with a Rater to develop compliance path options
4. Bring In-House: after test, start to grow or add capacity internally over time

Test & Inspect Phase (Best place to start)

1. Goal: start inspecting & testing your own work (blower door testing)
2. Rater Required: Only with Energy Star, DOE ZERH, LEED, ERI Path
3. Rater Not Required: The IECC does not Mandate use of Rater to inspect/test
4. Most Building Depts just want a # per Envelope & Duct leakage testing
5. BPI's Infiltration & Duct Leakage Cert (IDL) is a low pain & low cost entry point

Tailor Your Offering to Compliance Paths Used

Characteristics	IECC Compliance Path Options			
	Prescriptive	Prescriptive UA Alternative	Performance	Energy Rating Index (ERI)
% used in Your Market	25%?	35%?	40%?	0%?
Typical Builder using this path	Small	Small/Medium	Medium/Large	n/a
Must Meet Mandatory Requirements	Yes	Yes	Yes	Yes
Requires Software	No	An Option (REScheck)	Yes	Yes
IECC Requires Third Party Verification?	No	No	No	Yes
Impacts Builder & Subs Cycle Times	No	No	May	Yes

Primary Source: https://www.proudgreenhome.com/blogs/the-energy-code-compliance-conundrum/