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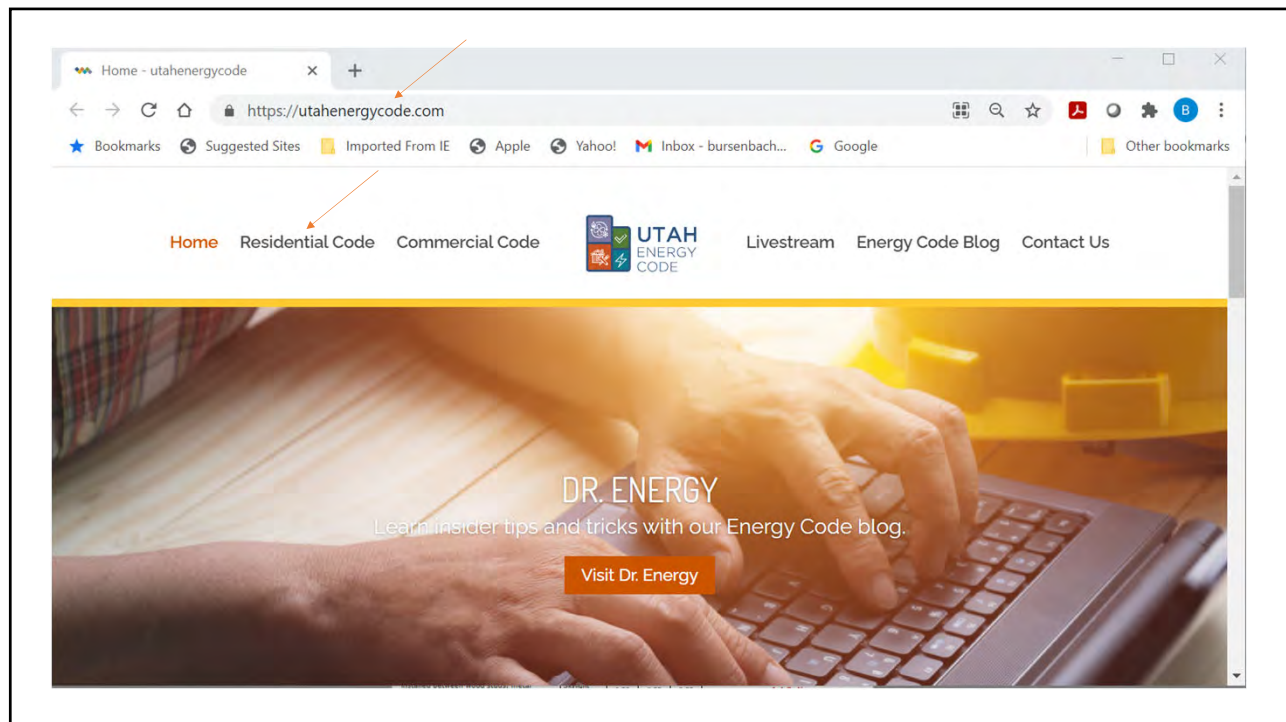
Funding for Energy Code Training



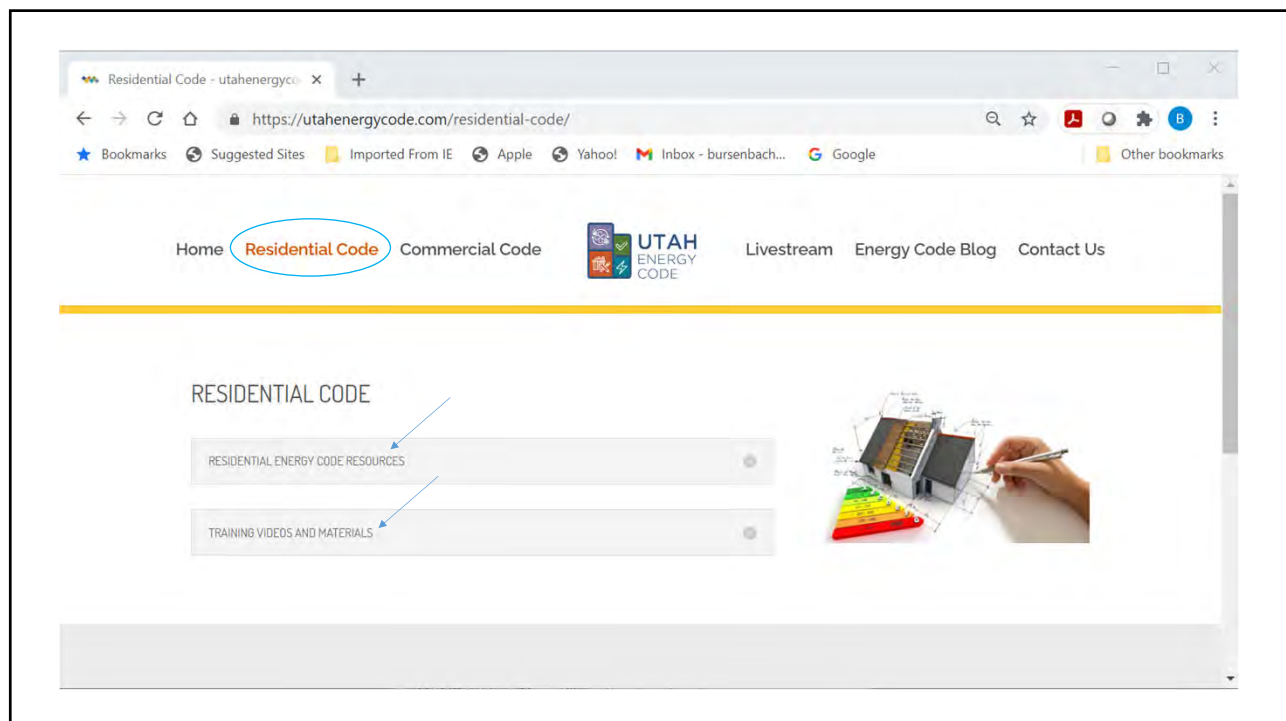
ThermWise®

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RESIDENTIAL CODE

RESIDENTIAL ENERGY CODE RESOURCES

- [Residential Quick Guide](#)
- [Utah 2015 International Energy Conservation Code – Residential & Commercial Amendments](#)
- [Residential Compliance Paths](#)
- [Utah HERS Rater Contact Info](#)
- [Air Barrier & Insulation Installation – Table N1102.4.1.1 \(402.4.1.1\)](#)

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RESIDENTIAL CODE

RESIDENTIAL ENERGY CODE RESOURCES

TRAINING VIDEOS AND MATERIALS

- September 9, 2020 – Residential IECC: Improving Air Quality and Controlling Moisture with Ventilation and Local Exhaust
 - [View the webinar recording](#)
- June 11, 2020 – Residential Energy Field Inspections
 - [View slide deck](#)
 - [View the webinar recording](#)
- May 13, 2020 – Energy Code Heat Pump Lab
 - [View slide deck](#)
- January 16, 2020 – Utility Program Incentive Updates
 - [Watch now](#)
 - [View Rocky Mountain Power Incentives slide deck](#)
 - [View Dominion Energy Incentives slide deck](#)
 - [View HERS raters slide deck](#)
- May 9, 2019 – Residential Code Compliance – Plumbing, Electrical, and Lighting
 - [Watch now](#)
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- April 25, 2019 – Understand Insulation Choices and Improve the Thermal Envelope
 - [View slide deck](#)
- April 11, 2019 – 2019 Legislative Updates
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- February 14, 2019 – Who is responsible for meeting Utah's Energy Code?
 - [Watch now](#)
 - [View slide deck](#)
- November 8, 2018 – Reducing air leakage in multifamily projects for code compliance
 - [Watch now](#)
 - [View slide deck](#)
- October 11, 2018 – Residential HVAC requirements for code compliance
 - [Watch now](#)
 - [View slide deck](#)
 - [Manual J brochure](#)
 - [Manual D brochure](#)
 - [Manual S brochure](#)
- May 16, 2018 – Benefits of Homes that meet Utah's Energy Code
 - [View slide deck](#)
- May 10, 2018 – Residential Energy Code – Mechanical Ventilation
 - [Watch now](#)
 - [View slide deck](#)
- April 12, 2018 – Residential Energy Code – Building Envelope
 - [Watch now](#)
 - [View slide deck](#)
- March 26, 2018 – Building Homes to Meet Utah Energy Code
 - [View slide deck](#)

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COMMERCIAL CODE

COMMERCIAL ENERGY CODE RESOURCES

- [Commercial Quick Guide](#)
- [Utah 2015 International Energy Conservation Code – Residential & Commercial Amendments](#)
- [Section C402.5.1.2.1 – Materials with Air Permeance](#)

TRAINING VIDEOS AND MATERIALS


- April 30, 2020 – Commercial IECC: Energy Performance Ratings for Windows, Doors, and Skylights Webinar
 - [View the webinar recording](#)
- April 8, 2020 – ARC Lab & Energy Code Webinar
 - [View the webinar recording](#)
- January 16, 2020 – Utility Program Incentive Updates
 - [Watch now](#)
 - [View Rocky Mountain Power Incentives slide deck](#)
 - [View Dominion Energy Incentives slide deck](#)
 - [View HERS raters slide deck](#)
- April 26, 2019 – Commercial Energy Commercial HVAC Technology Challenges & Solutions
 - [View slide deck](#)
- April 11, 2019 – 2019 Legislative Updates
 - [Watch now](#)
 - [View slide deck](#)
- March 14, 2019 – Commercial Lighting for Code Compliance with 2018 Updates
 - [Watch now](#)
 - [View slide deck](#)
- February 14, 2019 – Who is responsible for meeting Utah's Energy Code?
 - [Watch now](#)
 - [View slide deck](#)
- January 10, 2019 – Commercial HVAC Requirements for Code Compliance
 - [Watch now](#)
 - [View slide deck](#)
- June 14, 2018 – Commercial Energy Code – Multi-Family Projects
 - [Watch now](#)
 - [View slide deck](#)

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RESIDENTIAL ENERGY FIELD INSPECTIONS LIVESTREAM

[Join Live Stream](#)

Residential Energy Field Inspections slide deck



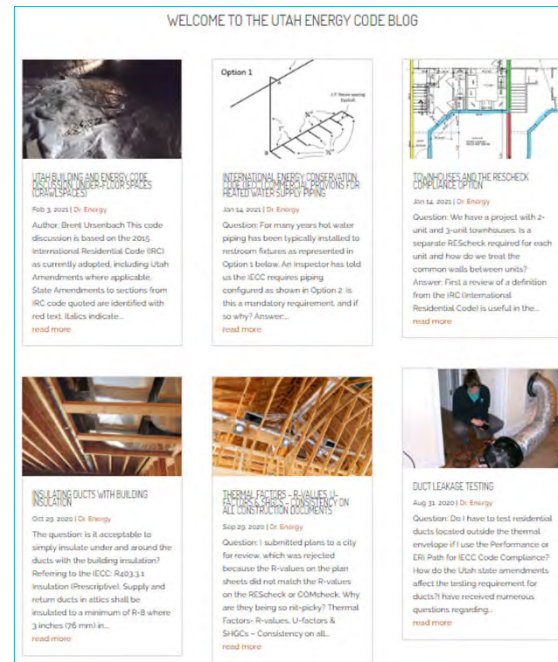
To see previous trainings, check out our YouTube channel

[Utah Energy Code YouTube Channel](#)

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Energy Code Website:

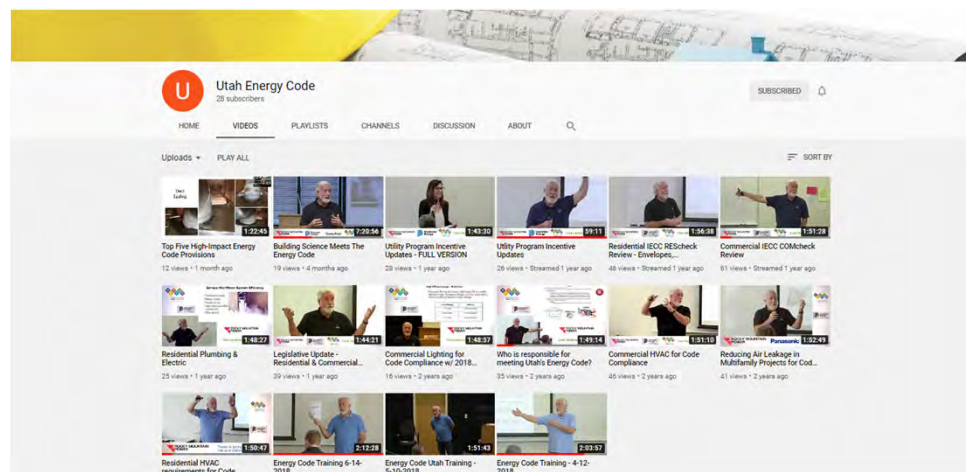
- Easy Access to Guides
- New Resources Added Monthly
- Ask Questions at Website, or Directly to Brent
- BLOGS- FAQ's Here >>>>>>>>>>
- Please Provide Suggestions



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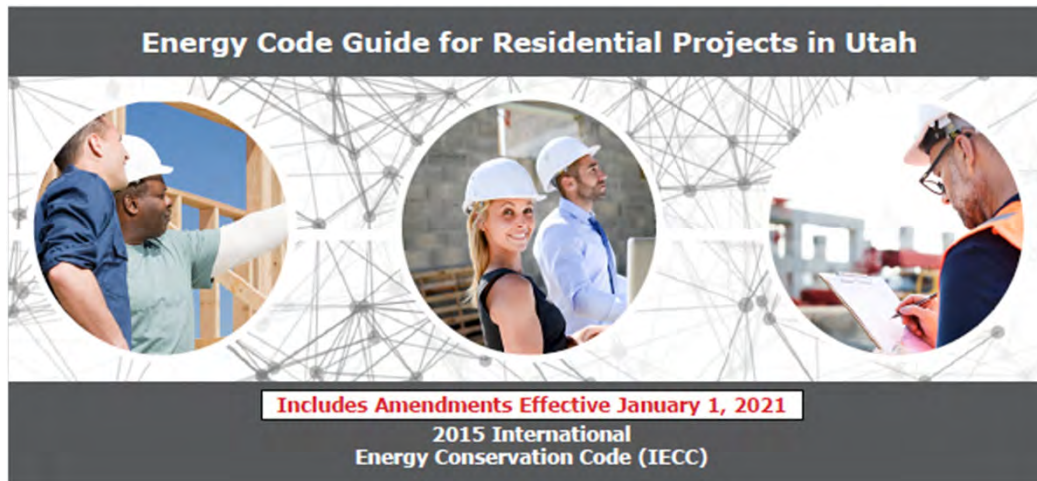
YouTube Includes Many Previous Classes

Editing in Progress



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Guide Updated to Include Only Current Amendments Effective January 1, 2021



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Utah Amended Sections in Red text

R401.2 Compliance Options

1. 2015 Prescriptive Table R402.1.2
2. Total UA Alternative – 2015 REScheck - R402.1.5
3. Simulated Performance Alternative – R405
4. ERI (Energy Rating Index) - HERs Score – R406
5. **2012 Utah REScheck – pass rate of 5% or better.**

- Option – REScheck is NOT required
- Other options are OK
- 2012 Utah REScheck is less efficient – Allows Equipment Trade-off
- ERI also allows Equipment Trade-off
- 2012 Prescriptive Table is NOT allowed
- 2018 or 2021 REScheck OK (#2)

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R103.2 Construction Documents

U-factors, R-value and other pertinent data must be shown and identical on plans, energy compliance reports, and HVAC design documents. **Construction documents include all documentation required to be submitted in order to issue a building permit.**

- Amendment removes specific list
- My Most Common PR Comment

Example:

- No Identified Compliance Option
- U-factor different on REScheck, Plans or Manual J
- R-values, U-factors, SHGCs not on plans

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R202 Definitions

CONTINUOUS AIR BARRIER. A combination of materials and assemblies that resist or prevent the passage of air through the building thermal envelope.

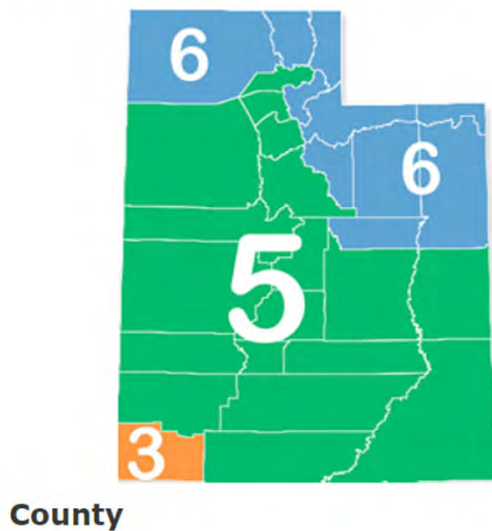
CONTINUOUS INSULATION (ci). Insulating material that is continuous across all structural members penetrated only with fasteners and service openings. – Attic insulation in trusses is cavity, not ci.

CAVITY INSULATION. Insulation installed between wood studs, metal framing, channels, or z-clips.

RESIDENTIAL BUILDING. One and two family dwellings, townhouses, and Group R-2, R-3 and R-4 buildings, 3 stories or less in height above grade plane.

- Common misunderstood definitions
- Air barriers can be inside or outside the building
- CI reduces the risk of condensation in walls and on roofs
- Attics typically do NOT have CI
- A residential energy building often is an IBC, NEC, IPC, IMC & IFGC building

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R301.1 Utah Climate Zones by

- Where's your County line?
- Simplifies, but not completely accurate
- OK to recommend building to a higher climate zone



Climate Zone 5

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R401.3 Certificate

Permanent certificate listing performance values, factors, and ratings for all building thermal envelope components, shall be posted in approved location.



Utah Energy Conservation Code Energy Efficiency Certificate

Insulation Rating		R-Value	
Above-Grade Wall		19.00	
Below-Grade Wall		0.00	
Floor		40.00	
Ceiling / Roof		60.00	
Ductwork (unconditioned spaces):		_____	
Glass & Door Rating		U-Factor	SHGC
Window		0.34	0.31
Door		0.28	0.31
Heating & Cooling Equipment		Efficiency	
Heating System:_____		_____	
Cooling System:_____		_____	
Water Heater:_____		_____	
Name:_____		Date:_____	
Comments			

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Prescriptive Table R402.1.2

Climate Zone and Subtype	3 - B	5 - B	6 - B
Crawl Space Wall R-value*	5/13	15/19*	15/19*
Fenestration U-factor*	0.35	0.32	0.32
Skylight U-factor*	0.55	0.55	0.55
Glazed SHGC Fenestration*	0.25	NR	NR
Ceiling R-value	38	49	49
Wood Frame Wall R-value*	20 or 13+5	20 or 13+5	20+5 or 13+10

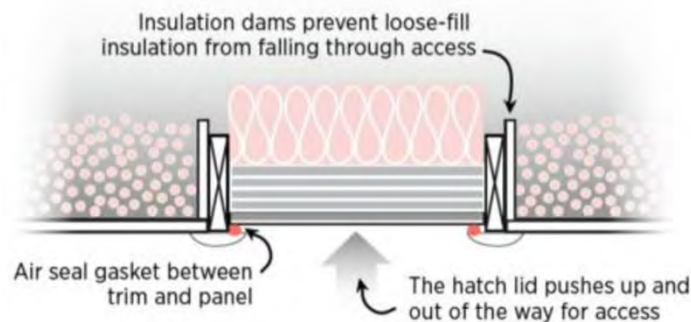
Mass Wall R-value*	8/13	13/17	15/20
Floor R-value	19	30	30
Basement Wall R-value*	5/13	15/19	15/19
Slab R-value* and depth (Add R-5 if heated slab)	0	10-2'	10-4'

*See footnotes in 2015 IECC

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R402.2.4 Access Hatches and Doors

- Must be weather stripped.
- Attic hatch must have insulation of required R-value attached to the panel.
- Insulation dam required around access opening.
- Vertical access doors must meet fenestration requirements - Table R402.1.2.



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R402.4 Air Leakage

The components of the Building Thermal Envelope as listed in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions.

R402.4.1 Building Thermal Envelope

Comply with all items in Table 402.4.1.1
OR Blower Door Test per R402.4.1.2.



TABLE R402.4.1.1 AIR BARRIER AND INSULATION INSTALLATION		
COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. The exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed. The air barrier in any dropped ceiling soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling attic	The air barrier in any dropped ceiling soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance of R-3 per inch minimum. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between window door joints and framing, and daylight and framing shall be sealed.	
Run joints	Run joints shall include the air barrier.	Run joints shall be insulated.
Floors (including above garage and cantilevered floors)	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking, or floor framing cavity insulation shall be permitted to be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing and extends from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.	Where provided instead of floor insulation, insulation shall be permanently attached to the crawlspace walls.
Shafts, penetrations	Drift shafts, utility penetrations, and fire shafts opening to exterior or unconditioned space shall be sealed.	
Narrow cavities		Batts in narrow cavities shall be cut to fit, or narrow cavities shall be filled by insulation that conforms to the available cavity space.
Garage separations	Air sealing shall be provided between the garage and conditioned spaces.	
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the drywall.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring		Batt insulation shall be cut neatly to fit around wiring and plumbing in exterior walls, or insulation that conforms to the available space shall extend behind piping and wiring.
Shower tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate them from the showers and tubs.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical or communication boxes or air-sealed boxes shall be installed.	
HVAC register booms	HVAC register booms that penetrate building thermal envelope shall be sealed to the subfloor or drywall.	
Concealed sprinklers	When required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealers shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	

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1st Option

R402.4.1.1 Air Barrier and Insulation Installation and Inspection per Table R402.4.1.1.

Table R402.4.1.1 Summary

- Insulation and air barriers installed in accordance with manufacturer's instructions.
- Continuous air barrier installed at the building thermal envelope.

- IF Blower Door Testing is **not** selected, *FULL compliance to the entire Table is required*
- Without Amendment, Both the Blower Door Test and Compliance with the Table is Required



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- All gaps and voids sealed between conditioned and un-conditioned spaces.
- Air-permeable insulation (fiberglass, rock-wool, cellulose) is not used for air sealing.
- Closed-cell foam is the only insulation that also serves as an air barrier.
- Dropped ceilings/soffits, shafts and chases shall be capped with an air barrier lid and sealed-(attic insulation does not drop down into soffits).
- Walls shall be framed to allow insulation in corners and in headers.
- Wall insulation shall be enclosed on 6 sides. Includes an air barrier, backside of knee-walls.
- Wall batt insulation shall be cut neatly to fit wall cavities and around all pipes, wiring and boxes in cavity (recommend blown insulation).
- Rim joist insulation shall include a sealed air barrier on the inside face of insulation, or closed cell spray foam.
- Recessed can lights, boxes and HVAC boots penetrating the thermal envelope shall be sealed.
- Exterior walls adjacent to fireplaces, tubs, showers shall include an inside surface air barrier.
- Air sealing shall be provided between the garage and conditioned spaces.
- Floor insulation in contact with underside of floor or topside of sheathing/lid below.
- Air barrier underside of cantilevers.

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2nd Option **R402.4.1.2 Blower Door Testing and Third-Party Verification**

- ≤ 3.5 ACH50 single family dwellings
- ≤ 5.0 ACH50 townhouses, multifamily
- Testing by BPI or RESNET certified parties or licensed contractors with approved training.

- Did not change to 3 ACH50 January 1, 2021 as previously indicated
- Amendment modification for Townhouses/multi-family deleted that 3.5-3.0 ACH50 step



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IRC- R806.5 Unvented attic and unvented enclosed rafter assemblies (NOT in the IECC)

Air-impermeable insulation, closed cell spray foam or rigid foam board, must be installed on the cold side of the roof assembly for condensation control-Table R806.5.

Climate Zone	Minimum Amount of Insulation that is Air-Impermeable or Rigid Board	Unvented Attic Total Required Installed R-Value ^{a,b}	
		2009 IRC	2012, 15, 18 IRC
2B and 3B tile roof only	0 (none required)	30	30
1, 2A, 2B, 3A, 3B, 3C	R-5	30	38
4C	R-10	30	38
4A, 4B	R-15	38	49
5	R-20	38	49
6	R-25	49	49
7	R-30	49	49
8	R-35	49	49

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R402.4.2 Fireplaces

Tight-fitting dampers and outdoor combustion air (wood-burning only); listed and labeled doors, UL 127 or UL 907.



**SECTION R1006
EXTERIOR AIR SUPPLY**

R1006.1 Exterior air. Factory-built or masonry fireplaces covered in this chapter shall be equipped with an exterior air supply to ensure proper fuel combustion unless the room is mechanically ventilated and controlled so that the indoor pressure is neutral or positive.

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R402.4.4 Rooms Containing Fuel Burning Appliances

- Where open combustion air ducts serve open combustion, fuel burning appliances:
 - The open duct and appliance shall be enclosed in a sealed and insulated room, isolated from inside the thermal envelope.
 - Combustion air duct passing through conditioned space shall be insulated to a minimum R-8.
 - Exceptions: Direct vent appliance, Fireplaces and stoves installed per code.



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R402.4.5 Recessed Lighting

- IC-rated and labeled, air leakage rate 2 cfm max.
- Gasketed or caulked at the ceiling.

R402.5 Maximum Fenestration U-factor and SHGC

- Area-weighted average maximum U-factor for total UA - alternative or simulated performance approach:
 - ≤ 0.48 for CZ 5B
 - ≤ 0.40 for CZ 6B
- Area-weighted average maximum SHGC for total UA - alternative or simulated performance approach:
 - ≤ 0.50 for CZ 3B



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R403.3.1 Duct Insulation

Outside thermal envelope, both return and supply.

- Ducts in attic- R-8
- Ducts in other areas- R-6

R403.3.2 Duct Sealing and Testing

Ducts, air handlers and filter boxes sealed per IRC/IMC AND tested if air handler is outside the thermal envelope, or at least 20% of duct is outside thermal envelope.

- Testing by BPI or RESNET certified parties or licensed contractors, approved training.



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R403.3.4 Duct Leakage

Rough-in or post-construction testing

- ≤ 6 cfm/100 sf, with or without the air handler

R403.3.5 Building Cavities

Shall not be used as ducts or plenums



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R403.4 Mechanical System Piping Insulation

Carrying fluids $> 105^{\circ}\text{F}$ or $< 55^{\circ}\text{F}$, insulate to R-3 min.

R403.5 Circulating and Demand Hot Water Systems

- Automatic controls- time or demand sensing
- Demand recirculation systems- maximum return temperature- 104°F .

R403.5.3 Hot Water Pipe Insulation R-3 (some exceptions)

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R403.6 Mechanical Ventilation

Per IRC 303.4 and M1507 with automatic or gravity dampers on outdoor air intake and/or exhaust. If ≤ 3 ACH 50, must be mech. ventilated.



- 303.4 – Natural or Mechanical Ventilation
- M1507 – Mechanical Ventilation if tighter than 3 ACH 50
 - If using Blower Door Option, simply choose to mechanically ventilate
- Without Amendment trigger is 5 ACH 50
- All intake and exhaust require backdraft dampers

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NEW

R403.6.1 Whole-house ventilation systems must be high efficacy.

Fan	Min CFM	Efficacy CFM/watt	Max CFM
HRV-ERV	Any	1.2	Any
Range	Any	2.8	Any
In-line	Any	2.8	Any
Bath-Utility	10	1.4	<90
Bath-Utility	90	2.8	Any

- New July 1, 2019, with the SFD Blower Door Test Rate Modifications
- Table from the 2018 IECC/IRC
- High Efficacy fan motors for all continuously operating whole-house ventilation fans



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R403.7 Equipment Sizing

Per ACCA Manual S, based on loads calculated per ACCA Manual J. Ducts per ACCA Manual D.

R403.9 Snowmelt Controls

Mandatory controls- Auto shutoff: no moisture, pavement T > 50°F and air T > 40°F.

R403.10 Pools and In-Ground Spas

Readily accessible shutoff switches for heaters (R403.10.2) and timers for pumps and heaters (R403.10.3), AND vapor-retardant covers for all pools (R403.10.4) and pool cover if heated (see exceptions).



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R404.1 Lighting

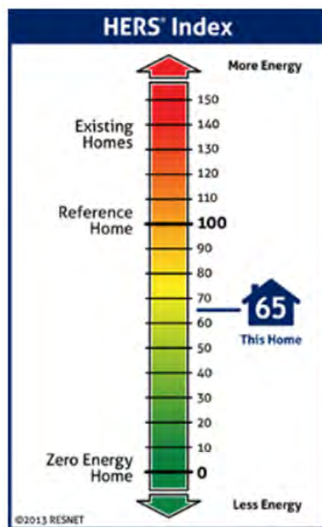
A minimum of 75% of permanently installed fixtures must have high-efficacy lamps.

- Compact fluorescent lamps (CFL), tubes T8 or smaller, or LED (Low Voltage exempt)

R405 Simulated Performance Alternative

Third Party Computer modeling, showing proposed home is more efficient than standard reference design home.

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R406 Energy Rating Index (ERI) Compliance Alternative

Third Party HERS rater uses modeling to generate an ERI or HERS score, equal to or lower than the required score for the applicable Climate Zone.

- Climate Zone 3 - 65
- Climate Zone 5 - 69
- Climate Zone 6 - 68

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Final Thoughts

Air Barriers:

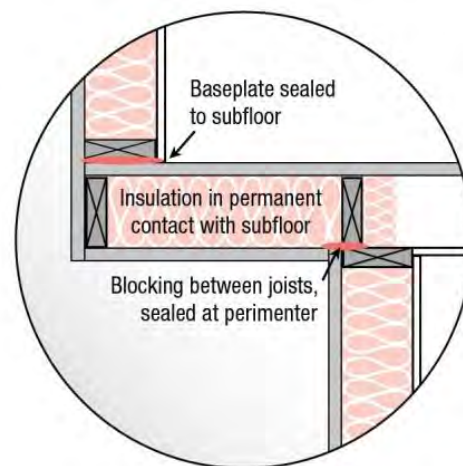
- Can a Building be Too Tight?
 - Minimize uncontrolled (infiltration) air flow
- AND
- Provide controlled (ventilation) air flow
- Walls separating Garage from Home?



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Air Flow Through the Thermal Envelope

- Pathways – holes
 - Many little holes = a large single hole
 - Some may be required for combustion air, chimneys, vents
 - How large of a hole do we want in our homes?
- Pressure differences
 - Wind
 - Stack effect – heat rising
 - Fans
 - HVAC design flaws – lack of return paths
- Air flow IN = Air flow OUT
 - Applies to both controlled and uncontrolled



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Ducts in Garage Ceilings – Insulate Duct with Floor Insulation

- Completely encapsulate the duct with minimum R-8
- Eliminate all air spaces – provides an air barrier
- Maintain required level of floor insulation
- Blown will generally work
- Batts will not
- See Blog



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Cantilevers

Proper insulation installation?
Gaps, air movement, duct above, rim joist, air barrier



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- Cantilevers
- Extremely critical to address this with air barriers/sealing and insulating to eliminate air spaces
- Fiberglass insulation is not an air barrier – must have air barrier added to all sides



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Supply Branch Out into Cantilever

- Open air spaces
- Is there a minimum R-8 under and around duct?
- Is the rim properly insulated?
- Net and blow probably only compliant method
- Sealed air barrier underside



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Ceiling/Attic Air Barriers – The Ceiling Lid

- Where ceilings are dropped with an attic above, maintaining an air barrier is near impossible
- Table 402.4.1.1 requires a ceiling lid in these drops, sealed around the edges
- The attic insulation flows continuously across the entire attic



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QUESTIONS OR COMMENTS?

Thank you for your participation!

Be Safe - Stay Healthy

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