



Nebraska's New Residential Energy Code

Requirements and Best Practices

Nebraska Energy Code Training Program

Instructor: Matt Belcher

April 5, 2022: 11:30 am – 1 pm CST



Housekeeping

- Attendees are muted upon entry
- Questions? Enter them in the chat box
- Webinar is being recorded – slides and recording will be sent to attendees
- **CEU's will be available upon request (ICC and AIA)**
 - Information at end of presentation
- Email nwestfall@mwalliance.org with questions



About MEEA

- MEEA is a nonprofit membership organization with 160+ members, including:
 - Utilities
 - Research institutions
 - State and local governments
 - Energy efficiency-related businesses
- MEEA helps stakeholders understand and implement cost-effective energy efficiency strategies



About the Nebraska Training Program

- Goal: prepare the Nebraska workforce for upcoming changes in construction best practices
 - Residential and Commercial Energy Code
 - Building Science
 - Practical Solutions
- Focused on providing training to builders, code officials, design professionals, public officials and students
- For more information, visit:
<https://www.mwalliance.org/nebraska-energy-codes-training-program>



About Verdatek Solutions



Matt Belcher





Introduction Poll #1

- What is your profession?
 - Code Official
 - Home Builder
 - State/local government
 - Energy Rater/Consultant
 - Architect/Engineer
 - Non-profit
 - Academic
 - Utility
 - Other (type in chat)



Introduction Poll #2

- How long have you been in the construction industry?
 - 0-5 years
 - 6-10 years
 - 11-15 years
 - 16-20 years
 - 21+ years



Introduction Poll #3

- How familiar are you with the residential provisions in the 2018 IECC?
 - Extremely Familiar
 - Somewhat Familiar
 - Somewhat Unfamiliar
 - Not familiar at all



Today's Agenda

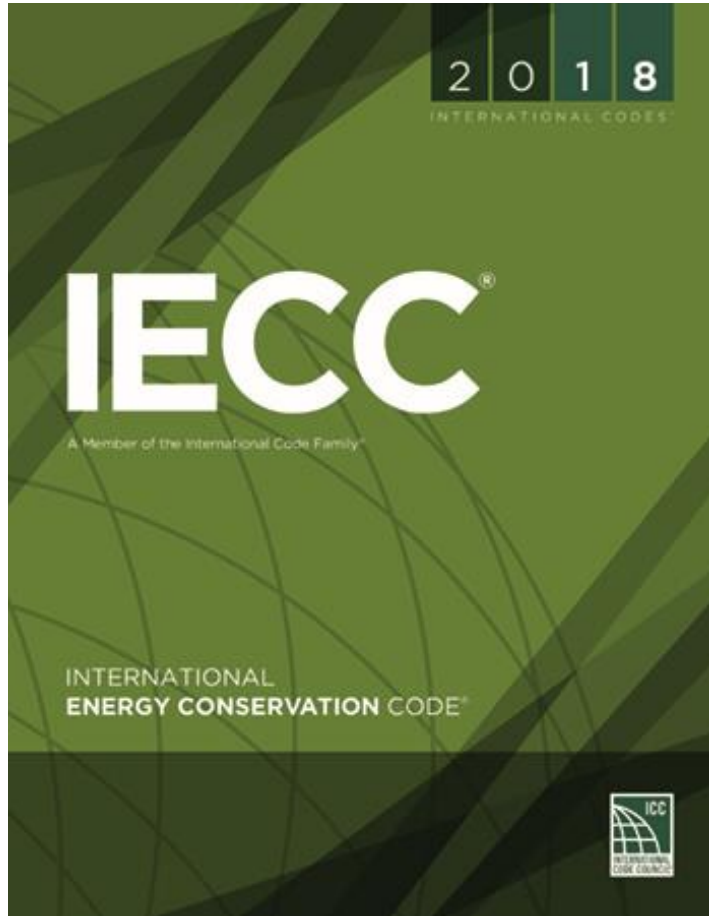
- The 2018 IECC
- Prescriptive Pathway
- Total UA Method
- Simulated Performance Path
- Energy Rating Index
- Performance testing



What is the 2018 IECC?

(Nothing scary, really!)

So, What's Changed?



2018 IECC / IRC Section 11

- Creates a Residential Energy Code separate from the Commercial Energy Code
- Uses the HERS index as an “equivalent” for residential applications
- Adds Testing and verification requirements
- Promotes Innovation through Energy Ratings Index (ERI)

Mandatory Requirements

Required regardless of pathway chosen

- Energy certificate
- Air sealing and blower door testing
- Duct sealing and testing
- Building cavities \neq ducts or plenums
- Heating and cooling requirements
- Minimum lighting efficacy
- Mechanical ventilation installed
- Other

Energy Code Compliance Pathways

Prescriptive Method Requirements

- All mandatory and prescriptive requirements must be met

Total UA Method Requirements

- All mandatory and prescriptive requirements (other than Table R402.1.2) must be met
- Include documentation to demonstrate compliance with the UA Trade-off method. Compliance software submittal must include completed compliance form, inspection checklist and certificate demonstrating compliance with 2018 IECC levels

Energy Code Compliance Pathways

Simulated Performance Requirements (Section R405)

- All mandatory requirements must be met
- Submit an energy cost analysis report which demonstrates that the proposed design (as built) home is more efficient than the standard reference design home

Energy Rating Index Requirements (Section R406)

- All Mandatory requirements met. Meet or exceed 2009 IECC prescriptive envelope requirements
- ERI score of 61 or lower. Submit report demonstrating compliance



Prescriptive Path



Prescriptive Path

- All mandatory and prescriptive requirements must be met
- Checklist of code requirements
- No trade-offs or offsets



Image: energycodes.gov

2018 IECC Prescriptive Requirements

 Indicates Change

Table R402.1.2 Insulation Requirements By Component

Requirement	2009 IECC	2018 IECC
Ceiling R-value	R-38	R-49
Wall R-value	R-20 or R-13+5	R-20 or R-13+5
Floors over unconditioned space	R-30	R-30
Basement R-value	10/13	15/19
Slab R-value and depth	10, 2 ft.	10, 2 ft. *R-5 insulation shall be provided under the full area of a heated slab
Crawl space wall R-value	10/13	15/19

2018 IECC Prescriptive Requirements

 Indicates Change

Table R402.1.2 Fenestration Requirements By Component

Requirement	2009 IECC	2018 IECC
Fenestration U-factor (windows, glass, opaque and swinging doors with <50% glazing)	.35	0.30
Skylight U-factor	.60	0.55

2018 IECC Prescriptive Requirements

 Indicates Change

Requirement	2009 IECC	2018 IECC
Eave Baffle	NO REQUIREMENT	For air permeable insulations in vented attics, a baffle shall be installed adjacent to soffit and eave vents. Baffles shall maintain an opening equal or greater size than the vent. The baffle shall extend over the top of the attic insulation. The baffle shall be permitted to be any solid material. (402.2.3)
Hot water pipe insulation	NO REQUIREMENT	Insulated to R-3, $\frac{3}{4}$ or larger pipes with exceptions (403.5.3)

Other changes in the 2018 IECC

 Indicates Change

Requirement	2009 IECC	2018 IECC
Thermally Isolated sunroom U-factor	Maximum fenestration U-factor shall be 0.50 and maximum skylight U-factor shall be 0.75. (402.3.5)	Maximum fenestration U-factor shall be 0.45 and maximum skylight U-factor shall be 0.70. (402.3.5)
Buried Ducts in Attic	Not referenced	Ducts tested to have a maximum leakage rate of 1.5 cfm25/100 sq. ft. to the outside, are insulated with \geq R-8 insulation, and have at least R-19 insulation above and to the sides of the ducts, count as being in conditioned space. (403.3.6)



Total UA Method



Total UA Method

- All **mandatory and prescriptive** requirements (other than Table R402.1.2) must be met
- Include documentation to demonstrate compliance with the UA Trade-off method. Compliance software submittal must include completed compliance form, inspection checklist and certificate demonstrating compliance with 2018 IECC levels





Case Studies





Simulated Performance Path

Simulated Performance Path (Section R405)

- Proposed design to be shown to have an annual energy cost that is less than or equal to the annual energy cost of the standard reference design
- Standard reference design in table R504.5.2(1)
- All mandatory requirements must be met



Image: nytimes.com

Simulated Performance Path (Section R405)

- Requires computer software to perform calculations
- Includes tradeoffs for envelope and some systems (Equipment treated equally in standard and proposed design)
- Defines compliance based on equivalency of calculated energy cost or source energy



Image: knowyourteam.com



Energy Rating Index



Energy Rating Index (Section R406)

- Compliance must be completed by an approved third party and documentation including compliance reports must be reviewed by the code official
- Compliance is demonstrated if the calculated ERI is \leq a defined threshold for the zone in which the building is located
- ERI is determined in accordance with ANSI/RESNET/ICC 301-2014
- Similar (but not equal) to HERS

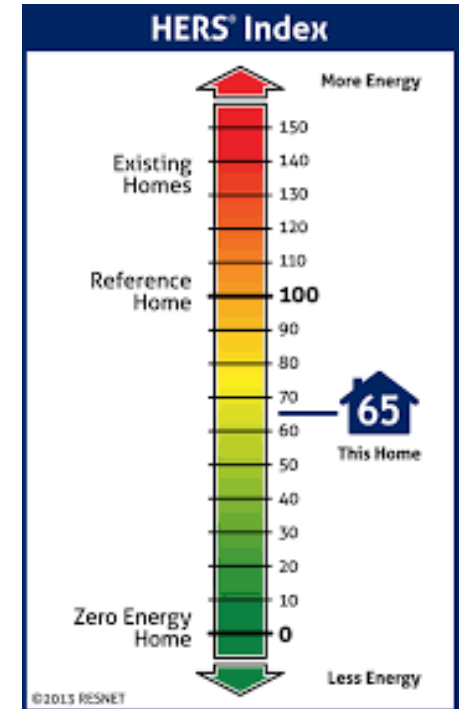


Image: Home Energy Rx



Energy Rating Index (Section R406)

- All Mandatory requirements met.
- Meet or exceed **2009 IECC prescriptive envelope requirements**
- For climate zone 5, **ERI score of 61 or lower** is required. Submit report demonstrating compliance



Performance Testing

*A Great Benefit
(and a new code requirement)*

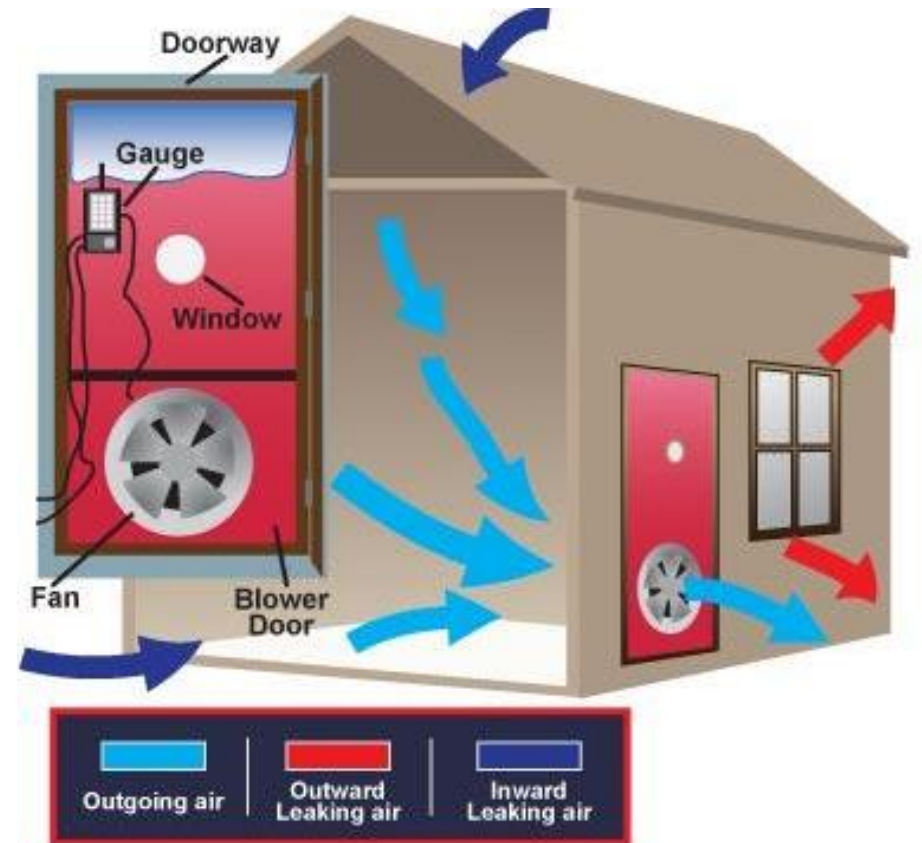


Performance Testing

- **Mandatory** for all compliance paths
- Provides critical information on building envelope and duct tightness
- Important for ensuring indoor air quality and managing moisture and temperature
- Provides liability protection for builders

A Critical Tool in the Fight Against Moisture

- Blower door tests quantify a home's air tightness
- Proper building tightness will help:
 - Reduce energy consumption
 - Avoid moisture condensation
 - Avoid uncomfortable drafts caused by cold air leaking in
 - Help Maximize proper HVAC performance



Air Leakage Report

- Blower door test documents a home's air leakage performance
- Required by code
- Third party verification (some areas; performed by Inspectors)
- Provides solid data for final equipment adjustment and energy use/cost forecast
- Great liability protection for all involved

AIR LEAKAGE REPORT

Date: May 02, 2012 Rating No.: 8016891 - 097

Building Name: 802EastMcCartyStreet Rating Org.: ASERusa
 Owner's Name: River City Habitat for Humanit Phone No.: 314-894-2300
 Property: 802 East McCarty Street Rater's Name: Gary Fries
 Address: Jefferson City, MO 65101 Rater's No.: 8016891
 Builder's Name: River City Habitat for Humanit Rating Type: Confirmed
 Weather Site: Columbia, MO Rating Date: 12/01/11
 File Name: 8016891 - 097 - eSTAR 2.0, TC, NR - 802 East M

Whole House Infiltration	Blower door test	
	Heating	Cooling
NaturalACH:	0.23	0.16
ACH @ 50 Pascals:	3.78	3.78
CFM @ 25 Pascals:	427	427
CFM @ 50 Pascals:	670	670
Eff. Leakage Area: [sq.in]	36.8	36.8
Specific Leakage Area:	0.00018	0.00018
ELA/100 sf shell: [sq.in]	0.96	0.96

Duct Leakage	Leakage to Outside Units	Ductwork
CFM @ 25 Pascals:		25
CFM25 / CFMfan:		0.0214
CFM25/CFA:		0.0181
CFM per Std 152:		N/A
CFM per Std 152 / CFA:		N/A
CFM @ 50 Pascals:		39
Eff. Leakage Area: [sq.in]		2.15
Thermal Efficiency:		N/A
Total Duct Leakage Units		CFM25/CFA
Total Duct Leakage:		0.0181

Ventilation	Air Cyclor
Mechanical:	
Sensible Recovery Eff. (%):	0.0
Total Recovery Eff. (%):	0.0
Rate (cfm):	50
Hours/Day:	24.0
Fan Watts:	150.0
Cooling Ventilation:	Natural Ventilation

ASHRAE 62.2 - 2010 Ventilation Requirements

For this home to comply with ASHRAE Standard 62.2 - 2010 Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings, a minimum of 44 cfm of mechanical ventilation must be provided continuously, 24 hours per day. Alternatively, an intermittently operating mechanical ventilation system may be used if the ventilation rate is adjusted accordingly. For example, a 88 cfm mechanical ventilation system would need to operate 12 hours per day, as long as the system operates to provide required average ventilation once each hour.

REM/Rate - Residential Energy Analysis and Rating Software v12.98

This information does not constitute any warranty of energy cost or savings.
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Ventilation and I.A.Q.



Building Envelope +
Air Sealing Package +
HVAC Design, Equipment & Installation +
ERV/HRV +
Water Heating Design

= Occupant Comfort

Right-Size the HVAC System

A correctly sized system:

- Provides **maximum comfort**
- **Required** by code (ACCA Manual J)
- Promotes **healthy** indoor environmental quality
- **Handles moisture** properly
- **Most efficient** system



HVAC Design and Loads

- Properly designed HVAC systems rely on scientific criteria and a systematic method to match the loads required for health and comfort:
 - *ACCA Manual J – Residential Load Calculation*
 - *ACCA Manual S – Residential Equipment Selection*
 - *ACCA Manual D – Residential Duct Systems*
- Reports should be submitted with permit application





HVAC Design and Loads

Today's homes risk health problems for occupants because:

- They are tighter than before:
 - < 3 ACH
- More chemicals and products are used in and around a house:
 - Concentration levels are often 2 to 100 times higher than outside.



Balanced Ventilation

- Blows air into and out of the house
- Is cost effective by reclaiming energy from exhaust and supply airflows (60%-80%!)
- Balances exhaust and supply flows
- Maintains the Minimum Ventilation Guideline automatically with proper set-up

Key Takeaways

- 2018 IECC has new requirements for:
 - Air sealing
 - Duct sealing
 - U-Factor
 - R-Values
 - Performance Testing
- Controlling moisture is *critical*
 - Proper air sealing is key
 - Right-sizing HVAC is required
 - Ventilation takes on new importance



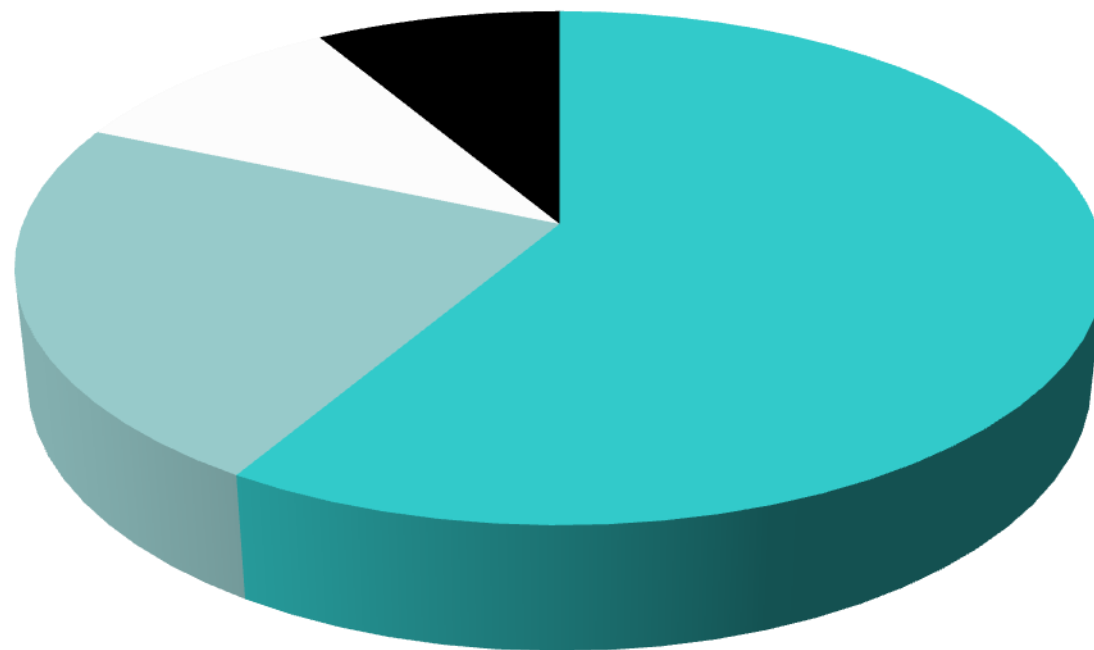
Key Takeaways

- There are 4 pathways one can follow to comply with the residential energy code
- Mandatory requirements must be met regardless of path chosen



Equity!

Cost



- Int/Tax, etc.
- Energy
- O&M
- Other

Monthly Payment



Thank you!

Questions?

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Continuing Education

- Certificates with Continuing Education Information will be sent to attendees
- AIA/ICC CEUs are available
- If you would like AIA CEUs, please send your AIA # to nwestfall@mwalliance.org. ICC CEUs are self-reporting



Upcoming Training Opportunities

- Thursday, April 21, 2022 (11:30AM-1:00PM) - *Commercial Lighting Systems and Controls* - [Register here](#)
- Coming soon: In-person trainings!
- For more information, visit:
<https://www.mwalliance.org/nebraska-energy-codes-training-program>