### Nebraska's Residential Energy Code

### **Requirements and Best Practices**

Nebraska Energy Code Training Program Instructor: Matt Belcher May, 2022:





NEBRASKA code officials association

### 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 costeffective 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-codestraining-program







## About Matt/Verdatek Solutions



- 40+ Years in the Building Industry
- Served as a Top Building Codes official in the St. Louis area.
   Director of University of Missouri Columbia High Perrformance Buildings Research Center. Created and Instructed Curriculum for Students and Industry Professionals.
- Currently Assisting University of Missouri Science & Technology in Building and Energy Code Curriculum and Policy
   ICC Member serving on 2012, 2015, 2018 and 2024 Energy Code Development Committee. 2021 Building Code-General Committee
   NAHB Approved Instructor for Advanced Building Science, Advanced Business Managment







# **Training Objectives**

- What is the 2018 Energy Code?
- Inside the Energy Code:
  - Building Envelope
  - Interior Comfort/Health
  - Remodeling/Rehab
  - Local Application/Amendments
- '21 Code  $\rightarrow$  '24 National Standard
- Marketing Energy Efficient/High Performance Buildings









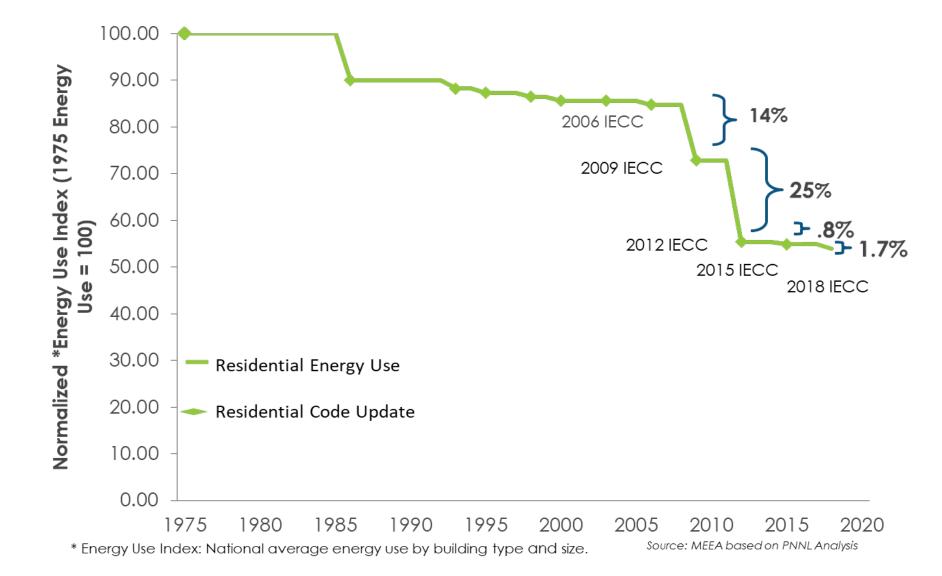
# What is the 2018 IECC?







### Model Energy Code Efficiency



## Nebraska Residential Field Study

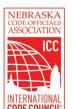
- Conducted in 2017 by **Nebraska Department of Environment** and Energy. 2009 IECC was the baseline.
- Collected and analyzed several data points for new homes, including:
  - Envelope air leakage
  - Efficacy in lighting
  - Duct leakage
  - Ceiling & exterior wall insulation
  - Basement & slab insulation
  - Windows

### For More Information and Data:

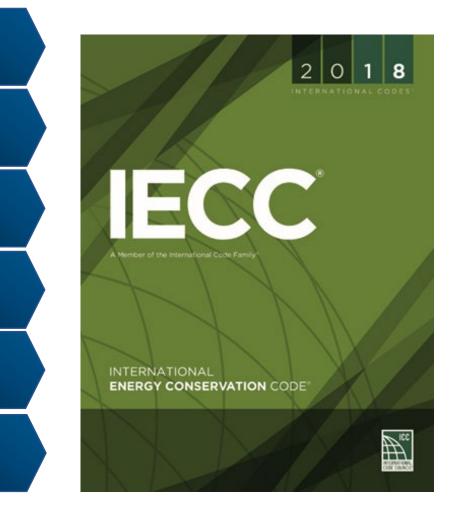
https://www.energycodes.gov/sites/default/files/documents/ Nebraska\_Residential\_Compliance\_Evaluation\_final.pdf







### So, What's Changed since 2009?

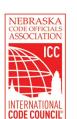


### 2018 IECC / IRC Section 11

- Creates a Residential Energy Code separate from the Commercial Energy Code
- Adds testing and verification requirements
- Promotes Innovation through Energy Ratings Index (ERI)
  - Uses a HERS-type index as an "equivalent" for residential applications
  - Mandatory requirements still apply







### **Energy Certificate**

• Energy Certificate located on circuit breaker box includes key energy efficiency measures and is signed by the builder

### Air Sealing

- All holes between floors and through exterior walls/ceilings have been sealed in **accordance with table R402.4.1.1**
- Building or dwelling unit is tested to verify air leakage rate of ≤ 3 Air Changes per Hour (ACH)
- Building or dwelling unit must have continuous air barrier installed







### Ducts

- All ducts are sealed with approved materials (e.g. mastic or UL 181 tape) duct tape is not acceptable
- All ducts outside conditioned space are tested to verify duct leakage with a total duct leakage or leakage to the outside test
- Supply & return ducts in attic insulated to  $\geq$  R-6 when ducts are outside conditioned space and  $\geq$  R-8 when ducts are outside the building thermal envelope

### **Building Cavities**

 Building framing cavities shall not be used as supply ducts or plenums







### Heating and Cooling

- Controls: Programmable thermostat installed
- Equipment sized per ACCA Manuals S & J

### Lighting

- Minimum of **90% high-efficacy lamps** installed
- Recessed lighting in thermal envelope IC-rated and airtight

### **Mechanical Ventilation**

- Installed according to requirements in the International Mechanical Code
- Required for all homes ≤ 5 ACH per Section M303.4 (3 ACH is a 2018 IECC mandatory requirement)







### Other requirements

- Wood-burning fireplaces have tight flue dampers or doors, and outdoor combustion air
- Mechanical system piping insulated to min R-3 for fluids >105° F or <55° F

• Circulating hot water systems shall be insulated to at least R-2. Systems shall include an automatic, or readily accessible, off-switch.







# **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







# Performance Testing

### A Great Quality Control Tool







- 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			
Weather Site:	Columbia, MO	Rating Type:	Confirmed	
File Name:	8016891 - 097 - eSTAR 2.0, TC, NR - 802 East M	Rating Date:	12/01/11	

		Blower do	oor test
se Infiltration		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

Whole Hou

Duct Leak

ige	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

tilation	Mechanical:	Air Cycler
	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



Date:	May 02, 2012
Building Name:	123 Main Street
Owners Name:	Jane Smith
Property Address:	123 Main Street Omaha, NE 68007
Builder's Name:	ABC Construction
Weather Site:	Omaha, NE
File Name:	101682391-097 eSTAR

**Rating N** Rating O Phone: Rater's Name: Rater's N **Rating Ty** Rating Do

o.:	81158891-901
rg.:	Raters USA
	555-555-5555
	John Williams
lo:	1234567
/pe:	Confirmed
ate:	12/01/20

	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
I	Address:	Jefferson City, MO 65101	Rater's No.:	8016891
I	Builder's Name:	River City Habitat for Humanit		
	Weather Site:	Columbia, MO	Rating Type:	Confirmed
	File Name:	8016891 - 097 - eSTAR 2.0, TC, NR - 802 East M	Rating Date:	12/01/11

		Blower do	por test
se Infiltration		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

Whole Hous

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 Mechanical:		Air Cycler
	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







### Whole House Infiltration

	Blower Door Test	
	Heating	Cooling
Natural ACH:	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

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			
Weather Site:	Columbia, MO	Rating Type:	Confirmed	
File Name:	8016891 - 097 - eSTAR 2.0, TC, NR - 802 East M	Rating Date:	12/01/11	

		Blower door test	
hole House Infiltration		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	Mechanical:	Air Cycler
	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







### **Duct Leakage**

Leakage to Outside Units	Ductwork
CFM @ 25 Pascals:	25
CFM25/CFM fan:	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

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			
Weather Site:	Columbia, MO	Rating Type:	Confirmed	
File Name:	8016891 - 097 - eSTAR 2.0, TC, NR - 802 East M	Rating Date:	12/01/11	

		Blower door test	
House Infiltration		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

Whole

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	Mechanical:	Air Cycler
	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







### Ventilation

Mechanical:	Air Cycler	
Sensible Recovery Eff (%):	0.0	
Total Recovery Eff (%):	0.0	
Rate (cfm):	50	
Hours/Day:	24	
Fan Watts:	150.0	
Cooling Ventilation:	Natural Ventilation	

AIR LEARAGE 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		
Weather Site:	Columbia, MO	Rating Type:	Confirmed
File Name:	8016891 - 097 - eSTAR 2.0, TC, NR - 802 East M	Rating Date:	12/01/11

AID I EAKAGE DEDODT

		Blower door test	
Whole House Infiltration		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	Mechanical:	Air Cycler
	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







### Ventilation and I.A.Q.



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

= Occupant Comfort







# Moisture Management

### It Connects EVERYTHING!







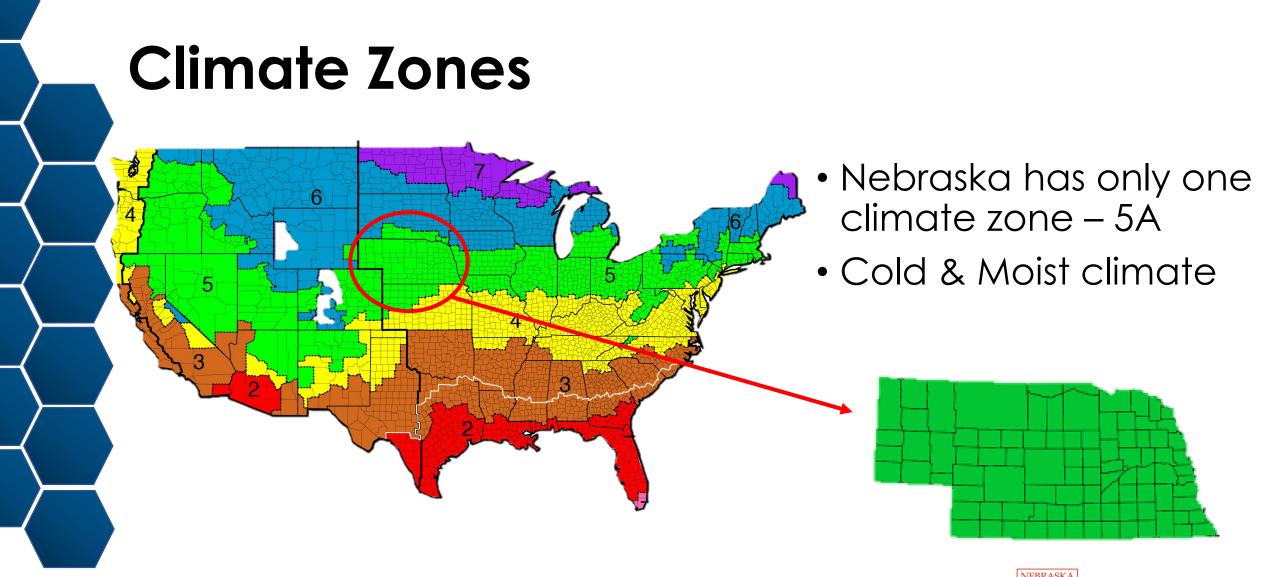
# The Major "Damage Functions"

- Liquid water (bulk and capillary)
- Air-borne water
- Vapor
- Radiation (UV degradation)
- Pests
- People









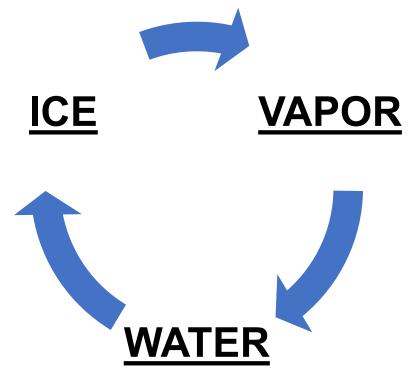






## **Prioritizing Moisture Movement**

#1 – Bulk Water
#2 – Capillary Water
#3 – Air-Transported Moisture
#4 – Diffusive Moisture Movement







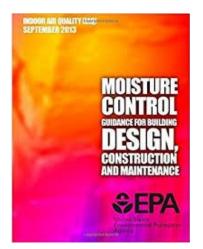


### **Bulk Water Management – Priority #1**

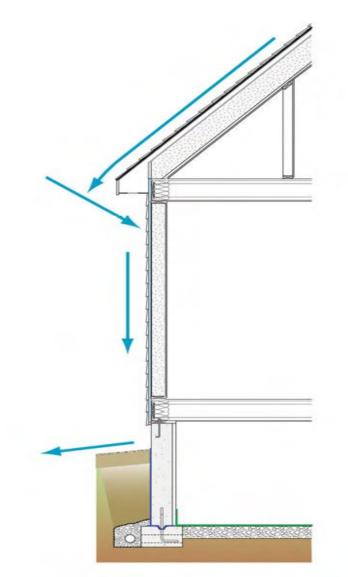




### The key is proper drainage!







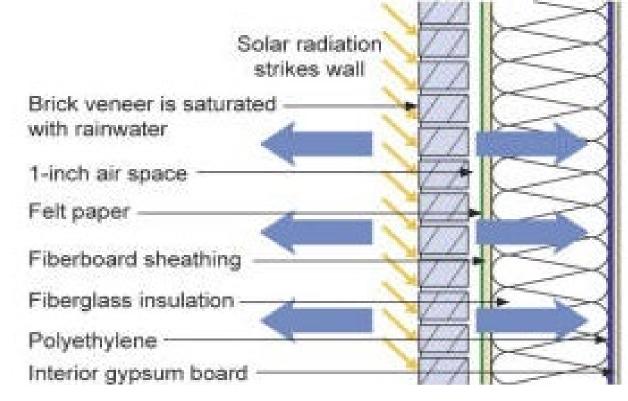
## **Always Allow For Drying**

**Exterior Conditions** 

Temperature: 80° F Relative Humidity: 75% Vapor Pressure: 2.49 kPa

### **Conditions Within Cavity**

Temperature: 120° F Relative Humidity: 100% Vapor Pressure: 11.74 kPa



### **Interior Conditions**

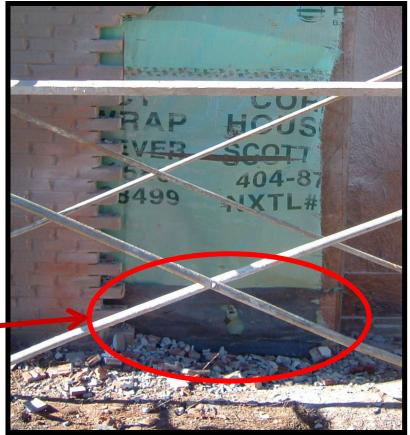
Temperature: 75° F Relative Humidity: 60% Vapor Pressure: 1.82 kPa

Vapor is driven both inward and outward by a high vapor pressure differential between the brick and interior and the brick and exterior

Image by Building Science Corp.

## **Properly Lap Flashing**

• The mason's flashing (black) was installed after and in front of the house wrap (green). This is reverse flashing that will trap any drain water that gets past the brick veneer.









### **Direct Water Away From Corners**



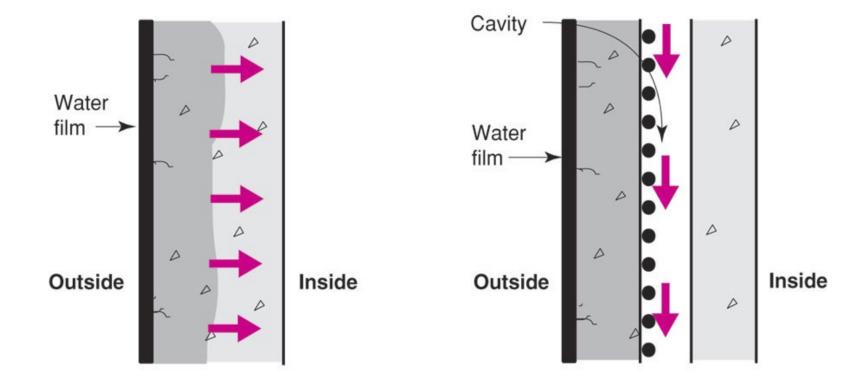








## Capillary Moisture Flows - Priority #2



Capillary suction draws water into porous material and tiny cracks Cavity acts as capillary break and receptor for capillary water interrupting flow

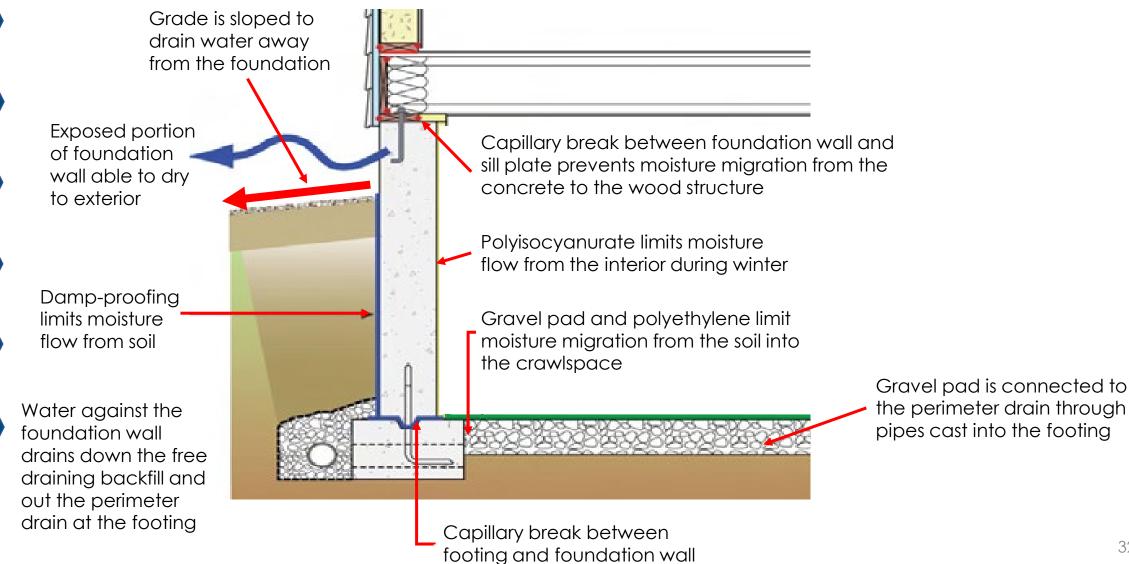
Image courtesy of Building Science Corp.



Good Life. Great Resources.



### **Foundation Moisture Management**



### Sill Plates Need Capillary Breaks











# Air Transport of Moisture – Priority #3

- Air carries a **lot** of water
- Air leakage
  - Moisture flow
    - 4X8 Drywall
    - 70 F
    - 40% RH
    - 1 square inch hole
- Flow quantity30 Quarts of water!!

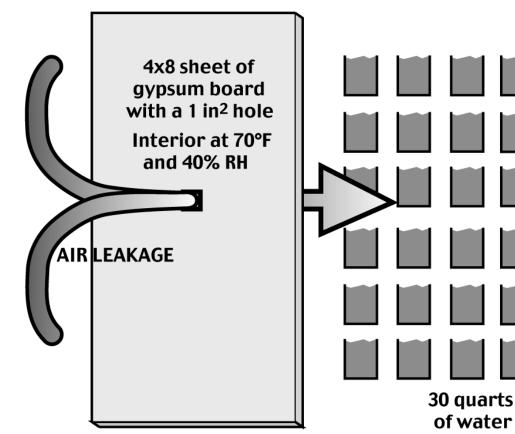


Image courtesy of Building Science Corp.







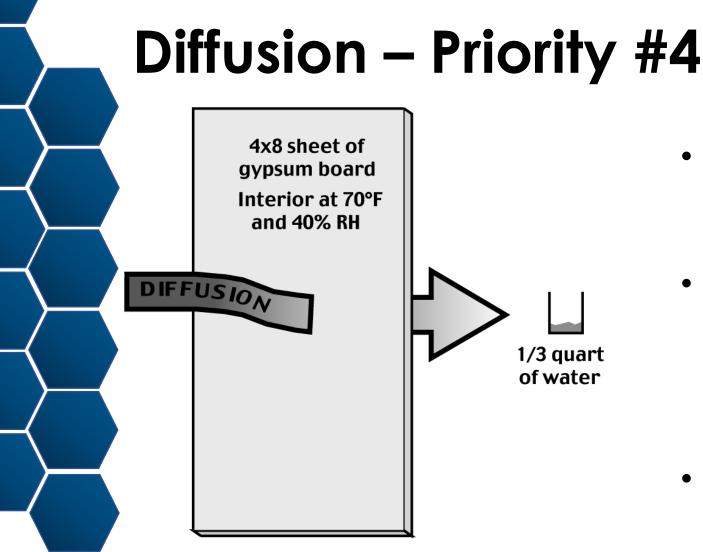


Image courtesy of Building Science Corp.





NEBRASKA code officials Association

- Migration of moisture by means of vapor pressure differential
- Occurs in either direction based on climate conditions and exterior/interior levels of humidity
- Different building materials have different permeability

# Air Movement

### Air Movement Seeks Balance





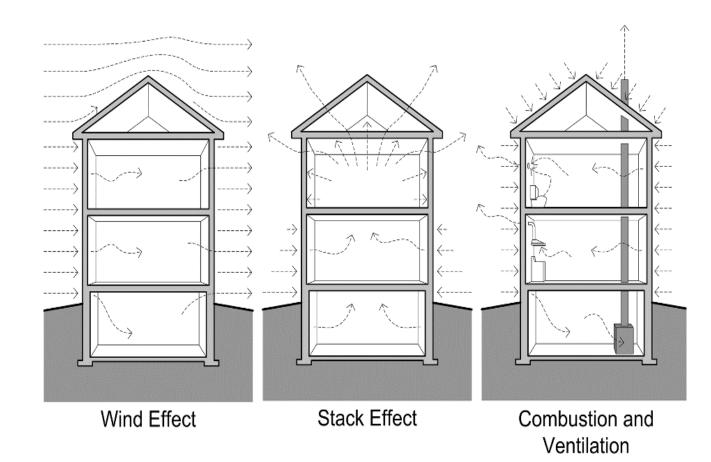


### How Does Air Get Around?

#### Air In = Air Out

For air movement you need:

- A hole
- A driving force
- Another hole

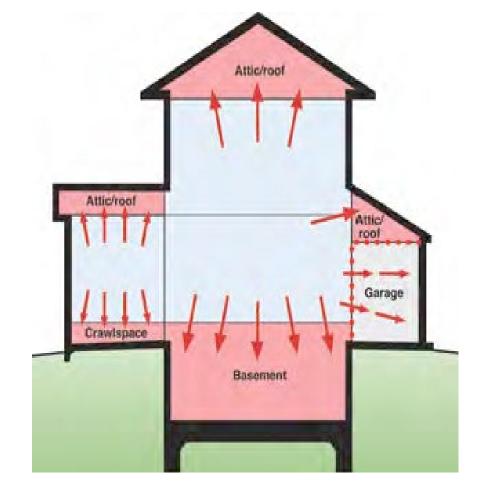








## **Internally Generated Air Pressure**



#### Expansion of Conditioned Space

- Conditioned space boundaries moving towards exterior surfaces of building
- Garage isolated from house by air barrier/pressure boundary
- Garage ventilated and conditioned independently of rest of conditioned spaces







### **Batt Insulation Grading**

## **Code Compliant** Not Acceptable Grade III: 2% - 5% Grade I: Almost no gaps Grade II: Up to 2% RESNET protocol for the effect of missing insulation on installation grade

Diagrams from the HERS Standards







## Heat Transfer

A Triple Threat

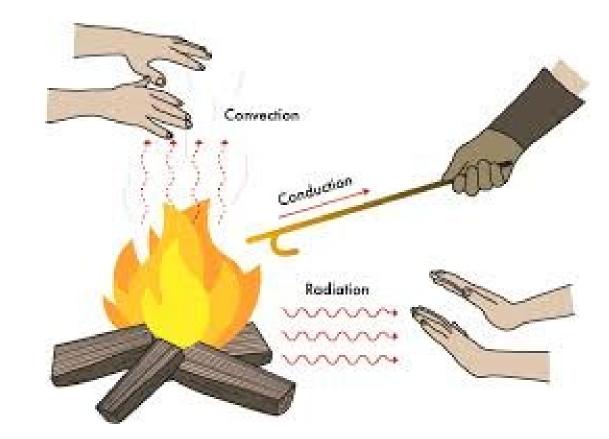




NEBRASKA code officials association

## Heat Transfers in 3 Ways

- Convection Through fluids (liquid or gas)
- Conduction Through solids
- **Radiation** Mostly windows



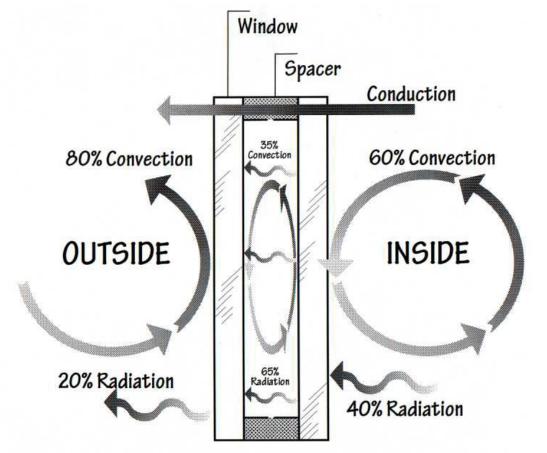






## **Practical Application - Windows**

- Heat always moves from hot to cold
- Always a mix of transfers
- Different rates of transfer can be important



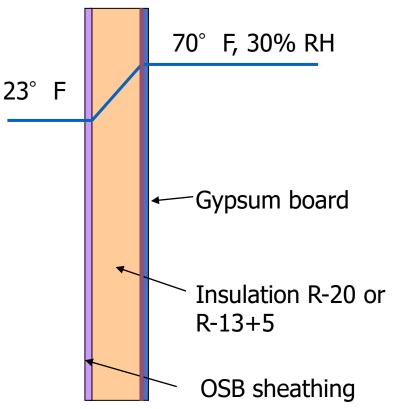






## **Condensing Surface Temperatures**

- Dewpoint of interior air =  $37^{\circ}F$
- Where will condensation occur? Inside surface of exterior sheathing
- One Solution? Interior vapor retarder, but what type and at what "cost?"









## Major Building Envelope Protection Systems

- Water Barrier
- Air Barrier
- Thermal Barrier
- Vapor Profile (not just the designated vapor retarder)
- Maintenance documents







### "You don't get what you expect, you get what you inspect!"









## **HVAC System**

Don't Forget the **"V"** 









## **HVAC Design and Loads**

#### **Oversized systems**:

- Less comfort
- Less efficient
- Poorly handles moisture
- Premature equipment failure

#### **<u>Right-sized systems</u>**:

- Better operating efficiencies
- Greater comfort
- Healthier indoor environments
- Better moisture control







## **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









## $H\underline{V}AC \ Design \ and \ Loads$

Today's homes risk health problems for occupants because:

- They are not properly ventilated:
  - < 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 (minimizes pressure differential)
- Maintains the Minimum Ventilation Guideline automatically with proper set-up







## Appraisals and Resale Value

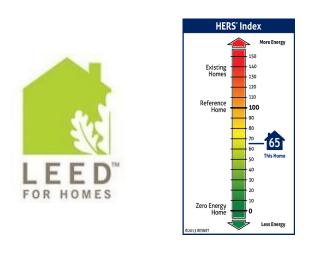






## Appraisers

- Unlike granite countertops, energy efficiency investments are not always visible at a glance
- Utilize certifications, labels, ratings, and scores
- Make sure appraisers are accurately valuing sustainable properties
  - Residential Green and Energy Efficient Addendum - Assists appraisers in analyzing residential "Green" features and properties.













#### Residential Green and Energy Efficient Addendum!

DEPT. OF ENVIRONMENT AND ENERG

- Resources for realtors and appraisers on properly valuing energy efficiency/green features
  - Educational materials
  - List of designated appraisers
  - Trainings
- For more information: http://www.appraisalinstitute.or g/education/green\_energy\_ad dendum.aspx





, de	Client	File #:		1	Appraisal File	#:			
. dlh	R	Residential Green and Energy Efficient Addendum							dum
AI Reports	Client:								
Form \$20.06*		t Property:							
	City:				State:			Zip:	
Additional			ation of green propert			f this for	rm can	be foun	d at
The appraiser here			alinstitute.org/education ation provided within t		nergy_addeno	oum ang			
<ul> <li>has been co</li> </ul>	nsidered in the	appraiser's	development of the ap	praisal of th	e subject prop			he client	and
			aisal report and only for y other purpose and she					than tho	ce identified
by the appr	aiser as the clie	nt or intend	ed user(s) in the report.						
<ul> <li>is the result features. Fr</li> </ul>	of the appraise transfinary ass	r's routine i amotion: D	inspection of and inquir tata provided herein is a	ies about the	e subject prop be arrurate ar	perty's g od if fou	reen a of to l	nd energ	y efficient r could alter
the appraise	r's opinions or	conclusions	L						
			warranty as to the effic property in general, an						
assessment	£								
			ures and using processe lesign, construction, op						
practice expands and	complements	the classic b	uilding design concern	s of econom					
Performance building	g and green bui	iding are of	ten used interchangeab	ly.					
Six Elements of Gree	n Building: Ag	reen buildir	ng has attributes that fa	Il into the si	elements of	green b	uilding	known i	as (1) site, (2
			onmental quality, and ( green or high performa						
income approach to				nce nousing	Appraisers r	NEEG SAN	niga a	mounts t	o develop at
			defined in glossary		ort monorby				
The following verifie	d items are con	sidered with	a defined in glossary tin the appraisal analysi Agency (EPA):	is of the sub	Indoor airPLU	s 🗆 w	aterSe	nse 🗆 E	NERGY STAI
The following verifie Green Certification	titems are con Environmenta Energy Depar	sidered with I Protection tment (DOE)	hin the appraisal analysi Agency (EPA): ]:	is of the subj		S 🗆 Wi heady Ho	aterše ome (2	nse 🗆 E ERH)	NERGY STAI
The following verifie	Environmenta Energy Depar Home Innova	sidered with al Protection tment (DOE) tion Researc	hin the appraisal analysi Agency (EPA):	is of the subj	Indoor airPLU Zero Energy R	S 🗆 Wi leady Ho I Silver	aterSe ome (2	ERH]	
The following verifie Green Certification Certifications attest that the home meets certain minimum	t items are con Environmenta Energy Depar Home Innova Home Innova Living Building	sidered with al Protection tment (DOE) tion Researce tion Researce to Challenge	hin the appraisal analysi h Agency (EPA): ]: th Labs NGBS Home Ren th Labs NGBS New Hom	s of the subj nodel: e:	Indoor airPLU Zero Energy R Bronze Living Building	leady Ho Silver g Certifie	ed	ERH) Sold	Emerals Certification
The following verifie Green Certification Certifications attest that the home meets	d items are con Environmenta Energy Depar Home Innova Home Innova Living Building Passivhaus St.	sidered with al Protection tment (DOE) tion Researce tion Researce challenge andard:	tin the appraisal analysi Agency (EPA): ]: th Labs NGBS Home Rer th Labs NGBS New Hom (LBC):	s of the subj	Indoor airPLU Zero Energy R Bronze	leady Ho Silver g Certifie	ed	ERH) Sold	Emerals Certification
The following verifie Green Certification Certifications attest that the home meets certain minimum	d items are con Environmenta Energy Depar Home Innova Uving Building Passivhaus St Passive House USGBC LEED:	sidered with al Protection tment (DOE) tion Researce tion Researce challenge andard:	tin the appraisal analysi Agency (EPA): ]: th Labs NGBS Home Rer th Labs NGBS New Hom (LBC):	s of the sub nodel: e:	Indoor airPLU Zero Energy R Bronze Living Building PHI Low Energ PHILON 2015	leady Ho Silver g Certifie	ed EnerP	ERH) Sold	Emerals Certification
The following verifie Green Certification Certifications attest that the home meets certain minimum	d items are con Environmenta Energy Depar Home Innova Home Innova Uving Buildin Passivhaus St Passive House	sidered with al Protection tment (DOE) tion Researc tion Researc challenge i andard: e Institute U	tin the appraisal analysi Agency (EPA): ]: th Labs NGBS Home Rer th Labs NGBS New Hom (LBC):	s of the sub nodel: e:	Indoor airPLU Zero Energy R Bronze Uving Building PHI Low Energ PHIUS+ 2015 Certified	leady Ho Silver g Certify by D Silver	ed EnerP	ERH] Sold D Petal Nit D P	Emerak Certification assive House
The following verifie Green Certification Certifications attest that the home meets certain minimum	d items are con Environmenta Energy Depar Home Innova Uving Building Passive House USGBC LEED: Other:	sidered with al Protection tment (DOE) tion Researc tion Researc challenge i andard: e Institute U	tin the appraisal analysi Agency (EPA): [: h: Labs NGBS Home Ren th Labs NGBS New Hom (LBC): 5: Dification Version:	s of the sub nodel: e:	Indoor airPLU Zero Energy R Bronze Living Buildin PHI Low Ener PHI LOW Ener PHI LOW Ener PHI LOW Ener PHI LOW Ener PHI LOW Ener PHI LOW ENER Certified	Isilver g Certifis RV D Silver Silver KOVE VA	ed EnerPl LID Of tion re	ERH] Sold D Petal Nit D P Gold NLY IF CH viewed o	Emerals     Certification     Assive House     Platinum     ECKED:     n site
The following verifie Green Certification Certifications attest that the home meets certain minimum thresholds.	I items are con Environmenta Energy Depair Home Innova Living Buildin Passiv-House USGBC LEED: Other: Date Verified: / /	sidered with al Protection tment (DOE tion Researc g Challenge andard: e Institute U Green Cert Organizati	Vin the appraisal analysis Agency (EPA): It Agency (EPA): It Labs NGBS Home Ren It Labs	is of the subject of	Indoor airPLU Zero Energy R Bronze Using Building PHI Low Energ PHI US+ 2015 Cartified AB	I Silver g Certifis by D Silver OVE VA Verifical Verifica	ed EnerPl LID Of tion re tion at	ERH] Sold Petal hit P Gold NLY IF CH viewed o tached to	Emerals Certification assive House Platinum ECKED: n site o this report
The following verifie Green Certification Certifications attent that the home meets cartain minimum thresholds.	I items are con Environment: Energy Depar Home Innova Home Innova Using Building Passive Hous USGBC LEED: Other: Date Verified: I / RESNET's HER Reating (0 to 1	sidered with il Protection tment (DOE tion Researc Challenge andard: Institute U Green Cert Organizati S 50):	in the appraisal analysi Agency (EPA): E: th Labs NGBS Home Ren th Labs NGBS Home Ren (LBC): 5: cification Version: on URL: Estimated energy Savings include	is of the subj nodel: e:	Indoor airPLU Zero Energy 8 Bronze Uning Buildin PHI Low Energ PHIUS+ 2015 Certified Certified AB	Isilver g Certifis by Silver Silver CVE VA Verifica year oling.	ed EnerPl Lion re tion at 	ERH] iold Petal hit P P Gold Sold NLY IF CH viewed o tached to h rate da	Emerak Certification issive House Platinum ECKED: n site o this report ted_/_/
The following verifie Green Certification Certifications attest that the home meets certain minimum thresholds.	I items are con Environmenta Emergy Depart Home Innova Home Innova Using Buildin Passivhaus SL Passivhaus SL Passive House USSBC LEED: Other: Date Verified: / I ReSNET's HER Rating (D to 1 Sampling R	sidered with I Protection tment (DOE) tion Research tion Research Challenge andard: Institute UD Green Cert Organizati S S0]: ating	In the appraisal analysis a Agency (EPA): b Agency (EPA): b Labs NGBS Nowe Home REC: S: Infration Version: on URL: Estimated energy saving Score below 200 indice	s of the subject nodel: e:	Indoor airPLU Zero Energy 8 Bronze Uving Buildin PHI Low Energ PHIUSe 2015 Cartified U AB Cartified C AB Cartified C AB Cartified C Cartified C	Leady Ho Silver g Certific ty Silver Silver Silver Verifical Verifical year oling. cted to L	ente (2 ed Eneriti tion at ckwi be low	ERH] iold Petal hit Petal hit P Gold surv IF CH viewed o tached to h rate da er than a	Emeraix     Certification     acsive House     Platinum     ECXED:     n site     o this report ted_/_/ verage local
The following verifie Green Certification Certifications attest that the home meets certain minimum thresholds.	I items are con Environment: Energy Depar Home Innova Home Innova Using Building Passive Hous USGBC LEED: Other: Date Verified: I / RESNET's HER Reating (0 to 1	sidered with il Protection tment (DOE) tion Researc tion Researc tion Researc to Research to Research	in the appraisal analysi Agency (EPA): E: th Labs NGBS Home Ren th Labs NGBS Home Ren (LBC): 5: cification Version: on URL: Estimated energy Savings include	is of the subj nodel: a: undel: unde	Indoor airPLU Zero Energy R Bronze Living Buildin PHI Low Ener PHI US+ 2015 Centified Centified AB D D D D D D D D D D D D D D D D D D	Leady Ho Silver g Certific ty Silver Silver Silver Verifical Verifical Verifical vear oling. cted to L stimate	ed EnerPl LID Of tion re tion at 	ERH old Petal hit P Gold HIY IF CH viewed to tached to t	Emerale Certification Sicke House Platinum ECKED: In site a this report ted _/_/_ werage local ised on
The following verifie Green Certification Certifications attest that the home meets certain minimum thresholds. Energy Label Labels disclose the table the home's	I items are con Environmenta Environmenta Home Innova Home Innova Home Innova Home Innova Home Innova Home Innova Home Innova Passive House USSBC LEED: Other: Date Verified: / / RESNET's HER Rating (0 to 1: Sampling R □ Confirmed DOE's Home I	sidered with al Protection Imment (DOE) tion Researchion Researchion andard: a	In the special analysis Agency (EPA): the table NGBS Home Rem th table NGBS Home Home NGC Second Seco	is of the subj model: w: angs for this h is electricity, tes energy c foot. HERS is fues one. Only ags for this h	Indoor siPLUZ Zero Energy R Bronze Living Buildin PHI Low Energ PHI Low Energ PHI Low Energ PHI Low Energ PHI Low Energies PHI Low Energies Cartified Ca	leady Ho Silver g Certifis Dr Silver Silver Silver Verifical Verifical year oling. cted to I stimoted rating year	enter (2 enter (2 enter (2) Ener (2) tion ret tion ret ti	ERH old Petal hit P Gold HIY IF CH viewed to tached to t	Emerale     Certification     Sishe House     Hatinum     Hatinum     ECRED:     n site     this report ted_/_/_ verage local seed on     test.
The following verifie Green Certification Certifications attest that the home meets certain minimum thresholds. Energy Label Labels disclose the table the home's	I items are con- Environment. Environment. Home Innova Home Innov	sidered with Il Protection timent (DOE tion Research to Research	in the apprainal analysis in the apprainal analysis E Labs NGB Shows New Hom LBC: Sc. Sc. Sc. Extimated energy savis Extimated energy savis Extimated energy savis Extimated energy savis Extimated energy savis Extimated energy savis	is of the sub model: #:	Indoor siPLU Zero Energy & Bronze Lixing Buildin PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer Certified Costs are expen- dick Report e y a "confirme orme: \$/ heating & Co	leady Ho Silver g Certific by Silver Silver CVE VA Verificat Verificat year oling. cted to L stimates d roting year oling.	ener (2 ed Ener (2) tion re tion at 	ERH) Petal Petal hit P Gold Sold sty IF CH viewed o tached to tached to h rate da er than a gy cost bo iognostic n rate dat	Emeraik Certification essive House Platinum ECKED: n sibe n this report ted verage local sed on test. ed
The following verifie Green Certification Certifications attest that the home meets certain minimum thresholds. Energy Label Labels disclose the table the home's	I tens are con Environment. Environment. Environment. Environment. Home Innova Uning Buildini Basishhaus SD Pasishe House. USG&LIED. Other: Date Verified: ☐ Sampling R Group Confirmed DOC's Home I Confirmed DOC's Home I Score (1o 10 Official Score	sidered with Il Protection toment (DOE tion Research c Challenge i andard: I Institute UD Green Cert Organizati S S S): tating Rating Rating (: re	in the apprainal analysis in the appravial analysis because the second second second second to take NGBS New Hom LLBC: S: S: S: Estimated energy savis Energy Sonings include Score above ToD indice code hom of bertalowne Estimated energy savis Estimated energy savis Estimated energy savis	s of the sub nodel: #	Indoor siPLU Zero Energy & Bronze Lining Building PHILLOW Finer PHILLOW Finer PHILSP 2015 Cartified Cartifie	leady Ho Silver g Certific Q Certific Q Certific Q Certificat Control	ame (2 ed EnerPl Lito Of tion re tion at 	ERH) Detail Petail Net Petail Net Petail Sold Sold Net Petail	Emerale Certification assive House Platinum ECKED: In sitie this report ted/_/ verage local sed on test. ed// werage local
The following verifie Green Certification Certifications attest that the home meets certain minimum thresholds. Energy Label Labels disclose the table the home's	I items are com Environment. Environment. Enring: Depair Home Innova Home Inn	sidered with Il Protection tion Researce tion Researce consear	In the apprainal analysis in the apprainal analysis E. B. Assence (EPA): E. B. Assence (EPA): E. Assence (EPA): S. Assence (EPA): S. Assence (EPA): Externation (EPA)	s of the sub nodel: a:	Indoor sinPLUZ Zero Energy II Bronze Using Building PHI Low Energy E PHI Low Energy PHI Low Energy PHI Low Energy PHI Low Energy PHI Low Energy Cartified Cartifie	leady Ho Silver g Certific g Certific g Certific g Certifica year 	eme (2 ed Enari?) LLD OF tion it ckWh be lown s energ " is a d _ckWh be lown on stat	ERH) Detail Petail Net Petail Net Petail Sold Sold Net Petail	Emerale Certification assive House Platinum ECKED: In sitie this report ted/_/ verage local sed on test. ed/ end/
The following verifie Green Certification Certifications attest that the home meets certain minimum thresholds. Energy Label Labels disclose the table the home's	I tens are con Environmenta Environmenta Environmenta Home Innova Home Innova Izing Baldin Pasivheat ST Pasivheat ST Pasi	sidered with Il Protection tion Research tion Research tion Research tion Research tion Research tion Research tion Research organization Green Cert Organization S SOI:  ating Rating Rating Energy E Core Score:	in the apprainal analysis in the appravial analysis because the second second second second to take NGBS New Hom LLBC: S: S: S: Estimated energy savis Energy Sonings include Score above ToD indice code hom of bertalowne Estimated energy savis Estimated energy savis Estimated energy savis	s of the sub nodel: a: a: a: a: a: a: a: a: a: a	Indoor siPLU Zero Energy & Bronze Lining Building PHILLOW Finer PHILLOW Finer PHILSP 2015 Cartified Cartifie	leady Ho Silver g Certific g Certific g Certific g Certifica year 	eme (2 ed Enari?) LLD OF tion it ckWh be lown s energ " is a d _ckWh be lown on stat	ERH) Detail Petail Net Petail Net Petail Sold Sold Net Petail	Emerale Certification assive House Platinum ECKED: In sitie this report ted/_/ verage local sed on test. ed/ end/
The following verifie Green Certification Certifications attest that the home meets certain minimum thresholds. Energy Label Labels disclose the table the home's	I lens are con Environments Environments Environments Home Innova Home Innova	sidered with I Protection Itement (DoCE tion Rusearc ( Challange and Andri: - Institute U Green Cart Organizati S S0): fating Rating Rating Rating Inergy (: re icore Score: to):	In the appraint analysis in the appraint analysis approximate analysis in the table NGES frome Ree In table NGES frome Ree Historics and the table State State and the table and table Score brokes 200 indice Score brokes 20	s of the sub nodel: a: a: a: a: a: a: a: a: a: a	Indoor sinPLUZ Zero Energy R Bronze Libing Building PHI Low Energy PHI Low Energy PHI Low Energy PHI Low Energy PHI Low Energy PHI Low Energy Cartified	leady Ho Silver g Certific g Certific g Certific g Certifica year 	eme (2 ed Enari?) LLD OF tion it ckWh be lown s energ " is a d _ckWh be lown on stat	ERH) Detail Petail Net Petail Net Petail Sold Sold Net Petail	Emerale Certification assive House Platinum ECKED: In sitie this report ted/_/ verage local sed on test. ed/ end/
The following verifie Green Certification Certifications attest that the home meets certain minimum thresholds. Energy Label Labels disclose the table the home's	I tens are con Environmenta Environmenta Environmenta Home Innova Home Innova Lixing Baildin Passive House Passive House Listale LIFED Other: Date Verified: ☐ Confirmed DOC's Home I Score ☐ Unofficial Score (1 to 10 ☐ Official Score (1 to 10) ☐ Official Score (1 to 10)	sidered with I Protection I Protection I Protection I Protection I Challenge I	In the approximate analysis Approximate analysis of the approximate I have holds from the approximate I have hold an a	is of the sub model: #: 	Index BiPLU Zera Energy R Bronze bioing Building Composition of the second PHI Low Energy R PHI Low Energy R PHI Low Energy Composition of the second PHI Low Energy Cost Internet Second Phile Second Phile Second Phile Second Phile Second Phile Second Phile Second Phile Second Phile Second Phile Second Phile Second Phile Second Phile Second Phile Second Phile Second Phile Second Phile Second Phile Second	leady Ho Silver g Certifica py Silver Silver Verifica year oling. cted to b stimote d roting? year oling. rate dal	anne (2 anne (2 charter) charter ch	ERUE) aold Peral Gold Sold	Carrification Carrification Steve House Hatimum Hatimum ECKED: n sibe this report ted end end end end end end ECKED: ECKED:
The following verifie Green Certification Certifications attest that the home meets certain minimum thresholds. Energy Label Labels disclose the table the home's	I terns are con Environments Environments Home Innova Home Innova	sidered with I Protection I Protection I Protection I Protection I Protection I Protection I I I I I I I I I I I I I I I I I I I	In the appraint analysis in the appraint analysis approximate analysis in the table NGES frome Ree In table NGES frome Ree Historics and the table State State and the table and table Score brokes 200 indice Score brokes 20	is of the sub model: #: 	Indeer airPLU Zero Energy R Bronze Living Building PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer Certified	Isilver g Cartific g Cartific g Cartific g Cartific g Cartifica Silver GOVE VA Verifica oling. Coling.	enne (2 end EnarPl Lib Of Lib Of tion at  ckWh be lown on stat  ckWh ted ckWh ted	ERVI) cold Cold	ECKED: n sibe Control of the second control of the second contro
The following verifie Green Certification Certifications attest due the home meets certain minimum hreaholds. Energy Label Labels duclose the table the home's	I lens are con Environments Environments Environments Home Innova Home Innova Home Innova Living Builden Passive House House House I Scale Liefto Other: Other: Other: Date Verified: ☐ Projected Coloris Home I Score (1 to 10) COS's Home I Score (1 to 10) Color Home I Date Verified:	sidered with I Protection I Protection I Protection I Protection I Challenge I	In the approximate analysis Approximate analysis of the approximate I have holds from the approximate I have hold an a	is of the sub model: #: 	Indeer airPLU Zero Energy R Bronze Living Building PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer Certified	Isilver g Cartific g Cartific g Cartific g Cartific g Cartifica Silver GOVE VA Verifica oling. Coling.	enne (2 end EnarPl Lib Of Lib Of tion at  ckWh be lown on stat  ckWh ted ckWh ted	ERVI) cold Cold	Carrification Carrification Steve House Hatimum Hatimum ECKED: n sibe this report ted end end end end end end ECKED: ECKED:
The following verifies Green Certifications attest that the home meets certain minimum thresholds.	I Jamis are con Environmental Depart Energy Depart Home Innova Uning Buildon Passive House Innova Using Buildon Passive House Innova Verified: Verified: Cher Esample (to 1: Esample (to 1	idered with idered with idered with idered line idered line in Research idered	In the appraid analysis in the appraid analysis E. Adverse (EPA): E. Adverse (EPA):	is of the sub model: #: 	Indeer airPLU Zero Energy R Bronze Living Building PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer Certified	Isilver g Cartific g Cartific g Cartific g Cartific g Cartifica Silver GOVE VA Verifica oling. Coling.	enne (2 end EnarPl Lib Of Lib Of tion at  ckWh be lown on stat  ckWh ted ckWh ted	ERVI) cold Cold	ECKED: n sibe Control of the second control of the second contro
The following verifie Green Certification Certifications attest that the home meets certain minimum thresholds. Energy Label Labels disclose the table the home's	I Jamis are con Environmental Energy Depar Home Innoval Home Innoval	idered with idered with idered with idered line idered line in Research idered	In the appraid analysis in the appraid analysis E. Adverse (EPA): E. Adverse (EPA):	is of the sub model: #: 	Indeer airPLU Zero Energy R Bronze Living Building PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer PHI Low Finer Certified	Isilver g Cartific g Cartific g Cartific g Cartific g Cartifica Silver GOVE VA Verifica oling. Coling.	enne (2 end EnarPl Lib Of Lib Of tion at  ckWh be lown on stat  ckWh ted ckWh ted	ERVI) cold Cold	ECKED: n sibe Control of the second control of the second contro
The following verifies Green Certifications start that the borne meets certain movimes certain movimes thresholds.	I Jems are con Environmental Depart Energy Depart Home Innova Home	Lidered with an end IDO Charaction mean and the ment IDO Charaction mean and the ment IDO Charaction mean and the mean and	In the appraind analysis in the appraind analysis E. Adverse (EPA): E. Adverse (EPA): E. Adverse (EPA): A table NGES New Hom IAC): Statistics New Hom IAC): Statistics New Hom IAC): Estimated energy saving Estimated energy saving Energy Sonings include Score below for address 20 indice Energy Sonings include Score below for address 20 indice Energy Sonings include Energy Soning include Energy Soning include Energy Soning include Energy Soning include Internet School (School (Sch	s of the subject of t	Indoor airPLU Zaro Energy R Bronze Lining Building PHILLow Fores PHILLow Fores PHILLow Fores PHILLow Fores Phillow Fores array = orme: S heating & Co asits are repre- nder Report energy cost res ear C With Ball ear C With Ball	In ady He Silver g Certifican g Certifican Development Silver COVE VA Verifican Verifican COVE VA to based of rate data Verifican COVE VA Verifican COVE VA COVE C	ame (2 ed EnerPl EnerPl Clion re CkWh be lown on start ted kub Of tion re tion re tion at	ERVII Sold Persain Gold NEY IF CO Sold NEY IF CO NEY IF CO NEY IF CO Sold NEY IF CO Sold S	Emerals Gernflication store House Platinum ECKED: in site of verage local stof an test. energy erage local e energy ECKED: in site in site this report
The following verifies Green Cettifications attent that the home meets contain minimum thresholds.	I Jamis are con Environmental Depart Energy Depart Home Innova Uning Buildon Passive House Innova Using Buildon Passive House Innova Verified: Verified: Cher Esample (to 1: Esample (to 1	Lidende wirken 4 Protactionen (DOE 4 Protactionen (DOE 1000) (DOE (DOE 1000) (DOE 10	In the appraid analysis in the appraid analysis E. Adverse (EPA): E. Adverse (EPA):	s of the subject of t	Indior airPLU Zero Energy R Sronze Licing Buildin PHI Low Fores PHI Low Fores Cartified C Cartified C C Cartified C C Cartified C C Cartified C C C Cartified C C C C C C C C C C C C C C C C C C C	Is addy Ho Silver g Cartific g Cartific g Cartific g Cartific g Cartific Silver IS Verifical	anne (2 ed EnarPl LID Of LID Of ckWh be lown on stat ted LID Of ted	ERVII Cold Persain Gold RLY IF Chan Color RLY	Emeral Cartification State State Platinum ECKED: n site ad energy excaps local sed on itest. ed site construct ECKED: n site bthis report ECKED:
The following verified Green Certification Certification stress for the horner meets of the horner meets of the horner here thresholds.	I terms are con Environmental peak Environmental peak Home Innova Home Innova	Lidende antikon menet (DOE Monactionon Researcher Destantion Researcher Destantioner Growen Cent Growen Cent Growen Cent Growen Cent Growen Cent Growen Cent Some Some Some Companianti Some Some Companianti Companianti Companianti Companianti Companianti Companianti Companianti Companianti Companianti Compania	in the appraid analysis in the appraid analysis behavior of the second second second behavior of the second second second second second second second second second second second second second second	ss of the subset	Indeor airPLU Zero Energy B Bronze Lining Building PHILLow Fores PHILLow Fores PHILLow Fores PHILLow Fores Phillow Fores Phillow Fores and a response notice represent ear AB ear C With  ear C With	Lady Ho Silver g Certific g Certific g Certific g Certific g Certifica long United Verifica verifica verifica verifica verifica	anne (2 ed EnerPl LID OF tion rat ckwh be lown on stat ted ckwh be lown on stat ted ted OF tion re tion rat tion rat	ERVI) Gold Peral Gold Peral Gold Peral Gold Peral Gold Peral Peral Gold Peral	Emeral Cartification State State Platinum ECKED: n site ad energy excaps local sed on itest. ed site construct ECKED: n site bthis report ECKED:

NDEGE: The Apparation instance patishines that from the raw by apposing where the approxime does now at of the form appropriate. Depending on the subgrapheness, the approxime ray tends to provide additional disk patishines and the approxime to the raw of the form the approximation instance makes on expensionality. Support of the Approximation and the Approximation approximation and the Approximation approximatio





#### **Lender Specification**

"This Home/Building is being built/renovated/updated to nationally recognized standards above prevailing code. It is designed and constructed with unique features and materials and with high efficient equipment and in accordance with high efficiency standards. The Lender shall choose an Appraiser educated and knowledgeable in this type of valuation of these specialized Homes, preferably an appraiser who holds a professional appraisal designation that requires advanced education on such issues as the valuation of sustainable buildings (e.g. MAI or SRA designations from the Appraisal Institute). The appraiser shall provide verification of green valuation education of 14 hours or more from a qualified educational provider and knowledge to be permitted to conduct the appraisal for this project."





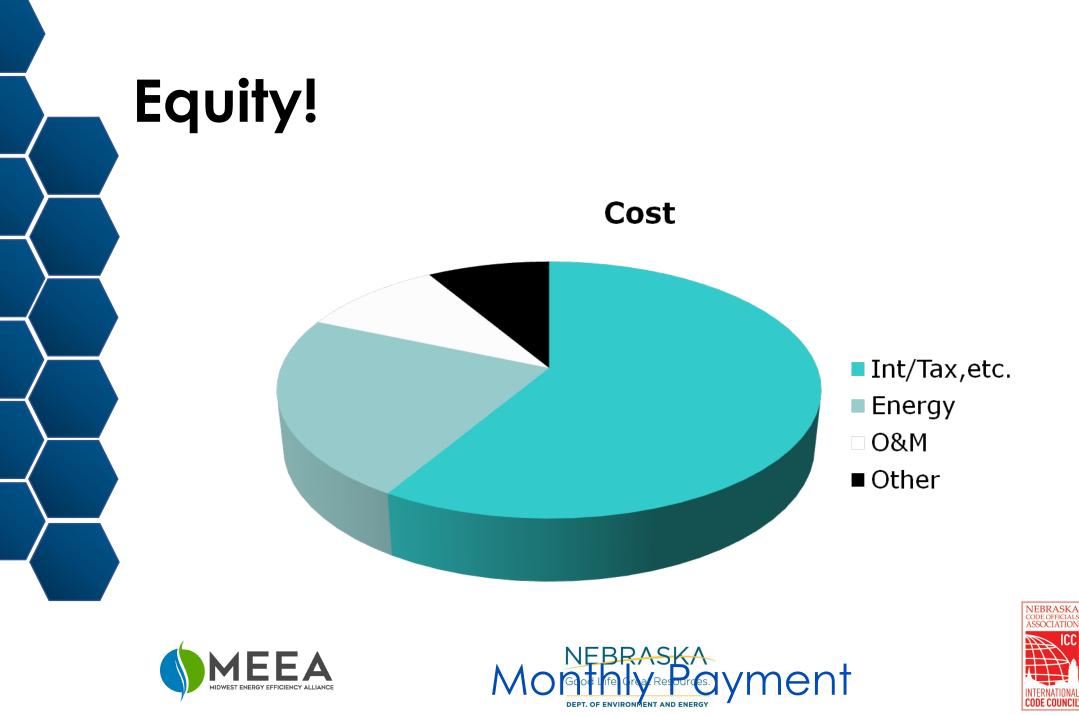


## Marketing High Performance homes







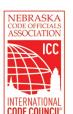


## Key Takeaways

- 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
  - Mechanical ventilation must be installed and takes on new importance







# Thank you!

### Questions? Matt Belcher, Verdatek Solutions <u>matt@verda-solutions.com</u> 314-749-4189 Cell





NEBRASKA code officials association



Live online trainings in June

Week of June 27<sup>th</sup>; Site Visits/Trainings

Matt Belcher, Verdatek Solutions <u>matt@verda-solutions.com</u>

314-749-4189 Cell





