

Great Plains Energy Codes Conference

Compliance Pilot Study for Nebraska
How are we doing?

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Compliance Pilot Study for Nebraska

- The State of Nebraska received \$3.1 billion in State Energy Program through the American Recovery and Reinvestment Act (ARRA). As a condition of receiving the funds, the State of Nebraska was required to make assurances regarding building energy codes.
 - Section 410.2.C of the *Act* requires: *"A plan for achieving compliance with the Energy Code within 8 years of the enactment of the Act (2017) in at least 90 percent of new and renovated residential and commercial building space. The plan is to include active training and enforcement programs and measurement of the rate of compliance each year."*

Compliance Pilot Study for Nebraska

- The 2003 International Energy Conservation Code (IECC) was established as the Nebraska Energy Code in 2004 and was enacted on July 1, 2005
- The Energy Office determined that working to establish Nebraska's "baseline" compliance with the Nebraska Energy Code would be the best way to:
 - > provide an accurate snapshot of compliance with the current state-wide energy code
 - > quantify educational needs within the construction industry
 - > help to establish a direction and scope for future industry training, and
 - > clarify Nebraska's best options as we proceed with future evaluations verifying 90% compliance



COMPLIANCE PILOT STUDY FOR NEBRASKA

Nebraska's Compliance Study included:

- On-site evaluations statewide on 100 single family residences constructed in 2010
- Evaluations completed with the assistance of a RESNET Certified Home Energy Rater
- \$250 stipends for the home owners of the 100 selected homes for allowing inspectors into their homes
- Compiling of the inspection results for the agency's use in determining current compliance levels
- Included home evaluations located geographically across the state consistent with the state-wide construction data available from the U.S. Census for 2010



Compliance Pilot Study for Nebraska

Nebraska's Compliance Study:

- In the larger metro areas home evaluations were located geographically across the city covering various price ranges and builders
- A compliance checklist developed from the Residential Data Collection Checklist for the 2009 IECC - Climate Zone 5 and Marine 4 - developed by the Pacific Northwest National Laboratory's (PNNL) - Building Energy Codes Program (BECP) as part of their State Compliance Evaluation Procedures
- When RESCheck documentation was made available to the evaluator, information including building envelope R and U-values and HVAC equipment efficiency information was included in the evaluation documentation. The 2003 IECC allowed the equipment efficiency "trade-off" which has been utilized by a number of Nebraska's builders, in conjunction with a RESCheck analysis. In these homes the building envelope R and U-values that may vary from the "prescriptive" requirements and the HVAC system efficiencies were documented for compliance
- Two additional columns in the Checklist that allowed the evaluators to make compliance determinations based on their experience and/or other factors encountered during the inspection

Residential Data Collection Checklist

2003 International Energy Conservation Code
Climate Zone 13

Building ID: _____ Date: _____ Name of Evaluator(s): _____
 Building Owner: _____ Phone: _____ Email: _____
 Building Address: _____
 City: _____ State: _____ County: _____ Jurisdiction: _____
 Conditioned Floor Area: _____ ft²
 Compliance Approach (check all that apply): Prescriptive Trade-Off Performance
 Compliance Software Used: _____ Green Building/Above-Code Program: N/A
 Building Type: 1- and 2-Family, Detached: Single Family Modular Townhouse

Compliance Codes: Y= Code requirement (product & R/U-value) visually verified as being present
 Y(*)= Code requirement (product & R/U-value) not specifically verified as being present but evidence established indicating compliance
 N= Code requirement (product & R/U-value) visually verified as not being present
 N(*)= Code requirement (product & R/U-value) not specifically verified as not being present but evidence established indicating non-compliance
 U= Unable to make a determination of specific code requirement (product & R/U-value) compliance
 N/A= Not applicable

IECC Section #	Pre-Inspection/Plan Review	Code Value	Plan Value	Verified Value	Complies						Comments/Notes/Assumptions ¹
					Y	Y(*)	N	N(*)	U	N/A	
104.2 [PR1]*	Construction drawings and documentation available. Documentation sufficiently demonstrates energy code compliance.				<input type="checkbox"/>						
503.3.1 [PR2]*	HVAC loads calculations: Heating system size(s): Cooling system size(s):			kBtu: _____ kBtu: _____	<input type="checkbox"/>						

Additional Comments/Assumptions: _____

¹ Use Comments/Assumptions to document code requirements that pass due to exceptions, and specify the exception. Also use Comments/Assumptions to document multiple values observed for a given code requirement, such as multiple equipment efficiencies.

A Checklist was developed for each of Nebraska's 2003 IECC Climate Zones that included specific Code Section requirements for verification

COMPLIANCE PILOT STUDY FOR NEBRASKA

IECC Section #	Framing / Rough-In Inspection	Code Value	Plan Value	Verified Value	Complies						Comments/Assumptions
					Y	Y(*)	N	N(*)	U	N/A	
502.2.4.6 [FR1]	Door U-factor. ³	U-0.35 (max.)		U-_____	<input type="checkbox"/>	_____					
502.2.4 [FR2]	Glazing U-factor ⁴	≤ 8% = U-0.45 8.1–12% = U-0.40 12.1–15% = U-0.35 15.1–18% = U-0.34 18.1–20% = U-0.31 20.1–25% = U-0.25		U-_____	<input type="checkbox"/>	_____					
102.5.2 [FR4]	Glazing labeled for U-factor (or default values used).				<input type="checkbox"/>	_____					
503.3.3.3 [FR12]	Duct insulation.	Outside Bldg: Supply: R-8 Return: R-4 Unconditioned: Supply: R-8 Return: R-2		Supply: R-_____ Return: R-_____	<input type="checkbox"/>	_____					
503.3.3.4. 3 [FR13]	Duct sealing complies with listed sealing methods.				<input type="checkbox"/>	_____					
502.3.1.3 [FR16]	IC-rated recessed lighting fixtures meet infiltration criteria.				<input type="checkbox"/>	_____					
503.3.3.1 [FR17]	HVAC piping insulation.			R-_____	<input type="checkbox"/>	_____					
504.5 [FR18]	Circulating hot-water piping insulation.			R-_____	<input type="checkbox"/>	_____					
503.3.3.5 [FR19]	Mechanical ventilation switching and dampers meet criteria				<input type="checkbox"/>	_____					
502.1.4.1 [FR20]	Window air leakage.	0.3 cfm/ft ²		_____ cfm/ft ²	<input type="checkbox"/>	_____					
502.1.4.1 [FR21]	Sliding door air leakage.	0.3 cfm/ft ²		_____ cfm/ft ²	<input type="checkbox"/>	_____					
502.1.4.1 [FR21]	Swinging door air leakage.	0.5 cfm/ft ²		_____ cfm/ft ²	<input type="checkbox"/>	_____					

Additional Comments/Assumptions: _____

³ One door can be exempted from the prescriptive door U-factor requirements.

⁴ One percent of the total window area may be exempted from U-factor requirement under the prescriptive approach.

Each of the Code Sections was assigned a point value based on its Impact Tier consistent with PNNL's - Building Energy Codes Program Compliance Evaluation Procedures

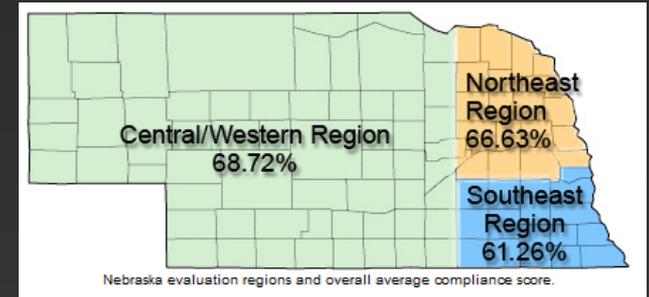
Nebraska's Evaluation Results:

Statewide

- The overall average compliance score was 64.7 percent
- The highest rated home scored 83.67 percent and was located in a community in central Nebraska
- The lowest rated home scored 42.55 percent and was located in a community in northeast Nebraska.

By Region

- Northeast Region:
 - 51 houses were evaluated in 8 counties
 - The high score was 80.85 percent
 - The low score was 42.55 percent
 - Average score: 66.63 percent
- Southeast:
 - 39 houses were evaluated in 4 counties
 - The high score was 69.39 percent
 - The low score was 57.06 percent
 - Average score: 61.26 percent
- Central/Western:
 - 10 houses were evaluated in 6 counties
 - The high score was 83.67 percent
 - The low score was 55.32 percent
 - Average score: 68.72 percent

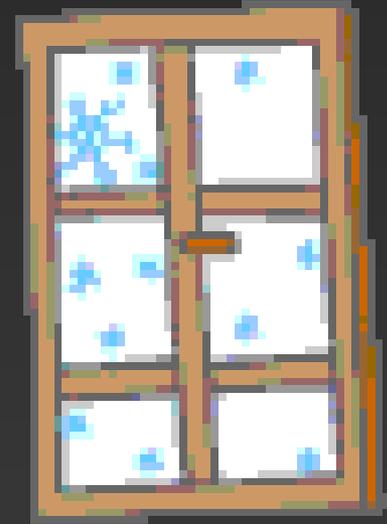


Nebraska's Evaluation Results:

The evaluation identified areas where builders were generally consistent in complying with the energy code as well as specific areas that were consistently non-compliant .

Areas of Success:

- Installing the doors and windows that meet minimum efficiency code requirements
- Sealing ductwork
- Installing the appropriate amount of insulation in floors and ceilings



Nebraska's Evaluation Results:

Areas Needing Improvement:

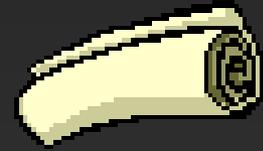
- Installing insulation according to the manufacturer's specification and in sufficient thicknesses in all of the building envelope areas
- Caulking and sealing holes throughout the home's building envelope
- Specifying, documenting and installing appropriately sized heating/cooling equipment



Nebraska's Evaluation Results:

Additional Evaluation Specifics:

- Drawing and Documents were available on 94 of homes
- RESCheck documentation was available on 58 homes evaluation
- Verifying the presence of slab edge insulation in homes that are completed required that the "edge" of the insulation be visible which is not typical construction practice in Nebraska, most builders trim the "edge" of the insulation at a 45° as allowed in Section 502.2.1.4 of the Code
- Documentation regarding HVAC load calculations is not collected by any of Nebraska's local code jurisdictions - this impacts the evaluation negatively by 3.8%
- On-site verification by local jurisdictions that the appropriately sized HVAC equipment is being installed is not being completed - this impacts the evaluation negatively by 5.7%
- Duct Sealing and Insulation impact the evaluation by 1.25%



Compliance Pilot Study for Nebraska

- As Nebraska looks toward the 2017 deadline we will need to focus on the results of our 64.7% compliance “snapshot”
 - › Educational needs, direction and scope will be paramount:
 - appropriate documentation submission requirements and review within the local jurisdictions
 - effective air sealing techniques, review and verification by inspectors, raters or entities trained in the use of blower door technologies
 - accurate HVAC sizing, installation and field verification
 - appropriate residential plan development and specification
 - › Training and informational updates of new technologies and Code options or mandates

