

Great Plains Energy Codes Conference

Case Study in Nebraska -
What Happens When a Home Does Not Meet Code
After Being Passed By The Local Code Jurisdiction?

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CASE STUDY IN NEBRASKA

Homeowner Perspective

- My job transferred me to Nebraska in 2007
- I purchased a newly built constructed home and requested the builder finish the basement
- Home was built in 2006
- Closing was in 2007
- 2700 square feet with 1000 square foot basement

Homeowner
Perspective

- Believed the basement walls were not insulated
 - › Experienced extremely cold temperatures throughout the winter
- Believed the furnace and AC unit was improperly sized
 - › Upstairs bedroom was cold
- Believed windows were installed improperly
 - › Experienced dirt blowing into the home and accumulating on the sill

CASE STUDY IN NEBRASKA

Homeowner Perspective

- Believed State Energy Code was not followed
- Requested the State Energy Office conduct a state energy code inspection of the home

Nebraska Law
81-1614. Nebraska
Energy Code;
applicability.



The Nebraska Energy Code shall apply to all new buildings, or renovations of or additions to any existing buildings, on which construction is initiated on or after August 27, 2011.

Nebraska Law
81-1616. Procedures
for insuring
compliance with
Nebraska Energy
Code; costs;
appeal.

- For purposes of insuring compliance with section 81-1614:
- (1) Authority to conduct investigations pursuant to section 81-1625 and may issue an order containing the findings; and
- (2) A building owner may submit a written request that the office investigate a possible non-compliance issue. Such request shall include a list of reasons why the building owner believes it is necessary.

Nebraska Law
81-1617. Nebraska
Energy Code;
inspections and
investigations
necessary to
enforce.



The State Energy Office and any local code authority may conduct inspections and investigations necessary to enforce the Nebraska Energy Code or equivalent code:

- > Reasonable hours
- > Only after permission has been granted by building owner –or–
- > After a warrant has been issued.

Nebraska Law
81-1625. Building;
failure to comply
with Nebraska
Energy Code or
equivalent
standard; liability.



If the building fails to comply with the Nebraska Energy Code or equivalent code adopted by a local jurisdiction, the director or code authority may order the owner or prime contractor to bring the building into compliance. This section does not limit the right of the owner to bring civil action for the cost of bringing the building into compliance.

- ◎ The Office shall investigate complaints that a local code jurisdiction is not effectively enforcing its local code, or that the code is not equivalent to the Nebraska Energy Code,
 - › May order corrective action if such complaints are substantiated by the investigation.

CASE STUDY IN NEBRASKA

State Energy Office Involved and Inspection Conducted

- “I do not feel that the builder followed the state energy code when he finished our basement...”
- “Therefore, I am requesting your office conduct a state energy efficiency code inspection of our house.”

Group Discussion

If the State Energy Code was not followed, what does the homeowner do?

Building Envelope Code Requirements

Section 502.2.2 of the 2003 IECC allowed designers/ builders the option of complying with the Code by showing that the total thermal transmission heat gain or loss for the proposed building envelope would not exceed the total heat gain or loss resulting from the proposed building's conformance to the Code's specified "prescriptive" R-value and U-value requirements.

This was the option selected by the Builder and a REScheck Compliance Certificate was submitted to the local jurisdiction. The Certificate indicated that the home exceeded the Code by 0.7% and a permit was granted.

Permit #
 Permit Date



REScheck Software Version 3.7 Release 1a
Compliance Certificate

Project Title: The
Report Date: 01/31/06

Energy Code: 2003 IECC
Location:
Construction Type: Single Family
Gleazing Area Percentage: 14%
Heating Degree Days: 6500

Construction Site: _____ **Owner/Agent:** _____ **Designer/Contractor:** _____

| Item | Area (sq ft) | Req. U-Value | Act. U-Value | Req. R-Value | Act. R-Value | U-Value % | R-Value % |
|--|--------------|--------------|--------------|--------------|--------------|-----------|-----------|
| Roof | 1440 | 0.08 | 0.08 | 12.5 | 12.5 | 100% | 100% |
| Foundation | 1440 | 0.18 | 0.18 | 5.6 | 5.6 | 100% | 100% |
| Wall 1: Wood Frame, 16" o.c. | 960 | 0.08 | 0.08 | 12.5 | 12.5 | 100% | 100% |
| Window 1: Wood Frame/Double Pane with Low-E | 70 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Window 2: Wood Frame/Double Pane with Low-E | 25 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Window 3: Wood Frame/Double Pane with Low-E | 20 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Window 4: Wood Frame/Double Pane with Low-E | 14 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Window 5: Wood Frame/Double Pane with Low-E | 14 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Wall 3: Wood Frame, 16" o.c. | 144 | 0.08 | 0.08 | 12.5 | 12.5 | 100% | 100% |
| Wall 4: Wood Frame, 16" o.c. | 570 | 0.08 | 0.08 | 12.5 | 12.5 | 100% | 100% |
| Window 6: Wood Frame/Double Pane with Low-E | 21 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Window 10: Wood Frame/Double Pane with Low-E | 24 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Window 19: Wood Frame/Double Pane with Low-E | 15 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Window 18: Wood Frame/Double Pane with Low-E | 59 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Window 13: Wood Frame/Double Pane with Low-E | 21 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Wall 8: Wood Frame, 16" o.c. | 272 | 0.08 | 0.08 | 12.5 | 12.5 | 100% | 100% |
| Window 22: Wood Frame/Double Pane with Low-E | 4 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Wall 9: Wood Frame, 16" o.c. | 960 | 0.08 | 0.08 | 12.5 | 12.5 | 100% | 100% |
| Window 21: Wood Frame/Double Pane with Low-E | 24 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Window 23: Wood Frame/Double Pane with Low-E | 14 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Window 24: Wood Frame/Double Pane with Low-E | 24 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Window 25: Wood Frame/Double Pane with Low-E | 7 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Window 26: Wood Frame/Double Pane with Low-E | 7 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Wall 7: Wood Frame, 16" o.c. | 270 | 0.08 | 0.08 | 12.5 | 12.5 | 100% | 100% |
| Window 27: Wood Frame/Double Pane with Low-E | 7 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Door 1: Solid | 21 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Wall 5: Wood Frame, 16" o.c. | 348 | 0.08 | 0.08 | 12.5 | 12.5 | 100% | 100% |
| Window 30: Wood Frame/Double Pane with Low-E | 7 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Window 28: Wood Frame/Double Pane with Low-E | 25 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Window 29: Wood Frame/Double Pane with Low-E | 48 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Door 2: Solid | 12 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |
| Wall 6: Wood Frame, 16" o.c. | 336 | 0.08 | 0.08 | 12.5 | 12.5 | 100% | 100% |
| Window 31: Wood Frame/Double Pane with Low-E | 16 | 0.310 | 0.280 | 3.23 | 3.57 | 90% | 93% |

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Building Envelope Code Requirements

As part of the review process the Energy Office reviewed the REScheck Compliance Certificate and the plans. That review indicated that, by design, the building envelope of the house exceeded the minimum requirements of the Nebraska Energy Codes.

The on-site inspection of the home showed non-compliance issues associated with the mandatory and implementation requirements of the Energy Code.

| | | | | |
|---|-----|------|-------|----|
| Wall 10: Wood Frame, 16" o.c.: | 290 | 19.6 | 0.8 | 17 |
| Basement Wall 4: Solid Concrete or Masonry: | 953 | 0.0 | 4.0 | 30 |
| Basement Wall 5: Solid Concrete or Masonry: | 338 | 0.0 | 4.0 | 25 |
| Basement Wall 6: Solid Concrete or Masonry: | 383 | 4.0 | 4.0 | 26 |
| Window 38: Vinyl Frame/Double Pane with Low-E: | 4 | | 0.310 | 1 |
| Basement Wall 7: Solid Concrete or Masonry: | 535 | 0.0 | 4.0 | 36 |
| Window 39: Vinyl Frame/Double Pane with Low-E: | 4 | | 0.310 | 1 |
| Window 40: Vinyl Frame/Double Pane with Low-E: | 4 | | 0.310 | 1 |
| Floor 1: All-Wood Joist/Fuses/Over Unconditioned Space: | 490 | 19.0 | 0.0 | 22 |
| Furnace 1: Forced Hot Air 82 AFUE | | | | |
| Air Conditioner 1: Electric Central Air 12 SEER | | | | |

Compliance Statement/Statement of Compliance: The proposed building design described here is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the 2009 IECC requirements in REScheck Version 3.7, Release 1e and to comply with the mandatory requirements listed in the REScheck Inspection Checklist.

Builder/Designer

Company Name

Date

Case Study in Nebraska

- NEO's Inspection included:
 - › A Review of the Construction Plan and RESCheck submitted to the City
 - The documentation is reviewed for accuracy including square footages, appropriate R-values, appropriate use of the RESCheck, etc...
 - › Inspection of the Building Envelope Properties associated with the Energy Code
 - Window and door openings that match the documents
 - R-values installed in all elements of the building envelope
 - › Inspection of the Prescriptive Requirements of the Code
 - Duct Sealing, appropriate installation of products, HVAC sizing, IC rated can lights, duct insulation, appropriate documentation of installed insulation, etc...

CASE STUDY IN NEBRASKA

Building Envelope Code Requirements

Basement Walls

The submitted *RESCheck* Compliance Certificate indicated an R-4.0 continuous insulation would be installed on the top four feet of all of the basement walls.

The visual inspection completed on-site showed that no interior or exterior basement wall insulation had been installed.



CASE STUDY IN NEBRASKA

Building Envelope Code Requirements

Basement Walls

In the finished area of the basement electrical and speaker wall plates were removed in three locations showing no insulation had been installed on the wall prior to the installation of the finish system.



CASE STUDY IN NEBRASKA

Building Envelope Code Requirements

Exterior Framed Walls

The *REScheck*

Compliance Certificate indicated that all exterior framed walls would have a R-13 cavity insulation.

The inspection of the attic area revealed that the exterior wall between the raised ceiling area of one of the bedrooms and the unconditioned attic was uninsulated.



CASE STUDY IN NEBRASKA

Building Envelope Code Requirements

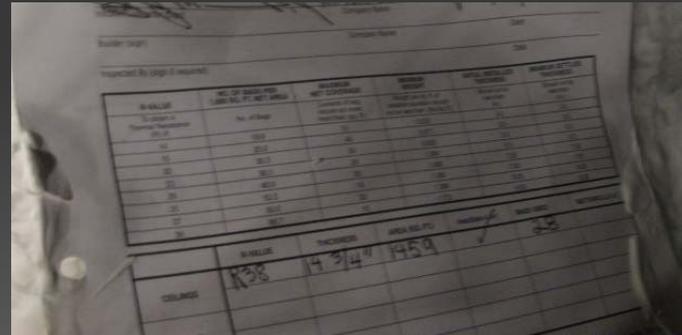
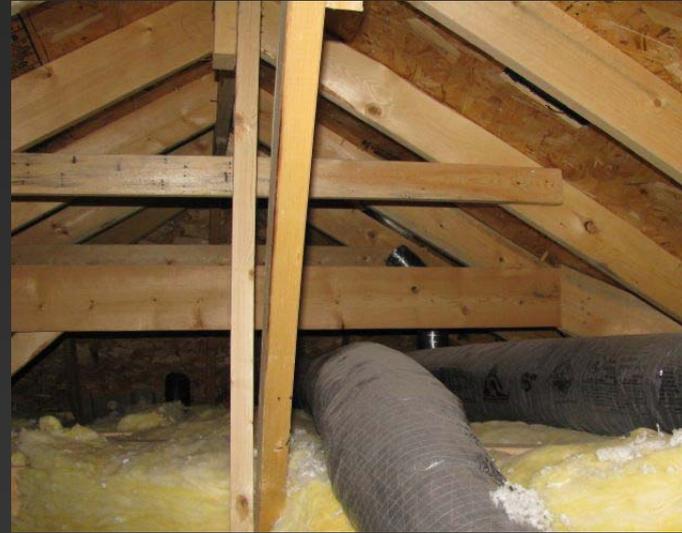
Attic/Ceiling Insulation

The *REScheck*

Compliance Certificate indicated that an R-50 insulation would be installed in the flat ceiling areas of the home and an R-38 would be installed in the cathedral ceiling areas of the home.

The inspection revealed:

- The cathedral ceiling areas had an R-38 batt insulation.
- The flat ceiling areas had a blown fiberglass insulation product installed with a labeled U-value of R-38.



CASE STUDY IN NEBRASKA

Building Envelope Code Requirements

Attic/Ceiling Insulation

- Tapes and density testing of the blown product indicated that the installed depth of the product in much of the attic provided an R-value of 44.
- The depth of the blown product was inconsistent with building framing showing through the insulation in many areas.



Prescriptive Code Requirements

Recessed Light Fixtures

Section 502.1.3 of the 2003 IECC requires that recessed light fixtures installed in the building envelope be either 1) IC rated fixtures with no penetrations between the inside of the fixture and the ceiling cavity or 2) non-IC rated and installed inside a sealed box.

During the inspection a number of fixtures were located that penetrated the building envelope, were not in a sealed box and showed no IC rating label.

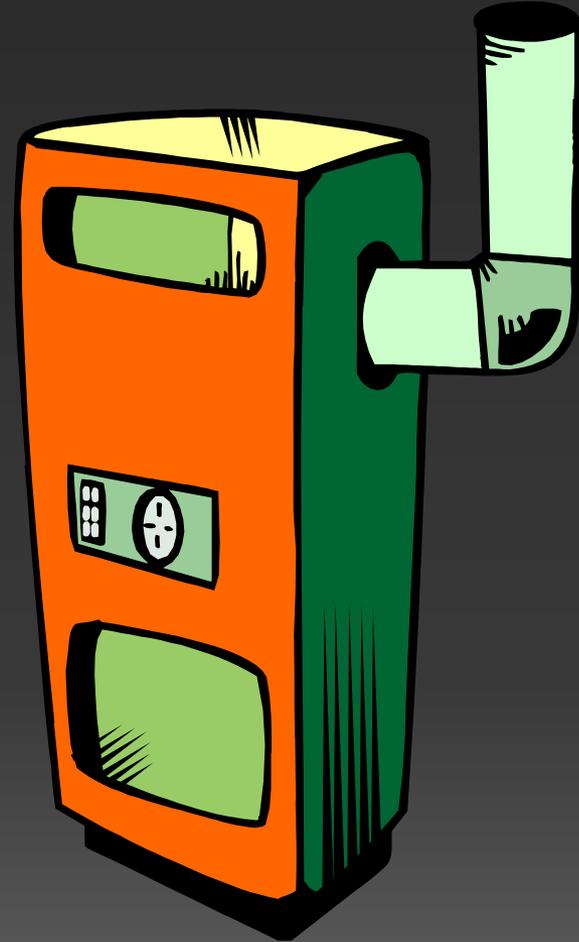


Prescriptive Code Requirements

Equipment Sizing

Section 503.3.1 of the 2003 IECC states: *Heating and cooling design loads for the purpose of sizing systems and equipment shall be determined in accordance with the procedures described in the ASHRAE Fundamentals Handbook.*

The residence was heated by a 90.0% efficient gas furnace with a heating capacity of 116,000 MBTUH and cooled by an air conditioner with a Seasonal Energy Efficiency Rating (SEER) rating of 13.2 and a cooling capacity of 55,500 Btuh (**5.0 tons**).



CASE STUDY IN NEBRASKA

Prescriptive Code Requirements

Duct Insulation

Section 503.3.3.4.3 of the 2003 IECC states: *All supply and return air ducts and plenums installed as part of an HVAC air distribution system shall be thermally insulated in accordance with Table 503.3.3.3.* The table indicates the minimum R-value requirement for ducts located in unconditioned attics in this climate zone is an R-8.0 on supply ductwork and an R-4.0 on return ductwork.

The flexible supply ductwork in the unconditioned attic had a marked R-value of 4.2 and the rigid ducts were uninsulated.



CASE STUDY IN NEBRASKA

Prescriptive Code Requirements

Duct Sealing

Section 503.3.3.4.3 of the 2003 IECC states: *All longitudinal and transverse joints, seams and connections in ductwork shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems or tapes installed in accordance with the manufacturer's installation instructions.*

None of the visible supply and return ductwork located in the basement or the supply ductwork located in the attic was sealed or masticed.



Group Discussion

If the builder does not make the corrective action repairs, what does the homeowner do?

Group Discussion

If the local jurisdiction does not enforce the Code, what does the homeowner do?

Case Study in Nebraska

- ◉ What was required to bring this home into compliance with the Code?
 - › Basement Walls
 - The basement wall finishes were removed and reinstalled following the installation of R-13 fiberglass batts in the framed wall cavities
 - The unfinished walls in the storage area remained uninsulated
 - › Exterior Framed Walls
 - R-13 batt insulation was installed in the uninsulated attic kneewall
 - › Attic/Ceiling Insulation
 - The existing R-44 insulation was appropriately leveled to provide a consistent insulation value

Case Study in Nebraska

- ◉ What was required to bring this home into compliance with the Code?
 - › Recessed Light Fixtures
 - Documentation was provided by the installer verifying the IC rating of the fixtures
 - › Equipment Sizing
 - Appropriate HVAC sizing calculation were completed and an appropriately sized air conditioner was installed
 - › Duct Insulation
 - Following appropriate duct sealing, documentation was provided showing that a minimum of 3" of blown insulation totally surrounded all supply and return ducts in the attic
 - › Duct Sealing
 - Both the City and NEO approved the use of an interior blown duct sealer to seal the ductwork in the home

Case Study in Nebraska

- Homeowner made the following repairs:
 - › All exterior basement walls were insulated

Topics to consider:

- What are your recommendations to the course of action the local code jurisdiction should have taken?
- What types of penalties could be enacted to ensure compliance?
- What is the next step if a company “goes out of business?”
- How can the homeowner be protected?
- How can the builder, contractor etc be protected from frivolous lawsuits?
- What are some current and future ideas to fund compliance?