

# North Dakota Residential Construction: Energy Efficiency-related Practices Executive Summary

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## Introduction

The purpose of this study was to identify residential energy efficiency-related building practices in North Dakota and compare current practices with the most recently accepted national building standards. This information will be used to identify areas where increased attention or concentrated educational programming would have the greatest impact on encouraging economical building practices to improve residential energy efficiency and energy code compliance.

The North Dakota Department of Commerce's Division of Community Service commissioned the North Dakota State University Extension Service through the NDSU Agricultural and Biosystems Engineering Department to conduct the evaluation.

## Study Participation

Participation in the survey was voluntary. Responses from 64 professional builders were analyzed. The builders represented all regions of the state.

## Study Design

A survey was developed in cooperation with the North Dakota Association of Builders.

The survey was designed to develop an understanding of building practices being used in North Dakota. It included questions on the use/nonuse of building techniques; amount of insulation installed; and the frequency that each

technique was used for ceiling, wall, foundation and floor construction.

Questionnaire responses were compared with the prescriptive minimums for insulation R-values, U-values and air sealing requirements defined in the 2009 *International Energy Conservation Code* (IECC). From that comparison, we were able to determine areas where increased awareness would have the greatest potential for improvement in current practices.

Compliance with the provisions of the 2009 IECC can be reached either by following a simplified prescriptive list or demonstrated performance. This survey made all comparisons to the simplified prescriptive list's individual building component values. Any comparisons to meeting or exceeding code are for that particular measure only and do not

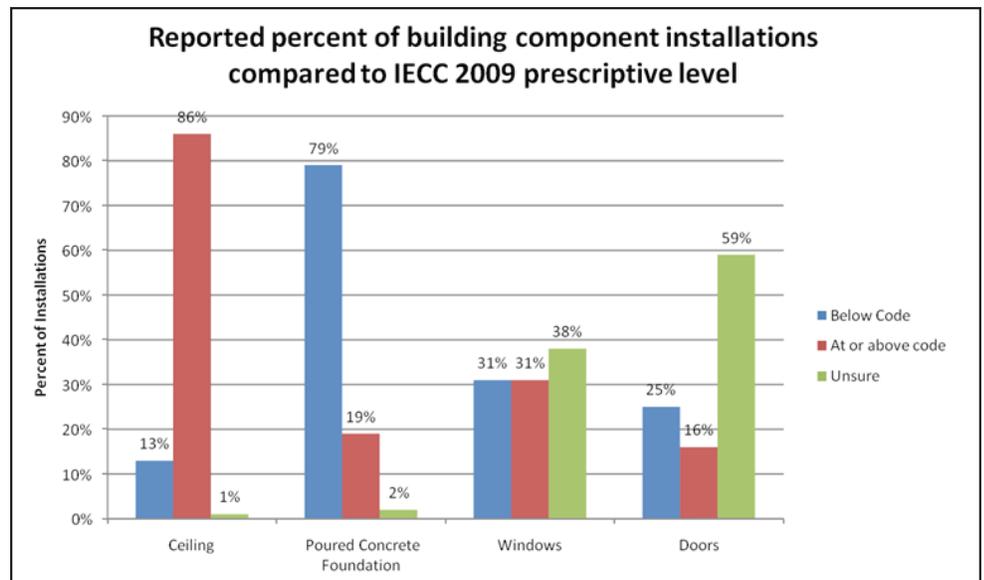
indicate whether the structure would achieve code limits based on the overall energy performance of the home.

Any results or conclusions drawn are based on the data collected and can be attributed only to the builders who responded and not to all North Dakota homes being constructed.

## Ceilings

For builders installing flat or scissor trusses in their housing projects, 95 percent (%) are installing insulation at or above recommended levels prescribed by the 2009 IECC, and 95% also were installing a raised or energy truss. Overall 86% of ceiling insulation levels reportedly installed meet or exceed the code levels.

## Results



Information for walls and floors is addressed separately due to variations in code requirements and multiple climate zones in North Dakota.

## Above-grade Walls

There are three code levels prescribed in the 2009 IECC for above-grade wall construction depending on climate zone, wall construction type and insulating technique. For the southern North Dakota climate zone, the IECC levels call for an R-18 (R-13 cavity plus R-5 continuous) or R-20; the northern climate zone in the state has a requirement of R-21. Of the builders who responded, 98 % are constructing walls using 2-inch by 6-inch studs spaced 16 inches on center in the vast majority of their housing projects and 69% indicated they installed insulation levels from R-19 or above and 23% installed insulation levels from an R13 to R19.

## Foundations

A statistical difference between the amount of insulation installed on poured-concrete foundations and wood-frame foundations was found. Builders installed poured-concrete foundations in 79% of their projects.

Of the poured foundations installed, they exceeded the 2009 IECC level foundation wall insulation value only 2% of the time and installed insulation meeting the 2009 IECC level only 17%

Foundation Type	Met 2009 IECC	Exceeded 2009 IECC
Poured Concrete	17%	2%
Wood Frame	13%	60%

of the time, while builders installing wood-frame foundations installed insulation exceeding the 2009 IECC 60% of the time.

## Floors

Ninety percent of builders surveyed currently insulate floors over unheated spaces such as in cantilevers, crawl spaces and livings spaces over garages. Of those who currently are installing insulation in floors, 49% are installing insulation at or above the highest 2009 IECC requirements for North Dakota.

## Windows

Thirty-one percent of the windows installed would meet the 2009 IECC levels.

## Doors

Builders reported installing doors that met or exceeded the 2009 IECC in only 16% of the installations.

## Air-sealing Measures

Ninety-five percent of responding builders always seal between the foundation and sill plate. Only 50% of builders are using sealed electrical boxes or extending air barriers behind boxes in all their homes. Fifty-three percent of builders indicated they never test their homes for air leakage with a blower door.

## Conclusions

The survey indicates that North Dakota builders who participated in the study are building residential structures that meet the needs of homeowners in the majority of their residential housing projects. However, builders have an opportunity for improvement concerning energy-related measures in portions of residential structures that could result in energy savings, greater comfort and compliance with the IECC. Those areas include foundation insulation, air-sealing measures, and window and door U-values.

While building to recommended code levels is important for the energy performance of residential structures, understanding the reasons for the recommended insulation and air-sealing measures is vital. Performing blower door tests on an increased number of houses would provide builders with valuable information on areas where attention to air sealing would have the greatest impact.

Higher levels of basement insulation could provide significant benefits. Too often, the assumption is the ground provides insulation for a structure. While the proper installation of foundation insulation can add some cost at the time of construction, it can add to the comfort level and energy performance of the home significantly.

Only minor differences were found between current building practices surveyed in North Dakota and the 2009 IECC. In most instances, the surveyed homes meet or exceed the latest code requirements. Only a small percentage would require significant efforts or additions to reach the code requirements.

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