



Iowa Department of Public Safety

Division of State Fire Marshal

State Building Code Bureau

Iowa Energy Code Evaluation Pilot Study

Final Report

June 2011

TABLE OF CONTENTS

Abstract	page 3
Pilot Study Background	page 5
Project Overview	page 5
RFP Process	page 6
Random Sample Generator	page 6-7
Notification and Contacting Jurisdictions	pages 7-8
Project Goals	page 8
Project Summary	page 8
Methodology	pages 9-12
Evaluation Times Summary	page 12
Composite Structures	page 13
Lessons Learned BECP Tools	pages 13-15
Recommendation for additional training	page 15
Barriers to Energy Code Compliance	page 16
Statewide Analysis	pages 16-19
Possible Outcomes resulting from the Energy Code Pilot Study	pages 19-20

APPENDICIES

- Appendix A: Request for Proposal (RFP)
- Appendix B: Field Inspection Evaluation Checklists
- Appendix C: Energy Evaluation Tracking Sheet
- Appendix D: Britt/Makela Report 2003
- Appendix E: State Compliance Information from Store and Score
- Appendix F: Evaluation pictures (included on CD)
- Appendix G: State of Iowa Map with color coded evaluation counties and sites

Report Prepared by: Iowa State Building Code Bureau Staff

Brian Bishop, Report Author and David Ruffcorn, Evaluation Study Project Manager

ABSTRACT

This report provides the results and methodologies for the 2010-2011 Iowa Energy Code Pilot Study that was conducted by the Iowa Department of Public Safety, division of State Fire Marshal, State Building Code Bureau. This study was funded by the U.S. Department of Energy with support from Pacific Northwest National Laboratories – Building Energy Codes Project and the Midwest Energy Efficiency Alliance (MEEA). Preliminary work on the study began in May of 2010. A contract with MEEA was signed in October 2010 with work commencing on the study in January 2011. The primary goal of the study was to determine the rate of compliance with the 2009 International Energy Conservation Code throughout the state of Iowa. Secondary goals of the study were to determine average energy code inspection durations, provide training to local code officials and builders participating in the study, and to determine areas of improvement.

The project team for this study consisted of the Iowa State Building Code Bureau, Midwest Energy Efficiency Alliance, Pacific Northwest National Laboratories, and The Building Inspectors, Inc. The pilot study was conducted on 50 single-family homes throughout the state of Iowa. The study utilized the methodologies and checklists provided by PNNL-BECP. Training was provided to The Building Inspectors, Inc., the contractor selected by the Iowa Department of Public Safety, Building Code Bureau, and to code officials from the jurisdictions taking part in the pilot study.

The pilot study collected data from design plan reviews and on-site verification per the PNNL-BECP provided checklists. A variety of energy code compliance methods were used on the homes in the study, with a majority of the homes utilizing the performance (energy rater) method. The average rate of energy code compliance for single family homes was 70.1%. Much of the reason for the low compliance number was due to the lack of documentation demonstrating energy code that was submitted to local building departments.

Iowa Energy Code Evaluation Pilot Study Final Report

PILOT STUDY BACKGROUND

In response to the federal American Recovery and Reinvestment Act, Governor Chester J. Culver submitted Iowa's letter of assurance to the Secretary of Energy on February 26, 2009. On January 1, 2010 the State of Iowa adopted the 2009 International Energy Conservation Code for all newly constructed buildings that are heated or cooled and intended for human occupancy, with the exception of the renovation of one- & two-family dwelling units. The provisions of the IECC have been adopted in the state of Iowa for both residential and commercial structures. The State Energy Code is mandatory across the state of Iowa. Cities and counties can amend the code to be stronger, but they cannot weaken the provisions of the state code. In 2008, the Iowa General Assembly created the Commission on Energy Efficiency Standards and Practices to study and recommend changes to the adoption and enforcement of energy codes in Iowa. The Commission submitted its final report to the Governor and Iowa General Assembly in January of 2011. A key recommendation included in the Commission's report is the creation and implementation of a comprehensive statewide energy code inspection program, using a combination of local government inspectors and third party inspectors. The energy code evaluation pilot study aligned with goals of the Commission. The Commission is looking forward to the findings of the pilot study to validate much of the data that had been studied for the past two years of the Commission's tenure.

PROJECT OVERVIEW

The primary goal of the energy code pilot program was to evaluate residential energy code compliance throughout the state of Iowa, and focused on the area of new residential construction. The evaluation utilized a mix of private third party energy raters, state building inspectors, and city and county building inspectors. The evaluations not only recorded energy code compliance, but also examined the logistics required to adequately perform residential energy code inspections. Since energy code enforcement in Iowa needs to be greatly enhanced per the recommendations of the State Building Code Bureau and the Commission on Energy Efficiency Standards and Practices, this study will allow city and county building departments to assess what is required to adequately perform energy code inspections. The energy code evaluations were performed per the provided Building Energy Codes Program (BECP) checklists and the evaluations concentrated on all tiers of the checklists being completed. The recommended sample size of 44 units was rounded up to 50 to give us a sample buffer. Samples were taken in each of Iowa's two climate zones and in rural and urban areas of the state since many of the rural areas of Iowa currently have no building code enforcement. The state of Iowa pilot study used BECP resources and training to aid in educating code officials, state officials and third party energy raters. Education was conducted by State Building Code Bureau staff with assistance from BECP and the Midwest Energy Efficiency Alliance (MEEA). The State Building Code Bureau with support from MEEA and BECP provided technical support to the city/ county inspectors and third party raters while they were performing the energy code evaluations. All

projects included in the evaluations were required to submit either a RESCheck or HERS rating documentation, when available, to compare prescriptive methods versus performance methods and also to promote the use of RESCheck as a compliance tool. Iowa has been a leader in the Midwest in regards to adopting a state energy code, but enforcement of the energy code across the state has been inconsistent and ineffective. Participation in this pilot study has greatly enhanced the work the State of Iowa has initiated to increase energy code enforcement throughout the state. The work associated with this pilot study will assist the development of Iowa's plan to achieve ninety percent energy code compliance by 2017.

RFP PROCESS

A grant, through the Department of Energy, was awarded to the State of Iowa to evaluate residential energy code compliance throughout the state and a general services contract was drawn up with MEEA. The contract with MEEA was executed September 1, 2010 with an end date of May 1, 2011. An amendment was added via change order to extend the final report time to June 30, 2011. Conforming to State of Iowa rules, it was required to procure services through an RFP "Request For Proposal" process. The RFP contained all of the legal and DOE requirements to enter into an agreement with a qualified residential inspection contractor. The RFP was executed December 1, 2010 and generated three proposals from an open state wide bidding process. On January 14, 2011 a contract commenced with "The Building Inspectors Inc." of Huxley Iowa. The scope of work for this contract was for The Building Inspectors Inc. to provide energy code evaluations at fifty residential sites to determine Iowa's energy code compliance rate, record the time and effort needed to provide energy code inspections, and provide feedback to PNNL on the use of checklists and energy code assessments.

RANDOM SAMPLE GENERATOR

The Department of Energy's "Random Sample Generator" was used to locate the areas which were most likely to have new housing starts in Iowa. Iowa is a very rural state and the majority of housing starts are located in the few larger cities. Many areas of Iowa do not have building code departments that provide any plan review or building code inspection services. This sample provides data from a majority of areas that have building code departments, and does not provide a true random sample of all residential construction in Iowa. Sixty percent of Iowa's population does reside in areas where there are actively enforced building code regulations. There were two unregulated areas that were included in this study, but they had energy raters on the projects providing consultation due to participation in a utility rebate program. Most of the unregulated

areas were not available for the study due to lack of permit tracking, unavailable site information, and lack of construction activity. A longer length study would allow for unregulated areas to be included in the evaluation study. The three year sample was used to locate counties to start the study but quickly broke down when the short time frame of the contract was weighed against the spring housing starts. The spring of 2011 had the country's economy and weather working against the random sample generator. The US and Iowa are currently in a housing slump with housing starts at an all time low and the spring had a late year snow storm. The three year sample identified the starts for the larger cities but the random counties in rural Iowa lacked spring housing starts. The two and one year random samples were used and in the end, The Building Inspectors Inc. (TBI) had to use samples in areas as close as possible to the original counties identified. The map of counties included in the final study is as close to random as possible for the time frame allotted. The final six houses were not selected until the last five weeks of the study. Additional time would have allowed a greater possibility of a more rural sample.

NOTIFICATIONS AND CONTACTING JURISDICTIONS

Iowa has a number of professional associations for building officials and the meetings are well attended. Early in this process the State Building Code Bureau enlisted the help of the City and County Building Officials to help identify probable housing starts and what documents would be needed for energy code evaluation visit. An informational flyer was sent out by the State Building Code Bureau to all of the jurisdictions that were determined by the DOE sample generator. The flyer provided general information about the pilot study and the responsibilities of the jurisdiction. The flyer and presentations by the State Building Code Bureau at Iowa Association of Building Official meetings stressed that this study was being conducted to determine an energy code baseline compliance rate and was not meant to penalize any participating jurisdiction. This study was not established to definitively determine the number of projects complying to the current energy code, but the outcome of the study could be extrapolated to determine an estimated, current compliance rate for the study area. Generally the Building Officials were very helpful and interested in the results of the study. Of course there were some that were resistant to anything coming from the state and what they considered interference from outside. TBI had one case of a code official who was hesitant in the beginning and later called the Inspector with a housing start. There were a number of counties and smaller towns that do not have staff building officials and code is not enforced. These areas are where TBI had the most difficulty finding new housing starts. Due to this fact, northwest and southeast Iowa will be underrepresented in the study. By

the time the study got underway a list of city and county officials was generated and first contact was made.

PROJECT GOALS

Overall goals for this project were:

- To evaluate residential new construction buildings for energy code compliance.
- Develop best practices to measure and increase energy code compliance rates in Iowa
- Establish data concerning energy code inspection time, plan review time, and number of inspections.
- Provide energy code information and training to city/county building inspectors and third party energy raters.
- Evaluate BECP-provided information and checklists to determine effectiveness when conducting energy code evaluations.
- Promote the use of energy code compliance tools, such as REScheck, to city and county building inspection departments.

PROJECT SUMMARY

Upon execution of the contract, The Building Inspectors Inc. (TBI) project team completed Building Energy Codes training for residential structures with trainers from Pacific Northwest Laboratories in Des Moines, Iowa in late February 2011.

In order to generate a random list of sites to evaluate, the BECP Sample Generator was used to produce a list of counties for locating new residential construction. With the slow down in construction activity across the state, this sample was expanded in order to provide more locations from which to obtain evaluation sites. After a great deal of effort contacting local jurisdictions, builders and others involved in the building industry, it was obvious that it would be impossible to generate evaluation sites based only on the generated list. Upon this determination, best efforts were made to find evaluation sites that were as varied in location and type as possible. Sufficient sites were located in order to generate 50 samples, most of which were composite evaluations. In a stronger economy, it's likely that the BECP Sample Generator would have worked well for generating evaluation sites.

Details of the evaluation sites including county, city and street address are included in Appendix E. A map of the State of Iowa with actual evaluation sites versus sample generated sites is also included with the data from this study.

METHODOLOGY

There was significant time dedicated to coordination on the front end of the site evaluations. Once the homes were identified and arrangements made with the building code department for plan review and the builder/homeowner for access to the property, The Building Inspectors Inc. (TBI) followed the Building Energy Codes Program guidelines and checklists very closely in completing site evaluations. TBI utilized the BECP checklists provided, for each evaluation, and referred to the “Instructions for the Residential Building Data Collection Checklist 2009 International Energy Conservation Code” that was provided during training. Attached as Appendix B are copies of the checklists used in the evaluations.

The following is a summary of the method of each site review step including what TBI looked at on site in the review of each home:

Plan Review

An appointment was made to meet a staff person from the City or County building code department. All available documentation submitted to the building department was reviewed. If there were no city or county building code department, TBI met with their contact whether it be the builder, one of the subcontractors or homeowner to try to obtain whatever documentation was available. Specifically, TBI examined:

- Building plans for energy components that indicate code compliance such as underslab, foundation and wall insulation, window and door type, etc.
- Documentation of method of compliance: if not utilizing the prescriptive method, either a ResCheck or preliminary RemRate analysis should have been included with the plans. At times this is not with the building plans, but if TBI knew there was an energy rater involved they requested this information from them.
- Manual J or D documentation for confirming that calculations have been completed for HVAC loads and duct sizing. (This was very rare.)

Overall, very little energy documentation was included with the building plans. TBI spoke with many of the jurisdictional staff regarding energy documentation at plan review and explained the use of ResCheck or RemRate for plan review documentation. TBI contacted others to try to gather this information and help educate the staff regarding the content of the information. It was evident that even those who gathered documentation like a ResCheck or RemRate analysis looked for the bottom line “pass” designation and didn’t scrutinize the components of the documentation. Only one jurisdiction required plan documentation in detail during TBI’s evaluation.

As a suggested change to the jurisdictional record keeping process, jurisdictions need to begin requiring energy code compliance documentation. For those that require some

documentation, TBI recommended the jurisdictions become consistent about requiring complete documentation and review the documentation for accuracy. Approximately 50% of jurisdictions that took part in the study had some form of plan review documentation.

Evaluation timeframe for plan review was brief for this study: an estimated 15 minutes or less due to lack of documentation. Had there been complete documentation at plan review, it's estimated that the review would have lasted longer, approximately 30 to 45 minutes.

Foundation

The Building Inspectors Inc., findings indicate that there were few homes that address foundation insulation and this was evident based on lack of information in the plan review. Often there was little to look at when they evaluated a home but for those that do provide information regarding foundation energy code measures TBI looked for included R value and installation of:

- Slab edge insulation
- Basement wall exterior insulation
- Crawl space wall insulation (and installation of vapor retarder if applicable)
- Insulation protection and
- Snow melt controls (if applicable)

Very few, only 4% of the foundations were insulated on the exterior. Therefore, TBI was able to complete interior foundation review with the rough-in, insulation or final inspection.

Evaluation time for foundations in this study was minimal due to lack of information at plan review and lack of insulation installed on the exterior of the foundation. Had documentation and installation of materials been in place, inspectors estimate that a foundation inspection would take 15 to 20 minutes once the inspector was on site.

Framing/Rough -In

At this stage TBI looked for the following items, based on the compliance approach utilized, whether prescriptive, trade off or performance. Trade off or performance methods utilized checklists generated by ResCheck or RemRate as appropriate and available.

- Door U factor and air leakage for any swinging door (if applicable) including labels indicating compliance with air leakage requirements

- Glazing U factor and SHGC values, noting if labels are in place, including air leakage ratings.
- Skylight U factor and SHGC values (if applicable)
- Glazing U factor if a thermally isolated sunroom is part of the structure
- Mass wall R value and installation
- Duct installation and sealing, including duct tightness testing documentation if completed
- Verification that no building cavities have been utilized as supply ducts
- Verification that recessed lighting fixtures are IC rated (for installation in areas with insulation) and that labels are intact indicating appropriate leakage rate
- HVAC and circulating hot water piping insulation
- Location of exterior intake and exhaust openings and operation of dampers

Evaluation time for the framing/rough-in inspection was estimated to be 30 to 45 minutes and include the insulation inspection in most cases.

Insulation

The following items were reviewed during the insulation inspection including labeled R value and installation of:

- Floor insulation
- Wall insulation
- Basement wall interior insulation
- Sunroom wall insulation (if applicable)

Air sealing is also looked at from both visual observation of openings and penetrations, joints and seams as well as documentation of any blower door test completed at this stage. Documenting blower door tests sometimes required another contact to the HERS rater or building code department.

As previously stated, in most cases, the insulation evaluation was conducted at the same time as the framing and rough-in evaluation and evaluation times for framing/rough-in.

Final

At the final inspection, the following were reviewed for labeled R value and installation:

- Ceiling insulation
- Attic access insulation

In addition, the following items were also reviewed at the final inspection:

- Post construction duct tightness testing documentation is verified if applicable and available.
- Heating equipment manufacturer and model number documenting whether these comply with the plans provided
- Lighting percentage of high efficacy lamps for prescriptive and trade off methods of compliance.
- Verification of the certificate identifying energy related features located in or on electrical panel
- Verification of outside combustion air and gasketed doors for any wood burning fire place
- Verification of programmable thermostat is installed
- Verification of service water piping system controls are in place when appropriate
- Verification that swimming pools have appropriate vapor retardant covers and automatic controls for circulating pump and pool heating equipment

EVALUATION TIMES SUMMARY

Evaluation time for the final inspection averaged 20 to 30 minutes. Due to the compressed timeline of this study, blower door and duct blaster numbers were often not yet available at the time of final inspection.

Inspection Type	Actual Time in Minutes	Estimated Time (with all documentation)	Notes
Plan Review	15	30-45	
Foundation	15	20-30	
Framing/Rough-in	30	20	
Insulation		20	Actual included in framing/rough-in
Final	20-30	30 – 45	
Data entry	60	60	Entry into Score and Store
Totals	140-150	180-220	No travel or consultation time included

COMPOSITE STRUCTURES

Due to the condensed timeline of this project, it was impossible to follow individual homes through all stages of construction for site evaluation. It was necessary to complete “composite” evaluations, or using multiple homes to get the complete data. The Building Inspectors Inc. (TBI) identified multiple homes within a jurisdiction or area that covered the stages of construction. In one example, a duplex was identified for the study. One side of the duplex was in the rough-in/insulation stage while the other was complete. This allowed the inspector to look at both sides and combine the data to get one complete set. This has also been used with other single family structures and most often, 2 homes were used for gathering one complete data set. The first will be evaluated for foundation, rough-in and insulation while the second is looked at for final. This approach caused extra plan review work since each house must be looked at based on the information provided and the compliance method utilized. (prescriptive, trade off, performance) However, TBI believes the data to be more random with the composite approach, since the contractor and/or code inspector will not have identified a home as an “energy study” home, possibly skewing the results.

LESSONS LEARNED - BECP TOOLS

The Building Inspectors Inc. utilized the Building Energy Codes Program (BECP) Residential Data Collection Checklists for the 250 individual site evaluations. The inspectors had the following feedback regarding the use of the checklists:

Energy Inspection Checklists

The evaluators felt checklists were reasonably easy to use and clear and understandable in general. One inspector recommended that individual checklists be based on the compliance approach. It was somewhat confusing to sort through what was necessary for each compliance approach. For example, in the insulation stage, there was a check for air sealing that was not necessary if a blower door test needed to be done. Realistically, this means that a checklist would be needed for the prescriptive method only. In our opinion, checklists should already be generated with a ResCheck or RemRate analysis, so these checklists should be utilized for the respective compliance approach.

The energy code evaluators appreciated the references to the code sections on the checklists. This makes it very easy to direct builders and contractors to the appropriate code should there be a question about the validity or interpretation of the item.

Another recommendation was to include a space for a blower door and duct blaster number on the final inspection. This is the stage that most HERS raters are conducting these tests in Iowa. If the insulation evaluation is checked N/A because the performance method is used, the HERS number can be missed or forgotten if the inspector does not go back to the insulation evaluation information during the course of the final inspection.

Score and Store Online Date Entry

Early in the process, three technical issues occurred with the use of the Score and Store system.

1. Unable to enter the jurisdiction, save it and continue data entry. This issue was resolved with the help of the Score Store technical help desk.
2. Another issue was on the same evaluation entry of the system not saving information when pages were advanced. This problem has been communicated to PNNL technical support.
3. On all evaluations, the system “errored out” every time an entry was saved or an attempt was made to advance to a new page of information. It was necessary to completely exit the evaluation entry and re-enter the data. Working with this situation was very time consuming for the data entry portion of the project. The technical support people were aware of this prior to our use of the system. As of June 2011, this issue appears to be resolved.

Overall, the system was cohesive and matched up easily with the forms. Other than the above issues, entering data was relatively simple and trouble free.

One recommendation was to include the building ID or address on the main screen so that you can return to the entry for updates more easily. For example, when entering partial data for a site and then returning later to complete, it is not obvious which site (street address) within the same county and city is the one being sought.

Training and Preparation

The Building Inspectors Inc. staff attended the BECP training in February 2011 before beginning site evaluations. The training was well organized and thorough as far as preparing inspectors to complete the evaluations. The Building Inspector’s staff had energy efficiency, building science and energy code training prior to this training, but felt that the training was adequate.

In TBI’s opinion, in order for a jurisdiction to implement this compliance program, staff would need training and technical assistance for successful implementation. The State

Building Code Bureau along with the Iowa Association of Building Officials have held numerous no cost energy code training events across the state, but they have been poorly attended by building inspectors and code officials, with the exception of those held in the Des Moines metro area.

RECOMMENDATION FOR ADDITIONAL TRAINING

It appears that builders need more education, especially hands on training for installation of energy materials. In many cases, it was evident that the appropriate materials were used, however, installation was incorrect. Again, pictures were taken at each evaluation and are included in CD format as an attachment to this report.

In some areas, builders were getting information on new energy efficient products from the local lumberyard. This may provide an opportunity for expanding educational efforts. If lumberyard personnel are well versed in the product and installation, this would be a potential resource for the builders, especially in outlying areas to gain information.

Many of the jurisdictional personnel were relatively uninformed about energy codes and enforcing compliance. In addition to the BECP training, TBI believes that technical assistance to city and county building department staff would be very helpful. For example, having a resource that could be on site intermittently for the initial implementation would be valuable. This resource could walk staff through plan reviews, requests for documentation and inspections. TBI also believes it would be valuable for staff to have a contact for questions as they become more familiar with the process. One of the recommendations included in the report from the Commission on Energy Efficiency Standards and Practices was to have the State Building Code Bureau provide technical protocols, checklists, and other standard operating procedures to adequately enforce the energy code through plan review and inspection.

Another recommendation for additional training is to educate City leaders including all decision makers and influencers about the value and importance of energy codes. If building code compliance departments are to get the resources needed for a compliance program, there will be additional funding needed and leaders will need to understand the importance of providing this funding.

BARRIERS TO ENERGY CODE COMPLIANCE

- Many building departments appeared to be just getting started with code compliance in this area. Most indicated that they would be increasing their energy code compliance efforts. Some were already consistent and some, like Cedar Falls, were already in full force with their efforts.
- Most jurisdictions are not inspecting to the State Energy Code (2009 IECC). Many departments did not take advantage of the free training provided. More basic education is still needed.
- Perceived hurdles to enforcement are:
 - Lack of funding for increased effort and time spent.
 - Lack of overall understanding of the value of energy codes
 - The perspective of many jurisdictional staff is that there is no way to add this workload without additional staffing and resources.
- Evaluators needed to limit the opportunity to educate due to some defensiveness, fear of being “ratted on”. Contractors or staff would ask how they did as far as compliance but sometimes were not open to what deficiencies were noted and the methods of bringing them into compliance.
- A majority of the jurisdictions did not want to be actively involved. It was difficult in some cases to get return calls, especially for final inspections. This was also attributed to the construction season being in full swing as the study was ending.
- A small number of jurisdictions were actively involved and interested in the study.

STATEWIDE ANALYSIS

One of the goals of the pilot study was to determine what deficiencies were inhibiting energy code compliance in the residential construction industry. In 2003 the Britt/ Makela Group submitted a report to the Iowa Department of Natural Resources Energy Bureau. The report was a residential energy code evaluation study that researched single-family homes and multi-family residential buildings for energy code compliance. That study’s findings discovered some of the same deficiencies that were discovered with the most recent energy code evaluation pilot study. A copy of the Britt/ Makela report is included as Appendix D.

According to the data collected by The Building Inspectors, Inc. and the Iowa State Building Code Bureau, one major deficiency that was lacking from many of the homes was lack of documentation for HVAC load calculations. ACCA Manual J or other load calculations were only completed on 12 of the 50 homes. Many of the jurisdictions that were sampled do not currently require HVAC load calculations at the time of plan submittal for new homes. Even before this study was ending, some jurisdictions were discussing requiring ACCA Manual J and D calculations at the time of plan submittal. In addition the investor-owned utilities in Iowa are offering training to HVAC contractors on HVAC load calculations and verified efficiency of HVAC equipment. Extremely low

compliance rates were found with relatively simple items such as posting the Energy Code certificate on the electrical panel and installation of high efficacy lighting. The energy certificate is generated by the RemRate and REScheck software automatically, to be printed on a sticky label and installed on the electric panel door. High efficacy lighting is another simple area to bring into compliance by substituting CFLs or LEDs in standard fixtures.

Another common deficiency uncovered by the pilot study was the lack of construction drawings and energy code documentation available for residential homes. Only 16 of the 50 homes surveyed provided plans and specifications that adequately demonstrated energy code compliance. The study that was conducted in 2003 contained much of the same findings regarding little to no documentation that demonstrated energy code compliance. This is an area that needs to be addressed to the various city and county jurisdictions that conduct plan reviews and building inspections throughout the state. In addition the State Building Code Bureau needs to change its submittal process for residential occupancies in order to achieve this goal.

Many common energy code components and their compliance rates are depicted in **Figure 1. 1.**

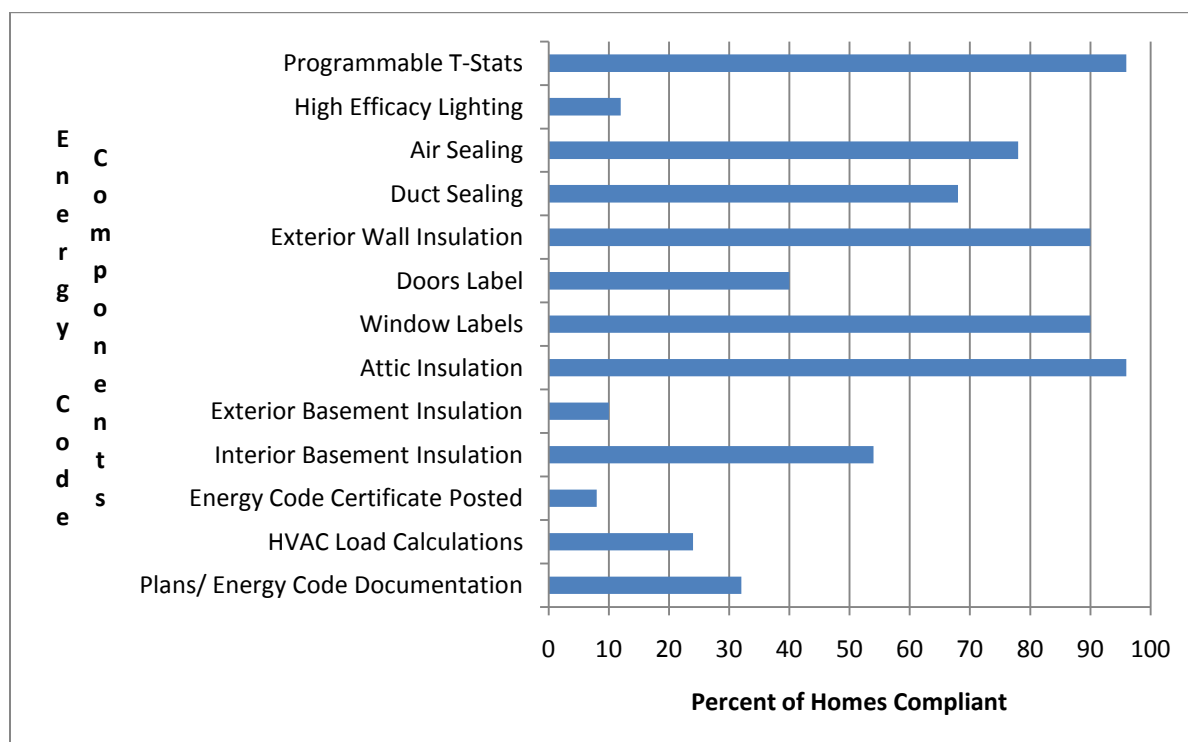


Figure 1.1

38% of the homes evaluated used the performance approach to compliance. This is depicted in **figure 1.2** showing the various compliance methods used. The trade-off method using ResCheck was used 26% of the time and prescriptive was used the remainder. The Des Moines metro area and other metropolitan areas within the state

had a very strong presence of HERS raters using the performance approach. The prescriptive and trade-off approaches were widely used in areas outside of Des Moines. The use of HERS raters was found in some rural areas where the utility company provided an incentive program to exceed the energy code. Yet many of the performance rated homes did not provide

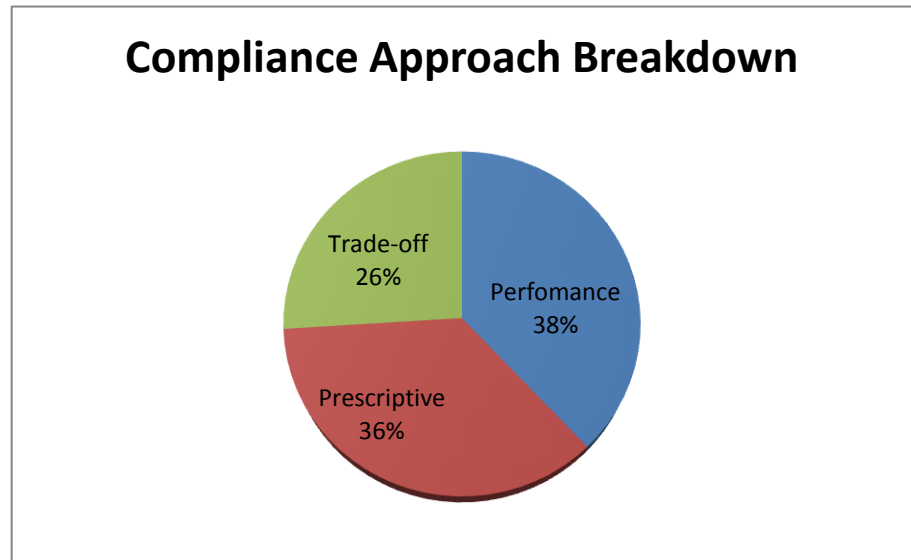


Figure 1.2

significantly higher percentages of compliance than those that were not HERS rated. This disparity can largely be attributed to lack of documentation or lack of documentation availability. Some discrepancies between what the field evaluators found and the HERS raters reported were discovered in some areas. Some of the RemRate reports specified blanket insulation on the basement walls, but the insulation was not installed at final inspection. Air barrier behind showers and fireplaces were not generally installed outside of the Des Moines metro area. Fifty percent of the homes performed blower door testing. Even some homes utilizing the trade-off approach for compliance used blower door testing to ensure air sealing methods were done properly. Many of the entry doors could not be inspected for energy code compliance since many of the builders were utilizing “construction doors” and not installing the final product until the home was completed. The labels were removed before an energy evaluator could confirm their U-values during the final inspection.

Jurisdictions wanting to implement energy code compliance will have additional time spent and therefore additional cost. While some inspections can be conducted during regularly called out building code inspections, others, like the insulation inspection, require yet another trip to the site. Plan review time will also be extended significantly

June 2011

until those submitting information become consistent with providing the necessary documentation. Iowa compliance rates overall for the study was 70.1%. **Figure 1.3** depicts the compliance rates for the state of Iowa. The reason for the low number can directly be attributed to significant tier 1 items either missing or not in compliance during the site evaluations. Accurate construction plans

demonstrating energy code compliance, HVAC load

calculations, and the addition of high efficacy lighting would provide a significant increase to the compliance rates for these homes. If these three items had been present in most of these homes, most of the homes would have scored close to 90%. A significant increase in compliance is necessary to reach the goals for 2017. These three major items will need to be addressed with stakeholders across the state in order to achieve higher compliance rates in the future.

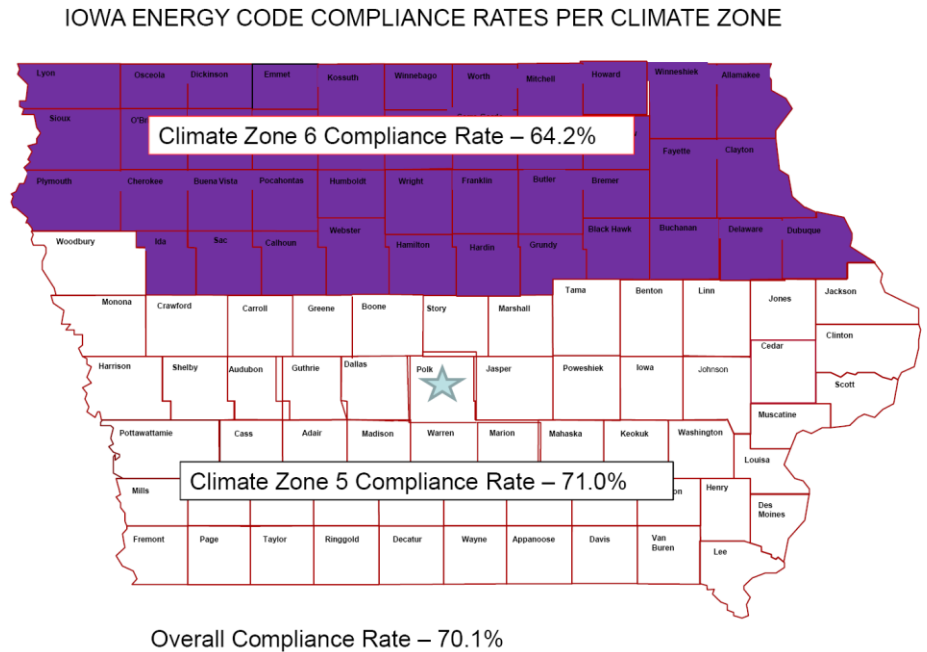


Figure 1.3

POSSIBLE OUTCOMES RESULTING FROM THE ENERGY CODE PILOT STUDY

Senate File 2386 (2008 Iowa Acts, Chapter 1133) created the Commission on Energy Efficiency Standards and Practices. The Commission was established in 2008. The legislation directed the Commission on Energy Efficiency Standards and Practices to submit a report to the Governor and the Iowa General Assembly by January 1, 2011. The report contains findings and recommendations for new energy efficiency standards, specifications, and guidelines for existing and newly constructed buildings in Iowa. The report contains findings and recommendations for the establishment of incentives for energy efficient construction projects and the adoption of a statewide energy efficient building labeling or rating system. Iowa received the award for the energy code pilot study during the life of the Commission. Many of the recommendations that the Commission submitted to the Governor and Iowa General Assembly have been

validated by the energy code pilot study. The recommendations submitted by the Commission were based on assumptions from various stakeholders throughout the state regarding barriers to energy code compliance. Recommendations of the Commission on Energy Efficiency Standards and Practices included the following:

- The State Building Code Bureau should develop a model protocol for energy code inspections and plan reviews.
- The State Building Code Bureau should continue to develop enhanced technical capacity in energy code issues, including the ability to provide interpretations of energy code provisions to code officials.
- The State Building Code Bureau should develop a database of energy and related building code enforcement information for political subdivisions, including codes adopted and areas enforced.
- The Building Code Commissioner should be given authority to develop and establish standards for third party energy code enforcement and to contract with third party providers for energy code enforcement.
- Education of code officials on the existence and scope of the energy code should be provided. Training on the content and enforcement of the energy code should be provided at no or very low cost to code and other government officials.
- Certification of energy code enforcement officials should be required, using existing national standards.

The State of Iowa Building Code Bureau plans to discuss the results of the energy code pilot study with various stakeholders, such as the Iowa League of Cities, Iowa Homebuilders Association, Iowa Association of Building Officials, and the Iowa Utilities Board. The findings of the study will be used to educate and inform those involved in energy efficient construction, design, code regulation, and utility energy programs. A similar energy code study was conducted in Iowa in 2001 to 2003 by the Britt/ Makela Group. The study conducted in 2003 and the study that was recently conducted arrived at many of the same conclusions. More education and training is needed for city and county building departments on the correct plan submittal requirements to determine energy code compliance. In addition, the home building industry needs to be educated on the needs and requirements of basement insulation, energy efficient lighting, and plan submittal requirements. All of these items that were revealed as deficiencies during the pilot study are correctable items. Many of these items require a process change by government officials or an operational change by builders or designers. All of these items can be corrected through education and outreach efforts by the State Building Code Bureau and other stakeholders interested in energy efficiency.