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REPORT #E10-212

# Codes Market Progress Evaluation Report #3

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# Evaluation of Codes and Standards Program

## *Market Progress Evaluation Report #3*

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THE CADMUS GROUP, INC.

Final Report

# Market Progress Evaluation Report 3: Evaluation of Codes and Standards Program

Prepared for:
The Northwest Energy Efficiency Alliance

December 1, 2009

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# 1. Executive Summary

This is the third Market Progress Evaluation Report (MPER) on the Northwest Energy Efficiency Alliance's (NEEA's) Codes and Standards Program. The conclusions and recommendations presented in this report are based on evaluation data collected from site visits, interviews with NEEA contractors, visits to building jurisdictions, and data from NEEA's training efforts.

## Market Progress

Cadmus finds NEEA effectively supports Northwest energy code. Oregon and Washington have adopted some of the most stringent energy codes in the nation, in large part due to NEEA's support. Additionally, NEEA's support of the national codes adopted by Idaho and Montana has resulted in code upgrades that will increase those states' stringency from 15 to 20 percent. Furthermore, NEEA funds training for building code officials and staff positions at state energy agencies in order to support new, more stringent, codes as they are adopted by Northwest states.

While data are limited regarding how training and education support compliance, data collected for this MPER suggest building code officials in Oregon are generally knowledgeable about the energy code, and, in the multifamily buildings we visited, we found high compliance with the energy code. Future studies of all states and sectors would provide a more detailed picture, but these are beyond the scope of this report.

More specifically, NEEA is impacting the energy code through the following actions:

1. **Increasing Stringency**: NEEA support of code upgrades has been a critical factor in developing more stringent energy codes in the Northwest. Codes that have either gone into effect or will go into effect soon are between 15 and 30 percent more stringent than current levels.

2. **Supporting Compliance**: NEEA-funded training supports understanding of energy codes by building officials and builders alike. Analysis of the training data showed building officials from all four states are attending NEEA-sponsored training, with Oregon and Washington training sessions the most well attended. Overall, trained building officials served Northwest counties (both urban and rural) that had the greatest number of building starts. Additionally, anecdotal evidence from visits to several jurisdictions, and associated discussions with local energy code compliance officials, indicates they have a high degree of energy code knowledge and a solid depth of understanding.

3. **Supporting Code Infrastructure:** The process of developing and implementing energy codes that are technically feasible and easy to comply with requires very specific knowledge and understanding. The group of people who can be considered "experts" in energy codes is quite small. NEEA has retained the expertise these "experts" for the region, either as contractors or as code specialists within state energy agencies, when cyclical funding from other sources has diminished.

## Challenges

During this evaluation, Cadmus identified the following three challenges facing the NEEA Codes and Standards program:

1. **Slowing construction market**: Our research indicates the slowing construction market could have multiple effects for the Codes and Standards Program. First, as construction slows, any expected energy savings from more efficient buildings will decrease, and this slowing market should be considered as NEEA moves forward. Additionally, decreased permit revenue is impacting local jurisdictions as they lay off staff and try to cut expenses. If old staff are rehired when construction returns, this should not change NEEA's training schedule; however, if new staff are hired without energy code training, NEEA may need to allocate education resources to make up for this shortfall.

2. **Logic Model**: The Codes and Standards Program does not have a logic model to help in strategic planning. Cadmus reiterates its previous recommendation for developing a logic model sufficiently flexible to accommodate a rapidly changing external environment, but which can also provide a clear map of the program's vision as well as the steps to realize that vision. NEEA has been able to respond to opportunities as they arise, and the program must retain this flexibility. At the same time, it is crucial the program's goals and objectives be mapped to provide a structure (however flexible that might be) for the program going forward. A simple logic model would provide the program with a map that explains varied program activities as well as provide an opportunity to strategize and brainstorm internally.

3. **Compliance Study**: In MPER #2, Cadmus' analysis of available data indicated a number of Idaho single-family and Oregon multifamily buildings did not comply with the energy code. However, evidence collected for this evaluation suggests energy code compliance for multifamily buildings in Oregon is high, an unexpected finding. While regional building characteristics studies have provided insights into code compliance, a full-scale compliance-specific study including all states and residential building types would provide NEEA and its stakeholders with valuable information on program performance. This proposed study should include multiple ways of assessing impacts: first, a check-in-the-box approach evaluating whether code measures are being installed at buildings then inspected and documented by the jurisdiction; and, second, an analysis of measure performance to assess whether the expected energy savings occur in practice.

# 2. Introduction

## Program Background

Since 1997, the Northwest Energy Efficiency Alliance (NEEA) has financially supported northwest and national energy building codes through its Codes and Standards Program. This program has assisted in the adoption of more stringent codes and standards, while also supporting increased compliance. NEEA's efforts have played a role in the Northwest by:

- Funding development of specific code proposals;
- Funding code experts to serve on committees working on code adoption and development;
- Funding training and educational support necessary for code compliance; and
- Funding staff members at key organizations (the Oregon Department of Energy, Washington State University, and the Montana Building Code Department).

Codes develop in cycles, and many external factors dictate the program's priorities. Overall, NEEA's role continues to reflect its 2001 Codes and Standards support plan, which laid out the following key principles:

- The preservation of institutional memory through maintaining experienced staff and their technical knowledge;
- Flexibility in approach and strategy to meet the cyclical opportunities in the codes process; and
- Support of all aspects of code support: development, implementation, marketing, education, enforcement, and quality insurance/evaluation.

The following sections outline NEEA's role in code development and compliance support both nationally and for each state respectively.

## National Code Development

The IECC, developed by the ICC, provides a template code for states to adopt. Because Montana and Idaho adopted the IECC as their state code, NEEA participates in IECC development at the national level. NEEA has brought together regional stakeholders through the formation of the Northwest Energy Codes Group (NWECG) for submitting proposals and testifying. The NWECG has developed a regional voice at the national level by convening multiple state code officials into a cohesive, technically proficient group of energy code experts.

The NWECG contributed the following upgrades to the 2009 IECC:

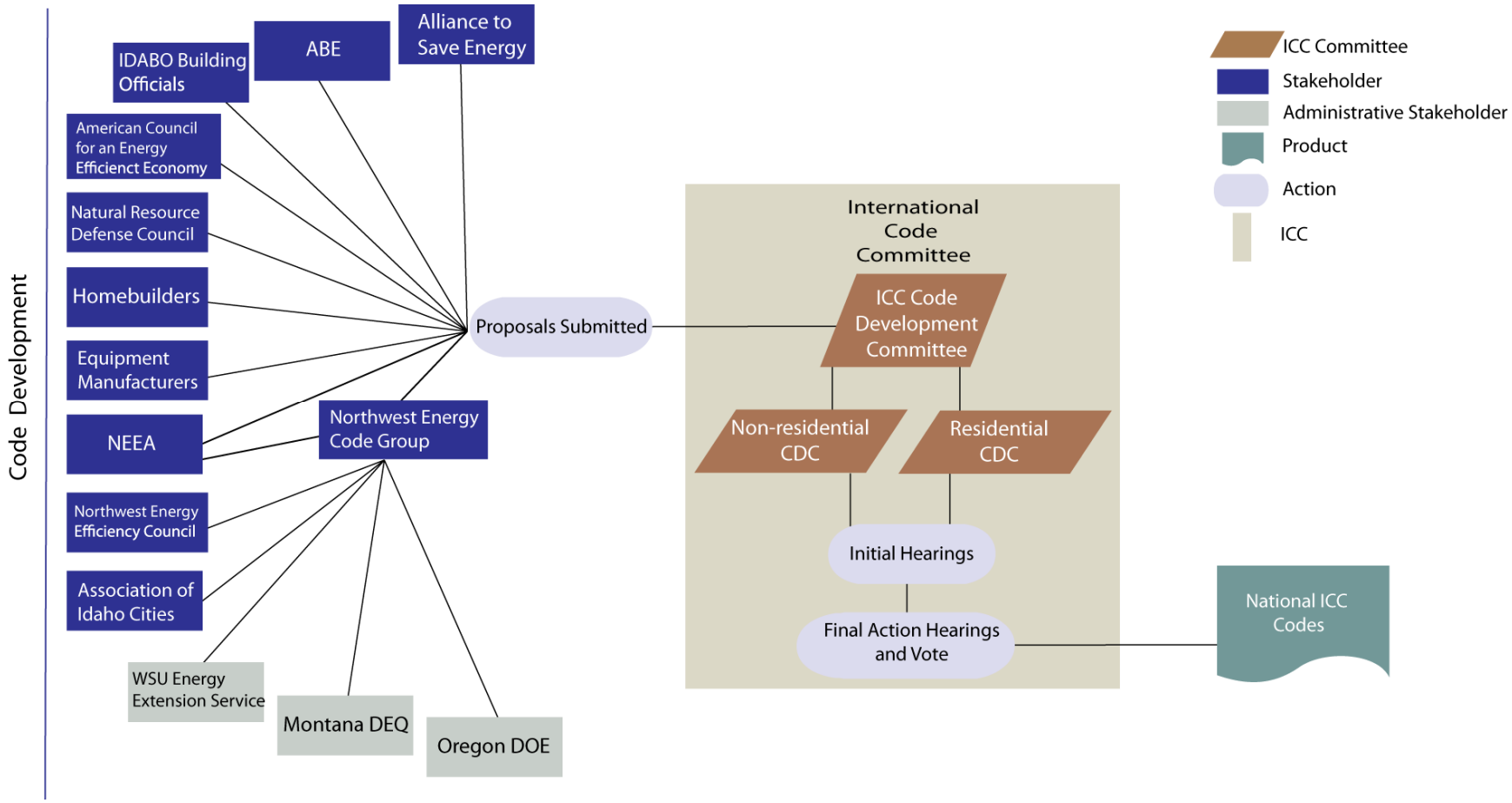
- Residential: The NWECG used parts of Oregon code and Northwest Best in their proposals to the IECC.[1] Idaho should expect to see about a 15 percent increase in stringency, and Montana (which is still using the 2003 IECC) should see a 20 percent increase.

- Nonresidential: The 2009 IECC upgrades include measures promoted by NEEA, which will increase the efficiency of most nonresidential buildings by about 15 percent.

Figure 1 (on the following page) illustrates the national code process. A key feature of the ICC process is that it is driven by the members that actually show up, develop, and review the proposed changes, and, in the end, vote on the proposals. Despite the national scale of the process and impacts, the complexity of the issues, and the large number of potential stakeholders, the NWECG and NEEA have a positive (and perhaps disproportionate) impact on the outcomes.

[1] Specific measures are highlighted in Appendix A:.

**Figure 1. The National Code Process**



## Idaho

Idaho is a "home-rule" state, which means local jurisdictions have decision-making power on energy code adoption. However, local jurisdictions have two options: they can adopt the IECC, with the amendments of the state Building Code Board (BCB);[2] or they can reject only energy code adoption. Nearly all jurisdictions adopt the energy code. Idaho's code adoption process contains the following actors, also illustrated below in Figure 2:

- ***Building Code Board***: The BCB promulgates the national ICC. The board consists of nine members, taken from various stakeholder groups. Members are appointed by the governor.

- ***Division of Building Safety (DBS):*** The DBS houses the BCB and administers the codes.

- ***Idaho Legislature:*** Amendments to the ICC are sent to the state legislature, which approves or denies the amendments. Additionally, the legislature approves promulgation of code by the BCB.

## Montana

Like Idaho, Montana has adopted the IECC, with regional revisions. However, Montana has not adopted every upgrade to the IECC. For instance, the 2003 IECC remains in effect, even though the 2006 IECC is available. Montana is also a "home rule" state, and most of the state falls outside of a local jurisdiction. As in Idaho, jurisdictions have the option of adopting the IECC with amendments or adopting no code at all. Our interviewee from Montana estimated between 50 to 66 percent of new homes are built outside the authority of a city jurisdiction; thus they are not inspected in person. Rather, Montana has a builder self-certification process. Montana's code process involves the following market actors, as illustrated in Figure 3:

- ***Department of Labor and Industry (DLI):*** DLI houses the BCB as well as the Montana Code Advisory Council.

- ***Building Codes Bureau:*** The BCB oversees building codes within Montana.

- ***Montana Code Advisory Council:*** The Council votes on amendments to codes.

[2] Any local amendments must offer "at least an equivalent level of protection to that of the adopted building code"; see http://www.idahocities.org/index.asp?Type=B_BASIC&SEC={CBD043D9-4CCD-48E4-9B1D-4CB00B70BBEF}

**Figure 2. The Code Process and Market Actors in Idaho**

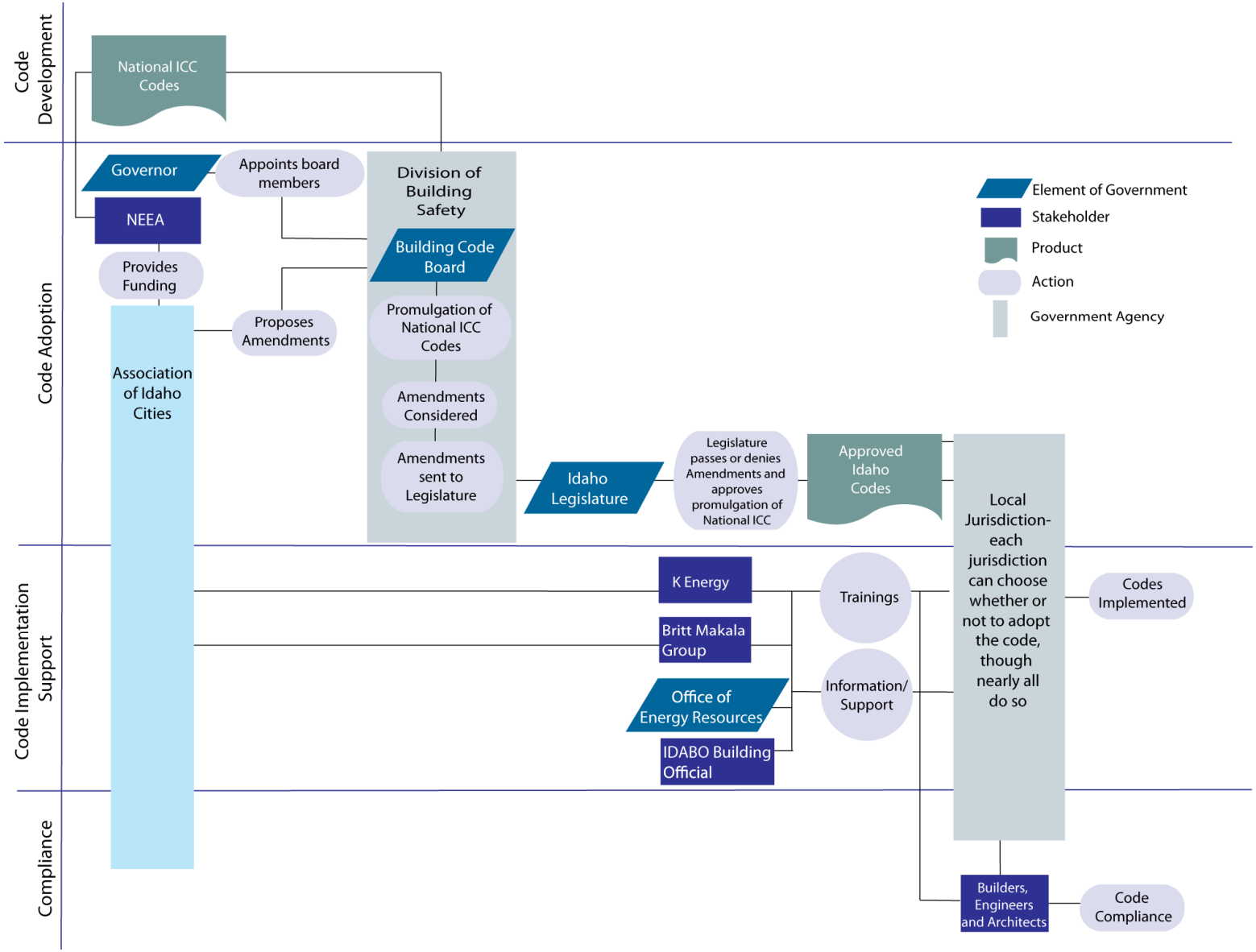
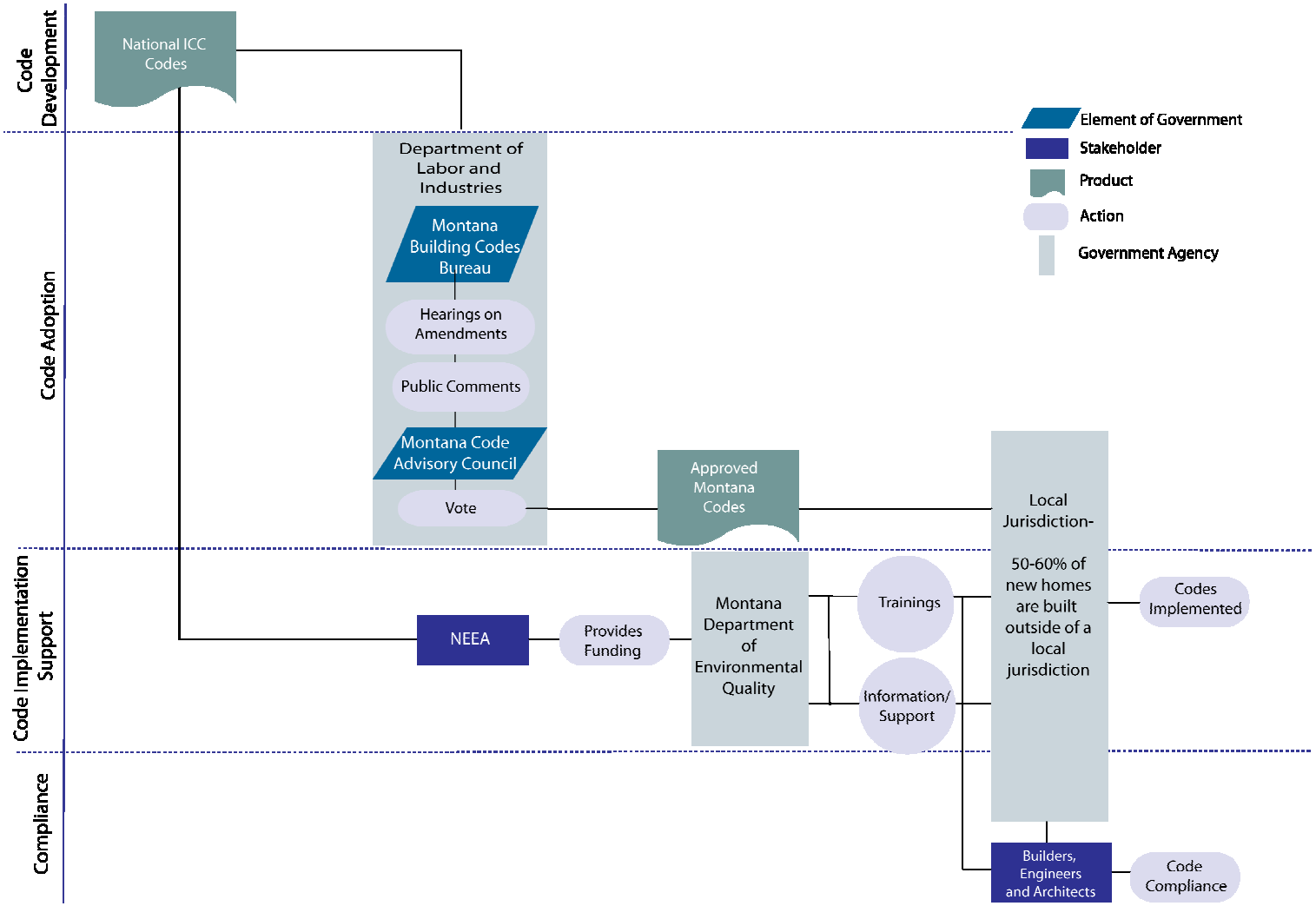


**Figure 3. The Code Process and Market Actors in Montana**



## Oregon

In Oregon, NEEA funds activities at all levels of the codes process. Currently, NEEA funds a full-time position in the Oregon Department of Energy and a range of technical consultants to support this staff position. This funding is being used to: (1) develop the nonresidential code proposal for the Oregon commercial upgrade, currently underway; (2) provide training and outreach to building code jurisdictions, builders, architects, engineers, and designers; and (3) support compliance through a free phone service to field code questions and problems.

Figure 4 illustrates the process of Oregon's code upgrades, from development of code through enforcement and compliance at the local jurisdiction. NEEA's role is considerable, as they fund development and support of the energy code. The following market actors are key players in the Oregon process:

- ***Oregon Department of Energy (ODOE)***. The ODOE has historically provided technical expertise to write energy code for Oregon. Their current role is to develop proposals for the Structures Board's review.

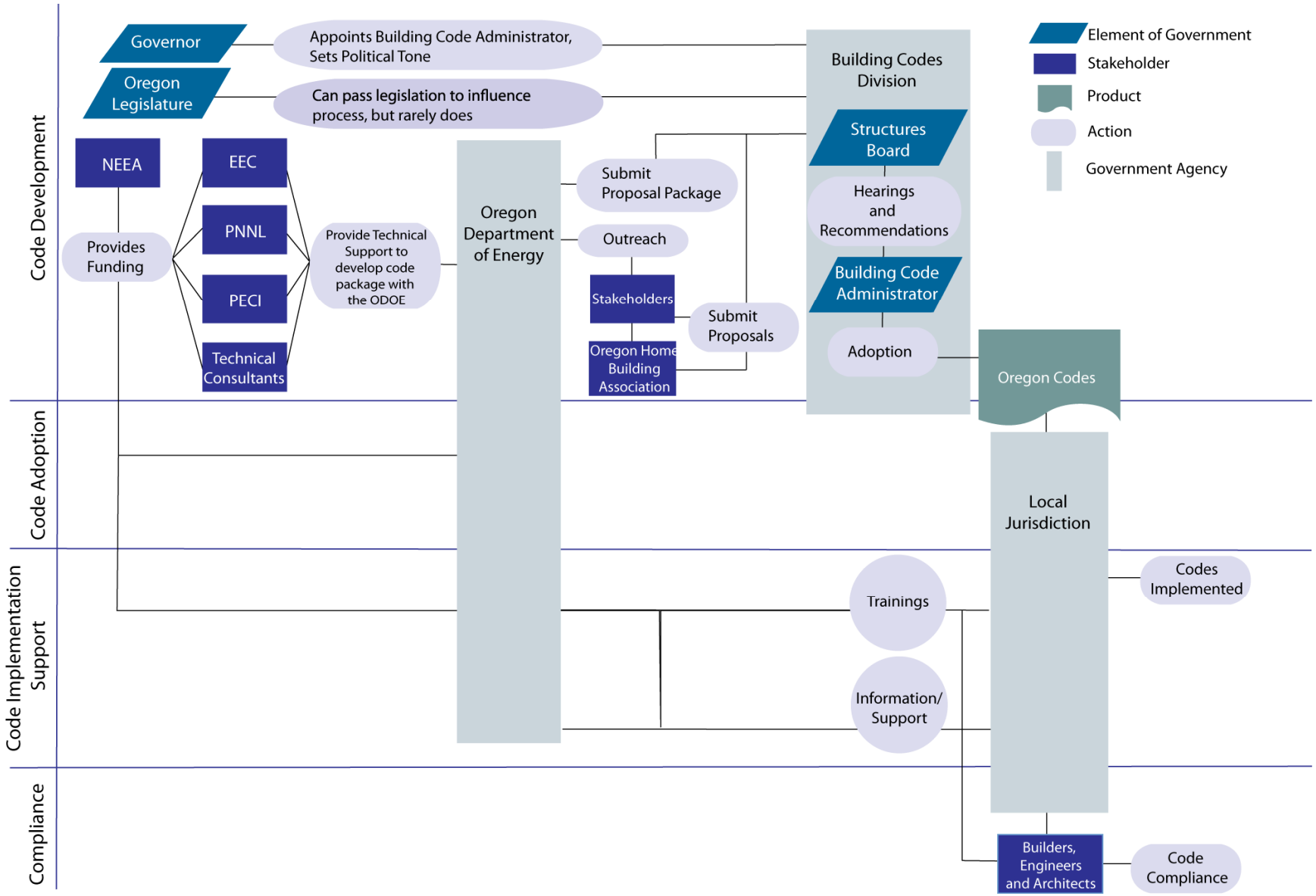
- ***Building Codes Structures Board***. The Structures Board partners with the Building Codes Division (BCD) to modify Oregon's building codes, including the energy chapter. The board submits its recommendations to the Building Codes Administrator.[3]

- ***Building Codes Division***. The BCD is responsible for all sections of building code in Oregon. The BCD administrator is appointed by Oregon's Governor. The Administrator adopts the building code, based on recommendations of the Structures Board.

- ***Local Jurisdictions***. Oregon has three jurisdiction levels: city, county, and state.

[3] More information on the Structures Board can be found at: http://www.bcd.oregon.gov/boards/bcsb/bcsb.html

**Figure 4. The Code Process and Market Actors in Oregon**



## Washington

In Washington, NEEA funds activities at all levels. NEEA's main Washington contractors are: the Washington State University Energy Extension Service (WSU); and the Northwest Energy Efficiency Coalition (NEEC). In the past, Washington had a state energy office, but this agency was disbanded, and its code-related functions were handed to WSU. Therefore, WSU is currently responsible for developing building code technical aspects in partnership with the Community Trade and Economic Development Department (CTED, the policy agency) and provides support to building jurisdictions through training and phone support.

NEEA funds staff members at WSU and NEEC, who provide training and outreach to builders, designers, architects, engineers, and building officials state-wide. Energy Extension staff handle the residential code responsibilities, and NEEC handles the nonresidential area. These staff members answer questions about the code and provide technical expertise in writing code upgrades. Staff also bridge the development and real-world applications of the energy code, which helps them advocate stringent code that is clear to code implementers. Additionally, they develop and distribute code compliance forms and tools such as the Builder's Field Guide. NEEA also funds consultants that provide technical support in drafting code proposals, and provides funding for regional experts to participate in regional and national committees.

Washington's main market actors in the code adoption process are:

- ***Washington State University Energy Extension Program***: WSU develops technical proposals and supports the energy code.

- ***Community Trade and Economic Development***: CTED provides office space and support staff to the State Building Codes Council. The main role it plays in the code process is through its Energy Policy Division, which is partnering with WSU and NEEC to develop an aggressive code package for the next cycle.

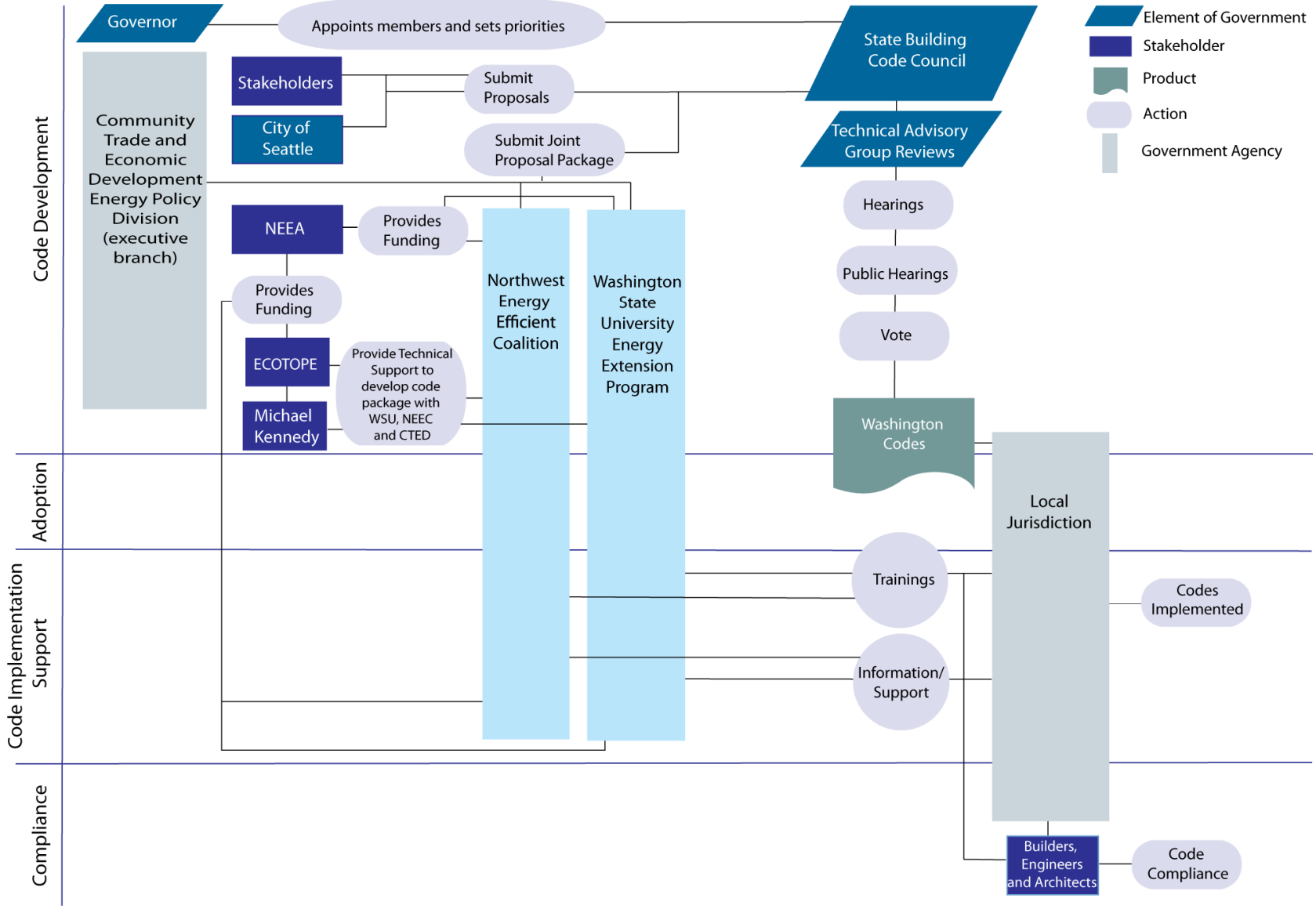
- ***State Building Codes Council:***. The State Building council is appointed by the Washington Governor to promulgate Washington's building codes. The 20-person committee represents a range of stakeholder groups.[4]

- ***Technical Advisory Groups (TAG)***: The Building Codes Council appoints TAG groups to review and advise the council on code proposals.

Figure 5 shows the code adoption process in Washington.

[4] More information on the council is available at http://www.sbcc.wa.gov/sbccindx.html

**Figure 5. The Code Process and Market Actors in Washington**



## Progress Toward Recommendations in MPER #2

In the last MPER, published in April 2008, Cadmus made five recommendations for the program. This section updates the progress made towards fulfilling these recommendations:

1. NEEA should continue to pursue the current set of Codes and Standards Project activities, such as encouraging the adoption of uniform and easily interpreted energy codes in the Northwest, and continuing to increase code stringency with successive code cycles. NEEA staff also should continue codes-related support efforts at state, regional, and national levels.

2. NEEA should create a logic model around which they can plan project implementation efforts.

3. NEEA should continue to provide outreach to designers and builders as well as to codes contractors. NEEA should continue to support multidimensional education and training that provides classroom and field training, and a tiered approach with introductory and specialized sessions tailored to varying levels of code complexity across states and within jurisdictions. NEEA should also conduct additional field studies to confirm state/housing type/building components identified with low compliance, and focus training efforts to raise compliance in these areas.

4. NEEA should retain its key objective of adopting cost-effective, performance-based, code change proposals and of pursuing commissioning and performance-based testing.

5. NEEA should continue to use attribution levels suggested by Summit Blue.

Cadmus finds NEEA is following most of these recommendations. However, based on the evidence collected during this evaluation, the first recommendation should be revised to exclude the reference to uniform codes.

There has been no progress towards our second recommendation. Currently, the Codes and Standards program does not have a written logic model to explain the program's strategy or goals. We continue to recommend development of logic model.It is crucial program goals and objectives be mapped out to provide a structure (however flexible it might be) for the program going forward. A simple logic model would provide the program with a map that explains the program's varied activities as well as provide an opportunity to strategize and brainstorm internally.

We suggest revisiting the fifth recommendation, as preliminary analysis by NEEA suggests that NEEA is a smaller piece of code adoption and compliance than in the past. If further analysis confirms this, then we would recommend NEEA change its attribution levels.

# 3. Evaluation Activities

## Evaluation Summary

In early 2004, NEEA documented its efforts to support energy codes and to participate in the federal standards-setting process from the time it began offering code support in 1997 through 2003.[5] This report, completed by Optimal Energy, summarized NEEA's role within state, regional, and federal level energy code support activities.

In 2004, NEEA engaged Quantec (now The Cadmus Group) and its subcontractor, Optimal Energy, to evaluate NEEA's efforts to support energy codes and its participation in the federal energy standards process. In July 2005, Cadmus completed the Evaluation of Energy Code Activities (MPER #1).[6] The majority of research conducted for that report occurred in the fall of 2004. For the 2006–2007 period, NEEA contracted with Cadmus to provide a project update, assess project goals and objectives, review contractor's Web sites for all four states, conduct surveys about training and technical support services, field target audience surveys, and analyze code compliance.

## MPER #3 Data Collection Activities

This evaluation includes the following three tasks: (1) a summative assessment of program activities, informed by interviews with NEEA contractors combined with secondary research (which includes the development of a visual representation of the code process for all three states); (2) analysis of attendance data for 2007 training in all four Northwest states; and (3) site visits to new multifamily construction to determine code compliance and visits to building jurisdictions to determine documentation on the energy code.

Data were collected through: visiting buildings; visiting building jurisdictions, reviewing building plan documentation, and speaking with building department officials about projects Cadmus visited; and interviewing four NEEA contractors.

Table 1 shows the various data collection activities for the three Market Progress Evaluation Reports.

[5] Optimal Energy, Inc., Documentation of the Northwest Energy Efficiency NEEA Efforts to Support Energy Codes and Participate in the Federal Standards Setting Process, April 2004.

[6] Quantec, LLC. Evaluation of Energy Code Activities, July 2005.

**Table 1. Data Collection Activities for Market Progress Evaluations 1, 2 and 3**

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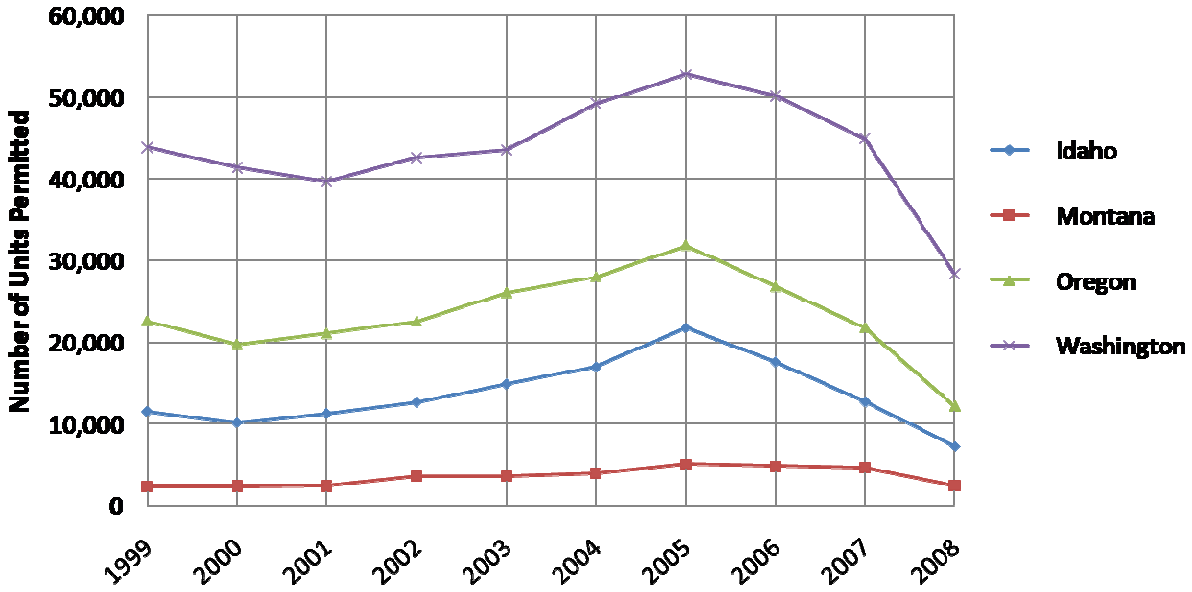
# 4. Market Characterization

New construction declined precipitously in 2008 and 2009. The downturn has impacted both building departments and builders. Building departments are often funded largely by permit fees rather than a general fund, making them particularly vulnerable to construction downturns.

Across the Northwest, the number of housing units permitted fell 40 percent from 2007 to 2008.[7] As shown in Figure 6, Washington and Oregon have the seen the largest absolute drop in new units permitted, though all four states have experienced similar relative drops. Spokane, Washington, reported that in the fourth quarter of 2008, they had the lowest number of housing permits on record.[8]

**Figure 6. Housing Units Permitted by Year and State (U.S. Census)**




As new construction stagnates, some building departments have looked for ways to cut costs, including workforce reductions. Departments resorting to staff layoffs include the City of Tigard,[9] the City of Spokane,[10] and Lane County, which has cut more than half its staff.[11] Deschutes County, which experienced substantial construction activity during the housing boom,

[7] US Census Bureau, compilation of "Housing Units Authorized by Building Permits," Table 2. Located at: http://www.census.gov/const/www/C40/table2.html

[8] "Spokane to Cut 9 Jobs." The Associated Press. January 26, 2009.

[9] "Tigard Building Department Axes Eight." Leigh Weissman. The Tualatin Times. November 6, 2008.

[10] "Spokane to Cut 9 Jobs." The Associated Press. January 26, 2009.

[11] "Lane County, Ore., to Slash Jobs in Building Division." The Register Guard. December 5, 2008.

has frozen six open positions as fee declines caused a $20 million budget deficit.[12] Oregon City has increased fees up to 33 percent.[13] Not all building departments have been adversely impacted. For instance, Hillsboro has experienced constant construction levels due to commercial construction.[14]

One way in which building departments fund themselves is through relying on permit fees. Kitsap County recently switched to being an enterprise fund, meaning they pay for department's costs through fees and self-generated income. The downturn has affected revenue beyond their expectations, and they may need to lay off staff or decrease work hours.[15]

New construction has also led to a number of large building companies declaring bankruptcy, such as: Pacific Lifestyle Homes, Legend Homes, and Renaissance Homes. These companies are expected to survive bankruptcy and continue building.[16] In Idaho, Crestwood Construction has filed for bankruptcy and has liquidated to pay creditors.[17]

The economic climate does not appear to be affecting state governments' commitment to increasing energy code stringency. In Washington, Governor Gregoire has scaled back plans for other measures on her environmental agenda because of budget constraints, but she is still working on "low cost" measures such as increasing the stringency of the energy code.[18] In Oregon, Governor Kulongoski is still calling to have energy codes strengthened, so, by 2030, all structures will have a zero net impact on carbon emissions.[19]

Nonresidential construction is also experiencing difficulty, partly due to rising vacancy rates. Additionally, access to credit has tightened. Commercial real estate lenders are scrutinizing possible tenants of new construction projects to assess their financial ability to pay.[20] The tightened standards are affecting projects of all scales. For instance, in Portland, a high-rise project being undertaken by Tom Moyer, one of Oregon's wealthiest developers, was halted during mid-construction in April.[21]

Data suggest, first, savings estimates based on new construction will be lower than expected in the previous new construction market, and, secondly, lay-offs in building departments will lead to both less staff and a possible loss of institutional knowledge about energy codes in the long term.

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[12] "Deschutes County Joins Soft Housing Market." Ethan Lindsay. OPB News. March 26, 2008.

[13] "Building Department Plans to Raise Permit Fees." Colin Miner. The Oregonian. December 18, 2008.

[14] "Hillsboro Budget Seeks Small Boost." Elizabeth Suh. The Oregonian. May 23, 2008.

[15] "Fewer Requests for Building Permits Could Mean County Layoffs." Steven Gardener. Kitsap Sun. September 12, 2008.

[16] "Pacific Lifestyle Homes Filing for Bankruptcy Today." Ryan Frank. The Oregonian. October 16, 2008.

[17] "Meridian Homebuilder's Bankruptcy may be a Cautionary Tale." Sandra Forester. Idaho Statesman. August 21, 2008.

[18] "State Pursuing Pared-Down Climate Change Agenda." Associated Press. December 23, 2008.

[19] "Salem Climate Change: Kulongoski Earning Green Stripes." Steve Law. Portland Tribune. January 15, 2009.

[20] "Idaho Lenders Maintain Higher 'Spreads' on Long-Term Deals." Brad Carlson. The Idaho Business Review. January 12, 2009.

[21] Downtown high-rise halted by tight credit" by Ryan Frank and Mike Rogoway The Oregonian 4/11/2009

# 5. Contractor and Staff Interviews

## Objective

NEEA funds the technical expertise to develop and support state energy codes through funding training and answering code-related questions from builders and local jurisdictions. The objective of the contractor and staff interviews were: (1) review NEEA's role in supporting the energy codes in each state; and (2) inform the development of a visual representation of each state's unique code adoption process. This chapter addresses the first objective; the second was addressed in the report's introduction.

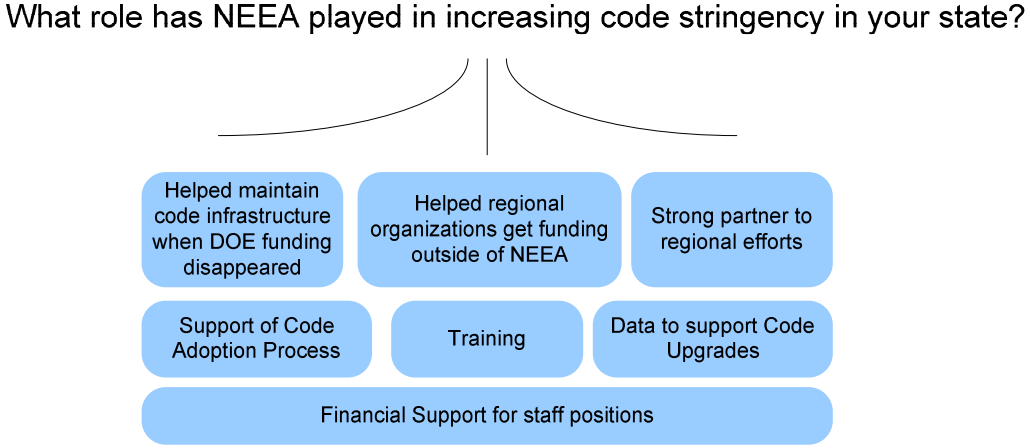
## Methodology

Cadmus interviewed four experts funded by NEEA, one in each state. These interviews took approximately one hour each. The Oregon interview was conducted in person, and the other three were conducted over the phone.

## Findings

Contractors report that, as part of the effort to increase code stringency, NEEA supports the adoption process, and financially maintains technical positions that develop the code . NEEA also provides data and documentation as well as consultant support where there is insufficient staff or knowledge of technical code. Over the long term, NEEA funding has remained consistent where other sources of funding, such as Department of Energy funding, have been volatile, allowing the Northwest states to have a stable source of institutional knowledge in the codes arena.

**Figure 7. Contractor Interview Responses**




The responses from contractors across the four states illustrate the variety of support that NEEA offers. There is no "one" role for NEEA, but rather a variety of ways that the program functions to support code adoption, stringency and compliance. Contractor remarks also do not point to a

role as much as a service, illustrating the loose nature of the program's overall strategic plan as well as the limited articulation of NEEA's role.

As noted, NEEA continues to pursue inclusion of performance-based testing within the code. This is currently in progress, as all four states have or will soon have the option of either placing ducts within the envelope or testing the ducts. Contractors supported this approach, while noting the objective was to get ducts inside the envelope. Contractors added they did not have the infrastructure (machinery and operators) to test every new building, making mandatory testing without options unfeasible.

The need for infrastructure partly explains why contractors were hesitant to support mandatory performance-based testing in the energy code, though this is NEEA's articulated goal. One contractor supported including it as an option. Another thought the prescriptive path was preferable, and two thought it would be good to include if the performance path could be kept simple.

Contractors identified possible areas of non-compliance, including:

- **Oregon**: Contractors thought nonresidential lighting might be an area of low compliance as well as a place of inconsistency between jurisdictions, with some inspecting and enforcing more than others.

- **Washington**: Nonresidential buildings are more complex than residential, making it difficult to determine compliance, and there might be issues with complex HVAC systems and envelope measures. Washington has mandatory building commissioning for larger nonresidential buildings, but code officials are not specifically involved, making it unclear whether buildings are being properly commissioned.

- **Idaho**: The residential sector might have compliance issues, given that some jurisdictions enforce and inspect more thoroughly than others.

- **Montana**: Contractors believed crawl space ventilation and basement insulation were areas of low compliance. Anecdotal evidence exists that builders initially leave spaces unfinished, but later finish the basements but do not install insulation.

Contractors thought the best way to increase compliance was through education and training. Other possible avenues suggested were to involve lenders in verifying a building was inspected for the energy code, continuing with the trade-off approach, and/or implementing a statistical approach to inspection that would allow more thorough inspections to occur at randomly selected sites.

# 6. Training Data Analysis

## Overview

NEEA supports code compliance through state training that educates stakeholders—namely architects, builders, and officials—about the energy code. Cadmus' analysis of state trainings focused on attendance by building officials, typically plan examiners and building inspectors, because of their role in code enforcement. In addition, Cadmus reviewed the data-collection process for training events. This chapter first discusses methodology, then presents an overview of attendance and in-depth analyses of individual states.

## Methodology

NEEA contractors provided a list of participants for each training event. Data were collected through sign-in sheets, though, in some cases, attendees did not provide complete information. Data covered training offered from January 2008 through the beginning of October 2008. Cadmus removed a number of database observations during the data cleaning process, including: telephone calls addressing code related questions; attendees that did not work for a jurisdiction; and attendees with incomplete information (see Table 2). A complete data cleaning flow is located in Appendix C.

**Table 2. Training Data Summary, January to October 2008**

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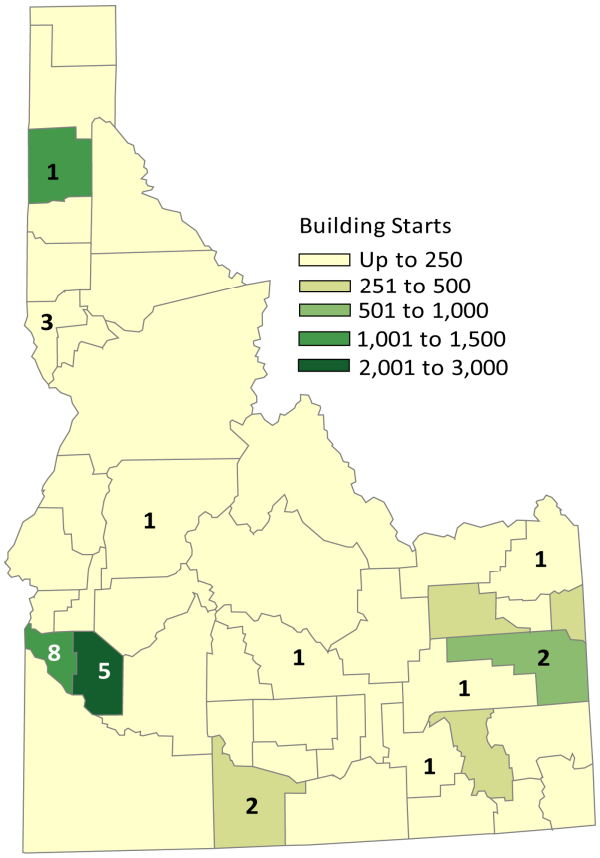
It should be noted that data received from contractors were of inconsistent quality, necessitating repeated data checks with contractors to ensure we received all information on all training, and, in some cases, obtained the original paper sign-in sheets. However, Cadmus conducted extensive double-checking and cross-referencing of the data, providing high confidence in the final results.

Cadmus then compared building starts to building jurisdiction employees that NEEA contractors trained. Because the Census aggregates data on building starts at the county level, we aggregated all the jurisdiction employees to the county level. We then mapped them in SAS, overlaying the quantity of building starts with the number of employees who attended trainings by county.

## Key Findings

In Idaho, a total of 26 officials attended training. These officials represented 11 of Idaho's 44 counties, meaning only 25 percent of Idaho's counties had a recently trained official. However, 70 percent of counties with building starts were served by building officials that had attended training.

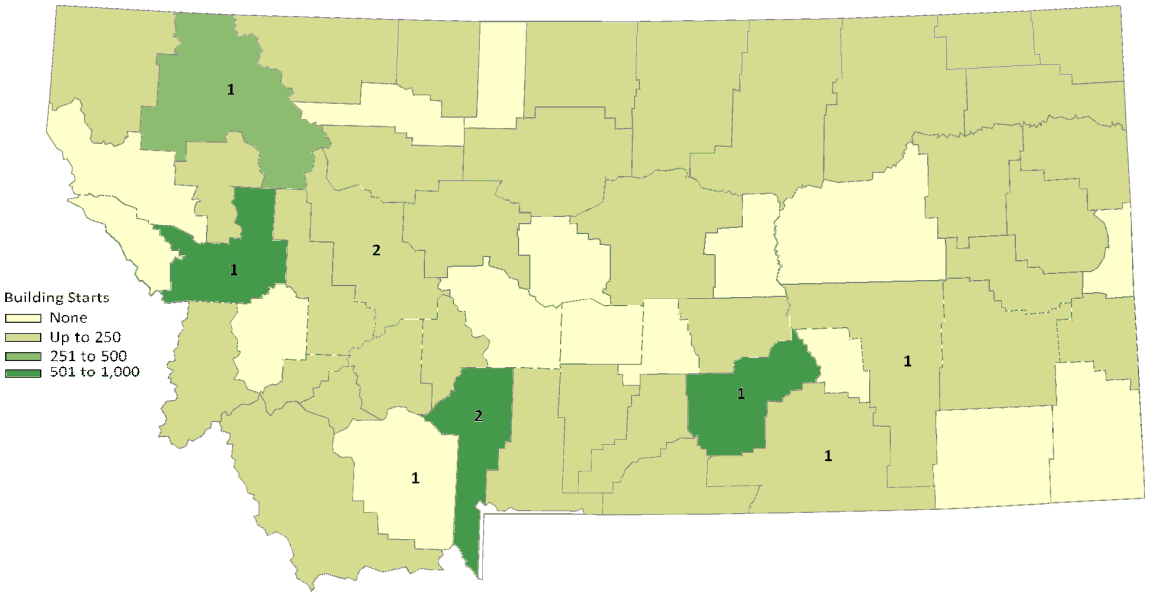
**Figure 8. Idaho Building Starts Overlaid with Number of Officials Trained**




**Numerals indicate the number of building officials attending training for that county.**

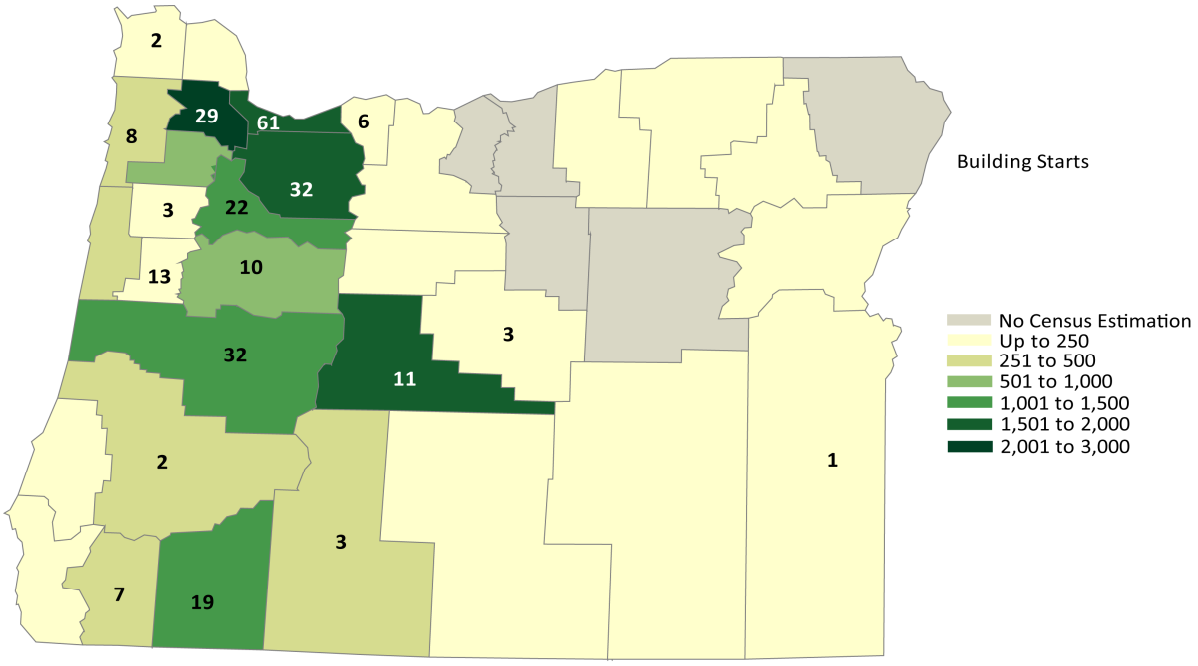
In Montana, 10 officials representing eight counties attended training, indicating 14 percent of the counties were represented by a trained building official. It is important to note new construction in Montana was highly concentrated: 15 of 56 counties accounted for 96 percent of the building starts in the state. Nine of these 15 counties, representing 18 percent of the building starts in Montana, were not served by a trained building official. The remaining six counties, which accounted for 78 percent of the building starts, were served by 80 percent of the state's total trained personnel. However, the three counties with the most building activity—Gallatin, Missoula, and Yellowstone—were slightly underserved, and, if building patterns remain consistent with 2007, they should be the focus of future training.

**Figure 9. Montana Building Starts Overlaid with Number of Officials Trained**




In Oregon, 264 officials from 18 of Oregon's 36 counties (50 percent) attended at least one training. This was one of the highest percentages in the region. In general, areas with the highest number of building starts were also served by the largest number of trained building officials. For example, only five counties, representing 10 percent of the building starts, had no trained building officials in their jurisdictions. Additionally, the four counties with the most building activity—Multnomah, Washington, Clackamas, and Deschutes—accounted for 47 percent of building starts in Oregon and 50 percent of trained officials.

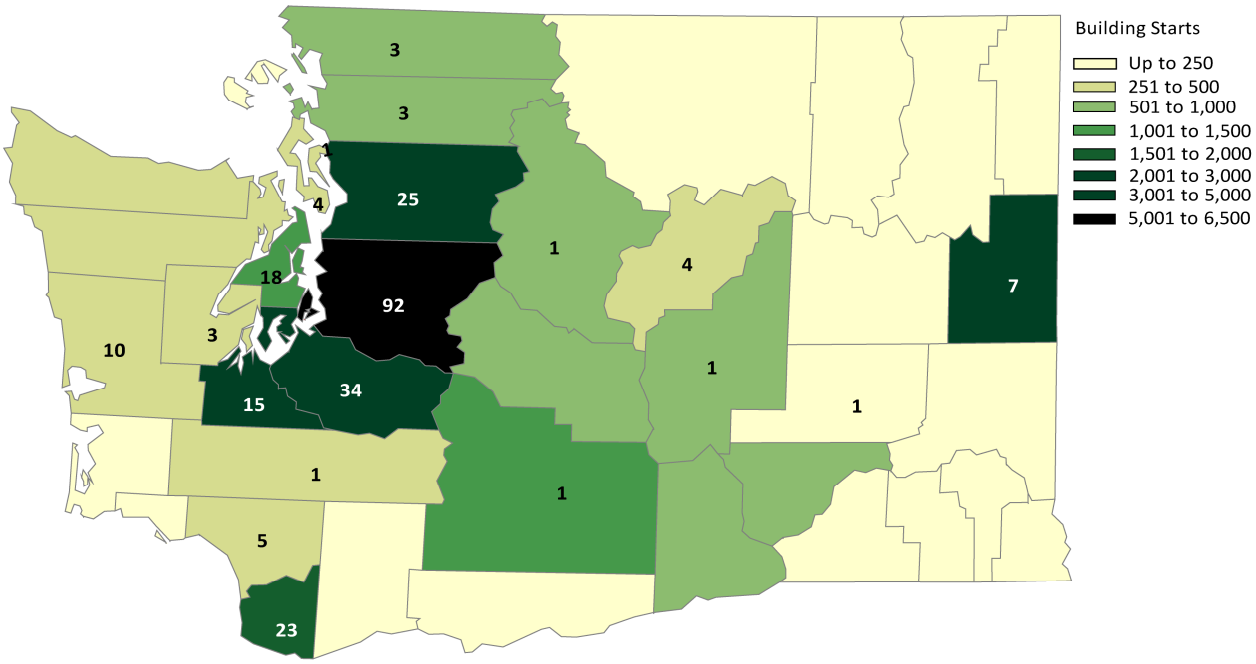
**Figure 10. Oregon Building Starts Overlaid with Number of Officials Trained**




**Numerals indicate the number of building officials attending training for that county.**

In Washington, 252 officials from 20 of the 39 counties (51 percent) attended training. Washington had the highest percentage of counties being served by trained officials, indicating a high level of training coverage. In comparing Washington training with building activity, we found only 13 percent of the building starts were in counties where no officials were trained during the time period Cadmus analyzed. Additionally, two of the three counties with the most building starts, Pierce County and Snohomish County, had approximately equal percentages of trained officials. King County had a much larger percentage of training attendees compared to building starts. In sum, Washington showed a pattern of training appropriate to building patterns in the state.

**Figure 11. Washington Building Starts Overlaid with Number of Officials Trained**




**Numerals indicate the number of building officials attending training for that county.**

In sum, data suggest Washington and Oregon are conducting training consistent with the amount of building in their states, while Idaho and Montana have more relative building activity than training. Furthermore, 70 percent of Idaho's building activity and 68 percent of Montana's building activity occur in counties with officials trained in 2007, as illustrated in Table 3.

**Table 3. Comparative Number of Trainings and Building Starts, for Each State**

# 7. Oregon Multi-Family Compliance Analysis

## Overview

The previous MPER summarized residential new home data collected several years ago by NEEA in its 2006 Multi-Family Residential New Construction Characteristics and Practices Study to determine areas where code compliance might be deficient. Both Idaho multifamily and Oregon multifamily were identified as possible areas with low compliance. Further analysis using RESCheck software showed Idaho multifamily largely complied with code in place at the time. To determine current energy code compliance in Oregon multifamily dwellings, Cadmus conducted site visits at multifamily housing developments in Oregon.

## Methodology

### *Sample Selection*

Sites were identified through building department visits and Internet searches. Cadmus visited 16 local building departments to request reports on completed (referred to as "finaled") permits for multifamily construction. Cadmus then reviewed each building in these reports to determine eligibility for the study. The preliminary screening removed any buildings with an initial permit under the previous code. Additionally, NEEA was interested in apartment buildings—where on the surface there would appear to be a greater likelihood of noncompliance—rather than owner-occupied townhomes or condominiums. Finally, buildings had to be: (1) wood or steel stud framed; (2) three stories or less in height; and (3) three to 25 units per building. Buildings larger or smaller than these specifications fell outside of Appendix N of the Oregon Structural Code.

Some jurisdictions identified buildings that were townhomes or condominiums, while others did not. For the latter group, Cadmus used a two-step process to screen out these owner-occupied buildings. First, we conducted extensive Internet searches over the course of a month to see if the addresses matched up with an apartment complex. However, addresses in the permit sometimes were not the same as the address in an advertisement; so we also searched all new rental listings on Craigslist and Forrent.com, and conducted general Internet searches. This step also provided a valuable cross-check for buildings that might have been missed in the building department lists. Finally, for buildings that seemed likely to fit our criteria, we conducted drive-by viewings to see if the building was an apartment, condominium, or townhouse. We were not able to find any information for some buildings, so we listed the information as a "possible building" in Table 5, though we did not have contact information for these.

Table 4 illustrates the number of apartment complexes built within each jurisdiction, based on the parameters described above. Using these data, we attempted to conduct a census of all buildings, but, in many cases, we were unable to contact building representatives or obtain permission to enter.

**Table 4. Site Visit Distribution, by Jurisdiction[22]**

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***Note: The numbers of buildings represented are the numbers of buildings in the field identical in construction to buildings inspected.**

As Table 4 illustrates, we visited 24 percent of the 37 complexes indentified. Of those complexes, one was large enough to have three unique types of buildings, and we inspected all three. Where buildings were identical, we only inspected one. Therefore, the 13 complexes inspected represented 105 buildings, which held 1,161 units.

## *Field Inspections*

Once we obtained permission to inspect an apartment complex (typically from a representative of the management company), we visited the building to inspect elements required for energy

[22] In one case, we found a building we thought should have been in Milwaukie's jurisdiction, but rather was in Clackamas County's jurisdiction. They were not in our original review, thus we do not have information on the total population. Additionally, we identified one complex in Sherwood, a city not included in our initial report request to jurisdictions. Hillsboro and Oregon City contained a large number of buildings we believe were condos, but we were unable to drive by every site to eliminate them.

code compliance. We inspected insulation levels, construction types, and heating and water heating units. A complete list of measures inspected and the data collection tool can be found in Appendix A.

In the field, we could not always access all building components needed to determine code compliance. For instance, unless there was an unfinished wall within the complex, we could not determine the R-value of the insulation behind the wall, and, occasionally, we could not gain access to the attic space. Additionally, we could not verify slab insulation in most cases, though it may have been present below grade.

### *Analysis*

In Oregon, there are three ways to comply with the energy code:

1) Prescriptive compliance, where the performance of each building shell component is specified, with these options found in Table 1104.1, Path 1.

2) Simplified trade-off, where the building shell components (wall insulation, window efficiency, ceiling insulation, etc.) can be traded off against one another. The requirement here is to build a building with the same or lower overall UA compared to the same building built in accordance with the prescriptive requirements.

3) Whole-building modeling, where the building components and systems can be traded off against one another, and the target efficiency is simply a building no less efficient in energy use than the same building built to prescriptive requirements.

Cadmus found all buildings in our study followed the prescriptive path. Consequently, we examined code compliance as a function of measure installation, meaning we did not study the measure's performance, but verified the measure was installed as specified in the code. This approach examines compliance in the field as it is designed—as a list of measures that either comply with the code or do not.

Our approach answers the following questions: (1) Are the measures specified in the Oregon energy code being installed in the field? (2) If measures are not being installed, which measures are not and how far do they fall from energy code specifications? (3) Are the jurisdictions inspecting and documenting energy code compliance in their permitting documents?

## Findings

Cadmus found overall compliance is consistently high in terms of the percentage of measures installed according to code. To calculate the percentage of compliance per measure, we divided the number of buildings where the measures complied perfectly with code by the total number of buildings represented in the sample. Table 5 shows overall compliance rates by measure.

**Table 5. Percentage of Measures Installed According to Code (n=105)**

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*Note: We only inspected one building with construction requiring floor insulation. This project met code, but had substandard installation quality.

### *Walls*

In general, Cadmus was not able to view buildings currently under construction, making it difficult to view insulation levels in wall cavities. In three cases, we were able to see units under construction and view behind the walls; in two others, we spoke with management representatives who had been on site during construction and who were able to attest to wall insulation levels. In all other cases, we verified the walls were 2 x 6 wood-framed construction and likely to have appropriate wall insulation levels. Information at the jurisdictions indicated R-21 insulation was present and inspected by the building inspector.

### *Ceiling*

Roofs were constructed with trusses rather than rafters, with R-38 insulation in the attic floors. In all cases, ceiling insulation was blown-in fiberglass, and, with only a couple of exceptions, appeared to be very well installed, with consistent coverage deep enough to account for settling. Most ceilings on upper floors were 100 percent flat, except two with a partially vaulted section.

We found two problems with ceiling insulation. One building's ceiling insulation no longer had the proper R-value because of electricians walking on the insulation and packing it down. Additionally, this ceiling had "fluffed" insulation in areas not trampled, meaning that once the insulation settled, it would likely not meet code. Another complex, which was part of a five-building complex, had very uneven insulation and, on average, not at the depth required by code. Weighting by the number of buildings in the complexes, we find 93 percent (where n=105) of buildings complied perfectly with ceiling insulation requirements of Oregon's energy code.

### *Floor*

Oregon energy code requires R-25 floor insulation in construction with crawlspaces. This construction style was uncommon for multifamily structures, as we inspected only one building with a crawlspace. This building had the required R-25 batt insulation, but it was fitted between 2 x 10 joists (9 ¼" deep), held up by crisscrossed twine. Therefore, there was a consistent 2 to 2 ½" air space between the top of the batts and the bottom of the subfloor. The language of the code is unclear on whether this air gap is permissible; the code reads "Batt-type insulation shall be installed flush against the warm side of the cavity insofar as practicable." Because the insulation required by this code did not fill the cavity, a different building style would be required to hold the insulation against the cavity, which, in this case, was interpreted as not

practicable. The upgrade to the code now requires R-30, filling the cavity and solving the problem of an air gap occurring due to the insulation falling from gravity. This building was part of an Earth Advantage homes development, and other installed measures (ceiling insulation, for instance), were above code.

### *Slab Insulation*

Most buildings had slab-on-grade foundations, and most of these were slabs inside a short-stem wall. For slabs inside a short-stem wall, we could not see the insulation. However, during the visits to the jurisdictions, discussions with code officials indicated the officials were knowledgeable about energy code requirements and checked for compliance. All blueprints showed R-15 thermal insulation. Additionally, officials noted this style of slab construction was the most prevalent, and that builders built and insulated the slabs consistently across projects. Given what we learned at the jurisdictions, our professional opinion is that slab insulation for short-stem walls is not a compliance issue. However, it is important to note we were unable to verify insulation at the site, and documentation at the jurisdiction did not always indicate whether or not the slab insulation had been inspected (though we believe this was an oversight in paperwork, not in actual inspection). We base this on speaking with code officials who were sometimes familiar with projects inspected, and who verbally explained how the project had complied with the energy code.

We found one instance of a different style of construction, with an edge-thickened slab. This was the only case where we could see the slab insulation. This slab insulation was only 1½" thick (we believe it was XPS under flashing), or about R-7.8: half that required by code in the prescriptive compliance path. The rest of the building was built to Energy Advantage specifications.

### *Windows and Doors*

Windows and patio sliders were uniformly vinyl-framed, low-e units. They all met code, which stipulates a maximum U-value of 0.40. We checked all windows with a low-e detector to ensure they met the code requirements. This meter could not tell us if a window exceeded the code requirements, but documentation in the building departments indicated 6 percent of the building represented had U-values lower than those required by code, meaning greater energy savings.

Exterior doors were uniformly R-5 metal insulated doors, with varying quality levels in weather-stripping seal around the perimeters.

## Visiting the Code Jurisdictions

Cadmus visited local building jurisdictions at two points in the investigations: initially as we were collecting information for our sample population, and after we inspected the buildings to see if the permit and inspection information coincided with what we found in the field. The initial visit showed larger jurisdictions generally were able to produce reports on building activity within their jurisdictions. Depending on the jurisdiction, some reports were produced within minutes and others required a records request and time for processing. Additionally, sometimes we needed to speak with multiple staff members, such as when the initial point of contact was unsure about the best way to obtain the information requested.

Second visits to jurisdictions were conducted after site visits. The purpose of these visits was to determine what energy code provisions were specified by the developer and used for compliance determination by the jurisdictions.

Post-project documentation for the permitting process varied from one jurisdiction to another, more in form than content. We found documentation submitted by a developer did not vary much from one project to another, but the post-project records trail created by code jurisdictions varied considerably. We also found evidence of the following methods of filing and retaining documents:

- Storing documents as microfiche within weeks of the final permit issue date.
- Maintaining the paper file record on site without blueprints.
- Filing all original permitting paperwork, including blueprints, on site.
- Filing different file elements in multiple storage locations.

Most often, the energy code information we sought was found on a marked-up (in plans review) copy of project blueprints or microfiched project blueprints. At the cities of Portland and Gresham, we found information on the microfiched version of blueprints. At several jurisdictions, we found specific references to Path 1 (the prescriptive path) of the energy code as part of the permit application documentation. In most jurisdictions, we found inspection records indicated energy code inspections had been completed, though there was rarely any detail about the specifications inspected. However, conversations with building officials at the jurisdictions about the paperwork indicated the lack of detail was in the paperwork, not the inspection.

Building officials confirmed that virtually all framed, multifamily buildings of three stories and under, with three to 25 units per building, used the prescriptive (Path 1) method for complying with the energy code. The residential code being stable for a long time seems to have resulted in a very good knowledge level about code provisions among developers and code officials. No doubt this was a factor in the apparent high compliance levels we saw in the field.

At most jurisdictions, we found code officials to be very knowledgeable about the energy code requirements, and most had detailed knowledge about the projects we inspected (in some cases, describing in great detail how the builder had complied). Most also knew where to find the information we sought, though this knowledge level was typically confined to staff who plan reviews and field inspections.

# 8. NEEA's Influence on Energy Code Development and Adoption

In a prior NEEA study,[23] contractors assessed energy savings related to codes and standards efforts, and attributed savings to the NEEA Codes and Standards Project. Summit Blue developed a range of attribution percentages for each state, and recommended a value for calculating net savings. The recommended value was applied to regional gross energy savings numbers (by state) to develop estimates of nonresidential savings attributable to NEEA's efforts through 2005. Table 6 presents the study's range of savings and recommended attribution levels by state.

**Table 6. Attribution of Savings to Alliance Efforts by State**

Source: *Review of Energy Savings Related to Codes and Standards Efforts.* Page 2. Table ES1.

These estimates were reasonable at the time, and MPER #2 found they remained appropriate. At the time, NEEA was one of the few organizations in the Northwest working to increase code stringency and compliance. NEEA's work in the codes field remains pervasive and unique, but new actors are contributing to code upgrades.

A recent change has been the heightened interest in codes from political leaders. Both Oregon and Washington have committed to an aggressive environmental agenda to reduce carbon emissions, and energy codes have been part of the plan to achieve their goals.[24] A further change has been federal interest in energy efficiency, though it remains unclear what type of funding will enter the Northwest to support energy code upgrades from the Department of Energy since the passage of the American Recovery and Reinvestment Act of 2009.

Because there has not been another attribution study like the Summit Blue report, Cadmus does not believe there is enough information at the time to recommend a different attribution. However, given the changing environment, these values should be revisited through another, similar, full-scale analysis to develop a new estimate integrating the new code environment.

[23] Summit Blue. *Review of Energy Savings Related to Codes and Standards Efforts.* April 2006.

[24] "Recommended Legislative Concepts: Energy Efficiency in the Built Environment" Governor's Energy Efficiency Working Group. September 2 2008. The report is located at: http://www.oregon.gov/ENERGY/CONS/EEWG/docs/EEWG_FinalReport-REV_9-08-08.pdf

# 9. Conclusions and Recommendations

Our conclusions address current achievements of the Codes Program, energy code compliance, and challenges and opportunities within the Codes program. This chapter ends with recommendations for future actions.

## Program Achievements

NEEA's Codes Program was intended to maximize energy code-related savings through: (1) increasing code stringency over time; (2) improving compliance; and (3) maintaining building energy codes infrastructure. Cadmus concludes that the program is successfully moving towards these long-term goals and has assisted the Northwest in becoming a model for energy code development and stringency.

NEEA has supported increases in stringency through funding staff positions and technical support to develop code proposals in both Oregon and Washington. For Idaho and Montana, NEEA formed the NWECG to create a regional voice during the IECC development process. The NWECG has successfully proposed Oregon and Washington measures for inclusion in the national code, which will be adopted by Idaho and Montana in the next code cycle.

Energy code stringency is poised to dramatically increase in the next two years. NEEA support of code development has helped to achieve or made likely the following stringency increases:

- **Washington**: In July 2010, the new nonresidential and residential codes will go into effect. While these codes are still in development, Washington policy makers have ordered energy code stringency be part of meeting greenhouse emissions goals. NEEA contractors report it is likely the new codes will be 30 percent more stringent for residential, and 20 to 30 percent more stringent for nonresidential.

- **Oregon**: Oregon's new residential code, implemented this year, is 15 percent more stringent. Nonresidential codes are on an accelerated cycle, and should go into effect in April 2010; these increases are expected to be 20 to 25 percent more stringent than current code.

- **Idaho**: In January 2011, Idaho will adopt the 2009 IECC, which should increase stringency by 15 percent.

- **Montana**: Montana is likely to implement the 2009 IECC sometime in 2010, which will increase code stringency by 20 percent over the 2003 IECC, which is Montana's current code.

NEEA has supported compliance though sponsoring training and general outreach on energy code in all four states. Building officials, builders, and other building industry professionals attend NEEA-sponsored training, learning how to comply with the energy code. NEEA-funded contractors provide energy code training, visit building jurisdictions, organize meetings to

discuss pending proposals and get feedback, and provide daily phone support for questions from builders and building officials alike. This constant support provides builders and building officials with the knowledge to comply with the energy code.

NEEA's support has maintained a group of people capable of developing stringent code and supporting implementation of that code. The world of energy codes is very specific, requiring skill sets that take years to develop. NEEA has been a constant source of funding to maintain that expertise, where other funding sources have fluctuated cyclically.

## Progress Toward Objectives and Goals

NEEA's Codes and Standards Program has five specific program objectives to help meet its long-term goals. This section first evaluates overall progress towards these objectives, then examines progress towards the long-term goals.

1. Develop an energy "reach" code for the region that can serve as a guideline for regional and state code adoptions for the next five to seven years.

**Objective Achieved:** NEEA supported the development of "Northwest Best," a "reach" code modeled on the most successful aspects of regional codes. This success was outlined in MPER #2. While Northwest Best was developed in 2007, recent code change upgrades have rendered Northwest Best out of date. Code changes have been so successful that reality quickly surpassed the model.

2. Increase the stringency of Northwest and national energy codes, with a target of a 15 percent overall increase in efficiency by 2010.

**Objective Likely to be Achieved:** NEEA is on target to achieve this objective in the next round of code upgrades for each state. Table 7 contains a summary of expected increases in code stringency by state. Most states will have met the target by 2010, except Idaho, which will implement the new code in 2011.

**Table 7. Percentage Increases in Code Stringency and Year of Code Upgrade**[25]

**Source: interviews with NEEA contractors**

3. Successfully adopt cost-effective, performance-based code change proposals.

**Objective Likely to be Achieved***:* NEEA is on target to meet this objective for the residential sector. Performance-based testing determines a measure's performance once installed. The two

[25] Most recent or pending building residential code changes in the Northwest.

most common performance based measures—(1) duct sealing and testing, and (2) blower-door testing and house-sealing—are common in the Northwest. The energy code for all four Northwestern states will soon require either placing ducts inside the thermal envelope, or sealing and testing any ducts placed outside the envelope.

In the non-residential sector, performance based measures include commissioning and duct leakage testing. At this time it is unclear whether these measures will be included in any of the non-residential code packages currently under consideration.

4. Encourage the adoption of uniform and easily interpreted energy codes in the Northwest.

**Objective to Reconsider:** While uniformity can help stakeholders better understand codes, it also maintains the same stringency level. In the Northwest, Oregon and Washington codes (which are more stringent than the national codes) have served as "reach" codes for the region, beneficially providing a testing ground for stringent upgrades. Many building practices are best tried on smaller scales before applying them to the larger region. Further, once the measures are proved practical and achievable, stringency can be applied to other code upgrades. The 2009 International Energy Conservation Code (IECC) upgrades were taken directly from successes in previous Oregon and Washington upgrades.

5. Increase compliance with energy codes where compliance falls below 85 percent, and maintain its current levels where it is at or above 85 percent; compliance rates will be measured by periodic regional new construction baseline surveys.

**Objective needing more research and work:** The most recent regional baseline studies have focused on non-residential new construction. This study[26] found that code compliance had improved: whereas lighting compliance was only near 70% for lighting in the 1996-1998 study, the most recent report found 80% compliance for lighting. Additionally, building shell compliance was closer to 90%.

Currently, limited information is available about residential compliance in the field. To gain insights into compliance, Cadmus conducted site visits of multifamily apartment buildings in Oregon and found high compliance rates, with measure level compliance between 88 to 100 percent. Furthermore, our work in the field showed remarkable consistency between buildings. A comprehensive new residential baseline study including code compliance would provide valuable information to assess residential code compliance.

## *Progress Toward Long-term Goals*

NEEA's long term goals are to maximize energy code-related savings through: (1) increasing the stringency of the codes over time; (2) improving compliance; and, (3) maintaining building energy codes infrastructure.

[26] Ecotope Consulting ""Baseline Characteristics of the 2002-2004 Nonresidential Sector: Idaho, Montana, Oregon and Washington" 2008. Located at: http://www.nwalliance.org/research/reports/08-196.pdf

1. **Stringency**: Overall, NEEA has experienced notable success in improving building codes' stringency. Oregon's July 2008 upgrade and the International Code Council (ICC) adoption of most new code measures put forth by the NEEA codes group in September 2008 have been significant milestones. The stringency of Oregon's upgrade has created a precedent and will influence Washington's upgrades in 2009. NEEA's work with the national model code upgrades influences the codes Idaho and Montana will use when they adopt the 2009 IECC.

2. **Compliance**: Cadmus spoke with inspectors at nine jurisdictions, and these interviews suggested local jurisdictions—at least in these jurisdictions—are inspecting energy codes in residential new construction. It should be noted that our study had a limited scope (Oregon multifamily). Anecdotally, NEEA's training efforts are important for compliance in all states and sectors. MPER #2 reported lack of knowledge was one of the compliance barriers most cited by builders and building officials; training addresses this. However, due to limited residential compliance studies, it is difficult to ascertain overall progress. Anecdotal evidence, based on conversations with regional contractors, suggests compliance has remained steady in the last few years, but Cadmus is unable to assess the degree to which NEEA is meeting this goal for the residential sector.

   For non residential, Ecotope found improvement for compliance rates since the 1996-1998 study. While lighting compliance still lags, hovering around 80%, compliance for shell measures is 90%.These figures demonstrate progress.

3. **Building Codes Infrastructure**: NEEA has spent time and resources in developing a strong infrastructure in the Northwest to increase code stringency and compliance. This role is detailed in Figures1-4 in the Introduction.

## Challenges for the Codes Program

While the Codes Program is markedly successful in helping to increase stringency and supporting energy codes in the Northwest, the program faces multiple challenges in the years to come. One of these is to effectively communicate the Codes Program's next phase as the current NEEA funding cycle renews, developing new objectives and adapting program strategies to a new environment. A logic model would help to internally strategize, then externally communicate the program's direction.

A further challenge is the current construction downturn, which has affected building departments and builders, two of the main audiences for NEEA-funded codes training. NEEA should closely monitor the construction market to increase training when construction rebounds. Idaho and Montana will particularly need training, as they will have new codes being implemented and have had relatively little recent training activity. Additionally, when the market rebounds, energy code experts will need to familiarize new employees at building departments and building companies with the energy code.

Finally, NEEA is not collecting data on training in an optimal fashion. The problem is systemic and should be addressed by making the process more user-friendly. A Web interface is the method individuals in most industries now use when they sign up for training or conferences. In

our opinion, such a system would facilitate increases in market penetration NEEA seeks, and will allow tracking jurisdictions and builders in the system to quickly pinpoint jurisdictions not attending training (and accordingly increase marketing efforts).

## Recommendations

Cadmus offers the following recommendations for future program actions:

1. A logic model for the Codes and Standards program would help articulate the program's strategy for the new funding cycle, both for internal purposes, as well as improving the evaluability of the program.

2. NEEA would benefit from a comprehensive compliance study for residential buildings, in order to understand how increasingly stringent energy codes are being complied with, as well as the actual energy savings occurring

3. While NEEA-funded training does reach building code officials that serve counties with the majority of building starts, Idaho and Montana have several counties with building activity where NEEA contractors conducted little or no training in 2007. For instance, in Idaho, 30 percent of building activity has been in counties without trained officials. In Montana, most building occurs in only 15 counties, nine of which have no trained building officials. Specifically, in Montana, Gallatin, Missoula, and Yellowstone counties have had the most building activity and should receive more training. In Idaho, more training should occur in Jefferson, Teton, and Bannock counties.

4. NEEA would have better data to track and market trainings to jurisdictions if they implemented a web-based sign up system for trainings. Where web-based systems may not be viable (e.g. rural jurisdictions or hard-to-reach audiences), NEEA should pursue a more disciplined approach of collecting hard-copy attendee information and contact data to improve its existing offerings in these areas. Better data tracking, as opposed to anecdotes, would allow NEEA to better target its support efforts to reach rural and hard to reach audiences.

5. With Oregon and Washington on the vanguard of energy code stringency, it is no longer advisable to aim for uniform codes in the region. NEEA should refine the objective of supporting uniform testing. Rather, we propose two optimal objectives:

    a. Include upgrades from the most stringent Northwest energy codes into proposals for upgrades in the national model codes processes.

    b. Encourage adoption of easily interpreted energy codes in the Northwest.

6. NEEA should monitor the new construction market and perhaps revise expectations regarding future savings from the Codes program. Cadmus' research suggests new construction market will remain soft for the foreseeable future, and savings expectations placed on the program should be in accordance with the diminished marketplace

7. NEEA should conduct an attribution study. Given the changing environment for codes, attribution levels should be revisited through a full-scale analysis to develop a current estimate.

# Appendix A: Site Visit Data Collection Tool

Field Inspection Sheet

Contact Name:_____

Building Name:_____

Address:_____

Phone Number:_____

Date:_____

Time:_____

**Walls above grade:**

Check One:

- ☐ Fiberglass Insulation
- ☐ Cellulose Insulation
- ☐ XPS Insulation
- ☐ EPS Insulation
- ☐ Other:_____

Specify:

R value:_____

Thickness:_____

Check One:

- ☐ Wood Frame
- ☐ Concrete Frame
- ☐ Metal Frame

Check One:

- ☐ 2x4
- ☐ 2x6

Other:_____

**Walls below grade (if applicable):**

Check One:

- ☐ Fiberglass Insulation
- ☐ Cellulose Insulation
- ☐ XPS Insulation
- ☐ EPS Insulation
- ☐ Other:_____

Specify:

R value:_____

Thickness:_____

Check One:

- ☐ Wood Frame
- ☐ Concrete Frame
- ☐ Metal Frame

Check One:

- ☐ 2x4
- ☐ 2x6
- ☐ Other:_____

**Flat Ceilings (if applicable):**

Check One:

- ☐ Fiberglass Insulation
- ☐ Cellulose Insulation
- ☐ XPS Insulation
- ☐ EPS Insulation
- ☐ Other:_____

Specify:

R value:_____

Thickness:_____

Check One:

- ☐ Truss
- ☐ Rafter

Specify:

% flat ceiling:_____

**Vaulted Ceilings (if applicable):**

Check One:

- ☐ Fiberglass Insulation
- ☐ Cellulose Insulation
- ☐ XPS Insulation
- ☐ EPS Insulation
- ☐ Other:_____

Specify:

R value:_____

Thickness:_____

Check One:

- ☐ Truss
- ☐ Rafter

Specify:

% vaulted ceiling:_____

**Underfloors**

**(if applicable):**

Check One:

- ☐ Fiberglass Insulation
- ☐ Cellulose Insulation
- ☐ XPS Insulation
- ☐ EPS Insulation
- ☐ Other:_____

Specify:

R value:_____

Thickness:_____

Check One:

- ☐ Joists
- ☐ Post and Deck

**Slab Edge Perimeter:**

Check One:

- ☐ Slab on Grade
- ☐ Crawl Spaces
- ☐ Basement

Check One:

- ☐ Fiberglass Insulation
- ☐ Cellulose Insulation
- ☐ XPS Insulation
- ☐ EPS Insulation
- ☐ Other:_____

Specify:

R value:_____

Thickness:_____

Check One:

- ☐ Edge-Thickened
- ☐ Interior (to stem wall)

**Heated Slab Interior:**

Check One:

- ☐ Yes
- ☐ No

Notes:_____

**Skylights:**

Check One:

☐ Yes
☐ No

Notes:_____

**Windows:**

Check One:

☐ Low-E
☐ Not Low-E

Specify:

U-value:_____

Frame Type:_____

**Exterior Doors:**

Check One:

☐ Wood
☐ Metal
☐ Fiberglass Clad

**Exterior Doors with 2.5 square feet of glazing (if applicable):**

Check One:

☐ Low-E
☐ Not Low-E

Specify:

U-value:_____

Frame Type:_____

**Domestic Hot Water Piping:**

Check One:

- ☐ Insulation present
- ☐ Insulation not present

Specify:

Feet insulated:_____

Location:_____

**Heating Type:**

Check One:

- ☐ Forced Air Gas
- ☐ Forced Air Electric
- ☐ Cadet Electric
- ☐ PTHP (packaged terminal heat pump)
- ☐ PTAC with electric resistance heating

**Forced Air Duct Insulation (if heat is forced air):**

R-value:_____

# Appendix B: Detailed Site Visit Tables

**Table 8. Detailed Site Visit Findings: Walls. Yellow cells indicate a compliance problem**

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**Table 9. Detailed Site Visit Findings: Ceilings, Yellow cells indicate a compliance problem**

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**Table 10. Detailed Site Visit Findings: Underfloors and Slab Edge Insulation, Yellow cells indicate a compliance problem**

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**Table 11. Detailed Site Visit Findings: Windows and Doors, Yellow cells indicate a compliance problem**

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# Appendix C: Training Data Tables

**Table 12. Training Data Summary, January-October, 2008**

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***Data Cleaning for Washington was unique, in that we only received observations related to the analysis. Therefore these fields do not apply.

## *Detailed Tables for Idaho*

**Table 13. Titles Of Training Attendees In Idaho**

| Title/Profession | Total |
|---|---|
| Building Official | 7 |
| Inspector | 7 |
| Plan Examiner | 8 |
| Unknown | 4 |
| **Grand Total** | **26** |

**Table 14. Jurisdictions Attending Training In Idaho, Both City And County Jurisdictions**

| Jurisdiction Represented | Total |
|---|---|
| City of Ammon | 1 |
| City of Boise | 4 |
| City of Caldwell | 3 |
| City of Idaho Falls | 1 |
| City of McCall | 1 |

| | |
|---|---|
| City of Moscow | 3 |
| City of Nampa | 2 |
| City of Twin Falls | 1 |
| Ada County | 1 |
| Bingham County | 1 |
| Blaine County | 1 |
| Canyon County | 3 |
| Fremont County | 1 |
| Kootenai County | 1 |
| Power County | 1 |
| Twin Falls County | 1 |
| **Grand Total** | **26** |

**Table 15. Type Of Training By Jurisdiction**

| Jurisdiction | Non-Residential | Residential | Both | Grand Total |
|---|---|---|---|---|
| Ada County | | | 1 | 1 |
| Bingham County | 1 | 1 | | 2 |
| Blaine County | | | 1 | 1 |
| Canyon County | | | 3 | 3 |
| City of Ammon | 1 | 1 | 2 | 4 |
| City of Boise | | | 4 | 4 |
| City of Caldwell | | 3 | 4 | 7 |
| City of Idaho Falls | | | 1 | 1 |
| City of McCall | 1 | 1 | | 2 |

| | | | | |
|---|---|---|---|---|
| City of Moscow | 1 | 3 | 2 | 6 |
| City of Nampa | | 2 | 1 | 3 |
| City of Twin Falls | 1 | 1 | 2 | 4 |
| Fremont County | 1 | 1 | 2 | 4 |
| Kootenai County | | | 1 | 1 |
| Power County | | 1 | | 1 |
| Twin Falls County | 1 | 2 | 2 | 5 |
| **Grand Total** | **7** | **16** | **26** | **49** |

**Table 16. County Building Starts By Attendees At Trainings**

| County | Building Starts | Attendees | % Of Building Starts | % Of Attendees | Building Starts Per Official Trained | Building Starts With No Trained Officials |
|---|---|---|---|---|---|---|
| Ada County | 2,492 | 5 | 25% | 19% | 498 | |
| Adams County | 45 | | 0% | 0% | | 45 |
| Bannock County | 309 | | 3% | 0% | | 309 |
| Bear Lake County | 32 | | 0% | 0% | | 32 |
| Benewah County | 30 | | 0% | 0% | | 30 |
| Bingham County | 194 | 1 | 2% | 4% | 194 | |
| Blaine County | 112 | 1 | 1% | 4% | 112 | |
| Boise County | 101 | | 1% | 0% | | 101 |
| Bonner County | 62 | | 1% | 0% | | 62 |
| Bonneville County | 906 | 2 | 9% | 8% | 453 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Boundary County | 127 | | 1% | 0% | | 127 |
| Butte County | 6 | | 0% | 0% | | 6 |
| Camas County | 18 | | 0% | 0% | | 18 |
| **County** | **Building Starts** | **Attendees** | **% Of Building Starts** | **% Of Attendees** | **Building Starts Per Official Trained** | **Building Starts With No Trained Officials** |
| Canyon County | 1,310 | 8 | 13% | 31% | 164 | |
| Caribou County | 22 | | 0% | 0% | | 22 |
| Cassia County | 81 | | 1% | 0% | | 81 |
| Clark County | 1 | | 0% | 0% | | 1 |
| Clearwater County | 33 | | 0% | 0% | | 33 |
| Custer County | 3 | | 0% | 0% | | 3 |
| Elmore County | 198 | | 2% | 0% | | 198 |
| Franklin County | 67 | | 1% | 0% | | 67 |
| Fremont County | 168 | 1 | 2% | 4% | 168 | |
| Gem County | 74 | | 1% | 0% | | 74 |
| Gooding County | 76 | | 1% | 0% | | 76 |
| Idaho County | 7 | | 0% | 0% | | 7 |
| Jefferson County | 334 | | 3% | 0% | | 334 |
| Jerome County | 193 | | 2% | 0% | | 193 |
| Kootenai County | 1,073 | 1 | 11% | 4% | 1,073 | |
| Latah County | 110 | 3 | 1% | 12% | 37 | |
| Lemhi County | 34 | | 0% | 0% | | 34 |
| Lewis County | 16 | | 0% | 0% | | 16 |
| Lincoln County | 22 | | 0% | 0% | | 22 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Madison County | 216 | | 2% | 0% | | 216 |
| Minidoka County | 29 | | 0% | 0% | | 29 |
| Nez Perce County | 98 | | 1% | 0% | | 98 |
| Oneida County | 13 | | 0% | 0% | | 13 |
| Owyhee County | 66 | | 1% | 0% | | 66 |
| Payette County | 135 | | 1% | 0% | | 135 |
| Power County | 14 | 1 | 0% | 4% | 14 | |
| Shoshone County | 46 | | 0% | 0% | | 46 |
| Teton County | 456 | | 5% | 0% | | 456 |
| Twin Falls County | 461 | 2 | 5% | 8% | 231 | |
| Valley County | 223 | 1 | 2% | 4% | 223 | |
| Washington County | 67 | | 1% | 0% | | 67 |
| **Grand Total** | **10,080** | **26** | **100%** | **100%** | **388** | **3,017** |

## *Detailed Tables for Montana*

**Table 17. Titles Of Training Attendees In Montana**

| Title/Profession | Total |
|---|---|
| Inspector | 9 |
| Plans Examiner | 1 |
| **Grand Total** | **10** |

**Table 18. Jurisdictions Attending Training In Montana, Both City And County Jurisdictions**

| Jurisdiction Represented | Total |
|---|---|
| Billings | 1 |
| Bozeman | 1 |
| Colstrip | 1 |
| Hardin | 1 |
| Helena | 2 |
| Kalispell | 1 |
| Madison County | 1 |
| Missoula County | 1 |
| West Yellowstone | 1 |
| **Grand Total** | **10** |

**Table 19. County Building Starts By Attendees At Trainings**

| County | Building Starts | Attendees | % Of Building Starts | % Of Attendees | Building Starts Per Official Trained | Building Starts With No Trained Officials |
|---|---|---|---|---|---|---|
| Beaverhead County | 13 | | 0% | 0% | | 13 |
| Big Horn County | 5 | 1 | 0% | 10% | 5 | |
| Blaine County | 1 | | 0% | 0% | | 1 |
| Broadwater County | 7 | | 0% | 0% | | 7 |
| Carbon County | 24 | | 1% | 0% | | 24 |
| Carter County | 0 | | 0% | 0% | | 0 |
| Cascade County | 246 | | 8% | 0% | | 246 |
| Chouteau County | 5 | | 0% | 0% | | 5 |
| Custer County | 15 | | 0% | 0% | | 15 |

| County | Building Starts | Attendees | % Of Building Starts | % Of Attendees | Building Starts Per Official Trained | Building Starts With No Trained Officials |
|---|---|---|---|---|---|---|
| Daniels County | 2 | | 0% | 0% | | 2 |
| Dawson County | 3 | | 0% | 0% | | 3 |
| Deer Lodge County | 30 | | 1% | 0% | | 30 |
| Fallon County | 1 | | 0% | 0% | | 1 |
| Fergus County | 4 | | 0% | 0% | | 4 |
| Flathead County | 309 | 1 | 10% | 10% | 309 | |
| Gallatin County | 956 | 2 | 29% | 20% | 478 | |
| Garfield County | 0 | | 0% | 0% | | 0 |
| Glacier County | 1 | | 0% | 0% | | 1 |
| Golden Valley County | 0 | | 0% | 0% | | 0 |
| Granite County | 0 | | 0% | 0% | | 0 |
| Hill County | 17 | | 1% | 0% | | 17 |
| Jefferson County | 2 | | 0% | 0% | | 2 |
| Judith Basin County | 0 | | 0% | 0% | | 0 |
| Lake County | 100 | | 3% | 0% | | 100 |
| Lewis and Clark County | 88 | 2 | 3% | 20% | 44 | |
| Liberty County | 0 | | 0% | 0% | | 0 |
| Lincoln County | 16 | | 0% | 0% | | 16 |
| Madison County | 10 | 1 | 0% | 10% | 10 | |

| County | Building Starts | Attendees | % Of Building Starts | % Of Attendees | Building Starts Per Official Trained | Building Starts With No Trained Officials |
|---|---|---|---|---|---|---|
| McCone County | 0 | | 0% | 0% | | 0 |
| Meagher County | 0 | | 0% | 0% | | 0 |
| Mineral County | 0 | | 0% | 0% | | 0 |
| Missoula County | 533 | 1 | 16% | 10% | 533 | |
| Musselshell County | 4 | | 0% | 0% | | 4 |
| Park County | 36 | | 1% | 0% | | 36 |
| Petroleum County | 0 | | 0% | 0% | | 0 |
| Phillips County | 1 | | 0% | 0% | | 1 |
| Pondera County | 0 | | 0% | 0% | | 0 |
| Powder River County | 0 | | 0% | 0% | | 0 |
| Powell County | 1 | | 0% | 0% | | 1 |
| Prairie County | 1 | | 0% | 0% | | 1 |
| Ravalli County | 47 | | 1% | 0% | | 47 |
| Richland County | 31 | | 1% | 0% | | 31 |
| Roosevelt County | 2 | | 0% | 0% | | 2 |
| Rosebud County | 18 | 1 | 1% | 10% | 18 | |
| Sanders County | 0 | | 0% | 0% | | 0 |
| Sheridan County | 1 | | 0% | 0% | | 1 |
| Silver Bow | 69 | | 2% | 0% | | 69 |

| County | Building Starts | Attendees | % Of Building Starts | % Of Attendees | Building Starts Per Official Trained | Building Starts With No Trained Officials |
|---|---|---|---|---|---|---|
| County | | | | | | |
| Stillwater County | 11 | | 0% | 0% | | 11 |
| Sweet Grass County | 3 | | 0% | 0% | | 3 |
| Teton County | 4 | | 0% | 0% | | 4 |
| Toole County | 4 | | 0% | 0% | | 4 |
| Treasure County | 0 | | 0% | 0% | | 0 |
| Valley County | 2 | | 0% | 0% | | 2 |
| Wheatland County | 0 | | 0% | 0% | | 0 |
| Wibaux County | 0 | | 0% | 0% | | 0 |
| Yellowstone County | 624 | 1 | 19% | 10% | 624 | |
| **Grand Total** | **3,247** | **10** | **100%** | **100%** | **325** | **704** |

## *Detailed Tables for Oregon*

**Table 20. Jurisdictions Attending Training In Oregon, Both City And County Jurisdictions**

| Jurisdiction Represented | Total |
|---|---|
| City of Albany | 5 |
| City of Ashland | 1 |
| City of Central Point | 2 |
| City of Corvallis | 11 |
| City of Dallas | 3 |

| | |
|---|---|
| City of Eugene | 23 |
| City of Florence | 1 |
| City of Grants Pass | 5 |
| City of Gresham | 17 |
| City of Happy Valley | 6 |
| City of Hillsboro | 15 |
| City of Hood River | 2 |
| City of Lebanon | 2 |
| City of Manzanita | 2 |
| City of Medford | 7 |
| City of Milwaukie | 1 |
| City of Molalla | 2 |
| City of Ontario | 1 |
| City of Oregon City | 4 |
| City of Portland | 44 |
| City of Salem | 13 |
| City of Seaside | 2 |
| City of Silverton | 2 |
| City of Springfield | 1 |
| City of Sweet Home | 1 |
| City of Tigard | 11 |
| City of Tualatin | 3 |
| Benton County | 3 |
| Clackamas County | 19 |
| Crook County | 3 |
| Deschutes County | 12 |
| Douglas County | 2 |

| | |
|---|---|
| Hood River County | 4 |
| Jackson County | 9 |
| Josephine County | 2 |
| Klamath County | 3 |
| Lane County | 7 |
| Linn County | 2 |
| Marion County | 7 |
| Tillamook County | 6 |
| **Grand Total** | **266** |

**Table 21. County Building Starts By Attendees At Trainings**

| County[27] | Building Starts | Attendees | % Of Building Starts | % Of Attendees | Building Starts Per Official Trained | Building Starts With No Trained Officials |
|---|---|---|---|---|---|---|
| Oregon Balance of State | 219 | | 1% | 0% | | 219 |
| Baker County | 60 | | 0% | 0% | | 60 |
| Benton County | 200 | 13 | 1% | 5% | 15 | |
| Clackamas County | 1952 | 32 | 12% | 12% | 61 | |
| Clatsop County | 215 | 2 | 1% | 1% | 108 | |
| Columbia County | 194 | | 1% | 0% | | 194 |
| Coos County | 41 | | 0% | 0% | | 41 |
| Crook County | 169 | 3 | 1% | 1% | 56 | |

[27] These data do not include six Oregon counties as the Census Bureau notes that annual county-level data are totals provided for each county that has permit-issuing jurisdictions regardless of reporting status.

| County[27] | Building Starts | Attendees | % Of Building Starts | % Of Attendees | Building Starts Per Official Trained | Building Starts With No Trained Officials |
|---|---|---|---|---|---|---|
| Curry County | 58 | | 0% | 0% | | 58 |
| Deschutes County | 1613 | 11 | 10% | 4% | 147 | |
| Douglas County | 375 | 2 | 2% | 1% | 188 | |
| Harney County | 36 | | 0% | 0% | | 36 |
| Hood River County | 151 | 6 | 1% | 2% | 25 | |
| Jackson County | 1046 | 19 | 7% | 7% | 55 | |
| Jefferson County | 42 | | 0% | 0% | | 42 |
| Josephine County | 397 | 7 | 2% | 3% | 57 | |
| Klamath County | 311 | 3 | 2% | 1% | 104 | |
| Lake County | 31 | | 0% | 0% | | 31 |
| Lane County | 1108 | 32 | 7% | 12% | 35 | |
| Lincoln County | 374 | | 2% | 0% | | 374 |
| Linn County | 652 | 10 | 4% | 4% | 65 | |
| Malheur County | 49 | 1 | 0% | 0% | 49 | |
| Marion County | 1242 | 22 | 8% | 8% | 56 | |
| Morrow County | 18 | | 0% | 0% | | 18 |
| Multnomah County | 1764 | 61 | 11% | 23% | 29 | |

| County[27] | Building Starts | Attendees | % Of Building Starts | % Of Attendees | Building Starts Per Official Trained | Building Starts With No Trained Officials |
|---|---|---|---|---|---|---|
| Polk County | 166 | 3 | 1% | 1% | 55 | |
| Tillamook County | 343 | 8 | 2% | 3% | 43 | |
| Umatilla County | 112 | | 1% | 0% | | 112 |
| Union County | 59 | | 0% | 0% | | 59 |
| Washington County | 2209 | 29 | 14% | 11% | 76 | |
| Yamhill County | 720 | | 5% | 0% | | 720 |
| **Grand Total** | **15,926** | **264** | **100%** | **100%** | **60** | **1,964** |

### *Detailed Tables for Washington*

**Table 22. Titles Of Training Attendees In Washington**

| Title/Profession | Total |
|---|---|
| Inspector | 48 |
| Permit Tech | 4 |
| Plan Examiner | 24 |
| Unknown | 176 |
| **Grand Total** | **252** |

**Table 23. Jurisdictions Attending Training In Washington, Both City And County Jurisdictions**

| Jurisdiction Represented | Total |
|---|---|

| Jurisdiction Represented | Total |
|---|---|
| Adams County | 1 |
| City of Aberdeen | 2 |
| City of Arlington | 3 |
| City of Auburn | 1 |
| City of Aulane | 1 |
| City of Battle Ground | 1 |
| City of Bellevue | 19 |
| City of Bonney Lake | 1 |
| City of Bremerton | 4 |
| City of Brier | 1 |
| City of Buckley | 1 |
| City of Burien | 2 |
| City of Camas | 3 |
| City of Centralia | 1 |
| City of Chelan | 1 |
| City of Cheney | 1 |
| City of Cosmopolis | 1 |
| City of Covington | 3 |
| City of Des Moines | 1 |
| City of DuPont | 1 |
| City of Edmonds | 1 |
| City of Everett | 3 |
| City of Everson | 1 |
| City of Fife | 1 |
| City of Granite Falls | 1 |

| Jurisdiction Represented | Total |
|---|---|
| City of Grays Harbor | 4 |
| City of Issaquaha | 2 |
| City of Kelso | 1 |
| City of Kenmore | 1 |
| City of Kirkland | 9 |
| City of LaCenter | 1 |
| City of Lacey | 5 |
| City of Lakewood | 1 |
| City of Lynnwood | 1 |
| City of Mantlake Terrace | 1 |
| City of Maple Valley | 2 |
| City of Marysville | 2 |
| City of McCleary | 3 |
| City of Medina | 1 |
| City of Mill Creek | 2 |
| City of Milton | 2 |
| City of Monroe | 3 |
| City of Mukilteo | 1 |
| City of Olympia | 6 |
| City of Port Orchard | 1 |
| City of Port Townsend | 1 |
| City of Poulsbo | 1 |
| City of Redmond | 6 |

| Jurisdiction Represented | Total |
|---|---|
| City of Renton | 1 |
| City of Seatac | 1 |
| City of Seattle | 8 |
| City of Selah | 1 |
| City of Shelton | 1 |
| City of Shoreline | 3 |
| City of Snohomish | 1 |
| City of Snoqualmie | 2 |
| City of Spokane | 4 |
| City of Spokane Valley | 2 |
| City of Stanwood | 1 |
| City of Tumwater | 2 |
| City of University Place | 1 |
| City of Vancouver | 4 |
| City of Washougal | 3 |
| City of Woodland | 1 |
| City of Yelm | 2 |
| Clark County | 11 |
| Coville Indian Housing Authority | 1 |
| Cowlitz County | 3 |
| Douglas County | 4 |
| Grant County | 1 |
| Island County | 1 |
| Jefferson County | 3 |

| Jurisdiction Represented | Total |
|---|---|
| King County | 29 |
| Kitsap County | 12 |
| Mason County | 2 |
| Pierce County | 26 |
| Skagit County | 3 |
| Snohomish County | 3 |
| Watson County | 1 |
| Whatcom County | 1 |
| **Grand Total** | **252** |

**Table 24. Types Of Training By Attendees**

| Type Of Training | Attendees |
|---|---|
| Energy Code Class | 24 |
| NWICC training | 18 |
| WA State Energy Code Training | 20 |
| WSEC training | 30 |
| WSEC Update Res and Non-res | 13 |
| Unknown | 157 |
| **Total** | **262** |

**Table 25. County Building Starts By Attendees At Trainings**

| County | Building Starts | Attendees | % Of Building Starts | % Of Attendees % | Building Starts Per Trained Official | Building Starts With No Trained Officials |
|---|---|---|---|---|---|---|
| Adams County | 52 | 1 | 0% | 0% | 52 | |
| Asotin County | 63 | | 0% | 0% | | 63 |
| Benton County | 825 | | 3% | 0% | | 825 |
| Chelan County | 506 | 1 | 2% | 0% | 506 | |
| Clallam County | 443 | | 1% | 0% | | 443 |
| Clark County | 1872 | 23 | 6% | 9% | 81 | |
| Columbia County | 15 | | 0% | 0% | | 15 |
| Cowlitz County | 496 | 5 | 2% | 2% | 99 | |
| Douglas County | 307 | 4 | 1% | 2% | 77 | |
| Ferry County | 32 | | 0% | 0% | | 32 |
| Franklin County | 579 | | 2% | 0% | | 579 |
| Garfield County | 8 | | 0% | 0% | | 8 |
| Grant County | 673 | 1 | 2% | 0% | 673 | |
| Grays Harbor County | 464 | 10 | 1% | 4% | 46 | |
| Island County | 473 | 1 | 1% | 0% | 473 | |
| Jefferson County | 269 | 4 | 1% | 2% | 67 | |
| King County | 6293 | 92 | 19% | 37% | 68 | |
| Kitsap County | 1267 | 18 | 4% | 7% | 70 | |

| County | Building Starts | Attendees | % Of Building Starts | % Of Attendees % | Building Starts Per Trained Official | Building Starts With No Trained Officials |
|---|---|---|---|---|---|---|
| Kittitas County | 523 | | 2% | 0% | | 523 |
| Klickitat County | 133 | | 0% | 0% | | 133 |
| Lewis County | 496 | 1 | 2% | 0% | 496 | |
| Lincoln County | 56 | | 0% | 0% | | 56 |
| Mason County | 423 | 3 | 1% | 1% | 141 | |
| Okanogan County | 213 | | 1% | 0% | | 213 |
| Pacific County | 157 | | 0% | 0% | | 157 |
| Pend Oreille County | 144 | | 0% | 0% | | 144 |
| Pierce County | 3741 | 34 | 12% | 13% | 110 | |
| San Juan County | 166 | | 1% | 0% | | 166 |
| Skagit County | 799 | 3 | 2% | 1% | 266 | |
| Skamania County | 82 | | 0% | 0% | | 82 |
| Snohomish County | 3861 | 25 | 12% | 10% | 154 | |
| Spokane County | 2213 | 7 | 7% | 3% | 316 | |
| Stevens County | 244 | | 1% | 0% | | 244 |
| Thurston County | 2081 | 15 | 6% | 6% | 139 | |
| Wahkiakum County | 50 | | 0% | 0% | | 50 |
| Walla Walla County | 217 | | 1% | 0% | | 217 |

| County | Building Starts | Attendees | % Of Building Starts | % Of Attendees % | Building Starts Per Trained Official | Building Starts With No Trained Officials |
|---|---|---|---|---|---|---|
| Whatcom County | 935 | 3 | 3% | 1% | 312 | |
| Whitman County | 143 | | 0% | 0% | | 143 |
| Yakima County | 1122 | 1 | 3% | 0% | 1,122 | |
| **Grand Total** | **32,436** | **252** | **100%** | **100%** | **129** | **4,093** |