U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

BUILDING TECHNOLOGIES PROGRAM

Nevada Compliance Implementation and Evaluation (CIE) Guide

Building Energy Codes

This Guide is designed to assist state and local code jurisdictions in achieving statewide compliance with the 2009 International Energy Conservation Code (IECC) for **residential buildings** and ANSI/ASHRAE/IESNA Standard 90.1-2007 for **commercial buildings**.

Nevada

Compliance Implementation and Evaluation (CIE) Guide

WHAT'S INSIDE

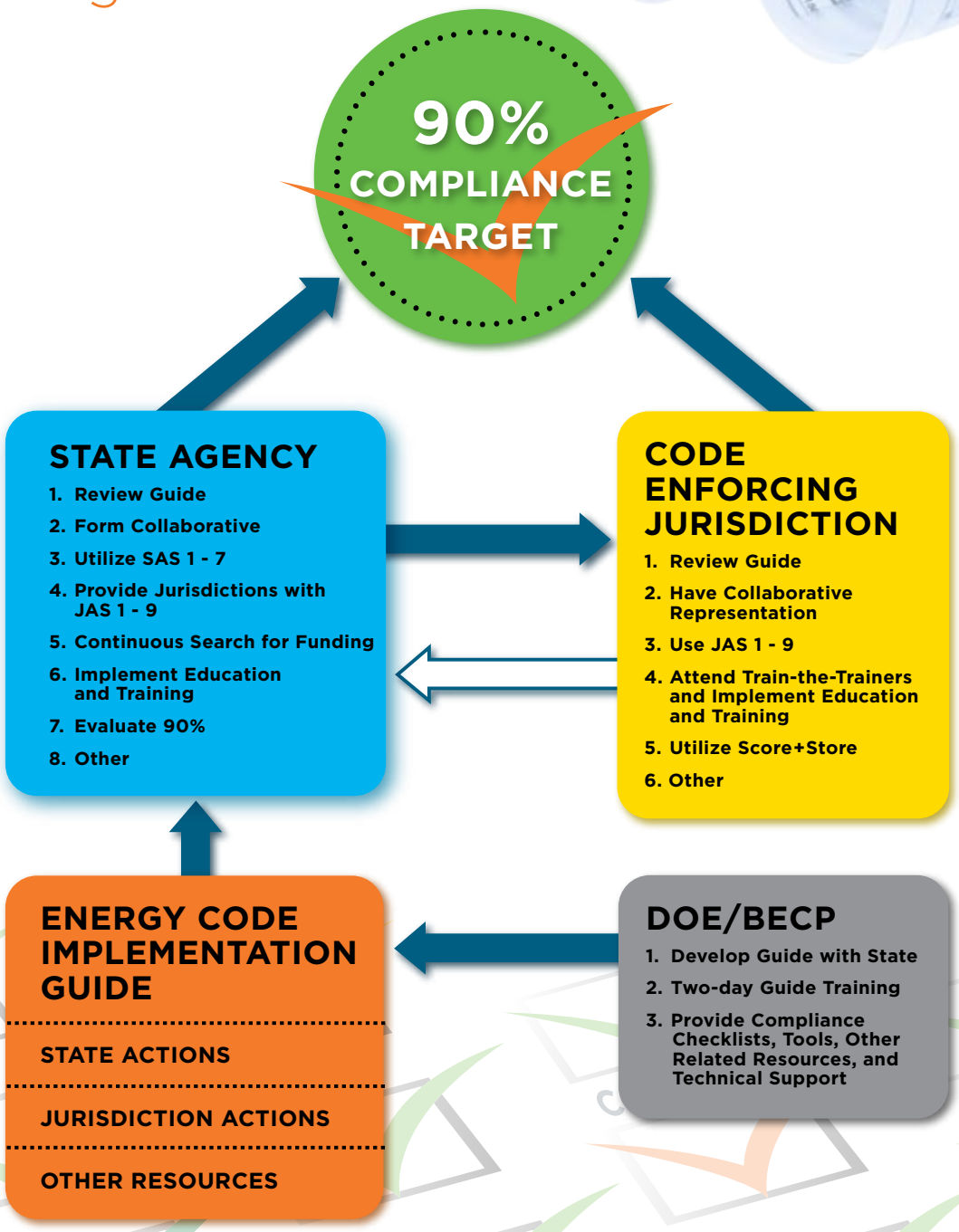
CIE Guide Overview—Flow Diagram 5

PART 1: Guide Overview 10
Resources 11
Addressing Specific State Challenges 12

PART 2: State Actions
State Action Sheet 1 (SAS 1): Code Administration and the State Role in Compliance 17
State Action Sheet 2 (SAS 2): Formation of Statewide Energy Code Collaborative 19
State Action Sheet 3 (SAS 3): Compliance Approaches 22
State Action Sheet 4 (SAS 4): Program Evaluation 24
State Action Sheet 5 (SAS 5): Rating a Building for Compliance 25
State Action Sheet 6 (SAS 6): Marketing and Outreach 26
State Action Sheet 6.1 (SAS 6.1): Energy Code Checklist for **Elected Officials**/Example 28
State Action Sheet 6.2 (SAS 6.2): Energy Code Guide for **Homebuilders**/Example 30
State Action Sheet 6.3 (SAS 6.3): Energy Code Checklist for **Homeowners**/Example 34
State Action Sheet 7 (SAS 7): Education and Training 36

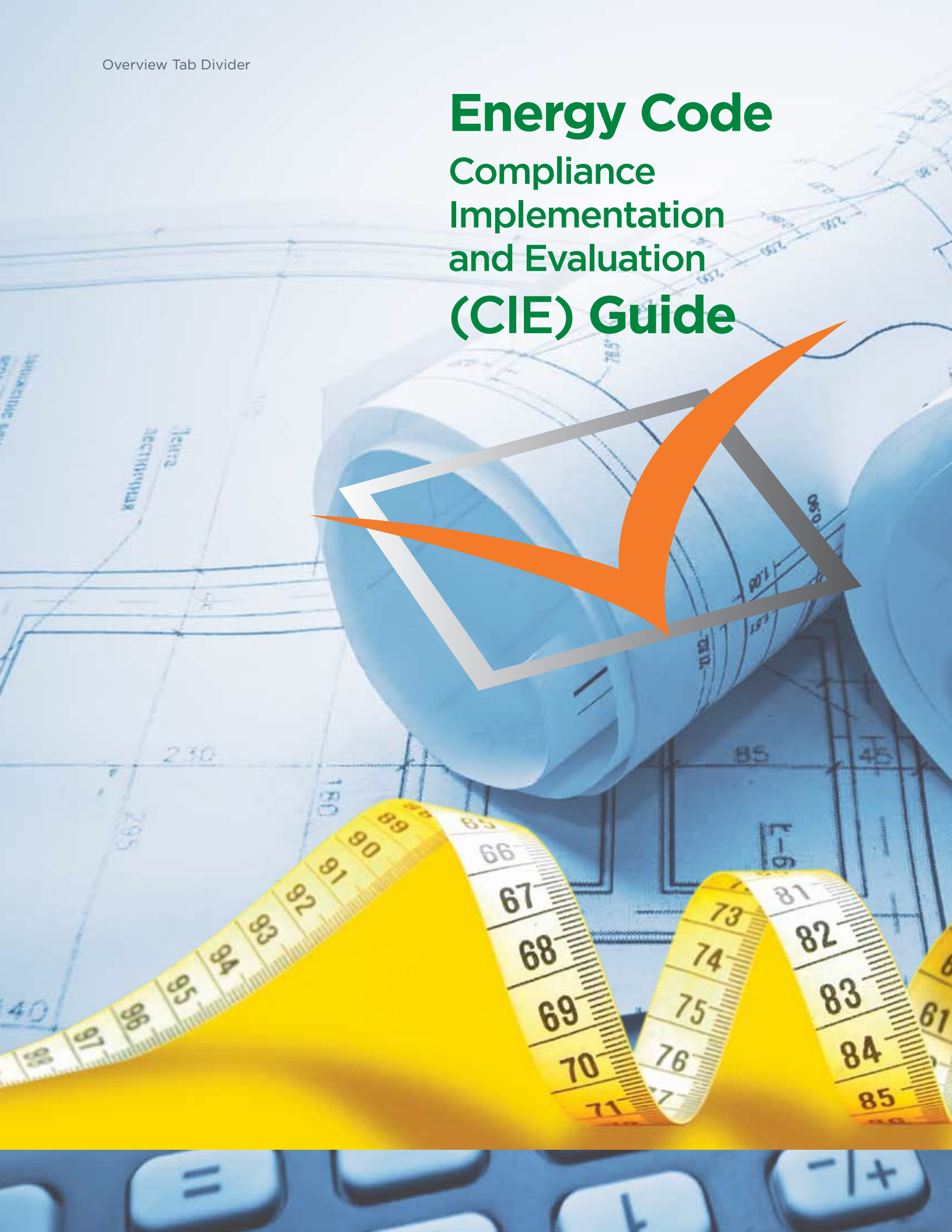
PART 3: Jurisdiction Actions
Jurisdiction Action Sheet 1 (JAS 1): Code Administration 41
Jurisdiction Action Sheet 2 (JAS 2): Compliance Role 42
Jurisdiction Action Sheet 3 (JAS 3): Submittal Guidelines—**Commercial** 44
Jurisdiction Action Sheet 3.1 (JAS 3.1): Example of **Commercial** Submittal Guideline 45
Jurisdiction Action Sheet 4 (JAS 4): Submittal Guidelines—**Residential** 48
Jurisdiction Action Sheet 4.1 (JAS 4.1): Example of **Residential** Submittal Guideline 49
Jurisdiction Action Sheet 5 (JAS 5): **Residential** Envelope and Duct Leakage Testing Protocol 53
Jurisdiction Action Sheet 6 (JAS 6): Plan Acceptance and Review 58
Jurisdiction Action Sheet 7 (JAS 7): Building Inspections 60
Jurisdiction Action Sheet 8 (JAS 8): Building Re-Inspections 63
Jurisdiction Action Sheet 9 (JAS 9): Rating a Building for Compliance 64

CIE Guide Overview — Flow Diagram



Overview Tab Divider

Energy Code Compliance Implementation and Evaluation (CIE) Guide



Notes

How the Guide Works

The approach taken in the Guide is that compliance is a partnership between state and local authorities and the design and construction communities. The thesis is that effective compliance at the 90% or greater level requires a systematic approach that is inclusive of the varied industry implementers, and that in order to implement effectively and consistently, each implementer—whether a state agency, local government, or subcontractor—will require a set of directions that are consistent throughout implementers.

These directions are provided through a series of action sheets. Each action sheet is designed to provide specific rationale and/or processes, relaying directional or step-by-step approaches to compliance. Thus, action sheets may include both general and specific information and process for compliance.

For example, at the state level, the action sheets tend to provide more generalized or process-oriented guidance and information. Such as a process for formation of a statewide energy code collaborative to be used for vetting stakeholder interests in energy code implementation strategies. Jurisdiction and industry-level action sheets identify specific processes and protocols or guidance for on-the-ground code implementation. An example would be a set of submittal requirements for residential and commercial building designers that documents specific energy code submittal requirements.

There are three parts to the Guide.

Part 1: Overview—provides the explanation of the intent and format of the Guide.

Resources—lists resources that are available to energy code implementers beyond what is in this Guide.

Addressing Specific State Challenges—address state- or region-specific challenges and approaches for effective energy code implementation and compliance. This section can be used for documentation of ongoing works in progress such as work performed through the energy code collaborative.

Part 2: State Action Sheets—provides a series of informative, and process-oriented action sheets for the state agency(s) holding responsibility for compliance implementation and certification.

Seven action sheets comprise Part 2:

1. Code Administration and the State Role in Compliance
2. Formation of Statewide Energy Code Collaborative
3. Compliance Approaches
4. Program Evaluation
5. Rating a Building for Compliance—Using the Compliance Checklists and Score+Store™
6. Marketing and Outreach (one overview sheet plus three messaging sheets)
7. Education and Training

Part 3: Jurisdiction Action Sheets—identifies on-the-ground or more direct code implementation actions that can be utilized by code jurisdictions and, through them, the design and construction industry in consistent implementation of the energy code.

There are nine action sheets for use in Part 3:

1. Code Administration
2. Compliance Role
3. Submittal Guidelines –Commercial
4. Submittal Guidelines –Residential
5. Residential Envelope and Duct Leakage Testing Protocol
6. Plan Acceptance and Review
7. Building Inspections
8. Building Re-Inspections
9. Rating a Building for Compliance—Using the Checklists and Score+Store

Part 1
Guide Overview

Why this Guide

This Guide is designed to assist state and local code jurisdictions in achieving statewide compliance with the 2009 International Energy Conservation Code (IECC) for residential buildings and ANSI/ASHRAE/IESNA Standard 90.1-2007 for commercial buildings.

The role of the responsible state agency is to ensure that an energy code compliance plan is developed and implemented, and that statewide code enforcement jurisdictions are provided the tools and resources necessary to perform the on-the-ground work that will help assure energy code compliance. This Guide provides many beneficial tools and identifies both processes and resources that will directly aid state agencies seeking to fulfill the federal residential and commercial energy code 90% compliance requirements.

Local code-enforcing jurisdictions have a large role in energy code compliance. State agencies often will not have direct authority to require jurisdictions to participate in actions that will achieve better energy code compliance. However, local jurisdictions that do adopt codes have the same public responsibility for ensuring energy code compliance as they do for life safety code compliance.

It is recommended that state agencies notify code enforcement jurisdictions of their potential responsibilities under the American Recovery and Reinvestment Act (ARRA). The following section from ARRA is repeated in State Action Sheet 3 and Jurisdiction Action Sheet 2, and could be utilized by state organizations when notifying code-enforcing jurisdictions of their responsibilities.

ARRA, Title IV, HR1-33

The State, or the applicable units of local government that have authority to adopt building codes, will implement the following:

(A) A building energy code (or codes) for residential buildings that meets or exceeds the most recently published International Energy Conservation Code, or achieves equivalent or greater energy savings.

(B) A building energy code (or codes) for commercial buildings throughout the State that meets or exceeds the ANSI/ASHRAE/IESNA Standard 90.1–2007, or achieves equivalent or greater energy savings.

(C) A plan for the jurisdiction achieving compliance with the building energy code or codes described in subparagraphs (A) and (B) within 8 years of the date of enactment of this Act in at least 90 percent of new and renovated residential and commercial building space. Such plan shall include active training and enforcement programs and measurement of the rate of compliance each year.

There are two key routes through the Guide

Route Number 1:

The Guide provides the state agency or organization that is responsible for statewide compliance certification a set of action sheets to guide them through implementation of a statewide compliance process.

Route Number 2:

The Guide provides a step-by-step process and action sheets that a code jurisdiction can use to achieve quality and consistency in compliance.

Part 1 (Continued)

Resources

1. To access this CIE Guide http://www.energycodes.gov/sites/default/files/documents/ia_cie_guide.pdf
2. Measuring State Energy Code Compliance, U.S. Department of Energy, Energy Efficiency & Renewable Energy, Building Technologies Program, March 2010 (compliance evaluation procedures and methodologies) http://www.energycodes.gov/compliance/evaluation/MeasuringStateCompliance.pdf
3. To download the current versions of RES*check*™ and COM*check*™: http://www.energycodes.gov/compliance/tools
4. To access the Building Energy Codes Program (BECP) residential and commercial data collection checklists: http://www.energycodes.gov/compliance/evaluation/checklists
5. To log in to Score+Store: https://energycode.pnl.gov/ScoreStore/login
6. To access the BECP home page: http://www.energycodes.gov/
7. To view the Building Codes Assistance Project (BCAP) Online Code Environment & Advocacy Network (OCEAN) Regional Energy Efficiency Organizations website: http://energycodesocean.org/regional-energy-efficiency-groups. These groups can offer key assistance and sometimes energy code funding or funding strategies for states.
8. To go to BCAP's online code environment and advocacy network: http://energycodesocean.org/

Part 1 (Continued)

Addressing Specific State Challenges

This section addresses challenges and issues surrounding energy codes that are state specific.

1. The International Energy Conservation Codes are written in cycles as a family of codes. Adopting different editions of the codes for residential versus commercial can be a challenge.
2. Adopting codes with state amendments.
   - Stringency, cost, and energy savings.
   - Supporting tools and resources available.
3. Creating a monitoring plan to ensure jurisdictions are actually doing the compliance requirements.
4. Using Score+Store.
5. Accountability.
6. Consistency in compliance can be a challenge.
7. Implementation planning.
8. Marketing and outreach of the plan.

Part 2
State Actions

This section of the Guide identifies seven state-level actions that can be utilized to guide a state or responsible agency through a process of statewide compliance.

Each of the seven actions in this section reference an action sheet that can be found under the State Action Tab.

1. Code Administration and the State Role in Compliance

State Action Sheet 1 (SAS 1) is a high-level discussion of the value and importance of energy codes and the rationale for compliance within your state. It also includes an explanation of the possible code administration processes that can be developed at a state level for assuring more consistent statewide code administration practices that are supportive of energy codes.

2. Formation of Statewide Energy Code Collaborative

State Action Sheet 2 (SAS 2) lays out a process for an energy code collaborative formation.

Many states are embracing a collaborative approach to energy code compliance. One advantage of this approach is that it provides a means and process to encourage industry and other stakeholder discussion on the issues surrounding code compliance. By placing the challenges and issues on the proverbial table, state agencies can more effectively facilitate solutions and approaches to compliance.

3. Compliance Approaches

State Action Sheet 3 (SAS 3) takes Action Sheet 1 to the deeper level of application. It addresses some available strategic compliance options for state agencies. Tactical-level options that may be used by jurisdictions for plan review and inspection, and by industry in submittal to jurisdictions, can be found under Jurisdiction Action Sheets 3 through 8.

4. Program Evaluation

State Action Sheet 4 (SAS 4) discusses specific evaluative approaches that can be used to assess compliance levels.

5. Rating a Building for Compliance—Using the Checklists and Score+Store

State Action Sheet 5 (SAS 5) provides rationale for use of the BECP-developed online tool for energy code compliance documentation.

6. Marketing and Outreach

State Action Sheet 6 (SAS 6) provides guidance for energy code messaging for states.

Maintenance and quality assurance of the code is dependent to a degree on the buy-in of the public, the building and design industry, the regulatory authority, and the promulgating authority. Whether or not identified as a formal part of the traditional code adoption and implementation process, some level of marketing and outreach is always prevalent during energy code development.

7. Education and Training

State Action Sheet 7 (SAS 7) discusses education and training needs and provides a process for building a statewide program. Though not always thought of as a formal part of the adoption and compliance processes, education and training is typically part of a traditional code adoption process and is always a necessary component for successful code implementation and compliance.

Part 3
Jurisdiction Actions

This section of the Guide identifies nine jurisdiction-level actions that can be utilized to guide code enforcement jurisdictions and the design and construction industry, residential and commercial, through a consistent compliance process.

Each of the nine actions in this section reference an Action Sheet that can be found under the Jurisdiction Action Tab.

1. Administration

Jurisdiction Action Sheet 1 (JAS 1) provides a process to assist jurisdictions in the creation of a consistent and reliable code program.

2. Compliance Role

Jurisdiction Action Sheet 2 (JAS 2) answers questions about why and how compliance requirements apply to individual jurisdictions, what their roles might be, and how to proceed in the process of determining compliance with the 2009 IECC.

3. Submittal Guideline–Commercial

Jurisdiction Action Sheet 3 (JAS 3) provides examples of items that should be included in a commercial submittal guideline that is given to designers and contractors so they know what items need to be included on or with the plans submitted for permitting.

4. Submittal Guideline–Residential

Jurisdiction Action Sheet 4 (JAS 4) provides examples of items that should be included in a residential submittal guideline that is given to designers and contractors so they know what items need to be included on or with the plans submitted for permitting.

5. Residential Envelope and Duct Leakage Testing Protocol

Jurisdiction Action Sheet 5 (JAS 5) provides the protocol required by the 2009 IECC for

conducting and reporting blower door testing (IECC Section 402.4.2.1) and/or duct leakage testing (Section 403.2) when required by the code or the jurisdiction. It also provides a visual inspection checklist option (Section 402.4.2.2) for envelope air leakage.

6. Plan Acceptance Review

Jurisdiction Action Sheet 6 (JAS 6) lists the different items that should take place at plan review to not only determine compliance with the IECC and ASHRAE Standard 90.1 but also to assist in determining overall state compliance.

7. Inspection

Jurisdiction Action Sheet 7 (JAS 7) lists the various items that should be inspected to not only determine compliance with the IECC but also to assist in determining overall state compliance.

8. Re-Inspections

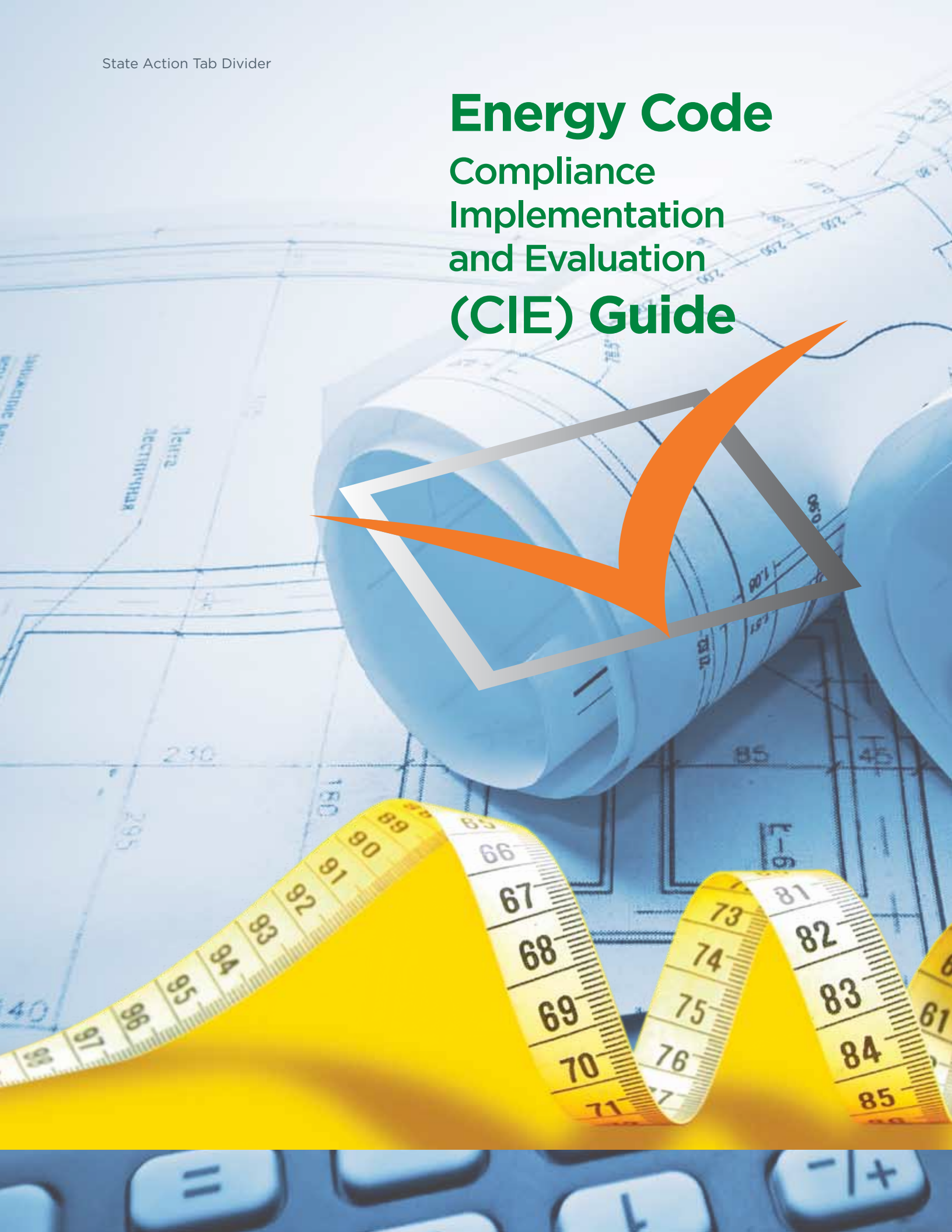
Jurisdiction Action Sheet 8 (JAS 8) examines the steps that should take place in documenting any changes in previous inspections status and/or compliance in order to prepare for entering items into the Score+Store tool.

9. Rating a Building for Compliance—Using the Checklists and Score+Store

Jurisdiction Action Sheet 9 (JAS 9) provides direction for users of the BECP-developed checklists and online tool for energy code compliance documentation.

State Action Tab Divider

Energy Code Compliance Implementation and Evaluation (CIE) Guide



Notes

State Action Sheet 1 (SAS 1)

Code Administration and the State Role in Compliance

Overview

The current economic, environmental, and energy security challenges facing our nation make the achievement of greater energy savings a major priority. "Energy savings" can be defined from several perspectives; most prominently, these include lessening costs, carbon emissions, and dependence on foreign oil. Because buildings use roughly 40% of our nation's energy, activities related to building energy codes and standards represent a key factor for achieving energy savings and the corresponding benefits to the nation.

Bottom line, energy codes are one of the lowest cost resources for gaining energy efficiency. By choosing to adopt and comply with the IECC or ASHRAE Standard 90.1, state agencies and jurisdictions bolster economic development and help to assure homebuyer value for generations.

ARRA has placed the responsibility on states that have received stimulus monies, after providing written assurances to DOE. They have until the year 2017 to show that the state as a whole is 90% compliant with the 2009 IECC and ASHRAE Standard 90.1-2007. Under contract with DOE, BECP is working with a number of states to develop state compliance guides that will assist in meeting the 90% compliance target.

The 2009 IECC and ASHRAE Standard 90.1-2007 are referred to as the "target codes" against which compliance is measured. Even after the 90% compliance rate is demonstrated, states may want to continue their efforts to monitor code compliance in order to continue achieving the benefits associated with compliance.

Changes in building department staff and processes, as well as changes in builders, designers, and contractors, make periodic evaluations a necessity to assure continued high energy code compliance rates. This is supported through jurisdictional evaluations performed over past years. Such evaluations have demonstrated that changes yield consequences that are not always in a positive direction, and can depend on many variables that require ongoing review to understand and address.

What State Agencies Can Do

The administration of code programs is inclusive of multiple components that states can consider, including:

1. How and when codes are adopted
2. The process developed and utilized for plan review and inspection and the interaction between the two
3. Code messaging
4. Continuing education and training for jurisdictional staff
5. Continuing education and training for the design and construction industry.

The state agency responsible for code compliance can assist on-the-ground jurisdictional compliance through development of consistent models that can be adopted by enforcing jurisdictions.

Here's how:

1. Develop a model ordinance that can be followed for code adoption. Many good ordinances probably already exist within the state. A review of existing ordinances within progressive large, midsize, and small jurisdictions should reveal the critical approaches and language required for adoption. The IECC includes a sample ordinance for adoption.
2. Make sure that enforcing jurisdictions are represented on the state's energy code collaborative (see State Action Sheet 2 for a step-by-step approach to collaborative formation). Most states have one or more building official associations. Ensure that representatives from these organizations are invited and encouraged to participate in collaborative efforts.
3. The jurisdiction action sheets are designed to provide structure and consistency to jurisdiction enforcement activities. Ensure that each enforcing jurisdiction within your state receives hard copies and access to the online jurisdiction action sheets.
4. Develop a marketing and messaging plan that supports compliance at the jurisdictional level (see State Action Sheet 6).
5. Consider using a portion of your state energy program dollars for energy code education and training. Pursue available training opportunities. Frequently check for training and events online at http://www.energycodes.gov/events/.

State Action Sheet 2 (SAS 2)

Formation of Statewide Energy Code Collaborative

Step 1: Assemble a Collaborative Formation Group

- ❑ 1. Identify Formation Group members—a small like-minded group that has a known interest in compliance. This initial FORMATION GROUP takes on the responsibility to initiate a collaborative but this is NOT the collaborative.
- ❑ 2. Set date and invite Formation Group members to a coordination meeting.
- ❑ 3. Meet with the Formation Group and: (1) brainstorm potential stakeholders that need to be involved; (2) organize a first collaborative meeting—get potential dates, times, locations; (3) put together agenda for the first Codes Collaborative meeting.

The meeting purpose explains why you are meeting.

The meeting outcome explains what you hope to achieve.

Step 2: Prepare for the Meeting

- ❑ 1. Develop a meeting agenda with a clear purpose and clear outcome.
- ❑ 2. If funding allows, enlist the aid of a professional and experienced facilitator to help develop the agenda. The facilitator will facilitate the first Codes Collaborative meeting.
- ❑ 3. Try to set a meeting time, date, and location that you know will work for interested parties.
- ❑ 4. Consider a neutral location for the meeting such as a city or county meeting room—or possibly the homebuilder association meeting space.

Step 3: Invite Interested and Crucial Representatives

- ❑ 1. Although you don't want to exclude, you may want to limit the number of representatives from each group to those who want or need to have a voice in energy code compliance. Look for those groups or individuals that have a position on energy codes, or a group that has expressed an interest in energy codes. For example, you may invite two representatives from each of these sectors:
  - State agencies responsible for code implementation
  - Builder groups

If you think there is a group or individual representing a group of interests that would derail the collaborative, MAKE SURE TO INCLUDE THEM. Consider hosting the meeting at their facility, and ask them to invite their member representatives.

- Energy code advocates
- Architect and engineer associations
- Consumer protection groups
- Building official associations
- City and county associations
- Technical experts (International Code Council, energy raters)
- Universities
- Environmental protection groups

❏ 2. To help increase attendance, consider asking a neutral but known party to extend the meeting invite.

Step 4: Prepare for the Meeting—Understand Key Issues

❏ Identify the KEY ISSUES on the agenda. You should know what the FORMATION GROUP key issues are before going into the meeting.

- A key issue may be something like: "Knowing that code compliance is a key issue to the DOE, and that our Governor has agreed to achieving 90% compliance to the 2009 IECC and ASHRAE Standard 90.1-2007, what can we do as a group to assure good compliance? In what time period? How will we know when we get there?"

Step 5: Initiate the Meeting

❏ Initiate the meeting.

- Use a professional facilitator if possible.
- Follow your meeting process.
- Remember to be clear about purpose and outcome. For example, "PURPOSE: We are here to discuss key energy code compliance issues;" "OUTCOME: We would like to establish an ongoing collaborative to discuss compliance issues."
- Seek separation of POSITIONS from INTERESTS.

INSIGHTS

Be fair and be clear. If you plan to have two representatives per organization from your FORMATION GROUP, allow other groups to send two representatives.

This may be the one and only key issue for your first meeting. Discussion on this could be your entire first agenda.

Keep the first meeting short.

You may not be a working TEAM yet but seek some level of agreement to continue working together.

You do not need to call yourself a collaborative.

You do need to keep the first meeting positive and outcome oriented.

Set rules: (e.g., Listen to everyone and speak only when it's your turn).

Holding the meeting over a sponsored breakfast or lunch works.

A POSITION is "the energy code is out-pricing buyers from the market."

An INTEREST is "we want to make sure that the energy code doesn't make homes so expensive that people can't afford to buy new homes."

Step 6: Formalize the Collaborative

- ❑ Following the first collaborative meeting, confirm the establishment of the collaborative. Thank members for their contribution to the state.
- ❑ Identify who will lead the collaborative going forward, or at least set upcoming meeting dates.

Step 7: Set up a Second Meeting

- ❑ How much time after the first one? How regular should the meetings be in the first year? After that is it on an "as-needed" basis (once "performing" is achieved)?

◀ You will not move forward until you find common interest, goals, and objectives, and then begin to move toward achieving those objectives.

Step 8: Set Performance Objectives

- ❑ Determine your compliance goals (e.g., percentage of compliance desired, quality of workmanship desired).
- ❑ Determine key issues for future meetings. For example, how will you measure compliance? What is the cost, and who pays?
- ❑ Determine the key players in achieving code compliance: code jurisdictions, designers, builders, subcontractors, etc.
  - Where does ultimate responsibility or authority lie?

◀ Performance objectives should clearly indicate who will do what by when, what will it cost, and how it will be measured.

Step 9: Normalize and Seek to Perform

- ❑ Meet every few months for the first year, then on an as-needed basis thereafter.
- ❑ When one individual from an organization drops out, another from that organization can be identified.
  - If the organization chooses to stop participating, another organization from that sector (code official, builder, etc.) should be identified by the group.

State Action
Sheet 3 (SAS 3)

Compliance Approaches

The State Level Compliance Approach

ARRA has placed the responsibility on states that have received stimulus monies, after providing written assurances to DOE. They have until the year 2017 to show that the state as a whole is 90% compliant with the 2009 IECC and ASHRAE Standard 90.1-2007.

ARRA, Title IV, HR1-33

(2) The State, or the applicable units of local government that have authority to adopt building codes, will implement the following:

> *(A) A building energy code (or codes) for residential buildings that meets or exceeds the most recently published International Energy Conservation Code, or achieves equivalent or greater energy savings.*
>
> *(B) A building energy code (or codes) for commercial buildings throughout the State that meets or exceeds the ANSI/ASHRAE/IESNA Standard 90.1–2007, or achieves equivalent or greater energy savings.*
>
> *(C) A plan for the jurisdiction achieving compliance with the building energy code or codes described in subparagraphs (A) and (B) within 8 years of the date of enactment of this Act in at least 90 percent of new and renovated residential and commercial building space. Such plan shall include active training and enforcement programs and measurement of the rate of compliance each year.*

What role should states play in 90% compliance? At a minimum the state needs to act as a statewide facilitator of compliance.

Table 3-1 examines three possible approaches, along with process and challenges, that could be utilized within a state for demonstrating 90% compliance to the 2009 IECC and ASHRAE Standard 90.1-2007. As you can see, every approach has challenges that must be addressed. Remember, ARRA requires only a plan for achieving compliance. There are many more approaches. This will make a great topic for your collaborative.

Table 3-1. Compliance approaches

OPTION	PROCESS	CHALLENGES
A state-designated agency assumes responsibility for statewide compliance.	Agency notifies statewide jurisdictions to evaluate compliance. Jurisdictions use BECP checklists and enter data in Score+Store. State agency produces quarterly reports based on statewide data.	Convincing jurisdictions to upload data to Score+Store. It should be noted that in the near future, RES*check* and COM*check* will produce the Score+Store checklist so one checklist will work for all applications.
The state assumes co-responsibility for statewide compliance with code enforcement jurisdictions such as cities and counties.	This may be the best approach. The state and local jurisdictions work together to develop a mutually agreed upon approach for determining compliance.	If this approach does not utilize Score+Store, the state should be prepared to make the case for the evaluation methodology.
Code permitting jurisdictions are required by the state to utilize BECP's checklists and to independently enter data in the online compliance database, Score+Store.	If the state has authority over cities and counties on code compliance, this is a direct approach where permitting jurisdictions are required to participate.	This option doesn't work in many home rule states. This approach puts most of the compliance burden on the permitting jurisdiction. Funding continues to be an issue but now it is a local manpower issue.

State Action
Sheet 4 (SAS 4)

Program Evaluation

This action sheet provides state agencies a concise set of directions for evaluation of statewide compliance to the energy codes.

Evaluation is one of the most critical components to ensuring continued improvement in energy code compliance.

If you do not have a consistent program for evaluation of statewide compliance, you will not know where code measures are implemented successfully and where measure and process improvements are needed.

An evaluation of compliance requires the availability of individuals or entities to gather relevant information concerning compliance. There are a number of approaches that may be used for determining compliance, but we suggest that the best approach is one that is a partnership of the state and code-enforcing jurisdictions. Here is the process.

1. Make sure to form a statewide energy code collaborative (see State Action Sheet 2 for details). One of the first areas of collaborative focus can be the issue of compliance – how do you measure, who needs to be involved, when will you begin, and how will you know when you get there? These questions should be discussed with the collaborative with a statewide compliance evaluation process as the outcome.
2. Perhaps the best outcome, one that you can steer the collaborative toward, would be for enforcing jurisdictions to utilize the plan review and inspection checklists for plan submittals and building inspections. The jurisdiction would then upload each building into the Score+Store online database: https://energycode.pnl.gov/ScoreStore/login.
   a. At the very least, you want the larger statewide jurisdictions using the BECP checklists and uploading data.
   b. BECP is currently incorporating the Score+Store checklist into RES*check* and COM*check*. This means that the software will create the very checklists that are needed for showing energy code compliance.
   c. Remember, code-adopting jurisdictions have responsibilities under ARRA (see State Action Sheet 3 or Jurisdiction Action Sheet 2 for more information).
3. BECP can provide the state agency online access to all jurisdictional submitted data. Anonymity is provided to the individual jurisdictions. The state agency can choose to review the data quarterly or twice yearly as a means of determining compliance and as a method of assessing where assistance and training are necessary.
4. Compile compliance data at least once each year and report progress to DOE.

State Action Sheet 5 (SAS 5)

Rating a Building for Compliance

Step 1: Using BECP's Compliance Checklists

- ❑ 1. Read State Action Sheet 3 for information regarding a jurisdiction's responsibility for showing compliance. If you feel that city and county jurisdictions share responsibility for compliance documentation, work with them to provide guidance and expectations as well as education.
- ❑ 2. Download compliance checklists at: http://www.energycodes.gov/compliance/evaluation/checklists.
- ❑ 3. To better understand the state role in statewide 90% compliance sampling, go to the BECP website and generate a residential and commercial sample for your state and counties: https://energycode.pnl.gov/SampleGen.

Step 2: DOE's Score+Store tool

Once you have gathered raw compliance data, the question becomes: how should this information be analyzed and used? At this stage, data for individual buildings and populations come together to generate an overall state compliance metric. States may use BECP's Score+Store tool. While overall compliance can be determined manually for individual buildings and groups of renovations, this tool provides automated building scores and statewide consolidation of data. Individual building scores will remain confidential, but this effort will shed valuable light on nationwide compliance.

Don't waste your staff's valuable time sorting through paper checklists to determine compliance. Instead, enter raw data into BECP's Score+Store tool at https://energycode.pnl.gov/ScoreStore/login.

State Action
Sheet 6 (SAS 6)

Marketing and Outreach

Marketing and outreach are a distinct component of energy code compliance. Similar to education and training, marketing and outreach provide support that can deliver the assurance that energy codes add value to our communities.

What should we know about marketing and outreach?

1. They can be used as an integral component of the energy code compliance process, providing consistent messaging on energy code purpose and expected outcomes.
2. Marketing and outreach can be the underlying structure or basis for all dialogue, discussion, education, and training that is purposefully initiated or generated in support of the code.
3. Remember that, as code proponents, whenever we speak about the energy code we are providing a message on behalf of all proponents.
4. The genesis of a code messaging and informational support structure is a marketing and outreach plan. Developing a plan is one of the first steps that should be taken when looking to adopt an energy code. Consider hiring professional support for development of a marketing and outreach plan and messaging materials.
5. Marketing and outreach are not one sided. They should include an approach for soliciting feedback from the stakeholders and entities impacted by the energy code, and they should include an approach for soliciting or assessing the value that the energy code provides to those affected parties such as building owners, the construction industry, code jurisdictions, and utilities. (Examples are surveys and workshops.)
6. Marketing and outreach set us on a path to proactively and continuously learn from our energy code endeavors and to improve our communications regarding the code.
7. Marketing and outreach need to have a multi-focal approach that is based on the phase of energy code enactment. During adoption, marketing and outreach messaging may best be broadly focused. For example, engaging early recognition of a new energy code and providing consistent information on the adoption process and on the value the code will provide to adopting entities and stakeholders. During post-adoption and implementation, marketing and outreach continue to provide consistent messaging, develop a value loop soliciting feedback for continuous improvement, and develop new supporting material such as case studies. The real purpose of marketing and outreach at this phase are to generate a collaboration of energy code compliance support and to engage a process for feedback that ultimately leads to better voluntary code compliance.

To sum it up, marketing and outreach are the communication strategy that is developed, delivered, and deliberately tailored to support consistent understanding of the energy code intent.

It is a dynamic approach to messaging and learning with the purpose of supporting the energy code through all phases of enactment.

Three outreach sheets that were developed for Idaho are provided as examples. Please feel free to duplicate and brand this information for your state. Ensure that these documents are distributed by providing them to your state associations of cities and counties and to code enforcement jurisdictions for distribution to members and permittees.

1. Action Sheet 6.1: Elected Officials (Idaho Example)
2. Action Sheet 6.2: Homebuilders (Idaho Example)
3. Action Sheet 6.3: Homeowners (Idaho Example)

Idaho Energy Code Guide for Elected Officials

Ensuring quality construction and efficient homes that save money.

On January 1, 2011, the state of Idaho adopted the 2009 International Energy Conservation Code (IECC). Every new home in Idaho is required to meet these minimum standards. **What does this mean for YOU, an elected official?** This guide will help you identify the aspects of a home that meet Idaho's energy code, which saves consumers money, creates jobs and protects Idaho residents by increasing home values and ensuring health and safety.

The energy used in buildings impacts our communities because buildings account for over 40% of total energy use in the United States, which is more than transportation.[1] Energy requires expensive infrastructure and the cost of energy is rising - electric utilities typically increase by 3% per year. **Energy efficiency—through the adoption and enforcement of strong building energy codes—is the quickest, cheapest and cleanest way to reduce energy consumption.**

How does Idaho's energy code save consumers money?

A home built to the new energy code standards saves money every month and has the potential for a higher resale value. The average American spends $2,200 on annual energy bills.[2] The 2009 IECC is designed to reduce energy use by 10-15% compared to the 2006 IECC, which saves each Idahoan family $220 – $330 per year. More energy-efficient homes also result in higher home resale value potential, and the ROI (return on investment) is typically less than one year! **It is simply more cost effective to build a home that meets the energy code now than to try and improve its efficiency later through expensive retrofits.**

How does Idaho's energy code create jobs and stimulate our state economy?

Consumers can bolster the local economy with money saved from reduced energy bills. Businesses can transfer savings to production and investment in our state economy. And, jobs are created as the market for skilled labor increases for heating and cooling mechanics, insulation contractors, duct and building leakage professionals, energy auditors and weatherization specialists.

A study by the Idaho Department of Labor in 2011 identified the green occupation with the most projected green employment in 2018 is a heating, air conditioning and refrigeration mechanic and installer. **Energy codes in Idaho directly affect the demand for these jobs now and in the future.**

How does Idaho's energy code protect Idaho residents?

Building for energy efficiency also results in superior quality of construction, improved comfort and enhanced indoor and outdoor air quality. Inadequate insulation and air leakage are leading causes of energy waste in most homes, as well as cause moisture and mold problems. Mold is a major trigger of asthma, which affects over 104,000 children and adults in Idaho. And, recent increases in asthma prevalence seem to coincide with worsening air quality conditions throughout the state.[3] Energy use directly correlates with emissions that pollute our air. **Idaho residents have a right to a home that meets national standards for energy efficiency and protects our air quality.**

For more information on energy codes, you can go to www.idabo.org/energy.htm or http://bcap-ocean.org/energycodes101.

Idaho Energy Code Guide for Elected Officials

Ensuring quality construction and efficient homes that save money.

Updating codes on a regular basis, typically every three years, with the cycle established by the International Code Council ensures that jurisdictions have support from a national level, *which conserves resources on a state and local level.*

Overview of the minimum standards to meet Idaho's energy code:

- ☐ Energy certificate signed by the builder and posted on the circuit breaker – Evidence of the energy-efficient features of the home
- ☐ Air sealing of all holes between floors and through walls and around windows, doors and fireplaces – Critical for comfort, air quality and energy efficiency
- ☐ High-efficiency light bulbs such as compact fluorescents (CFLs) or LEDs in at least 50% of permanent light fixtures – CFLs use about 75% less energy than incandescent bulbs!
- ☐ Windows have a U-factor of 0.35 or less – Enjoy light and views while saving on utility bills
- ☐ Heating and cooling systems are properly sized and meet minimum levels of efficiency (SEER, AFUE and HSPF) – HALF of a typical energy bill comes from heating and cooling!
- ☐ Water heaters have a minimum energy factor (EF)
- ☐ Insulation meets minimum R-values and is installed per manufacturer's specifications in walls, ceiling and floors – Properly installed insulation will blanket the home for more constant temperatures
- ☐ All ducts and air handlers are sealed with mastic (duct tape is not permitted) and insulated if in unconditioned space such as a non-heated crawlspace or attic – Proper duct sealing optimizes the home's comfort delivery system
- ☐ If any ductwork is located in unconditioned space, then a DuctBlaster test is required to measure air leakage – designing duct systems entirely within conditioned space is a best practice

Idaho's energy code saves consumers money, creates jobs and protects Idaho residents by increasing home values and ensuring health and safety.

1 U.S. Energy Information Administration (2008)
2 Lawrence Berkely National Laboratory (2009)
3 "Asthma in Idaho", Idaho Department of Health and Welfare (2009)

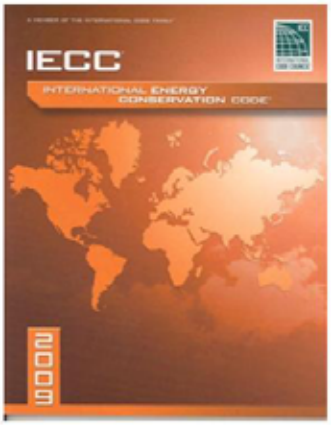
For more information on energy codes, you can go to www.idabo.org/energy.htm or http://bcap-ocean.org/energycodes101.

Idaho Energy Code Checklist for Homebuilders

Ensuring quality construction and efficient homes that result in a competitive advantage.

On January 1, 2011, the state of Idaho adopted the 2009 International Energy Conservation Code (IECC). Every new home in Idaho is required to meet these minimum standards. **What does this mean for YOU, the builder?** This checklist will help you identify the aspects of a home that meet Idaho's energy code and protect you against the risk of call backs and improve your bottom line.

Energy codes save money and resources.



A home built to the new energy code standards saves homeowners money in heating and cooling their homes and has the potential for a higher resale value. The average breakeven point for upgrading to the new energy code is only 11 months! If a home is built to last 100 years, this is 99 years of positive return on investment and savings for the homeowner.

Energy codes reduce risk for builders and improve the quality, safety and durability of homes.

Building for energy efficiency results in improved comfort and enhanced indoor air quality, which reduces callbacks and improves your bottom line. Inadequate insulation and air leakage are leading causes of energy waste in homes, and cause moisture and mold problems. Duct sealing requirements reduce the potential for HVAC backdrafting that can lead to carbon monoxide poisoning. Proper design and sizing of the HVAC system ensures that equipment works properly and is less likely to malfunction.

Statewide energy codes create a uniform standard between jurisdictions and reduce builder liability.

Builders with projects in multiple jurisdictions find compliance easier when the codes are the same statewide. This enables builders to streamline operations and save time and money. Energy codes are typically updated every three years, and training and other resources are provided by NEEA, DOE and ICC (Northwest Energy Efficiency Alliance, Department of Energy and the International Code Council). **Training is usually free and is posted on www.idahocities.org and www.idabo.org.**

For more information on energy codes, you can go to www.idabo.org/energy.htm or http://bcap-ocean.org/energycodes101. Code books can be ordered from www.iccsafe.org. Training materials are available from www.kenergy.us and www.northwestenergystar.com.

page 1

Idaho Energy Code Checklist for Homebuilders

Ensuring quality construction and efficient homes that result in a competitive advantage.

Overview of the 2009 IECC Energy Code Requirements

Compliance is required on all new homes, new additions and in certain situations for renovations. There are exceptions for historic buildings, low-energy use homes and some alterations when energy use does not increase.

Energy Certificate - Evidence of the energy efficient features of the home

ENERGY CODE COMPLIANCE CERTIFICATE - CLIMATE ZONE 5

This home was built under the 2009 IECC (International Energy Conservation Code), which was adopted by the State of Idaho on January 1, 2011.

Home Address: _____

☐ New Construction ☐ Addition ☐ Remodel

Insulation R-Values (check applicable boxes below)		Code	My Home
Ceiling/Roof	Flat	R-38	
	Vaulted or Raised Heel	R-30	
Wood Frame Walls	Above Grade	R-20	
	Below Grade (Basement)	R-10/13	
Crawlspace Wall	Conditioned	R-10/13	
Floor	Over Unheated Space	R-30	
	Slab Perimeter or Under Slab (Unheated)	R-10	
	Slab Perimeter or Under Slab (Heated)	R-10 + R-5	
Windows	NFRC U-Factor Rating	0.4-0.65	
	SHGC Rating	N/R	
Water Heater	Gas Tank/Tankless Energy Factor (EF)	0.67 / 0.62	
	Electric Tank/Tankless Energy Factor (EF)	0.97 / 0.93	
Heating Equipment	Gas Furnace	78% AFUE	
	Heat Pump	7.7 HSPF	
Cooling Equipment	Gas or Electric Air Conditioner	13 SEER	
	Heat Pump	13 SEER	
Ductwork	Air Sealing of Ductwork (Mandatory)		
If supply ducts in non-conditioned attic, then R-Value		R-8	
Any other ducts in non-conditioned space, then R-Value		R-6	
	Duct/Blower Test (rough-in @25 pascals)	[illegible]/100ft²	
Envelope Air Sealing	Visual Inspection		
	Blower Door Performance Test	7.0 ACH_{50}	

Signing below certifies compliance with the 2009 IECC.

Builder Name: _____

Company: _____ Permit # _____

This certificate must be permanently affixed to the electrical panel in the home as required by the 2009 IECC Section 401.3.

Est. 1958

☐ The energy certificate located on the circuit breaker is completed and signed by the builder.

☐ This certificate lists prescriptive requirements for meeting the energy code. An alternative compliance method is to use RES*check* (http://www.energycodes.gov) or a HERS Index (http://www.resnet.us), which estimate the overall energy performance of the home. Many jurisdictions in Idaho require a RES*check* report. It allows you to trade-off between envelope components such as wall R-value and window U-factor, but mechanical trade-offs are no longer allowed.

Air Sealing – Critical for comfort, air quality and energy efficiency

☐ All joints and seams along with holes between the inside and outside of the home have been sealed with caulk, foam or weatherstripping. Examples include:

- Openings between window and door assemblies and their respective jambs and framing
- Walls and ceilings separating the garage from conditioned spaces
- Where electrical, phone and cable wires enter the home
- Where plumbing goes through walls, floors and ceilings
- Dropped ceilings or chases adjacent to the thermal envelope
- Knee walls
- Behind tubs and showers on exterior walls
- Common walls between dwelling units
- Attic access openings
- Rim joist junctions

REScheck Software Version 4.4.1

Compliance Certificate

☐ Wood-burning fireplaces have doors with gaskets.

☐ Recessed lighting fixtures are IC rated and sealed with gasket or caulk when located between conditioned and unconditioned space.

☐ Builders are required to either submit to a visual inspection of the air sealing package or to show the building jurisdiction compliance through use of an air leakage test such as Blower Door™. This performance test is the most effective way to evaluate air leakage. Code requires a test result of 7 ACH_{50} (air changes per hour) at a 50 Pascal pressure differential (think of a 20 MPH wind) or lower.

For more information on energy codes, you can go to www.idabo.org/energy.htm or http://bcap-ocean.org/energycodes101. Code books can be ordered from www.iccsafe.org. Training materials are available from www.kenergy.us and www.northwestenergystar.com.

page 2

Idaho Energy Code Checklist for Homebuilders

Est. 1958

Ensuring quality construction and efficient homes that result in a competitive advantage.

Energy-Efficient Lighting - CFLs use about 75% less energy than incandescent bulbs!

- [ ] High-efficiency light bulbs, such as compact fluorescents (CFLs) and LEDs, are installed in at least 50% of the permanent light fixtures.

CFL Bulb

Windows - Enjoy light and views while saving on utility bills

- [ ] Windows have an average U-factor of 0.35 or less. Skylights have a U-factor of 0.60 or less. This can be found on the NFRC sticker attached to new windows. It is important that builders leave the NFRC labels on windows for inspectors and homeowners.

World's Best Window Co.
Millennium 2000®
Vinyl-Clad Wood Frame
Double Glazing • Argon Fill • Low-E
Product Type: Vertical Slider
(per NFRC 100-97)

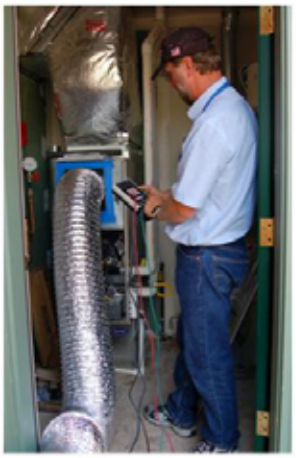
ENERGY PERFORMANCE RATINGS	
U-Factor (U.S./I-P) 0.35	Solar Heat Gain Coefficient 0.32
ADDITIONAL PERFORMANCE RATINGS	
Visible Transmittance 0.51	Air Leakage (U.S./I-P) 0.2

NFRC Sticker

Heating and Cooling - HALF of a typical energy bill comes from heating and cooling

- [ ] Minimum federally prescribed efficiencies are met on all heating and cooling systems.
- [ ] Heating and cooling systems are required to be properly sized using Manual J, S and D or equivalent.
- [ ] Forced-air furnaces must have a programmable thermostat with initial set points no higher than 70° for heating and no lower than 78° for cooling.

Programmable Thermostat



Ducts - Proper duct sealing optimizes the home's comfort delivery system

- [ ] All ducts and air handlers are sealed with mastic (duct tape is not permitted). Detail on proper duct sealing can be found in the IRC, Section M1601.4.1.
- [ ] If ducts are located in an unconditioned attic, crawlspace or garage, then ducts are insulated with R-6 or higher (R-8 for supply ducts in the attic).
- [ ] If any ductwork is located in unconditioned space such as a garage, crawlspace or attic that is not heated, then it is required to measure air leakage through a Duct Blaster® test.

For more information on energy codes, you can go to www.idabo.org/energy.htm or http://bcap-ocean.org/energycodes101. Code books can be ordered from www.iccsafe.org. Training materials are available from www.kenergy.us and www.northwestenergystar.com.

page 3

Idaho Energy Code Checklist for Homebuilders

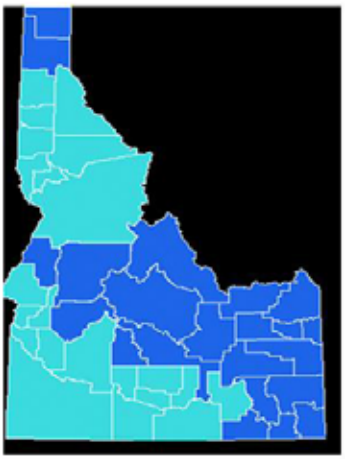
Ensuring quality construction and efficient homes that result in a competitive advantage.

Insulation - Properly installed insulation will blanket the home for more constant temperatures

Wall Insulation

- ☐ Insulation R-value measures the level of resistance to heat transfer. The higher the better.
- ☐ Walls are insulated to R-20 or higher in all climate zones in Idaho.
- ☐ Ceilings are insulated to R-38 or higher in climate zone 5 and R-49 or higher in climate zone 6. If there is blown-in insulation in the attic, then there are markers to indicate the depth of insulation.
- ☐ Floors over an unconditioned (not heated) crawlspace are insulated to R-30 or higher.
- ☐ Perimeter walls of a conditioned crawlspace are insulated to R-10/13, R-10 (continuous) or R-13 (cavity), AND have a vapor retarder across the ground and securely taped to the crawlspace walls.
- ☐ Basement walls are insulated to R-10/13 in climate zone 5 and R-15/19 in climate zone 6.
- ☐ Slab edge is insulated to R-10 that extends 2 ft in climate zone 5 and 4 ft in climate zone 6. If the slab is heated, then add R-5.
- ☐ Insulation is installed per manufacturer's specifications in walls, ceiling and floors.
- ☐ When insulation is blown or sprayed into walls and ceilings, builders must provide a certificate listing the type, manufacturer and R-value of the insulation. The insulation installer must sign, date and post the certificate on the job site.

Idaho Climate Zones - Aqua is climate zone 5 and blue is climate zone 6



- ✔ *A home built to the new energy code standards saves homeowners money in heating and cooling their homes and contributes towards a higher resale value.*
- ✔ *Energy codes reduce risk for builders and improve the quality, safety and durability of homes.*
- ✔ *Building for energy efficiency results in improved comfort and enhanced indoor air quality, which reduces callbacks and improves your bottom line.*
- ✔ *Meeting or exceeding national standards for energy efficiency, which are updated every three years, creates a competitive advantage.*

For more information on energy codes, you can go to www.idabo.org/energy.htm or http://bcap-ocean.org/energycodes101. Code books can be ordered from www.iccsafe.org. Training materials are available from www.kenergy.us and www.northwestenergystar.com.

page 4

Idaho Energy Code Checklist for Homeowners

Est. 1958

Ensuring quality construction and efficient homes that save you money.

On January 1, 2011, the state of Idaho adopted the 2009 International Energy Conservation Code (IECC). Every new home in Idaho is required to meet these minimum standards. ***What does this mean for YOU, the homeowner?*** *This checklist will help you identify the aspects of your home that meet Idaho's energy code and protect your investment.*

Energy Certificate - Evidence of the energy efficient features of your home

- ☐ The energy certificate is located on your home's circuit breaker panel.
- ☐ This certificate lists minimum requirements for meeting the energy code. An alternative compliance method is used to calculate the % above code using REScheck software (www.energycodes.gov/rescheck/) or a HERS Index (www.resnet.us/home-energy-ratings), which estimate the overall energy performance of the home.

Air Sealing – Critical for comfort, air quality and energy efficiency

- ☐ All holes between floors and through walls have been sealed with caulk or foam, examples include:
  - Where electrical, phone and cable wires enter the home
  - Where plumbing goes through walls, floors and ceilings
  - Around windows and doors
- ☐ Wood-burning fireplaces have doors with gaskets.
- ☐ Builders are required to either submit to a visual inspection of the air sealing package or to show the building jurisdiction compliance through use of an air leakage test. Code requires that a home's air leakage rate is less than 7 air changes per hour at 50 pascals (think of a 20 mph wind) of pressure.

CFL Bulb

Blower Door Test

Energy-Efficient Lighting - CFLs use about 75% less energy than incandescent bulbs!

- ☐ High-efficiency light bulbs (such as compact fluorescents and LEDs) are installed in at least 50% of the permanent light fixtures.

Windows - Enjoy light and views while saving on utility bills

- ☐ Windows have a U-factor of 0.35 or less. Skylights have a U-factor of 0.60 or less. This can be found on the NFRC sticker attached to new windows.

NFRC Sticker

For more information on energy codes, you can go to www.idabo.org/energy.htm or http://bcap-ocean.org/energycodes101.

Idaho Energy Code Checklist for Homeowners

Est. 1958

Ensuring quality construction and efficient homes that save you money.

Heating and Cooling - HALF of a typial energy bill comes from heating and cooling

- ☐ Minimum federally prescribed efficiencies are met on all heating and cooling systems. SEER, AFUE and HSPF indicate efficiency, and the higher the rating the greater the efficiency.
- ☐ Forced-air furnaces must have a programmable thermostat. The more you use the thermostat to automatically lower temperatures when the home is unoccupied or during the night, the more you will save.
- ☐ Water heaters are rated by a minimum EF (energy factor).

Insulation - Properly installed insulation will blanket the home for more constant temperatures

- ☐ Insulation R-value measures the level of resistance to heat transfer. The higher the better.
- ☐ Code walls now have an R-20 baseline requirement.
- ☐ Ceilings are insulated to R-38 or higher in climate zone 5 and R-49 or higher in climate zone 6. If there is blown-in insulation in the attic, then there are markers to indicate the depth of insulation.
- ☐ Floors over an unconditioned (not heated) crawlspace are insulated to R-30 or higher.
- ☐ Perimeter walls of a conditioned crawlspace are insulated to R-10/13, R-10 (continuous rigid insulation) or R-13 (insulation in cavity), AND have a vapor retarder across the ground and securely taped to the crawlspace walls.
- ☐ Basement walls are insulated to R-10/13 in climate zone 5 and R-15/19 in climate zone 6.
- ☐ Insulation is installed per manufacturer's specifications in walls, ceilings and floors.

Wall Insulation

Ducts – Proper duct sealing optimizes the home's comfort delivery system

- ☐ All ducts and air handlers are sealed with mastic (duct tape is not permitted).
- ☐ If ducts are located in an unconditioned attic, crawlspace or garage, then ducts are insulated with R-6 or higher (R-8 for supply ducts in the attic).
- ☐ If any ductwork is located in unconditioned space, then it is required to measure air leakage through a DuctBlaster test.

Duct Insulation

For more information on energy codes, you can go to www.idabo.org/energy.htm or http://bcap-ocean.org/energycodes101.

State Action
Sheet 7 (SAS 7)

Education and Training

Background

Though not always thought of as a formal part of the adoption and compliance process, education and training typically plays a key role in a traditional code adoption process and is always a necessary component for successful code implementation and compliance. When well incorporated into the planning of an energy code or standard adoption process, and developed and applied based on stakeholder and implementer needs, education and training provides the foundation for a common understanding of energy code technical requirements and intent.

The audience for energy code education and training includes code adoption decision makers, enforcement entities, industry stakeholders, compliance assessors, and to some degree, the general public. To be most effective, education and training needs to target the full range of audiences, providing critical information on the code in a timely manner, and in an acceptable format and package based on the audience level of need and specific focus. For example, a legislator doesn't typically need or want detailed information on the technical attributes of a code but does require a general understanding of code attributes with a deeper brief on the economic and societal value the code brings to constituents. Design professionals may benefit from the legislator-focused information but also needs a specific understanding of when and how the code applies to their designs, how to meet the technical requirements, and the process by which they show compliance. Designers and contractors may also need some training on how to represent the need and value of energy codes to their clients.

There are three distinct phases for education and training delivery. Pre-adoption education and training supports energy code marketing and outreach.

The focus of education at pre-adoption should be to provide information regarding the differences between current practice and code and the subsequent value that will be delivered with adoption. This pre-adoption phase of training works best when implemented with an outreach component that solicits public inquiry and comment. The code may not be considered absolute in scope until the education/outreach process is fully vetted.

Once the code has been adopted and an implementation date set, there becomes a greater need to inform those entities and industries responsible for code implementation on the scope and technical attributes of the code. This post-adoption phase of training should focus on preparing the implementers for successful implementation of the energy code. At this point, education and training implementers must be prepared to provide clear information on code-specific measures and facilitate discussions that lead to an understanding of energy code scope and application.

The third phase of education comes after the implementation date. It is very similar to phase two training but typically includes more knowledgeable industry discussion on areas that relate specifically to their needs. For example, an architect may want to discuss compliance choices in greater detail to gain a better understanding of the best approach for a certain building type or occupancy. This is also the phase where education and training can support compliance efforts through delivery of targeted information on assessment protocol, documentation, and code effectiveness.

A formal feedback loop should be established between compliance and education to provide direction for future training based on actual field observation and documentation of compliance issues.

To recap, the potential for energy code education and training should not be overlooked as a key support component of the conformity aspects of an energy code. Education and training should be thought of as an integral part of energy code development, adoption, and delivery. When used strategically, education and training supports a clearer understanding of the other conformity variables and can help to ensure a high level of energy code compliance.

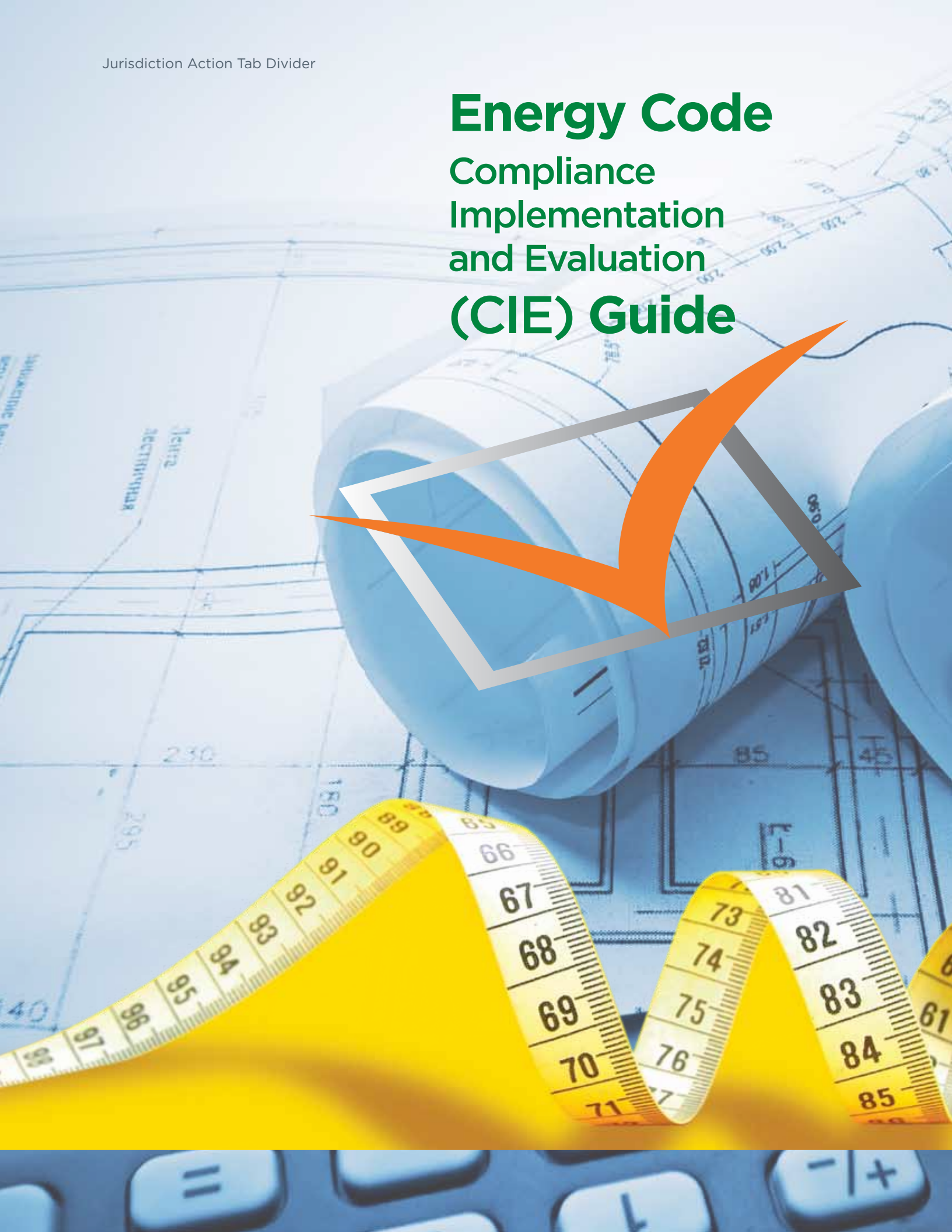
Building an Education Program

Here is a simple process for developing and implementing a statewide education and training program for your energy code.

1. First, someone or some entity(s) at a state level needs to take responsibility for education and training. An energy code collaborative could take on this role. See State Action Sheet 2 for details on how to form a collaborative.
2. Survey staff from within your agency and from within energy code permitting jurisdictions and find who is interested in becoming an energy code trainer.
3. Check dates for train-the-trainer offerings by going online to the BECP website: http://www.energycodes.gov
4. Determine the type of training that is needed.
5. Determine a funding source for sending volunteer trainees to train-the-trainer classes.
6. Once you have trained trainers, develop a plan for statewide training. Where will you need to train, how often, what topics, what schedule?
7. Marketing and outreach is critical to good training turnout. This is also where a strong energy code collaborative is key to success as the broader the representation of the collaborative, the more access you will have to stakeholders that need training.
   a. At a minimum you should be marketing training to:
      i. Local code permitting jurisdictions
      ii. Architects and engineers
      iii. Contractors
      iv. Sub trades
      v. Building suppliers
      vi. State agencies
      vii. Building operator associations.
8. Schedule classes and implement sessions. Make sure you conduct evaluations.
9. Review evaluations and consider where training gaps may be.

Jurisdiction Action Tab Divider

Energy Code Compliance Implementation and Evaluation (CIE) Guide



Notes

Jurisdiction Action Sheet 1 (JAS 1)

Code Administration

Administration consistency within energy code-enforcing jurisdictions has a large impact on compliance. The administration of code programs may involve several components including:

1. How and when codes are adopted
2. The processes used for plan review and inspections
3. File acceptance and storage: Are you utilizing one of the new electronic permitting formats?
4. Continuing education and training for jurisdictional staff
5. Continuing education and training for the design and construction industry.

The jurisdiction of authority having responsibility for code compliance can assist on-the-ground compliance through employment of processes that cover the five components listed above.

Here's how:

1. Work with jurisdiction leadership to reach agreement on the cycle of code adoption. Develop a model ordinance and adoption process that can be followed for code adoption. Time spent now can save on future efforts. A review of existing ordinances within progressive large, midsize, and small jurisdictions should reveal the critical approaches and language that are required for adoption.
2. Utilize a consistent process for plan review and inspection. The forms provided as Jurisdiction Action Sheets 3 through 9 are designed to provide structure and consistency to jurisdiction enforcement activities.
3. Plan review software and supporting hardware are expensive but save over time. Plus they provide for a consistent submittal and review process and documentation archival. Of course this software goes beyond the scope of the energy codes, so when it is in place, all of your submittal processes will be positively impacted.
4. With the construction downturn, many building departments have experienced substantial reductions in funding for code administration. While it may not always be possible to send all of the plan review and inspection staff to energy code training, you are encouraged to send as many as possible. When budgets are stretched thin, one strategy you may consider is to designate one or two staff as the "energy code experts" and ensure that they receive good training. These staff may then be used to train others within your jurisdiction. The BECP website provides some great resources for training staff. Training programs such as BECP's train-the-trainer sessions offer an opportunity for energy code trainer development within your jurisdiction.
5. Offer industry training on a yearly basis. One advantage to sending staff to train-the-trainer sessions is that your jurisdiction will always have in-house capability to meet at least some of the energy code education needs of your design and construction industry.

If your state has an agency responsible for energy code implementation, you can work collaboratively with them to sponsor education and training in your jurisdiction.

Jurisdiction Action
Sheet 2 (JAS 2)

Compliance Role

ARRA has placed the responsibility on states that have received stimulus monies, after providing written assurances to DOE. They have until the year 2017 to show that the state as a whole is 90% compliant with the 2009 IECC and ASHRAE Standard 90.1-2007.

ARRA, Title IV, HR1-33

(2) The State, or the applicable units of local government that have authority to adopt building codes, will implement the following:

> *(A) A building energy code (or codes) for residential buildings that meets or exceeds the most recently published International Energy Conservation Code, or achieves equivalent or greater energy savings.*
>
> *(B) A building energy code (or codes) for commercial buildings throughout the State that meets or exceeds the ANSI/ASHRAE/IESNA Standard 90.1–2007, or achieves equivalent or greater energy savings.*
>
> *(C) A plan for the jurisdiction achieving compliance with the building energy code or codes described in subparagraphs (A) and (B) within 8 years of the date of enactment of this Act in at least 90 percent of new and renovated residential and commercial building space. Such plan shall include active training and enforcement programs and measurement of the rate of compliance each year.*

What role will individual jurisdictions have in 90% compliance strategies?

At a minimum it is expected that the individual jurisdictions will need to keep an open line of communication with the state agency responsible for compliance. Plan review and inspection records will be needed in order to show how each building was evaluated.

Jurisdiction Action Sheets 3 through 9 provide good tools for jurisdictions to assist in their roles with 90% compliance strategies.

Compliance Options

The code compliance paths that are available can drive the format of the code. This section covers energy code provisions that are presented in prescriptive, component performance, and equivalent performance format.

1. **Prescriptive Path.** Prescriptive provisions are simple, singular metrics that individual components of the building must satisfy. Examples included minimum insulation R-value, maximum window U-factor, lighting source minimum lumens per watt, and requirements for certain specified controls, such as a thermostat.

Prescriptive **Trade-Off** **Performance**

2. **Trade-Off.** Component performance relates to the performance of a particular component, system, or sub-system of a building. Examples include the maximum overall U-factor for an entire wall or the thermal envelope of an entire building. Another example is the air leakage associated with a duct system. Rather than prescribe how to construct and seal the duct system, an energy code could limit air leakage at a specified test pressure. As long as the duct system, as tested, satisfies that leakage limit, the system would be considered to be in compliance with the energy code regardless of whether it appears to be sealed or not sealed.

3. **Performance.** Equivalent performance relates to the anticipated performance of the building as designed in comparison to the performance of the same building when it is assumed to be in compliance with all provisions of the code. This would allow the actual design to not comply with the lighting provisions of the code if an energy simulation can show that the expected increase in energy use associated with the lighting system is offset by an increase in the energy efficiency of the design in another area, such as building thermal envelope.

Jurisdiction Action
Sheet 3 (JAS 3)

Submittal Guidelines—**Commercial**

Step 1: Provide jurisdiction-specific information

- ❑ 1. Local design parameters—climate zone, design temperatures.
- ❑ 2. Local code amendments—has the jurisdiction amended any of the prescriptive requirements; has the jurisdiction amended any of the mandatory requirements?
- ❑ 3. Additional jurisdiction-specific requirements—does the jurisdiction require a COM*check* no matter which compliance path is chosen? Are third-party inspections required for energy compliance? Does the jurisdiction require mechanical load calculations by a licensed engineer? Does the jurisdiction have different requirements for new construction versus existing?

This could be specific for just energy submittal requirements or could encompass all aspects of submitting a commercial plan.

Step 2: Required documentation

- ❑ 1. What documentation is required for all plans, no matter which path is chosen? (Mandatory requirements, mechanical and lighting load calculations, etc.)
- ❑ 2. What documentation is required if only the Prescriptive Path is chosen?
- ❑ 3. What documentation is required if the Trade-Off Path is chosen?
- ❑ 4. What documentation is required if the Performance Path is chosen?

Step 3: Plan/permit submittal process

- ❑ 1. What is the review process for the jurisdiction?
- ❑ 2. What is the inspection process to verify energy compliance? In other words, how does the jurisdiction verify compliance with window requirements, National Fenestration Rating Council testing, Component Modeling Approach Program, etc.?
- ❑ 3. What will be expected of the designer after permit issuance?
- ❑ 4. What will be expected prior to Certificate of Occupancy (C.O.) issuance?

If the jurisdiction requires commissioning, there may be a requirement for the designer to put together a commissioning document with the contractor, to be turned over to the owner.

Jurisdiction Action Sheet 3.1 (JAS 3.1)

Example **Commercial** Submittal Guideline

(Jurisdiction Name)

Commercial Energy Code Submittal Requirements

As of _____(date),

_____(jurisdiction) adopted the 2009 series of the International Codes including the International Energy Conservation Code (IECC). The IECC contains specific design and submittal requirements. The submittal requirements for commercial energy compliance are outlined below as determined by the _____(Jurisdiction).

Energy code submittals are required for all commercial projects in accordance with the applicable provisions of the 2009 IECC or ASHRAE 90.1. When designing to the IECC, the designer has three design path choices. As the applicant you must decide if you are using: (1) the Prescriptive Path as IECC Chapter 5, (2) the Total U-factor Alternative (Trade-Off) Path, or (3) the Total Building Performance (Performance) Path as outlined in IECC Section 506.

All three of the path options have similar requirements for submittal documents to meet the code requirements. You must submit the building envelope information, building mechanical systems information, the service water heating information, and the electrical power and lighting systems information all from Chapter 5 of the IECC.

The items marked as mandatory must be met no matter which compliance path is chosen below. If a requirement is marked as prescriptive, then it only applies if the Prescriptive Path is chosen.

PRESCRIPTIVE PATH

The Prescriptive Path requirements for the building envelope are found in Chapter 5 of the IECC. _____(jurisdiction name) is located in Climate Zone _____in accordance with Tables 502.1 or 502.1(1) and 502.1(2) of the IECC. All prescriptive information shall be taken from the various tables using Climate Zone _____requirements. Both items marked prescriptive and mandatory shall be required using the Prescriptive Path.

At a minimum, the prescriptive building submittal must include the following information on the submitted plans or in accompanying documentation:

1. Address of the building (this is a site-specific submittal).
2. Define/delineate your building thermal envelope (this must be on the blueprint rather than a separate document). The plans must specify what is inside and outside of the thermal envelope.

3. Insulation materials, R-values, types of insulation, and where these are being used (e.g., above or below-grade walls, floors over outdoor air or unconditioned space, slab on grade, roofs/ceilings).
4. Fenestration area and U-factors as well as solar heat gain coefficients (SHGCs) in accordance with Section 502.3.
5. Air leakage requirements (e.g., vestibules, dampers, weather seals) in accordance with Section 502.4.
6. Mechanical load calculations specific to the site in accordance with Section 503.2.1.
7. Mechanical equipment efficiencies in accordance with Section 503.2.3.
8. Heating, ventilation, and air conditioning (HVAC) system controls in accordance with Section 503.2.4.
9. Ventilation in accordance with Section 503.2.5.
10. Energy recovery ventilation in accordance with Section 503.2.6.
11. Duct and plenum insulation and sealing in accordance with Section 503.2.7.
12. HVAC piping insulation in accordance with Section 503.2.8.
13. Air system balancing in accordance with Section 503.2.9.
14. Air system design and control in accordance with Section 503.2.10.
15. Heating outside the building in accordance with Section 503.2.11.
16. Simple HVAC systems shall be submitted in accordance with Section 503.3.
17. Complex HVAC systems shall be submitted in accordance with Section 503.4.
18. Service water heating submittals shall comply with Section 504.
19. Electrical power and lighting system submittals (both internal and external) shall comply with Section 505.

Total U-factor Alternative Path

The Total U-factor Alternative Path method of showing compliance is commonly known by users of COM*check*. COM*check,* with support for the 2009 and ASHRAE 90.1-2007, is available as a free download from DOE at http://www.energycodes.gov. COM*check* has been commonly required by many jurisdictions no matter which path of compliance is chosen but is truly to be used for the U-factor Alternative Path. COM*check* is submitted in three parts: the building thermal envelope, the mechanical system, and the lighting system.

The building plan must clearly define and delineate the building thermal envelope.

COM*check* submittal for the thermal envelope must include the following information:

1. Site-specific address, climate zone, project and occupancy type, building use, and code version.
2. Insulation type, R-value for all areas, and specify where the insulation is being used (e.g., slab, floor over outside air, above deck, attic, above grade wall). This information must be specific. Merely listing Wall 1, Wall 2, etc. will not be sufficient to allow the plans examiner and building inspector to be able to determine which wall you considered to be "Wall 1," etc. You must also specify if this is continuous or cavity insulation.
3. Using orientation: "unspecified" will not be acceptable when describing a wall, window, or door location. Please specify orientation as "front, back, left, or right" and the square footage of the wall, window, or door on each orientation.
4. Fenestration U-factors and SHGCs.
5. Accurate square footage.

COM*check* submittals for mechanical systems shall include the following:

1. Site-specific address, climate zone, project and occupancy type, and building use.
2. Each individual HVAC unit, including size, efficiency, etc.
3. Inspection checklist for mechanical filled out and checked off for all applicable mechanical requirements. If something on the checklist is not required, it shall be marked as N/A by the designer.

COM*check* submittals for electrical power and lighting systems shall include the following:

1. Site-specific address, climate zone, project and occupancy type, and building use.
2. Total allowed wattages for the building.
3. Total proposed wattages for the building.
4. Inspection checklist for lighting filled out and checked off for all applicable mechanical requirements. If something on the checklist is not required, it shall be marked as N/A by the designer.

Other details are required as listed below:

1. In addition to the COM*check* documentation, all items in Chapter 5 of the IECC that are marked as mandatory shall be addressed on the plans or in accompanying documentation.

Total Building Performance Path (Performance)

The Total Building Performance Path is found in the 2009 IECC in Section 506. This path still requires mandatory compliance with all items in Chapter 5 that are marked as mandatory.

The Performance Path method of compliance requires the submittal of energy compliance documents in accordance with 506.3–506.6.2. This documentation shall be in addition to the mechanical and lighting load calculations that are required to be submitted.

At a minimum, the building compliance document must provide the following information:

1. Site-specific address, climate zone, design temperatures.
2. An inspection checklist documenting the building component characteristics of the proposed design as well as standard reference design, including annual energy costs.
3. Accurate square footage.
4. Name of the individual completing the compliance report.
5. Name and version of the compliance software tool.

Other details are required as listed below.

1. In addition to the documentation required above, all items in Chapter 5 of the IECC that are marked as mandatory shall be addressed on the plans or in accompanying documentation.

Design Parameters for Sizing HVAC Equipment

_____

(Jurisdiction Name) Design Parameters

Climate Zone: _____

Elevation: _____

Outdoor Dry Bulb (winter): _____

Outdoor Dry Bulb (summer): _____

Indoor Dry Bulb (winter): _____

Indoor Dry Bulb (summer _____

Jurisdiction Action
Sheet 4 (JAS 4)

Submittal Guidelines—**Residential**

Step 1: Provide jurisdiction-specific information

- ❏ 1. Local design parameters—climate zone, design temperatures.
- ❏ 2. Local code amendments—has the jurisdiction amended any of the prescriptive requirements? Has the jurisdiction amended any of the mandatory requirements?
- ❏ 3. Additional jurisdiction-specific requirements—does the jurisdiction require a RES*check* no matter what path is chosen? Are third-party inspections required for energy compliance? Does the jurisdiction require Manual J submittals or mechanical load calculations by a licensed engineer? Does the jurisdiction have different requirements for new construction versus existing?

Step 2: Required documentation

- ❏ 1. What documentation is required for all plans, no matter which path is chosen? (Mandatory requirements, mechanical load calculations, duct sizing, etc.)
- ❏ 2. What documentation is required if only the Prescriptive Path is chosen?
- ❏ 3. What documentation is required if the UA Trade-Off Path is chosen?
- ❏ 4. What documentation is required if the Performance Path is chosen?

Step 3: Plan/permit submittal process

- ❏ 1. What is the review process for the jurisdiction?
- ❏ 2. What is the inspection process to verify energy compliance?
- ❏ 3. What will be expected of the designer after permit issuance?
- ❏ 4. What will be expected prior to Certificate of Occupancy (C.O.) issuance?
- ❏ 5. How does the jurisdiction verify compliance with window requirements? (National Fenestration Rating Council testing, Component Modeling Approach Program, etc.)

INSIGHTS

This could be specific for just energy submittal requirements or could encompass all aspects of submitting a residential plan.

Having a document that you can hand out to permit applicants defining exactly what you will be looking for makes their job easier but also makes your job easier as well. Plan review times are cut down by getting the information submitted the first time.

Jurisdiction Action Sheet 4.1 (JAS 4.1)

Example **Residential** Submittal Guideline

_____
(Jurisdiction Name)

Residential Energy Code Submittal Requirements

As of _____(date),

_____(jurisdiction)

adopted the 2009 series of the International Codes, including the International Residential Code (IRC) and the International Energy Conservation Code (IECC). The IECC and IRC contain specific design and submittal requirements. The submittal requirements for residential energy compliance are outlined below as determined by the _____(Jurisdiction).

Energy code submittals are required for all residential projects in accordance with the applicable provisions of the 2009 IECC. The designer has three design path choices. As the applicant, you must decide if you are using: (1) the Prescriptive Path as outlined in IECC Chapter 4, (2) the Total UA Alternative (trade-off) Path as outlined in IECC Section 402.1.4, or (3) the Simulated Performance Alternative (Performance) Path as outlined in IECC Section 405.

All three of the path options have similar requirements for submittal documents to meet the code requirements. You must submit the building envelope information, a Manual J equipment design in accordance with the IRC Section M1401.3, and a Manual D duct design in accordance with the IRC Section M1601.1.

PRESCRIPTIVE PATH

The Prescriptive Path requirements for the building envelope are found in Chapter 4 of the IECC. _____(jurisdiction name) is located in Climate Zone _____ in accordance with Table 402.1.1 of the IECC. All prescriptive information shall be taken from the various tables using Climate Zone _____ requirements.

At a minimum, the prescriptive building submittal must include the following information on the submitted building plans or in accompanying documents:

1. Address of the building (this is a site-specific submittal).
2. Define/delineate your building thermal envelope (this must be on the blueprint rather than a separate document).
3. Insulation materials, R-values, and where these are being used (e.g., wall, ceiling, floor over garage).
4. Crawl space insulation for structural floors and other crawl space areas. Specify whether you are insulating the foundation wall or the structural floor system. (See requirements of Section 402.2.9).
5. Fenestration U-factors.
6. Duct sealing, duct insulation, and testing where required.
7. Manual J specific to the site.

8. Manual D duct design specific to the building.
9. Documentation must be submitted verifying whether a blower door test will be done in accordance with Section 402.4.2.1 or the visual inspection option according to Section 402.2.2.
10. Documentation verifying that at least 50% of the lamps in permanently installed lighting fixtures will be high-efficacy lamps in accordance with Section 404.1.

Total UA Alternative Path

The Total UA Alternative Path method of showing compliance is found in Section 402.1.4 of the IECC. This method is commonly known by users of RES*check*. The 2009 IECC code option in RES*check* is available as a free download from the BECP website at http://www.energycodes.gov.

The building plan must clearly define and delineate the building thermal envelope.

RES*check* submittal must include the following information:

1. Site-specific address, project type, climate zone, and code version.
2. Insulation type, R-value for all areas, and specify where the insulation is being used (e.g., attic, floor over unconditioned space, and exterior walls). This information must be specific. Merely listing Wall 1, Wall 2, etc. will not be sufficient to allow the plans examiner and building inspector to be able to determine which wall you considered to be "Wall 1," etc. You must also specify if this is continuous or cavity insulation.
3. Using orientation: "unspecified" will not be acceptable when describing a wall, window, or door location. Please specify orientation as "front, back, left, or right" and the square footage of the wall, window, or door on each orientation.
4. Fenestration U-factors.
5. Accurate square footages.

For now, _____(jurisdiction) will require site-specific submittal. We do not have the historical evidence to show that you may use "worst case scenario" and make this path work.

Other details are required as listed below:

1. Duct sealing and insulation.
2. Manual J specific to the site.
3. Manual D duct design specific to the building.
4. Documentation must be submitted verifying whether a blower door test will be done in accordance with Section 402.4.2.1 or the visual inspection option per Section 402.2.2.

Simulated Performance Alternative Path (Performance)

The Simulated Performance Alternative Path is found only in the 2009 IECC in Section 405. This path still requires mandatory compliance with air leakage (402.4), maximum fenestration U-factor (402.5), and systems (portions of Section 403) requirements.

The Performance Path method of compliance requires the submittal of energy compliance documents and could have the additional task of on-site inspections to be performed by a certified rater. The rater must be certified by RESNET® if using the REM/Rate™ software to verify compliance with this path.

Submittal of the energy compliance document is required along with a Manual J at the time of plan/permit submittal. Again, these documents are required to be site-specific.

At a minimum, the building envelope compliance document must provide the following information:

1. Site-specific address.
2. An inspection checklist documenting the building component characteristics of the proposed and standard reference designs, including annual energy costs in accordance with Section 405.
3. Accurate square footage.
4. A mechanical system feature.
5. Name of the individual completing the compliance report.
6. Name and version of the compliance software tool.

It is very important that the insulation values not be listed as R-19/30 for floors, walls, or similar. This must be detailed as to the specific area and what is the required R-value for that particular area.

Other details are required as listed below:

1. Duct sealing and insulation.
2. Manual J specific to the site.
3. Manual D duct design specific to the building.
4. Blower door testing and duct leakage testing are a mandatory requirement of this path.

Manual J Submittal Information

All three of the compliance paths require the submittal of a Manual J at the time of plan/permit application submittal. The Manual J is a site-specific submittal. All Manual J documents must be calculated using one of the four Air Conditioning Contractors of America (ACCA)-accredited programs.

Attached to this document is a list of the specific prescriptive design criteria to be used in _____(jurisdiction). This prescriptive criteria is not to be altered or interpolated. Any submittal that does not use the prescribed design criteria will be rejected without review. The design values we have provided are extracted from the specific tables in the ACCA Manual J, Eighth Edition.

All Manual J submittals shall list the specific mechanical equipment to be used and shall include air conditioning.

All Manual J submittals shall match the building envelope compliance information regarding square footage of the building, U-values, and R-values, and shall represent the orientation of the home in a north, south, east, west direction.

Manual D Submittal

A Manual D duct design is required for each building. The Manual D submittal may be deferred in order to be as installed instead of as designed, but be advised this document must be submitted a minimum of 2 weeks prior to rough inspection and must comply with the requirements of ACCA Manual D. Design the Manual D with air conditioning included.

The Manual D submittal must be a schematic design rather than just a list of pipe sizes and lengths or equivalent duct lengths. The design must include take-off locations and sizes, register sizes, return air opening size, and duct run length and size. The schematic design enables the building inspector to have a document to inspect from.

General Information

The requirement for site-specific information is not something we will waive at this time. _____(jurisdiction) Building Division is aware of the additional burden this will place on designers. However, we must consider the time it will take to review numerous submittals. We need to allow our staff the time to accurately review the submitted information and continue to issue permits. We would not be able to issue any permits in a timely manner if we received a large influx of "mastered" submittals all at once. In addition, we do not have historical data to show that mastered energy submittal will accurately reflect the building.

As we continue through this process we will contact the residential builders with further information regarding any changes to our submittal requirements.

_____(jurisdiction) Building Inspection staff will be in contact with the residential builders to discuss the changes to the inspection program as a result of the adoption of the 2009 energy codes.

_____(jurisdiction) Building Division appreciates the cooperation of all of the builders and designers in this matter. Your continued cooperation will keep this process moving forward and help to allow us to review your plans and issue permits in a timely manner.

_____

(Jurisdiction Name) Design Parameters

Climate Zone: _____

Elevation: _____

Outdoor Dry Bulb (winter) _____

Outdoor Dry Bulb (summer): _____

Indoor Dry Bulb (winter): _____

Indoor Dry Bulb (summer): _____

Jurisdiction Action Sheet 5 (JAS 5)

Residential Envelope and Duct Leakage Testing Protocol

What's Required in the 2009 IECC

Envelope Air Tightness

The 2009 IECC allows **two options** for verification of residential envelope tightness:

1. The builder can opt to test the building envelope tightness per Section 402.4.2.1 of the 2009 IECC.
2. The builder may use a visual inspection method as described in Section 402.4.2.2 of the 2009 IECC and in Table 402.4.2.

Duct Tightness

Duct tightness shall be verified through a duct leakage test unless all ductwork and the air handler reside within the conditioned space of the building. There are three protocols for testing duct air leakage, each with different leakage requirements.

1. **Post-Construction Option 1:** Leakage to the outdoors = 8 cfm per 100 ft^2 of house. Under this option, simultaneous envelope and duct depressurization are performed to identify duct leakage to the outside of the building thermal envelope. Both envelope and duct depressurization are set to 0.1 inches of water or 25 pascals.

   Duct Leakage—leakage to outside

   Because some duct leakage may occur within the conditioned space of the building, a duct test option for measuring leakage only to the outside of the building may be utilized for certification. For this test, a blower door is used to pressurize the house to 25 pascals and a duct blaster pressurizes the ductwork to the same level. Because the house is at the same pressure as the ductwork, any measured leakage is leakage to the outside of the building and represents heating or cooling energy that is directly wasted.

2. **Post-Construction Option 2:** Total duct leakage = 12 cfm per 100 ft^2 of house. Under this option, duct leakage is measured separate from envelope depressurization. The duct depressurization is set to 0.1 inches of water or 25 pascals.

   Duct Leakage—total leakage

   The duct blaster is connected to the air handler to pressurize (or depressurize) the taped-over duct system to 25 pascals. The blower door is not used for this test. The Total CFM25 amount of duct leakage is determined.

3. **Rough-in Test Option:** Total leakage shall be less than or equal to 6 cfm per 100 ft^2.

2009 IECC Section 402.4.2.1—Envelope Leakage Testing Protocol

1. Set up blower door.
2. Prepare the building for the blower door test.
3. Perform a one-point blower door test.
4. Record the results.
5. Contractor—report results to jurisdiction of authority.
6. Signature verification of house leakage.

Step 1: Set up blower door

Set up blower door according to manufacturer's instructions. Use an exterior door on the main floor.

Step 2: Prepare the building for the Blower Door Test

Check	Description
❑	Exterior windows and doors, fireplace, and stove doors shall be closed but not sealed
❑	Dampers shall be closed but not sealed, including exhaust, intake, makeup air, backdraft, and flue dampers
❑	Interior doors shall be open
❑	Exterior openings for continuous ventilation systems and heat recovery ventilators shall be closed and sealed
❑	Heating and cooling system(s) shall be turned off
❑	HVAC ducts shall not be sealed
❑	Supply and return registers shall not be sealed

Step 3: Perform a one-point blower door test

Use manufacturer's guidelines to perform a one-point 50 pascals depressurization test.

Step 4: Record the results

Use the form that is provided by the blower door manufacturer and record and document the results of the blower door test.

Step 5: Return equipment to original settings

Check	Description	Action
❑	Turn on heating system	Return thermostat to original setting
❑	Turn furnace to pre-test setting	Use control to turn on, if appropriate
❑	Turn on water heater	Reset water heater temperature to original setting
❑	Return windows to pre-test position	Open windows, if appropriate

Step 6: Sign envelope leakage form and send the results to the building contractor who will provide the report to the jurisdiction of authority.

Step 7: Verification

Building Permit # _____

House Address _____

Envelope Leakage Test conducted by: _____

Result (at 50 Pa): _____CFM Interior Volume _____Cubic Ft _____ACH

_____ Signature _____ Date

2009 IECC Section 402.4.2.2—Envelope Leakage Visual Inspection

Date: _____ Name of Evaluator(s): _____

Building Name & Address _____ Conditioned Floor Area: _____ft^2_____

Building Contact: Name _____ Phone _____ Email: _____

Compliance Approach: ❏ Prescriptive (402.1 or 402.1.3) ❏ UA Trade-Off (402.1.4) ❏ Building Performance (404)

State:_____ Jurisdiction_____

Building Type 1- and 2-Family, Detached: ❏ Single Family ❏ Modular ❏ Townhouse

Multifamily: ❏ Apartment ❏ Condominium

Project Type: ❏ New Construction ❏ Addition to existing building ❏ Existing building renovation

COMPONENT	CRITERIA	PLAN REVIEW			SITE INSPECTION		
		Y	N	N/A	Y	N	N/A
Air barrier and thermal barrier	Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier.	❏	❏	❏	❏	❏	❏
	Breaks or joints in the air barrier are filled or repaired.	❏	❏	❏	❏	❏	❏
	Air-permeable insulation is not used as a sealing material.	❏	❏	❏	❏	❏	❏
	Air-permeable insulation is inside of an air barrier.	❏	❏	❏	❏	❏	❏
Ceiling/attic	Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed.	❏	❏	❏	❏	❏	❏
	Attic access (except in unvented attic), knee wall door, or drop down stair is sealed.	❏	❏	❏	❏	❏	❏
Walls	Corners and headers are insulated.	❏	❏	❏	❏	❏	❏
	Junction of foundation and sill plate is sealed.	❏	❏	❏	❏	❏	❏
Windows, skylights and doors	Space between window/door jambs and framing is sealed.	❏	❏	❏	❏	❏	❏
Rim Joists	Rim joints are insulated and include an air barrier.	❏	❏	❏	❏	❏	❏
Floors (including above garage and cantilevered floors)	Insulation shall be installed to maintain permanent contact with underside of subfloor decking. The air barrier shall be installed at any exposed edge of insulation.	❏	❏	❏	❏	❏	❏
Crawl space walls	Insulation is permanently attached to walls.	❏	❏	❏	❏	❏	❏
	Exposed earth in unvented crawl spaces is covered with Class I vapor retarder with overlapping joints taped.	❏	❏	❏	❏	❏	❏
Shafts, penetrations	Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.	❏	❏	❏	❏	❏	❏
Narrow cavities	Batts in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.	❏	❏	❏	❏	❏	❏
Garage separation	Air sealing is provided between the garage and conditioned spaces.	❏	❏	❏	❏	❏	❏
Recessed lighting	Recessed light fixtures are air tight, IC rated, and sealed to drywall. Exception—fixtures in conditioned space.	❏	❏	❏	❏	❏	❏
Plumbing and wiring	Insulation is placed between outside and pipes. Batt insulation is cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.	❏	❏	❏	❏	❏	❏
Shower/tub on exterior wall	Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.	❏	❏	❏	❏	❏	❏
Electrical/phone box on exterior walls	Air barrier extends behind boxes or air sealed-type boxes are installed.	❏	❏	❏	❏	❏	❏
Common wall	Air barrier is installed in common wall between dwelling units.	❏	❏	❏	❏	❏	❏
HVAC register boots	HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.	❏	❏	❏	❏	❏	❏
Fireplace	Fireplace walls include an air barrier.	❏	❏	❏	❏	❏	❏

_____ Signature _____ Date

2009 IECC Section 403.2.2—Duct Leakage Testing Protocol

1. Set up duct blaster.
2. Prepare the building for the duct blaster test.
3. Perform a one-point duct blaster test.
4. Record the results.
5. Contractor—report results to jurisdiction of authority.
6. Signature verification of house leakage.

Step 1: Set up duct blaster

Set up duct blaster according to manufacturer's instructions.

Note: The IECC requires the test to be performed with all register boots taped or otherwise sealed during the test.

Step 2: Prepare the ductwork for the post or rough-in test

There are three protocols that may be used:

1. **Post-Construction Option 1:** Leakage to the outdoors = 8 cfm per 100 ft^2 of house

   Under this option, simultaneous envelope and duct depressurization are performed to identify duct leakage to the outside of the building thermal envelope. Both envelope and duct depressurization are set to 0.1 inches of water or 25 pascals.

   Duct Leakage—leakage to outside

   Because some duct leakage may occur within the conditioned space of the building, a duct test option for measuring leakage only to the outside of the building may be utilized for certification. For this test, a blower door is used to pressurize the house to 25 pascals and a duct blaster pressurizes the ductwork to the same level. Since the house is at the same pressure as the ductwork, any measured leakage is leakage to the outside of the building and represents heating or cooling energy that is directly wasted.

2. **Post-Construction Option 2:** Total duct leakage = 12 cfm per 100 ft^2 of house.

   Under this option, duct leakage is measured separate from envelope depressurization. The duct depressurization is set to 0.1 inches of water or 25 pascals.

   Duct Leakage—total leakage

   A duct blaster is connected to the air handler to pressurize (or depressurize) the taped-over duct system to 25 pascals. The blower door is not used for this test. The Total CFM25 amount of duct leakage is determined.

3. **Rough-in Test Option:** Total leakage shall be less than or equal to 6 cfm per 100 ft^2.

Step 3: Perform a one-point duct blaster test

Use manufacturer's guidelines to perform a one-point 25-pascals test.

Step 4: Record the results

Use the form that is provided by the equipment manufacturer and record and document the results of the duct leakage test.

Step 5: Return equipment to original settings

Ensure that HVAC equipment is returned to the pre-test condition.

Step 6: Sign blower door form and send the results to the building contractor who will provide the report to the jurisdiction of authority.

Step 7: Verification

Building Permit # _____

House Address _____

Duct Leakage conducted by: _____

Method used:_____Post to outside_____Post total_____

Rough-in Result (at 25 Pa): _____CFM per 100 ft^2

_____ Signature _____ Date

Jurisdiction Action
Sheet 6 (JAS 6)

Plan Acceptance and Review

Step 1: Submittal guidelines

- ❏ 1. Has everything that is required per the submittal guidelines been submitted?
- ❏ 2. Have all of the requirements from the submittal guidelines been met for the locality? (climate zone, design parameters, amendments, etc.)
- ❏ 3. Have all specific jurisdictional requirements been met?

Step 2: Which compliance path was chosen?

- ❏ 1. Depending on the documentation submitted you will be able to determine if the designer used the Prescriptive, UA Trade-off, or the Performance Path for energy compliance.
- ❏ 2. If the Prescriptive Path is chosen, the plans must contain all of the required values from the prescriptive tables, as well as mechanical load calculations, duct design, lighting load calculations (for commercial), and construction details defining the thermal envelope.
- ❏ 3. If the UA Trade-Off Path is chosen, the plans will contain all of the requirements of the Prescriptive Path with the exception of including a RES*check* for residential or a COM*check* for commercial projects to show which items will be traded off and that the project still complies with code requirements.
- ❏ 4. If the Performance Path is chosen, the plans will contain all of the requirements of the Prescriptive Path with the exception of a Performance Report (from plans) to show which items will be traded off and that the project still complies with code requirements.

Step 3: Reviewing the plans for code compliance

- ❏ 1. Once the compliance path is determined, the plans can be reviewed for code compliance in accordance with the chosen path.

  Be sure to determine if the blower door or duct leakage testing will be required for residential projects.

INSIGHTS

If no RES*check*, COM*check* or Performance Report or calculations are submitted, assume the Prescriptive Path has been chosen. If the plans don't meet the prescriptive requirements, request additional documentation for one of the other compliance paths.

No matter which compliance path is chosen, the plan reviewer must verify that the mandatory items required by the code have been called out on the plans or in accompanying documents.

- ❏ 2. To review prescriptively, the reviewer could go through the code section by section or utilize plan review checklists or use the climate zone-specific BECP compliance checklists.
- ❏ 3. To review plans to the UA Trade-Off Path, the reviewer would look at the same things that were looked at prescriptively but also look at the values called out on the COM*check* or RES*check* to ensure that the local information is correct, the areas are correct, and that the R-values, U-factors, SHGCs, and type of construction all match what the mechanical designer has used for sizing the mechanical equipment. The area of the building and number of doors and windows should all match the construction drawings. The values on these documents must be what are actually used in the field or the documents will need to be redone to prove that they are still in compliance with the code.
- ❏ 4. To review plans to the Performance Path, the reviewer would go through the performance compliance report or calculations submitted by the designer to ensure that the local information is correct, the areas are correct, and that the R-values, U-factors, SHGCs, and type of construction all match what the mechanical designer has used for sizing the mechanical equipment. The area of the building and number of doors and windows should all match the construction drawings.

Step 4: Preparing documentation for the field inspector

- ❏ 1. Be sure that any energy code compliance documentation is sent to the jobsite with the plans for the inspector to verify. This may include a Manual J, Manual D, RES*check*, COM*check*, performance report, etc. The inspector should be able to easily locate the requirements on the plans so that they can verify compliance.
- ❏ 2. If your state or jurisdiction is utilizing BECP's compliance checklists, then the plan reviewer needs to complete the checklist from plans so that the inspector will be able to verify and document compliance for future entry into the Score+Store tool.

Jurisdiction Action
Sheet 7 (JAS 7)

Building Inspections

Step 1: From plans

- ❏ 1. Verify that the thermal envelope is constructed according to the plans, being sure to verify air barrier placement, vapor barriers where required, insulation installation and values, encapsulation of air permeable insulation, proper venting, etc. If the plans do not detail these items, check any accompanying documentation or refer to BECP's compliance checklist for requirements.
- ❏ 2. If there is no documentation as to how the thermal envelope is to be completed, and the inspector cannot determine compliance, the inspection should not pass until such time as compliance can be demonstrated by the contractor or designer. If the inspection is allowed to pass, the inspector should note that they were unable to verify that specific requirement so that this can be noted when entering the project into the DOE's Score+Store tool.
- ❏ 3. Verify that the mechanical and service water heating equipment is exactly as called out in the load calculations, including size, efficiency, ducting, sealing, insulation, balancing, etc. If what has been installed is different than what was designed, the inspection should not pass until either the designer can verify that what has been installed complies with the energy code or the contractor changes the equipment to match the design.
- ❏ 4. The interior and exterior lighting of a commercial building must match exactly to what was approved in the plans. The plan reviewer verified the load calculations as well as lighting controls, etc. and there should be no variance from the approved plans. If the construction does not match the design, verify first with any accompanying documentation (e.g., COM*check*) to see if the construction matches this submittal. If not, the inspection should not pass until such time as the designer, or a new COM*check*, can show that the lighting as installed still complies. Otherwise the lighting shall be redone to match the originally approved design.

Step 2: From additional documentation

- ❏ 1. If the Prescriptive Path was used, the inspector may only have the plans to look at to verify compliance. If the plan reviewer used a checklist then it should also be with the plans for the inspector. Residentially, the inspector may also see a Manual J and/or Manual D to verify mechanical equipment size and efficiency as well as the approved duct design.
- ❏ 2. If the UA Trade-Off Path was used, the inspector should be able to use the approved COM*check* or RES*check* along with the plans and mechanical load calculations to verify compliance. The R-values and U-factors on the RES*check* or COM*check* must match those shown in the equipment load calculations or the items must be redone to both match what was actually being constructed and to verify that it still meets the requirements of the energy code.
- ❏ 3. If the Performance Path was used, the inspector should be able to verify compliance by looking at the performance report or performance calculation sheets provided by the designer. This report will provide specific values for air leakage, R-value, U-factor, and more. If the construction does not match the report or calculations exactly, the designer needs to redo the report to match the construction to see if it still complies or the construction needs to change to match the calculations. There should be no differences between performance design and actual construction. The mechanical load calculations should still be done separately and will be looked at in addition to the items called out in the performance report.

Step 3: What if it doesn't pass?

- ❏ 1. If the construction does not match the design, there is no need to panic—yet. If the Prescriptive Path was chosen but the construction cannot meet the requirements, the contractor can go back to the designer and have them try to do a COM*check* or RES*check* for the project to see if there is a trade-off that can take place and still have the project comply. If that doesn't work, they can use the Performance Path to gain compliance.

INSIGHTS

Some jurisdictions require a COM*check* or RES*check* to be turned in no matter which compliance path is chosen.

No matter which compliance path is chosen, the inspector must verify that the mandatory items required by the code have been met during construction.

- ❏ 2. Prescriptively, if the construction isn't exactly in accordance with the plans and the energy code, then it fails inspection. If the owner, contractor, or designer does not wish to explore one of the other compliance paths, then they will need to correct the portion of construction that doesn't match the plans or the code. If the inspector passes an inspection without verifying compliance with the prescriptive requirements of the energy code, then this must be documented for future entry into the Score+Store tool.
- ❏ 3. For the UA Trade-Off Path, if construction does not match the plans plus the requirements as called out on the RES*check* or COM*check,* then the designer can try to: redo the document to see if still complies as constructed; use the Performance Path to gain compliance; or redo construction to match complying design. Again, if the inspector passes an inspection without verifying compliance with the code, this must be documented for future entry into the Score+Store tool.
- ❏ 4. If construction doesn't match exactly what is listed in the performance report or calculations, the options are limited at this point and either the design needs to be redone or the construction needs to change to match the plans. There are not many code alternatives past the Performance Path. There should be no differences between performance design and actual construction. The mechanical load calculations will be looked at in addition to the items called out in the performance report.

Step 4: Documentation and reporting

- ❏ 1. Be sure that any energy code compliance documentation turned in from inspections matches exactly as constructed so that future entries into the Score+Store tool can be done precisely as the building was actually constructed.
- ❏ 2. If the plans differ from actual construction, be sure to update the files so that future reference to any drawings or accompanying documentation will reflect actual construction. This becomes especially important when utilizing the UA Trade-Off or Performance Path for compliance so that when future work is done to the building, the actual construction, including R-values and U-factors used, will be known. If something was traded off, they are going to need to know that down the road.

Jurisdiction Action
Sheet 8 (JAS 8)

Building Re-Inspections

Step 1: Compliance

- ❏ 1. Verifying compliance in a re-inspection is no different than in the original inspection. The key is to be sure that no matter which compliance path was chosen, the construction absolutely matches the design. If something in the thermal envelope changes, it may have an effect on the mechanical equipment sizing as well. Check with the designer and contractor to be sure that anything that has changed from plans does not affect anything else.

Step 2: Documentation and reporting

- ❏ 1. If using a checklist the inspector should put an N/A next to anything that was not actually applicable to the project and should not put N/A if something was applicable but wasn't verified. In cases where something was not verified, the inspector should mark it as "unable to verify."
- ❏ 2. Actual R-values, U-factors, SHGCs, equipment efficiencies, motor horsepowers, etc. should be documented for future entry into the Score+Store tool, even if these values do not comply with code as installed. This will help to better evaluate overall state compliance.

.

Jurisdiction Action
Sheet 9 (JAS 9)

Rating a Building for Compliance

Step 1: Using the BECP Compliance Checklists

- ❑ 1. Read Jurisdiction Action Sheet 2 for information regarding a jurisdiction's responsibility for showing compliance. If you do not feel responsible for providing compliance proof, your jurisdiction will still benefit from use of the BECP compliance checklists that were produced for plan review and inspection of 2009 IECC buildings. These sheets will soon be part of RES*check* and COM*check*, so utilization should be simple and provide code conformity.
- ❑ 2. Download compliance checklists at: http://www.energycodes.gov/compliance/evaluation/checklists
- ❑ 3. To better understand your jurisdiction's role in statewide 90% compliance sampling, go to the BECP website and generate a residential and commercial sample for your state and county: https://energycode.pnl.gov/SampleGen.

Step 2: DOE's Score+Store Tool

Once you have gathered raw compliance data, the question becomes: how should this information be analyzed and used? At this stage, data for individual buildings and populations come together to generate an overall state compliance metric. While overall compliance can be determined manually for individual buildings and groups of renovations, the Score+Store tool will provide automated building scores and statewide consolidation of data. Individual building scores will remain confidential, but this effort will shed valuable light on nationwide compliance.

Don't waste your staff's valuable time sorting through paper checklists to determine compliance.

Instead, enter raw data into the Score+Store tool at: https://energycode.pnl.gov/ScoreStore/login

Implementation
Compliance
Compliance
Implementation

Nevada

Compliance Implementation and Evaluation (CIE) Guide

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

BUILDING TECHNOLOGIES PROGRAM

EERE Information Center
1-877-EERE-INFO (1-877-337-3463)
www.eere.energy.gov/informationcenter

August 2012 PNNL-21667

Building Energy Codes

For information on Building Energy Codes, visit **www.energycodes.gov**