CITY ENERGY
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The City Energy Project Assessment Methodology for Energy Code Compliance in Medium to Large Cities

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Code Compliance

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CEP Assessment Methodology

The CEP assessment methodology is designed to assist medium to large cities in identifying residential and commercial energy code compliance issues and developing solutions to such issues to ultimately increase compliance rates with the energy code. This methodology will provide an *informal* energy code compliance rate that is not intended to be statistically valid or supersede 90% compliance methodology recommended by the U.S. Department of Energy. Compliance information collected as part of the study can feed into larger statewide compliance studies. Strategies to increase compliance are contained in the *Establishing a Plan to Achieve Energy Code Compliance in Cities* document.

Section 1.0 Introduction

Building energy codes are typically adopted by states. The responsibility of verifying that buildings within a jurisdiction are in compliance with the provisions of the energy code, however, usually falls on a city or county. Building industry professionals are generally held accountable for adhering to the adopted code and demonstrating compliance by submitting plans and documentation to the city that meet the requirements of the code. Similarly, the building department is typically the city entity responsible for verifying that plans and supporting documentation comply with the applicable codes and that the building is constructed in accordance with these codes. As such, energy code compliance assessments are typically focused on city or county building departments with the compliance results feeding into larger statewide compliance studies.

The CEP Compliance assessments serve two purposes. First, compliance assessments determine potential issues with energy code compliance as well as develop solutions that will mitigate such issues, resulting in increased compliance. Second, compliance studies determine a compliance rate for the buildings that are reviewed, providing the city with an affordable and robust but non-statistically valid benchmark that can be used to measure progress. (This is to distinguish the CEP methodology from the statistically valid methodology for statewide assessments, described more fully below.) Because a city-wide compliance study should provide more in-depth local information than a study that would be administered statewide, it is important to develop a consistent, functional methodology that will meet the needs of the jurisdictions.

Section 1.1 The Importance of Code Compliance Evaluations

From 2006 to 2012, the national model energy codes have increased energy savings potential by nearly thirty percent (30%). However, these savings are only realized when a building is designed and constructed to meet the provisions of the adopted energy code. Informal analyses conducted in three cities by Britt/Makela Group, Inc. (BMG) under the City Energy Project (CEP) has shown energy code compliance rates of individual buildings to range from approximately 65-80 percent (65-80%) using the U.S. Department of Energy' s (DOE) "Measuring State Energy Code Compliance" methodology. The compliance standard set by the American Recovery and Reinvestment Act of 2009 and implemented by the DOE is 90 percent (90%) by 2017, which is significantly greater than what has been documented by BMG. The difference between 90% compliance goals and the existing 65-80% compliance rates indicates a considerable opportunity to increase energy savings.

Code compliance evaluations are critical for ensuring savings from energy codes and standards are realized. Evaluating a building department' s plan review and inspection process in relation to the energy code and correcting issues identified by the evaluation will ensure that plan submittals approved by the plan reviewer comply with the code and that compliant efficiency measures installed in the building are verified by the field inspector.

Section 1.2 Existing Code Compliance Evaluation Protocols

DOE' s Building Energy Codes Program (BECP) developed an evaluation protocol for determining energy code compliance rates. The document "Measuring State Energy Code Compliance" provides guidance for evaluating compliance rates at the state level. The protocol was based on methodologies used in past energy code compliance studies including the *Iowa Residential Energy Code Plan Review and Field Inspection Training* and the *Indiana Commercial Energy Code Baseline Study.* The BECP protocol has been used as a basis for subsequent energy code compliance assessments including studies in Georgia, Iowa, Utah, Illinois, New York and the Northwest. More recently, residential compliance studies funded by the Northwest Energy Efficiency Alliance in Oregon, Washington, Idaho and Montana were conducted using a modified version of the BECP protocol.

In the BECP evaluation protocol, weighted average compliance rates are determined for a population of buildings. To determine the compliance rate of a single building, energy efficiency features installed in the building are first compared to the prescriptive provisions within the energy code to determine if the features are in compliance. Each of the features is then prioritized (assigned a tier rating of high, medium or low) based on its potential for energy savings. A weighted average compliance rating is determined for each building based on the compliance and tier rating of the features. A weighted average compliance rate is then calculated for a population of buildings in the study using the results for each building and the associated floor area.

Statewide compliance studies are typically conducted by third-party evaluation companies who have limited interaction with the jurisdictions and focus on data collection from the building plans, compliance documentation, and on-site inspections. Once the evaluation is complete, a report is issued summarizing the results on a statewide level. Typically, cities that participate in the evaluation receive little to no feedback on the findings or what actions could be taken to correct compliance issues; little information is transferred from the evaluation team to the city that could enhance its ability to enforce the energy code. In addition, the studies typically do not identify the reason for compliance issues within a city. The building department may not be receiving complete compliance documentation from the designer, for example, or there may be a policy in place that prohibits a city from requesting additional documentation for energy code compliance because it is viewed as a barrier to development within the community. Unless these barriers are identified and solutions developed, it will be difficult for a city to increase its compliance rate. The evaluation protocols that are currently in use work on a statewide scale and are designed to be implemented over relatively short evaluation periods and use a small number of buildings per jurisdiction to determine results. As such, a modified version of the BECP protocol that uses a larger and more proportional population of buildings in a city and that focuses on building systems (e.g., building envelope, HVAC and lighting) is needed that can initially be achieved in a short evaluation period, but can be used on a long term basis as well.

CEP has developed a protocol that addresses such needs. The CEP Assessment Methodology focuses on using the strategies contained in the BECP protocol but tailors the strategies to provide the greatest benefits to medium and large cities (cities with a population larger than 200,000 people). The CEP Assessment Methodology is a cost-effective protocol aimed at gathering qualitative and quantitative data that can be used to provide constructive feedback to city leadership, building department staff and industry stakeholders. The CEP assessment methodology relies both on the city' s plan review and inspection staff to collect data and a third-party to oversee the data collection and provide analysis. This protocol is designed to continuously improve compliance rates through ongoing quality assurance.

Section 2.0 Choosing an Assessment Strategy

A jurisdiction has several different options for conducting an energy code compliance assessment including:

1. Self-Evaluation
2. Third-Party Evaluation (recommended)
3. CEP Assessment (recommended as an alternative to Third-party evaluation)

Each option uses a slightly different strategy for conducting the assessment with varying advantages and disadvantages, as discussed below.

Section 2.1 Self-Evaluation

Self-evaluation, sometimes considered first-party evaluation, involves in-house staff (e.g., plan review and inspection staff) performing an energy code compliance assessment on their department. Self-evaluation can lead to biased results. For example, those conducting the evaluation may not accurately report compliance issues in order to protect the jurisdiction or staff member involved in the plan review or inspection of a project. As such, self-evaluation should not be used as a formal evaluation process. However, because the evaluator has direct access to building plans and the construction site, the quantity of "real" data collected can be significantly greater than third-party evaluation. The self-evaluation process allows plan review and inspection staff to collect on-site data as the building is being constructed versus visiting the site just once during the evaluation process.

Advantages

A self-evaluation can be conducted in-house with a minimal budget. Since evaluators (plan review and inspection staff) have direct access to the building plans and construction projects

through their normal enforcement duties, they can collect compliance data as the project progresses. This reduces the number of assumptions that typically enter into the collection process. Compliance issues and problems can be identified and reported immediately. Multilevel compliance evaluations can also be conducted. For example, the plan reviewer can implement the compliance study during the first round of plan review and assess the quality of the submittals. A peer designated and trained as an energy code compliance evaluator can then review the approved plans and documentation to determine the plan reviewer's understanding of the energy code. Building department officials that are involved in the evaluation can increase their knowledge of the energy code over time as they evaluate their own work.

Disadvantages

Self-evaluation can lead to subjective, biased results that may not accurately reflect issues within a jurisdiction. A common problem is the evaluator may not have training or experience in evaluating energy code compliance and therefore may lack the expertise necessary to determine compliance with the energy code. This can lead to inaccurate results. A self-assessment may also make it difficult to address energy code compliance challenges that are caused by policies outside of the building department. For example, if the city council has set a policy to fast track development at the detriment of energy code compliance, it may be difficult for a building department staff to bring attention to such a policy. Finally, there may be reluctance on the part of code officials to expose low compliance rates which might reflect badly on the department.

Section 2.2 Third-Party Evaluation

Third-party evaluation involves the use of an independent evaluator with no conflict of interest with the city, designers or builders assessed as part of the project. Third-party evaluation is generally the most recommended assessment strategy as it is thought to eliminate bias in the evaluation process and produce objective results. The evaluator or evaluation team conducts the evaluation over a period of days, weeks or months based on the depth of the evaluation. Evaluators complete data collection forms for both quantitative and qualitative data and evaluate and summarize the data prior to reporting to the city.

Advantages

The advantage of third-party evaluation is that it minimizes potential bias in producing an objective evaluation of the building department's processes. This type of evaluation also typically involves companies with expertise in the assessment of energy code compliance and requires a very limited time commitment by building department staff.

Disadvantages

Third-party evaluations can be expensive. Due to time and budget constraints for a typical third- party evaluation, most data must be collected from the construction site during one on -site visit per project. Although information is collected from the building plans, it is difficult to determine from the on-site visit if all measures comply with the energy code or only those that are observed during the site visit under typical time constraints. Assumptions must then be made based on "typical construction practice" in the region in order to complete the data collection process. In addition, neither industry professionals nor code officials are included in the process and much of the information gathered is not effectively communicated between the third-party and code officials.

Section 2.3 CEP Assessment Methodology

The CEP assessment methodology uses a hybrid model where a third-party provides initial oversight and training to the building department during the evaluation process and in-house staff collects data from the building plans and on-site inspections. The CEP assessment methodology is recommended as an alternative to third-party evaluation as it reduces the cost of the evaluation. During a CEP assessment, the third-party monitors the evaluation process and provides assistance when needed while the building department staff receives training on the evaluation process and the energy code. As with self-evaluation, staff will have direct access to the building plans and all phases of construction so fewer assumptions are necessary during the data collection process. In-house staff can either assess the results of the evaluation process or provide the data to the third-party for assessment. The CEP assessment has the advantages of both the third-party and self-evaluation assessment strategies while minimizing the disadvantages associated with each.

Advantages

The third-party can provide oversight into the evaluation process and reduce the bias typically associated with self-evaluation. However, the overall cost is significantly less than third-party evaluation. Evaluators have direct access to the building plans and construction projects which enables them to collect compliance data as the project progresses, reducing the number of assumptions that typically enter into the collection process. Compliance issues and problems can be identified and reported immediately. Staff will increase their knowledge on the energy code over time as they evaluate their own work. The third-party can be used to validate compliance barriers that may exist outside of the building department and even engage city leadership on developing solutions.

Disadvantages

The cost of a CEP evaluation is greater than self-evaluation as a qualified third-party will need to be contracted to assist with the evaluation; the cost, however, is significantly less than a full

third-party review. There may also be some residual bias since plan review and inspection will be performed by in-house staff although the third-party oversight should reduce that problem.

Section 2.4 Recommended Evaluation Approach

It is recommended that medium and large cities use the CEP assessment methodology, discussed in detail in Section 4, or the third-party evaluation approach described above. When using a third-party evaluator, cities should require that the third-party evaluator follow the CEP assessment methodology as it relates to third-party evaluation outlined in this document.

Section 3.0 Quantitative and Qualitative Evaluations

Regardless of the assessment strategy chosen, the energy code compliance assessment should consist of both a quantitative and qualitative evaluation. Conducting both types of evaluations will ensure that a city knows which compliance challenges exist and why.

Section 3.1 Quantitative Evaluation Overview

Quantitative evaluations assess whether a project complies with the provisions of the energy code. In addition to determining a compliance rate, quantitative evaluations are used to identify features within the energy code that are commonly missed during the design, plan review and inspection processes. For example, National Fenestration Rating Council (NFRC) certificates for site-built window products are typically not included with documentation during plan review or inspection even though the energy code specifically requires that certificates for windows be submitted. A quantitative assessment would determine if the certificates are available during the on-site inspection and if the efficiency levels on the certificates meet or exceed the required efficiency levels for the project. If no certificate is available, the project will be non-compliant with the NFRC requirement and the fenestration may be non-compliant with the minimum efficiency requirements in the energy code.

Section 3.2 Qualitative Evaluation Overview

Qualitative evaluation is used to assess the process that the jurisdiction uses to review plans and conduct on-site inspections. It also identifies barriers that might hinder enforcement efforts for determining compliance with the energy code. For example, the qualitative evaluation may identify that the jurisdiction has too few staff to adequately handle the number of permits issued during the year. Cities may have had no training on the energy code, may not have purchased copies of the energy code for budget reasons, or may have recently adopted the code and are still in the learning process. There may also be a policy that the plan review and inspection process shall not be a barrier to development within the city, causing the building department to enforce only health and life/safety requirements and minimally review the energy code submittals. Or the department may not

have clearly set out the list of submissions necessary to document compliance with the code. In the NFRC certificate example cited above, a qualitative assessment would look to uncover why the certificates are not being required with documentation for plan review or inspections.

Both assessments are important and work in tandem to identify the comprehensive problem facing the jurisdiction. For example, a quantitative assessment may identify that insulation R-values are non-compliant in many installations. A qualitative assessment may reveal that insulation inspections are not being conducted because of budget cuts and too few staff. Developing a solution that requires the inspector to verify that the installed insulation R-value matches the energy code documentation will not solve the compliance problem if there is no insulation inspection. Effective solutions must be tailored to address the specific barriers faced by the city.

Section 4.0 Conducting a Quantitative CEP Assessment Methodology Evaluation

Quantitative evaluations for energy codes are conducted for three primary reasons:

1. To determine a compliance rate for the energy code that can then be used as a baseline to measure progress through subsequent evaluations.
2. To identify compliance issues with specific sections or provisions of the energy code that can be mitigated through training, education, enforcement, or other means.
3. To provide a basis for estimating energy savings from code implementation.

Quantitative evaluations are typically focused on collecting information from building plans, building specifications and on-site inspections to determine the level of energy code compliance. Data collection forms are used to collect information from the plans and in the field. The evaluator then compares the data to the provisions of the energy code to determine if a particular feature is in compliance. This information is used to determine compliance rates with the energy code and to identify potential issues with code compliance.

There are limitations in the quantitative assessment process. For example, the time spent to collect data can be an issue depending on the data collection process used (e.g., third-party or self-evaluation) and budget of the code compliance assessment project. The data collection process described in the BECP protocol is designed to collect data at each phase of the construction process in addition to plan review. The BECP methodology provides accurate results but is typically not practical from a time and budget standpoint as it requires the evaluator to visit the job site during each phase of construction. This is especially difficult for commercial projects that typically take one to two years (or even more) to complete. The CEP methodology (see Figure 1 and Section 4.2) decreas-

es the time necessary for collecting data from the plans and in the field to 9 months by selecting projects at one of two phases:

- Projects are selected where the complete project time frame is 6 months or less from start to completion. This would typically apply to additions and alterations.
- Projects are selected that are in a phase of construction that offers the best opportunity to view the installed system in the field following the plan review portion of the data collection process.

The experience of the evaluation team can also be a limitation of the quantitative evaluation process. Evaluators are asked to assess the project for compliance with the energy code and are required to use their best judgment in the field to make the assessment. This requires that the evaluator understand the code and how the code is to be applied and also requires the evaluator to have experience in plan review and field inspection. The overall results from quantitative analysis are only as accurate as the data used to generate the results. Inaccurate or incomplete data can lead to compliance rates that do not reflect the population of buildings being included in the study. Incorrect applications of the energy code can lead to overlooking energy code compliance issues or identifying "false" compliance issues.

Two options are available under the CEP assessment methodology to address these issues. A third party consultant, knowledgeable on the energy code and plan review and inspection processes, can be used to evaluate the jurisdiction. The second option is to have the third party consultant train the plan review and inspection staff on the evaluation process and then have the third party assess the quality of the reviews.

Section 4.1 Data Collection Process

The data collection process recommended for the CEP assessment methodology is designed to simplify and expedite the assessment process. It evaluates building systems in four different phases, sampling systems rather than whole buildings, and uses a different process for large and small projects. In doing so, it will reduce the time required for collecting building data and cities will be able to identify compliance problems and implement improvements faster.

In brief, the process divides projects into two groups: those where construction is likely to be completed within six months, and larger, more complex projects that will take longer. For the first, faster group, projects currently being submitted for approval will be assessed for energy code compliance during plan review, and when the work is ready in the field, the same systems that were assessed in plan review will be assessed in the field. For the larger projects, the city will select projects currently under construction, perform an ex-post-facto plan review for energy compliance as part of the assessment, and perform field inspections of the same systems that were assessed in the plan review. An overview of the process is provided in Figure 1 and the phases are discussed in detail in Section 4.2.

Each phase of the CEP assessment methodology builds on data collected using the CEP Data Collec-

tion Form (Section 4.1.1). In addition, plan review and on-site inspection processes are critical to data collection and it is recommended that those following the CEP protocol use the evaluation methods outlined below.

The CEP assessment methodology uses both a third-party evaluator as well as the plan review and field inspection staff from the jurisdiction being evaluated as the evaluation team. A third-party evaluation can also be conducted using this process by eliminating the role of the plan review and inspection staff and conducting the study using only third-party data collection.

Determining a Compliance Rate

The CEP assessment methodology is based on the BECP Methodology that focuses on whole building sampling and is designed to utilize the DOE Score and Store tool to determine compliance rates. After the compliance data is collected, it should be entered into the DOE Score and Store online tool to determine a compliance rate.

Section 4.1.1 Data Collection Forms

Data collection forms, including the checklists of energy code requirements developed by BECP, are intended to be used by evaluators to gather the appropriate information on energy code compliance. These forms generally reflect all of the energy code provisions that can be reviewed either during the plan review process or in the field and include instructions for proper use and recording results.

The Data Collection Forms developed for use with the CEP assessment methodology are provided to CEP cities and are based on the compliance checklists developed by BECP. The BECP checklist was selected since it is designed to be used with DOE' s Store and Score energy code compliance rate online software. Data Collection Forms representing several code years (e.g., 2009 or 2012 IECC commercial and ASHRAE 90.1-2007 or 2010) are available for use with the CEP assessment methodology process. The easy to understand forms were designed to be used as a plan review and inspection tool in addition to a resource for collecting data to determine compliance.

The CEP Data Collection Forms provide a variety of information that is crucial to determining whether a building complies with the code. The code section number as well as the building component being inspected is listed, along with a column for the value proposed in the building plans and the observed value of the component installed in the field. This information can be used to inform the magnitude of the compliance issue. For example, if the minimum code requirement was R-20 + R-5 wall insulation and all the insulation installed was R-19, installing slightly more efficient insulation would solve the problem at a minimal cost. However, if the installed insulation is R-13, a change in framing to 2" X 6" and additional insulation may be needed, resulting in a greater cost. The Data Collection Forms also include areas where the evaluator can record the actions necessary to correct any errors observed in the plan review and field inspection.

Based on the data collected from the plan reviews and field inspections, compliance for each com-

ponent is determined from the compliance options listed in the Data Collection Form. The compliance options available for the evaluator to select are:

- Complies
- Does Not Comply
- Not Applicable

Columns to record assumptions and observations are also included in the forms and can help inform the evaluation results. For example, a project may take credit for continuous insulation for an exterior concrete wall with insulation installed between metal furring strips. The installation would not comply with the code, but the issue could be solved for future projects through training and education. Selecting one of the choices from above (Complies, Does Not Comply, Not Applicable) without providing additional information would not provide the feedback necessary to correct the issue.

Section 4.1.2 Evaluation of Submittal Documents

The CEP assessment methodology uses a basic plan review process for determining compliance with the energy code. The CEP assessment methodology process, described in Section 4.2, has been designed so that plan review and inspection staff participating in the evaluation will learn a process that can be used after the completion of the evaluation for future compliance review. The evaluation follows a process common for plan review and inspection of energy code submittals:

1. Verify compliance documentation is complete and accurate. This includes prescriptive compliance submittals, COMcheck or REScheck documentation or performance approach submittals.
2. Verify compliance documentation matches the building plans.

Verify that all of the information is contained in the building plans, specifications and supporting documentation to show compliance with the energy code.

There are typically three types of energy code compliance options for a construction project:

1. Prescriptive
2. Trade-off (for example, COMcheck or REScheck)
3. Performance

Each of the options available to demonstrate compliance requires a slightly different approach when reviewing submittal documents.

Prescriptive Compliance. The CEP has developed forms that can be used to document compliance using the prescriptive approach. ASHRAE also provides forms for documenting compliance for the prescriptive requirements for commercial buildings. If no code compliance form is present with the

building plans, the plans and specifications must be assessed to determine if compliance with the energy code is achieved. The CEP Data Collection Form, included in Appendix A, can be used to guide the plan reviewer through verifying compliance with the code using the steps below:

- **Building envelope:** Use the minimum prescriptive R-values (for insulation) and maximum fenestration U-factors from the energy code to populate the minimum code requirements on the Data Collection Form. Review the plans to determine both the proposed insulation R-values for each assembly and window U-factors and determine if the proposed value meets or exceeds the minimum requirements. All deficiencies should be recorded on the CEP Data Collection Form and be listed as part of a correction notice. In addition, verify that the plans and specifications reflect the requirements for the building envelope that are not related to insulation and fenestration. Record all information on the CEP Data Collection Form and identify the deficiencies.
- **Mechanical and Service Water Heating:** Verify that the proposed HVAC and service water heating (SWH) systems comply with the provisions of the energy code. Record all deficiencies on the CEP Data Collection Form.
- **Building lighting system:** Verify that the lighting power density proposed in the building is less than or equal to the allowed lighting power density. Also verify that the lighting controls and other non-lighting power related lighting features comply with the energy code. Record all deficiencies on the CEP Data Collection Form.

Further instructions for completing the CEP Data Collection Form are provided in ***Appendix A.***

COMcheck and REScheck Compliance. DOE COMcheck and REScheck software provides forms for documenting compliance with the energy code. If a project complies with the COMcheck or REScheck compliance approach, the levels of efficiency for different measures can be used from the COMcheck or REScheck form to complete the Data Collection Form. A step-by-step process is included in ***Appendix A*** that will guide the evaluator through this process. When completing the Data Collection Form, use the proposed values in the COMcheck or REScheck documentation to populate the minimum code requirements for the building envelope, HVAC, SWH and lighting requirements. Use either the COMcheck or REScheck printout or energy code to verify that the plans and specifications provide all of the information needed to verify compliance with the code.

Performance Compliance. The energy codes require documentation that provides a summary of the building input file and associated output file when using the performance approach. Documentation from the software varies, but the steps used to evaluate COMcheck documentation can be used to complete the Data Collection Form. As with the COMcheck documentation, the minimum code requirements are the proposed values in the software.

Section 4.1.3 On-site Construction Evaluations

The field inspector will perform the on-site data collection during each inspection performed (e.g.,

foundation, framing, rough-in of mechanical, etc.). The goal is to determine if the installed energy features meet the minimum energy code requirements listed on the Data Collection Form used for the Phase 1 and Phase 2 portions of the CEP evaluation. The field inspector will record all findings when the job site is first visited for each inspection. An installation will either comply or not comply with the code. The action taken shall be recorded on the CEP Data Collection Form for all features that do not comply with the code. For example, if the foundation insulation is found to be non-compliant with the energy code, the action recorded would be that a correction notice was given to the contractor to correct the violation. Any additional actions for the violation should be recorded on the Data Collection Form until the feature is compliant.

Section 4.1.4 CEP Assessment Methodology Building Systems Approach to Assessment

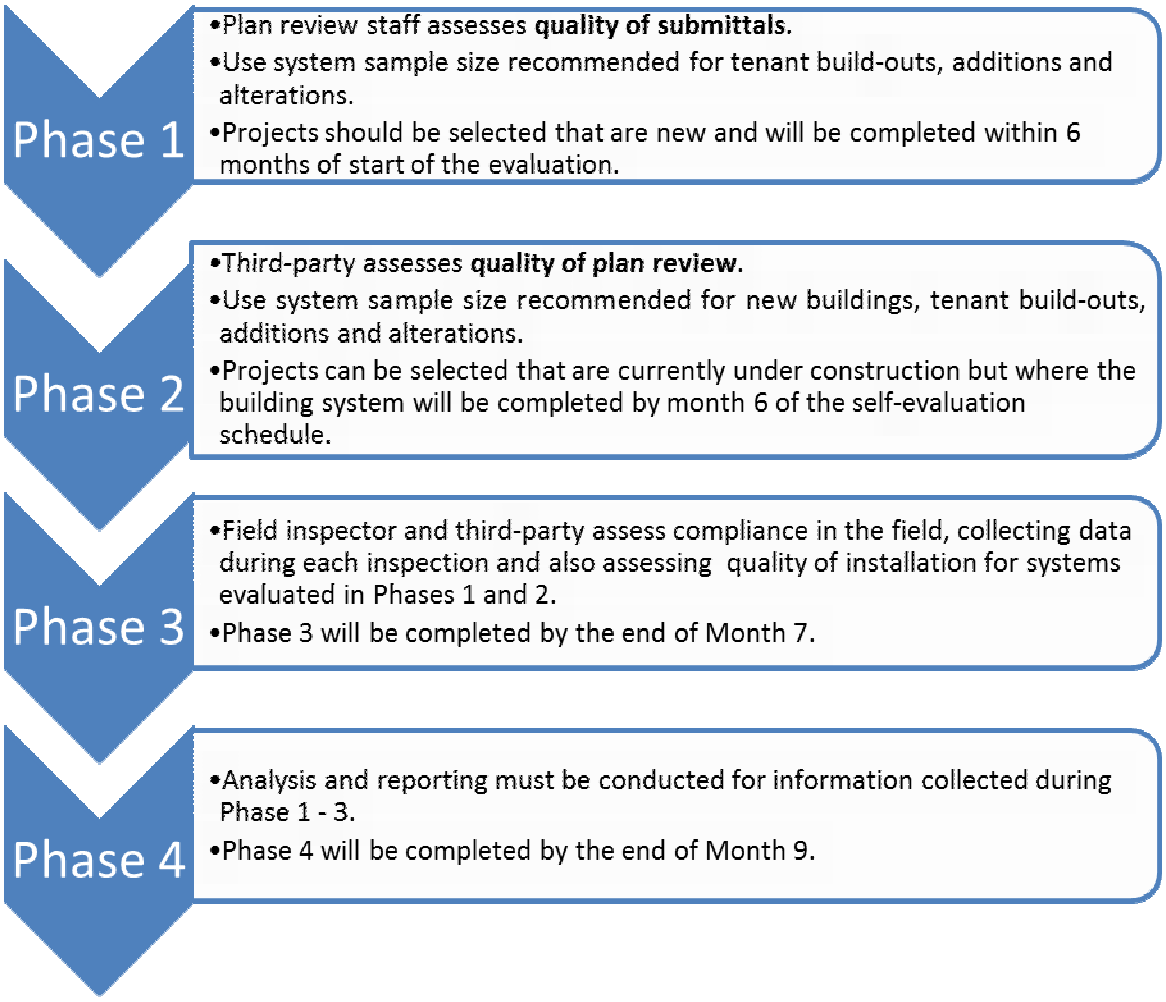
The CEP Assessment Methodology is unique in that it uses a systems approach to determining compliance rather than a whole-building approach. During each phase of evaluation, the plan reviewer and field inspector will be responsible for determining how a single system (i.e., envelope, lighting, HVAC/SWH) complies with the code. For example, the CEP assessment methodology requires that a total of 15 lighting systems be evaluated to determine a compliance rate for a city. Plan reviewers will evaluate the plans for 15 lighting systems (5 office buildings, 5 retail buildings and 5 other buildings) and the field inspector will evaluate only the components related to building lighting. The CEP assessment methodology outlines the recommended sample size for each building system in Section 4.3.

Section 4.2 Four Phases of CEP Compliance Assessment

The CEP Assessment Methodology recommends that the following four phases be used to determine the compliance rate of medium to large cities.

Phase 1: Plan review by building department staff. The first phase of the data collection process focuses on collecting data during the initial review of the building plans and documentation to assess the quality of the submittal from a compliance standpoint. Phase 1 only applies to tenant build-outs and additions and alterations where the project will be permitted and completed within six months from the start of the evaluation. During this stage, plan reviewers from the city will use the CEP Data Collection Form to record information from the plans and documentation for a select building system and determine if the building system complies with the energy code. Code violations will be recorded on the Data Collection Form with the action taken by the plan reviewer to correct the violation. For example, if window U-factors identified on the plans are less efficient than what is called for in the code, the action taken by the plan reviewer would be that a correction notice was sent to the designer to correct the issue with an additional comment on the form once the code violation has been corrected. This information is used by the third-party as part of the qualitative assessment to assess process.

Expected outcome: Evaluate the quality of plans and energy code documentation submitted



by the applicant.

Phase 2: Plan review by third-party evaluators. The second phase of the evaluation process will assess the same projects selected during Phase 1 as well as additional projects selected to complete the sample size provided in Table 1. This will allow the third-party to select projects at random, reducing the bias associated with this methodology. Selected projects will be in a phase of construction that will allow a particular system to be inspected in the field. For example, if a project is selected for review of the lighting system, it will be important that the building be in a phase of construction where the system components are installed in the field. The following process will be followed during Phase 2:

- Review the CEP Data Collection Form, plans and documentation completed for projects selected during Phase 1. A third-party evaluator will review the plans, documentation and associated CEP Data Collection Form to assess the effectiveness of the energy code plan review.
- Review randomly selected plans and energy code documentation for systems that were not se-

lected during Phase 1 and where no CEP Data Collection form was completed. Sufficient samples should be selected to complete the sample size in Table 1.

- The third-party evaluator will review the plans, documentation and complete the *CEP Data Collection Form* to assess the effectiveness of the energy code plan review. The third-party evaluator will also review correction notices that pertain to energy code compliance, determine the action taken to correct the code violation, and record these on the CEP Data Collection Form.

The third-party may be an independent entity with in-depth knowledge of the energy code that is not employed by the building department as a plan reviewer or inspector. The third-party should perform a mid-point assessment when 50% of the plan review samples are complete to provide feedback to the jurisdiction on the findings to date. Additional data may be collected at the request of the building department. For example, the length of time for receiving a permit for a project that complies with the International Energy Conservation Code (IECC) verses one that does not comply with the code.

> **Expected outcome:** Evaluate the effectiveness of the plan review for energy code compliance.

Phase 3: On-site Verification. The on-site data collection phase of the CEP assessment methodology will assess code compliance for components of the systems evaluated in phases 1 and 2. The Data Collection Form completed during either Phase 1 or 2 will be used in the field during Phase 3 for each phase of construction if more than one phase of construction is required to review the system. During Phase 3, the field inspector will perform the on-site verification using the Data Collection Form and must examine the applicable energy code features and determine compliance with the code. Code violations will be recorded on the Data Collection Form along with the action taken by the field inspector to correct the violation and a notation once the violation has been corrected.

The third-party should perform a mid-point assessment when 50% of the field inspection samples are complete to provide feedback to the jurisdiction on the findings to date.

> **Expected Outcome:** Evaluate energy code compliance in the field, prior to corrections, based on the approved plans and documentation. Evaluate the action taken by the field inspector to have the violation corrected.

Phase 4: Final Review of Data. All completed CEP Data Collection Forms will then be collected by the third-party overseeing the evaluation process for the city. Data and information will be analyzed to determine the rate of compliance, issues found during the collection process and other helpful feedback. This information will be used to determine an internal course of action to mitigate the compliance issues in concert with the results of the qualitative analysis. For information on how to establish an energy code compliance improvement plan, refer to the document *"Establishing a Plan to Achieve Energy Code Compliance in Cities."*

Section 4.3 Sample Size.

Section 4.3.1 CEP Assessment Methodology Sample Size

The CEP assessment methodology has determined the average number of building systems that need to be evaluated per building type, including new construction and additions and alterations of both commercial and residential structures, for medium and large cities. The average number of building systems selected is not intended to be statistically valid. Instead, the CEP assessment is intended to provide sufficient information to the building department to determine an informal compliance rate with the energy code and identify potential energy code compliance issues. The number of building systems selected is also intended to alleviate any undue burden on the building department implementing the methodology.

There are several goals for the sampling strategy of the CEP assessment methodology program:

1. Ensure that cities collect sufficient information on energy code compliance without overburdening plan review and field inspection staff.
2. Design the sample set so that it is reasonably representative of the energy impacts of the mix of projects that occur within cities. Since cities tend to have a higher percentage of large commercial buildings, including multifamily buildings taller than three stories, these building types are more highly represented than single-family residential structures. Similarly, since renovation rather than new building construction is more common in cities, the required sampling rate for alterations is comparatively high.
3. Create a common methodology for city to city comparison.

The sample size for each compliance approach in Table 1 can be adjusted based on what is typically submitted in the city. Occupancy types (e.g., lighting sample) can also be adjusted based on typical occupancy types being permitted in the city, but the number of total occupancy types should be limited to no more than 5. It is also recommended that projects that are unique to the jurisdiction (only one building of its type will be built) should be avoided when selecting the sample. Additions and alteration projects selected for the sample should be complex enough to illicit interest given the scope of the study. Residential buildings are defined as low-rise (3 story or less) projects that include one-, two- and multi-family homes. Fewer residential than commercial samples are proposed to reflect the typical proportion of residential and commercial buildings in a medium to large city.

Commercial Additions /Tenant Build-outs/Alterations (Projects ≤ 6 Months Time Frame)				
Building System	Sample Size			
Envelope	5 Prescriptive Approach	5 COMcheck / Performance Approach		Total Number of Envelope Systems: **10**
Lighting	5 Retail	5 Office	5 Other building types	Total Number of Lighting Systems: **15**
HVAC/Service Water	5 Single Zone Systems	5 Complex Systems		Total Number of HVAC systems: **10**
Total Number of System Samples		**35**		
Commercial New Construction / Alterations/Additions (Projects >6 Months Time Frame)				
Envelope	5 envelope systems			Total Number of Envelope Systems: **5**
Lighting	5 systems that represent alterations and additions that are tenant build-outs and 5 that represent new construction.			Total Number of Lighting Systems: **10**
HVAC/Service Water	5 new systems added to the building			Total Number of HVAC systems: **5**
Total Number of System Samples		**20**		
Residential New Construction/Additions				
Envelope	5 Prescriptive Approach	5 REScheck / Performance Approach		Total Number of Envelope Systems: **10**
Lighting	10 lighting systems			Total Number of Lighting Systems: **10**
HVAC/Service Water	10 HVAC systems/Service Water			Total Number of HVAC/Service Water systems: **10**
Total Number of System Samples		**30**		

Table 1. Recommended sample size per building type.

Note that Commercial as defined above includes multi-family residential four stories and above in height. The CEP Assessment Methodology includes a total of 85 system samples for both plan review and on-site verification, for a total of 170 samples.

Section 4.4 Length of Data Collection Process

The CEP Assessment Methodology is designed for a 6-9 month evaluation period (see Figure 3). It is anticipated that Phase 1 and Phase 2 can start concurrently based on the type of projects selected. Phase 3 can start within two weeks of the start of Phase 2 as the process may already be in progress for projects selected during Phase 2 (see Phase 2 description). Phase 3 should be completed by the

CEP Assessment Methodology Phase	Month								
	1	2	3	4	5	6	7	8	9
Phase 1: Plan Review by Building Department Staff									
Phase 2: Plan Review by Third Party Evaluators									
Phase 3: On-site Verification									
Phase 4: Final Review of Data									

Figure 3. Evaluation Schedule

end of month 7. Final data collected during Phase 3 will be compiled and evaluated in Phase 4, which should be completed by the end of 9 months.

Section 4.5 On-going Quality Assurance

The city is encouraged to perform periodic quantitative assessments one year after the completion of the initial assessment and then every two to three years thereafter. The results of the initial qualitative assessment should be reviewed as part of the ongoing evaluation to assess progress in implementing procedural changes. An ongoing quantitative assessment will provide continued feedback to the city. The CEP assessment methodology recommends using 50% of the sample size from Table 1 based on the building system types, and types of projects for future evaluations. Under this approach, the third-party will be either a plan review or inspection staff member who has participated in the evaluation process or a contracted third-party.

Section 5.0 Conducting a Qualitative Evaluation

As discussed in Section 3.2, a qualitative evaluation is used to assess the process that the jurisdiction uses to review plans and submittals and identifies barriers within the jurisdiction that might hinder enforcement efforts for determining compliance with the energy code. Qualitative evaluations can be used to determine barriers outside of the jurisdiction that affect compliance as well.

The CEP Assessment Methodology focuses on collecting basic information on the plan review and field inspection processes. In addition, information is collected on the political and decision making processes that are present in the jurisdiction and attitudes toward energy efficiency in general. The qualitative evaluation is initiated by the third-party evaluator in order to provide an objective viewpoint assessment. A questionnaire (see CEP Qualitative Assessment Tool in Appendix) is used in interviews with plan review and field inspection staff in addition to onsite observations by the third-party on how the enforcement process is working. Once complete, the third-party evaluator will review the findings of the qualitative assessment and make recommendations for improvements to the process, if warranted. The following type of information is collected as part of this process.

Section 5.1 Interview and Evaluate Energy Code Knowledge of Internal Staff

Representative plan review and field inspection staff are interviewed to determine their perceived knowledge of the energy code and also to determine what problems and issues they are having with the code. The gap in knowledge will be the difference between the perceived knowledge and how well they perform plan review and inspections. An assessment is done on the types of training that staff have attended and reference books that they may use for assisting on the job. Questions are asked concerning the issues and problems that the design and construction communities are having with the energy code.

Section 5.2 Assess the Process for Document Submittal and Plan Review

The qualitative evaluation process will also assess the plan review process used in the building department. This will include an assessment that starts with the permit technicians responsible for initial project submittal and ensuring that the plans are complete and ends with those responsible for plan and document storage. Issues to be identified may include a lack of clarity regarding what information needs to be submitted and in what format, receiving a project without all of the required energy code documentation, or the storage of plans in such a way that it becomes difficult to retrieve the energy code documentation. Internal processes can impact the ability to access accurate information about a project which can lead to energy code compliance issues. This evaluation will assess the process used for both new construction and additions and alterations.

Section 5.3 Assess the Process for On-site Inspections

The field inspection process will be assessed to determine what tools are currently being used in terms of checklists, computers, etc., to guide the field inspection for the energy code. The third-party evaluator will accompany the field inspector through a typical energy inspection at each phase of construction to assess the inspection process for energy to determine what is reviewed and how. Projects will be selected that represent both new buildings and additions and alterations.

Section 6.0 CEP Evaluation Budget

The proposed budget for the initial assessment considers the soft cost of contracting with a third-party to oversee the evaluation process, conduct the qualitative review of the city, participate in the Phase 2 portion of the review, evaluate results and provide a report. An estimated cost of the third-party for the initial assessment is $30,000 to $75,000 based on the evaluation team selected.

Building department staff time must also be accounted for in this estimate. Estimated staff time is presented for each phase of evaluation process on a per-staff basis (see Table 2).

A proposed budget for the on-going assessment again considers the soft cost of contracting with a third-party to oversee the evaluation process, participate in the Phase 2 portion of the review, evalu-

Task	Estimated Time per Task (Hours)
Participate in the evaluation training	8.0 per staff person
Participate in the qualitative evaluation	1.0 per plan reviewer per project
Participate in the qualitative evaluation	1.5 per field Inspector per project
Additional time for each project reviewed in Phase 1. Note that the additional time per plan review will be reduced as the Data Collection Form is integrated into the plan review process.	0.5 per plan reviewer per project
Additional time for each field inspection in Phase 3. Note that the additional time per inspection will be reduced as the Data Collection Form is integrated into the inspection process.	0.5 per field inspector per project

Table 2. Estimated Time for Jurisdiction — Initial Evaluation

ate the results, review and assess progress in modifying procedures based on the recommendations of the initial qualitative analysis and provide a report. The estimated cost per evaluation for the third-party for the one-year follow up assessment and the biennial or triennial assessments is $10,000 to $20,000 per city.

It will be the responsibility of the cities to determine a long term funding plan for implementing the initial evaluation, long term evaluation and compliance enhancement strategies based on the evaluation results.

Section 7.0 Conclusion

The CEP Assessment Methodology provides an effective, low cost protocol for increasing energy code compliance in cities. The protocol provides a sampling methodology tailored to cities that can be performed quickly to provide actionable feedback. Plan review staff participating in this process will learn how to use the Data Collection Form as a plan review checklist and will increase their overall knowledge of the energy code. Field inspectors will also learn how to use the Data Collection Form to guide them through the energy code inspection process, resulting in greater compliance rates for the energy code. Increased enforcement will result in more complete and accurate plan submittals from designers and engineers; this will ultimately lead to reduced plan review and inspection time for energy codes, resulting in a direct benefit for the building, design and construction industries.

Section 8.0 Important Resources

2009 International Energy Conservation Code and ASNI/ASHRAE/IENSNA Standard 90.1-2007 Energy Stand-

ard for Buildings Except Low-Rise Residential Buildings http://shop.iccsafe.org/codes/2009-international-codes/2009-international-energy-conservation-code-1.html

2012 International Energy Conservation Code and ASNI/ASHRAE/IENSNA Standard 90.1-2010 Energy Standard for Buildings Except Low-Rise Residential Buildings http://shop.iccsafe.org/codes/2012-international-codes/2012-international-energy-conservation-code.html

2009 IECC Code and Commentary http://shop.iccsafe.org/catalogsearch/result/?order=relevance&dir=desc&q=IECC+Commentary

2012 IECC Code and Commentary http://shop.iccsafe.org/catalogsearch/result/?order=relevance&dir=desc&q=IECC+Commentary

Standard 90.1-2013 User' s Manual http://www.techstreet.com/ashrae?ashrae_auth_token=

Establishing a Plan to Achieve Energy Code Compliance in Cities (from IMT)

Attachments:

Appendix A: Data Collection Form for the 2009 IECC, Commercial

Appendix B: CEP Qualitative Assessment Tool

2009 IECC Commercial Building Data Collection Checklist
2009 International Energy Conservation Code

Building ID: _____ System Type: _____ *Climate Zone*: _____

Date: _____ *Name of Evaluator(s):* _____

Building Contact: Name: _____ *Phone*: _____ *Email*: _____

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

State: _____ *County:* _____ *Jurisdiction*: _____

Compliance Approach (check all that apply): Prescriptive Trade-Off Performance

Compliance Software (if used): _____ *Green/Above-Code Program*: _____

Building Use: Office Retail/Mercantile Warehouse/Storage Education/School Lodging/Hotel/Motel

Restaurant/Dining/Fast Food Public Assembly/Religious Healthcare High-Rise Residential Other

Building Ownership: State-owned Local government-owned National account Speculative Private Other

Project Type: New Building Existing Building Addition Existing Building Renovation

Valuation (If Renovation): $ _____

General

2009 IECC Section #	Plan Review	Value from Plans	Plan Review Action	Complies	Comments/ Assumptions
103.2 [PR1][1]	Plans and/or specifications provide all information with which compliance can be determined for the building envelope and document where exceptions to the standard are claimed.			Complies Does Not Comply Not Observable Not Applicable	
103.2 [PR2][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the mechanical systems and equipment and document where exceptions to the standard are claimed.			Complies Does Not Comply Not Observable Not Applicable	
103.2 [PR3][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the service water heating systems and equipment and document where exceptions to the standard are claimed.			Complies Does Not Comply Not Observable Not Applicable	
103.2 [PR4][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include interior and exterior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.			Complies Does Not Comply Not Observable Not Applicable	
103.2 [PR8][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the exterior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include interior and exterior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.			Complies Does Not Comply Not Observable Not Applicable	

Building Envelope

2009 IECC Section #	Footing / Foundation Inspection	Value from Plans	Plan Review Action	Verified Value	Complies	Field Inspection Action	Comments/ Assumptions
502.2.4 [FO1]1	Below-grade wall insulation R-value.			R-	Complies Does Not Comply Not Observable Not Applicable		
303.2 [FO2]1	Below-grade wall insulation installed per manufacturer's instructions.				Complies Does Not Comply Not Observable Not Applicable		
502.2.6 [FO3]1	Slab edge insulation R-value.			R- Unheated Heated	Complies Does Not Comply Not Observable Not Applicable		
303.2 [FO4]1	Slab edge insulation installed per manufacturer's instructions.			___ft	Complies Does Not Comply Not Observable Not Applicable		
502.2.6 [FO5]1	Slab edge insulation depth/ length.				Complies Does Not Comply Not Observable Not Applicable		
502.3.2 [FR8]1	Vertical fenestration U-Factor.			U-	Complies Does Not Comply Not Observable Not Applicable		
502.3.2 [FR9]1	Skylight fenestration U-Factor .			U-	Complies Does Not Comply Not Observable Not Applicable		
502.3.2 [FR10]1	Vertical fenestration SHGC value.			SHGC:	Complies Does Not Comply Not Observable Not Applicable		

Building Envelope (continued)

2009 IECC Section #	Framing / Rough-In Inspection	Value from Plans	Plan Review Action	Verified Value	Complies	Field Inspection Action	Comments/ Assumptions
502.3.2 [FR11][1]	Skylight SHGC value.			SHGC:	Complies Does Not Comply Not Observable Not Applicable		
303.1.3 [FR13][1]	Fenestration products are certified as to performance. Labels or certificates provided.				Complies Does Not Comply Not Observable Not Applicable		
303.1.3 [FR12][2]	Fenestration products rated in accordance with NFRC.				Complies Does Not Comply Not Observable Not Applicable		
502.3.2, 502.4.1, 502.4.2 [FR14][2]	U-factor of opaque doors associated with the building thermal envelope meets requirements.			U- Swinging Non-swinging	Complies Does Not Comply Not Observable Not Applicable		
303.1.1 303.1.1.1 [IN10][2]	Building envelope insulation is labeled with R-value or insulation certificate providing R-value and other relevant data.				Complies Does Not Comply Not Observable Not Applicable		
303.2.1 [IN14][2]	Exterior insulation is protected from damage with a protective material. Verification for exposed foundation insulation may need to occur during Foundation Inspection.				Complies Does Not Comply Not Observable Not Applicable		
502.4.6 [FI1][1]	Weatherseals installed on all loading dock cargo doors in all zones.				Complies Does Not Comply Not Observable Not Applicable		

Building Envelope (continued)

2009 IECC Section #	Insulation Inspection	Value from Plans	Plan Review Action	Verified Value	Complies	Field Inspection Action	Comments/ Assumptions
502.4.3 [IN1] [1]	All sources of air leakage in the building thermal envelope are sealed, caulked, gasketed, weather stripped or wrapped with moisture vapor-permeable wrapping material to minimize air leakage.				Complies Does Not Comply Not Observable Not Applicable		
502.2.1 [IN2] [1]	Roof insulation R-value. For some roof systems, verification may need to occur during Framing Inspection.			R- Above deck Metal Attic	Complies Does Not Comply Not Observable Not Applicable		
303.2 [IN3] [1]	Roof insulation installed per manufacturer's instructions.				Complies Does Not Comply Not Observable Not Applicable		
502.2.3 [IN6] [1]	Above-grade wall insulation R-value.			R- Mass Metal Steel Wood	Complies Does Not Comply Not Observable Not Applicable		
303.2 [IN7] [1]	Above-grade wall insulation installed per manufacturer's instructions.				Complies Does Not Comply Not Observable Not Applicable		
502.2.5 [IN8] [1]	Floor insulation R-value.			R- Mass Steel Wood	Complies Does Not Comply Not Observable Not Applicable		
303.2 [IN9] [2]	Floor insulation installed per manufacturer's instructions.				Complies Does Not Comply Not Observable Not Applicable		

Service Water Heating

2009 IECC Section #	Plumbing Rough-In Inspection	Plan Review Action	Complies	Field Inspection Action	Comments/ Assumptions
504.5 [PL1][2]	Service hot-water piping systems insulated. Where piping is installed in or under a slab, verification may need to occur during Foundation Inspection.		Complies Does Not Comply Not Observable Not Applicable		
504.5 [FI19iecc][2]	Insulate automatic circulating hot water systems and 1st eight feet of non-circulating systems without integral heat traps.		Complies Does Not Comply Not Observable Not Applicable		
504.2 [ME36][2]	Service water heating equipment meets efficiency requirements.		Complies Does Not Comply Not Observable Not Applicable		
504.6 [PL3][1]	Automatic time switches installed to automatically switch off the recirculating hot water system or heat trace.		Complies Does Not Comply Not Observable Not Applicable		
504.7.3 [FI14][2]	Pool covers are provided for heated pools and pools heated to >90 ºF have a cover >=R-12.		Complies Does Not Comply Not Observable Not Applicable		

HVAC Systems

2009 IECC Section #	Mechanical Rough-In Inspection	Value from Plans	Plan Review Action	Verified Value	Complies	Field Inspection Action	Comments/ Assumptions
503.2.3 [ME1][2]	HVAC equipment efficiency verified.			Efficiency:	Complies Does Not Comply Not Observable Not Applicable		
503.2.5.1 [ME6][1]	Demand control ventilation provided for spaces >500 ft2 and >40 people/1000 ft2 occupant density and served by systems with air side economizer, auto modulating outside air damper control or design airflow >3,000 cfm.				Complies Does Not Comply Not Observable Not Applicable		
503.2.7 [ME8][2]	HVAC ducts and plenums insulated.			R-	Complies Does Not Comply Not Observable Not Applicable		
503.2.8 [ME9][2]	HVAC piping insulation thickness.			___in	Complies Does Not Comply Not Observable Not Applicable		
503.2.7.1 [ME10][2]	Ducts and plenums sealed based on static pressure and location.				Complies Does Not Comply Not Observable Not Applicable		
503.3.1, 503.4.1 [ME12][1]	Air economizers provided where required, meet the requirements for design capacity, control signal, and high-limit shut-off and integrated economizer control.				Complies Does Not Comply Not Observable Not Applicable		
502.4.5, 503.2.4.4 [ME13][2]	Return air and outdoor air dampers meet minimum air leakage requirements.				Complies Does Not Comply Not Observable Not Applicable		

HVAC Systems (continued)

2009 IECC Section #	Mechanical Rough-In Inspection	Value from Plans	Plan Review Action	Verified Value	Complies	Field Inspection Action	Comments/ Assumptions
503.3.1 [ME14][1]	Means provided to relieve excess outside air during economizer operation.				Complies Does Not Comply Not Observable Not Applicable		
503.4.5 [ME17] [1]	Zone controls can limit simultaneous heating and cooling and sequence heating and cooling to each zone.				Complies Does Not Comply Not Observable Not Applicable		
503.4.3.1 [ME50][2]	Three-pipe hydronic systems using a common return for hot and chilled water are not used.				Complies Does Not Comply Not Observable Not Applicable		
503.4.3.2 [ME51][2]	Two-pipe hydronic systems using a common distribution system have controls to allow a deadband >=15 ºF, allow operation in one mode for at least 4 hours before changeover, and have rest controls to limit heating and cooling supply temperature to <=30 ºF.				Complies Does Not Comply Not Observable Not Applicable		
503.4.3.3 [ME18][2]	Hydronic heat pump systems connected to a common water loop meet heat rejection and heat addition requirements.				Complies Does Not Comply Not Observable Not Applicable		
503.2.10.1 [ME52][2]	HVAC fan systems at design conditions do not exceed allowable fan system motor nameplate hp or fan system bhp.				Complies Does Not Comply Not Observable Not Applicable		
503.2.10.2 [ME21][2]	HVAC fan motors not larger than the first available motor size greater than the bhp.			bhp:	Complies Does Not Comply Not Observable Not Applicable		

HVAC Systems (continued)

2009 IECC Section #	Mechanical Rough-In Inspection	Value from Plans	Plan Review Action	Verified Value	Complies	Field Inspection Action	Comments/ Assumptions
503.4.2 [ME22][2]	VAV fan motors >=10 hp to be driven by variable speed drive, have a vane-axial fan with variable pitch blades, or have controls or devices to limit fan motor demand.			VSD Vane axial fan Other	Complies Does Not Comply Not Observable Not Applicable		
503.4.2 [ME24][2]	Reset static pressure setpoint for DDC controlled VAV boxes reporting to central controller based on the zones requiring the most pressure.				Complies Does Not Comply Not Observable Not Applicable		
503.2.6 [ME30][1]	Exhaust air energy recovery on systems ≥ 5,000 cfm and 70% of design supply air.				Complies Does Not Comply Not Observable Not Applicable		
502.4.4 [ME35][1]	Hot gas bypass on cooling systems limited to: ≤240 kBtu/h – 50% >240 kBtu/h – 25%				Complies Does Not Comply Not Observable Not Applicable		
503.2.4.1 [FI2][2]	Heating and cooling to each zone is controlled by a thermostat control.				Complies Does Not Comply Not Observable Not Applicable		
503.2.4.2 [FI3][2]	Thermostatic controls have a 5 ° F deadband.				Complies Does Not Comply Not Observable Not Applicable		

Lighting System

2009 IECC Section #	Electrical Rough-In Inspection	Value from Plans	Plan Review Action	Verified Value	Complies	Field Inspection Action	Comments/ Assumptions
505.2.2.2 [EL1][2]	Automatic lighting control to shut off all building lighting installed in buildings >5,000 ft^2.				Complies Does Not Comply Not Observable Not Applicable		
505.2 [EL2][2]	Independent lighting control installed per approved lighting plans and all manual control readily accessible and visible to occupants.				Complies Does Not Comply Not Observable Not Applicable		
505.2.2.1 [EL10iecc] [1]	Lighting controls installed to uniformly reduce the lighting load by at least 50%.				Complies Does Not Comply Not Observable Not Applicable		
505.2.2.3 [EL11iecc][2]	Daylighting zones provided with individual controls that control the lights independent of general area lighting.				Complies Does Not Comply Not Observable Not Applicable		
505.2.4 [EL3][2]	Automatic lighting controls for exterior lighting installed.				Complies Does Not Comply Not Observable Not Applicable		
505.2.3 [EL4] [1]	Verify separate lighting control devices for specific uses installed per approved lighting plans.				Complies Does Not Comply Not Observable Not Applicable		

Lighting System

2009 IECC Section #	Electrical Rough-In Inspection	Value from Plans	Plan Review Action	Verified Value	Complies	Field Inspection Action	Comments/ Assumptions
505.4 [EL6][1]	Exit signs do not exceed 5 watts per face.				Complies Does Not Comply Not Observable Not Applicable		
505.6.1 [EL7][1]	Exterior grounds lighting over 100 W provides >60 lm/W unless on motion sensor or fixture is exempt from scope of code or from external LPD.				Complies Does Not Comply Not Observable Not Applicable		
505.5 [FI18][1]	Interior installed lamp and fixture lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts.				Complies Does Not Comply Not Observable Not Applicable		
505.5 [FI19][1]	Exterior lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than nor equal to allowed watts.				Complies Does Not Comply Not Observable Not Applicable		

Evaluator Assessment

Please provide a general description of what was discovered during the onsite evaluation, and a professional estimate of what you feel the compliance rating should be, regardless of the individual metrics scored above. Include your assessment of the most impactful energy requirements for this particular building.

CEP Qualitative Assessment Tool

Agency _____

Jurisdiction served _____

Name of Person Completing Survey _____

Title of Person Completing Survey _____

Email address _____

Telephone Number _____

Surveyor _____

Date _____

	Question	Response
1	**Number of commercial building permits issued per year?**	
	How is your jurisdiction funded? Check all that apply	
	Permitting Revenue	
	Jurisdictional budget	
	Funding from the State	
	Other	
	Does everyone in your department have access to a copy of the energy code?	
	How often do you refer to any energy code?	
	How often do you refer to the other building codes?	

	Question	Response
2	**Who conducts energy code plan reviews? (Check any that apply)**	
3	In-House staff	
	3rd party entities	
	Other jurisdictions or government agencies	
	Not done	
	Other:	
4	**Who conducts field inspections for energy code compliance? (Check any that apply)**	
	In-House staff	
	3rd party entities	
	Other jurisdictions or government agencies	
	Not done	
	Other:	
	What level of education and training do you and/or your agency staff receive specifically for residential energy codes?	
	High – Professional certification by ICC or similar credentials. Receives annual training on the energy code.	
	Medium – Receives periodic training on the energy code.	
	Low – Receives on-the-job training on the energy code but seldom receives formal training.	
	None – Energy Codes training is never provided.	
	What level of education and training do you and/or your agency staff receive specifically for commercial energy codes?	
	High – Professional certification by ICC or similar credentials. Receives annual training on the energy code.	
	Medium – Receives periodic training on the energy code.	
	Low – Receives on-the-job training on the energy code but seldom receives formal training.	
	None – Energy Codes training is never provided.	

	Question	Response
	What level of education and training do you and/or your agency staff receive specifically for commercial energy codes?	
	High – Professional certification by ICC or similar credentials. Receives annual training on the energy code.	
	Medium – Receives periodic training on the energy code.	
	Low – Receives on-the-job training on the energy code but seldom receives formal training.	
	None – Energy Codes training is never provided.	
	If training is received, how is it delivered? Check all that apply	
	Classroom	
	In the Field	
	Webinar/ Online	
	Other	
	How would you prefer to receive your training?	
	If training is received, do you feel the training is worthwhile and you learned what you needed to learn?	
	Is there any specific training you would want to receive that would benefit you in your job?	
5	**What methods are used as a basis for documenting energy code compliance in commercial buildings and in what percentages?** **Note: Include COMcheck submissions for Trade-off percentage.**	
	Prescriptive	%
	Trade-off	%
	Performance	%

	Question	Response
6	**How much time (in hours) is devoted to the average plan review for residential energy codes?**	Hours
7	**How much time (in hours) is devoted to the average plan review for commercial energy codes?**	
8	**How much time (in hours) is devoted to the average field inspection for residential energy codes?**	Hours
9	**How much time (in hours) is devoted to the average field inspection for commercial energy codes?**	
10	**What major issues impede your ability to enforce the energy code for residential buildings?**	
11	**What suggestions would you give to improve the enforcement of the energy codes for residential buildings?**	
12	**What major issues impede your ability to enforce the energy code for commercial buildings?**	
13	**What suggestions would you give to improve the enforcement of the energy codes for commercial buildings?**	

	Question	Response
14	**Describe your process for reviewing plans for energy code compliance.** **How would you improve this process?**	
15	**Describe your process for reviewing energy features in the field for compliance with the energy code.** **How would you improve this process?**	

CITY ENERGY
A JOINT PROJECT of NRDC + IMT

ABOUT THE CITY ENERGY PROJECT

The City Energy Project is a groundbreaking national initiative to create healthier and more prosperous cities by improving the energy efficiency of existing buildings. The partnership between the City Energy Project and the ten participating cities will support innovative, practical solutions that cut energy waste, boost local economies and reduce harmful pollution. The pioneering actions of the cities involved in the City Energy Project will create models that can be replicated by other municipalities nationwide and around the world.

The City Energy Project is a joint project of the Natural Resources Defense Council (NRDC) and the Institute for Market Transformation (IMT). For more information visit us at www.cityenergyproject.org.