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Certified Energy Analyst (CEA) Assessment Research Report

Additional submitted attachment is included below.

Certified Energy Analyst (CEA) Assessment Research Project

Introduction:

With California being at the forefront of energy efficiency and having one of the most stringent building energy standards in the country, documenting and verifying compliance with these standards has become increasingly more complicated. Since energy saving goals set by the State largely depend on compliance with the Energy Code, accurate analysis and documentation is necessary to ensure these goals are met.

The new construction market in California predominantly utilizes the performance approach for analyzing and documenting energy code compliance, which requires a special set of skills to accurately model projects using State approved compliance software. These skills include;

- Comprehend and apply key energy efficiency design concepts and principals.
- Assess a project and determine the proper application of the Energy Code.
- Gather, calculate and organize project specific information to be entered into the performance software.
- Model a building using State approved compliance software and evaluate the results for accuracy.
- Evaluate projects to determine recommendations for improving building energy efficiency to meet or exceed the energy code requirements.

State approved compliance software has evolved over the past several code cycles to require more accurate annual energy use simulations for determining baseline (standard design) and proposed design energy use. Prior to the 2013 code cycle, the compliance software was required to perform an energy use simulation for each hour (60 min time-steps) over a one-year period. With the adoption of the 2013 Energy Code, the required simulations went from one hour to every 2-minute time-steps. The intent of this change was to improve the simulation accuracy of building energy use. Additionally, approved compliance software is required to demonstrate accuracy within 0.04 kBtu/ft²-yr (TDV). If the compliance software is designed to provide such accuracy, it is reasonable to conclude that the State expects accurate energy models for compliance purposes.

Currently, there are no energy code requirements for individuals to obtain special training, or to be certified to prepare documentation for compliance with California's Energy Code. While, a certification program does exist in California, the Certified Energy Analyst (CEA) Program, it has not been widely utilized as a method for ensuring accurate compliance documentation. This poses the question – is compliance documentation prepared by trained and certified individuals more accurate than those prepared by non-certified individuals?

In August of 2017, the Statewide Compliance Improvement Team, in cooperation with Selby Energy, Inc and Evergreen Economics (research team), developed a plan to assess the effectiveness of the Certified Energy Analyst (CEA) program by researching the following hypothesis: Title 24, Part 6 compliance documentation prepared by CEAs is more accurate than compliance documentation prepared by non-CEAs. The goal of the study was to determine if there are statistically significant differences in ability between CEAs and non-certified energy analysts (non-CEAs) with respect to their capacity to accurately gather, analyze and document compliance for residential new construction projects for compliance with the 2016 Energy Code.

The intent of exploring this hypothesis using statistical analysis was to prove (or disprove) that the CEA certification program is a useful tool for ensuring accurate compliance documentation. This research also serves to help identify common errors within compliance documentation that

may be useful for streamlining the energy code plan review process as well as enhancing current training programs. And, ultimately, more accurate compliance documentation will lead to code-compliant development, helping California meet aggressive energy efficiency and climate change mitigation goals and increasing the value of the CEA Program.

Research Plan

The CEA Assessment project began with the development of a research plan, which consisted of a scoring rubric, data sampling plan and data analysis plan. The team decided to focus the research on single-family residential new construction projects permitted under the 2016 Energy Code. This sample group was selected because of its high potential for whole-building performance approach compliance documentation and having a higher probability of CEAs preparing the compliance documentation.

The research team considered using nonresidential new construction projects for the sample group, but decided that collecting data for this sector would be more difficult and time consuming than the residential new construction sector, and that the likelihood of meeting sampling targets would be more difficult to achieve.

Scoring Rubric:

At a high level, the scoring rubric established a pre-determined set of data points and performance scoring criteria for assessing the accuracy of information contained within Title 24, Part 6 compliance documentation when compared to the project plans. Each data point was assessed to determine whether it would require an exact match, an allowed range match (percent \pm), or conditions for no score.

An absolute match required the data from the compliance documentation and plans to be an exact match to receive a score of “1” point. If the data did not match exactly, then it would receive a score of “0” points. For example, the project’s climate zone, site orientation and number of bedrooms were determined to require an exact match.

A range match allowed a percentage range \pm 5% of the plan data point value when compared to the compliance documentation. A score of “1” point required the compliance documentation data point to match within a 5% range \pm of what was indicated on the plans. If the data point did not match within the range value, then it would receive a score of “0” points. For example, the projects total conditioned floor area (CFA), roof/ceiling area and exterior wall area were determined to allow a range match. This methodology allowed for minor discrepancies between the plans and compliance documentation.

A “no score” indicated that either the data point did not apply to the project, or there was insufficient information on the plans to determine whether the data point matched the compliance documentation, therefore were excluded from scoring. For example, when the compliance documentation indicated that a vented attic with R-38 ceiling insulation was required from the compliance documentation, but the plans had no information regarding the insulation R-values, then the ceiling insulation R-value data point received no score and was removed from the overall score. The research team determined that if the plans did not contain the specific data point, it was out of the compliance documentation author’s control, therefore removed from scoring.

Projects in the sample group were assessed for accuracy with individual data points receiving a score of either “1” or “0” based on the scoring rubric, where “1” indicates the compliance documentation matched what was indicated on the plans and “0” indicates the compliance

documentation did not match what was indicated on the plans. There was a total of 74 potential data points (refer to appendix A) and the overall project score (percent of accuracy) was calculated based on the sum of all data point scores divided by the total number of applicable data points.

After each project in the sample group was scored, it was classified as either being prepared by a CEA, or non-CEA based on the documentation author's CEA status. The documentation authors CEA status was determined by searching the Residential CEA roster located on the CABEC.org website (<https://cabec.org/find/cea-current/res>). For a documentation author status to be classified as a CEA, they were required to be listed in the roster as "Active-Current" for the code year "2016 Standards."

Data Sampling Plan:

The research team understood from the beginning that the ability to employ rigorous sampling for this project is limited by data availability constraints. Knowing this, the team set an ideal target for sampling at 75 projects from CEAs and 75 projects from non-CEAs, for a total of 150 projects. Furthermore, the data sampling plan limited the assessment of projects prepared by the same documentation author to two per author, per jurisdiction. Broad coverage of CEAs was important to ensure that potential differences in ability from one CEA to the next would not bias the research results.

The data collection process consisted of a quasi-blind review of residential new construction project plan documents and associated Title 24, Part 6 compliance documents. After engaging and coordinating with building departments to provide access (on-site at the building department offices) to residential projects that fit the sample group profile, assessment data was collected and scored according to the research plan protocols. All projects were reviewed without knowledge of the documentation author to avoid bias of the reviewer. After the review was complete, the documentation author's name was recorded to determine, at a later time, whether they were a CEA or not.

Analysis plan:

The analysis plan outlined how the research team planned to compare the scores of CEAs and non-CEAs to assess whether CEAs outperform non-CEAs in their review performance. The general approach included independent samples t-test in order to determine if the CEA scores are statistically better or worse than non-CEAs.

Data Collection

A total of 88 individual residential, single-family, new construction projects were included in the sample group, with 37 projects from CEAs and 51 projects from non-CEAs. The original data sampling target of 75 projects from CEAs and 75 projects from non-CEAs proved to be more difficult and time consuming than initially planned. The ability to find willing jurisdictions took time on top of several weeks to coordinate site visits. Once at the site, the amount of time it took collecting assessment data was also time intensive, with an average of six to seven individual project reviews per visit.

The Bay Area Regional Energy Network (BayREN) was instrumental in helping the research team engage Bay Area building departments in the CEA Assessment Project. In addition to the seven Bay Area jurisdictions, five additional building departments within the Central Valley area also participated in the assessment project, for a total of twelve jurisdictions.

Each building department participating in the CEA Assessment Project received up to a one-hour overview of specific, high-value issues found during the reviews, including a live demonstration of the Energy Code Ace dynamic plan review checklist and answers to their specific energy code questions. Additionally, each participating jurisdiction received a written summary of errors and compliance issues found, including an explanation of how each error impacts compliance and a suggested plan review response. Refer to Appendix B for a compiled list of common errors and compliance issues found, how each error impacts compliance and the suggested plan review comment.

Findings:

These data were analyzed by the research team according to the analysis plan to determine the overall results.

Overall Results

Figure 1 indicates that CEAs were more accurate on average by 23%. However, it did not indicate a statistically significant difference (90% confidence interval) with the CEAs receiving an overall score of 90% accuracy and the non-CEA group receiving an overall score of 77% accuracy. The lower bound of the margin of error bar for CEAs is 83.9% and the upper bound for non-CEAs is 84.4%, indicating there is not a significant statistical difference in accuracy between the two groups.

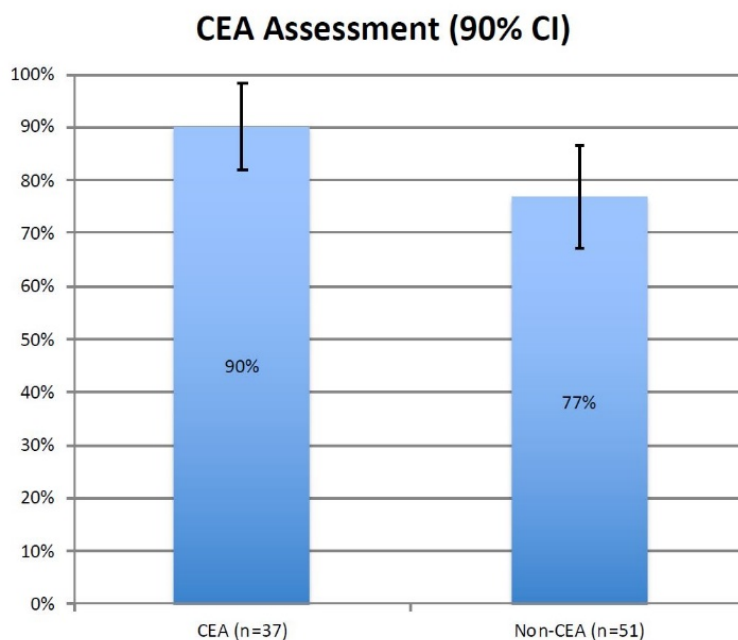


Figure 1

These data were also analyzed by the research team according to the analysis plan to determine individual data point results. Results shown below represent only those data with a significant statistical difference between CEAs and non-CEAs.

General Information – Site Orientation Results:

Figure 2 indicates that CEAs were more accurate on entering site orientation on average by 27%. This difference is highly significant (90% confidence interval) with the CEAs receiving a score of 86% accuracy and the non-CEA group receiving a score of 59% accuracy.

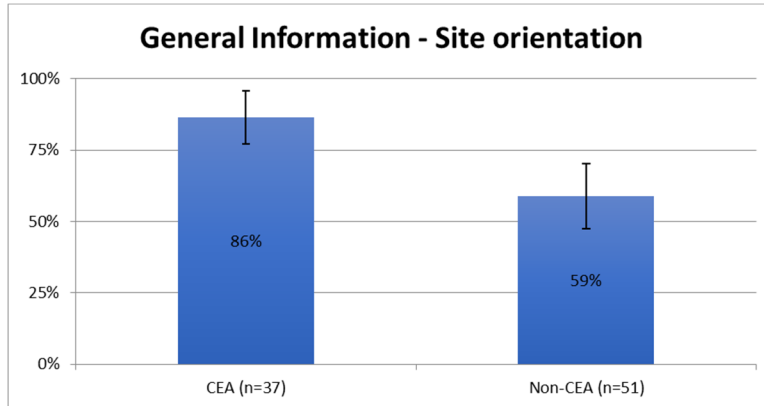


Figure 2

General Information – Number of bedrooms

Figure 3 indicates that CEAs were more accurate on entering the number of bedrooms on average by 18%. This difference is highly significant (90% confidence interval) with the CEAs receiving a score of 100% accuracy and the non-CEA group receiving a score of 82% accuracy.

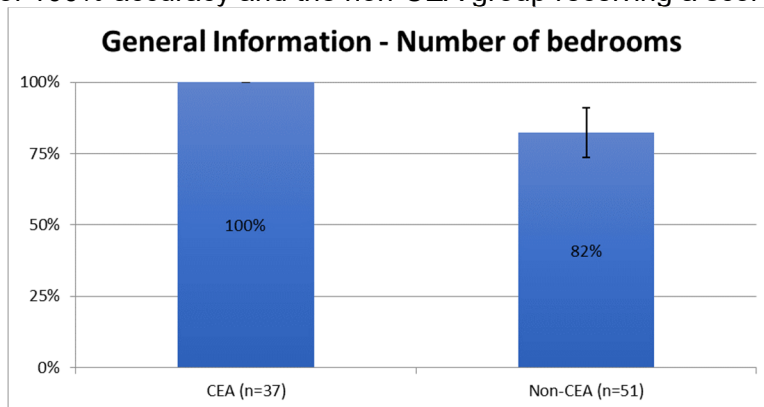


Figure 3

Envelope – Exterior Framed Wall Area

Figure 4 indicates that CEAs were more accurate on entering the exterior wall area on average by 43%. This difference is highly significant (90% confidence interval) with the CEAs receiving a score of 100% accuracy and the non-CEA group receiving a score of 57% accuracy.

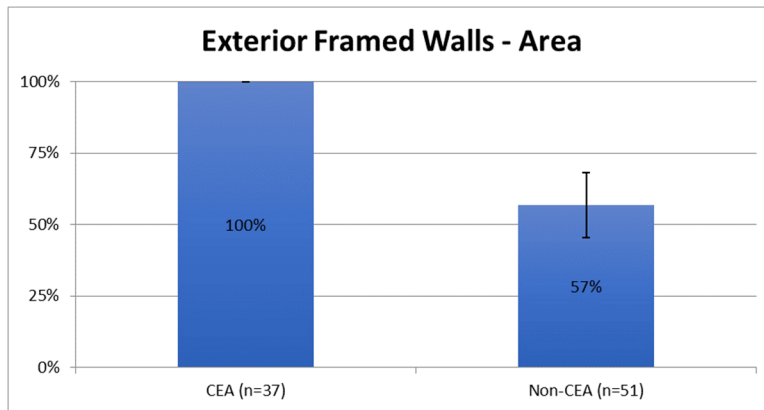


Figure 4

Envelope – Demising Wall Area

Figure 5 indicates that CEAs were more accurate on entering the demising wall area on average by 48%. This difference is highly significant (90% confidence interval) with the CEAs receiving a score of 89% accuracy and the non-CEA group receiving a score of 41% accuracy.

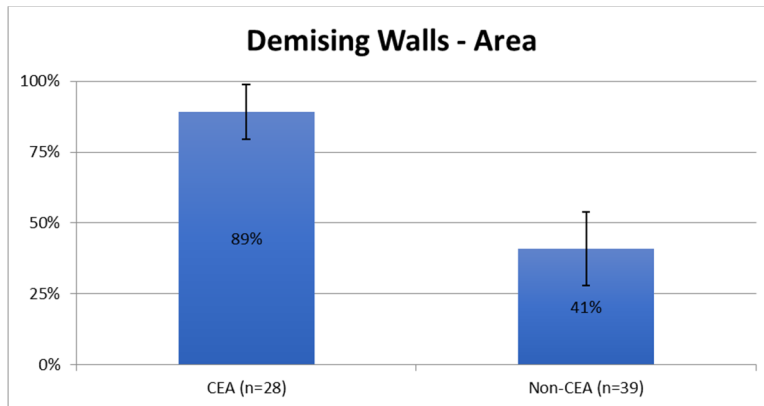


Figure 5

Envelope – Demising Wall Framing Type and Spacing

Figure 6 indicates that CEAs were more accurate on entering the demising wall framing type and spacing on average by 29%. This difference is highly significant (90% confidence interval) with the CEAs receiving a score of 85% accuracy and the non-CEA group receiving a score of 56% accuracy.

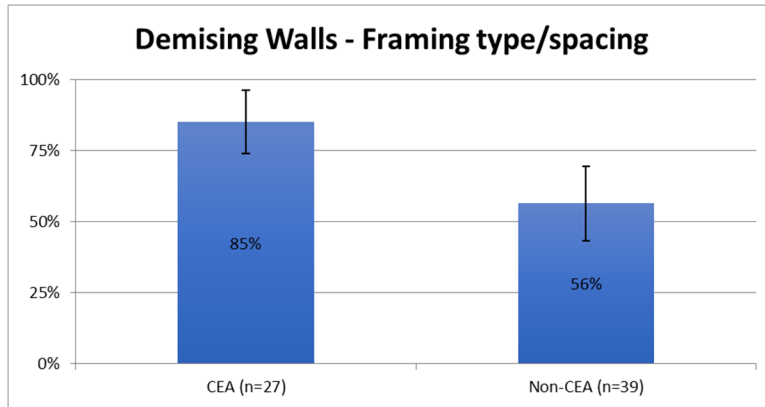


Figure 6

Envelope – Raised Floor Area

Figure 7 indicates that CEAs were more accurate on entering raised floor area on average by 26%. This difference is highly significant (90% confidence interval) with the CEAs receiving a score of 93% accuracy and the non-CEA group receiving a score of 67% accuracy.

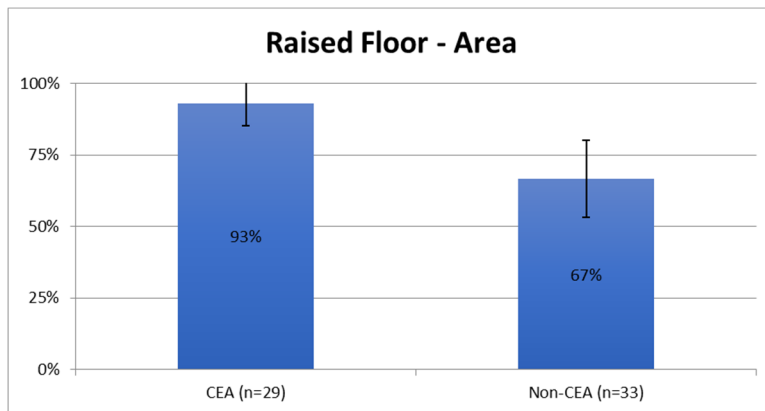


Figure 7

Envelope – Raised Floor Framing Type and Spacing

Figure 8 indicates that CEAs were more accurate on entering raised floor framing type and spacing on average by 31%. This difference is highly significant (90% confidence interval) with the CEAs receiving a score of 89% accuracy and the non-CEA group receiving a score of 58% accuracy.

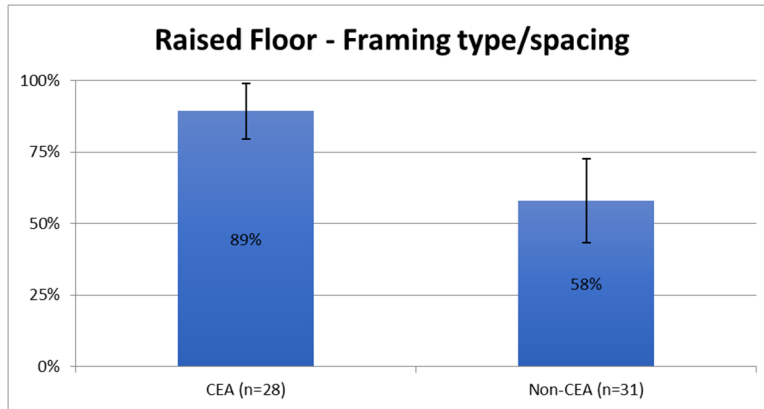


Figure 8

Envelope – Fenestration Area

Figure 9 indicates that CEAs were more accurate on entering fenestration area on average by 38%. This difference is highly significant (90% confidence interval) with the CEAs receiving a score of 89% accuracy and the non-CEA group receiving a score of 51% accuracy.

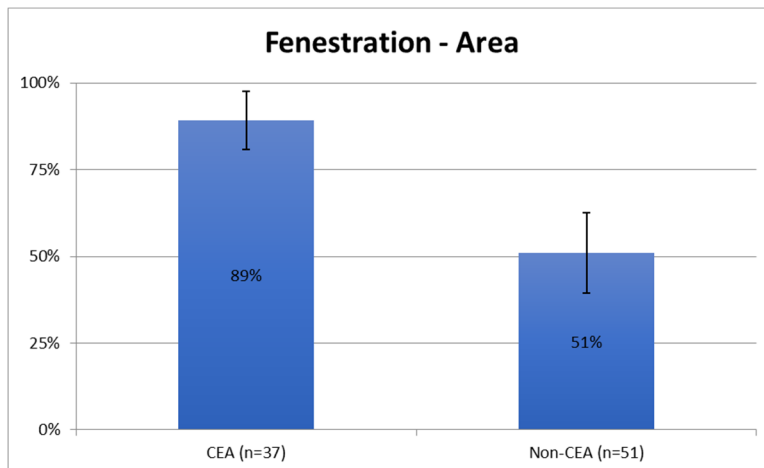


Figure 9

Secondary Findings:

As a token of appreciation for jurisdictions participating in the CEA Assessment program, each department was given an overview of specific high-value issues found during the reviews. This information proved to be very helpful to building department staff by increasing their awareness of common mistakes and understanding the impact they have on compliance.

One of the unintended findings from the CEA assessment was, in many cases the plans did not include sufficient information to determine the accuracy of the compliance documentation. This was a common issue among all jurisdictions visited. The missing information is essential for ensuring that project specific energy efficiency requirements from the compliance documentation is incorporated into the plans¹. The consequential risk of not incorporating this

¹ Title 24, Part 1: Section 10-103(a)2B When the enforcement agency requires building design plans and specifications to be submitted with the application for a building permit, the plans shall conform to the specifications for the features, materials, components, and manufactured devices identified on the Certificate(s) of Compliance, and shall conform to all other applicable requirements of Part 6.”

information into the plans is, the feature is less likely to meet the energy code requirement after installation. Therefore, putting the project in jeopardy of not meeting energy code compliance when built.

Common Energy Code information missing from the plans included features, such as:

- Missing insulation R-value for walls, ceilings, and floors
- Fenestration U-factor and SHGC
- Heating, cooling and water heating appliance type, location, fuel source and minimum efficiency
- HVAC system duct location and insulation R-value
- Required HERS verification's (i.e. QII, Min. Airflow, Fan Efficacy, Duct leakage, Refrigerant charge, etc.)

Recommendations

Collect more data! We believe a larger sample size will likely produce the statistically significant difference we hypothesized. Ideally, we will review at least 50 additional project plan documents from CEAs and non-CEAs.

The big question is, how to apply this data across other market sectors (i.e. low-rise multifamily, high-rise residential and nonresidential). The research team and other subject matter experts (SMEs) all agreed that if there is a significant difference in accuracy of compliance documentation between CEAs and non-CEAs for residential single-family new construction projects, then the difference in accuracy is much more likely to be greater for low-rise multifamily, high-rise residential and nonresidential projects given the complexity of the nonresidential code requirements.

A team of Energy Code compliance SMEs, including Martyn Dodd, Gina Rodda, Brian Selby, and Rosemary Howley met to discuss the advantages of requiring Nonresidential (NR) CEAs in Utility Incentive Programs. These advantages are summarized below from a discussion held on 9/29/2020.

- Nonresidential CEAs (NR CEAs) have proven that they know the California Energy Code and how to use the Energy Commission-approved Energy Compliance software by passing a rigorous Certification Exam that is updated for each Energy Code cycle.
- NR CEAs know the Energy Code and how to use compliance software much better than non-CEAs. Non-CEAs sometimes change software inputs without knowing what they are doing until the NRCC form shows "compliance" with no relationship to the actual design.
- To do whole-building performance compliance analyses accurately, a person must understand all the different components that are part of each energy model, rather than just being specialists in one component or another. Nonresidential projects usually have separate experts on lighting, HVAC, building envelope and water heating by themselves, but with NR CEAs you get professionals familiar with the Energy Code issues for all those fields
- NR CEAs are likely to provide more accurate building models than non-CEAs. Based on residential research, non-CEAs make more mistakes in take-offs and other inputs than CEAs. Nonresidential Energy Code compliance is much more complex than that for low-rise residential buildings, so this difference in modeling success between CEAs and non-CEAs is likely to be even more of an issue for nonresidential projects.

- A lot more discussion and coordination between team members is needed for successful Energy Code compliance in nonresidential projects compared to residential. This is more likely to happen if there is a NR CEA on the team.
- NR CEAs have skills and experience to know when some building features just will not work for Energy Code compliance.
- NR CEAs must agree to a Code of Ethics. In research on residential compliance documentation, non-CEAs were more likely than CEAs to go along with the design team on something shady.
- NR CEAs have the experience and expertise to use professional judgment to juggle conflicting issues between local all-electric reach codes, problems with compliance software and project timelines.
- NR CEAs must meet continuing education requirements every year, so that helps them stay up-to-date on current technology and Energy Code issues. Other design professionals may stay up-to-date within their own specialty, but not necessarily with the Energy Code.
- NR CEAs have proven knowledge, skills and abilities regarding the Energy Code, so design teams and building departments will likely have greater confidence in the CEAs compliance documentation.
- NR CEAs know more than non-CEAs about the current state of compliance software and planned updates.
- NR CEAs are likely to understand many different kinds of projects, including those that require the most expert energy compliance analyses. By contrast, mechanical engineers or lighting designers or other specialists may only see one kind of job.
- Taking advantage of the proven expertise of NR CEAs provides a return on investment for all the effort and money put into developing the CEA program.
- In these times of greater concern about climate change, requiring NR CEAs at key points in new utility incentive programs will help ensure that these public funds are used most effectively.

Appendix A

CEA Assessment Project			
Data Collection Sheet			
Review By			
Review Date			
Jurisdiction			
Permit Number			
Project Name			
Project Address			
City, ST Zip			
Compliance Results	Standard Design	Proposed Design	Compliance Margin
Energy Use Summary			
General Information	Plans	CF1R	Comments
CF1R printed on the plans			
HERS registration			
Climate zone			
Site orientation			
Total CFA			
Calculated CFA from plans			
Number of bedrooms			
Number of stories above grade			
Natural Gas Available			
Solar Ready	Plans	CF1R	Comments
Form(s) (CF1R-SRA-01-E/CF1R-SRA-02-E)			
Solar ready required			
Solar area (CF1R-SRA-02-E)			
Orientation/tilt (CF1R-SRA-02-E)			
Pathways (CF1R-SRA-02-E)			
PV System Credit	Plans	CF1R	Comments
PV System required			
Rated kW DC			
Orientation/tilt			
Envelope			
Roof/Ceilings:	Plans	CF1R	Comments
Area			

Type (vented/unvented)			
Attic Ceiling insulation (R-value)			
Attic Roof insulation (R-value)			
Rafter Roof Area			
Rafter Roof insulation (R-value)			
Cool roof required			
Reflectance/Emittance			
Radiant Barrier required			
Exterior Framed Walls:	Plans	CF1R	Comments
Area			
Framing type/spacing			
Cavity insulation			
Continuous insulation			
Exterior finish			
Exterior non-framed Walls:	Plans	CF1R	Comments
Area			
Type			
Insulation location			
Insulation type/R-value			
Demising Walls:	Plans	CF1R	Comments
Area			
Framing type/spacing			
Cavity insulation			
Continuous insulation			
Raised Floor	Plans	CF1R	Comments
Area			
Framing type/spacing			
Cavity insulation			
Slab-on-grade	Plans	CF1R	Comments
Area			
Heated			
slab edge insulation (mandatory if heated)			
HERS Measures	Plans	CF1R	Comments
QII			
Envelope leakage			
Fenestration	Plans	CF1R	Comments
Area by orientation			
U-factor			
SHGC			
Overhang/sidefin			

Skylights	Plans	CF1R	Comments
Area by orientation			
U-factor			
SHGC			
Mechanical Systems			
Heating System	Plans	CF1R	Comments
Type			
Efficiency			
Cooling System	Plans	CF1R	Comments
Type			
Efficiency			
HVAC Distribution System	Plans	CF1R	Comments
Type			
Location			
Duct R-value			
HERS Measures	Plans	CF1R	Comments
Duct leakage			
Airflow/Fan Efficacy			
Refrigerant Charge			
High SEER/EER			
Other			
Whole House Fan	Plans	CF1R	Comments
CFM (min 1.5 CFM/ft ² of CFA)			
Attic vent (NFV area)			
IAQ Fan	Plans	CF1R	Comments
Type			
CFM			
DHW System	Plans	CF1R	Comments
Fuel			
Type			
Efficiency			
Pipe insulation			
Recirculation pump			
Recirculation pump controls			
Solar Thermal System	Plans	CF1R	Comments
Solar savings fraction			
Documentation Author			
Documentation Author			Comments
Name			

Address		
City, ST Zip		
Phone Number		
Email Address		
Certification		
CEA		
Code Year		

Appendix B

CEA Assessment Project Common Errors Found		
Description of Error	Impact on Compliance	Suggested Plan Check Comment
CF1R was submitted for multiple houses in a sub-division with a specific orientation (degrees of North), but the sub-division map indicates the house will be built on lots that face several different directions.	The approach listed above requires that each unit comply separately, with separate documentation submitted for each unit plan in the orientation in which it will be constructed. To demonstrate that a home complies regardless of how it is oriented, it must be analyzed in each of the four cardinal orientations: north, east, south, and west.	The building orientation documented on the CF1R is not consistent with the orientation shown on plans. Please resubmit the CF1R with the home analyzed using the multiple orientation approach.
Plans indicate Solar Ready Area requirements are met, but the certificates of compliance (CF1R-SRA-01-E and CF1R-SRA-02-E) documenting the requirements were missing.	Solar Ready requirements are mandatory measures that apply to single-family homes in sub-divisions with 10 or more homes, when the tentative sub-division map was approved on or after July, 1, 2014, and for all low-rise residential multifamily buildings.	CF1R-SRA-01/02 forms is missing or is inconsistent with what's shown on the plans. Please correct and resubmit either the forms, the plans or both in compliance with §110.10(a).
CF1R indicates the attic roof area is significantly less than what is indicated on the plans.	The attic roof area has a significant impact on the overall compliance margin. Therefore, when the plans indicate more roof area than what's on the CF1R, there's a risk that the project will no longer comply if it were modeled accurately.	Attic roof area indicated on the CF1R does not match what's shown on plans. Please resubmit either plans matching the CF1R, or CF1R with the added roof area.
CF1R indicates an unvented attic, but the plans indicate a vented attic.	The differences between vented and unvented attics can make a significant impact on the overall compliance. The discrepancy between the plans and the CF1R also causes confusion regarding the installation of attic ventilation.	Attic roof ventilation indicated on the plans does not match what's shown on CF1R. Please resubmit either plans, or CF1R indicating matching attic roof requirements.
Plans indicate floor insulation between the garage and the conditioned floor above, but the CF1R indicates NO insulation.	Wood framed raised floors must be insulated with R-19 cavity insulation (or U-value ≤ 0.037) §150.0(d).	Floor insulation indicated on the CF1R does not match what's shown on the plans and/or are not compliant with Title 24, Part 6. Please resubmit either plans,

		CF1R forms or both in compliance with §150.0(d)
Plans indicate significantly more window area than what was documented on the CF1R.	Window area can have a negative impact on the overall compliance margin. Therefore, when the plans indicate more window area than what's on the CF1R, there's a risk that the project will no longer comply if it were modeled accurately.	Fenestration area indicates on the CF1R forms does not match what's shown on plans. Please resubmit either plans, CF1R forms or both in compliance.
CF1R indicated a Radiant Barrier (RB) and Below Roof Deck insulation (HPA-B).	There's nothing in the Standards that would prevent someone from using a RB in conjunction with below roof deck insulation, but they could not take the credit for the RB if it was between the sheathing and the below roof deck insulation. This is because there is no way to maintain an air space. The only way to achieve this is to place the RB below the insulation, which is most likely impractical.	Radiant barrier indicated on CF1R-PRF-01 does not match what's shown on plans and/or is not compliant with Title 24, Part 6.
Plans indicate an attached garage, but the CF1R was missing the wall area associated with the walls separating the garage and conditioned floor area (CFA).	Walls separating the house from an attached unconditioned attic or garage are typically modeled as interior walls with unconditioned space as the adjacent zone, which the performance software recognizes as a demising wall. If the attached garage was not modeled, then the wall separating the two space is modeled as exterior wall.	Demising wall properties (framed/non-framed, assembly type, insulation levels) indicated on the CF1R forms do not match what's shown on plans and/or are not compliant with Title 24, Part 6. Please resubmit either plans, CF1R forms or both in compliance with §150.0(c)1 for new construction.
CF1R indicated a ducted heat pump, but the plans indicated a ductless mini-split heat pump.	There is a significant energy use (TDV) difference between ducted and non-ducted (ductless) mini-split systems. Until there is an approved compliance option for ductless heat pumps (ductless mini-split, multi-split, and VRF systems) these systems are simulated as a minimum	The distribution system type and the location of space conditioning systems is required to be noted on the plans but is missing or not compliant with Title 24, Part 6. Please correct and resubmit the plans demonstrating compliance with §150.1(c)9

	<p>efficiency split system equivalent to the standard design and with default duct conditions (ducts in attic).</p>	
<p>The CF1R indicated a compliance credit for a Photovoltaic (PV) system, but was missing from the plans.</p>	<p>The compliance credit available for PV systems is available for new construction only and is dependent on the climate zone and dwelling unit size. The proposed PV system must be 2kW DC (or greater) for new single-family homes.</p>	<p>Provide plans and specifications for the proposed PV system matching what was indicated on the CF1R.</p>
<p>CF1R indicated ceiling insulation and below roof deck insulation meeting the High-Performance Attic Option B (HPA-B), but plans missing the below roof deck insulation.</p>	<p>When plans are missing important information like below roof deck insulation, there's a high risk that the installer will overlook this requirement and not install the measure, which could compromise the overall compliance of the project.</p>	<p>Roof/ceiling insulation or radiant barrier indicated on CF1R does not match what's shown on plans and/or is not compliant with Title 24, Part 6.</p>
<p>CF1R indicated more bedrooms than what is indicated on the plans.</p>	<p>The number of bedrooms is used to calculate the total CFM fan flow for the Indoor Air Quality fan ($CFA/100 + (7.5 \times (\# \text{ of Bedrooms} + 1))$). In this case the IAQ fan flow will be too hi, resulting in overventilation and wasted energy.</p>	<p>The number of Bedrooms shown on the CF1R forms is not consistent with the number of Bedrooms shown on plans. Please resubmit either the plans or CF1R forms showing the correct number of Bedrooms per §100.1(b).</p>
<p>CF1R indicated the total area of exterior walls were significantly less than what the plans indicate.</p>	<p>The total wall area has a significant impact on the overall compliance margin. Therefore, when the plans indicate less exterior wall area than what's on the CF1R, there's a risk that the project will no longer comply if it were modeled accurately.</p>	<p>Exterior wall area indicated on the CF1R do not match what's shown on plans. Please resubmit either plans, CF1R forms or both in compliance with §150.0(c).</p>
<p>CF1R indicated continuous rigid insulation on the exterior walls, but was missing from the plans.</p>	<p>When plans are missing important information like continuous wall insulation, there's a high risk that the installer will overlook this requirement and not install the measure, which could</p>	<p>Exterior wall insulation levels indicated on the CF1R form do not match what's shown on plans Please resubmit either plans, CF1R forms or both in compliance with §150.0(c).</p>

	compromise the overall compliance of the project.	
Plans indicate there was significantly more conditioned floor area (CFA) than what was indicated on the CF1R.	This is an important value for compliance since annual energy use is divided by this value to obtain the energy budget as well as a factor in determining IAQ fan flow requirements and glazing percentage. Understating the CFA has a significant impact on the overall compliance margin.	The total conditioned floor area shown on the CF1R forms is not consistent with the areas shown on the plans. Please resubmit either the plans or CF1R forms showing the corrected conditioned floor area per §100.1(b).
CF1R indicates the building orientation to be different than what is indicated on the plans.	Modeling the building orientation correctly is important to establish the appropriate energy budget (Standard Design). Therefore, when the orientation was analyzed incorrectly, there's a risk that the project will no longer comply if it were modeled accurately.	The building orientation documented on the CF1R forms is not consistent with the orientation shown on plans. Please resubmit either the plans or CF1R forms with the correct building orientation.
CF1R indicated the exterior walls has a higher cavity insulation R-value than what is indicated on the plans.	When plans are inconsistent with what's indicated on the CF1R, there's a high risk that the installer will overlook this requirement and not install the measure, which could compromise the overall compliance of the project.	Exterior wall insulation levels indicated on the CF1R form do not match what's shown on plans. Please resubmit either plans, CF1R forms or both in compliance.
CF1R indicated the raised floor has a higher cavity insulation R-value than what is indicated on the plans.	When plans are inconsistent with what's indicated on the CF1R, there's a high risk that the installer will overlook this requirement and not install the measure, which could compromise the overall compliance of the project.	Raised floor insulation levels indicated on the CF1R form do not match what's shown on plans. Please resubmit either plans, CF1R forms or both in compliance.
CF1R indicated the area of exterior walls were significantly less than what was indicated on the plans.	The total wall area has a significant impact on the overall compliance margin. Therefore, when the plans indicate less exterior wall area than what's on the CF1R, there's a risk that the project will no longer comply if it were modeled accurately.	Exterior wall area indicated on the CF1R do not match what's shown on plans. Please resubmit either plans, CF1R forms or both in compliance with §150.0(c).

<p>CF1R indicated the project did NOT comply using the performance approach.</p>	<p>The performance approach compares the proposed design Time Dependent Valuation (TDV) energy use (kTDV/ft²-yr) to the allowed (Standard Design) energy use. If the Proposed Design TDV energy use is equal to, or less than the Standard Design TDV energy, the building complies. If the Proposed Design TDV energy use is greater than the Standard Design TDV energy, the building does NOT comply.</p>	<p>The submitted CF1R-PRF-01 does not say "Building Complies". Please correct and resubmit the CF1R-PRF-01 indicating compliance.</p>
<p>CF1R indicates a credit for roof overhangs that that is inconsistant with what is shown on the plans.</p>	<p>Credit for roof overhangs may be included when the performance approach and can offer a significant compliance credit depending on the shading characteristics of the overhang. If the buildings overhang shading characteristics are overstated on the CF1R, the there's a risk that the project will no longer comply if it were modeled accurately.</p>	<p>The exterior shading device indicated on the CF1R does not match what's shown on plans and/or the overhang/sidefin dimensions shown on plans is not compliant with Title 24, Part 6. Please resubmit either plans, CF1R forms or both in compliance with §150.1(c)4.</p>
<p>The CF1R indicates a rafter roof, but the plans indicate a vented attic.</p>	<p>Modeling the roof/ceiling assembly correctly is important to establish the appropriate energy budget (Standard Design). Therefore, when the roof/ceiling assembly was analyzed incorrectly, there's a risk that the project will no longer comply if it were modeled accurately.</p>	<p>Roof/ceiling insulation indicated on CF1R does not match what's shown on plans. Please resubmit either the plans or CF1R forms showing the corrected roof/ceiling assembly.</p>
<p>Plans indicate there was significantly more conditioned floor area (CFA) that what was indicated on the CF1R.</p>	<p>This is an important value for compliance since annual energy use is divided by this value to obtain the energy budget as well as a factor in determining IAQ fan flow requirements and glazing percentage. Understating the CFA has a significant impact on the overall compliance margin.</p>	<p>The total conditioned floor area shown on the CF1R forms is not consistent with the areas shown on the plans. Please resubmit either the plans or CF1R forms showing the corrected conditioned floor area per §100.1(b).</p>
<p>Plans indicated skylights, but were missing from the CF1R.</p>	<p>Skylight area can have a negative impact on the overall compliance margin. Therefore, when the plans indicate more skylight area than what's on the CF1R, there's a risk that the project will no</p>	<p>Fenestration area indicated on the CF1R forms does not match what's shown on plans. Please resubmit either plans, CF1R forms or both in compliance with §150.0(q).</p>

	longer comply if it were modeled accurately.	
Plans indicate a below-grade conditioned basement, but the CF1R was missing the slab area associated with the conditioned basement.	Indicating the proposed construction assemblies is important to establish the appropriate energy budget (Standard Design). Therefore, when components like slab area are missing, there's a risk that the project will no longer comply if it were modeled accurately.	Slab area indicated on the plans is missing on the CF1R. Please resubmit the CF1R indicating the correct slab area for the conditioned basement.
CF1R indicated the attic ceiling has a higher cavity insulation R-value than what is indicated on the plans.	When plans are inconsistent with what's indicated on the CF1R, there's a high risk that the installer will overlook this requirement and not install the measure, which could compromise the overall compliance of the project.	Attic ceiling insulation levels indicated on the CF1R form do not match what's shown on plans Please resubmit either plans, CF1R forms or both in compliance.
The CF1R indicates compliance using the Existing + Addition + Alteration (E+A+A) performance approach, but the plans indicate the existing house will be completely demolished and a new house constructed.	The E+A+A approach is intended to be used when adding on and/or altering an existing house. Because the CF1R indicated most of the house was existing, only a small portion was considered an addition (<1000 ft ²), which prevented certain Mandatory Measures (i.e. IAQ fan) to be triggered.	Please resubmit the CF1R forms showing compliance for a newly constructed building.
CF1R indicated a ducted mini-split heat pump, but the attached specifications for the system did not meet the minimum mandatory efficiency requirements (14SEER 12.2 EER).	Federal and State appliance regulations establish the minimum efficiency requirements for Title 24, Part 6. When the specification sheet for the proposed HVAC system indicated the minimum requirements are not met, there's a high risk that the installed system doesn't meet the minimum requirements.	Heating system shown on the plans or specifications is not compliant with Title 24, Part 6. Please resubmit plans or specification indicating the minimum heating and/or cooling efficiencies are met.