THE NEW CERTIFIED ENERGY ANALYST (CEA) EXAM

Frequently Asked Questions and Exam Guidelines for 2013 Standards Certification

Q1: Why Develop a New CEA Exam?

In 2007, the California Energy Commission designated the Residential Certified Energy Plans Examiner (CEPE) credential as a requirement for documenting energy performance of new homes eligible for the state's New Solar Homes Partnership (NSHP) solar PV tax credits. Interest and participation in the CEPE program has increased considerably since then. In 2009, PG&E Codes and Standards Program Manager, Jill Marver, discussed with CABEC members, California Energy Commission staff and other stakeholders the possibility of creating an entirely new examination tailored to the role of energy consultants. This led to the revision of the exam which has a well-documented and defensible development process. The new CEA exam is part of a larger mission by the Investor Owned Utilities (IOUs) statewide Codes and Standards Program to develop specific and targeted trainings for different types of professionals whose work intersects with the Standards in order to improve compliance.

The new CEA exams are tailored to the specific roles, knowledge, analytic abilities and experience of energy consultants who help the building industry meet and exceed 2013 Title 24 Part 6 Standards. Energy consultants seeking to become a Certified Energy Analyst will be expected to pass a new CEA exam rather than the CEPE exam as the test requirement.

Q2: How Was the Exam Developed?

The group involved in this effort includes the IOU Codes and Standards team, Benningfield Group as Project Manager; McLain ID Consulting to provide certification exam development guidance; a dozen CABEC members serving as subject matter experts; the CABEC Board of Directors, and the CEA Committee and CABEC Executive Director.

The team began by developing the new Residential CEA exam that corresponds to the low-rise residential standards, and then followed the new nonresidential (and high-rise residential) CEA Exam. The same process was used for both exams.

To ensure a credible and defensible exam, we used a standard certification exam development process, beginning with an exam "blueprint" that defines the type and number of questions for the exam, followed by creation of exam questions using a rigorous method of technical review, psychometric review, and quality assurance. Once the test questions were developed, we conducted alpha and beta tests of the exam questions, analyzed the alpha and beta results, and revised the questions as necessary to address the findings from the alpha and beta tests.

- **Blueprint** — The exam blueprint defines the skills and knowledge the exam will test and how much "weight" (number of questions) each area should get.

  The blueprint is structured with the following key components:

  - The major **competencies** associated with successful performance of the roles and responsibilities of a residential building energy analyst

- For each competency, the primary performance **objectives**, which define the behaviors associated with the competency; that is, what an energy consultant must know and do to meet that competency
- For each objective, the **key content** that should be the focus of exam questions addressing that objective

After much discussion and a full day workshop, the team reached a consensus on a total of five competencies that generally mirror the process that an energy analyst must follow when performing his or her work, along with the objectives that support each competency.

See "What Competencies Will Be Tested?" for a listing of the competencies and objectives defined in the Residential Exam Blueprint and the Nonresidential Exam Blueprint.

- **Exam questions** — Each objective in the blueprint is tested by one or more exam questions.

  Four of the five competencies are tested through multiple-choice questions. One competency, "Model the building with approved energy compliance software", is tested by a combination of multiple-choice questions and a "hands-on" modeling section that requires construction of an energy model based on plans and a summary of relevant input information for a proposed project.

  Each multiple choice question includes a "setup", a "question", a "correct answer" and generally three "distractors" which are plausible, but wrong answers.

  Typically, a total of six individuals have written, reviewed and edited each question before it is alpha tested:

  - The author of the question
  - Two technical reviewers
  - Two psychometric (testing experts) reviewers
  - A final technical and quality assurance reviewer
- **Alpha test** — Once the questions were approved by the review team, we conducted an alpha test to help us identify likely issues with the questions and determine the approximate time required to answer the questions.

  Several experienced energy consultants who were not part of the development team tried out all the exam questions, and provided us with their comments on the questions.

  Based on their feedback, we revised any questions they identified as ambiguous or that raised other concerns.
- **Beta test** — All questions that passed the alpha test went through a beta test. During the beta test, a larger group of energy consultants, with a range of experience, completed the exam in a way that parallels how the exam will be administered in future.

  Our testing experts conducted statistical analyses of the beta test results to highlight any questions that raised concerns. Then the testing experts worked with the team of subject matter experts to determine how to revise any "problem" questions.

Only those questions that make it through the entire process are included in the 2013 CEA Exams.

For more on how the residential and nonresidential exams are being revised, see ""Detailed Overview of the New CEA Program and Exam" article by Mike Gabel, CEA Committee Chair

Q3: Is the Current CEPE Certification Going Away?

The new CEA certification will be replacing the CEPE certification for the 2013 Standards. Although the existing CEPE certification will remain valid for all energy efficiency program requirements completed under the 2008 Standards, it is intended that all new programs will require the new CEA certification. At this time, there are no plans to continue the CEPE program for the 2013 Standards.

Q4: What is the Value of This New Certification?

The value of the new certification is that it establishes the Certified Energy Analyst as one who has demonstrated the necessary knowledge, ability and experience to effectively apply Title 24, Part 6 requirements. It distinguishes proficient energy consultants from their competition and helps assure building officials, plans examiners, incentive program administrators and other stakeholders that they are receiving quality work.

The new CEA program will replace the Certified Energy Plans Examiner (CEPE). The California Energy Commission introduced the CEPE in 1988, and CABEC has supported and administered it since 1997. The goal of the new program is that all building energy efficiency projects that require Title 24, Part 6 energy analysis and documentation be authored by a CEA. CABEC is currently working with the California Energy Commission, Build It Green, LEED for Homes, the IOUs, and other program administrators to ensure that their programs specify the new CEA (for the 2013 Standards) rather than CEPE certification in the next code cycle.

Q5: What Elements Will Make Up This New Exam?

The residential and nonresidential exams each have two sections:

- A multiple choice section in which you will select one correct answer for each question.
- A compliance software modeling section in which you will construct an energy model based on plans, and a summary of relevant input information for a proposed residential or nonresidential project.

Q6: Who is Eligible to Take This Exam?

To become certified under the new CEA program:

- All candidates must pass the new Residential and/or Nonresidential CEA exam, and meet the ongoing annual continuing education credit requirements.
- Current (2008 Standards) CEAs will have the Professional Practices Workshop and Experience requirements waived (“grandfathered”) for certification purposes.
- All other candidates (including current CEPEs) must also meet additional requirements including a combination of direct experience, education and training, or other professional licenses. For more information read “CABEC’s New Certified Energy Analyst (CEA) Certification Requirements.”

Q7: Where Can I Take the Exam?

The CEA exam will be offered in an estimated eight different areas throughout the state. The first round of exams will be more frequent at the beginning of the code cycle in order to provide ample opportunity for candidates to take the exam. Testing will become less frequent and take place at fewer locations as the code cycle continues.

Registration for the exams will be made available through the CABEC website. Exam dates and locations have not been determined yet, but information will be posted on the CABEC website as it is available.

Q8: What to Bring to the Exam

Examinees will bring a pencil, note pad, calculator and laptop computer with currently licensed and state approved compliance software to the testing facility. Examinees are permitted to bring their own copies of the Standards, manuals and appendices. CABEC will provide a memory stick with PDF copies of the Standards, manuals and other appropriate reference materials.

Q9: What Happens if I Fail the Exam?

If an examinee fails the exam, he/she will be eligible to retake the exam at the next available exam date. For those participating in the first round of exams, the next round of testing will occur approximately three months after the first round.

Q10: What Will be the Costs Associated with Taking the exam?

CABEC does not have the exact costs at this time. There are many factors to consider before an exam cost can be determined (location, delivery, scoring, etc.), but once we answer these questions, the cost to take the exams will be available on the CABEC website.

Q11: What Competencies Will Be Tested?

Residential

The following outline lists the key competencies and objectives in the Residential CEA Exam Blueprint. The blueprint identifies the content areas covered on the examination. Each content area comprises the knowledge, skills, and abilities that are essential elements of competency to become a CEA. Each content area is defined by a required competency and a set of related objectives.

1. Comprehend Key Residential Energy Efficiency Design Concepts and Issues — Demonstrate knowledge of basic heat transfer, residential energy design measures, and how they relate to building energy performance or metrics.

- Describe methods of heat transfer and ways to maintain comfort conditions within living spaces and energy units
- Determine appropriate general methods for reducing building and end-use energy consumption through energy design and energy efficiency
- Describe envelope design elements and explain how they affect energy design and efficiency
- Describe mechanical and water heating design elements and explain how they affect energy design and efficiency
- Describe lighting design elements and explain how they affect energy design and efficiency
- Explain what common building energy performance metrics measure, and what factors are included in the calculation of these metrics

2. Conduct Initial Project Assessment and Determine How to Apply the 2013 California Building Energy Efficiency Standards — Gather preliminary information from drawings, related documents, and the client to determine the nature and scope of the project; determine how to apply the Standards in establishing the correct code requirements and the available energy compliance options.

- Explain scope and triggers for specified portions of the Title 24 low-rise residential standards, federal and state appliance standards
- Analyze information about a proposed project (e.g., drawings, related schedules and documents, information from client) to determine scope and key attributes

• Analyze proposed project information to determine which standards apply, possible compliance options and strengths and weaknesses of compliance methods
• Review information about a proposed project (e.g., drawings, related schedules and documents, information from client) to determine key data about the building's envelope and mechanical components
• Analyze proposed project information to determine if all data is correct and internally consistent, and whether relevant information is missing or incomplete

3. Gather, Calculate and Organize All Information Needed for Energy Modeling — Review drawings, specifications and information provided by the designer or client; gather, calculate and record all pertinent data to input into the energy modeling software.

• Analyze a proposed project to determine pertinent data regarding HVAC systems and zones, including any HERS measures, to input into energy modeling software
• Analyze a proposed project to identify pertinent data regarding water heating system(s) to input into energy modeling software
• Organize and perform zone-by-zone area take-offs in accordance with the scope, type, and compliance approach for the project
• Analyze take-offs for a proposed project to identify any relevant information that is missing or inconsistent

4. Model the Building with Approved Energy Compliance Software — Create an energy model of the building from all information gathered. Check to see if on-screen and report results are reasonable, and if not, correct the source of the error(s).

• Create an accurate energy model of a proposed project using state-approved energy modeling software
• Explain how the Standard Design is established based on the modeled envelope, HVAC and water heating
• Evaluate the results of a building energy model to determine whether the results shown in reports and on-screen are reasonable
• Compare the CF-1R and other relevant compliance forms relative to known or listed project information (e.g., drawings, schedules and other data from client) to determine any modeling or data entry errors
• Summarize the mandatory envelope, mechanical, water heating, and lighting measures that apply to a proposed project

5. Consider Recommendations for Improving Energy Performance and Comfort — Use the knowledge of the project design and climate zone to make recommendations for improving energy performances to meet or exceed code.

• Evaluate the energy model for a proposed project to determine defensible recommendations for improving envelope design to meet or exceed code
• Evaluate the energy model for a proposed project to determine defensible recommendations for improving HVAC and water heating systems to meet or exceed code
• Identify HERS measures, when they apply, and the HERS registration and verification process; determine Installation Certificates and other documentation that must be completed after permit issuance
• Describe the general characteristics and requirements of local Tier 1 energy codes, various utility incentives, tax credits and other energy programs; and energy-related calculation methods other than the Title 24 performance approach

Nonresidential

The following outline represents the Nonresidential CEA Exam Blueprint. The blueprint identifies the content areas covered on the examination. Each content area comprises the knowledge, skills, and abilities that have been determined to be essential elements of competency to become a CEA. Each content area is defined by a required competency and a set of related objectives.

1. Comprehend Key Nonresidential Energy Efficiency Design Concepts and Issues — Demonstrate knowledge of basic heat transfer, Nonresidential energy design measures, and how they relate to building energy performance metrics and code compliance.

- Describe methods of heat transfer and ways to maintain comfort conditions within living spaces and energy units
- Describe general energy efficiency and energy design concepts of building, and general methods of reducing end-use energy consumption with energy efficiency and energy design
- Describe envelope design elements, including daylighting design features and explain how they affect energy design and efficiency
- Describe mechanical and service hot water design elements and systems, and explain how they affect energy design and efficiency
- Describe lighting design elements, and explain how they affect energy design and efficiency
- Explain why different energy metrics are used for different purposes, what common building energy performance metrics measure, and what factors are included in calculation of these metrics

2. Conduct Initial Project Assessment and Determine How to Apply the 2013 Standards — Gather preliminary information from drawings, related documents, and the client to determine the nature and scope of the project; and determine how to apply the Standards in establishing the correct code requirements and the available energy compliance options.

- Explain scope and triggers for specified portions of the Title 24 Nonresidential Standards, high-rise residential standards and the appliance standards
- Review all available information about a proposed project (e.g., drawings, related schedules and documents, information from client) to determine overall scope and to analyze which standards and what compliance options are available
- Analyze proposed project information to determine if all data is correct and internally consistent and whether relevant information is missing or incomplete
- Summarize mandatory envelope, mechanical, service hot water and lighting measures that apply to a proposed project

3. Gather, Calculate and Organize All Information Needed for Energy Modeling — Review drawings, specifications and information provided by the designer or client; gather, calculate and record all pertinent data to input into the energy modeling software.

- Analyze pertinent project data regarding mechanical systems/zones and service hot water to input into energy modeling software
- Organize and perform envelope and daylighting zone-by-zone area take-offs in accordance with the scope, type, and compliance approach for the project
- Organize and perform indoor lighting prescriptive calculations including sub-zone area take-offs in accordance with the scope, type, and compliance approach for the project
- Organize and perform prescriptive calculations for exterior hardscape lighting and signage lighting including area take-offs in accordance with the scope, type, and compliance approach for the project

4. Model the Building with Approved Energy Compliance Software – Create an energy model of the building from all information gathered. Check to see if on-screen and report results are reasonable, and if not, correct the source of the error(s).

- Create an accurate energy model of a proposed project using state-approved energy compliance software
- Determine how the Standard Design that sets the energy budget is established based on the proposed envelope, indoor lighting, HVAC and service hot water
- Evaluate the results of a building energy model to determine whether the results shown in reports and on-screen are reasonable with respect to envelope and daylighting design inputs
- Evaluate results of a building energy model to determine whether the results shown in reports and on-screen are reasonable with respect to the indoor lighting inputs
- Evaluate the results of a building energy model to determine whether the results shown in reports and on-screen are reasonable with respect to the mechanical and service hot water inputs
- Compare the Certificate of Compliance and other relevant compliance forms relative to known or listed project information (e.g., drawings, schedules and other data from client) to determine any modeling or data entry errors

5. Consider Recommendations for Improving Energy Performance and Comfort– Use the knowledge of the project design and climate zone to make recommendations for improving energy performance to meet or exceed code.

- Evaluate the energy model for a proposed project to determine recommendations for improving envelope and daylighting design to meet or exceed code
- Evaluate the energy model for a proposed project to determine recommendations for improving indoor lighting to meet or exceed code
- Evaluate the energy model for a proposed project to determine recommendations for improving HVAC and service hot water systems to meet or exceed code
- Describe the general characteristics and requirements of local Tier 1 energy codes, various utility incentives, tax credits and other energy programs, and energy-related calculation methods other than the Title 24 performance approach

Q12: Where Can I Find Training That Relates to These Competencies?

Currently there are several classes offered by the Investor Owned Utilities. While these classes are not specifically targeted to help examinees prepare for the CEA exam; they are a good starting point.

- Title 24 Nonresidential Modeling Essentials
- Title 24 Nonresidential Standards Essentials
- Title 24 Residential Modeling Essentials
- Title 24 Residential Standards Essentials

CABEC is currently developing advanced training courses which will directly correspond to the major competencies of the CEA exam. The goal is to have these new trainings in place before the effective date of the 2013 Standards.

There are also other related courses under development by the IOUs. More information on these and other trainings will be provided when it becomes available.

Below are the names of two documents that provide information about training and where. Both may be downloaded from the CABEC web site:

- "Residential Training and Where"
- "Nonresidential Training and Where"

Q13: Could You Provide Some Sample Questions?

CABEC Residential CEA Exam Sample Questions

1. **When an existing split HVAC system is altered by replacing a heating coil, are you required to replace the existing non-setback thermostat with a setback thermostat?**
   A. Yes, the existing non-setback thermostat must be replaced with a setback thermostat
   B. Yes, but only if the existing HVAC system has ducts in the attic space
   C. No, the existing non-setback thermostat must be replaced only when the whole HVAC system is replaced
   D. No, if the existing HVAC system was installed prior to 1978

2. **You are asked to perform the energy compliance analysis on a new custom home that needs to exceed the Title 24 energy budget by 15 percent. The owner would like to use a custom-designed high efficiency split HVAC system and has provided you with the makes and model numbers for the condenser, furnace, and cooling coil. You have determined that you will need to take a HERS performance credit for high efficiency cooling equipment to exceed Title 24 by 15 percent.**

   In order to take a HERS performance credit for high efficiency cooling equipment, what additional information do you need and where should you look to find it?
   A. The SEER and EER rating of the tested system from the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) directory
   B. The SEER and EER rating of the tested system from the California Energy Commission (Energy Commission) Appliance Database
   C. The SEER rating of the tested system from the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) directory
   D. The SEER rating of the tested system from the California Energy Commission (Energy Commission) Appliance Database

3. **Which of the following performance credits requires HERS field verification?**
   A. Building Envelope Sealing
   B. CRRC Certified Roofing
   C. Attic Radiant Barrier
   D. All of the above

Answer Key

CABEC Nonresidential CEA Exam Sample Questions

1. **You have completed the modeling of a 9,000 ft2 single story gymnasium designed at 0.95 watts/ ft2 of lighting with all walls, roof, and HVAC designed to prescriptive requirements for climate zone 2. The project has a 20' ceiling height. The designers have decided to provide no windows or skylights in order to try to be as energy efficient as possible. Which of the following best describes the results of a performance analysis of the building?**

   A. No credit or penalty on total energy usage
   B. A penalty on the heating and cooling energy usage
   C. A penalty on the lighting energy usage
   D. A credit on the lighting energy usage

2. **You are completing a performance analysis of a new 10,000 ft2 conditioned airport concourse. The lighting designer has given you a plan that shows dimmable electronic ballasts with a fixture count that totals to an LPD of 0.93 watts/ft2. Another 0.14 watts/ft2 of lighting is considered to be ornamental sconces at the gate areas. The client has a stated goal of achieving 20 percent better than code on each piece of the building (envelope/lighting/mechanical). Which of the following recommendations would be a valid approach for achieving this goal for the lighting?**

   A. Document the sconce lighting on the plans, which will increase the allowed LPD using the Area Category Method
   B. Use demand responsive lighting controls only
   C. Use manual dimming controls only
   D. Use both demand responsive lighting controls and manual dimming controls

Answer Key

Residential Answer Key: 1:A, 2:A, 3:A
Nonresidential Answer Key: 1:C, 2:D