CEA Exam Prep Workshop

How to Prepare to Pass the Nonresidential CEA Exam

Brian Selby
Selby Energy, Inc.

Energy Code Ace™
HELPING YOU PLAY YOUR CARDS RIGHT

This program is funded by California utility customers under the auspices of the California Public Utilities Commission and in support of the California Energy Commission.

Presentation Schedule

Welcome

- Welcome
- Questions and Concerns
- About the Exam

Multiple-choice Exam

- Exam Structure
- Exam Competencies and Objectives
- Sample Questions

ACM Exam

- Exam Structure and Tips
- Modeling Demonstration and Practice
- Common Modeling Mistakes

Wrap-up

- Before the Exam
- During the Exam
- Q&A and Wrap Up

Session Ground Rules

Please:

- Silence your cell phones
- Respect the opinion of others
- Ask questions about preparing for the CEA exam
- Refrain from complaints about your experience taking the CEA exam
- Help maintain focus
- Have fun!

What are your questions or concerns regarding nonresidential CEA exam?

About CABEC

www.cabec.org
6965 El Camino Real, Ste. 105-124
Carlsbad, CA 92009

Linda Pierce
CABEC Executive Director
Phone: (760) 537-0009
linda@cabec.org

CABEC's Mission

- Further technical expertise and ethics through certification
- Foster professional development through training, information, and peer exchange/networking
- Represent and enhance the stature of its members to the California Energy Commission and other political entities
- Encourage energy efficiency and regulatory compliance throughout the energy consulting industry

Value of becoming a CEA?

Recognized Professional

- Qualified for providing energy calculations under these programs:
  - Build It Green, Green Point Rated
  - Leadership in Energy and Environmental Design (LEED)
  - California Tax Credit Allocation Committee (CTCAC)
  - Low-Income Housing Tax Credit Program
  - City of Santa Ana (nonres third-party plan check)
  - Department of State Architect (coming soon!)
  - Reach Codes (jurisdictions vary)
- Measured and recognized skill in the energy field
- Membership privileges of a respected organization when a CABEC member.

About the CEA Exam

Supported

The CA Investor Owned Utilities Statewide Codes & Standards team has supported the development and ongoing success of the CEA exam since 2010.

Developed

The exam development team is composed of testing and measurement experts and some of the top energy analysts in the state.

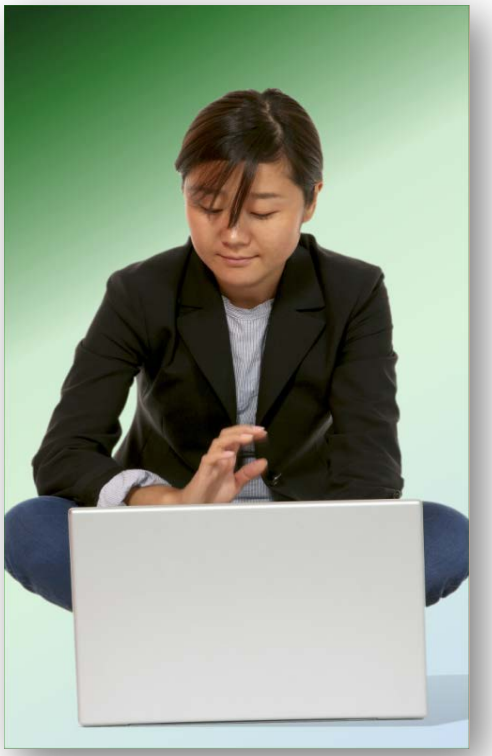
Tailored

The exam is designed to specifically reflect the skills and knowledge associated with qualified professionals in the energy consulting field.

Verified

The exam has been through rigorous alpha and beta tests, with fine-tuning based on detailed analysis of test results.

What should I bring?



* These also will be provided on a flash drive in PDF format

- Bring a picture identification (such as a driver's license)
- Bring a calculator that's not an app in your phone.
- Bring your own laptop (updated and with power cord) that can connect to WiFi and read a USB flash drive, pre-loaded with any CEC-approved Nonresidential software.

  Make sure it is the most current version!

- You may bring hard copies of any materials you want to use, such as:
  - 2019 Building Energy Efficiency Standards
    2019 Compliance Manuals
    2019 ACM Reference Manuals
    2019 Reference Appendices
    2019 CalGreen - California Green Building Standards Code
    Fact Sheet – What's New 2019 Nonresidential Energy Code
    Fact Sheet – What's New 2019 Residential Energy Code

EnergyCode Ace™

Helping you play your cards right

Ace Tools™

A variety of tools to help you identify the forms, installation techniques, and standards relevant to building projects in California.

Ace it

Ace Training™

Targeted classroom and online training on Title 24, Part 6 and Title 20 addressing a variety of stakeholders and measures.

Ace it

Ace Resources™

Application Guides, Facts Sheets, Trigger Sheets and Checklists to help you understand how and when to comply with California's building and appliance energy efficiency standards.

Ace it

Completing CEA Qualifications

It's not required to complete your CEA qualifications before taking the exam.

Now What?

- Attain or prove 100 points combined within these categories:
  - Must show experience as documentation author for a minimum of projects
  - Further education or other professional certifications
  - OR… you are a CEA under a previous code cycle
- Continuing Education
  - 9 approved credits per calendar year
- Attend professional practices workshop, or are a CEA under a previous code cycle

Check Your Understanding

Which of the following resources may be used during the exam?

a. 2019 Energy Standards PDF saved on my computer.
b. Compliance modeling software installed on my computer.
c. The energycodeace.com website.
d. All of the above

Check Your Understanding

True or false, I'm not allowed to take the CEA exam until I meet all of the experience requirements?

a. True

b. False

c. I don't know

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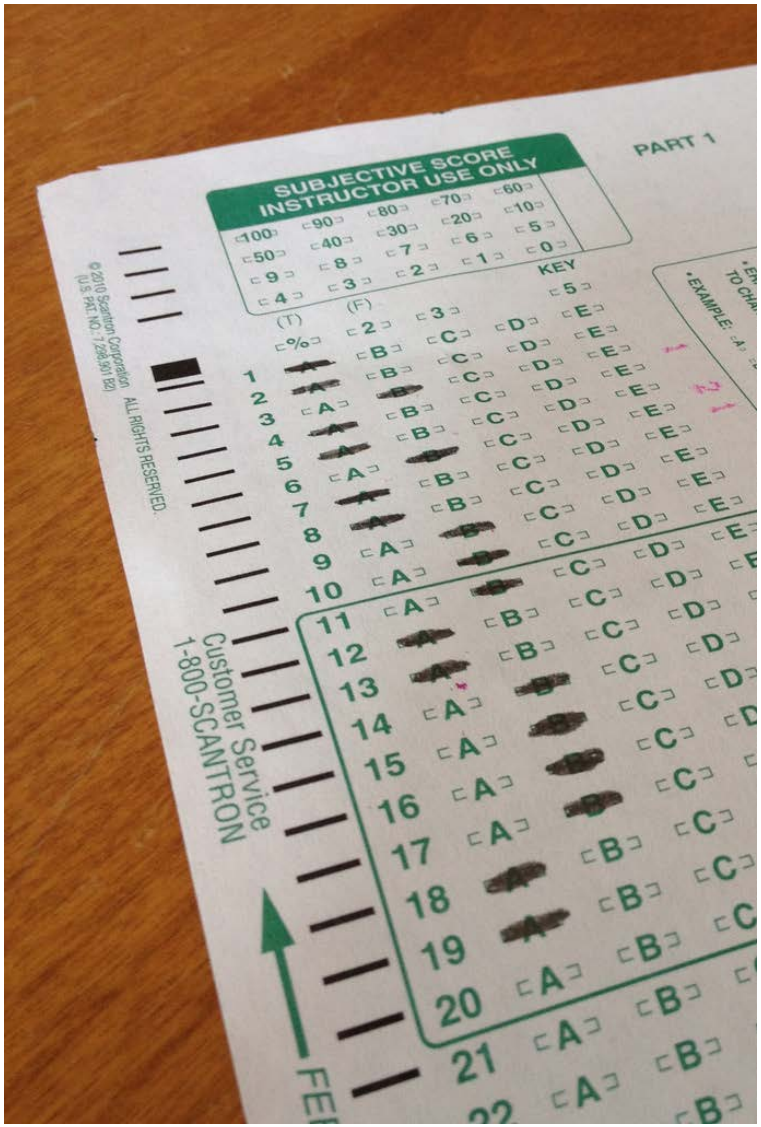
Multiple-Choice Exam Structure



Multiple Choice

- 50 (full exam) multiple choice questions covering five competencies, or
- 30 (recertification exam) multiple choice questions covering new or changed objectives in five competencies
- Up to 4 hours allowed to complete this section during the morning portion
- Pass score is 70%

CEA Exam Competencies

1. **Energy Basics**
   Comprehend Key Nonresidential Energy Efficiency Design Concepts and Issues
2. **Project Assessment**
   Conduct Initial Project Assessment and Determine How to Apply the 2019 Energy Standards
3. **Project Take-Offs**
   Gather, calculate and organize all information needed for energy modeling
4. **Modeling and Troubleshooting Results**
   Modeling the building with approved energy compliance software
5. **Energy Consulting**
   Consider recommendations for improving energy performance and comfort

Competency One

Energy Basics

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

Competency One

Comprehend Key Nonresidential Energy Efficiency Design Concepts and Issues

Objective 1: Understanding the basics of thermodynamics, heat transfer in and out of buildings and maintaining comfort conditions.

Essential content in this objective may contain concepts such as:

- 1st and 2nd Laws of Thermodynamics and basic heat transfer.
- Maintaining comfort conditions (i.e. temperature, humidity, air movement, air cleanliness, mean radiant temperatures, evaporation).
- Relevant energy terms, units and conversions (i.e. Btu, Btu/hr, watt, kW, kWh, cooling capacity (sensible and latent), pascal, TDV, etc.)

Competency One

Comprehend Key Nonresidential Energy Efficiency Design Concepts and Issues

Objective 2: Describe general energy efficiency and energy design concepts of buildings, and general methods of reducing end-use energy consumption with energy efficiency and energy design.

Essential content in this objective may contain concepts such as:

- Design features and energy end use components regulated by the Energy Standards: Space heating and cooling, water heating, pump and fan energy, indoor lighting, exterior lighting, processes.
- Energy efficiency vs. on-site power generation.
- Major differences in the energy use of nonresidential building components compared with high-rise residential and hotel/motel building components.
- The effect that lighting and mechanical system designs have on energy use in nonresidential buildings.

Competency One

Comprehend Key Nonresidential Energy Efficiency Design Concepts and Issues

Objective 3: Describe envelope design elements, including daylighting design features and explain how they affect energy design and efficiency.

Essential content in this objective may contain concepts such as:

- Construction assemblies, insulation (cavity and continuous), impacts of thermal barriers and thermal bridging, assumptions built into the prescriptive envelope assemblies
- Cool roofs and when they have a large impact on TDV energy use.
- Fenestration area, orientation, U-factor, SHGC and VT; fixed shading
- Design elements of good daylighting design, and how they can inadvertently increase energy use if not applied properly

Competency One

Comprehend Key Nonresidential Energy Efficiency Design Concepts and Issues

Objective 4: Describe mechanical and service hot water design elements and systems, and explain how they affect energy design and efficiency.

Essential content in this objective may contain concepts such as:

- Heating and Cooling systems, equipment types and efficiencies.
- Duct systems, location, insulation and duct leakage (HERS measure).
- Service hot water systems, types and efficiencies.
- Fans and pumps
- Main energy efficiency strategies in the design of typical mechanical systems

Competency One

Comprehend Key Nonresidential Energy Efficiency Design Concepts and Issues

Objective 5: Describe lighting design elements, and explain how they affect energy design and efficiency.

Essential content in this objective may contain concepts such as:

- Light sources and fixtures (types, directional sources, high efficacy lighting, lamp types, ballast types, input watts)
- Indoor and outdoor lighting controls (mandatory control measures versus controls for compliance credit)
- Color Temperature and CRI
- Daylighting design (integrated with envelope)
- General vs. display lighting, and different kinds of lighting designs and fixture types typically used for each; illuminated area of exterior lighting; Lighting Power Density (LPD)

Competency One

Comprehend Key Nonresidential Energy Efficiency Design Concepts and Issues

Objective 6: 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.

Essential content in this objective may contain concepts such as:

- Site and source energy
- Energy cost
- TDV energy
- Peak demand
- Cost-effectiveness of energy measures
- CO2 emissions

Sample Question

A new office building designed with large window areas to the north and east is to be built along the Pacific coast in Eureka (climate zone 1). It will have no mechanical cooling.

Which of the following measures is most likely to provide the best thermal comfort for building occupants in this design location?

a. Cool roof

b. Tinted glass windows

c. Radiant floor heating

d. Attic radiant barrier

Sample Question

A six-story high-rise residential building is proposed in climate zone 12. As an energy consultant you are asked to provide effective energy-efficiency measures for reducing TDV energy use for the project.

Which of the following measures will likely result in the most energy-efficient building?

a. Increase the wall insulation from R-19 to R-21

b. Install fixed windows with an RSHGC lower than 0.25 and operable windows with an RSHGC lower than 0.22

c. Install low-flow plumbing fixtures in all units and fluorescent lighting in all bathrooms

d. Install windows with a U-factor of 0.40 or higher, and install 12 EER air conditioners

Where to find more information

Online Self-Study

- Residential and Nonresidential Energy Efficiency Concepts

Application Guides:

- Nonresidential Envelope and Solar Ready
- Nonresidential HVAC and Plumbing
- Nonresidential Lighting and Electrical Power Distribution

Check Your Understanding

Where would I find information regarding mean radiant temperature and thermal comfort?

a. Residential and Nonresidential Energy Efficiency Concepts online self-study course

b. Nonresidential Envelope and Solar Ready Application Guide

c. ASHRAE Handbook Fundamentals

d. All of the above

Competency Two

Project Assessment

Conduct Initial Project Assessment and Determine How to Apply the 2019 California Building Energy Efficiency 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.

Competency Two

Conduct Initial Project Assessment and Determine How to Apply the 2019 California Building Energy Efficiency Standards

Objective 1: Explain scope and triggers for specified portions of the Title 24 Nonresidential Standards, High-rise Residential Standards and the Title 20 Appliance Efficiency Regulations.

Essential content in this objective may contain concepts such as:

- Specific scope and triggers for Nonresidential, High-rise Residential and Hotel/Motel buildings.
- Requirements for conditioned versus unconditioned space, and indoor versus outdoor areas.
- Mandatory measures, Prescriptive and Performance compliance approaches.
- Federal and State Appliance Efficiency Standards; and what types of equipment are covered in State standards but not Federal appliance standards.

Competency Two

Conduct Initial Project Assessment and Determine How to Apply the 2019 California Building Energy Efficiency Standards

Objective 2: Analyze all available information about a proposed project (e.g., drawings, related schedules and documents, information from client) to determine overall scope; analyze which Standards and what compliance options are available.

Essential content in this objective may contain concepts such as:

- Reviewing and analyzing architectural, mechanical and electrical (lighting) drawings and schedules; conditioned/unconditioned space
- Nonresidential vs. high-rise residential standards; and new construction vs. additions vs. alterations.
- Triggers for envelope, indoor or outdoor lighting and mechanical systems, ducts and service hot water systems compliance.
- Strengths and weaknesses of difference compliance options.

Check Your Understanding

Which sub-chapter in the 2019 Energy Standards contains mandatory insulation requirements specifically for nonresidential buildings, high-rise residential and hotel/motel buildings?

a. Sub-chapter 1
b. Sub-chapter 2
c. Sub-chapter 3
d. None of the above

Competency Two

Conduct Initial Project Assessment and Determine How to Apply the 2019 California Building Energy Efficiency Standards

Objective 3: Analyze proposed project information to determine if all data is correct and internally consistent, and whether relevant information is missing or incomplete.

Essential content in this objective may contain concepts such as:

- Correctly scaled/dimensioned architectural drawings.
- Mechanical plans and schedules: system and equipment types, efficiencies, water heater efficiencies, BHP of fans.
- Existing conditions for an Existing + Addition + Alteration analysis.
- Finding inconsistencies within the drawings.
- Finding missing information in the electrical (lighting) and mechanical drawings and schedules.

Competency Two

Conduct Initial Project Assessment and Determine How to Apply the 2019 California Building Energy Efficiency Standards

Objective 4: Summarize mandatory envelope, mechanical, service hot water and lighting measures that apply to a proposed project.

Essential content in this objective may contain concepts such as:

- Pick out envelope, mechanical, water heating, indoor and outdoor lighting mandatory measures applicable to proposed project.
- Distinguish mandatory envelope requirements from prescriptive or performance measures.
- Distinguish mandatory indoor lighting requirements from prescriptive credits.
- Distinguish mandatory HVAC requirements from prescriptive or performance measures.

Check Your Understanding

Which section in the 2019 Energy Standards includes requirements for the design and installation of all lighting systems, lighting controls, and equipment in high-rise residential dwelling units?

a. Section 110.9(e)
b. Section 130.0(b)
c. Section 140.6(a)
d. Section 150.0(k)

Sample Question

A tenant improvement to an existing 1,600 ft2 courtroom (occupant density = 40 ft2 per person) is proposed in climate zone 12. The mechanical contractor is installing a 5 ton packaged air source heat pump with an air economizer to serve the space.

What requirement would have to be met regardless of the compliance approach?

a. Demand control ventilation.
b. Supply air temperature reset controls
c. Direct digital controls
d. 15 SEER cooling efficiency

Sample Question

You are beginning work on analyzing a set of plans for a new four-story mixed-use project. The project will have three stories of residential apartments located above the ground floor parking garage. Included at the ground floor is a small amount of retail space (less than 10% of the total conditioned floor area) that is fully designed with lighting and mechanical.

Which of the following choices is the correct application of the Title 24 Standards for this project, in addition to all applicable mandatory measures?

a. Show compliance of the retail lighting under the Nonresidential Standards; show compliance of all other features of the project under the High-rise Residential Standards.

b. Show compliance of the upper floors under the Low-rise Residential Standards; show compliance of the retail space under the Nonresidential Standards

c. Show compliance of the building envelope, HVAC system, lighting and water heating for the entire project under the High-rise Residential Standards

d. Show compliance of the retail lighting under the Nonresidential Standards; show compliance of all other features of the project under the Low-rise Residential Standards

Where to find more information

Online Self-Study

- Nonresidential Standards & Technology for Indoor Lighting Mandatory Measures **Coming Soon!**
- Nonresidential Standards & Technology for Indoor Lighting Prescriptive Compliance **Coming Soon!**

Virtual Classroom

- Nonresidential Standards for Energy Consultants

Resource Ace

- Nonresidential Fact & Trigger Sheets

Competency Three

Project Take-Offs

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.

Competency Three

Gather, Calculate and Organize All Information Needed for Energy Modeling

Objective 1: Analyze pertinent project data regarding mechanical systems/zones and service hot water to input into energy modeling software.

Essential content in this objective may contain concepts such as:

- How different systems serve different parts of the building, and strategies for modeling multiple HVAC systems serving one zone.
- Getting equipment data from CEC directories and acceptable sources of other efficiencies.
- Plans, symbols, organization of plan sheets, location of data.
- Determine minimum ventilation rates for sub-occupancies.

Competency Three

Gather, Calculate and Organize All Information Needed for Energy Modeling

Objective 2: Organize and perform envelope and daylighting zone-by zone area take-offs in accordance with the scope, type, and compliance approach for the project.

Essential content in this objective may contain concepts such as:

- Reading plans, sections, elevations and architectural details and using the appropriate construction assemblies.
- Using the correct fenestration U-factor, SHGC and VT; CMAST software and COG calculations
- Defining what are the skylit, primary sidelit and secondary sidelit zones.
- Organizing and coordinating envelope take-offs with HVAC Systems/Zones and lighting Area Category areas.
- Envelope data often missing or inconsistent between plans, sections and elevations

Competency Three

Gather, Calculate and Organize All Information Needed for Energy Modeling

Objective 3: 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.

Essential content in this objective may contain concepts such as:

- Allowed Total Watts v. Adjusted Installed Watts in the Prescriptive and Performance approaches
- Calculating Allowed Watts using the Complete Building, Area Category and Tailored Lighting methods.
- Power Adjustment Factors (PAFs) and lighting control credits; and control credits vs. mandatory lighting controls.
- Calculating display lighting areas, relevant rules and definitions.
- Use of lighting fixture schedules, CEC defaults for installed fixtures and when they can be used.

Competency Three

Gather, Calculate and Organize All Information Needed for Energy Modeling

Objective 4: Organize and perform prescriptive calculations for exterior hardscape lighting and sign lighting including area take-offs in accordance with the scope, type, and compliance approach for the project.

Essential content in this objective may contain concepts such as:

- Outdoor Lighting Zone
- How to calculate illuminated area within the hardscape; Allowed Total Watts v. Installed Watts for hardscapes
- Calculating Allowed Watts including selection of appropriate lighting power allowances; Tables 140.7-A and B
- Maximum Allowed Lighting Power v. Alternate Light Source compliance for signs
- Exterior lighting information needed (e.g., mounting height, property lines) but sometimes missing.

Check Your Understanding

Which of the following sources may be used to determine the minimum heating and cooling equipment efficiencies for a 10 ton packaged constant velocity heat pump unit?

a. AHRI Directory of Certified Product Performance

b. Modernized Appliance Efficiency Database System (MAEDBS)

c. Table 110.2-B Heat Pumps

d. All of the above

Sample Question

A new barber shop is planned which includes a 200 ft^2 waiting area, a 75 ft2 restroom, a 75 ft2 storage room and 650 ft2 for the barber chairs.

What is the total allowed wattage for the general lighting?

a. 763.75 Watts

b. 995.25 Watts

c. 1,355.00 Watts

d. 1,485.50 Watts

I. LIGHTING POWER ALLOWANCE: COMPLETE BUILDING OR AREA CATEGORY METHODS

Table Instructions: Complete the table for each area complying using the Complete Building or Area Category Methods per §140.6(b). Indicate if additional lighting power allowances per §140.6(c) or adjustments per §140.6(a) are being used.

Conditioned Spaces

01	02	03	04	05	06	
Area Description	Complete Building or Area Category Primary Function Area	Allowed Density (W/ft^2)	Area (ft^2)	Allowed Wattage (Watts)	Additional Allowances / Adjustment	
					Area Category	PAF
Waiting area	Lounge/Waiting (Low Vision)	0.75	200	150	☐	☐
Restrooms	Restroom	0.65	75	48.75	☐	☐
Storage room	Commercial and Industrial Storage	0.6	75	45	☐	☐
Barber chairs	Beauty Salon	0.8	650	520	☐	☐
		TOTAL:	**1,000**	**763.75**	See Tables J or P for detail	
				Reset	Add Row	Remove Last

Where to find more information

Online Self-Study

- Nonresidential Standards & Technology for Indoor Lighting Mandatory Measures **Coming Soon!**
- Nonresidential Standards & Technology for Indoor Lighting Prescriptive Compliance **Coming Soon!**

Virtual Classroom

- Nonresidential Standards for Energy Consultants

Resource Ace

- Nonresidential Fact & Trigger Sheets

Competency Four

Modeling and Troubleshooting Results

Modeling the building with approved energy compliance software

- Determine an appropriate modeling approach, understand the limitations of the energy model, recognize mandatory requirements, and evaluate compliance results based on input vs. report. Determine the source of error(s), if any.

Competency Four

Model a Building with Approved Energy Compliance Software

Objective 1: Assess a proposed project to determine appropriate structure and organization of inputs to state-approved modeling software.

Essential content in this objective may contain concepts such as:

- Correct hierarchies of Plant, System, Zone, Room, Surfaces, Fenestration; input mechanical and service hot water systems, zones by occupancy type, envelope surfaces and assemblies, and fenestration, including shading.
- Input indoor lighting by area categories and outdoor lighting by lighting applications.

Competency Four

Model a Building with Approved Energy Compliance Software

Objective 2: Determine how the Standard Design sets the energy budget for a given project based on the proposed envelope, indoor lighting, HVAC, and service hot water.

Essential content in this objective may contain concepts such as:

- Overall geometry, zoning and occupancy features of the Standard Design.
- Envelope features: how the ACM "decides" what construction assemblies and fenestration to put in the Standard Design.
- Indoor lighting: how the ACM "knows" what LPD to use in the Standard Design.
- HVAC system and service hot water: equipment types, fan power and other features; how the ACM picks the Standard Design HVAC system type based on the Proposed Design.

Competency Four

Model a Building with Approved Energy Compliance Software

Objective 3: 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.

Essential content in this objective may contain concepts such as:

- Reasonable TDV energy per square foot for Standard and Proposed.
- Reasonable relative size of TDV energy use components given the building occupancy, climate zone, fenestration, et al; and between Standard and Proposed Designs.
- Compliance margin
- How the Prescriptive calculations can be used to assess the reasonableness of performance approach results.

Competency Four

Model a Building with Approved Energy Compliance Software

Objective 4: 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.

Essential content in this objective may contain concepts such as:

- Reasonable Allowed LPD.
- Reasonable Adjusted Installed LPD.
- Display lighting watts.
- Reasonable PAFs.

Competency Four

Model a Building with Approved Energy Compliance Software

Objective 5: 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.

Essential content in this objective may contain concepts such as:

- Reasonable heating and cooling energy in Standard and Proposed.
- Reasonable fan power in Standard and Proposed: likely causes of large discrepancies between the two.
- Reasonable pump energy use in Standard and Proposed.
- Reasonable equipment efficiencies, use of economizers, DDC, FDD; VAV box minimum CFM and box reheat
- Reasonable mechanical ventilation rates; use of Table 120.1-A & B, Air Class, DCV based on occupancy category

Competency Four

Model a Building with Approved Energy Compliance Software

Objective 6: Compare the Certificate of Compliance and other relevant compliance forms to known or listed project information (e.g., drawings, schedules and other data from client) to determine any modeling or data entry errors.

Essential content in this objective may contain concepts such as:

- Review the Performance Certificate of Compliance NRCC-PRF-01-E to determine any modeling or data entry errors
- Where to find specific software input values for proposed construction assemblies and fenestration values.
- Where to find specific software input values for proposed indoor lighting measures such as wattage of each fixture type, number of fixtures, types and locations of lighting controls.
- Where to find specific software input values for proposed HVAC and service hot water system measures such as equipment types and efficiencies and fan power.

Check Your Understanding

Where would you find the standard design for an HVAC system type that serves an 8000 ft2, two-story office building?

a. Nonresidential Compliance Manual, Section 4.8 Performance Approach

b. Nonresidential ACM Reference Manual, Section 5.1.2 HVAC System Map

c. Section 140.4 – Prescriptive Requirements For Space Conditioning Systems

d. All of the above

Sample Question

You have completed the modeling of a 9,000 ft2 single story gymnasium designed at 0.45 watts/ft^2 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 statement best describes the compliance margin you can expect to see based upon 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.

Where to find more information

Virtual Classroom

- Nonresidential Standards for Energy Consultants
- Introduction to Nonresidential Modeling
- Nonresidential Modeling

Traditional Classroom

- Beginning EnergyPro – Nonresidential
- Advanced EnergyPro – Nonresidential

Competency Five

Energy Consulting

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.

Competency Five

Consider Recommendations for Improving Energy Performance and Comfort

Objective 1: Evaluate the energy model for a proposed project to determine recommendations for improving envelope and daylighting design to meet or exceed code.

Essential content in this objective may contain concepts such as:

- Envelope or fenestration measures most likely to provide greatest improvement in TDV energy for a given project
- Daylighting measures most likely to provide greatest improvement in TDV energy for a given project

Competency Five

Consider Recommendations for Improving Energy Performance and Comfort

Objective 2: Evaluate the energy model for a proposed project to determine recommendations for improving indoor lighting to meet or exceed code.

Essential content in this objective may contain concepts such as:

- Opportunities to improve fixture optical characteristics, lamps and ballast efficiencies
- Opportunities for additional lighting controls for PAF credits
- Possible use of alternative light sources / lamp types
- Given a specific Item setup that defines the project reflected ceiling plan, fixture schedule and Energy Use Summary: pick the best lighting design improvement of those listed

Competency Five

Consider Recommendations for Improving Energy Performance and Comfort

Objective 3: Evaluate the energy model for a proposed project to determine recommendations for improving HVAC and service hot water systems to meet or exceed code.

Essential content in this objective may contain concepts such as:

- Evaporative pre-cooling on DX units; duct testing and HERS Verification
- Equipment output capacities and efficiencies; Fan BHPs
- Given a specific Item setup that defines the project mechanical system, equipment schedule and Energy Use Summary: pick the best mechanical design improvement of those listed.
- Given a specific Item setup that defines the project service hot water system, equipment schedule and Energy Use Summary: pick the best service hot water design improvement of those listed.

Competency Five

Consider Recommendations for Improving Energy Performance and Comfort

Objective 4: 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.

Essential content in this objective may contain concepts such as:

- Tier 1 building energy performance (Title 24, Part 11), and whether local green building or energy ordinances (reach codes) incorporate the CALGreen Tier 1 energy performance requirements
- LEED, and whether LEED energy pre-requisite and EAc1 requirement use the same or a similar energy metric as Title 24, Part 6
- Local reach codes or green building code requirements for high-rise residential or nonresidential buildings; utility incentive programs; whether the programs uses the same or similar metric as Title 24, Part 6

Sample Question

A proposed single-story 7,200 ft2 office building in Sacramento (climate zone 12) exceeds the energy code by only 0.3 percent using the performance approach. The proposed building has a 40 percent window wall ratio on each of it's four sides with all site-built glazing that is 7'-0" high. All other envelope measure meet the prescriptive requirements.

Which of these envelope design strategies is most likely to produce the greatest improvement in the compliance margin?

a. Add a 5'-0" (50 degree cutoff angle) overhang to all glazing in all four orientations

b. Add tinted glazing with a VT of 0.17

c. Reduce the glazing U-factor from 0.34 to 0.30

d. All of the above

Where to find more information

Resource Ace

- Nonresidential Fact & Trigger Sheets

Other Reference Material

- 2019 Building Energy Efficiency Standards and Nonresidential ACM Reference Manual
- USGBC – Advanced Energy Modeling for LEED Technical Manual v2.0 September 2011 Edition

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Test-taking Tips

Preparation for the Exam

- Bring the resources and reference you typically use on the job.
- Although you cannot use online resources (other than energycodeace.com) during the exam, you CAN use quick look-up sheets and annotated reference materials you typically use to save you time on the job.
- Get familiar with using the available resources

Test-taking Tips

During the Multiple Choice Exam

- When you first receive your test, do NOT scan the entire test, just start with the first question
- Pace yourself, don't rush
- Try answering each question in your head before you look at the answer options
- Read the question and ALL the answer choices, then re-read the question before choosing an answer
- Avoid watching for patterns
- If you don't know an answer, skip it. Come back after you finish the remaining questions
- When you have answered all the questions, don’t rush to leave

Wrap-Up

Thank you!

For more information or to provide feedback...

Contact	Role	Email	Phone
Brian Selby	Instructor	brian@selbyenergyinc.com	209-352-2281
Jill Marver	Statewide Lead	jkz1@pge.com	925-415-6844