This guide is to help professionals learn about the Certified Energy Auditor (CEA) Program, apply for the CEA Examination, register for the CEA Training Seminar, and to provide resources for this dynamic program.

- Program Overview
- Course Outline
- Seminar Schedule
- CEA Certification Application
- Books & Resources
- Sample Questions & Answers
The Certified Energy Auditor (CEA) certification was developed and added to the portfolio of certifications offered by the Association of Energy Engineer as a means of elevating the energy auditing professional's training & knowledgebase. Rising energy costs. Policy changes, reduction mandates and inefficiency in plants and buildings is continually driving the need for trained and experienced energy auditors. The CEA certification is one that identifies professionals as having the required knowledge and experience needed to succeed in the growing field of energy auditing.

**CEA Objectives**
To raise the professional standards of those engaged in energy auditing.

To improve the practice of energy auditors by encouraging energy auditing in a continuing education program of professional development.

To identify persons with acceptable knowledge of the principles and practices of energy auditing through completing an examination and fulfilling prescribed standards of performance and conduct.

To award special recognition to those energy auditing professionals who have demonstrated a high level of competence and ethical fitness in energy auditing.

**CEA Eligibility**
The candidate for CEA certification must have:

- A four-year degree from an accredited university or college in engineering or architecture, or be a registered Professional Engineer (P.E.) or Registered Architect (R.A.). In addition, the applicant must have at least three years of experience in energy auditing, energy management, facility management, or experience related to energy management.

  or

- A four-year non-engineering degree with at least four years experience in energy auditing, energy management, facility management, or experience related to energy management.

  or

- A two-year technical degree with at least five years experience in energy auditing, energy management, facility management, or experience related to energy management.

  or

- Ten years of experience in energy auditing, energy management, facility management, or experience related to energy management.

  or

- The current status of Certified Energy Manager (CEM®).
Required Body of Knowledge

The effective practice of energy auditing in the energy field requires in-depth knowledge of a wide variety of subjects. However, the candidate need only demonstrate to the satisfaction of the certification board the knowledge and ability to apply the essentials of energy auditing.

The CEA Examination

To be awarded the CEA designation, candidates must attend the Fundamentals of Energy Auditing Seminar prior to taking the CEA exam and receive a pass rate of 70% on the certification examination. The certification director keeps examination scores on file for a period of three years. Applicants that do not receive certification status can request that their applications be resubmitted to the CEA Board, if during that three-year period their education or experience level changes. The examination will be administered by the Association of Energy Engineers.

The applicant must complete the written exam. The applicant is given four hours to complete the exam. Dates and locations are determined by the CEA Board. Candidates are notified of this information by the CEA Director. The examination questions are based on concepts and experiences basic to energy auditing on recognized tests, and on supplemental reading. The exam is open book!

An examination administrator will proctor the examination. This administrator may be an AEE executive, an educator, a testing expert or agency, or whomever the certification board deems appropriate. The questions will be multiple choice and true/false.

Grading is accomplished by the CEA Director. Examinations are identified by number rather than by the candidate name to assure confidentiality and objective grading.

The written CEA examination deals with such subjects as:

- Energy Auditing Methodology
- Energy Audit Instrumentation
- Auditing Tools
- Economic Analysis
- Building Systems
- Lighting
- Building Envelope
- HVAC
- Controls
- Boilers and Steam Systems
- Water Auditing
- Reviewing Auditing Reports

Fundamentals of Energy Auditing Seminar

This 3-day program is designed to provide the specific training needed by professionals preparing to sit for AEE’s Certified Energy Auditor (CEA) exam. You’ll gain the fundamental knowledge needed to evaluate how energy is being used in a facility, and to identify where consumption can be reduced, covering useful calculation methods and practical examples. The instructor will emphasize effective auditing basics while putting them in the context of the “big picture” and the bottom line. Taking the Fundamentals of Energy Auditing Seminar is required to sit for the CEA Exam.

The program is also designed to provide you with the opportunity to take part in a focused, fast-paced instructional program, designed both to expand your knowledge in the field, and to serve as a preparatory vehicle for the examination required to achieve AEE’s Certified Energy Auditor (CEA) credential. For those wishing to qualify for the CEA certification, the CEA examination will be administered on the morning of the day following the seminar to pre-qualified applicants.

CERTIFICATION
Please Note: In order to qualify to sit for the CEA exam, you must submit your completed CEA application, along with a $300 application fee. For information on obtaining your CEA application form, or for further information on the CEA program, visit www.aeecenter.org/certification/CEA.
DETAILED SEMINAR OUTLINE

Introduction to Energy Auditing

Building Envelope
• Heat flow concept
• R and U values
• Walls, roofs, windows, Low E glass
• Infiltration
• Energy management opportunities

Lighting Systems
• Measurement of light
• Efficiency / efficacy / light color-CCT/CRI
• Lamp lumen depreciation
• Lamp types and characteristics
• Controls
• Energy management opportunities

Air Conditioning Systems
• HVAC basics / load estimating / efficiencies
• Components
• Chillers — electric, gas-driven, absorbers
• Piping arrangements
• Energy savings opportunities

Heating Systems
• Boilers: fire tube, water tube, cast iron
• Distribution systems and thermal units
• Boiler energy management opportunities
• Furnaces — electric, gas, pulse, condensing
• Furnace energy management opportunities

Motors and Drives
• Types of motors
• Squirrel cage induction motors
• Operating characteristics / efficiencies
• Variable frequency drives
• Energy management opportunities

Heat Pumps
• Operation / efficiencies
• Classifications
• Energy management opportunities

Ventilation Systems
• Types / characteristics
• Heat recovery methods
• Energy management opportunities

Domestic Hot Water Systems
• Types / efficiencies
• Circulating pumps
• Heat pump water heaters
• Energy management opportunities

Water Conservation and Audits
• Rate structures
• Water conservation methods
• Irrigation and landscaping
Certified Energy Auditor (CEA) Program & Exam Application

Please note: In addition to completing and submitting the seminar registration, in order to take the CEA exam certification applicants are also required to complete the CEA Certification online application

CEA Certification Online Application:  
http://www.aeecenter.org/forms/form.html?id=560

The CEA exam is administered at each Fundamentals of Energy Auditing seminar site, on the morning following the last day of the seminar.

Notification of Exam Results
Within thirty days of the date of the exam, you will be notified of your score. Your application fee must be paid before your score can be released. Please do not call AEE about your test results before the end of the thirty-day period. Exam results are not available on the AEE website.

Review by Certification Board: If you receive a passing score and have paid the examination fee, and if your file is complete, including all supporting documents, your file will be sent to the Certification Board for final review. You will be notified at that time that you will receive the Board's approval or denial within sixty days.
CEA Sample Test Questions

1. Which of the following is not always correct:
   (A) 10 kWh = 34,120 Btus
   (B) 5 therms = 500,000 Btus
   (C) 3 tons = 36,000 Btu/hr
   (D) 1 MCF = 1MMbtu

2. Determine the solar heat gain through a 1’ x 3’ window at 1:00 pm in August located at latitude 28° N. The window has an east orientation. The SHGF for the specified conditions is 160 BTU/Hr- ft². The SC is 0.70.
   (A) 1,120 Btu/hr
   (B) 228.6 Btu/hr
   (C) 336 Btu/hr
   (D) None of the above

3. The lighting efficiency term is lumens per watt.
   (A) True
   (B) False

4. A chiller has a full load rating of 0.7 kW/ton. What is the full load kW if this unit has a 200 ton rating?
   (A) 286
   (B) 140
   (C) 900
   (D) 75

5. What is the $/MMBtu delivered to the space for an 80% efficient gas furnace if gas costs $12.00/MCF?
   (A) $8.89
   (B) $11.23
   (C) $22.46
   (D) $15.00
6. Ground source heat pumps may not meet efficiency projections due to:
   
   (A) Improperly installed ground loop  
   (B) Poor water treatment  
   (C) Soil contamination  
   (D) Oversizing

7. ASHRAE standard 62-2010 defines the minimum standards for:
   
   (A) HVAC equipment sizing  
   (B) Acceptable indoor air quality levels  
   (C) Chiller efficiencies  
   (D) Motor efficiencies

8. An office building has 50 employees and is occupied for 250 work days a year. It is estimated that each employee uses, on the average, 1 gallon of hot water per day for hand washing. The hot water temperature required is 120°F and the city water is 60°F. Calculate the amount of annual energy required to heat this water:
   
   (A) 12.50 MMBTUs  
   (B) 6.25 MMBtus  
   (C) 25 Mbtus  
   (D) 15.4 MMBtus

9. A three phase induction motor draws 13 amps at 240 volts. The power factor is 0.9. Determine the kW.
   
   (A) 5.54  
   (B) 5.16  
   (C) 4.86  
   (D) 6.32

10. A hospital uses 400,000 gallons of water per year just for showers. The showers have the old style showerheads that use 4.5 gpm. What is the annual amount of water saved if they replace the showerheads with new ones that comply with the maximum flow rates allowed per the Energy Policy Act of 1992?
   
   (A) 200,000 gallons per year  
   (B) 285,765 gallons per year  
   (C) 222,222 gallons per year  
   (D) 177,778 gallons per year
Answer Key:

1- D
2- C
3- A
4- B
5- D
6- A
7- B
8- B
9- C
10- D

Resources:

U.S. Depart of Energy:
http://www.eere.energy.gov

U.S. EPA Energy Star:

Plant Energy Auditing:
http://www.energystar.gov/index.cfm?c=industry.bus_industry_plant_energy_auditing

State Energy Offices
http://apps1.eere.energy.gov/state_energy_program/seo_contacts.cfm

Industrial Technologies Program
http://www1.eere.energy.gov/industry/

AEE Certification Programs
http://www.aeecenter.org/certification

Real-time online seminars
http://www.aeecenter.org/realtime

Professional Reference Books
http://www.aeecenter.org/books

Technical Papers on Energy / Energy Auditing
http://aeecenter.metapress.com
RECOMMENDED TEXTS FOR CEA EXAM PREPARATION
Order Form provided on next page, or order online at www.aeeprograms.com/books

**Handbook of Energy Audits 9th edition**

This best-selling handbook is the most comprehensive and practical reference available on energy auditing in buildings and industry. Completely edited throughout, this latest edition includes new chapters on investment grade energy audits and retro-commissioning audits, as well as new information on ISO 50001 and the Superior Energy Performance program.

ISBN: 0-88173-685-6, 6 x 9, 495 pp., Illus., Hardcover, Order Code 675  Price: $130.00

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This practical desk reference for energy engineers, now fully updated and expanded with new material throughout, is designed to serve as a comprehensive resource for performing energy audits in commercial facilities. Although there are no "typical" commercial buildings, the book begins with the premise that when commercial facilities are subdivided into categories based on business type, many useful patterns can be identified which become generally applicable to the performance of an effective energy audit. Hence, discussion of procedures and guidelines is provided for a wide range of business and building types, such as schools and colleges, restaurants and fast food, hospitals and medical facilities, grocery stores, laboratories, lodging, apartment buildings, office buildings, retail, public safety, data centers, churches and religious facilities, libraries, laundries, warehouses and more.

ISBN: 0-88173-648-1, 6 x 9, Illus., 689 pp., Hardcover  ORDER CODE: 0644 Price: $135.00

**Energy Management Handbook 8th edition**

Newly revised and edited, this eighth edition includes significant updates to energy management controls systems, commissioning, measurement and verification, and high performance green buildings. Also updated are chapters on motors and drives, HVAC systems, lighting, alternative energy systems, building envelope, performance contracting and natural gas purchasing. You'll find coverage of every component of effective energy management, including energy auditing, economic analysis, boilers and steam systems, heat recovery, cogeneration, insulation, thermal storage, indoor air quality, utility rates, energy systems maintenance, and more. Detailed illustrations, charts and other helpful working aids are provided throughout.

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