Instructions

for Participating in
ASHRAE's

Building Energy Modeling Professional (BEMP)

Certification
Program

Effective date: 1/21/2012

About ASHRAE

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) is an international membership society committed to the advancement of the arts and sciences of heating, ventilation, air conditioning and refrigeration to serve humanity and promote a sustainable world. In support of this mission, ASHRAE offers many products and services, including the Building Energy Modeling Professional (BEMP) certification program, which is designed to meet educational needs of the HVAC&R industry.

ASHRAE does not discriminate on the basis of race, color, sex, religion, disability, or national or ethnic origin in its policies, procedures, or eligibility requirements for its programs.

About the Guide

The purpose of this guide is to provide information about ASHRAE's BEMP certification program. No information or material in this guide creates a contract between ASHRAE and an individual customer or organization. ASHRAE will do its best to apply the principles and provisions contained within this guide as written, but reserves the right to change those principles and provisions without actual notice. Nevertheless, ASHRAE will make reasonable efforts to notify customers of any changes.

Purpose of the BEMP Certification

The purpose of this certification is to certify individuals' ability to evaluate, choose, use, calibrate, and interpret the results of energy modeling software when applied to building and systems energy performance and economics and to certify individuals' competence to model new and existing buildings and systems with their full range of physics.

Disclaimer of Warranty

ASHRAE does not warrant that this program or its examination certifies a candidate's technical competence or technical ability to design any part of the HVAC&R system. Furthermore, nothing about this program or its examination is intended to replace, override, or conflict with licensing requirements for design engineers, architects, or other building professionals.

Who Can Participate

Participation in ASHRAE's BEMP program requires that a candidate meet eligibility requirements and successfully complete the program's examination. **Membership in ASHRAE is not a prerequisite to participate in the program.**

Eligibility Requirements

Any individual who meets one of the following combinations of academic and work experience requirements will be eligible to take the examination for the Building Energy Modeling Professional certification.

- Government-issued or government-recognized license as a professional engineer or architect and a minimum of two (2) years' building energy modeling experience
- Minimum of Bachelor's degree in engineering or a related field (e.g., building science, architecture, physics, or mathematics) from an accredited institution of higher learning and a minimum of five (5) years' energy-related HVAC, architecture, lighting, or renewable energy experience, including a minimum of two (2) years' building energy modeling experience; up to two years of graduate studies at an accredited institution of higher learning can be counted toward the five (5) years' experience in this category
- Associate's degree or Technical degree or certificate in design, construction, or a related field from an accredited institution of higher learning and a minimum of seven (7) years' energy-related HVAC, architecture, lighting, or renewable energy experience, including a minimum of two (2) years' building energy modeling experience
- High School diploma or equivalent and a minimum of ten (10) years' energy-related HVAC, architecture, lighting, or renewable energy experience, including a minimum of two (2) years' building energy modeling experience

Testing Requirements

Candidates who have completed and submitted the BEMP application and who have received approval thereof from ASHRAE can enroll for the Building Energy Modeling Professional examination. To earn the Building Energy Modeling Professional certification, the candidate must successfully pass the examination in full; no partial credit for this examination will be given.

Completing and Submitting the Application

To participate in ASHRAE's Building Energy Modeling Professional program, a candidate must complete and submit an application. Within a reasonable time after receiving a candidate's application, ASHRAE will notify the candidate either of ASHRAE's acceptance and approval of the application or of ASHRAE's denial of approval and the reasons therefore.

(ASHRAE has a process in place if a candidate's application is denied and the candidate wants to reapply. Please contact certification@ashrae.org to request information on this process.)

If an application is declined by ASHRAE or cancelled by the applicant, the amount of the fee, less $50 to cover administrative costs, will be refunded to the applicant.

About the Examination

The examination for the BEMP program is a proctored, closed book/closed notes, 2.5-hour, 115-item multiple-choice test. A candidate's score is based on 100 of the items; the other 15 items, which are interspersed throughout the examination, are included for "trial" or "pre-test" purposes.

A detailed content outline for the BEMP examination is provided on page 6. This outline identifies the following aspects of the examination:

- The four major content areas, as well as tasks within each area, that the examination covers
- The number of examination items devoted to each major content area
- The number of items at each cognitive level that a candidate is likely to use in responding to items in each major content area

The three cognitive levels tested on the BEMP examination are:

1. **Recall:** The ability to remember or recognize specific information
2. **Application:** The ability to comprehend, relate, or apply knowledge to new or changing situations
3. **Analysis:** The ability to synthesize information – sometimes from a variety of sources, determine solutions, and/or evaluate the usefulness of a solution

Scheduling an Examination

After receiving notification that your application has been approved, you may schedule an examination appointment by one of the following methods. Be prepared to confirm a date, time, and location for testing and to provide your ASHRAE identification number.

1. Schedule Online: The candidate may schedule an examination appointment online at any time by using the Online Scheduling service at www.goAMP.com. To use this service, follow these easy steps:

- Go to www.goAMP.com and select "Candidates."
- Follow the simple, step-by-step instructions to choose your examination program and schedule the examination.

2. Telephone Scheduling: Call AMP at 888-519-9901 to schedule an examination appointment. This toll-free number is answered from 7:00 a.m. to 9:00 p.m. (Central Time) Monday through Thursday, 7:00 a.m. to 5:00 p.m. on Friday and 8:30 a.m. to 5:00 p.m. on Saturday.

If special accommodations are being requested, please submit a Request for Special Examination Accommodations form prior to contacting AMP at 888-519-9901 to schedule your examination.

The examinations are administered by appointment only Monday through Saturday at 9:00 a.m. and 1:30 p.m. Individuals are scheduled on a first-come, first-served basis. Refer to the chart below for scheduling information.

If you contact AMP by 3:00 p.m. Central Time on…	Depending on availability, your examination may be scheduled as early as…
Monday	Wednesday
Tuesday	Thursday
Wednesday	Friday/Saturday
Thursday	Monday
Friday	Tuesday

When the appointment is made, the applicant will be given a time to report to the Assessment Center. Please make a note of this time because an admission letter will not be sent. The candidate will be allowed to take only the examination for which the appointment has been made. No changes in examination type will be made at the Assessment Center. UNSCHEDULED CANDIDATES (WALK-INS) WILL NOT BE ADMITTED to the Assessment Center.

Assessment Center Locations

Examinations are administered by computer at over 150 AMP Assessment Centers geographically distributed throughout the United States. Assessment Centers are typically located in H&R Block offices. Assessment Center locations, detailed maps and directions are available on AMP's website, www.goAMP.com. Specific address information will be provided when a candidate schedules an examination appointment.

Holidays

The examinations are not offered on the following holidays:

New Year's Day
Martin Luther King Day
Presidents' Day
Good Friday
Memorial Day
Independence Day (July 4)
Labor Day
Columbus Day
Veterans' Day
Thanksgiving Day (and the following Friday)
Christmas Eve Day
Christmas Day
New Year's Eve Day

Special Arrangements for Candidates with Disabilities

AMP complies with the Americans with Disabilities Act and strives to ensure that no individual with a disability is deprived of the opportunity to take the examination solely by reason of that disability. AMP will provide reasonable accommodations for candidates with disabilities. Candidates requesting special accommodations must call AMP, ASHRAE's exam vendor, at 888-519-9901.

1. Wheelchair access is available at all established Assessment Centers. Candidates must advise AMP at the time of scheduling that wheelchair access is necessary.

2. Candidates with visual, sensory, or physical disabilities that would prevent them from taking the examination under standard conditions may request special accommodations and arrangements.

Verification of the disability and a statement of the specific type of assistance needed must be made in writing to AMP at least 45 calendar days prior to the desired examination date. Please inform AMP of the need for special accommodations when scheduling the examination.

Telecommunication Devices for the Deaf

AMP is equipped with Telecommunication Devices for the Deaf (TDD) to assist deaf and hearing-impaired candidates. TDD calling is available 8:30 a.m. to 5:00 p.m. (Central Time) Monday through Friday at 913-895-4637. This TDD phone option is for individuals who have compatible TDD machinery.

Examination Appointment Changes/Failure to Report or to Schedule an Examination

1. A candidate may reschedule an appointment for an examination by calling AMP at 888-519-9901 at least two business days prior to the scheduled testing session. (See following table.)

If the examination is scheduled on . . .	AMP must be contacted by 3:00 p.m. Central Time to reschedule the examination by the previous . . .
Monday	Wednesday
Tuesday	Thursday
Wednesday	Friday
Thursday	Monday
Friday	Tuesday

The first reschedule or deadline extension with a two-day notice will be free; any additional reschedules or extensions will be at **full price**. Similarly, a candidate can extend the 90-day deadline for registering for and taking an exam by emailing certification@ashrae.org at least two business days prior to the 90-day deadline. ASHRAE will provide an extension of up to 45 days.

2. A candidate who wishes to reschedule his/her examination appointment, but fails to contact AMP at least two business days prior to the scheduled testing session, **will forfeit the examination fee and must reschedule the examination.**

Inclement Weather, Power Failure or Emergency

In the event of inclement weather or unforeseen emergencies on the day of an examination, AMP will determine whether circumstances warrant the cancellation, and subsequent rescheduling, of an examination. The examination usually will not be rescheduled if the Assessment Center personnel are able to open the Assessment Center. If power to an Assessment Center is temporarily interrupted during an administration, your examination will restart where you left off and you may continue the examination.

Candidates may contact AMP's Weather Hotline at 800-380-5416 (24 hours/day) prior to the examination to determine if AMP has been advised that any Assessment Centers are closed. Every attempt is made to administer the examination as scheduled; however, should an examination be canceled at an Assessment Center, all scheduled candidates will receive notification following the examination regarding rescheduling or reapplication procedures.

On the Day of Your Examination

On the day of your examination appointment, report to the Assessment Center no later than your scheduled testing time. After you enter the office, look for the signs indicating AMP Assessment Center check-in. A CANDIDATE WHO ARRIVES MORE THAN 15 MINUTES AFTER THE SCHEDULED TESTING TIME WILL NOT BE ADMITTED. To gain admission to the Assessment Center, a candidate needs to present two forms of identification, one with a current photograph. Both forms of identification must be current and include the candidate's current name and signature. The candidate will also be required to sign a roster for verification of identity.

Acceptable forms of identification include a current:

1. Driver's license with photograph
2. State identification card with photograph
3. Passport
4. Military identification card with photograph
5. Social security card (secondary form)

Employment ID cards, student ID cards, and any type of temporary identification are NOT acceptable as primary identification. Candidates are prohibited from misrepresenting their identities or falsifying information to obtain admission to the testing room.

Security

ASHRAE and AMP maintain examination administration and security standards that are designed to assure that all candidates are provided the same opportunity to demonstrate their abilities. The Assessment Center is continuously monitored by audio and video surveillance equipment for security purposes.

The following security procedures apply during the examination:

- Examinations are proprietary.
- No cameras, notes, tape recorders, Personal Digital Assistants (PDAs), pagers, or cellular phones are allowed in the testing room.
- You are encouraged to bring a non-programmable scientific calculator for the BEMP examination. Only silent, non-programmable calculators are permitted, but they will not be provided for you.
- No guests, visitors, or family members are allowed in the testing room or reception areas.
- No personal items, valuables, or weapons are allowed in the Assessment Center. Only keys and wallets may be taken into the testing room and AMP is not responsible for items left in the reception area.

Examination Restrictions

- No personal belongings will be allowed in the Assessment Center. Pencils will be provided during check-in. Use of a cellular phone or other electronic device is strictly prohibited and will result in dismissal from the examination.
- You will be provided with scratch paper to use during the examination. You must sign and return the scratch paper to the supervisor at the completion of testing, or you will not receive a score report. No documents or notes of any kind may be removed from the examination room. If you need a second piece of scratch paper, you need to ask the test proctor for another piece of paper and turn in the one you used before.
- No questions concerning the content of the examination may be asked during the examination.
- Eating, drinking, or smoking will not be permitted in the Assessment Center.
- You may take a break whenever you wish, but you will not be allowed additional time to make up for time lost during breaks.

Misconduct

Individuals who engage in any of the following types of conduct, either in the testing room or during a break, may be dismissed from the examination, their scores will not be reported, and their examination fees will not be refunded. Examples of misconduct are when a candidate:

- creates a disturbance, is abusive, or is otherwise uncooperative;
- displays and/or uses electronic communications equipment such as pagers, cellular phones, or PDAs;
- gives or receives help or is suspected of doing so;
- attempts to record examination questions or make notes;
- attempts to take the examination for someone else; or
- is observed with notes, books, or other aids.

Copyrighted Examination Questions

All examination questions are the copyrighted property of ASHRAE. It is forbidden under federal copyright law to copy, reproduce, record, distribute or display these examination questions by any means, in whole or in part. Doing so may subject you to severe civil and criminal penalties.

Practice Examination

Upon signing in, after your identification has been confirmed, you will be directed to a testing carrel. You will be instructed on-screen to enter your identification number. You will take your photograph which will remain on screen throughout your examination session. This photograph will also print on your score report.

Prior to attempting the examination, you will be given the opportunity to practice taking an examination on the computer. The time you use for this practice examination is NOT counted as part of your examination time or score. When you are comfortable with the computer testing process, you may quit the practice session and begin the timed examination.

Timed Examination

Following the practice examination, you will begin the timed examination. Before beginning, instructions for taking the examination are provided on-screen. The computer monitors the time you spend on the examination. The examination will terminate if you exceed the time allowed. You may click on the “Time” box in the lower right-hand corner of the screen or select the “Time” key to monitor your time. A digital clock indicates the time remaining for you to complete the examination. The time feature may be turned off during the examination. Only one examination question is presented at a time. The question number appears in the lower right hand corner of the screen. Choices of answers to the examination question are identified as A, B, C, or D. You must indicate your choice by either typing in the letter in the response box in the lower left hand of the computer screen or clicking in the option using the mouse. To change your answer, enter a different option by pressing the A, B, C, or D key or by clicking on the option using the mouse. You may change your answer as many times as you wish during the examination time limit.

To move to the next question, click on the forward arrow (>) in the lower right portion of the screen or select the NEXT key. This action will move you forward through the examination question by question. If you wish to review any question or questions, click the backward arrow (<) or use the left arrow key to move backward through the examination.

An examination question may be left unanswered for return later in the examination session. Questions may also be bookmarked for later review by clicking in the blank square to the right of the Time button. Click on the hand icon or select the NEXT key to advance to the next

unanswered or bookmarked question on the examination. To identify all unanswered and bookmarked questions, repeatedly click on the hand icon or press the NEXT key. When the examination is completed, the number of examination questions answered is reported. If all questions have not been answered and there is time remaining, return to the examination and answer those questions. Be sure to provide an answer for each examination question before ending the examination. There is no penalty for guessing.

Candidate Comments

During the examination, online comments may be provided for any question by clicking on the button displaying an exclamation point (!) to the left of the "Time" button. This opens a dialogue box where comments may be entered. Comments will be reviewed, but individual responses will not be provided.

Following the Examination

After completing the examination, candidates are asked to complete a short evaluation of their examination experience. Then, candidates are instructed to report to the examination proctor to receive their examination completion report. Scores are reported as either "Pass" or "Fail" and are provided in written form only by U.S. mail. Scores are not reported over the telephone, by electronic mail, or by facsimile.

Scores Cancelled by ASHRAE or AMP

ASHRAE and AMP are responsible for the validity and integrity of the scores they report. On occasion, occurrences such as misconduct by a candidate may cause a score to be suspect. ASHRAE and AMP reserve the right to void or withhold examination results if, upon investigation, violation of its regulations is discovered.

Confidentiality

Information about candidates for testing and their examination results are considered confidential. Studies and reports concerning candidates will contain no information identifiable with any candidate, unless authorized by the candidate.

By participating in the BEMP program, each person who earns and maintains this certification agrees to be listed on ASHRAE's public website. Only those individuals who are active BEMP certificants will be listed on the site. Upon request, ASHRAE will provide a link to your company's website.

Duplicate Score Report

Candidates may purchase additional copies of their results at a cost of $25 per copy. Requests must be submitted to ASHRAE, in writing. The request must include the candidate's name, identification number, mailing address, telephone number, date of examination and examination taken. Submit this information with the required fee payable to ASHRAE in the form of a check, money order or cashier's check. Duplicate score reports will be mailed within approximately two weeks after receipt of the request and fee.

Candidate Responsibilities

Each candidate for ASHRAE's Building Energy Modeling Professional certification is responsible for:

- Submitting a completed, signed application form and the application fee.
- Enrolling for the examination.
- Paying a reschedule or cancellation fee if the candidate chooses to cancel or reschedule an enrollment.
- Complying with the rules for examination.
- Immediately notifying ASHRAE of any suspected violations of the rules for examination.

Available Resources to Help Candidates Prepare for the BEMP Examination

Neither participating in a preparatory activity nor purchasing a publication is a requirement for participating in the BEMP program or for enrolling to take the BEMP examination. However, candidates who choose to participate in preparatory activities or to purchase publications are responsible for ensuring that the timing of the activity or purchase aligns with the timing of the examination session for which the candidate has enrolled.

Resources available to help prepare for the BEMP examination include, but are not limited to, the following:

- ANSI/ASHRAE Standard 55-2004: Thermal Environmental Conditions for Human Occupancy
- ANSI/ASHRAE Standard 62.1-2004 and 2007 update: Ventilation for Acceptable Indoor Air Quality
- ANSI/ASHRAE/IESNA Standard 90.1-2004 and 2007 update: Energy Standard for Buildings Except Low-Rise Residential Buildings
- ANSI/ASHRAE/IESNA Standard 100-2006: Energy Conservation in Existing Buildings
- ANSI/ASHRAE Standard 140-2007: Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs
- ASHRAE Guideline 14-2002: Measurement of Energy and Demand Savings
- User's Manual for ANSI/ASHRAE/IESNA Standard 90.1
- 2009 ASHRAE Handbook—Fundamentals
- CIBSE Applications Manual AM11: 1998, Building energy and environmental modelling
- IESNA Lighting Handbook, 9th Edition

- Solar Radiation and Daylight Models by T. Muneer
- Heat and Mass Transfer in Building Services Design by Keith J. Moss
- Mechanical and Electrical Equipment for Buildings by Benjamin Stein, John S. Reynolds
- Complying with Standard 62.1-2007 – ASHRAE Learning Institute instructor-led seminar
- Complying with Standard 90.1-2007 – ASHRAE Learning Institute instructor-led seminar
- Standard 90.1 – ASHRAE eLearning course
- Standard 62.1 – ASHRAE eLearning course
- Fundamentals of HVAC Systems – ASHRAE eLearning course
- Fundamentals of Sustainable Buildings – ASHRAE eLearning course

ASHRAE does not warrant that participation in or use of any listed resources will guarantee successful completion of the examination. Nor does ASHRAE warrant that all information presented in all of the resources is non-contradictory. However, ASHRAE will do its best to avoid testing contradictory, out-of-date, or inaccurate information.

Renewal/Recertification Requirements

The BEMP certification is renewable every three years. To retain certification, each certificant must earn 45 PDHs during the three year period following initial certification or the last renewal.

More information about acceptable renewal activities and the continuing education hours applicable to them is provided on page 15.

American Society of Heating, Refrigerating and Air-Conditioning Engineers

Building Energy Modeling Professional Examination
Detailed Content Outline

Open cells show an examination could include items from indicated cognitive levels.
Shaded cells prevent appearance of items on examinations.

	Items			
	Cognitive Level			
	Recall	Application	Analysis	Totals
I. ESTABLISHING THE MODELING SCOPE	**3**	**7**	**7**	**17**
A. Modeling Objectives	**0**	**1**	**2**	**3**
1. Define the purpose of the modeling study				
2. Interpret the design intent of the building project				
3. Evaluate the completeness of the design and operation information				
4. Link required project deliverables to goals of the modeling study				
B. Analysis Methodologies	**2**	**3**	**3**	**8**
1. Differentiate among calculation methods within available software and tools e.g.,				
a. time-neutral e.g., • bin method • degree day				
b. time-sequencing e.g., • heat balance • thermal network • weighting factor • parametric				
2. Evaluate mathematical modeling methods for building components e.g., • empirical • first-principle of thermodynamics • regression				
3. Translate a building project into an energy model				
a. simplify building physics to a mathematical model				
b. anticipate the impact of simplification and model deficiencies				
C. Software and Tool Selection	**1**	**2**	**1**	**4**
1. Evaluate the appropriateness of the methodology by characteristics of the project e.g., • project phase • climate • building type				
2. Select the optimal software and tools to meet output data needs of the project e.g., • life-cycle cost analysis • individual component performance • energy use and demand				

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	Items			
	Cognitive Level			
	Recall	Application	Analysis	Totals
D. Project Scheduling and Budget Considerations	**0**	**1**	**1**	**2**
1. Tailor the modeling strategy to the design phase e.g., • conceptual • design benchmarking • mid-design				
2. Recognize budget implications of and on modeling methodology				
3. Make approximations targeted toward specific model limitations				
II. COMPONENTS OF BUILDING AND ENERGY SYSTEMS	**14**	**18**	**16**	**48**
A. Location and Climate Definition	**2**	**1**	**1**	**4**
1. Use commonly available data about the local climate e.g., • temperature • solar • humidity • elevation • precipitation • wind				
2. Choose the best source of weather data for a project e.g., • long-term representative • geographically equivalent • constructed • historical for a time period				
3. Identify site characteristics e.g., • microclimates • reflectance • orientation • vegetation effects • adjacent buildings • local wind • shading • solar effects				
B. Building Envelope and Partitions	**1**	**3**	**2**	**6**
1. Model exterior and interior opaque surface performance e.g., • geometry • thermal transmission and capacitance • boundary conditions				
2. Model ground-coupled surface performance				
3. Model fenestrations e.g., • solar heat gain • glazing • shading • framing • reflectance • spectral				
4. Model building airflow e.g., • psychrometrics • driving forces of infiltration • air-tightness				

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	Items			
	Cognitive Level			
	Recall	Application	Analysis	Totals
C. Building HVAC Systems	**3**	**3**	**3**	**9**
1. Model terminal equipment in each zone e.g., • perimeter heating • heated / chilled radiant slabs • fan coil units • VAV / CAV boxes				
2. Model secondary distribution systems e.g., • air • refrigerant • water				
3. Model primary energy systems e.g., • chillers • thermal storage • boilers • combined heat and power • heat rejection				
4. Model packaged systems e.g., • split • packaged terminal air-conditioner • roof-top				
5. Model ventilation e.g., • mechanical • natural				
D. Lighting Systems	**1**	**1**	**1**	**3**
1. Model artificial lighting power				
2. Model daylighting e.g., • glare • illuminance				
3. Distribute lighting heat gain among room, return, and plenum				
E. Other Internal and Process Loads	**2**	**2**	**3**	**7**
1. Differentiate between space loads and building loads				
2. Model loads as sensible, latent, or radiant fractions and thermal distribution e.g., • occupants • vertical transportation • water heating • commercial refrigeration • plug loads • external lighting • appliances • special processes				
F. District Energy Systems	**0**	**1**	**1**	**2**
1. Model purchased energy				
2. Model shared energy systems				

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	Cognitive Level			
	Recall	**Application**	**Analysis**	**Totals**
G. Renewable Energy Systems	**1**	**1**	**1**	**3**
1. Model solar thermal systems				
2. Model onsite power generation e.g., • photovoltaic • micro-hydro • wind				
H. Controls	**4**	**6**	**4**	**14**
1. Model HVAC controls				
a. temperature				
b. humidification and de-humidification				
c. pressure				
d. outside air ventilation e.g., • quantity • temperature • quality • demand-control • humidity				
e. supply and return flow e.g., • economizers • maximum and minimum • exhaust • capacity control				
2. Model lighting controls e.g., • illuminance • energy-rate based • occupancy • glare considerations • time-based • dimming				
3. Model controls for miscellaneous equipment e.g., • service hot water • vertical transportation • process equipment				
4. Describe basic control sequences e.g., • 2-position • proportional integral derivative • scheduled				
5. Sequence equipment to manage loads e.g., • pumps • large plant equipment • fans				

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	Items			
	Cognitive Level			
	Recall	Application	Analysis	Totals
III. APPLICATIONS OF ENERGY MODELS FOR BUILDINGS	**3**	**6**	**3**	**12**
A. Simulation Comparisons	**1**	**2**	**1**	**4**
1. Compare alternative simulation results e.g., • code compliance • parametric studies • performance relative to standards • equipment and component selection				
2. Compare a simulation to measured data				
a. statistical models				
b. calibrated building-specific data e.g., • forensics • measurement and verification • utility bills				
B. Modeling Energy Performance	**2**	**3**	**1**	**6**
1. Choose whole-building metrics e.g., • cost • source energy consumption • emissions • site energy consumption • demand				
2. Choose component metrics e.g., • equipment usage • component performance • equipment sizes				
3. Choose metrics for indoor environmental performance e.g., • temperature • ventilation rate • humidity • daylighting				
C. Evolution of Simulation Techniques to Meet Project Methods and Objectives	**0**	**1**	**1**	**2**
1. Adapt simulations to the project phase				
2. Customize simulations for changes in building use				

American Society of Heating, Refrigerating and Air-Conditioning Engineers **Building Energy Modeling Professional Examination** **Detailed Content Outline** Open cells show an examination could include items from indicated cognitive levels. Shaded cells prevent appearance of items on examinations.	**Items**			
	Cognitive Level			
	Recall	**Application**	**Analysis**	**Totals**
IV. INTERPRETATIONS OF ENERGY MODEL RESULTS	**5**	**10**	**8**	**23**
A. Verification and Troubleshooting of Simulation Results	**1**	**3**	**3**	**7**
1. Perform reality check e.g., • hand calculations • conformance with expected values • mass and energy balance				
2. Perform software check e.g., • metering • hourly reports • input files				
3. Perform parametric bracketing to verify model sensitivity				
4. Review data for anomalies				
5. Reconcile anomalies using single time-step reports				
6. Resolve loads not met and hours outside of control range				
B. Analyzing and Comparing Modeling Results	**2**	**4**	**2**	**8**
1. Analyze simulation outputs e.g., • component metrics • whole building metric • energy use intensity				
2. Compare outputs to targets e.g., • rating programs • building labelling programs • codes				
C. Economic Analyses	**1**	**1**	**1**	**3**
1. Determine effects of utility rate structures and regulations on costs				
2. Calculate financial metrics e.g., • life-cycle costing • investment performance • cash flow • client financing needs				
3. Estimate the effects of incentives				
D. Sensitivity Analyses	**0**	**1**	**1**	**2**
1. Perform a sensitivity analysis on modeling assumptions				
2. Identify critical synergistic interactions of building components				

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	Cognitive Level			
	Recall	**Application**	**Analysis**	**Totals**
E. Project Deliverable	**1**	**1**	**1**	**3**
1. Communicate results				
2. Communicate methodology and assumptions on which results are based				
3. Submit documentation that affirms the accuracy and completeness of results				
4. Recommend actions				
Totals	**25**	**41**	**34**	**100**

Renewal Requirements for ASHRAE Certification Programs

Each Certificant is required to renew his/her certification every three years. The renewal process includes submittal of a renewal fee ($125 for members, $195 for non-members) and evidence of earning 45 ASHRAE Continuing Education (ACE) units during each three-year renewal period.*

The three-year renewal period starts on December 31 of the year in which the Certificant earns the certification. For example, a Certificant who earns the certification anytime in 2012 will have a renewal deadline of December 31, 2015.

Individuals who fail to submit renewal fees and evidence of the required ACEs by the December 31 deadline will be considered as "non-renewing," notified accordingly, and advised to cease using the specific certification designation after their names. The names of non-renewing Certificants will be removed from the list of Certificants on ASHRAE's website.

To be reinstated, non-renewing Certificants must submit the renewal fee, a reinstatement fee ($60), and evidence of the required ACEs by December 31 of the year following their active status. After that date, non-renewing Certificants must follow the same process as that for the initial application. Extenuating circumstances will be reviewed on a case-by-case basis by the Committee.

Acceptable Methods of Obtaining ACE credits

Type	**Credits**
Successful completion of a course in a related field from an accredited institution of higher learning Note: To qualify for this credit, a course must be offered regularly and must conclude with a test that sets a passing grade.	15 ACEs per credit hour (semester system) OR 10 ACEs (quarter system)
Patent Note: Credit can be claimed after a patent is issued and the inventor submits details to the board. The invention must be related to engineering.	10 ACEs
Publication of article/paper/book in recognized peer reviewed journal in relevant field (max. 3 per year). Note: A "news" article in a technical or professional bulletin is not considered a published paper.	10 ACEs per published item
Active participation in a professional or technical society relevant to the field Note: The certificant must serve as an officer and/or must actively participate in a committee of the organization. PDH credits are earned at the end of each year of service.	2 ACEs per year per organization
Writing ASHRAE certification exam items in relevant field	5 ACEs per exam
Accreditation Visit Evaluator (or ASHRAE approved equivalent)	3 ACEs per year
Professional awards	2 ACEs per award
Teaching of approved courses and workshops in relevant field Note: Teaching credit is valid for teaching a course or seminar for the first time only. It does not apply to faculty performing regular duties.	ACEs are determined by multiplying by two (2) the total number of course hours (for preparation time).
Attendance at meetings and conferences (e.g. National, Annual, Regional) or special conferences relevant to the field	Qualifying seminars and workshops will be based on one ACE unit for each hour of attendance.
Attendance and completion of approved short courses and other continued education activities in relevant field	Qualifying seminars and workshops will be based on one ACE unit for each hour of attendance.

*Certificants are not required to submit a report of Professional Development activities as part of certification renewal. A percentage of Certificants are randomly chosen for audit each year. If audited, a report of continuing professional development with documentation must be submitted to the Certification Coordinator for review.

Activities that qualify for ASHRAE's Continuing Education units **might** also qualify for continuing education credits (e.g., PDHs, CEUs, or LUs) from other credentialing bodies or organizations. The individual is responsible for contacting the relevant governing body to determine whether an activity qualifies for that body's continuing education credit.

For questions about any of the information about ASHRAE's certification renewal requirements, including clarification of acceptable and reportable qualifying activities, please contact ASHRAE's Communications Coordinator-Certification at certification@ASHRAE.org.