

BOC 1002 Instructor Notes & Metrics

Overview

One major program goal of the Building Operator Certification (BOC) is to increase participants' ability to identify areas for reductions in energy consumption and demand and to design projects to accomplish this. The competency basis of BOC adds responsibilities to the instructors to ensure appropriate material coverage and effective delivery so that participants are successful on the test and any related project assignments (see below). To the degree possible, instructors should encourage and maintain an interactive classroom environment to enable participants to learn from each other's experiences and apply the information to their facilities. Metrics are defined for Class Exercises, Project Debrief, and Proctorship of Exams to ensure quality of program delivery. You should familiarize yourself with these metrics and seek assistance from the BOC program administrator or the BOC office, if questions arise.

Preparation

Familiarize yourself with the Benchmarking and Disclosure Policies in the U.S. The Institute for Market Transformation (imt.org) has comprehensive information on the growing adoption of benchmarking policies. Review the suggested activities and checklist below. Reference the project workbook and review the project rubric from the previous class. Both provide criteria for effectively engaging participants, promoting discussion on key topics, and helping participants review and check for understanding. Since class activities are a required component of BOC training, determine if you will be implementing activities suggested or equivalent (objective, method, and time) activities of your choice. In making your decision, remember that the ultimate goal is to facilitate the learning by adults who prefer experienced-centered and problem-centered instruction.

The instructor should acquire a copy of the current rate schedules (natural gas and electric) for the utilities in the immediate area and copies of representative bills for use in the section on utility bills and rates. Also, in the section on Trends and Data Analysis, instructors should bring graphic reports on 12-month rolling averages, monthly usage for a variety of fuels and electrical energy consumption and demand graphs. The instructor will demonstrate interpretation and analysis approaches to these graphical representations.

Speak with your BOC program manager to determine who is sponsoring the BOC course. The BOC program helps connect participants to local resources including utility programs that can assist them with their energy efficiency projects. Check the www.dsireusa.org website. DSIRE is a comprehensive source of information on state, local, utility and federal incentives and policies that promote renewable energy and energy efficiency. Research and become familiar with utility rebate and incentive programs, state energy office initiatives, and local energy efficiency trends and

initiatives relevant to the class subject matter. Use the research to supplement discussion and tailor/adapt BOC curriculum to support sponsor interests. For example:

1. Describe how the BOC sponsor's EE initiative and/or DSM program benefits building owners.
2. Provide one or more examples of how their initiative/program relates to the topic you are teaching. What would a building operator need to know about this relationship? How would you tailor the instruction to share this information with the participants?

Review the Test and Answer Key documents prior to teaching the class and ensure that each question is covered adequately in the lecture and/or activities during the class.

(However, explicit coaching of participants about material that appears on the test is not permitted during instruction of BOC classes. Directing participants to highlight or put post-it notes at specific points in the Participant Handbook is also not permitted.)

Presentation Materials

The BOC Program provides electronic MS PowerPoint slides that complement the participant handbook to help you prepare participants for the tests and exercises. We encourage you to enhance the slides with your own teaching aides provided these do not confuse coverage of the basic materials nor create any ambiguity in the minds of the participants. These aides might include additional slides, case studies, demonstration props and specialty equipment, videos, and in-class exercises. Instructors are also encouraged to note current changes and developments in the topic they are presenting. See the suggested props/specialty equipment in the checklist below.

Safety Message: BOC is now including a "Safety Message" slide prompt in each class going forward. Instructors can check with their course sponsor/administrator, Course Manager, and the BOC repository for safety topic ideas. This can be a quick discussion (1-3 minutes).

Participant Materials

Participants receive a handbook that complements the presentation slides. The handbook may contain pages, illustrations, tables, charts, and other documents, supporting activities. Instructors should reference the handbook during class and refer participants to specific pages when giving instructional cues.

Class Exercises

Metric: Integrate a minimum of one hour of non-lecture, participant-centered activity into the training day.

Class exercises are activities led by the instructor in class to enable participants to practice skills and concepts taught. The average retention rate for lecture mode of instruction is 5 percent compared to 50 percent for discussion group and 75 percent for

practice by doing. Additionally, activities break up a long day of presentations and offer participants an opportunity to network with and learn from each other's experiences. Most classes in BOC Level I and II have several suggested in-class exercises for the instructor to administer. Review the suggested exercises below.

Project Assignment

Metric: Allot a minimum of ten minutes of class time for facilitating a debrief on the project assignment from the class taught before yours.

Successful completion of all project assignments is required for Level I certification. It is therefore important to ensure participants understand the assignment and are comfortable completing it. Participants return the completed projects to the following class where it is reviewed and graded by the training coordinator.

Review the Project Workbook to familiarize yourself with the project assignments. Instructors will need to create their own Portfolio Manager (PM) account. Sample data can be obtained from BOC or use your own. Review the project specific to the class taught before yours (see BOC schedule provided by administrator). Develop three questions you would use to facilitate the discussion keeping in mind the goal of providing participants with the opportunity to share their experiences and create action steps for implementing energy efficiency improvements. Even if you are not an expert in the previous class topic, with thoughtful questions you can encourage students to steer the discussion and provide insight. For example, in response to an issue a student may have experienced, follow-up questions like "Did anyone else encounter that issue? How did you handle it?" could encourage discussion.

The instructor is responsible for reviewing the project assignments at the end of the class before administering the test. Refer participants to their Project Workbook and grading rubric when reviewing the assignment.

Sample Building Data: ENERGY STAR® has provided the BOC Program with a set of sample utility data for buildings covering all the occupancies covered by ENERGY STAR® Portfolio Manager. That data is available to all BOC instructors and site coordinators to download and provide to participants who do not have their own utility data.

To complete the assignment, participants should set up an account in Portfolio Manager using their own building address, square footage, and physical characteristics as prompted by the tool. Once the account is established, they can use the sample data from the building type (e.g., school, office, healthcare, etc.) that best matches theirs. This is in hopes that if the real utility data actually becomes available, all the participant has to do is edit those fields and they get a real score. **The main goal is for them to use the tool and set up their account.**

When looking at the SEP, look for energy performance rating or EUI. If facility type is “other”, or there is not enough data (12 consecutive months needed) then the score will be NA but that’s okay. They still get the EUI. Make announcements during the to explain this. **Again, the goal is to get the participants familiar enough with the tool to be able to use it.** If possible, we recommend doing a live demonstration of logging into PM and using it realtime. If not possible, a slide deck with screenshots is available.

Go to the Energy Star Portfolio Manager site and sign in with your user name and password. Access your portfolio of sample buildings. It's easy to export the utility data to an Excel file. You can use any of this data to help participants who are in a jam.

BOC Test Proctor Procedure

Metric: Follow the BOC test procedure.

The BOC test is designed as an assessment of a participant’s grasp of the material and it is essential that the integrity of the test be maintained. The following test procedure maintains the integrity of the test by preparing participants to be successful in the absence of coaching to the test.

TEST PROCEDURE: The instructor is responsible for administering the test and will be present throughout the test to answer questions. The instructor is permitted to clarify the questions, if needed, but may not provide the answers to any questions under any conditions.

Note: For classes held virtually, the test will be administered through a learning management system (LMS) or similar online platform. In this case, instructors should remain available (via the virtual class session, by email, and/or by phone) to aid students taking the test.

At the beginning of the class session, the instructor will review the day’s agenda, including the timing of the test and general points concerning its administration. The instructor will review the test procedures and restrictions with participants prior to taking the test.

The exams are open-book and any notes or handout materials may be used as a reference. A period of one hour is available for the test, but it will not be strictly timed. The instructor is responsible for ensuring a quiet test environment, which includes no use of cell phones and no unnecessary conversation of any kind while the test is underway.

When finished, the TEST BOOKLET and the COMPETED ANSWER SHEET should be turned in to the instructor or the site coordinator, as appropriate.

Evaluation

At the end of class, all participants will complete a *Class Evaluation* form after taking the test. The evaluation is designed to collect information about the class content, instruction, and future interest in topics. The information is used by NEEC to make improvements to the curriculum, to share with instructors, and to plan future classes offered in the BOC program.

Suggested Activities

The key objective of this class is to demonstrate how to organize and implement energy accounting practices at the participant's facility. While many operators may find this activity more challenging than O&M procedures on building equipment, we want to impress on them the importance of "you can't manage what you don't measure." Understanding utility rate structures, developing an energy use index, and benchmarking that index against like facilities is a crucial step in developing an energy conservation strategy for the facility. This course involves more math and manipulation of data than other BOC classes. Instructors must be sensitive to a variety of mathematical skill levels present in the classroom. Use local examples of utility rates and actual building data with which you are familiar to supplement the curriculum. The exercises are designed to be a blend of practice on the computations required to do energy accounting as well as opportunity for interactive discussion on what the data suggests relative to efficiency opportunities. Instructors should encourage this dialogue both within work groups and in general classroom discussion.

BOC 1002 has five exercises designed to give participants an opportunity to practice calculations and prepare for the test, successfully complete the project, and meet learning objectives. Refer to the Participant Handbook Table of Contents for the exercises by page number. These exercises are extremely important to help each participant successfully pass the tests and complete the project. Instructors should familiarize themselves with these exercises and are encouraged to improve upon them or add to them, as time will permit. There are energy accounting exercise forms, a fuel cost comparison form, and a weather adjustment example in the Appendix. Note that Exercise #5 uses building data which is provided in the Appendix as well.

Exercise #1: Energy Efficiency at Your Facility

Exercise #2: Utility Billing and Rate Structures

Exercise #3: Energy Accounting

Exercise #4: Calculating Site EUI

Exercise #5: Analyzing Building Data

Be sure that the participants are comfortable with basic problem set-up and unit analysis. Emphasize a step-by-step approach to setting up problems. When working the exercises with the class, call on participants to provide calculations and data to finish the problem.

BOC 1002 has a project assignment which participants must complete at their facility. The project for BOC 1002 is a series of energy accounting activities and gathering of billing information.

Materials	Suggested Activities	Time
<p>General Prep: Review project assignment from the previous class</p> <p>Slides 3-6: Agenda Project Debrief Objectives</p> <p>Slide: 16 Handbook: Exercise 1</p>	<p>A. Introductions/Project Debrief - Instructor Led Discussion</p> <p>B. Class Agenda Provide an overview of the day and a brief explanation of the topics the class will cover and why.</p> <p>C. Project Debrief</p> <ol style="list-style-type: none"> 1. Lead a brief discussion on the project from the previous class. This slide lists some general, open-ended questions. Initiate the project discussion by asking participants a few open-ended and specific questions about the project sufficient to generate a discussion. Some questions specific to the assignment from the first class might be: <ul style="list-style-type: none"> • How many of you had a quick reference map of building systems? • How many used plan sheets (blueprints) and how many did a hand drawing? • Did you find out anything new about your building doing this exercise? • Does your organization already have clearly labeled mechanical and building system plans? Are they easily accessible to maintenance staff and managers? • How familiar are you with mechanical, electric, plumbing and architectural drawings and the symbols and notations they use? 2. If applicable, reference any project grading docs and walk participants through assigned calculations and answers. The Class Exercise section, below, provides additional support information for helping you effectively engage participants and implement discussion on key topics. <p>D. Learning Objectives Provide an explanation of the learning objectives, which are broken into two categories: Energy Program and Energy Accounting.</p> <p>E. Exercise 1, Energy Consumption - Small Group Discussion.</p> <p>F. Queue participants to break into small groups and refer them to the exercise instructions in the handbook.</p>	<p>10 min</p> <p>10 min</p>

Materials	Suggested Activities	Time
<p>Slide: 39 Handbook: Exercise 2 Appendix B</p> <p>Electronic Docs: B_1SummerBill.pdf B_2WinterBill.pdf B_3CombinedBill.pdf</p>	<p>G. Groups should spend 5 minutes discussing the following three questions as they relate to energy consumption and energy efficiency in their facilities:</p> <ol style="list-style-type: none"> 1. What type(s) of energy is consumed at your facility? 2. What types of energy efficiency projects have been completed? 3. What are the challenges to achieving energy efficiency at your facility? <p>H. Whole class discussion - Ask a spokesperson from each group to summarize their answers and respond to questions.</p> <p>I. Exercise 2, Utility Billing - Practice.</p> <p>J. Refer Participants to the summer, winter, and summer/winter combined utility bill examples in Appendix B. On your laptop open the electronic Summer, Winter, and Combined Energy Bills (PDF docs) supplied with your course documents or use your own examples (could be electric, gas, water, or waste).</p> <ol style="list-style-type: none"> 1. Demonstrate how to identify the type of rate structure for one of the bills. 2. Discuss whether the structure encourages or discourages energy conservation or demand. <p>K. Refer participants to the exercise instructions in their handbook.</p> <p>L. Participants will use the other utility bills provided in Appendix B to answer the following questions. <i>Alternatively, you can provide local schedules and meter data as a handout.</i></p> <ol style="list-style-type: none"> 1. What type of rate structure is the utility using? 2. Discuss how this rate structure encourages or discourages either energy or demand conservation and why? <p>M. Ask participants to volunteer their answers and discuss responses.</p> <p>N. Review key Energy Fundamentals and Billing/Rate Structures, answer questions, and segue into Energy Accounting.</p> <p>O. Portfolio Manager - Presentation/Demo.</p> <p>P. Open PM online (recommended) or the PM Demo .pptx file for 1002 and refer participants to the PM Quickstart guide in appendix G.</p> <p>Q. Explain to participants that they will be using PM to complete their next project assignment.</p> <p>R. Provide an overview of PM tool and answer any questions.</p>	<p>15 min</p> <p>10 min</p>
<p>Slides: 53-56 Handbook: Benchmarking (pp. 59-63) Appendix G</p> <p>Slide: 58 Handbook: Exercise 3</p>	<p>S. Exercise 3, Energy Accounting - Practice.</p> <p>T. Refer participants to the exercise instructions in the handbook.</p>	<p>10 min</p>

Materials	Suggested Activities	Time
<p>Slides 59-61 Handbook: Exercise 4 Appendix C</p>	<p>U. Use the following information to calculate and determine the energy performance of a building:</p> <p>V. Building Type: Office</p> <p>W. Total Area: 28,500 ft²</p> <p>X. Electric Consumption: 523,700 kWh/year</p> <p>Y. Natural Gas Consumption: 5,500 Therms</p> <p>Z. Calculate the Energy Use Index in kWh/ft²/year: ____</p> <p>AA. Btu/ft²/year: ____</p> <p>BB. Is this building performing well and why or why not? <i>(We do not know due to lack of Geographic Location and Benchmark Comparison Chart. To determine the building performance, the EUI needs to be determined and compared to a benchmark chart.)</i></p> <p>CC. Review answers, provide feedback, and respond to questions</p> <p>DD. Review key Energy Accounting concepts, answer questions, and segue into the Building Data Analysis.</p> <p>EE. Exercise 4, Energy Use Index - Practice.</p> <p>FF. Refer participants to the exercise instructions in the handbook.</p> <p>GG. Participants should use the EUIs calculated in Exercise #3, and compare them to City and National Site EUI Averages in appendix C. Then answer the following questions.</p> <p>HH. How does the building perform when compared to the EUI of comparable buildings?</p> <p>II. Is this building operating efficiently?</p> <p>JJ. Review answers, provide feedback, and respond to questions</p> <p>KK. Share/demonstrate resources for obtaining regional EUI data specific to your location, such as the DOE CBECS advanced tables or other local databases.</p> <p>LL. Review key Data Analysis and Benchmarking concepts, answers questions, and segue into the Trend Analysis.</p> <p>MM. Exercise 5, Analyzing Building Data - Practice</p> <p>NN. Refer participants to the exercise instructions in the handbook and the three years of building data in the E appendix.</p>	<p>10 min</p> <p>15 min</p> <p>10 min</p>
<p>Slide 75 Handbook: Exercise 5 Appendix E</p>	<p>OO. Participants should break into small groups and determine how this building is performing by answering the following questions.</p> <ul style="list-style-type: none"> • List the steps you would use to determine how this building is operating. • Determine what areas should be addressed in greater detail and how you might do this. 	

Materials	Suggested Activities	Time
<p>Slide 77</p>	<p>PP. Review and ask a spokesperson from each group to volunteer answers; provide feedback and respond to questions.</p> <p>QQ. Project Assignment - Large Group.</p> <p>RR. Refer participants to the Project Workbook.</p> <p>SS. Review the instructions for Energy Start Portfolio Manager including alternative methods using sample data and paper/pencil calculations.</p> <p>TT. Point out that the project reflects the three-part energy accounting exercise done earlier in the day (data organization, EUI calculations, and annual energy usage graph) using the utility bills for their facility.</p> <p>UU. Answer questions. If there is time, allow students to start working on the project assignment in class and provide assistance as needed.</p> <p>VV. Segue into the test and class evaluations.</p>	

BOC 1002 Instructor's Checklist (for in-person classes)

- Number of people expected: _____
- Classroom set-up confirmed?
- Instructor(s) bio
- Participant IDs (if applicable)
- Pens and sign-in sheets
- Evaluation forms
- Participant handbooks
- Test booklets
- Test answer sheets
- Extension cord
- Props:
 - Dataloggers, other monitoring/diagnostic tools (optional)
 - Local utility rate schedule and sample bills
 - Sample trend data for EUI's, electricity and gas usage graphs to demonstrate data analysis

**Be sure to review with participants all of the material covered on the test.
Forward all test booklets and answer sheets to NEEC within two weeks of the class.**

**Collect these evaluations at the end of the class and return the completed
evaluations to the training coordinator.**