

TEST BOOKLET
BOC 2001-A – Building Scoping for Operational Improvement
Edition 2.00

TEST INSTRUCTIONS

The BOC 2001 test consists of 20 multiple choice questions. A period of 1 hour is available for the test, but it will not be strictly timed. This is an open book test. You may use any notes or handout materials of your own. Mark all answers only on the ANSWER SHEET. Make no marks in the TEST BOOKLET.

Select only one answer by circling the corresponding letter on the ANSWER SHEET. Where it appears that two answers may be correct, choose the one better answer. There are no questions that require the circling of more than one choice.

Below are some sample questions:

Example #1: Electric motors typically have an efficiency of approximately.

- A. 95% to 99%
- B. 78% to 93%
- C. 50% to 75%
- D. 40% to 48%

Standard motors are approximately 78% to 93% efficient, depending on size. High efficiency electric motors can have very high efficiencies, but even these special motors exceed 95% in only very large sizes. While there are specialized motors that can exceed 95%, this is not typical. The answer should be marked by drawing a circle around letter “B” on the ANSWER SHEET.

Example #2: In the past, asbestos fibers were commonly used in numerous building materials, including which of the following:

- A. Pipe Insulation
- B. Furnishings
- C. Window coverings, such as drapes
- D. All of the above.

While all three could have contained asbestos, it was commonly used in only one of these--pipe insulation. The answer should be marked by drawing a circle around letter “A” on the ANSWER SHEET.

Note: In the preceding example question, only pipe insulation was included as a material that commonly contained asbestos. That does not mean that only pipe insulation contained asbestos. It should be understood that the items covered in this test have been chosen to sample the operator's knowledge.

**BEGINNING OF TEST
EDITION 2.00**

Mark all answers on *only* the ANSWER SHEET. Make *no* marks in the TEST BOOKLET.

1. **High performance buildings have key performance attributes as defined by the National Institute for Building Sciences. What are they?**
 - A. Energy efficiency, waste reduction, water conservation, and indoor environmental quality
 - B. Environmental management, occupant satisfaction, energy efficiency and durability of materials
 - C. Occupant productivity, energy efficiency, life cycle performance, and durability of materials
 - D. Resource conservation, energy efficiency, life cycle costing, and environmentally sound materials

2. **What best describes the role building operators can take in high performance buildings?**
 - A. Conducting a building scoping once a year and submitting a report to management.
 - B. Benchmarking the building in ENERGY STAR Portfolio Manager and keeping the account up to date.
 - C. Monitoring occupancy schedules to ensure equipment is operating in accordance with occupied hours.
 - D. Maintaining the building's high-performance attributes over time by monitoring key performance indicators and optimizing equipment operation to meet performance standards.

3. **Which of the following standards would a building operator reference for guidance in verifying and certifying the energy performance of an existing building?**
 - A. ASHRAE Standard 189.1
 - B. ENERGY Star Certification
 - C. ASHRAE Standard 55
 - D. International Green Conservation Code

4. **Most buildings can cut total energy consumption by what amount while fully maintaining or improving both comfort and function?**
 - A. 30% or more
 - B. 10-20%
 - C. 5-10%
 - D. 5-20%

5. **What is the minimum ENERGY STAR score a building must meet in order to earn ENERGY STAR certification?**
 - A. 50
 - B. 67
 - C. 75
 - D. 90

6. **What is the primary desired outcome of a building energy scoping?**
- A. To collect all of the data necessary to complete a building energy tune-up
 - B. Repair deficiencies found during the scoping walkthrough including replacing dirty filters, broken or cracked belts, etc.
 - C. A scope of work for a building energy tune-up
 - D. Identify and implement operational changes that reduce building energy costs in gas and electricity
7. **A detailed, systematic diagnosis of problems that delivers quick fixes while building a list of problems, solutions, potential benefits and cost is called:**
- A. Scoping
 - B. Energy Tune-up
 - C. Level 1 Audit
 - D. Walkthrough
8. **What is first element in a building energy scoping action plan?**
- A. Gather building information and energy use data
 - B. Walk through the building during occupied hours
 - C. Set up trend logs
 - D. Walk through the building at night
9. **Which of the following is a reason to conduct a building scoping?**
- A. Poor indoor environmental quality
 - B. Comfort complaints
 - C. Increased utility bills
 - D. All of the above
10. **Building operation and maintenance tasks are different but equally important. What best describes the difference?**
- A. Maintenance tasks focus on HVAC equipment while operation tasks cover building control systems.
 - B. Maintenance tasks involve organization of building systems whereas operation tasks involve primarily analysis.
 - C. Operation tasks are conducted only after maintenance tasks are complete and up to date.
 - D. Maintenance tasks ensure that equipment and systems have the capacity to run effectively, while operational tasks ensure that equipment and systems perform optimally.
11. **What is a building EUI?**
- A. Total annual electric use per square foot of conditioned space
 - B. Total annual energy use per square foot of conditioned space
 - C. A comparison of a building's energy performance relative to buildings within a 100-mile radius
 - D. A building energy score of 0-100 created by Energy Star

12. **An EUI can be used by the building operator and building management to do what?**
- A. Establish an energy consumption baseline for the building, set a target goal for the building, and estimate potential annual energy savings
 - B. Establish an energy consumption baseline for the building and set a target date for replacing older inefficient energy-using equipment.
 - C. Set a target goal for improving energy performance of the building and provide a cost estimate for potential energy efficiency projects.
 - D. Estimate potential annual energy savings and set a target date for replacing older inefficient equipment and completing an energy tune up.
13. **There is basic information the building operator must obtain in order to benchmark their building's annual energy performance in ENERGY STAR Portfolio Manager. What is NOT required?**
- A. 12 months of utility consumption data
 - B. Square footage and location of the building
 - C. Year constructed
 - D. Temperature settings during occupied hours
14. **The Metropolis office tower uses natural gas for domestic hot water and all heating. The lowest monthly usage, 500 therms is in the month of August. The total annual use is 12,000 therms. What is a reasonable estimate of the annual natural gas consumption for heating?**
- A. Cannot be determined.
 - B. 6,000 therms
 - C. 11,500 therms
 - D. 3,000 therms
15. **The base load for natural gas would be typically found in what season?**
- A. Fall
 - B. Winter
 - C. Spring
 - D. Summer
16. **A high Electric Load Factor (ELF) compared to the Occupancy Factor (OF) indicates what?**
- A. There may be excessive electricity use after occupied hours.
 - B. The building has a low base load.
 - C. The building is only partially occupied.
 - D. The billed demand charge is too high.
17. **What is NOT a requirement for BOC Certification?**
- A. Completion of Level I or II training, or an equivalent training.
 - B. A passing score on the tests.
 - C. Membership in a professional association.
 - D. Meeting the eligibility requirements for BOC certification.

Q's 18-20. Read the description below and answer the questions.

The ACME Building is an office building located in a metropolitan area. The facility manager is concerned that this building has higher energy bills than similar buildings that the company owns, even though the equipment is relatively newer and the building is well maintained by in-house staff.

Constructed in 1985, ACME Office Building is a 10-story office building consisting of approximately 100,000 square feet of office space. Occupancy is 7:30am to 6:00pm Monday through Friday with some Saturday usage. The HVAC system consists of multiple variable air volume (VAV) rooftop air handlers. Fan powered VAV boxes with electric reheat serve the perimeter zones of the building and standard VAV boxes without reheat serve the core. Cooling is provided by two air-cooled chillers. One of the air handlers is dedicated to the computer room. Main coil heating is provided by natural gas fired hot water boilers. HVAC controls are full direct digital control (DDC). The system is reasonably flexible, but is somewhat underutilized. Current controls provide supply air reset, economizer control, start/stop of the water chillers, boilers, fans, and space temperatures, but it does not provide monitoring or control of lighting or the VAV boxes. Although occupancy is typical for an office, the HVAC system operates extra hours to maintain space temperatures for cleaning crews. Additionally, the boilers and chillers are used year-round, due to occupant comfort issues.

- 18. You do a walkthrough of the building on two Sundays during the month in the early afternoon and find that the office temperature is at occupied mode levels. What is one step you would take to investigate?**
- A. Turn off the boiler.
 - B. Verify the room temperature and occupancy schedule, and check the programmed setting.
 - C. Check for open windows and doors.
 - D. Adjust control settings for the economizer.
- 19. On the Sunday walkthrough, you also find that 30% of the office lighting is on and the space is unoccupied. What is one step you would take to investigate?**
- A. Check for burned out bulbs.
 - B. Install lighting controls.
 - C. Install vacancy sensors.
 - D. Verify the light switches are functional and confirm the occupancy schedule on Sundays.
- 20. What conditions in the building could cause it to have higher energy bills?**
- A. The computer room requires a dedicated air handler operating 24/7.
 - B. Lack of central lighting controls.
 - C. The boilers and chillers are enabled year round to satisfy comfort issues.
 - D. All of the above.

END OF TEST