TEST BOOKLET
BOC 1006 – Common Opportunities for Operational Improvement
Edition 2.00

TEST INSTRUCTIONS

The BOC test consists of 20 multiple choice questions. A period of one 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
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Mark all answers on *only* the ANSWER SHEET. Make *no* marks in the TEST BOOKLET.

1. What best defines a low-cost operational improvement?

A. Replacing older, inefficient equipment in the building such as HVAC and lighting systems.
B. Adjustments to the operation of building systems and equipment to improve performance which do not require a large capital investment.
C. Using a data logger to track the operating hours of a packaged roof top unit.
D. Documenting ventilation levels in all rooms to ensure code compliance.

2. Which of the following are common operational problems in buildings?

A. HVAC set points
B. Sensor calibration
C. HVAC schedules
D. All of the above.

3. A procedure to ensure effective scheduling of equipment operation involves which of the following activities?
A. Checking occupant schedules and space requirements.
B. Re-evaluating equipment operating schedules twice a year or after a major tenant change.
C. Adjusting equipment operation schedules based on the current operation needs.
D. All of the above**.**

4. Demand controlled ventilation saves energy by _____

A. adjusting the amount of outside air based upon number of occupants in space by measuring CO_2 levels.
B. operating chillers only during peak demand times.
C. increasing supply air based on decreased CO_2 levels.
D. allowing space occupants to change room setpoints

5. In a large, multi-story office complex in Las Vegas, the economizers are fully open at 2 p.m. on a hot summer day in late August. This may be caused by a/an _____

A. VAV box that has unnecessarily gone into reheat mode.
B. improper outdoor air temperature sensor location, failed sensor, or jammed damper blades.
C. controls contractor that has improperly set a temperature deadband of 2 °F.
D. allowing occupants to control space temperature setpoints.

6. If the control strategy for a supply air temperature is not optimized, the result may be_____.

A. increased energy consumption due to an increased need for simultaneous heating and cooling.

B. increased noise due to increased usage.
C. short circuiting of return air into the space.
D. a decrease in fan use leading to energy savings.

7. Common causes of poor outside air control include _____.

A. damper leakage
B. improper location of a CO_2 sensor
C. temperature sensors that are out of calibration
D. All of the above.

8. To minimize the occurrence of simultaneous heating and cooling, building operators should _____.

A. decrease air flows to rogue zones.
B. evaluate and implement supply air reset schemes based in industry standards.
C. disable any system controls and place all HVAC equipment in manual mode.
D. force OSA damper to minimum position and increase mechanical cooling.

9. Sensors are the interface between controls and the system. An outdoor air temperature sensor that registers a temperature that is 10 degrees lower than actual can be attributed to _____.

A. improper installation.
B. improper application.
C. out of calibration/failure.
D. All of the above.

10. A critical control sensor is any sensor in a large system that is used as an input into a control sequence. Which of the following is typically NOT considered a critical control sensor?

A. Outside air temperature
B. Supply air temperature
C. Filter pressure drop
D. Chilled water temperature

11. Which of the following is a common cause of scheduling problems in buildings and facilities?

A. Improperly oriented sensors for lighting controls
B. Unrestored manual overrides
C. Simultaneous operation of a boiler and chiller
D. All of the above.

12. An office building with a higher EUI (energy use intensity) than the average office building is more likely to have _____ opportunities for operational improvements.

A. fewer
B. more
C. the same
D. unknown

13. Optimum start and stop programming for HVAC scheduling _____.

A. varies the start of heating/cooling system based on difference between outdoor air and space temperatures.
B. requires that a VFD be installed on all HVAC fans to modulate speed based on space temperature.
C. throttles the valves in Variable Air Volume terminal units to provide the minimum amount of ventilation air required by code.
D. locks out the boiler system when the outdoor air is above 80 ˚F in an effort to reduce simultaneous heating and cooling.

14. A properly functioning outside air economizer can save energy on cooling costs by:

A. Closing outside air dampers when the building is occupied.
B. Maintaining a fixed ventilation rate required by the energy code.
C. Drawing cool, dry outside air into the building when it is cooler in temperature than the return air.
D. Drawing warm, dry outside air into the building for additional conditioning.

15. A data logger is an electronic device containing sensors that record data. Loggers are ideal for:

A. Identifying anomalies, unnecessary energy use.
B. Identifying sources of problems (i.e., stuck dampers, faulty sensors).
C. Determining EUIs for end-use equipment.
D. All of the above.

16. Why is it important to be able to collect data on equipment operations and environmental conditions?

A. You can't manage what you don't measure.
B. It is not important to collect data on environmental conditions, only on equipment operations.
C. It is required by law to maintain three years of facility data for major HVAC equipment.
D. None of the above.

17. What is one advantage of using data loggers for collecting data over using the BAS's data collection capabilities?

A. Data loggers can transmit the recorded data directly to the BAS system.
B. Data loggers can download data directly from the BAS front-end computer.
C. Data loggers are portable, standalone devices that can be used to collect data almost anywhere, independently of the BAS system.
D. Data loggers utilize superior technology to record data more accurately than BASs.

18. What would be the best data logger to use for determining motor run-times?

A. One that measures AC/DC voltage.
B. One that measures on/off status.
C. One that measures volts/amps.
D. None of the above.

19. What would be the best application of data loggers for investigating your facility's electric demand for possible peak demand reduction?

A. Record light levels throughout the facility to view lighting schedules and demand.
B. Record motor amps on AHUs to view fluctuations in power demand.
C. Record amp levels on the electric main to view fluctuations in power demand.
D. None of the above.

20. What safety precautions should be taken when working with data loggers in conjunction with Split-core AC Current Transformer or AC Amperage to DC Voltage Transducer?

A. Turn off all power supplying equipment before working on or inside the equipment.
B. Don't depend on the logger for voltage indication.
C. Equipment must only be installed and serviced by qualified electrical personnel.
D. All of the above.

END OF TEST

Please return the Test Booklet and your Answer Sheet to the administrator.