

TEST BOOKLET
BOC 1011 – Energy Efficient Ventilation Strategies and
Energy Savings through Energy Recovery

Edition 2.0

TEST INSTRUCTIONS

The BOC 1011 test consist 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 examination have been chosen to sample the operator's knowledge.

BEGINNING OF TEST

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

1. **Do displacement ventilation systems require the installation of a raised access floor (select the best answer)?**
 - A. Yes
 - B. Yes, except when displacement diffusers are placed at the ceiling level
 - C. No, never
 - D. No, but “low-throw” floor diffusers can be installed in a raised floor that perform similar to a displacement ventilation system

2. **Which of the following best describes the temperature and pollutant distribution in a displacement ventilation system?**
 - A. Cool and polluted air in the lower zone, warm and polluted air in the upper zone
 - B. Uniform temperature and pollutant concentration from floor to ceiling
 - C. Cool and fresh air in the lower zone, warm and polluted air in the upper zone
 - D. Warm and polluted air in the lower zone, cool and fresh air in the upper zone

3. **What is the normal range of supply temperature and discharge velocity for displacement ventilation diffusers?**
 - A. 55-57°F, \leq 50 fpm
 - B. 55-57°F, \geq 200 fpm
 - C. 61-68°F, \leq 50 fpm
 - D. 61-68°F, \geq 200 fpm

4. **In a more severe heating (cold weather) climate, how should the displacement ventilation system be operated during heating conditions?**
 - A. A separate heating system is required in more severe heating climates
 - B. Use moderate heating supply air temperatures with higher airflow rates
 - C. Control room air stratification to be about 3°F
 - D. Control room air stratification to be greater than 5°F

5. **Which of the following functions requires, on average, the most airflow?**
 - A. Space cooling
 - B. Structural cooling
 - C. Health
 - D. Bodily cooling

6. **Which of the following is NOT typically controlled for in automated windows in a mixed-mode system?**
 - A. Ventilation requirements
 - B. Daytime comfort
 - C. Nighttime cooling
 - D. Indoor acoustics

7. **Surveys are showing higher satisfaction with which aspect of the indoor environment, in mixed-mode buildings?**
- A. General satisfaction
 - B. Thermal comfort
 - C. Air quality
 - D. All of the above
8. **Which statement best describes what surveys are finding about what occupants think about air movement in buildings?**
- A. Many more people want more air movement than less, in both seasons
 - B. There are frequent complaints about excessive air movement (drafts) in buildings
 - C. People only like air movement when they are feeling really hot
 - D. People associate air movement with a broken air distribution system
9. **What statement about the new ASHRAE Std. 55 (adaptive thermal comfort standard) is NOT true?**
- A. The standard is based on extensive field studies done in real buildings around the world.
 - B. Research considered forms of behavioral, physiological and psychological adaptation.
 - C. The adaptive comfort standard universally applies to all climates and building types.
 - D. The adaptive standard was created because people preferred a wider range of conditions in naturally ventilated buildings.
10. **For the same cooling load and airflow rate, how would the amount of stratification (vertical temperature difference) in the space provided by a UFAD system compare to the stratification provided by a DV system?**
- A. UFAD stratification would be greater
 - B. UFAD stratification would be less
 - C. They would be the same, since they both provide well-mixed conditions
 - D. They both provide the same amount of stratification
11. **Which of these items is an opportunity for energy recovery in a typical building?**
- A. Boiler flue exhaust
 - B. Air handler supply air
 - C. Overhead lighting
 - D. Baseboard radiators
12. **Which process best describes how energy is wasted when air is exhausted from a building?**
- A. People add energy to the air and then this air is exhausted directly to the outside.
 - B. Exhaust is air that was once heated or cooled by the building HVAC system. The energy that went into heating or cooling this air is wasted when exhausted.
 - C. Exhaust air can be re-circulated back into the building to be reused. This can reduce the energy used by the building's HVAC system. If it's exhausted it can't be reused.
 - D. None of the above

13. What are the main categories of energy recovery systems?
- A. Indirect, direct
 - B. Air-to-air, air-to-water, and water-to-water
 - C. Primary, secondary, and primary/secondary
 - D. Continuous, seasonal
14. Select the statement that is NOT true concerning operations and maintenance of energy recover systems.
- A. A dirty coil reduces pressure across the coil and reduces heat transfer between fluids.
 - B. Chemicals need to be added to prevent scale in air-to-water and water-to-water systems.
 - C. Energy recovery systems need to be clean to produce optimal energy savings.
 - D. Energy recovery devices should be included in scheduled preventative maintenance.
15. A sensible heat wheel or permeable medium heat exchanger would not be a good choice for energy recovery in a laboratory because (select the best answer):
- A. They are fragile and can tear easily.
 - B. They require more maintenance and have a higher operating cost than other types of energy recovery.
 - C. They can transfer contaminants between the exhaust and outside air streams.
 - D. They both can allow latent heat transfer between exhaust air and outside air.
16. What should be taken into account when writing a control sequence for an energy recovery system?
- A. Its application
 - B. Type of system used
 - C. Climate zone
 - D. All of the above.
17. Why do electric and gas utilities support the use of energy recovery systems?
- A. The utilities can charge a higher energy rate if energy recovery systems are used.
 - B. Utilities have partnerships with the energy recovery manufacturers.
 - C. Use of energy recovery systems shifts the load to the nighttime, when it's more efficient for the utilities to provide electricity and gas
 - D. Use of energy recovery systems helps support the utilities' energy savings goals.
18. Which statement about energy performance of heat recovery systems is NOT true?
- A. Peak energy demand and possibly equipment sizes can be reduced.
 - B. Whole building energy consumption can be lowered.
 - C. The number of utility transmission lines can be reduced.
 - D. Energy recovery can be most effective when outside air temperatures are mild.

- 19. How does energy recovery help building owners in meeting their energy management goals?**
- A. The energy usage related to energy recovery systems is easier to monitor and record than conventional systems.
 - B. Energy recovery systems have complex controls associated with them that require a building automation system (BAS).
 - C. Energy recovery reduces the overall energy use of a facility.
 - D. Owners pay lower utility rates if they use energy recovery systems.
- 20. Which of the following statements is true related to state and local energy efficiency requirements for energy recovery?**
- A. Energy codes require owners to upgrade their existing systems to include energy recovery.
 - B. Some energy codes require exhaust air energy recovery where fan systems exceed 5,000 cfm.
 - C. Energy codes do not require energy recovery if owners can show that they cost too much to install.
 - D. For new construction, energy codes only require energy recovery for large buildings.

END OF TEST