

# NRGY 235: Building Energy Efficiency

## Week 6 Quiz



1. What kind of boiler operators must service the equipment regularly by adding chemical additives to drain water and remove sediment?
  - a) Hydronic
  - b) Steam
  - c) Fire-Tube
  - d) Heat Pump
2. Which of the following statements about HVAC fans is least true?
  - a) For a given fan, as the differential pressure between the fan inlet and outlet increases, the fan can move more airflow (CFM) than it can when the differential pressure is lower
  - b) The greatest differential pressure between fan inlet and fan outlet that a fan can generate is near zero flow (zero CFM)
  - c) A fan for an HVAC application should be carefully selected so that the differential pressure required to move air at the desired flow rate (operating point) is near the fan's Best Efficiency Point (BEP), which is the region of highest fan efficiency
  - d) The total system efficiency of a fan and motor assembly depends on the efficiency of the fan at moving air, as well as the efficiency of the motor
3. A blower door test measures air changes per hour (ACH) under specific non-natural conditions, and then one can correlate the results of the test to an ACH<sub>n</sub> under natural conditions. What is the pressure differential required to be achieved between interior and exterior when conducting a blower door test to meet Montana's current residential energy code?
  - a) 50 psig
  - b) 4 Pascals
  - c) 4 psig
  - d) 50 Pascals
4. A blower door test measures air changes per hour (ACH<sub>50</sub>) under specific non-natural conditions, and then one can correlate the results of the test to an ACH<sub>n</sub> under natural conditions. A

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- blower door test is conducted at 50 Pascals differential pressure on a house with approximate volume of 29,565 cubic feet, and the CFM50 is measured at 1,971 CFM. This results in  $ACH_{50} = 4 = CFM_{50} * 60 / Volume = 1,971 \text{ CFM} * 60 \text{ min/hr} / 29,565 \text{ ft}^3$ . What is the expected approximate number of ACH under natural conditions (ACH<sub>n</sub>) if the LBL n-factor is 17?
- a) 0.24 ACH<sub>n</sub>
  - b) 4.25 ACH<sub>n</sub>
  - c) 1.33 ACH<sub>n</sub>
  - d) 4 ACH<sub>n</sub>
5. What is Energy Recovery Ventilator (ERV)?
- a) A piece of HVAC equipment that absorbs solar heat and transfers that heat to ventilation air that is delivered into the building
  - b) A piece of HVAC equipment that can transfer heat from kitchen exhaust air to pre-heat make-up water for more efficient domestic hot water generation
  - c) An important part of a ground-source heat pumps system
  - d) A piece of HVAC equipment that transfers sensible and latent heat between the incoming ventilation air and the outgoing exhaust air
6. In a closed loop hydronic system, when the water is heated, the liquid undergoes what change?
- a) The liquid turns to vapor
  - b) The liquid flows more rapidly through the pipes
  - c) The liquid volume increases
  - d) The system pressure decreases
7. Why is an expansion tank a necessary component of a Domestic Hot Water (DHW) plumbing or HVAC hydronic system?
- a) It is not necessary; it is only a fail-safe protection to prevent pipes from bursting if a section of the pipe freezes
  - b) It is only necessary on well water systems to handle surges in pressure when the pump turns on
  - c) When the water in the system changes temperature, it will

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- expand or contract in volume, which could cause harmful changes in pressure without an expansion tank
- d) It is necessary to absorb the pressure fluctuations that can result from water hammer when valves are closed abruptly
8. A “system curve” for a hydronic system or air flow system (ex/furnace and ducts), describes what important relationship?
- Pressure vs. Flow
  - Temperature vs. Flow
  - Temperature vs. Heat Capacity
  - Density vs. Temperature
9. Choose the option that most correctly completes the sentence:  
As the flow rate in a duct or pipe increases, (blank).
- ...the friction between the fluid and the duct/pipe walls results in a significant increase in the temperature of the fluid.
  - ...the pressure in the pipe or duct could increase enough to cause a rupture or damage to the pipe/duct if not controlled.
  - ...the flow rate will eventually reach a maximum that cannot be exceeded for the given size of pipe or duct.
  - ...the difference between static pressures measured at two different points in the duct or pipe (“pressure drop”) will also increase, and thus the capacity of the fan or pump must be sufficient to meet the increase in load on the fan/pump to maintain the increased flow rate.
10. In a system of ducts with a fan to move air through the ducts, which of the following is NOT a good description of the “operating point”?
- The operating point describes the volumetric flow rate that the fan is able to achieve at the differential pressure that results through the system from fan outlet to fan inlet at that flow rate
  - The operating point is the highest temperature at which the system can operate safely
  - The operating point associated with the maximum flow rate the fan can generate occurs at the lowest possible

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- differential pressure of the system
- d) The operating point is the intersection of the system curve and the fan curve under operating conditions