
Q696 - Engineering Safety & Environmental Protection

1. A three inch overboard discharge line, located six feet below the waterline, has ruptured and separated from the hull. What would be the minimum number of strokes per minute required from a 8" x 12" x 12" duplex double acting reciprocating bilge pump, operating at 82% efficiency, to keep the bilge level from continuing to rise

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Flow of Gallons of Water Per Minute (gpm)
Through Various Hole Diameters (in)
at Various Heads (ft) of Water

	2 ft	4 ft	6 ft	8 ft	10 ft	12 ft	14 ft	16 ft
1 in	28 gpm	40 gpm	49 gpm	56 gpm	63 gpm	69 gpm	74 gpm	79 gpm
2 in	111 gpm	157 gpm	192 gpm	222 gpm	248 gpm	272 gpm	294 gpm	314 gpm
3 in	250 gpm	354 gpm	433 gpm	500 gpm	559 gpm	612 gpm	661 gpm	707 gpm
4 in	445 gpm	629 gpm	770 gpm	889 gpm	994 gpm	1089 gpm	1176 gpm	1257 gpm
5 in	695 gpm	982 gpm	1203 gpm	1389 gpm	1553 gpm	1701 gpm	1837 gpm	1964 gpm
6 in	1000 gpm	1414 gpm	1732 gpm	2000 gpm	2236 gpm	2449 gpm	2646 gpm	2828 gpm
7 in	1361 gpm	1925 gpm	2357 gpm	2722 gpm	3043 gpm	3333 gpm	3601 gpm	3849 gpm
8 in	1777 gpm	2514 gpm	3078 gpm	3555 gpm	3974 gpm	4354 gpm	4702 gpm	5027 gpm
9 in	2249 gpm	3181 gpm	3896 gpm	4499 gpm	5030 gpm	5510 gpm	5951 gpm	6362 gpm
10 in	2777 gpm	3927 gpm	4809 gpm	5553 gpm	6209 gpm	6802 gpm	7347 gpm	7854 gpm

- **45 strokes per minute**
- 56 strokes per minute
- 87 strokes per minute
- 98 strokes per minute

Note:
The pump must deliver approximately 45 strokes per minute to match the flooding rate and prevent the bilge from rising, based on a calculated inflow of 192 gallons per minute through a likely 2-inch rupture at a 6-foot head.

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2. In a compartment that has been completely flooded with water, the greatest pressure will be exerted _____.

- at a point that is one-third from the bottom of the bulkhead
- at the vertical center of the bulkhead
- **along the bottom of any bulkhead**
- along the top of the bulkhead

Note:
Hydrostatic pressure increases with depth; therefore, the greatest pressure in a flooded compartment is exerted along the bottom of any bulkhead.

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3. If a cargo tank has not been certified as gas free, _____.

- breathing apparatus would not be necessary in an emergency as you would only be in the tank a short time
- entry without a breathing apparatus may be made at the top of the tank since petroleum vapors are heavier than air
- **breathing apparatus should always be used**
- a man may work safely without breathing apparatus in cold weather, as vapors are less volatile

Note:
A cargo tank lacking gas-free certification presents a potentially toxic or oxygen-deficient atmosphere, mandating the use of breathing apparatus for entry.

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4. Which of the listed pumping arrangements will be hazardous when two similar centrifugal pumps are used to discharge a cargo of flammable liquid?

- Both pumps operating at the same speed and taking suction from a common line.
- **Each pump operating at a different pressure and discharging into a common line.**
- Each pump operating at a different speed and taking suction from a common line.
- Both pumps operating at the same speed and discharging into a common line.

Note:
Discharging pumps at different pressures into a common line can cause reverse flow, overheating, and mechanical damage, creating a significant hazard when handling flammable liquids.

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5. An LNG carrier has an approved type of gas detecting system to detect methane leaks in the _____.

- cargo handling rooms
- boiler burner supply piping
- barrier spaces
- **all of the above**

Note:
Methane detection systems are required on LNG carriers in all gas-hazard locations, including cargo handling rooms, boiler burner supply piping, and barrier spaces. Therefore, 'all of the above' is the correct answer.

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6. Before entering any space that has been sealed, its oxygen level should be tested. What level of oxygen in the space is equal to fresh air?

- 10.0%
- 15.8%
- **20.8%**
- 25.8%

Note:
Fresh air contains approximately 20.8% oxygen by volume; therefore, a space should have 20.8% oxygen to be considered equivalent to fresh air.

7. How does good housekeeping prevent fires on a vessel?

- Allowing better access in an emergency
- Improving personnel qualifications
- **Eliminating potential fuel sources**
- Eliminating trip hazards

Note:
Good housekeeping prevents fires by eliminating potential fuel sources, directly addressing the 'fuel' component of the fire triangle. Fire prevention focuses on controlling fuel and ignition sources, and good housekeeping practices like cleaning spills and properly storing combustibles reduce the risk of fire ignition or spread. Options related to emergency access, personnel qualifications, and trip hazards address safety and response, not primary fire prevention.

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8. As chief engineer of an oceangoing passenger vessel, it is important to know the effect of trim and stability of your ship in the event of damage to a compartment. To minimize the impact of flooding in the event of a grounding, what should be your ship's safe practice regarding watertight doors and hatches?

- **All watertight doors in subdivision bulkheads shall be kept closed during navigation except when necessarily opened for working of the vessel, and in such cases they shall always be ready to be immediately closed.**
- All watertight doors in subdivision bulkheads shall be kept closed when the vessel is anchored except when necessarily opened for working of the vessel, and in such cases they shall always be ready to be immediately closed.
- All watertight doors in subdivision bulkheads shall be kept open during navigation to facilitate crew movement and in all cases they shall always be ready to be immediately closed.
- All watertight doors in subdivision bulkheads shall be kept open during normal operation, except during adverse weather when they shall be closed.

Note:
Watertight doors in subdivision bulkheads must remain closed during navigation, except when briefly opened for necessary work, and must be immediately closable to maintain damage stability.

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9. A fire in the paint locker would probably be _____.

- Class A
- **Class B**
- Class C
- Class D

Note:
A fire in a paint locker involves flammable liquids like paints, thinners, and solvents, which defines a Class B fire.

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10. A galley grease fire would be classified as _____.

- Class A
- **Class B**
- Class C
- Class D

Note:
Grease fires involve flammable liquids like cooking oils, classifying them as Class B fires. Fire classes categorize fires based on fuel type: Class A for ordinary combustibles, Class B for flammable liquids and grease, Class C for energized electrical equipment, and Class D for combustible metals. The fire's classification is determined by the burning fuel, not the ignition source, and water should not be used on Class B fires.
