
Q516 - 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. A segregated ballast system is a system where _____.

- all ballast is processed through the oily water separator
- ballast is taken on and discharged through a separate main deck riser
- ballast and cargo tanks are separated by cofferdams
- **all ballast lines, tanks, and pumps are independent of those used for oil**

Note:
A segregated ballast system requires ballast tanks, lines, and pumps to be entirely independent of oil cargo or fuel systems to prevent contamination.

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3. In order to prevent the unnecessary release of hydrocarbons to atmosphere, when taking on departure ballast, one method used is to _____.

- **allow entering ballast to displace the inert gas to a tank where cargo is currently being discharged**
- manually open the pressure/vacuum device
- completely open the mast riser valve
- use blowers to purge the inert gas from tanks

Note:
Displacing inert gas with ballast into a tank undergoing discharge maintains a closed system, preventing hydrocarbon release to the atmosphere.

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4. A new ocean going ship of 2000 gross tons having an inoperative oily water separator may dispose of its bilge slops by _____.

- pumping them into a settling tank for separation before pumping the oily water residue overboard
- **holding its slops onboard until they can be discharged to a shore side reception facility**
- circulating them through the lube oil purifier to remove water and debris
- holding its slops onboard until they can be pumped into the city sewer system

Note:
With an inoperative oily water separator, bilge slops must be retained onboard and discharged to a shore reception facility.

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5. 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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6. In preparation for an extended yard period, you are reviewing your ship's plans. You notice several bulkheads are labeled A60. What is indicated by the label A60?

- **Fire division boundary, A Class, with insulation that will limit temperature rise to below the allowable level for 60 minutes.**
- Materials meeting construction yard specification A60.
- Damage stability bulkhead, A Class, with bulkhead strength that will limit flooding for 60 minutes.
- Fire division boundary, A Class, with insulation that will limit temperature rise to below the allowable level for 60 seconds.

Note:
The A60 designation indicates an A-class fire division boundary with insulation limiting temperature rise to below allowable levels for 60 minutes.

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7. During repairs it is necessary to replace an existing vessel bulkhead. Drawings indicate the bulkhead is A60. "A" indicates which of the following?

- "A" class bulkheads must not allow flame or smoke passage for 15 minutes when subjected to a fire test
- "A" class bulkheads must not allow flame or smoke passage for 30 minutes when subjected to a fire test
- **"A" class bulkheads must not allow flame or smoke passage for 60 minutes when subjected to a fire test**
- "A" class bulkheads must not allow flame or smoke passage for 120 minutes when subjected to a fire test

Note:
“A” in A60 bulkheads indicates that the bulkhead must prevent flame and smoke passage for 60 minutes during a fire test.

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8. During repairs it is necessary to replace an existing vessel bulkhead. Drawings indicate it is a "B" class bulkhead. This indicates which of the following?

- "B" class bulkheads must not allow flame or smoke passage for 15 minutes when subjected to a fire test.
- **"B" class bulkheads must not allow flame passage for 30 minutes when subjected to a fire test.**
- "B" class bulkheads must not allow flame passage for 60 minutes when subjected to a fire test.
- "B" class bulkheads must not allow flame passage for 120 minutes when subjected to a fire test.

Note:
A 'B' class bulkhead must prevent flame passage for 30 minutes during a fire test, as defined by SOLAS regulations.

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9. Pressure-vacuum relief valves on tank vessel cargo tanks should be kept in good working order to prevent _____.

- entry of burning substances
- escape of explosive vapors
- **damage to tank boundaries**
- oil spillage on deck

Note:
Pressure-vacuum relief valves prevent damage to tank boundaries by maintaining safe internal pressure and vacuum levels, protecting the tank structure from deformation or collapse.

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10. 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.
