

MSC Guidance for Review of Bilge and Ballast Systems

Procedure Number: E1-2

Revision Date: 1/3/00

References

- a. Except as provided by this procedure, all CFR references will be from Title 46-Shipping.
 - b. Except as provided below, all vessels need to meet CFR 56.50-50 (bilge and ballast piping) and 56.50-55 (bilge pumps).
 - c. Tankships (Subchapter D) do not need to meet the above requirements regarding bilge piping but instead must meet 32.52-5.
 - d. Small Passenger Vessels (Subchapter K) have exceptions listed in 119.510 and 119.520 for bilge systems and 116.1200(d) for ballast systems.
 - e. Offshore Supply Vessels (Subchapter L) have exceptions listed in 128.440 for bilge systems.
 - f. Small Passenger Vessels (Subchapter T) do not need to meet the above requirements but instead must meet 182.510 and 182.520 for bilge systems and 182.540 for ballast systems.
 - g. SOLAS Chapter II-1, Regulation 21 addresses bilge systems and Regulation II-1/9 addresses ballast systems on passenger vessels in relation to the OWS system.
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Disclaimer

These guidelines were developed by the Marine Safety Center as an aid in the preparation and review of vessel plans and submissions. They were developed to supplement existing guidance. They are not intended to substitute or replace laws, regulations, or other official Coast Guard policy documents. The responsibility to demonstrate compliance with all applicable laws and regulations still rests with the plan submitter. The Coast Guard and the U. S. Department of Homeland Security expressly disclaim liability resulting from the use of this document.

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General Review Guidance

Vessels Subject to Title 46 CFR Subchapter T

- ❑ Small Passenger Vessels (Subchapter T) must meet the requirements of 46 CFR 182.510 and 182.520 for bilge systems and 46 CFR 182.540 for ballast systems.

Vessels Subject to Title 46 CFR Subchapter F

Materials

- ❑ Where bilge or ballast piping is led through tanks, except ballast piping in ballast tanks, means must be provided to minimize the risk of flooding of other spaces due to pipe failure within the tanks. (CFR 56.50-50(k) and SOLAS Chapter II-1, Regulation 21.1.4)
- ❑ All bilge pipes used in or under fuel storage tanks or in the boiler or machinery space, including spaces in which oil settling tanks or oil pumping units are located, shall be of steel or other acceptable material. (CFR 56.50-50(m) and SOLAS Chapter II-1, Regulation 21.1.3)

Application

- ❑ All vessels except unmanned barges shall be provided with a bilge pumping plant capable of pumping from and draining any watertight compartment except for ballast, oil and water tanks. (CFR 56.50-50(a)(1) and SOLAS Chapter II-1, Regulation 21.1.1)
- ❑ Passenger vessels need to be fitted with a non-return valve to the end of the pipe in the compartment in which it serves to prevent any compartment from being flooded in the event the pipe is damaged by collision or grounding. (CFR 56.50-50(b) and SOLAS Chapter II-1, Regulation 21.2.10)
- ❑ Each bilge suction must lead from a manifold. Each manifold must be in, or be capable of remote operation from, the same space as the bilge pump. Also each bilge-manifold valve controlling a bilge suction from any compartment must be of the stop-check type. (CFR 56.50-50(c)(1))
- ❑ A common-rail bilge system may be installed as an acceptable alternative provided that it meets all of the following criteria (CFR 56.50-50(c)(3)):
 - ❑ The common-rail main runs inboard at least one-fifth of the beam of the vessel,

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- ❑ A stop-check valve or both a stop valve and a check valve are provided in each branch line and located inboard at least one-fifth of the beam of the vessel,
 - ❑ The stop valve or the stop-check valve is capable of remote operation from the space where the pump is, and is capable of manual operation to both open and close the valve,
 - ❑ The stop valve or the stop-check valve is accessible for both manual operation and repair,
 - ❑ A port and a starboard suction serve each space protected,
 - ❑ For each vessel designed for the carriage of combinations of both liquid and dry bulk cargoes, no bilge pump or piping is located in a machinery space other than in a pump room for cargo, and no liquid and other cargoes are carried simultaneously, and
 - ❑ For each cargo vessel in Great Lakes service, each common-rail piping installed for the bilge and ballast system serving cargo spaces must lead separately from a valved manifold located at the pump.
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- ❑ Bilge and ballast piping must be separate systems and be so arranged as to prevent oil or water from the sea or ballast spaces from passing into cargo holds or machinery spaces, or from passing from one compartment to another, whether from the sea, water ballast, or oil tanks, by the appropriate installation of stop **and** non-return valves. The ballast mains must be fitted with separate control valves at the pumps. (CFR 56.50-50(h))
 - ❑ Ballast piping shall not be installed to any hull compartment of a wooden vessel. Where the carriage of a liquid ballast in such vessels is necessary, suitable ballast tanks, structurally independent of the hull, shall be provided. (CFR 56.50-50(i))
 - ❑ When dry cargo is to be carried in deep tanks, arrangement shall be made for disconnecting or blanketing-off the ballast lines. Blind flanges or reversible pipe fittings may be employed for this purpose. (CFR 56.50-50(j))

Internal Diameter of Bilge Suction Pipes

- ❑ For vessels of 150 tons and over, no main suction piping shall be less than 2½ inches internal diameter. Branch piping need not be more than 4 inches and shall be not less than 2 inches in diameter except for drainage of small spaces in which case a 1½ inch diameter can be used. (CFR 56.50-50(d)(3))
- ❑ For vessels less than 150 gross tons no bilge suction shall be less than 1½ inches internal diameter and no branch piping shall be less than 1 inch nominal pipe size. (CFR 56.50-50(d)(3))

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- ❑ For vessels of 65 feet in length or less and not engaged on an international voyage, the bilge pipe sizes computed by the above formulas are not mandatory, but in no case shall the size be less than 1 inch nominal pipe size. (CFR 56.50-50(d)(4))

Independent Bilge Suction (CFR 56.50-50(e))

- ❑ One of the independent bilge pumps must have a suction of a diameter not less than the formula given by 4.1.3.2 that is led directly from the engine room bilge entirely independent of the bilge main.
- ❑ On passenger vessels each independent bilge pump located in the machinery space must have such direct suctions from these spaces, except that not more than two pumps are required to have direct suctions from any one space.
- ❑ In a vessel with more than one hull, there must be one bilge pump that has an independent bilge suction in each hull.

Emergency Bilge Suction (CFR 56.50-50(f))

- ❑ On passenger vessels propelled by internal combustion engines, the largest available pump in the engine room is to be fitted with the direct bilge suction in the machinery space, except that a required bilge pump may not be used. The discharge shall exceed the capacity of the required main bilge pump.
- ❑ Vessels over 180 feet in length which are not passenger vessels must be provided with a direct emergency bilge suction from any pump in the machinery space, except that a required bilge pump may not be used.
- ❑ Vessels under 180 feet in length which are not passenger vessels need not provide an emergency bilge suction.
- ❑ Each vessel with more than one hull must have an emergency bilge suction in each hull.

Bilge Pumps

- ❑ When bilge pumps are being utilized for other services, the piping shall be so arranged that under any condition at least one pump will be available for drainage of the vessel through an overboard discharge.

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- ❑ Each self propelled vessel must be provided with a power-driven pump or pumps in accordance with Table 56.50-55(a).
- ❑ Each power bilge pump must have the capacity to develop a suction velocity of not less than 400 feet per minute through the size of the bilge main piping required by 4.1.3.1 (CFR 56.50-55(c) and SOLAS Chapter II-1, Regulation 21.2.6). Another way to look at this is to use the formula $Q = 16.35D^2$, where Q is the required flow rate in gallons per minute and D is the inside diameter of the pipe in inches.
- ❑ Suction for Each Main Bilge: $d = 1 + \sqrt{\frac{L(B+D)}{2500}}$ in English units or $d = 25 + \sqrt{L(B+D)}$ in metric units (CFR 56.50-50(d) and SOLAS Chapter II-1, Regulation 21.2.9)
- ❑ Suction for Cargo and Machinery Space Branch Lines: $d = 1 + \sqrt{\frac{c(B+D)}{1500}}$

where:

- ❑ d = Required Internal Diameter of Suction Pipe, in inches (in millimeters)
- ❑ L = Length of Vessel at Loadwater Line, in feet (in meters)
- ❑ B = Breadth of Vessel, in feet (in meters)
- ❑ D = Molded Depth to the Bulkhead Deck, in feet (in meters)
- ❑ c = Length of Compartment, in feet
- ❑ 1 inch = 25.4 millimeters; 1 foot = 0.3048 meters

Additional SOLAS Requirements

- ❑ All vessels seeking SOLAS approval must meet the regulations outlined in both the CFRs and SOLAS, which ever is more stringent. The regulations in this section apply in addition to the regulations in the CFRs.

For Passenger Ships and Cargo Ships (SOLAS Chapter II-1, Regulation 21.1)

- ❑ An efficient pump shall be provided, capable of pumping from and draining any watertight compartment other than water/oil/liquid cargo tanks and for which other means of pumping are provided.
- ❑ Sanitary, ballast and general service pumps may be accepted as independent power bilge pumps if fitted with the necessary connections to the bilge pumping system.

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- ❑ Provisions shall be made for the drainage of enclosed cargo spaces situated on the bulkhead deck of a passenger ship and on the freeboard deck of a cargo ship.

For Passenger Ships (SOLAS Chapter II-1, Regulation 21.2)

- ❑ The bilge pumping system requirements shall be capable of operation under all practical conditions after a casualty whether the ship is upright or listed. For this purpose, wing suctions shall be generally fitted except in narrow compartments at the end of the ship where one suction may be sufficient.
- ❑ At least three power pumps shall be placed in separate watertight compartments and so arranged or situated that these compartments will not be damaged by the same damage.
- ❑ On a ship of 91.5m (300 feet) in length and upwards or having a criterion numeral (provided by owner) of 30 or more, the arrangements shall be such that at least one power bilge pump shall be available for use in all flooding conditions which the ship is required to withstand, as follows:
 - ❑ One of the required bilge pumps shall be an emergency pump of a reliable submersible type having a source of power above the bulkhead deck; or
 - ❑ The bilge pumps and their sources of power shall be so distributed throughout the length of the ship that at least one pump in an undamaged compartment will be available.
 - ❑ In addition to the direct bilge suction or suctions required, a direct suction from the main circulating pump leading to the drainage level of the machinery space and fitted with a non-return valve shall be provided in the machinery space. The diameter of this direct suction pipe shall be of the same diameter as the pump inlet (two thirds in case of steamships).
 - ❑ The spindles of the sea inlet and direct suction valves shall extend well above the engine-room platform.
 - ❑ All bilge suction piping up to the connection to the pumps shall be independent of other piping.

For Cargo Ships (SOLAS Chapter II-1, Regulation 21.3)

- ❑ At least two power pumps connected to the main bilge system shall be provided, one of which may be driven by the propulsion machinery.