

MSC Guidelines Miscellaneous Piping Systems

Procedure Number: E1-35

Revision Date: 12/12/2013

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References:

- a. 46 CFR 56.01 ,56.60 (Subchapter F – Marine Engineering)
- b. 46 CFR 77.03, (Subchapter H – Passenger Vessels)
- c. 46 CFR 96.03, (Subchapter I – Cargo and Miscellaneous Vessels)
- d. 46 CFR 119.700, (Subchapter K – Small Passenger Vessels)
- e. 46 CFR 128, (Subchapter L – Offshore Supply Vessels)
- f. 46 CFR 182.700, (Subchapter T – Small Passenger Vessels)
- g. Marine Safety Center Technical Note (MTN) 02-10, “ Material Selection for Vital Piping Systems
- h. MTN 01-10, “Marine Safety Center Review of Systems Containing Plastic Pipe”
- i. IMO Resolution A.753(18), “Guidelines for the Application of Plastic Pipes on Ships”

Contact Information

If you have any questions or comments concerning this document, please contact the Marine Safety Center (MSC) by e-mail or phone. Please refer to the Procedure Number: **E1-35**

E-mail: MSC@uscg.mil

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Responsibilities:

The submitter shall provide sufficient documentation and plans to indicate compliance with the applicable requirements; this includes a complete bill of materials, component technical data sheets, and arrangement plans. The submission shall be made in triplicate.

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General Guidance:

Vessels Subject to 46 CFR Subchapter F (Subchapters D, H, I, I-A, K, O)

Materials

- ❑ Materials used in piping systems shall be selected from the material specifications listed in 46 CFR 56.60, in the latest version of the ASME Boiler and Pressure Vessel Code, Sections I or VIII, or in accordance with reference (g). For other materials, the submitter must provide documentation to prove equivalency to the acceptable materials. Material specifications must be listed on the bill of materials.
- ❑ Fittings and valves shall be constructed of acceptable materials, as noted above, and to the design standards listed in 46 CFR 56.60. Design standards and pressure class must be noted on the bill of materials. Additional guidance is provided in reference (g).
- ❑ Pressure piping design for shipboard systems shall be in accordance with ANSI/ASME B31.1, providing a minimum safety factor of 4:1 (allowable stress \leq $\frac{1}{4}$ ultimate stress). (46 CFR 56.07-10, 46 CFR 56.15 & 46 CFR 56.20)
- ❑ Pressure piping design for industrial systems shall be in accordance with ANSI/ASME B31.3, providing a minimum safety factor of 3:1 (allowable stress \leq $\frac{1}{3}$ ultimate stress). (46 CFR 58.60-7)
- ❑ Ferrous materials used for salt water must be protected against corrosion by hot dip galvanizing or by the use of extra heavy schedule material. (46 CFR 56.60-3)
- ❑ Cast iron and malleable iron are not acceptable in installations in which shock loading may occur. (46 CFR 56.60-10 (a))
- ❑ Cast iron and malleable iron fittings shall not be used at temperatures exceeding 450 °F. Valves constructed of these materials are acceptable provided they conform to ASME B16.1, Class 125 or 250 and are within the acceptable pressure rating. (46 CFR 56.60-10 (b))
- ❑ Cast iron and malleable iron shall not be used for valves or fittings for flammable or combustible fluid piping systems located in the proximity of flames or component temperatures above 500°F. (46 CFR 56.60-10 (b))
- ❑ Cast iron shall not be used for hull fittings, or in systems containing lethal products. (46 CFR 56.60-10 (b))

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- ❑ Installations of plastic pipe (CPVC, PVC, fiberglass) shall be in accordance with reference (i). Flame spread, fire endurance, smoke and toxicity tests may be required depending on system application and location of pipe. See reference (h) for additional guidance. (46 CFR 56.60-25 (a))
- ❑ Flexible non metallic hoses and fittings shall conform to SAE J1942 and J1475 specifications. The hoses shall be suitable for the pressure and be fitted with fire sleeves, if required. Hose applications (hose suitable for the fuel system, pressure rating and sleeve requirement) should be verified in the SAE J1942/1 listing. Flexible non metallic hoses are limited to 30 inches in length. (46 CFR 56.60-25(b))

Overboard Discharges and Shell Connections

- ❑ Scuppers and deck drains originating at any level, penetrating the shell more than 17 ½ inches below the freeboard deck or less than 23½ inches above the summer load line, must have an automatic non-return valve located at the shell.
 - (1) Unless required by the table below, the check valve may be omitted if the piping is not less than schedule 80 for piping thru 8 inches NPS, schedule 60 for larger than 8 inches NPS and less than 16 inches NPS, and Schedule 40 for piping 16 inch NPS and larger. (46 CFR 56.50-95 (b)(1))
- ❑ Discharges originating from below the freeboard deck or within enclosed superstructures on the freeboard deck shall be equipped in accordance with the table below , based on location of the penetration with respect to the summer load line:

Vertical height of penetration above summer load line	Minimum valve arrangement
$D \leq .01L$	stop valve and check valve*
$D > .01L$	two check valves**
$D > .02L$	a single check valve without positive means of closing

Where:

D = vertical distance of pipe above the waterline

L = length of vessel

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* The stop valve must be operable from above freeboard deck and valve position indication must be provided

** Where two check valves are used, the inboard valve must be above the tropic load line and be accessible for examination.

- ❑ Scuppers and drains from deck structures or superstructures that are not enclosed shall be led overboard. (46 CFR 56.50-95 (b)(3))
- ❑ Overflow piping shall be fitted with two automatic non-return valves unless it is impracticable to locate the inboard valve in an accessible position, in which case a non return valve with a positive means of closure from a position above the freeboard deck will be acceptable. Overflows which extend at least 30 inches above the freeboard deck before discharging overboard may be fitted with a single automatic non-return valve at the vessel's side. (46 CFR 56.50-95 (c))
- ❑ Sea inlets for main and auxiliary machinery shall be fitted with a shutoff valve located as near the shell plating as practicable. (46 CFR 56.50-95 (d)(1))
- ❑ In unmanned machinery spaces, machinery inlets and discharges shall be remotely operable from a position above the freeboard deck. (46 CFR 56.50-95 (d)(2))
- ❑ Pipes terminating at the shell shall have bends or elbows between the outboard openings and the first rigid connection inboard and be as short as possible. (46 CFR 56.50-95 (e)(1))
- ❑ The thickness of hull connections outboard of shutoff valves, and exclusive of seachests, must be not less than that of Schedule 80 for NPS through 8 inches, Schedule 60 for NPS above 8 inches and less than 16 inches, and Schedule 40 for NPS larger than 16 inches. (46 CFR 56.50-95 (e)(3))
- ❑ Valves located at the shell in vessels of 150 gross tons and over shall be constructed of steel, bronze, or ductile cast iron specification listed in 46 CFR Table 56.60-1(a). (46 CFR 56.50-95 (f))

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Vessels Subject to 46 CFR Subchapter L

Materials

- ❑ Materials that provide an equivalent level of safety to those listed in 56.60 may be used in Class II vital piping. Materials, design standards, and pressure class must be noted on the bill of materials, as appropriate. (46 CFR 128.210)
- ❑ Salt-water piping must be corrosion-resistant and, if ferrous, be hot-dip galvanized or be at least of extra-heavy schedule in wall thickness. (46 CFR 128.220 (b))
- ❑ In lieu of meeting the material requirements of 56.60, Class II non-vital piping-systems may be builder certified as suitable for its intended service. (46 CFR 128.220 (c))

Overboard Discharges and Shell Connections

- ❑ Each piping penetration, shell penetration and overboard discharge shall conform to the Subchapter F penetration and overboard discharge requirements . (46 CFR 128.230)
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Vessels Subject to 46 CFR Subchapter K

Materials

- ❑ Metallic and non metallic piping materials used in vital systems must comply with the material requirements of 46 CFR 56.60. See material requirements on page (1) of this guide. Materials, design standards, and pressure class must be noted on the bill of materials. (46 CFR 119.710 & 119.720)
- ❑ Vital systems and non vital piping systems subject to pressure > 150 psi shall be designed in accordance with ANSI/ASME B31.1 with a minimum safety factor of 4:1 (allowable stress = ultimate stress/4). (46 CFR 119.715)

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- ❑ Non ferrous metallic piping is acceptable as follows (46 CFR 119.730):
 - 1) In non- vital systems
 - 2) Aluminum fuel piping , not less than schedule 80, on an aluminum hulled vessel
 - 3) Aluminum bilge, ballast and firemain piping on an aluminum hulled vessel
 - 4) Aluminum exhaust piping, not less than schedule 80, in wet exhaust systems only. Aluminum piping is prohibited in dry exhaust systems
 - 5) Other arrangements acceptable to OCMI

- ❑ The use of aluminum alloys with copper content > .6% is prohibited in shipboard piping systems.

Overboard Discharges and Shell Connections

- ❑ Each inlet or discharge that penetrates the hull less than 6 inches above the deepest subdivision loadline (waterline) must have a means to prevent water from entering the hull in the event of piping failure. A stop valve located as close to the shell as possible is acceptable for this purpose. (46 CFR 171.119)
 - 1) If the valve is inaccessible, the valve must be operable from the weather deck or location above the bulkhead deck.
 - 2) The valve must be labeled with identity and direction for closing.
 - 3) Each plug cock in an inlet or discharge pipe must have a means, other than a cotter pin, to prevent its loosening or removal from the body.

- ❑ Penetrations in watertight bulkheads must be as high and inboard as practicable, have means to make them watertight, and not contain sluice valves. (46 CFR 171.114)

Vessels Subject to 46 CFR Subchapter T

Materials

- ❑ Vital piping system materials may be composed of ferrous metallic piping materials. “Acceptable engineering practices” dictate material selection. See reference (i) for guidance. (46 CFR 182.710)
- ❑ Non ferrous metallic piping is acceptable as follows (46 CFR 182.730):
 - 1) In non- vital systems
 - 2) Aluminum fuel piping , not less than schedule 80, on an aluminum hulled vessel
 - 3) Aluminum bilge, ballast and firemain piping on an aluminum hulled vessel
 - 4) Aluminum exhaust piping, not less than schedule 80, in wet exhaust systems only. Aluminum piping is prohibited in dry exhaust systems
 - 5) Other arrangements acceptable to the OCMI
- ❑ Rigid plastic (CPVC, PVC, fiberglass, etc) piping may be used in non-vital piping systems only, subject to the following:
 - (1) Must be suitable for the installation
 - (2) Prohibited in gasoline and diesel piping systems
 - (3) Penetrations of watertight bulkheads shall be made thru metallic fittings
 - (4) Metallic valves shall be provided at the penetrations.
- ❑ Flexible non metallic hoses and fittings shall conform to the SAE J1942 and J1475 specifications. The hoses shall be suitable for the pressure and be fitted with fire sleeves, if required. Hose applications (hose suitable for the fuel system, pressure rating and sleeve requirement) should be verified in the SAE J1942/1 listing. (46 CFR 182.730(e))

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- 1) Nonmetallic flexible hoses conforming to SAE J1942 may be used without length limitations provided they do not penetrate watertight bulkheads and decks .
- ❑ The use of flexible hose connected by double hose clamps is acceptable for system pressures not more than 5 psi. Flexible hoses for use in fuel systems must be USCG Type A or Type B hoses or otherwise exhibit equivalent fire endurance properties (2 ½ minute fire test).

Overboard Discharges and Shell Connections

- ❑ Penetrations in watertight bulkheads must be as high and inboard as practicable, have means to make them watertight, and not contain sluice valves. (46 CFR 171.114)
- ❑ Each inlet or discharge that penetrates the hull less than 6 inches above the deepest subdivision loadline (waterline) must have a means to prevent water from entering the hull in the event of piping failure. A stop valve located as close to the shell as possible is acceptable for this purpose. (46 CFR 171.119)
 - 1) If the valve is inaccessible, the valve must be operable from the weather deck or location above the bulkhead deck.
 - 2) The valve must be labeled with identity and direction for closing.
 - 3) Each plug cock in an inlet or discharge pipe must have a means, other than a cotter pin, to prevent its loosening or removal from the body. (46 CFR 171.119(f))

Disclaimer:

This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. It is not intended to nor does it impose legally-binding requirements on any party. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other federal and state regulators, in applying statutory and regulatory requirements. You can use an alternative approach for complying with these requirements if the approach satisfies the requirements of the applicable statutes and regulations. If you want to discuss an alternative, you may contact the Marine Safety Center (MSC), the unit responsible for implementing this guidance.
