

MSC Guidelines for Review of Bow Thruster Systems

Procedure Number: E1-3

Revision Date: 01/31/2000

References

- (a) Title 46 Code of Federal Regulations
- CFR 58.30-1(a)(5)
 - Tankship (Subchapter D) must meet F per 31.30
 - Passenger Vessels (Subchapter H) must meet F per 77.03-1
 - Cargo and Misc. Vessels (Subchapter I) must meet F per 96.03
 - Small Passenger Vessels (Subchapter K) have exceptions listed in 119.715 - refers to ANSI B31.1. must meet F per 119.600
 - Offshore Supply Vessels (Subchapter L) have exceptions listed in 128.240.
 - Nautical Vessels (Subchapter R) refer to F per 169.600
 - Small Passenger Vessels (Subchapter T) has exceptions listed in 182.710 - refers to ANSI B31.1.
- (b) American National Standards Institute (ANSI) B 31.1, "Code for Pressure Piping, Power Piping"
- (c) The International Convention for the Safety of Life at Sea (SOLAS) 1974 Regulation II-1: Construction Part C: Machinery Installations p. 100
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Disclaimer

These guidelines were developed by the Marine Safety Center staff 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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Plan Review
Guidance

Bow Thruster Piping

❖ **Application**

- All fluid power transmission systems and control systems installed on vessels subject to inspection per 58.30-10

❖ **Design Requirements**

- The designer should consider the additional pressure due to hydraulic shock as well as the rate of pressure rise 58.30-5(a)
- Back pressure shall not affect the system, any system it is connected to nor emergency systems (Look for connections to other systems) 58.30-5(b)
- Pneumatic systems greater than 150 psi shall have a surge tank per 58.30-5(c)

❖ **Hydraulic fluid**

- Hydraulic fluid flash point NOT less than 200°F for pressures less than 150 psi/ 315°F for 150 psi and above per 58.30-10(b). The system shall use recommended hydraulic fluids per 58.30-10(e).

❖ **Pipe, tubing, valves, fittings**

- Materials/specs shall be selected from Table 56.60-1(a) or 2(a) OR ASME code sections I, III, VIII per 58.30-15(b).
- Materials designated by other specs shall be evaluated on the basis of physical and chemical properties per 58.30-15(b)
- Materials shall remain ductile per 58.30-15(b)
- Bolting is addressed in 58.30-15(c).

- Calculate: $\frac{\text{Outside_Diameter}}{\text{Wall_Thickness}}$

- If this value is greater than 6 the mawp and minimum thickness shall be calculated per 56.07-10(e)

- If less than 6 the wall thickness may be established with a thick-wall cylinder formula using the allowable stress values found in 56.07-10(e)* per 58.30-15(d)

$$t_m = \frac{PD_o}{2(SE + Py)} + A$$

$$t_m = \frac{Pd + 2SEA + 2yPA}{2(SE + Py - P)}$$

$$P = \frac{2SE(t_m - A)}{D_o - 2y(t_m - A)}$$

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$$P = \frac{2SE(t_m - A)}{d - 2y(t_m - A) + 2t_m}$$

t_m = minimum required wall thickness, in.

P = internal design pressure, psig

D_o = outside diameter of pipe, in.

d = inside diameter of pipe, in.

The above formulas are located in 104.1 Straight Pipe under internal pressure in ANSI B31.1

* This refers to 102.3.1 of ANSI B31.1, Tables 56.60-1 and 56.60-2(a)

❖ **Fluid Power Hose and Fittings** 58.30-20

- Hose and fittings shall meet the requirements of subpart 56.60
- Use hoses between two points of relative motion but not subject to torsional deflection, sharp bends shall be avoided.

❖ **Accumulators** 58.30-25

- Must meet 54.01-5(c)(3)
- Each accumulator shall be protected by relief valves set at mawp

❖ **Fluid Power Cylinders** 58.30-30

- Cylinders shall be designed for a bursting pressure of not less than 4 times the mawp. Drawings and cales or a certified burst test report shall be submitted to show compliance with this requirement.
- Materials shall be in accordance with 58.30-15(b)

❖ **Testing** 58.30-35

- This shall be done by the local OCMI.

SOLAS Requirements

Regulation II-1: Construction Part C: Machinery Installations p. 100