

MSC Guidelines for Compressed Air Systems

Procedure Number: E1-04

Revision Date: 12/16/2013

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References:

- a. 46 CFR 54 Pressure Vessels (Subchapter F)
 - b. 46 CFR 56 Piping Systems & Appurtenances (Subchapter F)
 - c. 46 CFR 58.30 Fluid Power & Control Systems (Subchapter F)
 - d. 46 CFR 119.700 Piping Systems (Subchapter K)
 - e. 46 CFR 182.700 Piping Systems (Subchapter T)
 - f. 46 CFR 128 Marine Engineering: Systems & Equipment (Subchapter L)
 - g. 46 CFR 32.35-15 Installation of Air Compressors (Subchapter D)
 - h. 46 CFR 32.50-3 Cargo Discharge (Subchapter D)
 - i. 46 CFR 197.310 Diving Air Compressor System (Subchapter V)
 - j. ASTM F1155-98, Standard Practice for Selection and Application of Piping System Materials
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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: **E1-04**

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Responsibilities:

Using applicable portions of references (a) through (j), the submitter shall provide sufficient documentation and plans to indicate compliance with the applicable requirements. The submission shall be made in triplicate. To facilitate plan review and project management, all plans and information specified in these guidelines should be submitted as one complete package through a single point of contact for the project.

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General Guidance: To assist in applying the correct regulations, first determine the type and class of the compressed air system:

- ❑ Vital/non-vital (46 CFR 56.07-5, 119.710, 128.130, 182.710)
- ❑ Class I or II (46 CFR 56.04)

Vessels Subject to Subchapter F

The guidelines in this section are provided specifically for vessels subject to regulation under 46 CFR Subchapter F. However, following these guidelines for any compressed air system will facilitate and expedite the plan review process. Specific guidelines for various classes of vessels can be found in subsequent sections below.

- ❑ Are the plans complete and suitable for submission to the Coast Guard for review (46 CFR 56.01-10) to include the following?
 - a. Piping diagram
 - b. List of materials
 - c. Pipe diameters
 - d. Wall thicknesses
 - e. Design pressure/temperature
 - f. ASTM material and ANSI component specifications
 - g. Type, size, design standard and rating of valves, flanges, and fittings
 - h. Bulkhead & watertight boundary penetration details
 - i. Calculations required by 46 CFR 50.20-25 (MAWP, minimum thickness)
 - j. Calculations for all pressure containment components (46 CFR 54.01-18) or acceptable evidence of industry standard (i.e. ASME “U” or “UM” stamp) (46 CFR 54.01-5)
- ❑ Materials used in the manufacture of tubing, pipes, valves, flanges, and fittings shall be selected from those specifications which appear in 46 CFR Table 56.60-1(a) or Table 56.60-2(a), or they may be selected from the applicable material specifications of sections I, III, and VIII of the ASME Code. (46 CFR 58.30-15(b))
- ❑ Flexible nonmetallic hose shall meet SAE J-1942 and may be used only where flexibility is required, in lengths not exceeding 30 inches and limited to the manufacturer’s recommended MAWP. Hose fittings shall comply with SAE J1475. Unreinforced hoses are limited to a maximum service pressure of 50 psi, reinforced hoses are limited to a maximum pressure of 150 psi. (46 CFR 56.60-25(b))

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General Guidance (continued):

- ❑ Bolting shall meet the requirements of 46 CFR 56.25-20 except that regular hexagon bolts conforming to SAE J429, Grades 2 through 8, or ASTM A-193 may be used in sizes not exceeding 1 ½ inches. (46 CFR 58.30-15(c))
- ❑ Nonferrous materials may only be used in accordance with 56.60-20 and reference (j).
- ❑ Piping systems shall be designed, constructed, and inspected in accordance with ANSI B31.1, as limited, modified, or replaced in 46 CFR Part 56.
- ❑ All fluid power and control systems listed in 46 CFR 58.30-1(a) shall comply with the requirements of 46 CFR 58.30-5 through 58.30-40.
- ❑ The design, construction, and testing of unfired pressure vessels, such as accumulators, shall meet the applicable requirements of 46 CFR 54.01-5 (c)(3), (c)(4), and (d) or the remaining requirements in Part 54. (46 CFR 58.30-25).
- ❑ Those systems not listed in 46 CFR 58.30-1(a) shall meet the requirements of 46 CFR 58.30-50.
- ❑ Pressure piping calculations must be submitted which show that the compressed air system is designed in accordance with ANSI B31.1.
- ❑ Unless stamped with an ASME “U” or “UM” stamp, pressure vessels must be designed to the ASME Boiler and Pressure Vessel Code, Section VIII (or other appropriate reference). Detailed calculations must be submitted to verify compliance.
- ❑ Pneumatic systems with a maximum allowable working pressure in excess of 150 psi shall be designed with a surge tank or other acceptable means of pulsation dampening. (46 CFR 58.30-5(c))
- ❑ Each pneumatic system must minimize the entry of oil into the system and must drain the system of liquids. (46 CFR 58.30-5(d))
- ❑ Pneumatic cylinders consisting of a container and a movable piston rod extending through the containment vessel, converting pressure to work, shall comply with 46 CFR 58.30-30.
- ❑ Where pipes are carried through bulkheads, decks, or tank tops, the integrity of the structure shall be maintained. (46 CFR 56.50-1)

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General Guidance
(continued):

The following guidelines may be in addition to the requirements of 46 CFR Subchapter F.

Vessels Subject to Subchapter D

- ❑ Use of compressed air as a means of discharging cargo from gravity type cargo tanks is prohibited. (46 CFR 32.50-3)
- ❑ Installation of air compressors in cargo areas is restricted for those areas listed in 46 CFR 32.35-15.

Vessels Subject to Subchapters T or K

Applicability of the following guidelines is denoted by (T), (K) or (T/K)

- ❑ (T) Flexible nonmetallic hose shall meet SAE J-1942 and is subject to the limitations of 46 CFR 182.720(d)(1) through (d)(4). Unreinforced hoses are limited to a maximum service pressure of 50 psig, reinforced hoses are limited to a maximum service pressure of 150 psig. Hose fittings shall comply with SAE J1475.
- ❑ (T/K) Unfired pressure vessels (accumulators, flasks, receivers, etc.) must meet the applicable requirements of 46 CFR Subchapter 54.
- ❑ Piping used in vital systems (i.e. propulsion or steering control systems):
 - a. (K) Must meet 46 CFR 56.60 (piping materials) with the exception of nonferrous metallic piping, which must meet 46 CFR 119.730 or reference (j). or reference (j)
 - b. (T) Must be composed of ferrous materials except when nonferrous metallic piping materials are permitted by 46 CFR 182.730 or reference (j).
- ❑ (K) Nonmetallic piping materials in both vital and non-vital systems must meet 46 CFR 56.60-25.
- ❑ (T/K) Piping subject to more than 1,034 kPa (150 psig) in a non-vital system shall be designed, constructed, and inspected in accordance with ANSI B31.1 (46 CFR 119.715 and 182.715)

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General Guidance (continued):

Vessels Subject to Subchapter L

- ❑ Pressure design must meet the standards in 46 CFR Subchapter F (46 CFR 128.210).
- ❑ For Class II non-vital systems, materials and design need not meet 46 CFR Subchapter F. The submitter must certify in writing that the system, as designed, is suitable for the intended service (46 CFR 128.220).
- ❑ Penetrations of hulls and watertight bulkheads must be to 46 CFR Subchapter F standards for materials and design in both vital and non-vital systems. (46 CFR 128.230)
- ❑ Non-standard hydraulic or pneumatic component (such as control valves, check valves, relief valves, and regulators) may be accepted by the cognizant OCMI or the Commanding Officer, Marine Safety Center, if the component is certified by the manufacturer as suitable for marine service and if:
 - a. The component meets each of the requirements for materials and pressure design of 46 CFR 56.60 and 46 CFR 58.30 and if its service is limited to the manufacturer's rated pressure; or
 - b. The service of the component is limited to 1/2 the manufacturer's recommended maximum allowable working pressure (MAWP) or 1/10 the component's burst pressure. Burst-pressure testing is described in ANSI B 31.1, Paragraph 104.7.A, and must be conducted to comply with Paragraph A-22, Section I, ASME Boiler and Pressure Vessel Code. Written certification of results of burst-pressure testing must be submitted with the plans required by 46 CFR 127.110(d). (46 CFR 128.240)

Commercial Diving Operations (Subchapter V)

- ❑ Air compressor systems installed onboard for commercial diving operations shall comply with 46 CFR 197.310.

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, the unit responsible for implementing this guidance.
