REVIEW OF VENTS, FILLS, AND SOUNDS

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Purpose

This Plan Review Guideline (PRG) provides guidance regarding the information required to be submitted to the Marine Safety Center (MSC) for review of venting, filling, and sounding piping system arrangements on U.S. flagged inspected vessels.

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 Procedure Number E1-29.

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Table of Contents

1. Applicability

This Plan Review Guideline (PRG) is applicable to installations of vents, fills, and sounds on all US flagged inspected vessels, including cargo tank ventilation. Reviews of vapor control systems (VCS) are handled by the Vessel and Cargo Branch. See PRG C1-46 for further details on VCS installations.

2. References

46 CFR 56.50-85 & 56.50-90
46 CFR 32.55, 36.20-1 & 38.20
46 CFR 119.445 & 119.450
46 CFR 182.445 & 182.450
ASTM F1155-98, Standard Practice for Selection and Application of Piping System Materials

3. Content

Vessels Subject to 46 CFR Subchapter F

a. Piping materials may be selected from 46 CFR 56.60 or the materials listed in section II of the ASME Boiler and Pressure Vessel Code. Alternatively, ASTM F1155-98 is recognized as an acceptable alternative standard from which to select materials for vital piping systems. (46 CFR 56.60-1))

b. Small surface area tanks need be fitted with only one vent pipe, but tanks with large surface areas shall be fitted with at least two vent pipes. The vent pipes shall be located to provide venting of the tanks under any service condition. (46 CFR 56.50-85(a)(2))

c. In deep tanks intended for the occasional carriage of dry or liquid cargo, a "spectacle" or ring and blank flange may be fitted in the overflow pipe so arranged as to not interfere with venting when the tanks contain oil. (46 CFR 56.50-85(a)(12))

Vent Location and Routing

a. Vents from oil tanks must terminate not less than three feet from any opening into living quarters. (46 CFR 56.50-85(a)(5))

b. Vents extending above the weather decks must be at least schedule 40 pipe. (46 CFR 56.50-85(a)(6))

c. Tanks vents shall remain within the watertight boundaries in which the tanks they serve are located. (46 CFR 56.50-85(b))

d. Tanks vents must extend above the weather deck, except that fresh water; bilge oily-water; bilge slop; and grade E combustible liquids such as lube oil may terminate in the machinery spaces provided:

(1) Vents are arranged to prevent overflow onto machinery, electrical equipment, and hot surfaces.
(2) Tanks containing combustible liquids are not heated.
(3) The vents terminate above the deepest load waterline if the tanks have boundaries in common with the hull. (46 CFR 56.50-85(a)(4))

e. Vent pipes for fuel oil tanks shall where possible have a slope of no less than 30º. Adequately drained header lines are excluded from this requirement. (46 CFR 56.50-85(a)(3))

f. Vents for fresh and ballast water tanks shall not be connected to a common header with vents from oil or oily ballast tanks. (46 CFR 56.50-85(a)(13))

g. Fills, vents and fuel lines on gasoline independent fuel tanks must be located at the topmost surface of the tank. Fills and vents on diesel independent fuel tanks must be located on the topmost surface of the tank; fuel lines are not restricted to the top of the tank (46 CFR 58.50-5(a)(4)/46 CFR 58.50-10(a)(4))

Vent Pipe Diameters

a. The diameter of each vent pipe must not be less than:
(1) Fresh water tanks 1.5" NPS
(2) Ballast tanks 2.0" NPS
(3) Fuel oil tanks 2.5"NPS
(4) Small independent tanks with vents that are more than 25% greater in cross sectional area than the fill line are acceptable. (46 CFR 56.50-85(a)(10))

Vent Heights

a. Vent height, for **Non Great Lake and Inland Barges**, from the deck to any point where water may gain access through the vent to below deck: (46 CFR 56.50-85(a)(6))

(1) At least 30 inches on freeboard deck
(2) At least 17.5 inches minimum on the superstructure deck

b. Vent height for **Great Lakes** from the deck to any point where water may gain access through the vent to below deck: (46 CFR 56.50-85(a)(6))

(1) At least 30 inches minimum on freeboard
(2) At least 24 inches minimum on the raised quarter deck
(3) At least 12 inches minimum on other superstructure decks
(i) Where the height of vents may interfere with the working of the vessel, a lower height may be approved by the MSC provided the vent cap is properly protected from mechanical damage

c. Vent height for **Inland Barges** (46 CFR 56.50-85(a)(6))

(1) At least 6 inches above the deck

(i) A lesser height may be approved by MSC if evidence is provided that a particular vent has proven satisfactory in service.

Vent Flame Screens

a. Vent outlets from all tanks which may emit flammable or combustible vapors must be fitted with either: (46 CFR 56.50-85(a)(8))

(1) A single screen of corrosion resistant wire of at least 30 by 30 mesh; **or**
(2) Two screens of corrosion resistant wire of at least 20 by 20 mesh spaced not less than 1/2 inch nor more than 1 1/2 inches apart. The clear area through the mesh must not be less than the internal unobstructed area of the required pipe.

Vent Closure Devices

a. Satisfactory means, permanently attached, shall be provided for closing the openings of all vents. (inland barges may be exempted) (46 CFR 56.50-85(a)(7)(i))

(1) Ball check valve must close under the action of a submerging wave.
(2) Hinged closure must close under the action of a submerging wave.
(3) Other suitable device acceptable MSC

b. Where vents are provided with flame screens, the closure device shall be situated so as to not damage these screens.

Tank Over Pressure Protection

a. If a tank may be filled by a pressure head exceeding the tank's design pressure, the total cross-sectional area of the vents in each tank must be not less than the cross-sectional area of the filling line unless the tank is protected by overflows. (46 CFR 56.50-85(a)(11))

(1) If overflows are used the total cross-sectional area of the overflows must not be less than the cross-sectional area of the filling line.

b. Provisions must be made to guard against liquids from rising in the venting system to a height that would exceed the design head of a tank by using one of the following: (46 CFR 56.50-85(a)(11)(ii)))

(1) High level alarms, or
(2) Overflow-control systems, or
(3) Other, equivalent means, together with gauging devices and procedures for filling cargo tanks.

Sounding Devices (excluding fuel tanks)

a. Except for the main cargo tank on a tank vessel, each integral hull tank and compartment must be fitted with a sounding pipe unless the tank is accessible at all times while the vessel is operating. (46 CFR 56.50-90(a))

b. Cargo vessel sounding pipes terminating below the freeboard deck must be fitted with gate valves. (46 CFR 56.50-90(b))

c. Passenger vessel sounding pipes terminating below the bulkhead deck must be fitted with self-closing gate valves. (46 CFR 56.50-90(b))

Sounding Devices for Fuel Tanks (built on or after 9 June 1995)

a. Fuel tank sounding pipes may not terminate in the following spaces: (46 CFR 56.50-90(c))

(1) Spaces with risk of ignition of spillage from the pipe
(2) Passenger or crew spaces
(3) Machinery spaces, when practicable

(i) The MSC may permit a sounding pipe to terminate in the machinery space; refer to the special requirements of 46 CFR 56.50-90(c)(1), (2) and (3).

Sounds Closure Devices

a. The upper end of pipes terminating at the weather deck shall be closed by: (46 CFR 56.50-90(e))

(1) A screw cap or plug
(2) Great lakes dry cargo carriers may have hinged covers with a positive means to secure the caps, for sounding pipes terminating at least 4 inches above the deck, which service ballast water tanks

Alternative Sounding (gauge glasses) for vessels constructed on or after June 9, 1995

a. For a passenger vessel, the gauge must not require penetration below the tank top, and failure of the gauge or overfilling the tank must not spill fuel (46 CFR 56.50-90(d)(1)).

b. For a cargo vessel, gauge failure or overfilling shall not result in a fuel spill. Flat gauge glass with self-closing valves between the gauges and fuel tanks is acceptable (46 CFR 56.50-90(d)(2)).

Vessels Subject to Subchapter D (Cargo Tank Venting)

General

a. Each cargo tank must be equipped with a vent of diameter not less than 2.5 inches (46 CFR 32.55-20(a) & 32.55-25(a))

b. Additional requirements for cargo tank venting for liquefied flammable gases are contained in 46 CFR Part 38.

Tankships

For Grade A liquids:

a. Vent branches must extend to a height above the weather deck of at least 13.1 ft and terminate at least 13.1 ft from living or working spaces, ventilator inlets, or sources of ignition (46 CFR 32.55-20(b)(1)

b. Valves shall not be installed on branch lines to prevent the free flow of gas (46 CFR 32.55-20(b)(3)(i)

c. Vents fitted with a PV relief valve must have a means for opening the pressure valve or bypass configuration with manual operated stop valve (46 CFR 32.55-20(b)(3)(ii).

d. The vent heater must be fitted with flame arrestor or PV valve with:

(1) A means for opening the pressure valve or bypass configuration with manual operated stop valve
(2) Connections for flushing and draining
(3) Sufficient capacity during loading without opening of ullage plates, cargo hatches (46 CFR 32.55-20(b)(4)

For Grades B & C liquids:

a. Venting arrangement must be fitted with individual PV relief valves or a branch system connected to a vent heater, with both extending to a reasonable height above the weather deck.

b. If fitted with a vent header, suitable means for flushing and draining

Tank Barges

For Grades A, B, & C liquids:

a. Venting arrangement must be fitted with individual PV relief valves or a branch system connected to a vent heater, with both extending to a reasonable height above the weather deck.

b. If fitted with a vent header, suitable means for flushing and draining (46 CFR 32.55-25(b)).

Tankships and Tank Barges

For Grades D & E liquids:

a. Venting arrangement must be fitted with gooseneck vents and flame screens (46 CFR 32-55.20(d) & 32.55-25(c)).

Vessels Subject to Subchapter O (Cargo Tank Venting)

a. Venting requirements for each cargo is provided in Table 151.05. (46 CFR 151.15-5).

b. All vents must penetrate into tanks at the top of the vapor space (46 CFR 151.15-5).

c. Open venting systems must meet the requirements of 46 CFR 151.15-5(a) (46 CFR 151.15-5(a)).

d. Pressure-vacuum venting systems must meet the requirements of 46 CFR 151.15-5(b) (46 CFR 151.15-5(b)).

e. Safety relief venting systems must meet the requirements of 46 CFR 151.15-5(c) (46 CFR 151.15-5(c)).

f. Rupture disk systems must meet the requirements of 46 CFR 151.15-5(d) (46 CFR 151.15-5(d)).

g. Back pressure in relief valve discharge lines shall not exceed 10% of valve operating pressure. Alternatively, a compensating-type valve shall be used (46 CFR 151.15-6(a)).

h. Suitable provision shall be made for draining condensate which may accumulate in the vent piping (46 CFR 151.15-6(a)).

Vessels Subject to 46 CFR Subchapters K or T

a. Vessels less than 65 feet in length and carrying not more than 12 passengers may comply with the following alternative standards: (46 CFR 182.455(f))

(1) For gasoline fuel systems, ABYC H-24 or 33 CFR 183, Subpart J
(2) For diesel fuel systems, ABYC H-33

b. Piping materials shall be in accordance with the vital piping system material requirements for the subchapter (46 CFR 119.710/182.710)

Fill Pipe Diameters

a. Fill pipes for fuel tanks must be not less than 1.5 inches nominal pipe size. (46 CFR 119.445(a)/182.445(a))

Fill Pipe Location and Routing

a. Fill pipes must be such that overflow of liquid or vapor cannot escape to the inside of the vessel. (46 CFR 119.445(d)/182.445(d))

b. Diesel fill pipes must run as directly as possible from the deck connection to the top tank. Such pipes must terminate on the weather deck and be fitted with shutoff valves, watertight deck plates, or screw caps, and marked. (46 CFR 119.445(e)/182.445(e))

c. Diesel fill and sounding pipes may terminate at the top of the tank. (46 CFR 119.445(e)/182.445(e))

d. Gasoline fill pipes must extend to within ½ of their diameter from the bottom of the tank. (46 CFR 182.445(e))

e. Where a flexible fill pipe section is necessary, the tubing or hose must meet the following:

(1) Have a high resistance to salt water, petroleum oils, heat and vibration.
(2) The hose or tubing must overlap metallic pipe ends at the least 1 ½ times the pipe diameter and be secured at each end by clamps.
(3) The flexible section must be accessible and as near the upper end of the fill pipe as practicable.
(4) When the flexible section is a nonconductor of electricity, the metallic sections of the fill pipe separated thereby must be joined by a conductor for protection against a static charge when filling with fuel. (46 CFR 119.445(f)/182.445(g))

Vent Location and Routing

a. Unpressurized fuel tanks must be fitted with a vent pipe at the highest point of the tank. (46 CFR 119.450(a)/182.450(a))

b. Vent pipes terminating on the hull exterior must be installed to prevent the contamination of the fuel by water under normal operating conditions. (46 CFR 119.450(c)/182.450(d))

c. Where a flexible vent pipe section is necessary, the tubing or hose must meet the following:

(1) Have a high resistance to salt water, petroleum oils, heat and vibration.

(2) The hose or tubing must overlap metallic pipe ends at the least 1 ½ times the pipe diameter and must be secured at each end by clamps.
(3) The flexible section must be accessible and as near the upper end of the fill pipe as practicable. (46 CFR 119.450(e)/182.450(g))

d. Fuel tank vent pipes shall be installed to gradient upward to prevent fuel from being trapped in the line. (46 CFR 119.450(f)/182.450(h))

Vent Diameters

a. The net cross sectional area of the vent pipe for a gasoline fuel tank must not be less than that of 0.75 inch outer diameter x 0.035 inch wall thickness. (20 gauge) except where the tank is filled under pressure, the net cross sectional area of the vent pipe must be not less than that of the fill pipe minimum nominal pipe diameters. (46 CFR 182.450(b))

(1) EPA requires vessels to meet 40 CFR 1060 requirements for evaporative emissions in fuel systems. Compliance with these regulations may require using a passively purged canister in the vent lines. These filters do not meet the cross sectional or material requirements of 46 CFR, but are allowed for use in Subchapter T vessels only. Please contact the EPA if you have any questions on the evaporative emissions regulations.

b. The net cross sectional area of the vent pipe for a diesel fuel tank must not be less than that of 0.625 inch outer diameter x 0.035 inch wall thickness (20 gauge), if the vent pipe terminates at the tank top. (46 CFR 119.450(b)(1)/182.450(c)(1))

c. If the vent pipe extends into a diesel fuel tank, the net cross sectional area of the vent pipe must not be less than that of 0.75 inch outer diameter x 0.035 inch wall thickness (20 gauge),. (46 CFR 119.450(b)(2)/182.450(c)(2))

d. If a diesel fuel tank if filled under pressure, the net cross sectional area of the vent pipe for a diesel fuel tank must not less than the cross sectional area of the fill pipe. (46 CFR 119.450(b)(3)/182.450(c)(3))

Vent Height

a. The discharge ends of fuel tank vent pipes must terminate on the hull exterior as high above the waterline as practicable and remote from any hull openings or they must terminate in U-bends as high above the weather deck as practicable and as far as practicable from openings into any enclosed spaces. (46 CFR 119.450(c)/182.450(d))

Vent Flame Screens

a. Fuel vents must be fitted with 30 x 30 mesh flame screens or flame arrestors which do not reduce net cross sectional area of the vent pipe and permit cleaning of the screens (46 CFR 119.450(d)/182.450(e))

Sounding Pipes

a. Sounding pipes must be such that overflow of liquid or vapor cannot escape to the inside of the vessel. (46 CFR 119.445(d)/182.445(d))

b. Sounding pipes must run as directly as possible from the deck connection to the top tank. Such pipes must terminate on the weather deck and must be fitted with shutoff valves, watertight deck plates, or screw caps. Sounding pipes shall be marked. (46 CFR 119.445(e)/182.445(e))

c. Gasoline sounding pipes must extend to within 1/2 of their diameter from the bottom of the tank. (46 CFR 182.445(e))

d. Diesel sounding pipes may terminate at the top of the tank. (46 CFR 119.445(e)/182.445(e))

Sounding Pipe Height

a. Where sounding pipes are used, their openings must be at least as high as the opening of the fill pipe. The sounding pipes must be closed at all times, except during use. (46 CFR 182.445(c))

4. **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 MSC, the unit responsible for implementing this guidance.