United States Coast Guard and Environmental Protection Agency

Compliance Guideline

-How to Comply with the Law-

Fuel and Emissions

Prepared by the American Boat & Yacht Council, Inc.
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INTRODUCTION

There are many requirements for the fuel system of gasoline powered inboard boats. They may be found in Title 33 CFR, Part 183, Sub Part J and Title 40 CFR Parts 1045 and 1060.

Some of these requirements may be specifically applied but many are dependent on other requirements. Some of the requirements should be complied with only if certain conditions of installation are selected or if certain types of fuel system products or components are used. This many faceted approach may lead to confusion.

As this is a compilation of regulations from multiple government bodies written over many years, some of the definitions and terms may not be consistent. For example, the 33 CFR 183 is a safety related regulation and pertains to gasoline engines. The 40 CFR 1060 is an environmental regulation and pertains to spark ignition (SI) engines. Gasoline and SI engines are referring to the same engine type resulting in multiple regulations for the same engine type but under different titles. This document serves to help the marine industry understand what is required during a boat’s construction.

Regulations are typically written in concise terms, the words and arrangements chosen to be enforceable and in some cases to be legally interpreted. A regulatory format does not allow for explanations, recommendations and easily detected alternate solutions. A regulation provides an outline about which a great deal of further information, interpretation, explanation, clarification and some helpful hints are needed in order to provide a good understanding and compliance with its intent.

This fuel system guideline assists the designer, boat builder, surveyor and repairer to achieve compliance with the regulation. The guideline explains, interprets, clarifies, provides alternatives, diagrams, tabulates, makes recommendations, and in general, compliments the regulation to improve the user’s understanding.

CAUTION

It is recommended that standards and recommended practices developed by voluntary standards organizations be used for constructing, installing and maintaining fuel systems on boats. One such source is Standards and Technical Information Reports for Small Craft, which is available from:

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FORMAT

The format of this guideline has been chosen to follow the sequence of presentation in the fuel system regulation. Other arrangements could have been chosen; however, this format provides the user with a sequence of information, which reduces confusion.

A portion of the regulation is stated, preceded by the titles IT’S THE LAW - USCG or EPA, followed by the effective date of that portion of the regulation. Then a discussion follows which explains, interprets, clarifies, and identifies interdependence of requirements and is designed to improve the understanding of the intent of the regulatory requirement. Diagrams are freely used and tables included wherever they can be helpful.

The discussion, diagrams and tables are followed by a box identified by the title TO COMPLY, which asks questions to which the answer must be YES if compliance is achieved. This is a checklist for each regulatory requirement.
IT’S THE LAW - USCG:

183.501 Applicability

(a) This subpart applies to all boats that have gasoline engines, except outboard engines for electrical generation or mechanical power for propulsion.

IT’S THE LAW - EPA:

1060.1

(a) The standards and other requirements in this part 1060 apply to the fuel lines, fuel tanks, couplings and fittings, and fuel caps used or intended to be used in the following categories of new engines and equipment that are fueled with a volatile liquid fuel (such as gasoline, but not including diesel fuel), and to the equipment in which these components are installed, starting with the model years shown in Table 1 to this section:
FIGURE 1 - Applicability

APPLIES TO ALL

GASOLINE POWERED INBOARD & STERN DRIVE BOATS

OUTBOARD (EPA ONLY)

GASOLINE ENGINES FOR INBOARD & STERN DRIVE BOATS

GASOLINE AUXILIARY ENGINES

GASOLINE FUEL TANKS WHICH ARE PERMANENTLY INSTALLED ON INBOARD & STERN DRIVE BOATS
IT’S THE LAW - USCG:

183.501 Applicability

(b) The sections in this subpart are effective on the following dates:

NOTE: THIS PARAGRAPH WAS DELETED AND RESERVED DECEMBER 15, 1983. ALTHOUGH THIS LISTING IS NO LONGER IN THE FEDERAL REGULATIONS, IT IS REPRODUCED HERE FOR REFERENCE.

EFFECTIVE DATE:

August 1, 1977

183.501 Applicability
183.505 Definitions
183.507 General
183.518 Fuel Tank Openings
183.520 Fuel Tank Systems
183.528 Fuel Stop Valves
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183.572 Grounding
183.580 Static Pressure Test for Fuel Tanks
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183.586 Pressure Impulse Test
183.588 Slosh Test
183.590 Fire Test

February 1, 1978

183.510 Fuel Tanks
183.514 Fuel Tanks: Labels
183.530 Spud, Pipe and Hose Fitting Configuration
183.532 Clips, Straps and Hose Clamps
183.550 Fuel Tanks: Installation
183.554 Fittings, Joints and Connections
183.560 Hose Clamps: Installation
183.564 Fuel Tank Fill System
183.570 Fuel Filters and Strainers: Installation

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August 1, 1978

183.512 Fuel Tanks: Prohibited Materials
183.516 Cellular Plastic Used to Encase Fuel Tanks
183.524 Fuel Pumps
183.526 Carburetors
183.540 Hoses: Installation
183.552 Plastic Encased Fuel Tanks: Installation
183.558 Hoses and Connections

**IT’S THE LAW – EPA:**

1060.101 What evaporative emission requirements apply under this part?

Products subject to this part must meet emission standards and related requirements as follows:

a. Section 1060.102 describes permeation emission control requirements for fuel lines.
   b. Section 1060.103 describes permeation emission control requirements for fuel tanks.
   c. Section 1060.104 describes running loss emission control requirements for fuel systems.
   d. Section 1060.105 describes diurnal emission control requirements for fuel tanks.

**TO COMPLY**

The regulation goes on to describe general provisions for the components that are used to comply with this rule:

Adjustable parameters – if there is any adjustment involved it cannot fall outside of the parameters that passed the certification.

Prohibited controls – Anything unsafe or that bypasses the controls used to comply with the regulation.

Fuel-line fittings – Remain securely attached throughout the useful life of the product. Detachable fittings must be self-sealing.

Refueling – Boats filled primarily by portable cans need a filler neck that will accept the spouts, and the level of the tank should be visible while filling.

Filling necks on the side of the boat should be designed to prevent spilling by activating the automatic shutoff feature of the pump.
Table I - Timeline for Implementation EPA 40 CFR part 1060

Marine Evaporative Standards

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<th>Hose Permeation</th>
<th>Tank Permeation</th>
<th>Diurnal</th>
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<tr>
<td>Standard level</td>
<td>15 g/m²/day</td>
<td>1.5 g/m²/day</td>
<td>0.40 g/gal/day</td>
</tr>
<tr>
<td>Portable tanks</td>
<td>2009 ¹</td>
<td>2011</td>
<td>2010 ²</td>
</tr>
<tr>
<td>Other Tanks</td>
<td>2009 ³</td>
<td>2012</td>
<td>2011 ³  ⁴</td>
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IT’S THE LAW - USCG:

183.505 Definitions.

As used in this subpart:

Flame arrestor means a device or assembly that prevents passage of flame through a fuel vent.

A flame arrestor for a fuel tank may be a specially designed fitting with flame arresting elements, such as screens, or the vent tubing may itself be effective. Air flows in both directions in the fuel tank vent. Outside air goes into the tank to equalize the pressure when gasoline is used in the engine and fuel vapor-laden air flows out of the tank through the vent when the tank is being filled. Ambient temperature changes also cause air flow in both directions. If the fuel vapor-laden air is ignited outside the fuel tank fittings or discharge point, the flame arrestor is to prevent the flame from being propagated through the fuel tank vent into the fuel tank.

If it is intended to qualify a vent system without especially designed fitting containing flame arresting elements, it is recommended that extreme caution be exercised to assure safe conduct of any qualifying test.

¹ 2011 for primer bulbs. Phase-in for OB under-cowl fuel lines, by length: 30% in 2010, 60% in 2011, 90% in 2012, 100% in 2015.
² Design standard
³ Fuel tanks installed in nontrailerable boats (≥ 26 ft. in length or >8.5 ft. in width) may meet a standard of 0.16 g/gal/day over an alternative test cycle.
⁴ The standard is effective July 31, 2011. For boats with installed fuel tanks, this standard is phased-in 50%/100% over the first two years. As an alternative, small manufacturers may participate in a diurnal allowance program.
IT’S THE LAW - USCG:

183.505 Definitions.

As used in this subpart:

Fuel system means the entire assembly of the fuel fill, vent, tank, and distribution components, including pumps, valves, strainers, carburetors and filters.

A traditional fuel system is diagrammed in Figure 2a. An EPA-compliant fuel system (Figure 2b) may contain more components, and may be of other materials as permitted under these conditions. Two or more engines in a boat will necessitate a more complicated system, which may include a number of fuel tanks with possible provisions for interconnection. Fuel transfer pumps may also be included in the fuel system.
FIGURE 2a  A Traditional Fuel System
FIGURE 2b An EPA Compliant Fuel System

Exploded view diagrams of the individual components are included in the Appendix.
IT’S THE LAW - USCG:

183.505 Definitions.

As used in this subpart:

Static floating position means the attitude in which the boat floats in calm water, with each fuel tank filled to its rated capacity, but with no person or item of portable equipment on board. This is to establish a standard measurement condition. It is not related to freeboard or other safety considerations, but is an attitude of the boat which can be obtained on a repeatable basis for use in testing certain criteria of the regulation. The requirements which will be checked with the boat in a “static floating position” are:

(1) Water accumulation on the top of the fuel tank (183.550)

(2) Anti-siphon protection (183.568)

(3) 5-ounce fuel leakage (183.558)

(4) Fuel fill overflow (183.564)

FIGURE 3 Static Floating Position
Examples of portable equipment:

- Mattresses
- Portable fire extinguishers, except brackets
- Lines
- Fenders
- Personal flotation devices
- Chairs
- Tables
- Anchors and chains

A boat builder should record what equipment the test sample has on board during the test in order that a compliance test may be conducted in the same manner.
IT’S THE LAW - USCG:

183.507 General.

Each fuel system component on a boat to which this subpart applies must meet the requirements of this subpart unless the component is part of an outboard engine or is part of portable equipment.

IT’S THE LAW – EPA:

1045.1 Does this part apply for my products?

(2) The requirements of this part related to evaporative emissions apply to fuel lines and fuel tanks used with marine engines that use a volatile liquid fuel (such as gasoline) as specified in 40 CFR part 1045.112. This includes fuel lines and fuel tanks used with auxiliary marine engines. This also includes portable marine fuel tanks and associated fuel lines.

The boat manufacturer, not the manufacturer of each component, is required to certify each boat as complying with this regulation. Component parts of outboard engines and portable equipment, such as a self-contained gasoline engine generator unit, are not covered by these USCG regulations. Outboard engines, their fuel systems, along with other spark-ignition marine engine systems are covered by the EPA regulations.

The Equipment Standards of this regulation appear to impose requirements, and consequently certification responsibilities, on component manufacturers including inboard engine manufacturers. This is not the case. The boat manufacturer is responsible under these regulations and must certify compliance. Purchase orders can stipulate that component manufacturers provide affidavits of compliance which a boat manufacturer may choose to recognize as supporting evidence in certifying the entire fuel system.
Equipment Standards

IT’S THE LAW- USCG:

183.510 Fuel tanks.

(a) Each fuel tank in a boat must have been tested by its manufacturer under Sec. 183.580 and not leak when subjected to the pressure marked on the tank label under Sec. 183.514(b) (5).

Each fuel tank must be tested to see if it leaks. This leakage test includes all fittings supplied as part of the tank.

TEST PRESSURE

The test pressure must be the greater of 3 Pounds per square inch gauge (psig) or 1-1/2 times the pressure created at the lowest point in the fuel system when the fill or vent line, whichever is lower in height, is filled to its top with fuel, as indicated in 183.542. A 3 psig test will cover installations whose height from the lowest point in the fuel system is 6.4 feet to the lower of the fill or vent. See Figure 5 for height covered by various pressures. These heights refer to a head of gasoline and take into account the one and one-half times the head. The determined pressure is the minimum pressure that must appear on the fuel tank label. For the test procedure, refer to 183.580. Normally, the test is conducted by the tank manufacturer who applies the tank label. The boat manufacturer is responsible for determining that this test has been performed on the tank, in addition to the fuel system pressure test required by 183.542. (See Figure 4)
FIGURE 4  Fuel Tank Pressure
FIGURE 5  Pressure versus Height
IT’S THE LAW - USCG:

183.510 Fuel tanks.

(b) Each fuel tank must not leak if subjected to the fire test under Sec. 183.590. Leakage is determined by the static pressure test under Sec. 183.580, except that the test pressure must be at least one-fourth PSIG.

Each fuel tank must be designed and constructed so that if selected to be fire tested according to one of the procedures of 183.590, it will not leak following the fire test when pressure tested to 0.25 pounds per square inch gauge (psig)) in accordance with the test procedure described in 183.580.

Selection for a fire test may be made by the USCG in order to conduct a compliance check. A manufacturer may also select a representative tank and subject it to a fire test in order to assure compliance. Note that 183.590 permits the subject tank to be tested for fire resistance in an actual or simulated hull section. This may be less a severe test for the tank.

TO COMPLY

The fuel tank will withstand at least one of the following fire tests:

Fire chamber test - 183.590 (a)(3), (b) & (c), or

Actual or simulated hull section - 183.590(a)(3), (b) & (e); or

The fuel tank does not leak following the fire test - see 183.510(b). For this test, the tank is only subjected to 0.25 psig.

IT’S THE LAW- USCG:

183.510 Fuel tanks.

(c) Each fuel tank of less than 25 gallons capacity must not leak if tested under Sec. 183.584.

Each fuel tank less than 25 gallons capacity must be designed and constructed so that if selected to be shock tested according to the procedures of 183.584, it will not leak following the shock test when pressure tested to the pressure marked on its label, using the procedure described in 183.580.
Tanks tested at 25g. vertical accelerations, between 6 and 14 milliseconds duration, may be installed anywhere in the boat. Tanks tested at 15g., between 6 and 14 milliseconds, must be marked according to 183.514(b)(8):

"MUST BE INSTALLED AFT OF THE BOAT'S HALF LENGTH"

**FIGURE 6 Fuel Tank Shock Test**

![Fuel Tank Shock Test Diagram]

**TO COMPLY**

The fuel tank's capacity is less than 25 gallons.

The fuel tank will withstand the shock of the test described in 183.584.

The fuel tank does not leak following the shock test. Use procedures described in 183.580. Use pressure marked on the tank label.
IT’S THE LAW - USCG:

183.510 Fuel tanks.

(d) Each fuel tank with a capacity of 25 to 199 gallons must not leak if tested under Sec.183.586.

Each fuel tank with a capacity of 25 to 199 gallons must be designed and constructed so that if selected to be pressure-impulse tested according to the procedures of 183.586, it will not leak. To determine if it leaks, it shall be pressure tested to the pressure marked on its label, using the procedure described in 183.580.

Selection of a tank for a pressure-impulse test may be made by the USCG in order to conduct a compliance check. A manufacturer may also select a representative tank and subject it to a pressure-impulse test in order to assure compliance. This test has proven to be quite effective in finding weak spots in the tanks. It has been found to be effective for plastic tanks.

TO COMPLY

The fuel tank's capacity is from 25 to 199 gallons.

The fuel tank will withstand the pressure-impulse test described in 183.586.

The fuel tank does not leak following the pressure-impulse test. Use procedures described in 183.580. Use pressure marked on tank label.

IT’S THE LAW - USCG:

183.510 Fuel tanks.

(e) Each fuel tank of 200 gallons capacity or more must not leak if tested under Secs. 183.586 and 183.588.

Each fuel tank with a capacity of 200 gallons or more must be designed and constructed so that it will not fail if subjected to both the pressure-impulse and slosh tests according to procedures of 183.586 and 183.588 respectively. It will not leak when pressure tested to the pressure marked on its label following the pressure-impulse test and the slosh test.

Selection of a tank for the pressure-impulse and slosh tests may be made by the USCG in order to conduct a compliance check. A manufacturer may also select a representative tank and subject it to the pressure-impulse and slosh tests in order to assure compliance.
TO COMPLY

The fuel tank's capacity is 200 or more gallons.

The fuel tank will withstand the pressure-impulse test described in 183.586. Be sure to pre-condition non-metallic tanks per 183.586(b).

The fuel tank does not leak following the pressure impulse test. Use procedures described in 183.580. Use pressure marked on tank label.

The fuel tank will withstand the slosh test described in 183.588.

The fuel tank does not leak following the slosh test. Use procedures described in 183.580. Use pressure marked on tank label.

IT’S THE LAW - EPA

§ 1060.520 How do I test fuel tanks for permeation emissions?

(f) Flow chart. The following figure presents a flow chart for the permeation testing described in this section:

TO COMPLY

Follow the testing procedure as outlined in the 1060 CFR part 520. This is generally carried out by an independent laboratory, however, it can be completed by the tank manufacturer.
IT’S THE LAW - USCG:

183.512 Fuel tanks: Prohibited materials.

(a) A fuel tank must not be constructed from terneplate.

Terneplate is a steel that has been coated with a lead-tin alloy. Since the lead-tin alloy is cathodic relative to steel, the steel, in the presence of an electrolyte such as salt water, can corrode galvanically, weakening the tank's structure.

Permanently installed terneplate fuel tanks are prohibited for use as fuel tanks on boats with inboard gasoline engines.

TO COMPLY

The fuel tank is constructed from a material other than terneplate.

IT’S THE LAW - USCG:

183.512 Fuel tanks: Prohibited materials.

(b) Unless it has an inorganic sacrificial galvanic coating on the inside and outside of the tank, a fuel tank must not be constructed of black iron or carbon steel.

An inorganic sacrificial galvanic coating is a treatment applied to steel that combines the steel base metal with a surface of another metal, such as zinc and aluminum, which are anodic to the base metal. Such materials are known as "hot-dipped galvanic steel" and "aluminized steel."

Organic materials may not be used. Organic materials include paints, resins, epoxy coatings, metallic paints, etc.

TO COMPLY

If the fuel tank is constructed of black iron or carbon steel:

Has it been hot-dipped galvanized inside and out?

Has it been constructed of aluminized steel?
IT’S THE LAW - USCG:

183.512 Fuel tanks: Prohibited materials.

(c) A fuel tank encased in cellular plastic or fiber reinforced plastic must not be constructed from a ferrous alloy.

A ferrous alloy is a metal containing the chemical element iron as one of its major components. Materials such as black iron, carbon steel, galvanized steel, aluminized steel, terneplate and stainless steel are all examples of ferrous alloys.

Cellular plastic (foam) and/or fiber-reinforced plastic (fiberglass) may not be used to coat or encase ferrous alloy tanks.

TO COMPLY

Is the tank constructed of a ferrous alloy?

If YES, it may not be encased in foam or fiberglass.

If NO, you may encase it with foam or fiberglass, so long as you comply with Section 183.552 which requires that water must not be held or trapped next to the metallic tank surfaces.
IT’S THE LAW - USCG:

183.514   Fuel tanks: Labels.

(a) Each fuel tank must have a label that meets the requirements of paragraphs (b) through (d) of this section.

FIGURE 7   Fuel Tank Label

TO COMPLY

Is there a label on the fuel tank?

While the law only requires that there be a label on the tank, the boat builder and tank builder should work together to ensure that the label will be visible for inspection after the tank has been installed.
IT’S THE LAW - USCG:

183.514 Fuel tanks: Labels.

(b) Each label required by paragraph (a) of this section must contain the following information:

(1) Fuel tank manufacturer's name (or logo) and address.

(2) Month (or lot number) and year of manufacture.

(3) Capacity in U.S. gallons.

(4) Material of construction.

(5) The pressure the tank is designed to withstand without leaking.

(6) Model number, if applicable.

(7) The statement, "This tank has been tested under 33 CFR 183.510 (a)."

(8) If the tank is tested under Sec. 183.584 at less than 25g vertical accelerations, the statement, "Must be installed aft of the boat's half-length."

IT’S THE LAW - EPA

§ 1060.135 How must I label and identify the engines and equipment I produce?

(5) Readily visible in the final installation. It may be under a hinged door or other readily opened cover. It may not be hidden by any cover attached with screws or any similar designs. Labels on marine vessels must be visible from the helm.

Is the label on the equipment visible from the helm?

Visible from the helm means the operator will have a direct line of sight when viewing the equipment through a readily accessible (no tools to open) panel or hatch. If not visible due to boat structure or other permanently installed equipment, a duplicate label should be applied to a fixed portion of the boat.
Figure 7A EPA and USCG Capacity Combined Label Example—Under 20 feet

**U.S. COAST GUARD**

**MAXIMUM CAPACITIES**

**XX PERSONS OR XXX LBS**

**YELLOW**

**XXX LBS PERSONS, MOTORS, GEAR**

**XXX H.P. MOTOR**

**THIS BOAT COMPLIES WITH U.S. COAST GUARD SAFETY STANDARDS IN EFFECT ON THE DATE OF CERTIFICATION**

**MEETS U.S. EPA EVAP STANDARDS USING CERTIFIED COMPONENTS**

**MANUFACTURER:** XYZ BOATS

**MODEL:** 183 MANATEE ANnapolis, MD

Figure 7B EPA and USCG Compliance Label Example—20 feet and over

**YACHT CERTIFICATION**

**THIS BOAT COMPLIES WITH U.S. COAST GUARD SAFETY STANDARDS IN EFFECT ON THE DATE OF CERTIFICATION**

**MEETS U.S. EPA EVAP STANDARDS USING CERTIFIED COMPONENTS**

**XYZ BOATS** ANNAPolis, MD
§ 1060.137  How must I label and identify the fuel-system components I produce?

(1) All fuel tanks, except for metal fuel tanks that are deemed certified under §1060.103(f).

(b) Label your certified fuel-system components at the time of manufacture. The label must be—

(1) Attached so it is not removable without being destroyed or defaced. This may involve printing directly on the product. For molded products, you may use the mold to apply the label.

(2) Durable and readable for the equipment's entire life.

(3) Written in English.

(c) Except as specified in paragraph (d) of this section, you must create the label specified in paragraph (b) of this section as follows:

(1) Include your corporate name. You may identify another company instead of yours if you comply with the provisions of §1054.640.

(2) Include EPA's standardized designation for the emission family.

(3) State: “EPA COMPLIANT”.

(4) Fuel tank labels must identify the FEL, if applicable.

(i) Identify the applicable numerical emission standard (such as 15 g/m² /day).

(ii) Identify the applicable emission standards using EPA classifications (such as EPA Nonroad Fuel Lines).

(iii) Identify the applicable industry standard specification (such as SAE J30 R12).
FIGURE 8  Fuel Tank Label

xyz tanks

<table>
<thead>
<tr>
<th>CITY = STATE = ZIP CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MORT/LT NO.</td>
</tr>
<tr>
<td>CAPACITY</td>
</tr>
<tr>
<td>OTHER</td>
</tr>
</tbody>
</table>

TO COMPLY

Does the fuel tank label have all the following information?

- Update with EPA FEL, if applicable
  - Numerical emission standard \((15\text{g/m}^2\text{day})\)
  - Or
  - Applicable emission standard
  - Or SAE/UL spec
  - “EPA COMPLIANT”
  - Manufacturer's name or logo
  - Manufacturer's address
  - Month or lot number
  - Year of manufacture
  - Capacity in U.S. gallons
  - Material of construction
  - Maximum test pressure
  - The statement "This tank has been tested under 33 CFR 183.510(a)" if applicable:
    - Model number

- The statement "Must be installed aft of the boat's half-length," if applicable.
IT’S THE LAW - USCG:

183.514 Fuel tanks: Labels.

(c) Each letter and number on a label must:

(1) Be at least 1/16 inch high and

(2) Contrast with the basic color of the label or be embossed on the label.

The minimum letter and number size has been established at one-sixteenth inch in height for the required information. Additional information may be displayed in smaller lettering. This is equivalent to 8 point upper case (capitals) lettering in printer’s terminology.

THIS IS A SAMPLE OF 8 POINT LETTERING

Dark colored letters on a light colored background or light colored letters on a dark colored background will be easier to read. For example, black letters on a white or yellow background, or white letters on a black, blue or red background may be used to satisfy the contrast requirement.

Raised letters that are stamped into the label are also permitted. Embossing, debossing, stamping, engraving, molding and etching are examples of ways to raise or lower the lettering from the background surface of the label. Care must be taken not to damage the tank if the label is embossed while attached to the tank.

TO COMPLY

Are all letters and numbers eight point type or larger?

Do all letters and numbers contrast in color or texture with the background of the label?
IT’S THE LAW –USCG:

183.514 Fuel tanks: Labels.
(d) Each label must:

(1) Withstand the combined effects of exposure to water, oil, salt spray, direct sunlight, heat, cold, and wear expected in the normal operation of the boat, without loss of legibility; and

(2) Resist efforts to remove or alter the information on the label without leaving some obvious sign of such efforts.

IT’S THE LAW –EPA:

1060.137
(b) Label your certified fuel-system components at the time of manufacture. The label must be—

(1) Attached so it is not removable without being destroyed or defaced. This may involve printing directly on the product. For molded products, you may use the mold to apply the label.

(2) Durable and readable for the equipment's intended life.

Labels are required to be durable so they may be used to identify a fuel tank and provide the information required in 183.514(b) and 1060.137. Labels should be used that have demonstrated durability, either by experience in service or by test, considering all the listed exposure items.

Labels shall be designed, manufactured or installed so that any effort to remove or change the information thereon is apparent. Some pressure sensitive labels will self-destruct upon removal. Printed labels that have raised letters make it difficult to alter information.

Correct application of the label, particularly the pressure sensitive type, is important. Many types of labels will tend to curl up at their edges unless they are applied correctly. The backing should be peeled off of the label, keeping the label flat, instead of the other way around. See Figure 9. Labels should be legible for the equipment’s intended life: 10 years.
FIGURE 9 Pressure Sensitive Label

TO COMPLY

Will the label withstand exposure to:

- Water
- Oil
- Salt spray
- Direct Sunlight
- Heat
- Cold
- Wear

Will the label show signs of efforts to:

- Remove data
- Alter data
IT’S THE LAW - USCG:

183.516 Cellular plastic used to encase fuel tanks.

(a) Cellular plastic used to encase fuel tanks must:

(1) Not change volume by more than five percent or dissolve after being immersed in any of the following liquids for 24 hours at 29 deg.C.:
   (i) Reference fuel B ASTM D-471.
   (ii) No. 2 reference oil of ASTM D-471.
   (iii) Five percent solution of trisodium phosphate in water; and

(2) Not absorb more than 0.12 pound of water per square foot of cut surface, measured under Military Specification MIL P-21929B.

(b) Non-polyurethane cellular plastic used to encase fuel tanks must have a compressive strength of at least 60 pounds per square inch at ten percent deflection measured under ASTM D-1621, "Compressive Strength of Rigid Cellular Plastics".

(c) Polyurethane cellular plastic used to encase metallic fuel tanks must have a density of at least 2.0 pounds per cubic foot, measured under ASTM D-1622, "Apparent Density of Rigid Cellular Plastics."

If cellular plastic (foam) is to be used to encase a metallic fuel tank, it must as a minimum comply with the properties and tests specified in the regulation.

If the foam used for encasing a metallic fuel tank is to be counted as part of the flotation required for boats under 20 feet in length by 33 CFR 183 Subpart F, it may be required to comply with additional properties and tests as follows:

* If the foam is in the engine compartment and low in the bilge it must be resistant to gasoline and oil, and must not absorb water.

   a. If the encasing foam is:

      (1) in the engine compartment, and

      (2) BELOW a height of 12 inches above the lowest point where liquid can collect in that compartment
then, the foam must not lose more than five percent of its buoyancy or dissolve after being immersed in any of the following liquids for 30 DAYS (instead of 24 hours) at 23°C (80°F):

   (1) Reference fuel B of ASTM D-471

   (2) No. 2 reference oil of ASTM D-471

   (3) Five percent solution of trisodium phosphate in water.

* If the foam is high in the engine compartment it must be resistant to gasoline vapors.

b. If the encasing foam is:

   (1) in the engine compartment, and

   (2) ABOVE a height of 12 inches above the lowest point where liquid can collect in that compartment

then, the foam must not lose more than five percent of its buoyancy or dissolve after being immersed in a fully saturated gasoline vapor atmosphere for 30 DAYS at 38°C (100°F).

* If the foam is not in the engine compartment but is low in the bilge of the boat it must still have some resistance to gasoline and bilge cleaners.

c. If the encasing foam is:

   (1) outside the engine compartment, and

   (2) below a height of 4 inches above the lowest point where liquid can collect in that compartment

then, the foam must not lose more than five percent of its buoyancy or dissolve after being immersed in any of the following liquids for 24 hours at 23°C (80°F).

   (1) Reference fuel B of ASTM D-471

   (2) Number 2 reference oil of ASTM D-471

   (3) Five percent solution of trisodium phosphate in water.

Suppliers of foam should advise buyers if their products comply with these specifications.

**NOTE: The 4- and 12-inch heights are measured when the boat is in the static floating position. Refer to 183.505.**
### TABLE II - Foam Requirements If Used For Both Fuel Tank Encasement And Flotation

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>24-HOUR IMMERSION</th>
<th>30-DAY IMMERSION</th>
<th>WATER ABSORPTION</th>
<th>COMPRESSIVE STRENGTH OR DENSITY</th>
<th>SATURATED GASOLINE VAPOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Compartment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 12” height</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Above 12’ height</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

| Outside Engine Compartment|                   |                  |                  |                                 |                          |
| Below 4” height           | X                 | X                | X                | X                               | X                        |
| Above 4” height           | X                 | X                |                 |                                 |                          |

A boat builder may choose to accept a foam supplier’s certification to these requirements. Alternatively, these tests can be performed by the boat builder or a laboratory. There is special equipment involved and careful measurements required in accordance with laboratory techniques. It is recommended that all referenced standards and specifications be obtained and that the tests be performed in accordance with the detailed instructions contained therein.

Regardless of who performs the tests, the boat builder is responsible for compliance.

**TO COMPLY**

Foam meets the applicable chemical immersion requirements.

Foam meets the water absorption requirements.

Non-polyurethane foam meets the compressive strength requirement (60 pounds per square inch at 10 percent deflection).

Polyurethane foam meets the density requirement (2.0 pounds per cubic foot minimum).
IT’S THE LAW - USCG:

183.518 Fuel tank openings.
Each opening into the fuel tank must be at or above the topmost surface of the tank.

Fuel tank openings refer to holes into which fittings may be installed or fuel lines attached. Fuel tank fill, fuel tank vent, fuel distribution, fuel tank sounding, and fuel level sender fitting accesses are examples of such openings. If the attachment fitting is welded or attached by other non-removable means to the fuel tank, the opening is considered at the top of the attachment. The sketches below clarify this interpretation.
FIGURE 10  Fuel Tank Openings

TO COMPLY

Are all openings at or above the topmost surface of the tank?
IT’S THE LAW - USCG:

183.520 Fuel tank vent systems.

(a) Each fuel tank must have a vent system that prevents pressure in the fuel tank from exceeding 80 percent of the pressure marked on the tank label under Sec.183.514(b) (5).

Pressure build-up can occur in a fuel tank due to temperature changes and during filling. The fuel tank vent system must be designed and installed to prevent the pressure build-up from exceeding 80 percent of the pressure marked on the tank label.

Unless there is trapped liquid or a clogged vent, temperature changes should not cause pressure problems. Filling a fuel tank at the normal rate of liquid flow (9 to 12 gallons per minute) found with most fuel dispensing pumps (some may put out more), might present a problem if too small a vent line is selected or if there are restrictions in the line. Blow-back through the fill opening will occur if the vent system is plugged. It has been generally found that a 9/16 inch inside diameter vent line with not less than 7/16 inch inside diameter fittings, provides sufficient flow capability to allow the fuel tank to breathe without excessive pressure build-up. It must be emphasized that vent lines be installed so that there are no potential liquid traps.

TO COMPLY

Does the vent prevent fuel tank build-up from exceeding 80 percent of the pressure marked on the label?
IT’S THE LAW - USCG:

183.520 Fuel tank vent systems.

(b) Each vent must

(1) Have a flame arrestor that can be cleaned unless the vent itself is a flame arrestor; and

(2) Not allow a fuel overflow at the rate of up to two gallons per minute to enter the boat.

Fuel tank vent flame arrestors must be able to be cleaned so they will not adversely restrict the breathing of a fuel tank. Flying particles, debris and salts from sea spray can attach to flame arrestor elements. There must be some means to free the arrestor from this contamination. Access to the arrestor may be from outside or inside the boat as long as it can be accomplished in a normal servicing manner. Removal of the vent fitting is also acceptable.

It is possible that a fuel tank vent system itself may perform the function of a flame arrestor. The diameter and length of the vent tubing and its routing are considerations in designing a fuel tank vent system that is itself a flame arrestor. There are no recommendations of proper diameters and lengths at this time. The burden of proof as to whether or not a fuel tank vent system performs is the boat manufacturer's.

The fuel tank vent outlet fitting must be located so that overflowing fuel coming out of the vent at a rate of up to 2 gallons per minute will not enter the boat. This requirement may involve deck design, cockpit coaming design, air vent location, hawsehole design for underdeck cleating of lines and any other opening where fuel would overflow into the boat.

Deck joints in riveted metal decks, or wooden decks, could provide a path for fuel to flow to the boat's interior unless they are caulked to resist such fuel leakage.

TO COMPLY

If the vent has a flame arrestor, can it be cleaned?

Does the fuel tank vent system prevent overflow of up to 2 gallons per minute from getting into the boat?
A diaphragm pump is the usual type of fuel pump found on marine engines. This requirement calls for means to prevent fuel from leaking into the interior of the boat or into the bilge if the main diaphragm fails. Some means presently used to accomplish this are:

1. A second diaphragm with a means of identifying failure of the primary diaphragm, such as a sight glass bowl, and
2. A sealed fuel pump hosing connected to the crankcase or equipped with a stripper tube connected to the carburetor.

Automotive fuel pumps are vented. In a vehicle, fuel leaking from a ruptured diaphragm falls harmlessly on the ground; in a boat, this type of pump would allow leaking fuel to accumulate in the bilge.

FIGURE 11  Fuel Pumps, Diaphragm Type

TO COMPLY

Is there a provision to prevent fuel leakage if the primary diaphragm of a fuel pump fails?
IT’S THE LAW - USCG:

<table>
<thead>
<tr>
<th>183.524</th>
<th>Fuel pumps.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) Each electrically operated fuel pump must not operate except when the engine is operating or when the engine is started.</td>
<td></td>
</tr>
</tbody>
</table>

Electric fuel pumps are not permitted to be operable except:

1. during the engine starting procedure, and
2. while the engine itself is operating.

This requirement does not apply to electric fuel pumps used to transfer fuel between tanks.

Compliance is typically achieved as follows:

1. wire the electric fuel pump to operate only when the starter is operating, and
2. by means of an oil pressure switch, only allow the pump to operate only as long as the engine is running.
FIGURE 12  Wiring Diagram For Electric Fuel Pump

TO COMPLY

Is the fuel pump unable to operate when ignition switch is turned on?

Is the fuel pump unable to operate after engine stops with ignition switch turned on?
IT’S THE LAW - USCG:

<table>
<thead>
<tr>
<th>183.524 Fuel pumps.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c) If tested under Sec. 183.590 each fuel pump, as installed in the boat, must not leak more than five ounces of fuel in 2-1/2 minutes, inclusive of leaks from fuel line, fuel filter and strainer.</td>
</tr>
</tbody>
</table>

Fuel pumps must be able to withstand the 2-1/2 minute fire test as described in 183.590 of this regulation. The fuel pump may be tested separately in a fire chamber or as installed on the engine. If a fuel pump can be mounted either on the engine or remotely such as an electrically operated fuel pump, it may be tested according to where it is located in a specific installation. For example:

(1) If the electric fuel pump is to be mounted on an engine, it may be fire tested on an engine.

(2) If it is to be mounted remote from the engine, but in compliance with 183.566 (within 12 inches of the engine), it may be fire tested with the engine, providing the fire pan under the engine includes the fuel pump.

(3) If it is to be mounted remote from the engine, such as a fuel transfer pump, it must be tested in a fire chamber as a separate component.

(4) A fuel pump may be qualified for installation in any permitted location by conducting the fire test in a fire chamber.

Following the fire test, the fuel pump will be subjected to a 3-foot head of fuel in order to determine if it exceeds the permitted 5 ounces leakage of fuel in 2-1/2 minutes. While the fire test is usually performed by the pump manufacturer, the boat builder must remember that leakage from an associated fuel filter or strainer must be included. The content of an engine-mounted fuel line from the fuel pump to the carburetor must be added, if it will drain through the pump.
FIGURE 13 Fuel Pump Leakage Test

(1) FILL THE SYSTEM WITH BOTH VALVES OPEN TO BLEED ALL THE AIR OUT OF THE TEST SET UP.
(2) CLOSE THE LINE BLEEDING VALVE AND TOP OFF THE STANDPIPE WITH FUEL.
(3) EXAMINE THE FUEL PUMP FOR LEAKAGE.

TO COMPLY

Will the fuel pump withstand a fire test as specified in 183.590, without leaking more than five ounces of fuel in 2-1/2 minutes?

You must also consider how much fuel will drain out of your fuel filter and hoses.
IT’S THE LAW - USCG:

183.526 Carburetors.

(b) Each carburetor must not leak more than five cubic centimeters of fuel in 30 seconds when:

(1) The float valve is open;

(2) The carburetor is at half throttle; and

(3) The engine is cranked without starting; or

(4) The fuel pump is delivering the maximum pressure specified by its manufacturer.

There are two leakage tests for carburetors to satisfy the intent of 183.526(b). This test relates to 183.526(b)(1), (2), and (3).

This test is performed by the marine engine manufacturer and the carburetor manufacturer. Additional information and requirements for marine fuel metering devices may be found in SAE J1223 Marine Carburetors and Throttle Body Injection. Fuel injection is now prevalent in marine engines. The regulations specifically addresses carburetors, as fuel injection was not commonly available in the mid-1970s when the regulation was written. This test is to confirm the integrity of the fuel metering equipment and is conducted as follows:

(1) the float valve is free to operate normally

(2) the throttle is in the half open position.

Crank the engine without starting for 30 seconds. During this period there shall be no more than 5 cc observed gasoline flow coming from the carburetor fuel bowl, vent port or any other place on the exterior of the carburetor. This test includes only external flow, not fuel flowing down the throat of a downdraft carburetor.

NOTE: A more detailed description of the test is available in the United States Coast Guard Compliance Test Procedures - Fuel Systems Standards, Leak - Test of Carburetors. Copies of this standard are available from the National Technical Information Service, Springfield, VA 22161 or through their web site (www.ntis.gov).
TO COMPLY

With the float free and the throttle half open, the carburetor will not leak more than 5 cc of fuel in 30 seconds while the fuel pump is delivering fuel, at the engine cranking pressure.

This is the second leakage test for carburetors to satisfy the intent of 183.526(b). The test described on this page relates to 183.526(b)(4).

This test is to confirm the integrity of the float valve with a remote fuel pump and is conducted as follows:

(1) the float valve is free to operate normally

(2) the throttle is in the fully closed position.

Connect the fuel pump with the largest pressure intended for use with the carburetor and run it for 30 seconds. During this period there shall be no more than 5 cc observed gasoline flow coming from the carburetor fuel bowl, vent port or any other place on the exterior of the carburetor. This test includes only external flow, not fuel flowing down the throat of a downdraft carburetor.

NOTE: A more detailed description of the test is available in the United States Coast Guard Compliance Test Procedures - Fuel Systems Standards, Leak - Test of Carburetors. Copies of this standard are available from the National Technical Information Service, Springfield, VA 22161 or through their web site (www.ntis.gov).

TO COMPLY

With the float valve open and the throttle half open, the carburetor will not leak more than 5 cc of fuel in 30 seconds while the engine is cranked without starting.
IT’S THE LAW - USCG:

183.526 Carburetors.

(c) Each updraft and horizontal draft carburetor must have a device that:

(1) Collects and holds fuel that flows out of the carburetor venturi section toward the air intake;

(2) Prevents collected fuel from being carried out of the carburetor assembly by the shock wave of a backfire or by reverse air flow; and,

(3) Returns collected fuel to the engine induction system after the engine starts.

Marine engines today use downdraft carburetors; however, if an engine uses an updraft or a horizontal draft carburetor, then it must be fitted with a means to collect fuel from flooding and return it to the engine so it will be consumed. Some auxiliary generators and some small propulsion engines have updraft or horizontal draft carburetors.

The collector for the fuel must be capable of holding or delivering to the engine a quantity of fuel that collects during 12 ten-second periods of cranking without external leakage from the air inlet or dripping of liquid fuel from joints in the air inlet components. The collector and carburetor must be designed so that fuel will run into the collector rapidly to prevent fuel collection in the carburetor horn where it can be expelled during a backfire or "spit-back."

The collector must be fitted with a stripping means to return the collected fuel to the engine for combustion. Typically, this stripper is a tube connected to the throat of the carburetor so the manifold vacuum will pull the fuel out of the collector.
TO COMPLY

If you have an updraft or horizontal draft carburetor, is it equipped with a means to collect fuel?

Also, is there a means to return the fuel to the engine for combustion?
**IT’S THE LAW - USCG:**

<table>
<thead>
<tr>
<th>Regulation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>183.528</td>
<td>Fuel stop valves.</td>
</tr>
</tbody>
</table>

(a) Each electrically operated fuel stop valve in a fuel line between the fuel tank and the engine must:

1. Open electrically when the ignition switch is on; and
2. Operate manually.

If an electrically operated fuel stop valve is in the fuel system, it must be wired to the ignition switch so it will open only when the ignition switch is on. It must also have a means to manually open the valve in the event of loss of electricity. This is often a slot for a screwdriver to turn the valve.

**FIGURE 15  Electrically Operated Fuel Stop Valve**

---

**TO COMPLY**

If you use an electrically operated fuel stop valve:

Does it open only when the ignition switch is on?

Can it be operated manually?
IT’S THE LAW - USCG:

183.528 Fuel stop valves.

(b) If tested in accordance with the fire test under Sec. 183.590, a fuel stop valve installed in a fuel line system requiring metallic fuel lines or "USCG Type A1" hose must not leak fuel.

All fuel stop valves installed in metallic fuel lines or Type A1 hose, whether they are of the manual type or electrically operated and equipped with the required means for manual operation, must withstand the 2-1/2 minute fire test. Fuel stop valves must be tested in a fire chamber described in 183.590(c) regardless of where they are installed.

After the fire test there shall be no leakage of fuel when subjected to the head as installed or a 36-inch head of fuel applied on the inlet side of the valve. Internal leakage such as could be expected with a soft seat type would not be considered leakage as long as it remained inside the fuel system.

Fuel stop valves installed in systems permitted to use USCG Type B hose need not be fire resistant.

FIGURE 16 Leakage Test For Valves
TO COMPLY

Will the fuel stop valves, electric or manual, withstand the fire test in 183.590 conducted in a fire chamber, without external leakage?

IT’S THE LAW - USCG:

183.530 Spud, pipe, and hose fitting configuration.

Except when used for a tank fill line, each spud, pipe, or hose fitting used with hose clamps must have:

(a) A bead;

(b) A flare; or

(c) A series of annular grooves or serrations no less than 0.015 inches deep, except a continuous helical thread, knurl, or groove.

Fittings (spud, pipe and hose barb are examples) require some treatment of their surface in order to be acceptable for use with hose and hose clamps.

The regulation prohibits continuous helical threads (pipe threads), knurls or grooves which can provide a path for fuel leakage. Depicted are a number of acceptable types and some of those that are not acceptable.

FIGURE 17 Spud, Pipe and Hose Fittings
TO COMPLY

Do all fittings used with hose and hose clamps have the proper configuration for hose attachment?

IT’S THE LAW - USCG:

<table>
<thead>
<tr>
<th>183.532</th>
<th>Clips, straps, and hose clamps.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>Each clip, strap, and hose clamp must:</td>
</tr>
<tr>
<td>(1)</td>
<td>Be made from a corrosion resistant material; and</td>
</tr>
<tr>
<td>(2)</td>
<td>Not cut or abrade the fuel line.</td>
</tr>
</tbody>
</table>

A clip, strap, or hose clamp used anywhere in the fuel system must resist corrosion. The surfaces in contact with the fuel line must be smooth and their edges such that there will be no cutting or wearing of the fuel line.

It is recognized that all materials are corrosion resistant to a degree; however, the intent is to accept all stainless steel, plated steel, plastic coated steel, plastics and non-ferrous metals as suitable materials for clips, straps, and hose clamps.

TO COMPLY

Clips, straps, and hose clamps:

Are made of corrosion resistant material as defined above?

Will not cut or abrade the fuel line?
IT’S THE LAW - USCG:

183.532 Clips, straps, and hose clamps.

(b) If tested in accordance with the fire test under Sec. 183.590, a hose clamp installed on fuel line system requiring metallic fuel lines or "USCG Type A1" hose must not separate under a one-pound tensile force.

Hose clamps used to connect fuel lines in the fuel system, except stated below, must withstand a 2-1/2 minute fire test conducted in a fire chamber as described in 183.590(c). Tie straps, straps and clips used for support and bundling are not included in this requirement. Only nonmetallic clamps need to be tested, since all stainless steel clamps can easily pass this test.

At the end of the 2-1/2 minute fire test, the hose clamp must withstand a 1-pound force.

Clips, straps, and hose clamps used on systems permitted to use "USCG Type B" hose need not be fire resistant.

FIGURE 18 Hose Clamp Tensile Test

TO COMPLY

Will hose clamps withstand a 1-pound tensile force after 2-1/2 minute fire test per 183.590?
IT’S THE LAW - USCG:

183.534 Fuel filters and strainers.

If tested under Sec. 183.590, each fuel filter and strainer, as installed in the boat, must not leak more than five ounces of fuel in 2-1/2 minutes inclusive of leaks from the fuel pump and fuel line.

Fuel filters, strainers, and their connections must withstand a 2-1/2 minute fire test conducted as described in 183.590. The fire test may be performed on an engine for filters and strainers designed to be engine-mounted or may be performed in a fire chamber to qualify a filter or strainer to be mounted anywhere in the fuel system.

After the fire test, the filter or strainer is to be subjected to a 3-foot head of fuel to determine its rate of leakage. Acceptable leakage is up to 5 ounces of fuel in 2-1/2 minutes, but must include leakage from an associated fuel pump and fuel line. Internal leakage, destruction of straining or filtering elements, and impairment of function are acceptable.

FIGURE 19 Leakage Test For Fuel Filters And Strainers
TO COMPLY

Each fuel filter, strainer and its connections will not leak more than 5 ounces of fuel in 2-1/2 minutes after the fire test in 183.590.

IT’S THE LAW - USCG:

<table>
<thead>
<tr>
<th>183.536</th>
<th>Seals and gaskets in fuel filters and strainers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b)</td>
<td>Each gasket and each sealed joint in a fuel filter and strainer must not leak when subjected for 24 hours to a gasoline that has at least 50 percent aromatic content at the test pressure marked on the fuel tank label.</td>
</tr>
</tbody>
</table>

Fuel is made up of basic petroleum products in various quantities or concentrations. Depending on the amount of these components, fuel may have varying effects on the materials used for gaskets and seals. Fuels with high aromatic content have been found to damage fuel system components such as gaskets, seals, hoses and other usually non-metallic items.

To test gaskets and seals, it is required to subject samples to gasoline with at least a 50 percent aromatic content for a period of 24 hours. The described fuel is to be placed in the filter or strainer at a minimum head of 3-feet. After the 24-hour period, there shall be no leakage external to the tested unit.

FIGURE 20 Seals And Gaskets Leakage Test

NOTE: The bleed valve may be omitted if the outlet line terminates at the same height as the standpipe.
TO COMPLY

There is no leakage due to gasket or seal deterioration when tested to 183.536(b).

IT’S THE LAW - USCG:

<table>
<thead>
<tr>
<th>183.538</th>
<th>Metallic fuel line materials.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each metallic fuel line connecting the fuel tank with the fuel inlet connection on the engine must:</td>
<td></td>
</tr>
<tr>
<td>(a) be made of seamless annealed copper, nickel copper, or copper nickel; and</td>
<td></td>
</tr>
<tr>
<td>(b) except for corrugated flexible fuel line, have a minimum wall thickness of 0.029 inches.</td>
<td></td>
</tr>
</tbody>
</table>

If metal is used for any portion of the fuel line (except for fittings) from the tank connection to the engine connection (usually at the fuel pump), the metallic fuel line portions must be seamless, annealed:

(1) Copper;

(2) Nickel copper (Monel); or

(3) Copper-nickel.

No other metals are permitted.

Also, the thickness of the tubing wall must be at least 0.029 inches unless the fuel line portion is a corrugated or accordion type of flexible fuel line. Tubing is available with thinner wall thicknesses, but they SHALL NOT be used.

Metal fuel lines used on the engine, i.e. the fuel line from the fuel pump to the carburetor, may be made of materials other than those listed. This line is usually supplied with the engine.

TO COMPLY

Are metallic fuel lines made of seamless annealed:

Copper;

Nickel copper; or

Copper-nickel?

Is the thickness of the fuel line tube wall at least 0.029 inches?
IT’S THE LAW -USCG:

183.540  Hoses: Standards and markings.

(a) "USCG Type A1" hose means hose that meets the performance requirements of:

    (1) SAE Standard J1527DEC85, Class 1 and the fire test in Sec.183.590; or

    (2) Underwriters’ Laboratories, Inc. (UL) Standard 1114.

(b) "USCG Type A2" hose means hose that meets the performance requirements of
    SAE Standard J1527DEC85, Class 2 and the fire test in Sec 183.590;

(c) "USCG Type B1" hose means hose that meets the performance requirements of
    SAE Standard J1527DEC85, Class 1.

(d) "USCG Type B2" hose means hose that meets the performance requirements of
    SAE Standard J1527DEC85 Class 2.

NOTE:

SAE Class 1 hose has a permeation rating of 100 grams or less fuel loss per square
meter of interior surface in 24 hours.

SAE Class 2 hose has a permeation rating of 300 grams or less fuel loss per square
meter of interior surface in 24 hours.

The permeation rating of the hose refers to the quantity of fuel which will pass through the walls
of the hose out into the boat when the hose is filled with fuel. You could think of this as a slow
leak. Fortunately, the fuel vapors formed by this low level of permeation are readily dissipated by
the ventilation system.

The USCG safety ratings do not meet the EPA requirements for fuel line permeation, which shall
be less than 15g/m^2/day when tested according to SAE J1527 FEB 2011. EPA-compliant fuel
hose is labeled A1-15 or B1-15 showing the A or B fire rating and the permeation at 15 g/m/day.
The 100 or 200 g/m^2/day hose types may not be available in the future, so traditional systems
may use the EPA-compliant hose during replacement by default.

You may use EPA USCG Type A1-15 hose for any application. In some cases, you may find the
difference in price between A1, A2, B1, and B2 does not justify stocking all four types.
IT’S THE LAW - USCG:

183.540 Hoses: Standards and markings.

(e) Each "USCG Type A1," "USCG Type A2," "USCG Type B1," and "USCG Type B2" hose must be identified by the manufacturer by a marking on the hose.

(f) Each marking must contain the following information in English:

1. The statement "USCG Type (insert A1, A2, B1, or B2)."
2. The year in which the hose was manufactured.
3. The manufacturer's name or registered trademark.

(g) Each character must be block capital letters and numerals that are at least one-eighth inch high.

(h) Each marking must be permanent, legible, and on the outside of the hose at intervals of 12 inches or less.

IT’S THE LAW – EPA:

§ 1060.137 How must I label and identify the fuel-system components I produce?

b) Label your certified fuel-system components at the time of manufacture. The label must be—

1. Attached so it is not removable without being destroyed or defaced. This may involve printing directly on the product. For molded products, you may use the mold to apply the label.
2. Durable and readable for the equipment's entire life.
3. Written in English.

(c) Except as specified in paragraph (d) of this section, you must create the label specified in paragraph (b) of this section as follows:

1. Include your corporate name. You may identify another company instead of yours if you comply with the provisions of §1054.640.
2. Include EPA's standardized designation for the emission family.
3. State: “EPA COMPLIANT”.
(4) Fuel tank labels must identify the FEL, if applicable.

(5) Fuel line labels must identify the applicable permeation level. This may involve any of the following approaches:

(i) Identify the applicable numerical emission standard (such as 15 g/m²/day).

(ii) Identify the applicable emission standards using EPA classifications (such as EPA Nonroad Fuel Lines).

(iii) Identify the applicable industry standard specification (such as SAE J30 R12).

(6) Fuel line labels must be continuous, with no more than 12 inches before repeating. We will consider labels to be continuous if the space between repeating segments is no longer than that of the repeated information. You may add a continuous stripe or other pattern to help identify the particular type or grade of your products.

(d) You may create an abbreviated label for your components. Such a label may rely on codes to identify the component. The code must at a minimum identify the certification status, your corporate name, and the emission family. For example, XYZ Manufacturing may label its fuel lines as “EPA–XYZ–A15” to designate that their “A15” family was certified to meet EPA's 15 g/m²/day standard. If you do this, you must describe the abbreviated label in your application for certification and identify all the associated information specified in paragraph (e) of this section.

(e) You may ask us to approve modified labeling requirements in this section as described in §1060.135(e).

The use of a fire sleeve does not automatically qualify a hose as "USCG Type A." Hose and sleeve must be property matched. Hose and sleeve suppliers should be consulted to obtain a certification that the hose-sleeve combination will qualify as "USCG Type A."

All lettering, numerals, and trademarks used on hose must be at least one-eighth inch high. Markings must be permanent, legible and on the outside of the hose. Hose markings must be repeated along the length of the hose so there is a complete marking within every 12-inch section of the hose. Short pieces of hose which do not show the complete label are permitted to be used, provided it is shown that the longer pieces of the same hose and the inventory of hose comply.
Merging these standards, the fuel hose installed outside an engine compartment from hose manufacturer XYZ may have a label as follows:

“XYZ EPA USCG TYPE B1-15 2011”

Is the hose marked?

Does the marking contain all the following?

1. EPA & USCG
2. Type A1-15 or B1-15
3. Year of hose manufacture
4. Manufacturer's name or trademark
5. Permeation rating
   a. 15 g/m²/day (A1-15 or B1-15)
   b. SAE J 1527 Feb2011
   or
   c. Applicable EPA Classification (Marine non-metal fuel line)
Are all the letters and numerals at least one-eighth inch high?

and

(1) Are the markings permanent?
(2) Legible?
(3) In the English language?
(4) On the outside of the hose?

Are the marking intervals on the hose 12-inches or less? Hose sections less than 12 inches in length may be tagged with required information.

**IT’S THE LAW - USCG:**

<table>
<thead>
<tr>
<th>183.542</th>
<th>Fuel systems</th>
</tr>
</thead>
</table>

(a) Each fuel system in a boat must have been tested by the boat manufacturer and not leak when subjected to the greater of the following pressures:

(1) Three pounds per square inch; or

(2) One and one-half times the pressure created in the lowest part of the fuel system when it is filled to the level of overflow with fuel.

(b) The test pressure shall be obtained with air or inert gas.

The entire fuel system up to the engine fuel inlet, as installed in a boat, must be pressure tested by the boat manufacturer prior to the boat being sold to a customer. The entire fuel system includes:

- Fuel fill(s)
- Fuel Cap(s)
- Fuel vent(s)
- Carbon canister(s) –if installed
- ullage tank(s) –if installed

Note on ullage tanks – these are expansion spaces installed in the vent system when the fuel tank may not have enough air space to ensure that emission control and other critical components are not affected by fuel expansion due to the normal heating/cooling cycles of the day. These tanks must meet all of the installation requirements of vent hose (e.g. must meet the fire test if installed in a gasoline engine space).

- Fuel tank(s)
- Fuel distribution(s)
• All components and accessories in fuel distribution lines, to the attachment point on the engine. The attachment point may be a fuel filter, fuel pump or carburetor, depending on what components are supplied with, and mounted on the engine.

Each boat manufactured must be tested as part of the certification of compliance with this Federal regulation. Record the date and name of the person who performed that test.

**TO COMPLY**

The entire fuel system, up to the engine fuel inlet, has been pressure tested to 3 psig or 1-1/2 times the head whichever is the greater pressure.

There is no leakage.
Manufacturer Requirements

IT’S THE LAW - USCG:

183.550 Fuel tanks: Installation

(a) Each fuel tank must not be integral with any boat structure or mounted on an engine

Each fuel tank intended to be permanently installed, must be made as a separate component and then installed in the boat. Portions of a boat’s structure, i.e. hull surfaces, bulkheads, stringers, floors, decks, frames, etc., may not form part of a fuel tank.

Fuel tanks glued, bonded or foamed-in-place are not considered integral and are therefore acceptable. However, that installation must comply with the applicable portions of this regulation.

Fuel tanks may not be mounted on an engine, except if the engine is part of a portable piece of equipment that is not permanently installed in the boat. If a fuel tank is removed from an engine to be installed in the boat, the installation must comply with the requirements of this standard. Particular attention is directed to the fuel tank vent requirements and the requirements for all openings to be in or at the topmost surface. Many tanks installed on engines have a bottom fuel supply; this fuel tank is not acceptable for installation in a boat.

TO COMPLY

Each fuel tank is not integral with any boat structure.

There is no fuel tank mounted to a permanently installed engine.

IT’S THE LAW - USCG:

183.550 Fuel tanks: Installation.

(b) Each fuel tank must not move at the mounting surface more than one-fourth inch in any direction.

The basic intent of this requirement is to restrict the movement of an installed fuel tank with respect to its mounting surfaces to a minimum amount. No movement would be best. To establish a quantitative test, one-fourth inch in any direction has been selected. A fuel ullage tank should be mounted similarly, if installed.
TO COMPLY

The tank cannot move more than one-fourth inch in any direction, measured at its mounting surface when force is applied in the forward, aft, port, starboard, and vertical directions.

IT’S THE LAW - USCG:

183.550   Fuel tanks: Installation.

(c) Each fuel tank must not support a deck, bulkhead, or other structural component.

A fuel tank is not permitted to be a structural part of a boat to the extent that it provides support for a deck, bulkhead or other boat structure. To determine whether the intent of this regulation is met, the following question must be answered in the affirmative - Is the deck, bulkhead or other structural component properly supported to function as intended with the fuel tank removed? If the answer is no, the tank is providing support that is not acceptable.

It is not intended to prohibit incidental contact of a deck, or hatch with a fuel tank, or to prevent the use of protective covers or panels for fuel tanks. The Coast Guard has also accepted fuel tanks specifically designed to be walked or sat upon: Protective mats or panels resting on the tank top to provide a walking surface have also been accepted by the Coast Guard.

TO COMPLY

The fuel tank does not support a deck, bulkhead, or other structural component.

The structure will not collapse if the tank is removed.

IT’S THE LAW - USCG:

183.550   Fuel tanks: Installation.

(d) Water must drain from the surface of each metallic fuel tank when the boat is in its static floating position.

Metallic fuel tanks must be designed, installed, or a provision made to drain water from the surface when the boat is in its static floating position. (See 183.505 for the definition of static floating position). It is recognized that irregularities in the top surface of a flat-topped fuel tank may be able to retain water by surface tension. The intent of this requirement is to prevent the entrapment of water which may occur with lipped edges or saucer type tops on fuel tanks.
Foamed-in-place metallic (must be non-ferrous) fuel tanks must be installed with a provision made to prevent water from collecting on top of the metal surface of the fuel tank, such as might occur if the foam formed a basin around fuel tank fittings. An alternate method is to coat the metal fuel tank surface with a barrier coating, other than paint, which will effectively prevent water from contacting the metal surface.

**TO COMPLY**

Water will drain from the metallic fuel tank surface when the boat is in its static floating position, or

The tank is effectively coated to prevent water from contacting the metal surface.

**IT’S THE LAW - USCG:**

183.550 Fuel tanks: Installation.

(e) Each fuel tank support, chock or strap that is not integral with a metallic fuel tank must be insulated from the tank surface by a non-moisture absorbing material.

Unless a metallic fuel tank has built-in means for supporting and holding the metallic fuel tank in place, a non-moisture absorbing material must be placed between the fuel tank surface and the support, chock or strap. The non-moisture absorbing quality of the material is necessary to prevent localized corrosion of the fuel tank that might occur if moisture was trapped at the support tank interface for prolonged periods of time.

Care should be taken to avoid abrasive combinations of materials even though it is not a mandated requirement of the regulation.

Basically, this requirement provides for the isolation of the metallic fuel tank from a potentially moisture laden support system and also from abrasion by the supports, chocks and straps.

The following table lists some materials that appear to be suitable and some that should be avoided.

**FUEL TANK ISOLATION MATERIALS**

<table>
<thead>
<tr>
<th>SUITABLE</th>
<th>UNSUITABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neoprene</td>
<td>Cardboard</td>
</tr>
<tr>
<td>Teflon</td>
<td>Carpeting</td>
</tr>
<tr>
<td>High Density Plastics</td>
<td>Unpainted Wood</td>
</tr>
<tr>
<td></td>
<td>Felt</td>
</tr>
<tr>
<td></td>
<td>Canvas</td>
</tr>
<tr>
<td></td>
<td>Foams</td>
</tr>
</tbody>
</table>
NOTE: These lists are not limiting in the materials to be included. They are to establish the intent of the regulatory requirement prohibiting moisture absorbent materials. If possible, the isolation materials should be bonded (glued) to the tank so that moisture (from condensation) cannot be trapped next to the tank.

TO COMPLY

The fuel tank supports, chocks or straps are integral with the fuel tank or

The fuel tank supports, chocks or straps are insulated from the fuel tank by non-moisture absorbing material?

IT’S THE LAW - USCG:

183.550 Fuel tanks: Installation.

(f) Cellular plastic must not be the sole support for a metallic fuel tank.

Non-ferrous metallic fuel tanks may be foamed-in-place if the installation provides support for the fuel tank that is independent of the cellular plastic (foam) (see 183.512(c)). Supports for metallic fuel tanks must be in accordance with 183.550(e). The installation must comply with all applicable sections of 183.550, particularly sections (b), (c) and (d). It is recognized that the foam, upon curing, will assume some of the support for the tank. This is acceptable.
FIGURE 22  Foamed-in-Place Non-Ferrous Metallic Tank

TO COMPLY

If foam is used to install a metallic tank:

Is the fuel tank made from non-ferrous metal?

Is the fuel tank supported independently of the foam?

Can water drain from the fuel tank's surface?

Fuel tank supports, chocks and straps are integral with the fuel tank, or

Fuel tank supports, chocks and straps are insulated from the fuel tank surface with a non-moisture absorbing material.

The fuel tank does not support a deck, bulkhead or other component of boat structure.

The fuel tank is restrained from moving more than one-fourth inch in any direction.
IT’S THE LAW - USCG:

183.550 Fuel tanks: Installation.

(g) If cellular plastic is the sole support of a non-metallic fuel tank, the cellular plastic must meet the requirements of Sec. 183.516 (b) or (c).

Cellular plastic (foam) may provide the only support for non-metallic fuel tanks. Fiberglass reinforced plastic fuel tanks and other suitable plastics used for fuel tanks may be installed in foam. In order to use foam as the only support for these non-metallic tanks, the foam must meet or exceed the requirements of 183.516(b) for non-polyurethane foam (i.e. compressive strength of at least 60 pounds per square inch at 10 percent deflection or 183.516 (c) for polyurethane foam (i.e. density of at least 2.0 pounds per cubic foot). Refer to these sections for further information about the properties required of foam.

TO COMPLY

If foam is used as the only support for a non-metallic fuel tank:

The foam meets the requirements of 183.516 (b), or (c).

The fuel tank is restrained from moving more than one-fourth inch in any direction.

The fuel tank does not support a deck, bulkhead or other component of boat structure.

IT’S THE LAW - USCG:

183.550 Fuel tanks: Installation.

(h) Each fuel tank labeled under Sec. 183.514 (b)(8) for installation aft of the boat's half length must be installed with its center of gravity aft of the boat's half length.

Fuel tanks which are labeled "Must be installed aft of the boat's half length" in accordance with 183.514 (b)(8) are to be installed with the fuel tank's center of gravity toward the stern of the mid-length of the boat. These fuel tanks have been qualified at a lower strength criteria than those fuel tanks capable of installation at any location in a boat. The shock loading or impacts felt by boats are more severe in the forward portion of a boat than in the aft section.

Fuel tanks that are meant for installation at any location in a boat shall be tested at 25g vertical accelerations in accordance with 183.584 (e)(1), or they must be tested in accordance with either 183.586, or both 183.586 and 183.588, depending on their capacity. Fuel tanks meant only for installation aft of the boat's half length may be tested at 15g accelerations in accordance with 183.584 (e)(2) if their capacity is less than 25 gallons. Table III shows the strength test for fuel tanks according to the tank's capacity and intended location in a boat.
TABLE III - Strength Tests for Fuel Tanks

<table>
<thead>
<tr>
<th>CAPACITY</th>
<th>SHOCK</th>
<th>PRESSURE-IMPULSE</th>
<th>SLOSH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Tank Located Anywhere in Boat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 25 gallons</td>
<td>183.584 [use (e) (1) ]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>25 to less than 100 gallons</td>
<td>-</td>
<td>183.586</td>
<td>-</td>
</tr>
<tr>
<td>100 gallons or more</td>
<td>-</td>
<td>183.586</td>
<td>-</td>
</tr>
<tr>
<td>Fuel Tank’s Center of Gravity Aft of Half-Length</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 25 gallons</td>
<td>183.584 [use (e) (2) ]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>25 to less than 100 gallons</td>
<td>-</td>
<td>183.586</td>
<td>-</td>
</tr>
<tr>
<td>100 gallons or more</td>
<td>-</td>
<td>183.586</td>
<td>183.588</td>
</tr>
</tbody>
</table>

TO COMPLY

Is the fuel tank marked "Must be installed aft of the boat's half length"?

If so marked, is the tank's center of gravity located aft of the boat's half length?

IT’S THE LAW - USCG:

183.552 Plastic encased fuel tanks: Installation.

(a) Each fuel tank encased in cellular plastic foam or in fiber reinforced plastic must have the connections, fittings, and labels accessible for inspection and maintenance.

The connections at the tank for the fuel tank fill, fuel tank vent, fuel distribution fittings, fuel level gauge and the fuel tank label must all be located to be available for inspection and servicing when using foam or fiberglass for the fuel tank installation.

If the fuel tank connections are welded to the fuel tank, then the top of the fuel tank may be covered with foam. If the fuel tank connections are screw-type spuds in the fuel tank surface, these connections and joints must be accessible.

Accessibility may be achieved by removable panels, hatches, access ports and boat components. Seats, fish boxes and consoles that are designed so they may be removed also provide accessibility.
FIGURE 23  Encased Fuel Tank Connections, Fittings and Label Accessibility

TO COMPLY

Is the fuel tank encased in foam or fiberglass?

If so, are the fuel tank connections, fittings and label accessible for inspection and maintenance?

IT’S THE LAW - USCG:

183.552  Plastic encased fuel tanks: Installation.

(b) If a metallic fuel tank is encased in cellular plastic or in fiber reinforced plastic, water must not collect between the plastic and the surface of the tank or be held against the tank by capillary action.

Encased metallic fuel tanks (only non-ferrous tanks are permitted) might corrode in the presence of stagnant moisture. This moisture could be held against a fuel tank surface by tight fitting, slip-in foam blocks or other plastic materials not bonded to the fuel tank surfaces (see 183.552 (c)).
Unless the encasement materials are bonded to the fuel tank surfaces, there must be an air space between the fuel tank surface and the encasement materials to allow water to run off. This space must be sufficient to prevent water droplets from bridging the space and being held in place by capillary action. One-fourth inch has proven satisfactory in many installations; however, in installations where this may be a problem, the installation should be evaluated.

Supports, chocks or straps and the insulation material between these items and the fuel tank surface are not included in this requirement (see 183.550 (e)). An intervening plastic film between the encasement materials and the fuel tank surface does NOT meet the intent of this requirement unless water is prevented from collecting against the surface of the fuel tank.

**TO COMPLY**

Is the fuel tank metallic?

Is the fuel tank encased in foam or fiberglass?

Does the installation prevent water from collecting between the plastic and the surface of the fuel tank?

or

Does the installation prevent water from being held against the surface of the fuel tank by capillary action?

**IT’S THE LAW - USCG:**

<table>
<thead>
<tr>
<th>183.552</th>
<th>Plastic encased fuel tanks: Installation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c) If the plastic is bonded to the surface of a metallic fuel tank, the adhesive strength of the metal to the plastic bond must exceed the cohesive strength of the plastic.</td>
<td></td>
</tr>
</tbody>
</table>

Encasement of metallic (only non-ferrous tanks are permitted) fuel tanks must be done carefully to avoid accelerated corrosion. The adhesion of the encasement materials to the surface of the fuel tank must prevent water from contacting the fuel tank's metallic material. This is the reason for the requirement that the plastic's cohesive strength be less than the strength of the adhesive bond to the fuel tank. If a failure of the encasement material is to occur, it should fail within the encasement material rather than pulling away from the surface of the fuel tank.
FIGURE 24  Failure of Encasement Materials

TO COMPLY

Should a failure occur to the encasement material used with a metallic tank, the failure will not occur at the joint to the surface of the fuel tank.

IT’S THE LAW - USCG:

183.554  Fittings, joints and connections.

Each fuel system fitting, joint, and connection must be arranged so that it can be reached for inspection, removal, or maintenance without removal of permanent boat structure.

The fuel system must be installed and the boat must be designed and constructed to provide access to every fuel system fitting, joint and connection. This access must permit:

(a) inspection of these items for leakage and deterioration (mirrors may be used to see the hidden portion),

(b) removal of these fuel system components for repair or replacement, and

(c) maintenance of these fuel system components to preserve the integrity and reliability of the fuel system.

All fuel system fittings, joints and connections must be accessible for inspection, removal and maintenance. This requirement does not apply to fuel tanks, only to the fuel tank fittings. Long
runs of fuel hose, likewise must be accessible for inspection, but only the fittings must be readily accessible. In a long run of hose, it is acceptable to disconnect the fittings and to pull the hose out to inspect it. The entire run of hose does not have to be immediately accessible. Access may be gained by means of removable panels, hatches, ports, doors, removable seats, removable consoles or other means designed for such access. It is intended that these items be reached without cutting portions of the boat. Bolts, screws and other fastenings may be removed in order to move panels, flooring, furnishings and other items to gain access. Caulking and sealants do not make a part permanently attached so long as it can be removed and replaced without destruction of boat structure. Figure 25 depicts typical means of access.

**TO COMPLY**

Each fitting, joint and connection in the fuel system can be reached for inspection, removal or maintenance without removal or damage to permanent boat structure.
FIGURE 25  Examples

CAPABLE OF BEING
REACED FOR INSPECTION,
REMOVAL OR MAINTENACE
WITHOUT REMOVAL OF
PERMANENT BOAT
STRUCTURE(S)
IT’S THE LAW - USCG:

183.556 Plugs and fittings.

(a) A fuel system must not have a fitting for draining fuel.

There shall be no fitting or component in the fuel system with the purpose of draining fuel from the fuel system. Fuel tank drains, valves or plugged tee fittings in fuel lines, and drain or bleed valves at engine connections are prohibited.

TO COMPLY

Except as provided in 183.556 (b) there is no fuel drain in the system.

IT’S THE LAW - USCG:

183.556 Plugs and fittings.

(b) A plug used to service the fuel filter or strainer must have a tapered pipe-thread or be a screw type fitted with a locking device other than a split lock washer.

Fuel filters and strainers may have a servicing plug or screw fitting; however, they must be either:

(a) a tapered pipe-thread type of plug, or

(b) a screw-type of plug incorporating or provided with a locking means other than a split lock washer. Gaskets and seals must be an unsplit ring and meet the leakage prohibition required by 183.536 (b).

The locking device should provide for repetitive removal and replacement without leakage. Some types of a locking device, such as a star lock washer, can damage surfaces upon repetitive disassembly and assembly, potentially affecting the ability of the filter or strainer to remain leakproof.

TO COMPLY

The servicing plug for a filter or strainer is either:

   a tapered pipe-thread, or

   a screw-type with a locking device other than a split lock washer.
IT’S THE LAW - USCG:

183.558 Hoses and connections.

(a) Each hose used between the fuel pump and the carburetor must be "USCG Type A1" hose*

*USCG Type A-1, A-2, B-1, B-2 is not compliant with EPA regulations, instead, use A-1-15 in place of A-1/A-2 and B-1-15 in place of B-1/B-2. The wording of the regulation in the 33 CFR is not likely to change.

If a hose is used in the fuel line running between the fuel pump and the carburetor, the hose must be USCG Type A1-15 and so labeled as required by 183.540 and § 1060.137. This requirement is applicable whether the fuel pump is engine mounted or mounted remote from the engine, as permitted by 183.566.

This requirement does not apply to a tube used to detect fuel pump diaphragm failure.

TO COMPLY

A hose used between the fuel pump and the carburetor is "EPA USCG Type A1-15."

IT’S THE LAW - USCG:

183.558 Hoses and connections.

(b) Each hose used -

(1) For a vent line or fill line must be:

   (i) "USCG Type A1" or "USCG Type A2"; or

   (ii) "USCG Type B1" or "USCG Type B2" if no more than five ounces of fuel is discharged in 2-1/2 minutes when:

       (A) The hose is severed at the point where maximum drainage of fuel would occur,

       (B) The boat is in its static floating position, and

       (C) The fuel system is filled to the capacity marked on the tank label under Sec. 183.514 (b) (3).

(2) From the fuel tank to the fuel inlet connection on the engine must be:

   (i) "USCG Type A1"; or
IT’S THE LAW - USCG: (continued)

183.558 Hoses and connections (continued)

(ii) "USCG Type B1"* if no more than five ounces of fuel is discharged in 2-1/2 minutes when:

(A) The hose is severed at the point where maximum drainage of fuel would occur,

(B) The boat is in its static floating position, and

(C) The fuel system is filled to the capacity marked on the tank label under Sec. 183.514(b) (3).

*USCG Type A-1, A-2, B-1, B-2 is not compliant with EPA regulations, instead, use A-1-15 in place of A-1/A-2 and B-1-15 in place of B-1/B-2. The wording of the regulation in the 33 CFR is not likely to change.

The selection of the type of hose to be used in a fuel system is evaluated in accordance with the following:

(a) The boat must be in its static floating position as defined by 183.505(b). The fuel system is filled to the capacity marked on the fuel tank label as specified by 183.541 (b)(3). Normally this quantity of fuel may fill the fuel tank to its topmost surface but will not fill the fuel tank fill or vent lines. Fuel is required to fill the fuel distribution line to the carburetor connection in order to determine the quantity of fuel that will leak in 2-1/2 minutes if a hose is severed.

Table IV shows the length of hose or tubing of various diameters, that if filled with fuel will contain five ounces. You will see that only a short portion of fuel fill or vent hose will require that hose to be "USCG Type A1-15."; Most fuel fill and fuel tank vent installations will permit the use of "USCG Type B1," but particular care must be taken if the fuel fill line and/or fuel tank vent line are run horizontally from the fuel tank connection. Any dips below the topmost surface of a fuel tank may cause a need for "USCG Type A1-15 ";

To determine what type of hose may be used for the fuel distribution line, it is necessary to:

(a) determine where, in the hose portion of the fuel line, maximum drainage could occur.

(b) cut the hose at the maximum drainage point. The intent is to cut the hose completely through and then support the hose at both sides of the cut at their original location.

(c) measure the fuel leakage from this opening in the fuel hose for a period of 2-1/2 minutes. If more than five ounces leaks, use "USCG Type A1." If less than five ounces leaks, you may use "USCG Type B1-15."

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"USCG Type A-1-15" hose may be used for all hose portions, regardless of whether the installation proves that "USCG Type B-1-15" hose is acceptable. If "USCG Type A-1-15" hose is used, there is no need to test for five ounces of fuel leakage in 2-1/2 minutes.

TABLE IV - LENGTH OF HOSE VS. FIVE OUNCE FUEL CAPACITY

<table>
<thead>
<tr>
<th>Hose Inside Diameter</th>
<th>Length in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4</td>
<td>184</td>
</tr>
<tr>
<td>5/16</td>
<td>118</td>
</tr>
<tr>
<td>3/8</td>
<td>82</td>
</tr>
<tr>
<td>7/16</td>
<td>60</td>
</tr>
<tr>
<td>½</td>
<td>46</td>
</tr>
<tr>
<td>9/16</td>
<td>36</td>
</tr>
<tr>
<td>5/8</td>
<td>29</td>
</tr>
<tr>
<td>¾</td>
<td>20</td>
</tr>
<tr>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>1-1/4</td>
<td>7</td>
</tr>
<tr>
<td>1-1/2</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

TO COMPLY

Are all fuel distribution lines "USCG Type A1-15"? If not

- Place the boat in its static floating position (see 183.505)
- Fill the fuel system to the capacity marked on the fuel tank label
- Cut the hose portion of the fuel line at its maximum drainage point
- Measure the fuel leakage in 2-1/2 minutes.

If less than five ounces leaks, "USCG Type B1-15" hose may be used.

If more than five ounces leaks, "USCG Type A1-15" hose must be used or the fuel line must be rerouted to comply.
IT’S THE LAW - USCG:

183.558 Hoses and connections.

(c) Each hose must be secured by:

   (1) A swaged sleeve;
   (2) A sleeve and threaded insert; or
   (3) A hose clamp.

This requirement does not apply to the tube used to detect fuel pump diaphragm failure.

Hose connections may be made by one of the following means:

(a) SWAGED SLEEVE - This type of connection is usually made by the supplier of a hose assembly since special machinery or apparatus is necessary to perform the swaging operation. The attachment to the fuel system is usually made by means of a threaded hose fitting.

(b) SLEEVE AND THREADED INSERT - This type of connection usually can be made by an installer using normal shop tools. Usually the sleeve is placed on the outside of the hose and the threaded insert is screwed into the inside of the hose and sleeve. There are also connections in which the sleeve is installed on the hose after the insert is installed. The attachment to the fuel system is usually made by means of a threaded hose fitting.

(c) HOSE CLAMP - This type of connection is usually made upon installation using normal shop tools. The device usually has a mechanically operated tightening mechanism such as a screw or bolt but may require a specific means of deformation to secure the connection. A hose clamp is usually slipped on each end of the hose in a loosened condition, the hose installed and the hose clamp tightened. The attachment to the fuel system is usually made by means of a beaded, flared or serrated spud, pipe or hose fitting.

NOTE: Wire types of hose clamps are not acceptable.

TO COMPLY

Are all hose ends mechanically fastened?

Is the securing device one of the following?

   A swaged sleeve,
   A sleeve and threaded insert, or
   A hose clamp
IT’S THE LAW - USCG:

183.558 Hoses and connections.

(d) The inside diameter of a hose must not exceed the actual minor outside diameter of the connecting spud, pipe, or fitting by more than the distance shown in Table 8.

<table>
<thead>
<tr>
<th>If minor outside diameter of the connecting spud, pipe or fitting is --</th>
<th>The inside diameter of the hose must not exceed the minor outside diameter of the connecting spud, pipe, or hose fitting by more than the following distance:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3/8 in.</td>
<td>0.020 in.</td>
</tr>
<tr>
<td>3/8 in. to 1 in.</td>
<td>0.035 in.</td>
</tr>
<tr>
<td>Greater than 1 in.</td>
<td>0.065 in.</td>
</tr>
</tbody>
</table>

This requirement does not apply to a tube used to detect fuel pump diaphragm failure.

To assure a leakproof hose connection, certain permitted hose to spud clearances have been established. Figure 26 depicts these clearances as applied to some spuds, pipes or fittings.
FIGURE 26 Hose Connections

LESS THAN 3/8 INCHES

MINOR DIAMETER

HOSE INSIDE DIAMETER

TOTAL CLEARANCE .020 INCHES ON THE DIAMETERS (.010 INCHES EACH SIDE)

HOSE BARB

3/8 INCHES TO 1 INCH

MINOR DIAMETER

HOSE INSIDE DIAMETER

TOTAL CLEARANCE .035 INCHES ON THE DIAMETERS (.0175 INCHES EACH SIDE)

AT LEAST .015" DEEP

GROOVED FITTING
FIGURE 26a Hose Connections

NOTE: Hose connections using hose clamps must comply with 183.530 which requires a bead, a flare or series of annular grooves or serrations at least .015 inches deep on the connecting fitting. Fuel tank fill pipe connections may be made on smooth pipe.

TO COMPLY

The inside diameter of the hose is not larger than the minor diameter of the connecting fitting in accordance with the permitted clearance allowed in Table 8 of 183.558 (d).
§ 1060.101

(2) **Fuel-line fittings.** The following requirements apply for fuel-line fittings that will be used with fuel lines that must meet permeation emission standards:

(i) Use good engineering judgment to ensure that all fuel-line fittings will remain securely connected to prevent fuel leakage throughout the useful life of the equipment.

(ii) Fuel lines that are intended to be detachable (such as those for portable marine fuel tanks) must be self-sealing when detached from the fuel tank or engine.

All fuel-line fittings such as hose clamps, swaged sleeve, and sleeve and threaded insert shall stay connected for their useful life. Fuel-line fittings may include fuel line supports, gas caps, gaskets, o-rings and other items that prevent fuel leaks and prevent fuel leaks. Useful life shall be defined according to the following table:

<table>
<thead>
<tr>
<th></th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outboards</td>
<td>10</td>
</tr>
<tr>
<td>Sterndrive</td>
<td>10</td>
</tr>
<tr>
<td>Inboard</td>
<td>10</td>
</tr>
</tbody>
</table>

Quick-disconnect type fuel fittings shall not leak fuel when detached from the fuel tank or engine.

**TO COMPLY**

Do the fuel lines fittings expect to last throughout the normal, useful life of the equipment?

Does the quick disconnect fuel fitting leak when the engine and fuel line contain fuel?
IT’S THE LAW - USCG:

183.560 Hoses clamps: Installation.

Each hose clamp on a hose from the fuel tank to the fuel inlet connection on the engine, a hose between the fuel pump and the carburetor, or a vent line must:

(a) be used with hose designed for clamps.

This requirement does not apply to a tube used to detect fuel pump diaphragm failure.

Hoses may or may not be designed to be clamped, particularly wire or the mesh reinforced hoses. The proof of whether or not a hose is satisfactory is that the hose connection does not leak when subjected to the “Static Pressure Test for Fuel Systems" as required by 183.542.

TO COMPLY

Have you selected hose for your boat’s fuel system that can work with hose clamps such that connections will not leak when subjected to the “Static Pressure Test for Fuel Systems” as required by 183.542?
IT’S THE LAW - USCG:

183.560 Hoses clamps: Installation.

Each hose clamp on a hose from the fuel tank to the fuel inlet connection on the engine, a hose between the fuel pump and the carburetor, or a vent line must:

(c) Be beyond the bead, flare, or over the serrations of the mating spud, pipe, or hose fitting; and

This requirement does not apply to a tube used to detect fuel pump diaphragm failure.

Any hose to be used with hose clamps and installed in:

(a) the fuel tank vent line;
(b) the fuel line between the fuel pump and the carburetor; or
(c) the fuel distribution line between the fuel tank and the fuel inlet connection at the engine (this connection is often at the fuel pump) is required to be assembled with the hose clamp:

(a) at least one-quarter inch from the end of the hose, and
(b) beyond a bead or flare, or
(c) over serrations or annular grooves (183.530).

NOTE: Wire types of hose clamps are not acceptable.

FIGURE 27 Shows some satisfactory installations

TO COMPLY
Is the hose clamp beyond a bead or flare, or installed over the serrations or annular groves, depending upon the design of the hose barb fitting?

**IT’S THE LAW - USCG:**

<table>
<thead>
<tr>
<th>183.560 Hoses clamps: Installation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each hose clamp on a hose from the fuel tank to the fuel inlet connection on the engine, a hose between the fuel pump and the carburetor, or a vent line must:</td>
</tr>
<tr>
<td>(d) Not depend solely on the spring tension of the clamp for compressive force.</td>
</tr>
</tbody>
</table>

This requirement does not apply to a tube used to detect fuel pump diaphragm failure.

Hose clamps are available that use different means for securing the hose to the hose fitting, pipe or spud.

(a) MECHANICAL TIGHTENING - This type employs a screw or bolt to apply pressure to the connection. A screwdriver, pliers or wrench is used to adjust the hose clamp depending on the adjustment configuration. These clamps are reusable.

**NOTE: Wire type hose clamps are not acceptable.**

(b) DEFORMATION OF THE CLAMP MATERIAL - This type usually depends on the use of a special tool for installation. The clamp material is bent or formed in such a manner as to apply pressure to the hose thereby securing the hose connection. Generally this type of clamp is not reusable and may be difficult to tighten in the event of a leak. This style of clamp requires a specific tool for correct application. Since technicians in the field will not have access to these tools, these clamps should not be used on connections where routine disconnection for servicing may be required.

(c) SPRING TYPE - This type is prohibited. The compressive force depends on the clamp material and there is no positive mechanical type of fastening.

**TO COMPLY**

Do hose clamps rely on a means of tightening other than spring tension of the clamp?

**NOTE ON EPA HOSES** - Some low-permeation hose (A/B-1-15) is not designed to be clamped, manufacturer’s instructions must always be followed.

**FIGURE 28 Hose Clamp Types**

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IT’S THE LAW - USCG:

183.562 Metallic fuel lines.

(a) Each metallic fuel line that is mounted to the boat structure must be connected to the engine by a flexible fuel line.

Metallic fuel lines are relatively rigid and need protection from vibration. This is particularly true for the fuel lines attached to the boat structure that run from the fuel tank to the engine.

A boat responds to forces created by waves and resultant pounding by the hull twisting and moving. An engine vibrates and moves in its resilient mounts. If a rigid fuel line is connected directly to the engine, unusual stress is likely to be transmitted to its connections, probably resulting in leakage. For these considerations, a flexible portion of fuel line is required to connect the metallic fuel line that is attached to the boat to the engine connection.

The flexible fuel line may be hose, "EPA/USCG Type A1-15" or "EPA/USCG Type B1-15," depending on compliance with the criteria of 183.558.

TO COMPLY

If a metallic fuel line is used, is there a flexible fuel line connecting this line to the engine?

IT’S THE LAW - USCG:

183.562 Metallic fuel lines.

(b) Each metallic fuel line must be attached to the boat’s structure within four inches of its connection to a flexible fuel line.

To prevent damaging stresses on the metallic fuel line at the connection of the flexible fuel line, there must be a means of support for the metallic fuel line within four inches of the connection. This support must be installed wherever a flexible fuel line is used and attached to a rigid metallic fuel line. The closer the support is to the end of the metallic fuel line, the better the protection of the metallic fuel line.
TO COMPLY

Is there support for metallic fuel lines within four inches of a connection to a flexible fuel line?

IT’S THE LAW - USCG:

183.564 Fuel tank fill system.

(a) Each fuel fill opening must be located so that a gasoline overflow of up to five gallons per minute for at least five seconds will not enter the boat when the boat is in its static floating position.

One of the key principles of this regulation is to prevent gasoline from getting inside a boat where it can vaporize and create an explosive atmosphere. Overflow at the fuel fill opening is one potential source of fuel that could get inside a boat unless precautions are taken.

The location of the fuel tank fill opening must be chosen with the following considerations in mind:

(a) Nearby ventilators, on deck or on the side of a boat, could provide access for fuel to flow inside a boat. The distance between the fuel fill opening and ventilators may have to be increased over that normally considered adequate for keeping vapors from entering ventilators.

(b) The deck configuration and its slope could channel overflow fuel into a boat.
(c) High coamings or cabin sides can offer protection against overflow from flowing into a boat,

(d) Deck joints in riveted construction or wooden construction could provide a path for fuel to flow into the boat’s interior unless they are caulked to resist such fuel leakage.

FIGURE 30 Fuel Fill Locations
The test to determine compliance is as follows:

(a) Place the boat in its static floating position - see 183.505

(b) Plug the fuel tank fill line at least a distance of six inches below the fuel tank fill opening.

(c) Insert a 13/16 outside diameter hose into the fuel tank fill opening.

(d) Discharge water at a rate of five gallons per minute (53.3 ounces in five seconds).

(e) Time the overflowing water for five seconds and shut off the flow.

(f) Investigate to determine if any of the overflowing water got into the boat. None is permitted in order to comply. Overflow entering a self-bailing cockpit is considered entering the boat and is not permitted.

NOTE: Interpretation of this requirement by the Coast Guard prohibits fuel fill fittings located in the cockpit sole or in seats inside the gunwales.

FIGURE 31 Fuel Overflow Test

TO COMPLY

Gasoline will not overflow into the boat when its fuel fill is tested at an overflow rate of five gallons per minute for a period of five seconds with the boat in its static floating position.
IT’S THE LAW - USCG:

183.564 Fuel tank fill system.

(b) Each hose in the tank fill system must be secured to a pipe, spud, or hose fitting by:

(1) A swaged sleeve;

(2) A sleeve and threaded insert; or

(3) Two adjacent metallic hose clamps that do not depend solely on the spring tension of the clamps for compressive force.

Fuel tank fill system hose connections shall be made to a pipe (smooth pipe is acceptable), a spud or a hose fitting. The hose connections may be made by one of the following means:

(a) SWAGED SLEEVE - This type of connection is usually made by the supplier of a hose assembly, since special machinery or apparatus is necessary to perform the swaging operation. The attachment to the fuel system is usually made by means of a threaded hose fitting.

(b) SLEEVE AND THREADED INSERT - This type of connection usually can be made by an installer using normal shop tools. Usually the sleeve is placed on the outside of the hose and the threaded insert screwed into the inside of the hose and sleeve. There are connections in which the sleeve is installed on the hose after the insert is installed. The attachment to the fuel system is usually made by means of a threaded hose fitting.

(c) TWO ADJACENT METALLIC HOSE CLAMPS THAT DO NOT DEPEND SOLELY ON THE SPRING TENSION OF THE CLAMPS FOR COMPRESSIVE FORCE - For a fuel tank fill line, 2 hose clamps are usually slipped on each end of the hose in a loosened condition, the hose installed and the hose clamps tightened. The attachment to the fuel system is usually made by means of a beaded, flared or serrated spud, pipe or hose fitting. Hose clamps are to be installed side by side, not on top of each other. Two clamps are required for mechanical strength and to resist any tendency for the hose to twist.

NOTES:

1. Spring wire and other type clamps that depend on the spring tension properties of the clamp material are prohibited from use on fuel line installations on boats.

2. Wire types of hose clamps are not acceptable.
TO COMPLY

Are all fuel tank fill hoses secured?

Is the securing device one of the following?

A swaged sleeve

A sleeve and threaded insert

Two hose clamps on each end of the hose

IT’S THE LAW - USCG:

183.564 Fuel tank fill system.

(c) Each hose clamp in the tank fill system must be used with a hose designed for clamps.

Hoses may or may not be designed to be clamped, particularly wire or wire mesh reinforced hose. The proof of whether or not a hose is satisfactory is that the hose connection does not leak when subjected to the "Static Pressure Test for Fuel Systems" as required by 183.542.

TO COMPLY

A hose has been selected for use with hose clamps and is installed such that connections will not leak when subjected to the "Static Pressure Test for Fuel Systems" in 183.542.

IT’S THE LAW - USCG:

183.564 Fuel tank fill system.

(d) Hose clamps used in the tank fill system must:

(1) Have a minimum nominal band width of at least one-half inch; and

(2) Be over the hose and the spud, pipe, or hose fitting.

If hose clamps are used to secure a hose in the fuel tank fill system, they must have a nominal band width of at least one-half inch. "Nominal" means that the normal SAE tolerances specified for hose clamps are acceptable. SAE states in their J536b standard, "Hose Clamps," that a one-half inch band width may actually measure 0.495 inches.
NOTE: Wire types of hose clamps are not acceptable.

Hose and hose clamp installations must be made so the hose is pushed onto the spud, pipe (smooth pipe is permitted for fuel tank fill systems) or hose fitting far enough to permit 2 hose clamps to be fully over the spud pipe or hose fitting.

NOTE: The inside diameter of a fuel tank fill hose may NOT be more than 0.065 inches larger than the minor outside diameter of the spud, pipe or hose fitting.

FIGURE 32 Fuel Tank Hose Clamping

TO COMPLY

Do the hose clamps used in the fuel tank fill system have at least a nominal band width of one-half inch?

Are the 2 hose clamps fully over the spud, pipe or hose fitting?
IT’S THE LAW - EPA:

1060.101  (3) Refueling.

For any equipment using fuel tanks that are subject to diurnal or permeation emission standards under this part, you must design and build your equipment such that operators can reasonably be expected to fill the fuel tank without spitback or spillage during the refueling event. The following examples illustrate designs that meet this requirement:

(i) Equipment that is commonly refueled using a portable gasoline container should have a fuel tank inlet that is larger than a typical dispensing spout. The fuel tank inlet should be located so the operator can place the nozzle directly in the fuel tank inlet and see the fuel level in the tank while pouring the fuel from an appropriately sized refueling container (either through the tank wall or the fuel tank inlet). We will deem you to comply with the requirements of this paragraph (f)(3)(i) if you design your equipment to meet applicable industry standards related to fuel tank inlets.

(ii) Marine SI vessels with a filler neck extending to the side of the boat should be designed for automatic fuel shutoff. Alternatively, the filler neck should be designed such that the orientation of the filler neck allows dispensed fuel that collects in the filler neck to flow back into the fuel tank. A filler neck that ends with a horizontal or nearly horizontal segment at the opening where fuel is dispensed would not be an acceptable design.

TO COMPLY

The design and orientation of the fuel filler neck shall be such that common fuel nozzles’ automatic shutoff feature operates to prevent fuel spills and contaminating emissions equipment such as carbon canisters. Fuel shall not remain in fuel filler neck once fueling is complete.

EPA part 1060.101 (3.) Refueling states that the operator can “reasonably be expected to fill the tank without spitback or spillage.” ABYC H-24 Gasoline Fuel Systems outlines testing procedures to ensure this requirement is met. Additional benefits to complying with ABYC H-24 also include protection of the emission components required by the EPA by limiting the fuel level in the tank.

Does a common fuel nozzle automatically shutoff and not spill fuel?

Does the emissions equipment remain free of liquid fuel after filling?

Does fuel remain in the filler neck after filling? If yes, a change in the orientation or design of the fuel fill is required.
IT’S THE LAW - USCG:

183.566 Fuel pumps: Placement.

Each fuel pump must be on the engine it serves or within 12 inches of the engine, unless it is a fuel pump used to transfer fuel between tanks.

Most engines are equipped by the engine manufacturer with a fuel pump as an installed engine component. For engines that are not so equipped, a remote fuel pump, usually electric, may be used. In order to keep the length of the pressurized portion of the fuel distribution line at a minimum, it is required that a remote fuel pump be installed within 12-inches of the engine. The 12-inches are measured directly to the engine, not along the fuel line.

Pumps used to transfer fuel from one tank to another may be installed in other locations, and are not required to be within 12 inches of the engine.

FIGURE 33 Remote Fuel Pump

TO COMPLY

If the fuel pump is not on the engine, is it within 12 inches of the engine?

If the fuel pump is not on the engine or within 12 inches of the engine, is it used only to transfer fuel from tank to tank?

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IT’S THE LAW - USCG:

183.568 Anti-siphon protection.

Each fuel line from the fuel tank to the fuel inlet connection on the carburetor must:

(a) Be above the level of the tank top; or

(b) Have an anti-siphon device or an electrically operated fuel stop valve:

   (1) At the tank withdrawal fitting; or

   (2) Installed so the line from the fuel tank is above the top of the tank; or

(c) Provided that the fuel tank top is below the level of the carburetor inlet, be metallic fuel lines meeting the construction requirements of Sec. 183.538 or "USCG Type A1" hose, with one or two manual shutoff valves installed as follows:

   (1) Directly at the fuel tank connection arranged to be readily accessible for operation outside the compartment, and

   (2) If the length of fuel line from the tank outlet to the engine inlet is greater than 12 feet, a manual shutoff valve shall be installed at the fuel inlet connection to the engine.

"Anti-siphon protection" is a term applied to the means of preventing the siphon action of permitting fuel to continue to flow out of the fuel tank in the event there is a break or rupture in a fuel distribution line, or if a fitting in the fuel line loosens, creating a leak.

"Anti-siphon protection" may be accomplished by one or more of the following methods:

(a) Keep all parts of the fuel line from the fuel tank to the fuel line connection at the carburetor above the level of the top of the fuel tank. The tank top level is determined with the boat in its "static floating position." Practically, the fuel pump and fuel filter(s) must also be above the tank top.

(b) Install an anti-siphon device at the tank withdrawal fitting. The fuel distribution line may then run below the level of the tank top. A filter may be installed between the fuel tank withdrawal fitting and the anti-siphon device.

NOTES:

1. Some anti-siphon devices are spring loaded check valves. These valves have a specific cracking pressure and provide protection up to a specific head. Therefore, the anti-siphon valve must be selected or ordered to protect against the siphon head for a particular installation.
2. Too high a cracking pressure may cause vapor lock. This has become an increasing problem with reformulated gasoline (RFG). Be sure to select the correct cracking pressure.

3. Some anti-siphon devices involve a bleed hole in the fuel pick-up tube, near the top of the fuel tank. The size of the hole is critical for a particular application. Each installation using this type of protection must be evaluated to assure its effectiveness. Too large a hole will bleed excessive air into the fuel flow affecting engine operation. Too small a hole may not stop fuel flow in the event of a fuel leak. This installation is used very infrequently because of inherent problems that may result.

(c) Install an anti-siphon device at a location where a line from the fuel tank will no longer remain above the fuel tank top level. The anti-siphon device will then protect the portion of the line that must run below the tank top level. The portion of the line that is above the fuel tank top level will be automatically taken care of.

(d) Install an electrically operated fuel stop valve at the fuel tank withdrawal fitting. This valve requires electrical power to open and must be connected to operate only when the ignition switch is on. A filter may be installed between this valve and the fuel tank withdrawal fitting. Electrically operated fuel stop valves must comply with 183.528.

(e) Install an electrically operated fuel stop valve at the point in a fuel line where it must run lower than the fuel tank top level. This valve requires electrical power to open and must be connected to operate only when the ignition switch of the engine it serves is on. A filter may be installed between this valve and the fuel tank withdrawal fitting. Electrically operated fuel stop valves must comply with 183.528.

NOTES:

1. Fuel stop valves used in the fuel system, whether electrically operated or manually operated, must withstand the 2-1/2 minute fire test in accordance with 183.590.

2. Anti-siphon devices are not required to meet a fire test.

3. The fuel stop valve is required to be directly at the fuel tank connection by 183.568(c)(1) and must be installed so that it can be operated from outside the compartment. This can be accomplished with a reach rod or a long valve stem. The installation of an access panel over the valve is also permitted. However, once open, the valve must be immediately accessible inside the panel so that the operator does not have to reach through fire to shut off the fuel.
FIGURE 34 Anti-Siphon Protection

FUEL LINE ALWAYS ABOVE FUEL TANK TOP LEVEL

NO ANTI-SIPHON DEVICE OR ELECTRICALLY OPERATED VALVE NEEDED

FUEL LINE BELOW FUEL TANK TOP LEVEL

NOT ACCEPTABLE

ANTI-SIPHON DEVICE OR ELECTRICALLY OPERATED FUEL STOP VALVE AT FUEL TANK WITHDRAWAL FITTING

FUEL LINE ABOVE FUEL TANK TOP LEVEL

ANTI-SIPHON DEVICE OR ELECTRICALLY OPERATED FUEL STOP VALVE AT POINT WHERE FUEL DISTRIBUTION LINE GOES BELOW FUEL TOP LEVEL
TO COMPLY

Is the fuel distribution line above the fuel tank top level?

If not, is an anti-siphon device or an electrically operated fuel stop valve installed at the fuel tank withdrawal fitting?

If not, is an anti-siphon device or an electrically operated fuel stop valve installed at the point where the fuel distribution line goes below the fuel tank top level?

IT’S THE LAW - USCG:

183.570 Fuel filters and strainers: Installation.

Each fuel filter and strainer must be supported on the engine or boat structure independent from its fuel line connections, unless the fuel filter or strainer is inside a fuel tank.

Fuel filters and strainers may not use the attached fuel lines for their primary means of support. Many fuel filters and strainers have brackets designed to provide support. If brackets are not provided as part of the fuel filter or strainer, clips, straps or other means must be employed to support the fuel filter or strainer independent of its connected fuel lines.

Fuel filters or strainers used inside a fuel tank, such as might be attached to the fuel tank withdrawal fitting, are not required to be independently supported.
FIGURE 35  Fuel Filter or Strainer Support

TO COMPLY

Are fuel filters and strainers not installed in a fuel tank provided with support independent of the connected fuel lines?
IT’S THE LAW - USCG:

183.572  Grounding.

Each metallic component of the fuel fill system and fuel tank which is in contact with fuel must be statically grounded so that the resistance between the ground and each metallic component of the fuel fill system and fuel tank is less than 100 ohms.

Fuel flowing from the dispensing nozzle into a fuel tank is a potential source of a static electric charge which could cause a spark between the dispensing nozzle and metal component of the fuel tank fill system. To prevent such a spark from occurring, metallic components of the fuel tank fill system and metallic fuel tanks must be grounded.

Grounding or bonding may be accomplished by connecting the metallic components electrically by running a wire from one component to the next, and so forth to the boat's ground. Grounding can usually be accomplished by a connection to the common bonding conductor or the engine negative terminal.

If the fuel tank deck fill fitting is nonmetallic, and nonconductive hose is used as a fill pipe, there is no need for grounding the fill fitting. Chrome-plated plastic fill fittings are treated the same as metallic fittings.

NOTES:

1. **If a metal hose attachment fitting is used, it must be grounded.**

2. **Fill cap retaining chains need not be grounded.**
CAUTION: BONDING WIRES PUT UNDER THE END OF A HOSE COULD CAUSE A FUEL LEAK. The bonding wire should be a “bolted connection” on the tank’s ground tab. At the deck plate the bonding wire may be securely connected to a ground fitting provided on the deck plate, or securely connected to a deck fill plate bolt.

TO COMPLY

Are metallic components of the fuel tank fill system and the metallic fuel tank grounded?

Is the resistance between each of these metallic components, including the metallic fuel tank and ground less than 100 ohms?

CAUTION

THE FOLLOWING TEST PROCEDURES ARE NOT INTENDED TO PROVIDE SUFFICIENT DETAILS TO PROPERLY CONDUCT THE REQUIRED TESTS.

THE INFORMATION IS PROVIDED TO FAMILIARIZE THE USER OF THIS GUIDELINE WITH THE OBJECTIVES OF THE TESTS AND TO DIAGRAM IN SCHEMATIC FORM SOME OF THE TEST CONSIDERATIONS.
FOR FULL DETAILS, REFER TO "UNITED STATES COAST GUARD COMPLIANCE TEST PROCEDURES - FUEL SYSTEM STANDARDS."

COPIES OF THIS STANDARD ARE AVAILABLE FROM: NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VA 22161 OR THROUGH THEIR WEB SITE (www.ntis.gov).

Tests

IT’S THE LAW - USCG:

183.580 Static pressure test for fuel tanks.

A fuel tank is tested by performing the following procedures in the following order:

(a) Fill the tank with air or inert gas to the pressure marked on the tank label under Sec. 183.514(b) (5).

FIGURE 37 Typical Fuel Tank Pressure Test

In most installations, it is almost impossible to completely inspect all surfaces of a tank. Therefore, this test should be performed before the tank is installed. Testing the tank before installation should result in the discovery of defects in the tank that could result in drastic disassembly of the boat, if such test was performed after installation.

The tank should be empty for this test. Testing pressure can be supplied by pressurized air or compressed inert gas. The tank's rated testing pressure is marked on the tank, but in no case will it be below 3psig.

During the test, the sides, top and bottom of the tank should be accessible. All openings except the one used to admit the pressure should be sealed.

A regulated source of pressure, a gauge or manometer, a pop-off or relief valve and a shut-off valve will be needed. The gauge should have a range of less than three times the test pressure.
The relief valve should be set for less than the maximum gauge pressure to prevent harm to the gauge and as a safety measure for testing personnel.

When the tank has been pressurized to its rating, it should be isolated from the pressure source by closing the shut-off valve.

**IT’S THE LAW - USCG:**

| 183.580 | Static pressure test for fuel tanks.  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) Examine each tank fitting and seam for leaks using a leak detection method other than the pressure drop method.</td>
<td></td>
</tr>
</tbody>
</table>

The static pressure test must be supplemented with another method to check for leaks. Soapy water or a detergent solution, both of which should be non-corrosive and non-toxic, can be used as well as total immersion of the tank in water. Most small leaks do not produce an immediately detectable drop on the face of the pressure gauge, but soap solutions or immersion will reveal very small leaks by bubbling.

**CAUTION:** It is suggested that soapy test solutions be non-corrosive and non-toxic. Ammonia, which is present in some soaps and detergents, creates a condition which attacks brass fittings like those used in fuel systems. Undetectable at first, in a matter of months these fittings may develop cracks creating a very hazardous situation.

If immersion of the tank is used, remember that immersion increases the pressure on the outside of the tank above normal atmospheric pressure. The testing pressure in this case must be the differential in actual pressures. For example, if the head of water over a tank will produce 1 pound of pressure and the tank is to be tested to a label pressure of 3 pounds of pressure, then, when underwater, the pressure inside the tank must be 4 pounds per square inch. For every foot of head, the pressure correction is 0.433 psig.

There are also several devices available that are designed to detect small leaks of the nature of those that might appear in fuel systems. Most work by a principle of amplification of sound or detection of sounds of certain frequencies.

Inspect all seams and attachments - fill, vent, fuel lines, fuel level indicator, etc. for leakage.

To determine the height of the head pressure, measure from the top of the fuel fill plate, or the vent system; if it is lower than the deck fill, measure to the lowest point in the system.
FIGURE 38  Test Pressure Determination

IN THIS CASE - FILL LOWER THAN VENT

FUEL TANK

HEIGHT OF FUEL SYSTEM - FROM TOP OF FUEL FILL (SINCE IT IS LOWER THAN THE VENT) TO LOWEST POINT OF SYSTEM

LOWEST POINT OF SYSTEM
For a given measured height, this chart gives you the required test pressure.
IT’S THE LAW - USCG

183.584 Shock test.

A fuel tank is tested by performing the following procedures in the following order:

(a) Perform the static pressure test under Sec. 183.580.

To prepare fuel tank for the shock test, a pressure test must be conducted first (see 183.580.)

The fuel tank must be pressurized with air or inert gas to the pressure stated on the label and, while pressurized, inspected for leaks using soapy water or total immersion test. If bubbles reveal leaks, the fuel tank fails this test - do not proceed any further.

The test is construed to be a destructive test and a fuel tank subjected to this test should not be installed in a boat.

IT’S THE LAW - USCG:

183.584 Shock test.

(b) If the tank is non-metallic, fill it to capacity with a gasoline that has at least 50 percent aromatic content. Keep the fuel in the tank at 21 deg.C. or higher for 30 days prior to testing.

This test is performed on all tanks of less than 25 gallons.

If the fuel tank passes the pressure test, and it is nonmetallic, it must then be filled with a gasoline that has at least 50 percent aromatic content.

What this refers to is the same type of test fuel specified as "ASTM Reference Fuel C." The average premium grade gasoline bought at a roadside filling station does not quite reach 50 percent aromatics - it usually averages about 45 percent. The Phillips Petroleum Company does sell a 50 percent aromatic gasoline in some locations.

ASTM Reference Fuel C is compounded to produce the severe swelling (or shrinking) and degrading actions of premium gasoline. It consists of 50 percent Tolulene and 50 percent ISO-octane.

The nonmetallic fuel tank must be kept filled with this fuel for 30 days at an ambient temperature [but no less than 70ºF (21ºC)] and ambient pressure without being adversely affected.

This is a pre-conditioning for further testing.

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IT’S THE LAW - USCG:

<table>
<thead>
<tr>
<th>183.584</th>
<th>Shock test.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(c) Mount the tank to the platform of an impact test machine.</td>
<td></td>
</tr>
</tbody>
</table>

Generally, the mounting of the fuel tank to be tested should simulate the actual installation conditions to be found aboard a boat.

The fuel tank will be subjected to 1,000 shock cycles using a suitable shock machine. Few boat manufacturers have the test equipment to conduct these tests, so they are usually done by the fuel tank manufacturer, a testing lab or other facility.

A flat bottomed fuel tank shall be mounted on separating strips or battens under each baffle and end plate directly on the test platform; a fuel tank with something other than a flat bottom must be mounted in fitting chocks, and it is best to use the type of chocks used in actual construction of the boat - chocks that exactly fit the contour of the fuel tank's bottom.

The fuel tank should include all attachments and fittings as would normally be found on a fuel tank, such as a fuel gauge, fuel feed adapter, etc.

**FIGURE 40  Shock Test - Fuel Tank Mounting**
IT’S THE LAW - USCG:

183.584 Shock test.

(d) Fill the tank to capacity with water.

Before conducting further testing, if the tank is a non-metallic type, it has undergone the 30-day test with a 50 percent aromatic fuel, or if it is a tank that has previously contained fuel, it should have been flushed or purged of all traces of the fuel. This can be done with water or inert gas.

Fill the tank with water to at least the rated capacity.

IT’S THE LAW - USCG:

183.584 Shock test.

(e) Apply one of the following accelerations within three inches of the center of the horizontal mounting surface of the tank. The duration of each vertical acceleration pulse is measured at the base of the shock envelope.

IT’S THE LAW - USCG:

183.584 Shock test.

(e) (1) If the tank is not labeled under Sec. 183.514 (b) (8) for installation aft of the half-length of the boat, apply 1000 cycles of 25g vertical accelerations at a rate of 80 cycles or less per minute. The duration of the acceleration pulse must be between 6 and 14 milliseconds.
The test should be monitored with suitable instrumentation mounted as near to the center of gravity of the tank as is possible.

The tank should be inspected during the shock test to detect an obvious failure. This is a visual inspection, and should a failure of any type occur, the tank should be rejected.

**IT’S THE LAW - USCG:**

<table>
<thead>
<tr>
<th>183.584</th>
<th>Shock test.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(e) (2) If the tank is manufactured for installation with its center of gravity aft of the half-length of the boat, apply 1000 cycles of 15g vertical accelerations at a rate of 80 cycles or less per minute. The duration of the shock pulse must be between 6 and 14 milliseconds.</td>
<td></td>
</tr>
</tbody>
</table>
The test should be monitored with suitable instrumentation mounted as near to the center of gravity of the tank as is possible.

During the shock test, the tank should be visually inspected, and the tank should be rejected at the slightest sign of failure.

**IT’S THE LAW - USCG:**

<table>
<thead>
<tr>
<th>183.584</th>
<th>Shock test.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(f)</td>
<td>Perform the static pressure test under Sec. 183.580.</td>
</tr>
</tbody>
</table>

After performing the shock test, a pressure test must be performed as a verification that the tank doesn't leak. If any leakage is found during the pressure test, the tank has failed the test.
The pressure impulse test is applicable only to fuel tanks which have a rated capacity of 25 gallons or more. Tanks which have a rated capacity of between 25 gallons (94.61 liters) and 199 gallons (756.0 liters) must be subjected to the pressure impulse test. Tanks which have a rated capacity of 200 gallons or more must be subjected to both the pressure impulse test and the slosh test.

Before subjecting the tank to the pressure impulse test, it should be subjected to the static pressure test (see 183.580) and pass with no leakage.

The empty tank must be pressurized with air or compressed inert gas to the pressure indicated on the tank label.

This test is construed to be a destructive test and a fuel tank subjected to this test should not be installed in a boat.

This test is performed on all tanks of 25 gallons or greater capacity.

Non-metallic tanks should be filled to rated capacity with a gasoline such as ASTM Reference Fuel C for a period of 30 days at a temperature of not less than 70°F (21°C).

This is a pre-conditioning for further testing.
IT’S THE LAW - USCG:

183.586 Pressure impulse test.

(c) Mount the tank on a test platform.

The tank should be mounted in a similar manner to an actual installation and secured in that position.

The fuel tank should include all attachments and fittings as would normally be found on a fuel tank, such as a fuel gauge, fuel feed adapter, etc.

A flat-bottomed tank may be mounted directly on the test platform. A tank that doesn't have a flat bottom shall be mounted on chocks cut to fit the contour of the tank under the ends of the tank and under baffles, if any.
FIGURE 44  Fuel Tank Mounting for Testing

IT’S THE LAW - USCG:

183.586  Pressure impulse test.

(d) Fill the tank to capacity with water.

If the fuel tank has previously contained fuel, it should be purged using water or inert gas. It should be reasonably clean and not contaminated with fuel.

Fill the tank to at least its rated capacity with water. The more water in the tank, the faster the test cycle will be.
IT’S THE LAW - USCG:

183.586 Pressure impulse test.

(e) Cap and seal each opening in the tank.

After the tank has been filled to its rated capacity with water, cap or plug the fuel feed adapter. If a fuel gauge is not installed, cap this opening. Also, seal the fuel fill and vent openings. Some of the openings may be used for piping necessary to conduct the test.

IT’S THE LAW - USCG:

183.586 Pressure impulse test.

(f) Apply 25,000 cycles of pressure impulse at the rate of no more than 15 impulses per minute varying from zero to three PSIG to zero inside the tank top from a regulated source of air, inert gas or water.

A regulated source of pressurized air or compressed inert gas should be connected to the tank fill pipe. A calibrated pressure gauge should be connected to the vent or fill pipe to monitor the tank pressure.

A pressure relief valve should be installed in the pressure gauge line. Adjust the pressure relief valve to 3.5+/-0.5psig.

A pressure switch with a maximum range of 0 - 20 psig should be installed into the pressure gauge line.

The pressure in the tank should be controlled by a solenoid valve. A counter capable of recording 25,000 cycles should be tied to the solenoid valve.

In this test, the pressure in the fuel tank should vary from zero psig to 3+/0.4/ psig at a rate not to exceed 15 cycles per minute. The cycle rate will vary depending on the following conditions:

(a) supply pressure

(b) air volume in the tank after water is added

(c) line sizes

(d) valve sizes, particularly in the vent port
(e) actual pressure settings

*NOTE: Any of the above may be varied within reasonable limits to give the desired cycle rate up to the maximum of 15 cycles per minute.*

Apply 25,000 cycles of pressure to the fuel tank. It should not leak during or after this test.

**IT’S THE LAW - USCG:**

183.586 Pressure impulse test.

(g) Perform the static pressure test under Sec. 183.580.

When the fuel tank cycling of the pressure impulse test is completed, subject it to the static pressure test as a verification that the tank does not leak. If any leakage is found, the tank has failed the test.

This test is construed to be a destructive test and a fuel tank subjected to this test should not be installed in a boat.
FIGURE 45  Pressure Impulse Test

IT’S THE LAW - USCG:

183.588  Slosh test.

A fuel tank is tested by performing the following procedures in the following order:

(a) Perform the static pressure test under Sec. 183.580.

If the tank has a rated capacity of 200 gallons or more, and it has passed the pressure impulse test in 183.586, then it must be subjected to the slosh test.

First, it must pass the static pressure test (see 183.580). This could be the same static pressure test used at the end of the pressure impulse test.

This test is construed to be a destructive test and a fuel tank subjected to this test should not be installed in a boat.
IT’S THE LAW - USCG:

183.588 Slosh test.

(b) Perform the pressure impulse test under Sec. 183.586.

In order for a fuel tank to be subjected to the slosh test, it is first necessary for the fuel tank to have successfully passed the pressure impulse test in 183.586.

IT’S THE LAW - USCG:

183.588 Slosh test.

(c) Secure the tank to the platform of a tank rocker assembly.

A set up similar to the pressure impulse test is used, but in addition, wood blocks should be mounted to the test platform forward and aft of the tank to prevent longitudinal movement. Similarly, wood blocks should be mounted to the platform to prevent lateral movement. Straps or clips may be used to prevent vertical movement.

IT’S THE LAW - USCG:

183.588 Slosh test.

(d) Fill the tank to one-half capacity with water.

If the fuel tank has previously contained fuel, it should be purged using water or inert gas. It should be reasonably clean and not contaminated with fuel.

Fill the tank to one-half its rated capacity with water.

IT’S THE LAW - USCG:

183.588 Slosh test.

(e) Cap and seal each opening in the tank.

After the tank has been filled to one-half its rated capacity with water, cap or plug the fuel feed adapter. If a fuel gauge is not installed, cap this opening. Also, seal the fuel fill and vent openings.
IT’S THE LAW(110,122),(880,881) - USCG:

183.588 Slosh test.

(f) Apply 500,000 cycles of rocking motion 15 degrees to each side of the tank centerline at the rate of 15 to 20 cycles a minute. The axis of rotation of the rocker and fuel tank must be perpendicular to the centerline of the tank length at a level of six inches or less above or below the tank’s bottom.

Figure 46 shows how to locate the fuel tank for mounting. The axis of rotation of the test machine is also located in the diagram. The fuel tank should withstand 500,000 complete cycles. The fuel tank must not leak during or at the completion of the test.

FIGURE 46 Slosh Test - Fuel Tank Mounting

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IT’S THE LAW - USCG:

183.588 Slosh test.

(g) Perform the static pressure test under Sec. 183.580.

When the fuel tank cycling of the slosh test is completed, conduct the static pressure test as a verification that the tank doesn't leak. If leakage is found, the tank has failed the test.

IT’S THE LAW - USCG:

183.590 Fire test.

(a) A piece of equipment is tested under the following conditions and procedures:

(1) Fuel stop valves, "USCG Type A1" or "USCG Type A2" hoses and hose clamps are tested in a fire chamber.

(2) Fuel filters, strainers, and pumps are tested in a fire chamber or as installed on the engine in a boat.

(3) Fuel tanks must be tested filled with fuel to one-fourth the capacity marked on the tank in a fire chamber or in an actual or simulated hull section.

(b) Each fire test is conducted with free burning heptane and the component must be subjected to a flame for 2-1/2 minutes.

CAUTION: Fire tests can be dangerous, particularly using heptane. Heptane is a gasoline type of product that produces a repeatable fire test. Gasolines vary, due to additives, in their heat content and therefore will not uniformly reach a repeatable temperature from test to test - heptane will. Precautions must be taken when conducting fire tests to have fire-fighting equipment capable of extinguishing Class B (gasoline and oil) fires and have personnel experienced in firefighting. Typical extinguishing agents are CO₂, dry chemical, foam and Halon or other clean agent extinguishing systems. CO₂ is frequently used for testing as there is no residue that could inhibit inspection of the test sample.

It is important that the fire be extinguished quickly at the end of the 2-1/2 minutes so the test sample may be judged at the required time and not subjected to a prolonged fire.
TABLE V - Fire Test Selection

<table>
<thead>
<tr>
<th>ITEM</th>
<th>FIRE CHAMBER</th>
<th>ON ENGINE</th>
<th>HULL SECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Tank</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Stop Valves</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>USCG Type A Hose</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Filters</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Strainers</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Fuel Pumps</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

IT’S THE LAW - USCG:

183.590 Fire test.

(c) If the component is tested in a fire chamber:

(1) The temperature within one inch of the component must be at least 648 deg.C. sometime during the 2 and 1/2 minute test;

(2) The surface of the heptane must be 8 to 10 inches below the component being tested; and

(3) The heptane must be in a container that is large enough to permit the perimeter of the top surface of the heptane to extend beyond the vertical projection of the perimeter of the component being tested.

If the component being tested is a hose clamp, it must be subjected to a tensile test after the fire test. It must withstand a 1-pound (0.5 kg.) pull in any direction in which it might be subjected in any use. It must not separate, break, crack or noticeably deform as a result of the application of the weight used for the test.

"USCG Type A1" and "USCG Type A2" fuel hoses and stop valves must not leak fuel after the fire test when subjected to a 3-foot head of fuel. (See 183.528) (See 183.532).

Fuel filters, fuel strainers and fuel pumps must not leak more than 5 ounces of fuel in 2-1/2 minutes after the fire test, in accordance with 183.524 and 183.534.

All fuel components including fuel tanks tested in a fire chamber must be subjected to a fire test that causes the temperature within one inch of the component to reach at least 648ºC 1200ºF).
FIGURE 47  Fire Test in a Typical Fire Chamber
IT’S THE LAW - USCG:

183.590 Fire test.

(d) If the component is being tested as installed on an engine, heptane sufficient to burn 2 and 1/2 minutes must be poured over the component and allowed to run into a flat-bottomed pan under the engine. The pan must be large enough to permit the perimeter of the top surface of the heptane to extend beyond the vertical projection of the perimeter of the engine.

FIGURE 48 Fuel Component Fire Test on an Engine

IT’S THE LAW - USCG:

183.590 Fire test.

(e) If a fuel tank is being tested in an actual or simulated hull section, the actual or simulated hull section must be of sufficient size to contain enough heptane to burn for 2 and 1/2 minutes in a place adjacent to the tank.

An actual or simulated hull section must duplicate the configuration from which the tank was removed or is intended to be installed. Figure 49 shows typical test setups using simulated hull sections.
Just as with other components of the fuel system, the test tank, filled to no more than quarter of its listed capacity with fuel, must withstand the 2-1/2 minute fire test. There are no temperature requirements for this test as the temperature achieved depends on the configuration of the hull section and the distribution of the fuel in this hull section. The hull section must be arranged so there will be enough fuel to burn for 2-1/2 minutes, even if a special dam is necessary to hold the fuel.

**FIGURE 49 Fuel Tank Fire Test in a Simulated Hull Section**

The fuel tank is subjected to a fire test. The tank being tested here is supported by structure to replicate the actual installation in a boat. A dam has been built to contain the heptane fuel during the test.
Appendix A

The following standards are referenced in this regulation:


MIL P-21929B “Plastic Material, Cellular, Polyurethane, Foam in Place (2 pounds per cubic foot)”. Applies to section 183.516.


UL 1114 “Marine Flexible Fuel-line Hose”. Applies to section 183.540.

ABYC H-24 “Gasoline Fuel Systems” Applies to section 1060.101

ABYC standards are available from the American Boat & Yacht Council, 613 Third Street, Suite 10, Annapolis, MD 21403. (410) 990-4460, www.abycinc.org

ASTM standards are available from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, (610) 832-9585. www.astm.org


SAE standards are available from the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096, (412) 776-4841. www.sae.org

UL (Underwriter Laboratories) standards are available from COMM 2000, Inc., 1414 Brook Drive, Downers Grove, IL 60515, (888) 853-3503. www.UL.com

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For further information, contact

American Boat & Yacht Council, Inc.,
613 Third Street, Suite 10
Annapolis, MD 21403
www.abycinc.org
APPENDIX B – Typical Components Used in EPA Compliant Systems

Carbon Canister
Inlet Control Valve (ICV)

Grade Rollover Valve (GRV)
Fill Limit Vent Valve (FLVV)
APPENDIX C - Test Enclosure for Temperature Tests

METAL HOOD

METAL SHEATHED PLYWOOD

STOVE POSITION

(1 inch = 25.4 mm)

APPENDIX D - Types of Acceptable Lock Seams

FOLD LOCKED STANDING SEAM

DOUBLE LOCK

OFFSET DOUBLE SEAM

ACME LOCK

CORDON SEAM

LOCK SEAM