

TABLE 169.567(a)—Continued

Space protected	Total number extinguishers required	Type extinguishers permitted		Coast Guard classification
		Medium	Minimum size	
Galley (without fixed system).	1 per 500 cu. ft	Dry chemical	10 pounds	B-II.
		Halon 1211 or 1301	10 pounds	
		Foam	2½ gallons	
		Carbon dioxide	15 pounds	
		Dry chemical	10 pounds	
		Halon 1211 or 1301	10 pounds	

(b) The Officer in Charge, Marine Inspection, may permit the use of any approved fire extinguishers, including semiportable extinguishers, which provide equivalent fire protection.

(c) All portable fire extinguishers installed on vessels must be of an approved type.

(d) Portable fire extinguishers must be stowed in a location convenient to the space protected.

(e) Portable fire extinguishers must be installed and located to the satisfaction of the Officer in Charge, Marine Inspection.

(f) Portable fire extinguishers which are required to be protected from freezing must not be located where freezing temperatures may be expected.

(g) Each vessel must carry spare charges for at least 50 percent of each size and variety of hand portable extinguishers required. For units that can not be readily recharged on the vessel, one spare extinguisher for each classification carried onboard must be provided in lieu of spare charges.

[CGD 83-005, 51 FR 897, Jan. 9, 1986; 51 FR 3785, Jan. 30, 1986]

§ 169.569 Fire axes.

(a) Each vessel must carry at least the number of fire axes set forth in Table 169.569(a). The Officer in Charge, Marine Inspection may require additional fire axes necessary for the proper protection of the vessel.

TABLE 169.569(a)

Length		Number of axes
Over	Not over	
	65	0
65	90	1
90	120	2
120	150	3

TABLE 169.569(a)—Continued

Length		Number of axes
Over	Not over	
150	4

(b) Fire axes must be stowed so as to be readily available in the event of emergency.

(c) If fire axes are not located in the open or behind glass, they must be placed in marked enclosures containing the fire hose.

Subpart 169.600 Machinery and Electrical

§ 169.601 General.

(a) The regulations in this subpart contain requirements for the design, construction and installation of machinery on sailing school vessels.

(b) Machinery must be suitable in type and design for the purpose intended. Installations of an unusual type and those not addressed by this subpart are subject to the applicable regulations in Subchapter F (Marine Engineering) and Subchapter J (Electrical Engineering) of this chapter.

(c) The use of liquefied inflammable gases, such as propane, methane, butane, etc., as fuel, except for cooking purposes, is prohibited.

INTERNAL COMBUSTION ENGINE INSTALLATIONS

§ 169.605 General.

(a) Generators, starting motors, and other spark producing devices must be mounted as high above the bilges as practicable.

(b) Gages to indicate engine cooling water temperature, exhaust cooling

water temperature and engine lubricating oil pressure must be provided and located in plain view.

(c) All electrical components of the engine must be protected in accordance with §183.410 of Title 33, Code of Federal Regulations to prevent ignition of flammable vapors.

§ 169.607 Keel cooler installations.

(a) Except as provided in this section, keel cooler installations must meet the requirements of §56.50-96 of this chapter.

(b) Approved metallic flexible connections may be located below the deepest load waterline if the system is a closed loop below the waterline and its vent is located above the waterline.

(c) Fillet welds may be used in the attachment of channels and half round pipe sections to the bottom of the vessel.

(d) Short lengths of approved non-metallic flexible hose may be used at machinery connections fixed by hose clamps provided that—

(1) The clamps are of a corrosion resistant material;

(2) The clamps do not depend on spring tension for their holding power; and

(3) Two clamps are used on each end of the hose or one hose clamp is used and the pipe ends are expanded or beaded to provide a positive stop against hose slippage.

§ 169.608 Grid cooler installations

(a) Hull penetrations for grid cooler installations must be made through a cofferdam or at a sea chest.

(b) Grid coolers must be suitably protected against damage from debris and grounding by recessing the unit into the hull or by the placement of protective guards.

(c) Each grid cooler hull penetration must be equipped with a shutoff valve.

§ 169.609 Exhaust systems.

Engine exhaust installations and associated cooling systems must be built in accordance with the requirements of American Boat and Yacht Council, Inc. Standard P-1, "Safe Installation of Exhaust Systems for Propulsion and Auxiliary Machinery" and the following additional requirements:

(a) All exhaust installations with pressures in excess of 15 pounds per square inch gage or employing runs passing through living or working spaces must meet the material specifications of part 56 of Title 46, Code of Federal Regulations.

(b) Horizontal dry exhaust pipes are permitted if they do not pass through living or berthing spaces, terminate above the deepest load waterline, are arranged to prevent entry of cold water from rough seas, and are constructed of corrosion resistant material at the hull penetration.

(c) When the exhaust cooling system is separate from the engine cooling system, a suitable warning device must be provided to indicate a failure of water flow in the exhaust cooling system.

§ 169.611 Carburetors.

(a) This section applies to all vessels having gasoline engines.

(b) Each carburetor other than a down-draft type, must be equipped with integral or externally fitted drip collectors of adequate capacity and arranged so as to permit ready removal of fuel leakage. Externally fitted drip collectors must be covered with flame screens.

(c) All gasoline engines must be equipped with an acceptable means of backfire flame control. Installations of backfire flame arresters bearing basic Approval Nos. 162.015 or 162.041 or engine air and fuel induction systems bearing basic Approval Nos. 162.015 or 165.042 may be continued in use as long as they are serviceable and in good condition. New installations or replacements must meet the applicable requirements of part 58, subpart 58.10 (Internal Combustion Engine Installations) of this chapter.

[CGD 83-005, 51 FR 896, Jan. 9, 1986, as amended by CGD 88-032, 56 FR 35827, July 29, 1991]

FUEL SYSTEMS

§ 169.613 Gasoline fuel systems.

(a) Except as provided in paragraph (b) each gasoline fuel system must meet the requirements of §56.50-70 of this chapter

(b) Each vessel of 65 feet and under must meet the requirements of

§ 169.615

§§ 182.15-25, 182.15-30, 182.15-35 and 182.15-40 of this chapter.

§ 169.615 Diesel fuel systems.

(a) Except as provided in paragraph (b) each diesel fuel system must meet the requirements of § 56.50-75 of this chapter.

(b) Each vessel of 65 feet and under must meet the requirements of §§ 182.20-22, 182.20-25, 182.20-30, 182.20-35 and 182.20-40 of this chapter.

STEERING SYSTEMS

§ 169.618 General.

(a) Each vessel must have an effective steering system.

(b) The steering system must be designed to withstand all anticipated loading while under sail, including shocks to the rudder. Additionally, the steering system on vessels with an auxiliary means of propulsion must not be susceptible to damage or jamming at the vessel's maximum astern speed.

(c) The main steering gear must be capable of moving the rudder from hard-over to hard-over at an average rate of not less than 2 1/3° per second with the vessel at design service speed (ahead).

§ 169.619 Reliability.

(a) Except where the OCMI judges it impracticable, the steering system must—

(1) Provide continued or restored steering capability in the event of a failure or malfunction of any single steering system component other than the rudder or rudder stock;

(2) Be independent of other systems, including auxiliary propulsion machinery; and

(3) Be operable in the event of localized fire or flooding.

(b) A main and independent auxiliary steering gear must be provided, except when—

(1) A small vessel uses a tiller or direct mechanical linkage as the primary means of controlling the rudder; or

(2) Installation of an auxiliary steering gear is not possible.

NOTE: A partial reduction of normal steering capability as a result of malfunction or failure is acceptable. This reduction should

not be below that necessary for the safe navigation of the vessel.

(c) The strength and reliability of any component that is not provided in duplicate must be suitable to the cognizant OCMI. Where redundant or backup equipment or components are provided to meet the requirements of paragraphs (a) and (b) of this section, the following must be provided:

(1) A means to readily transfer from the failed equipment or component to the backup.

(2) Readily available tools or equipment necessary to make the transfer.

(3) Instructions for transfer procedures, posted at the main steering location.

(4) A means to steady the rudder while making the transfer.

§ 169.621 Communications.

A reliable means of voice communications must be provided between the main steering location and each alternate steering location.

§ 169.622 Rudder angle indicators.

Each vessel must have a rudder angle indicator at the main steering location that meets the requirements of § 113.40-10 of this chapter, except where a tiller or direct mechanical linkage is the primary means of controlling the rudder.

§ 169.623 Power-driven steering systems.

(a) Power-driven steering systems must have means to be brought into operation from a dead ship condition, without external aid. The system must automatically resume operation after an electric power outage.

(b) Control of power-driven steering systems from the main steering control location must include, as applicable—

(1) Control of any necessary ancillary device (motor, pump, valve, etc.);

(2) A pilot light to indicate operation of each power unit; and

(3) Visual and audible alarms to indicate loss of power to the control system or power units and overload of electric motors.

(c) Overcurrent protection for steering system electric circuits must meet § 111.93-11 of this chapter, as applicable.

VENTILATION

§ 169.625 Compartments containing diesel machinery.

(a) Spaces containing machinery must be fitted with adequate drip-proof ventilators, trunks, louvers, etc., to provide sufficient air for proper operation of the propulsion and auxiliary engines.

(b) Air-cooled propulsion and auxiliary engines installed below deck must be fitted with air intake ducts or piping from the weather deck. The ducts or piping must be arranged and supported to safely sustain stresses induced by weight and engine vibration and to minimize transfer of vibration to the supporting structure. Prior to installing ventilation for the engines, plans or sketches showing the machinery arrangement including air intakes, exhaust stack, method of attachment of ventilation ducts to the engine, location of spark arresting mufflers and capacity of ventilation blowers must be submitted to the OCM for approval.

(c) Spaces containing machinery must be fitted with at least two ducts to furnish natural or mechanical supply and exhaust ventilation. One duct must extend to a point near the bottom of the compartment, and be installed so that the ordinary collection of water in the bilge will not trap the duct. Where forced ventilation is installed, the duct extending to the bottom of the compartment must be the exhaust. The total inlet area and the total outlet area of ventilation ducts must be not less than one square inch for each foot of beam of the vessel. These minimum areas must be increased when such ducts are considered part of the air supply to the engines.

(d) All ducts must be of rigid permanent noncombustible construction, properly fastened, supported, and reasonably gastight from end to end.

(e) All supply ducts for ventilation purposes must be provided with cowls or scoops having a free area not less than twice the required duct area. When the cowls or scoops are screened, the mouth area must be increased to compensate for the area of the screen wire. Dampers are prohibited in supply ducts. Cowls or scoops must be kept open at all times except when weather

would endanger the vessel if the openings were not temporarily closed. Supply and exhaust openings must not be located where the natural flow of air is unduly obstructed, or adjacent to possible sources of vapor ignition, and must not be located where exhaust air may be taken into the supply vents.

§ 169.627 Compartments containing diesel fuel tanks.

Unless they are adequately ventilated, enclosed compartments or spaces containing diesel fuel tanks and no machinery must be provided with a goose-neck vent of not less than 2½ inches in diameter. The vent opening must not be located adjacent to possible sources of vapor ignition.

§ 169.629 Compartments containing gasoline machinery or fuel tanks.

Spaces containing gasoline machinery or fuel tanks must have natural supply and mechanical exhaust ventilation meeting the requirements of American Boat and Yacht Council Standard H-2.5, "Design and Construction; Ventilation of Boats Using Gasoline."

§ 169.631 Separation of machinery and fuel tank spaces from accommodation spaces.

(a) Machinery and fuel tank spaces must be separated from accommodation spaces by watertight or vapor tight bulkheads of double diagonal wood, marine plywood, steel plate, or equivalent construction.

(b) On vessels less than 90 feet in length, segregation may be by means of a watertight or vapor tight engine box.

PIPING SYSTEMS

§ 169.640 General.

(a) Vital piping systems, as defined in § 169.642 of this subpart, must meet the material and pressure design requirements of Subchapter F of this chapter.

(b) Except as provided in this paragraph, nonmetallic piping system materials must meet the applicable requirements of 46 CFR 56.60-25.

(1) Rigid nonmetallic materials are acceptable for use in bilge, ballast, and machinery-connected piping systems on vessels less than 120 feet in length,

§ 169.642

provided that bilge and fire systems do not use the same piping.

(2) Nonmetallic piping is prohibited in fuel systems except where flexible hose is permitted.

(3) Rigid nonmetallic materials may be used in non-vital systems.

§ 169.642 Vital systems.

For the purpose of this part, the following are considered vital systems—

(a) A marine engineering system identified by the OCMI as being crucial to the survival of the vessel or to the protection of the personnel on board; and

(b) On vessels greater than 120 feet in length—

- (1) Bilge system;
- (2) Ballast system;
- (3) Fire protection system;
- (4) Fuel oil system; and
- (5) Steering and steering control system.

BILGE SYSTEMS

§ 169.650 General.

All vessels must be provided with a satisfactory arrangement for draining any compartment, other than small buoyancy compartments, under all practical conditions. Sluice valves are not permitted in watertight bulkheads except as specified in § 169.652(a).

§ 169.652 Bilge piping.

(a) All vessels of 26 feet in length and over must be provided with individual bilge lines and suction for each compartment except that the space forward of the collision bulkhead may be serviced by a sluice valve or portable bilge pump if the arrangement of the vessel is such that ordinary leakage can be removed this way.

(b) The bilge pipe on vessels 65 feet in length and under must be not less than one inch nominal pipe size. On vessels greater than 65 but less than 120 feet in length the bilge pipe must be not less than one and one-half inches. Piping on vessels of 120 feet or greater or of 100 gross tons or greater must meet the requirements contained in § 56.50-50 of this chapter.

(c) Each bilge suction must be fitted with a suitable strainer having an open

area not less than three times the area of the bilge pipe.

(d) Each individual bilge suction line must be led to a central control point or manifold. Each line must be provided with a stop valve at the control point or manifold and a check valve at some accessible point in the bilge line, or a stop-check valve located at the control point or manifold.

(e) Each bilge pipe piercing the collision bulkhead must be fitted with a screw-down valve located on the forward side of the collision bulkhead and operable from above the weather deck.

§ 169.654 Bilge pumps.

(a) Vessels of less than 65 feet in length must have a portable hand bilge pump having a maximum capacity of 5 gpm.

(b) In addition to the requirements of paragraph (a) of this section, vessels of 26 feet but less than 40 feet in length must have a fixed hand bilge pump or fixed power bilge pump having a minimum capacity of 10 gpm. If a fixed hand pump is installed, it must be operable from on deck.

(c) In addition to the requirements of paragraph (a) of this section, vessels of 40 feet but less than 65 feet must have a fixed power bilge pump having a minimum capacity of 25 gpm.

(d) Vessels of 65 feet in length but less than 120 feet and under 100 gross tons must have two fixed power bilge pumps having a combined minimum capacity of 50 gpm.

(e) Vessels of 120 feet or greater and vessels of 100 gross tons and over must have two fixed power pumps meeting the capacity requirements of § 56.50-55(c) of this chapter.

(f) Each power driven bilge must be self priming.

(g) Each fixed bilge pump required by this section must be permanently connected to the bilge main.

(h) Bilge pumps may also be connected to the firemain provided that the bilge system and firemain system may be operated simultaneously.

ELECTRICAL

§ 169.662 Hazardous locations.

Electrical equipment must not be installed in lockers that are used to store

paint, oil, turpentine, or other flammable liquids unless the equipment is explosion-proof or intrinsically safe in accordance with §111.105-9 or §111.105-11 of this chapter.

ELECTRICAL INSTALLATIONS OPERATING AT POTENTIALS OF LESS THAN 50 VOLTS ON VESSELS OF LESS THAN 100 GROSS TONS

§ 169.664 Applicability.

The requirements in this subpart apply to electrical installations operating at potentials of less than 50 volts on vessels of less than 100 gross tons.

§ 169.665 Name plates.

Each generator, motor and other major item of power equipment must be provided with a name plate indicating the manufacturer's name, its rating in volts and amperes or in volts and watts and, when intended for connection to a normally grounded supply, the grounding polarity.

§ 169.666 Generators and motors.

(a) Each vessel of more than 65 feet in length having only electrically driven fire and bilge pumps must have two generators. One of these generators must be driven by a means independent of the auxiliary propulsion plant. A generator that is not independent of the auxiliary propulsion plant must meet the requirements of §111.10-4(c) of this chapter.

(b) Each generator and motor must be in a location that is accessible, adequately ventilated, and as dry as practicable.

(c) Each generator and motor must be mounted as high as practicable above the bilges to avoid damage by splash and to avoid contact with low lying vapors.

(d) Each generator must be protected from overcurrent by a circuit breaker, fuse or an overcurrent relay.

§ 169.667 Switchboards.

(a) Each switchboard must be in as dry a location as practicable, accessible, protected from inadvertent entry, and adequately ventilated. All uninsulated current carrying parts must be mounted on nonabsorbent, noncombustible, high dielectric insulating material.

(b) Each switchboard must be—

- (1) Totally enclosed; and
- (2) Of the dead front type.

(c) Each ungrounded conductor of a circuit must have at the point of attachment to the power source either—

- (1) A Circuit breaker; or
- (2) A switch and fuse.

(d) Each switch other than one mounted on a switchboard must be of the enclosed type.

§ 169.668 Batteries.

(a) Each battery must be in a location that allows the gas generated in charging to be easily dissipated by natural or induced ventilation.

(b) Except as provided in paragraph (c) of this section, a battery must not be located in the same compartment with a gasoline tank or gasoline engine.

(c) If compliance with paragraph (b) of this section is not practicable, the battery must be effectively screened by a cage or similar structure to minimize the danger of accidental spark through dropping a metal object across the terminals.

(d) Each battery must be located as high above the bilges as practicable and secured against shifting with motion of the vessel. Each battery and battery connection must be accessible so as to permit removal.

(e) All connections must be made to battery terminals with permanent type connectors. Spring clips or other temporary type clamps may not be used.

(f) Each battery must be located in a tray of lead or other suitable material resistant to deteriorating action by the electrolyte.

(g) Each battery charger intended for connection to a commercial supply voltage must employ a transformer of the isolating type. An ammeter that is readily visible must be included in the battery charger circuit.

(h) A voltage dropping resistor, provided for charging a battery, must be mounted in a ventilated noncombustible enclosure that prevents hazardous temperatures at adjacent combustible materials.

(i) The main supply conductor from the battery must have an emergency switch, located as close as practicable

to the battery, that opens all ungrounded conductors.

(j) If a storage battery is not in the same compartment and adjacent to the panel or box that distributes power to the various lighting, motor and appliance branch circuits, the storage battery lead must be fused at the battery.

§ 169.669 Radiotelephone equipment.

A separate circuit from the switchboard must be provided for each radiotelephone installation.

§ 169.670 Circuit breakers.

Each circuit breaker must be of the manually reset type designed for—

- (a) Inverse time delay;
- (b) Instantaneous short circuit protection; and
- (c) Repeated opening of the circuit without damage to the circuit breaker.

§ 169.671 Accessories.

Each light, receptacle and switch exposed to the weather must be watertight and must be constructed of corrosion-resistant material.

§ 169.672 Wiring for power and lighting circuits.

(a) Wiring for power and lighting circuits must have copper conductors, of 14 AWG or larger, and—

- (1) Meet Article 310-8 and Table 310-13 of the National Electrical Code;
- (2) Be listed as "50 volt boat cable"; or
- (3) Meet subpart 111.60 of this chapter.

(b) Wiring for power and lighting circuits on new vessels must have stranded conductors.

(c) Conductors must be sized so that—

- (1) They are adequate for the loads carried; and
- (2) The voltage drop at the load terminals is not more than 10 percent.

§ 169.673 Installation of wiring for power and lighting circuits.

(a) Wiring must be run as high as practicable above the bilges.

(b) Wiring, where subject to mechanical damage, must be protected.

(c) A wiring joint or splice must be mechanically secure and made in a junction box or enclosure.

(d) Unless a splice is made by an insulated pressure wire connector, it must be thoroughly soldered and taped with electrical insulating tape or the soldered joint must be otherwise protected to provide insulation equivalent to that of the conductors joined.

(e) Where ends of stranded conductors are to be clamped under terminal screws, they must be formed and soldered unless fitted with pressure terminal connectors.

(f) Conductors must be protected from overcurrent in accordance with their current-carrying capacities.

(g) Conductors supplying motors and motor operated appliances must be protected by a separate overcurrent device that is responsive to motor current. This device must be rated or set at not more than 125 percent of the motor full-load current rating.

(h) On metallic vessels the enclosures and frames of all major electrical equipment must be permanently grounded to the metal hull of the vessel by the mounting bolts or other means. Cable armor must not be used as the normal grounding means.

(i) On nonmetallic vessels, the enclosures and frames of major electrical equipment must be bonded together to a common ground by a normally non-current carrying conductor.

(j) For grounded systems the negative polarity of the supply source must be grounded to the metal hull or, for nonmetallic vessels, connected to the common ground.

(k) On a nonmetallic vessel, where a ground plate is provided for radio equipment it must be connected to the common ground.

(l) For grounded systems, hull return must not be used except for engine starting purposes.

ELECTRICAL INSTALLATIONS OPERATING AT POTENTIALS OF 50 Volts or MORE ON VESSELS OF LESS THAN 100 GROSS TONS

§ 169.674 Applicability.

The requirements in this subpart apply to electrical installations operating at potentials of 50 volts or more, on vessels of less than 100 gross tons.

§ 169.675 Generators and motors.

(a) Each generator and motor must be fitted with a nameplate of corrosion-resistant material marked with the following information as applicable:

- (1) Name of manufacturer.
- (2) Manufacturer's type and frame designation.
- (3) Output in kilowatts or horsepower rating.
- (4) Kind of rating (continuous, intermittent, etc.).
- (5) Revolutions per minute at rated load.
- (6) Amperes at rated load.
- (7) Voltage.
- (8) Frequency if applicable.
- (9) Number of phases, if applicable.
- (10) Type of winding (for direct-current motors).

(b) Each vessel of more than 65 feet in length having only electrically driven fire and bilge pumps must have two generators. One of these generators must be driven by a means independent of the auxiliary propulsion plant. A generator that is not independent of the auxiliary propulsion plant must meet the requirements of § 111.10-4(c) of this chapter.

(c) Each generator and motor must be in a location that is accessible, adequately ventilated, and as dry as practicable.

(d) Each generator and motor must be mounted as high as practicable above the bilges to avoid damage by splash and to avoid contact with low lying vapors.

(e) Each motor for use in a location exposed to the weather must be of the watertight or waterproof type or must be enclosed in a watertight housing. The motor enclosure or housing must be provided with a check valve for drainage or a tapped hole at the lowest part of the frame for attaching a drain pipe or drain plug.

(f) Except as provided in paragraphs (g) and (h) of this section, each generator and motor for use in a machinery space must be designed for an ambient temperature of 50 degrees C. (122 degrees F.).

(g) A generator or motor may be designed for an ambient temperature of 40 degrees C. (104 degrees F.) if the vessel is designed so that the ambient

temperature in the machinery space will not exceed 40 degrees C. under normal operating conditions.

(h) A generator or motor designed for 40 degrees C. may be used in a 50 degrees C. ambient location provided it is derated to 80 percent of full load rating, and the rating or setting of the overcurrent device is reduced accordingly. A nameplate specifying the derated capacity must be provided for each motor and generator.

(i) A voltmeter and an ammeter must be provided that can be used for measuring voltage and current of each generator that is in operation. For each alternating-current generator a means for measuring frequency must also be provided. Additional control equipment and measuring instruments must be provided, if needed, to ensure satisfactory operation of each generator.

§ 169.676 Grounded electrical systems.

(a) Except as provided in paragraph (b) of this section, each electrical system must meet subpart 111.05 of this chapter.

(b) Ground detection is not required.

§ 169.677 Equipment protection and enclosure.

(a) Except as provided in this section, all electrical equipment including motors, generators, controllers, distribution panels, consoles, etc., must be at least dripproof and protected.

(b) Equipment mounted on a hinged door of an enclosure must be constructed or shielded so that no live parts of the door mounted equipment will be exposed to accidental contact by a person with the door open and the circuit energized.

(c) Any cabinet, panel, or box containing more than one source of potential in excess of 50 volts must be fitted with a sign warning personnel of this condition and identifying the circuits to be disconnected to remove all the potentials in excess of 50 volts.

(d) Each distribution panelboard must be enclosed.

§ 169.678 Main distribution panels and switchboards.

(a) A distribution panel to which the generator leads are connected, and

from which the electric leads throughout the vessel directly or indirectly receive their electric power is a switchboard.

(b) Each switchboard must have a driphood or an equivalent means of protecting against falling liquid.

(c) Nonconductive deck materials, mats, or gratings must be provided in front of each switchboard.

(d) If the switchboard is accessible from the rear, nonconductive deck material, mats, or gratings must be provided in the rear of the switchboard.

(e) Metal cases of instruments and secondary windings of instrument transformers must be grounded.

(f) Each switchboard must be placed in a location that is accessible, adequately ventilated, and as dry as practicable. All uninsulated current carrying parts must be mounted on non-absorbent, noncombustible, high dielectric insulating material.

(g) Each switchboard must be of the dead front type.

(h) Each switchboard must have front and, if accessible from the back, rear non-conducting hand rails except on vessels where the surrounding bulkheads and decks are of an insulating material such as fiberglass or wood.

§ 169.679 Wiring for power and lighting circuits.

Wiring for each power and lighting circuit must meet subpart 111.60 of this chapter.

§ 169.680 Installation of wiring for power and lighting circuits.

(a) Wiring must be run as high as practicable above the bilges.

(b) Each cable installed where particularly susceptible to damage such as locations in way of doors, hatches, etc., must be protected by removable metal coverings, angle irons, pipe, or other equivalent means. All metallic coverings must be electrically continuous and grounded to the metal hull or common ground, and all coverings such as pipe that may trap moisture must be provided with holes for drainage. Where cable protection is carried through a watertight deck or bulkhead, the installation must maintain the watertight integrity of the structure.

(c) Each cable entering a box or fitting must be protected from abrasion, and must meet the following requirements:

(1) Each opening through which conductors enter must be adequately closed.

(2) Cable armor must be secured to the box or fitting.

(3) In damp or wet locations, each cable entrance must be watertight.

(d) The enclosures of all equipment must be permanently grounded to the metal hull of the vessel by the mounting bolts or other means. Cable armor must not be used as the normal grounding means.

(e) On a nonmetallic vessel, the enclosures must be bonded to a common ground by a normal noncurrent carrying conductor.

(f) On a nonmetallic vessel, where a ground plate is provided for radio equipment it must be connected to the common ground.

(g) Except as provided in paragraph (i) of this section, each armored cable must have a metallic covering that is—

(1) Electrically and mechanically continuous; and

(2) Grounded at each end of the run to—

(i) The metal hull; or

(ii) The common ground required by paragraph (e) of this section on non-metallic vessels.

(h) In lieu of being grounded at each end of the run as required by paragraph (g) of this section, final sub-circuits may be grounded at the supply end only.

(i) All equipment, including switches, fuses, lampholders, etc., must be of a type designed for the proper potential and be so identified.

(j) Except as provided in paragraph (l) of this section, each junction box, connection box, and outlet box, must have an internal depth of at least 1½ inches.

(k) For a box incorporated in a fixture having a volume of not less than 20 cubic inches, the depth may be decreased to not less than 1 inch.

(l) Each conductor, except a fixture wire within a box, must have a free space computed using the volume per conductor given in Table 169.680(l). If a fitting or device such as a cable clamp,

hickey, switch or receptacle is contained in the box, each fitting or device must count as one conductor.

TABLE 169.680(I)

Size of conductor A.W.G.	Free space for each conductor in box, cubic inches
14	2.0
12	2.25
8	2.50
1	3.0

(m) Each junction box, connection box, and outlet box for use in a damp or wet location must be of watertight construction.

(n) Each lighting fixture must be constructed in accordance with the requirements of Subchapter J of this chapter.

(o) A separate circuit from the switchboard must be provided for each radiotelephone installation.

(p) Knife switches must be so placed or designed that gravity or vibration will not tend to close them. Knife switches, unless of the double throw type, must be connected so that the blades are dead when the switch is in the open position.

(q) Circuits must be connected to the fuse end of switches and to the coil end of circuit breakers, except that generator leads or incoming feeders may be connected to either end of circuit breakers.

(r) Receptacle outlets and attachment plugs for the attachment of portable lamps, tools, and similar apparatus supplied as ship's equipment and operating at 100 volts or more, must provide a grounding pole and a grounding conductor in the portable cord to ground the non-current carrying metal parts of the apparatus.

(s) Receptacle outlets of the type providing a grounded pole must be of a configuration that will not permit the dead metal parts of portable apparatus to be connected to a live conductor.

§ 169.681 Disconnect switches and devices.

(a) Externally operable switches or circuit breakers must be provided for motor and controller circuits and must open all ungrounded conductors of the circuit.

(b) If the disconnect means is not within sight of the equipment that the

circuit supplies, means must be provided for locking the disconnect device in the "open" position.

(c) For circuits protected by fuses, the disconnect switch required for fuses in § 169.683(b) of this chapter is adequate for disconnecting the circuit from the supply.

(d) The disconnect means may be in the same enclosure with motor controllers.

(e) Disconnect means must be provided to open all conductors of generator and shore power cables.

[CGD 83-005, 51 FR 896, Jan. 9, 1986; 51 FR 10632, Mar. 28, 1986]

§ 169.682 Distribution and circuit loads.

(a) Except as provided in paragraph (b) of this section, the connected load on a lighting branch circuit must not exceed 80 percent of the rating of the overcurrent protective device, computed using the greater of—

- (1) The lamp sizes to be installed; or
- (2) 50 watts per outlet.

(b) Circuits supplying electrical discharge lamps must be computed using the ballast input current.

(c) The branch circuit cables for motor and lighting loads must be no smaller than No. 14 AWG.

§ 169.683 Overcurrent protection, general.

(a) Overcurrent protection must be provided for each ungrounded conductor for the purpose of opening the electric circuit if the current reaches a value that causes an excessive or dangerous temperature in the conductor or conductor insulation.

(b) Disconnect means must be provided on the supply side of and adjacent to all fuses for the purpose of de-energizing the fuses for inspection and maintenance purposes. All disconnect means must open all ungrounded conductors of the circuit simultaneously.

(c) Each conductor, including a generator lead and shore power cable, must be protected in accordance with its current-carrying capacity.

(d) If the allowable current-carrying capacity of a conductor does not correspond to a standard size fuse, the next larger size or rating may be used

but not exceeding 150 percent of the allowable current-carrying capacity of the conductor.

(e) Plug (screw in type) fuses and fuseholders must not be used in circuits exceeding 125 volts between conductors. The screw shell of plug type fuseholders must be connected to the load of the circuit. Edison base fuses may not be used.

(f) If the allowable current-carrying capacity of the conductor does not correspond to a standard rating of circuit breakers, the next larger rating not exceeding 150 percent of the allowable current-carrying capacity of the conductor may be used.

(g) Lighting branch circuits must be protected against overcurrent either by fuses or circuit breakers rated at not more than 20 amperes.

(h) Each circuit breaker must be of the manually reset type designed for—

(1) Inverse time delay;

(2) Instantaneous short circuit protection; and

(3) Repeated opening of the circuit in which it is to be used without damage to the circuit breaker.

(i) Circuit breakers must indicate whether they are in the open or closed position.

(j) Devices such as instruments, pilot lights, ground detector lights, potential transformers, etc. must be supplied by circuits protected by overcurrent devices.

(k) Each generator must be protected with an overcurrent device set at a value not exceeding 15 percent above the full-load rating for continuous rated machines or the overload rating for special rated machines.

§ 169.684 Overcurrent protection for motors and motor branch circuits.

(a) Except as provided in paragraph (d) of this section, each motor must be provided with running protection against overcurrent. A protective device integral with the motor that is responsive to motor current or to both motor current and temperature may be used.

(b) The motor branch circuit conductors, the motor control apparatus, and the motors must be protected against overcurrent due to short circuits or grounds with overcurrent devices.

(c) The motor branch circuit overcurrent device must be capable of carrying the starting current of the motor.

(d) Each manually started continuous duty motor, rated at one horsepower or less, that is within sight from the starter location, is considered as protected against overcurrent by the overcurrent device protecting the conductors of the branch circuit.

§ 169.685 Electric heating and cooking equipment.

(a) Each electric space heater for heating rooms and compartments must be provided with thermal cutouts to prevent overheating. Each heater must be so constructed and installed as to prevent the hanging of towels, clothing, etc., on the heater, and to prevent overheating of heater parts and adjacent bulkheads or decks.

(b) All electric cooking equipment, attachments, and devices, must be of rugged construction and so designed as to permit complete cleaning, maintenance, and repair.

(c) Doors for electric cooking equipment must be provided with heavy duty hinges and locking devices to prevent accidental opening in heavy seas.

(d) Electric cooking equipment must be mounted to prevent dislodgment in heavy seas.

(e) For each grill or similar type cooking equipment, means must be provided to collect grease or fat and to prevent spillage on wiring or the deck.

(f) Where necessary for safety of personnel, grab rails must be provided. Each electric range must be provided with sea rails with suitable barriers to resist accidental movement of cooking pots.

§ 169.686 Shore power.

If a shore power connection is provided it must meet the following requirements:

(a) A shore power connection box or receptacle and a cable connecting this box or receptacle to the main distribution panel must be permanently installed in an accessible location.

(b) The shore power cable must be provided with a disconnect means located on or near the main distribution panel.

ELECTRICAL INSTALLATIONS ON VESSELS
OF 100 GROSS TONS AND OVER**§ 169.687 General.**

Except as provided in this subpart, electrical installations on vessels of 100 gross tons and over must meet the requirements of parts 110-113 of this chapter.

§ 169.688 Power supply.

(a) The requirements of this section apply in lieu of subpart 111.10 of this chapter.

(b) If a generator is used to provide electric power for any vital system listed in §169.642 of this subchapter, at least two generating sets must be provided. At least one required generating set must be independent of the auxiliary propulsion machinery. A generator that is not independent of the auxiliary propulsion plant must meet the requirements of §111.10-4(c) of this chapter. With any one generating set stopped, the remaining set(s) must provide the power necessary for each of the following:

(1) Normal at sea load plus starting of the largest vital system load that can be started automatically or started from a space remote from the main distribution panel (switchboard).

(2) All vital systems simultaneously with nonvital loads secured.

(c) The adequacy of ship service generators must be demonstrated to the satisfaction of the OCMI during the initial inspection required by §169.221 of this subchapter.

§ 169.689 Demand loads.

Demand loads must meet §111.60-7 of this chapter except that smaller demand loads for motor feeders are acceptable if the cable is protected at or below its current-carrying capacity.

§ 169.690 Lighting branch circuits.

Each lighting branch circuit must meet the requirements of §111.75-5 of this chapter, except that—

(a) Appliance loads, electric heater loads, and isolated small motor loads may be connected to a lighting distribution panelboard; and

(b) Branch circuits in excess of 30 amperes may be supplied from a lighting distribution panelboard.

§ 169.691 Navigation lights.

Navigation light systems must meet the requirements of §111.75-17 of this chapter except the requirements of §111.75-17 (a) and (c).

§ 169.692 Remote stop stations.

In lieu of the remote stopping systems required by subpart 111.103 of this chapter, remote stop stations must be provided as follows:

(a) A propulsion shutdown in the pilothouse for each propulsion unit,

(b) A bilge slop or dirty oil discharge shutdown at the deck discharge,

(c) A ventilation shutdown located outside the space ventilated, and

(d) A shutdown from outside the engineroom for the fuel transfer pump, fuel oil service pump, or any other fuel oil pump.

§ 169.693 Engine order telegraph systems.

An engine order telegraph system is not required.

Subpart 169.700—Vessel Control, Miscellaneous Systems, and Equipment**§ 169.703 Cooking and heating.**

(a) Cooking and heating equipment must be suitable for marine use. Cooking installations must meet the requirements of ABYC Standard A-3, "Recommended Practices and Standards Covering Galley Stoves."

(b) The use of gasoline for cooking, heating or lighting is prohibited on all vessels.

(c) The use of liquefied petroleum gas (LPG) or compressed natural gas (CNG) is authorized for cooking purposes only.

(1) The design, installation and testing of each LPG system must meet either ABYC A-1 or Chapter 6 of NFPA 302.

(2) The design, installation, and testing of each CNG system must meet either Chapter 6 of NFPA 302 or ABYC A-22.

(3) The stowage of each cylinder must comply with the requirements for the stowage of cylinders of liquefied or non-liquefied gases used for heating,