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PART IV

DEPARTMENT OF TRANSPORTATION

Coast Guard

■

ELECTRICAL ENGINEERING

DEPARTMENT OF TRANSPORTATION

Coast Guard

[46 CFR Parts 32, 33, 35, 37, 72, 75, 77, 78, 79, 92, 94, 96, 97, 99, 100–139, 190, 192, 195, 196]

[CGD 74–125]

ELECTRICAL ENGINEERING

Revision of Subchapter J

AGENCY: Coast Guard, DOT.

ACTION: Proposed rules.

SUMMARY: The Coast Guard is considering amendments to its Electrical Engineering regulations. The purpose of the proposed amendments is to clarify the Electrical Engineering regulations, bring them up-to-date, and delete unnecessary requirements. To accomplish this the proposal incorporates recommendations for electrical installations of the Inter-Governmental Maritime Consultative Organization's (IMCO) Resolution A.325 (IX) "Recommendation Concerning Regulations for Machinery and Electrical Installations in Passenger and Cargo Ships" adopted by the IMCO Assembly on November 12, 1975. Additionally, the proposal replaces many requirements by similar requirements of the National Electrical Code, the Institute of Electrical and Electronics Engineers Standard No. 45 "Recommended Practice for Electric Installations on Shipboard", and the American Bureau of Shipping "Rules for Building and Classing Steel Vessels". The proposal will bring the Electrical Engineering regulations up-to-date, clarify these regulations, and delete unnecessary requirements from the regulations. Additionally, the proposal would result in a fifty percent decrease in the volume of the Electrical Engineering regulations.

DATES: Comments must be received on or before August 11, 1977.

ADDRESSES: Comments should be submitted to Commandant (G–CMC/81) U.S. Coast Guard, Washington, D.C. 20590. Comments will be available for examination at the Marine Safety Council (G–CMC/81), Room 8117, Department of Transportation, Nassif Building, 400 Seventh Street, SW., Washington, D.C. 20590.

FOR FURTHER INFORMATION CONTACT:

Captain George K. Greiner, Marine Safety Council (G–CMC/81), Room 8117, Department of Transportation, Nassif Building, 400 Seventh Street, SW., Washington, D.C. 20590, 202–426–1477.

SUPPLEMENTARY INFORMATION: Interested persons are invited to participate in this proposed rulemaking by submitting written views, data or arguments. Each person submitting a comment should include his name and address, identify this notice (CGD 74–125) and the specific section of the proposal to which his comment applies, and give the reasons for his comment. The proposal may be changed in light of comments received. All comments received will be considered before final action is taken on this proposal. Copies of all written comments received will be available for examination by interested persons. No public hearing is planned but one may be held at a time and place to be set in a later notice in the FEDERAL REGISTER if requested in writing by an interested person raising a genuine issue and desiring to comment orally at a public hearing.

DRAFTING INFORMATION

The principal persons involved in drafting this proposal are: Lieutenant Commander John W. Reiter, Project Manager for the Office of Merchant Marine Safety and Lieutenant William R. Kerivan, Project Counsel for the Office of Chief Counsel.

DISCUSSION OF THE PROPOSED REGULATIONS

The most significant proposed revisions are discussed below. Other revisions would also be made; these are incorporated in the proposed rules. The entire subchapter is contained in the notice to provide the reader with a complete picture of what the total subchapter would look like. Comments need not be limited to a proposed change; rather, comments are invited on any part of the subchapter.

Applicability dates and requirements for existing installations would be deleted throughout the subbchapter since the requirements in the proposed revised subchapter would apply only to installations after the effective date.

In the subparts listed below, references to National Electrical Code requirements would replace similar requirements in the existing regulations. The purpose of this proposal is to bring these requirements in line with the generally accepted safety provisions of the National Electrical Code. These proposed subparts are:

111.20	Transformer Construction, Installation, and Protection (existing §§ 111.20 and 111.75–3).
111.40	Panelboards.
111.50	Overcurrent Protection (existing § 111.50–1 through § 111.50–10).
111.53	Fuses (existing § 111.50–15(a)–(d)).
111.54	Circuit Breakers (existing § 111.50–15(e)).
111.55	Switches.
111.70	Motor Circuits, Motor Controllers, and Protection.
111.79	Receptacles (existing § 111.75–35).
111.89	Motion Pictures Projectors (existing § 111.80–30).
111.105	Hazardous Locations (existing § 111.80–5, § 111.80–8, § 111.85).

It is proposed to amend Parts 32, 33, 35, 37, 72, 75, 77, 78, 79, 92, 94, 96, 97, 99, 190, 192, 195, and 196 by deleting specific references to Subchapter J. Also, material that is contained both in these parts and in Subchapter J would be deleted from these parts. Each vessel subchapter would then simply contain a requirement that electrical installations meet Subchapter J. The purpose of this proposal is to avoid the possibility of future erroneous references and inconsistent regulations.

It is proposed to revise § 35.30–30 to prohibit the use of most portable electrical equipment in all hazardous locations, except under specified conditions. The purpose of this proposal is to prevent explosions on tank vessels.

Proposed Subpart 110.01—*Application* would replace Subparts 110.01, 110.05, and 110.25. Proposed new § 110.01–1 describes the scope of the proposed regulations. The proposed regulations would apply to electrical equipment and systems installed after the effective date of these proposed regulations (new installations). Electrical equipment and systems installed before that date (existing installations) would be required to meet the specifications in effect at the time of the installation. Repairs to existing installations would have to meet the specifications in effect on the date of the original installation or the specifications in effect on the date of the repair (proposed § 110.01–5).

Subpart 111.10—*Reference Specifications, Standards, and Codes* would be up-dated for current references and changes in addresses of referenced organizations.

It is proposed to change Subpart 110.15 by replacing technical definitions of electrical and electronics terms with a reference to the Institute of Electrical and Electronics Engineers' IEEE Standard Dictionary of Electrical and Electronics Terms' (IEEE Standard No. 100) in order to be consistent with the definitions used in the electrical industry.

Proposed Subpart 110.25—*Plan Submittal* would replace § 111.05–5 and amend the requirements as follows:

a. The requirements for submission of drawings of switchboard front, rear, end, and section views, generators and propulsion motors, and motor starters would be deleted. Only one copy of isometric or deck wiring plans of power and lighting systems would be required to be submitted for information to the Officer in Charge, Marine Inspection. Technical review of the information on these plans is not necessary because the suitability of the items depicted on these plans can be adequately determined during vessel inspection.

b. The plans requiring technical review would be submitted to the appropriate field technical office. Present regulations permit submittal of these plans to the Commandant (G–MMT) or the Officer in Charge, Marine Inspection. In actual practice, the Commandant or the Officer in Charge, Marine Inspection forwards these plans to the appropriate field technical office for review. The proposed change in the regulations should reduce delays in plan approval.

c. The requirements of existing § 111.50–20(c) for submission of detailed short circut current calculations would be incorporated in this subpart. Additionally, to ensure coordination, an overcurrent protective device coordination study would be required when detailed short circuit current calculations are required.

d. Proposed § 110.25–1(j) would require that plans be submitted for technical review showing each item of elec-

trical equipment that is in a hazardous location on a tank vessel or a mobile offshore drilling unit. This should ensure, at the earliest possible time, that the equipment in hazardous locations meets the requirements of the regulations for such equipment. This is necessary because of the long lead times associated with procurring such equipment.

e. Procedures for providing copies of approved plans to the American Bureau of Shipping would be added.

Section 111.50–10 concerning tests and inspections would be made a new Subpart 110.30 to make these requirements easier to read. As an aid to the inspector, reference to specific subparts would be added for each item to be inspected.

Inspection requirements for installations in hazardous locations, fire screen doors, watertight doors, boat winches, steering gear circuits, emergency fire pump circuits, and specified operation of motor controllers would be added in proposed 110.30–5.

Existing § 111.05–15(d) (proposed § 111.01–9) would be amended by permitting motors to be waterproof instead of watertight. This is proposed because waterproof motors provide an adequate level of safety since such motors have automatic drains to remove any water that may enter the motor housing.

Existing § 111.05–15(e) (proposed § 111.05–11) would be amended to prohibit the use of aluminum alloys with a copper content exceeding 0.4 percent for corrosion resistant parts since the corrosion resistance of these alloys in a marine atmosphere is poor. This proposal is consistent with the requirements of Underwriters' Laboratories, Inc. "Standard for Marine Lighting Fixtures".

The requirement in existing § 111.05–20(a) (proposed § 111.01–15) that the assumed ambient temperature for enginerooms and boiler rooms be 50° C would be delted. Experience has shown that 40° C is adequate for the majority of installations in these spaces.

Proposed Subpart 111.05 would be added to consolidate the requirements for grounding, ground detection, and grounded systems. The proposed subpart would also clarify several existing requirements. Additionally, the subpart would, in § 111.05–11, adopt the requirements of Regulation 23(d)(i) of IMCO Resolution A.325(IX) by limiting the use of grounded distribution systems on tank vessels.

Existing § 111.10–1—*Power requirements* would be amended by proposed Subpart 111.10 by:

a. Making the requirement that a vessel have at least two generating sets applicable to all self-propelled vessels because the ability of a vessel to operate with a single electrical malfunction is considered necessary for the safety of self-propelled vessel;

b. Deleting the alternative presently contained in paragraph (b)(2) that a smaller automatically started diesel generator may be substituted for a larger required steam turbogenerator, because this alternative does not comply with SOLAS 1960, SOLAS 1974, or IMCO Resolution A.325(IX);

c. Requiring the generating plant to have the capability to start the main propulsion plant from a dead ship condition to adopt the requirement of Regulation 19 of IMCO Resolution A.325(IX); and

d. Requiring that transformers be installed in duplicate to meet the requirement of Regulation 19 of IMCO Resolution A.325(IX).

Proposed § 111.12–1(b) would require that each diesel generator have an overspeed device. These devices were generally fitted on all generators in the past, but in recent years they have not been fitted on some generators. Overspeed devices should be fitted on all generators to prevent dangerous overspeeding of generator prime movers which may occur when a generator drops the load.

Proposed § 111.12–3 would provide that static exciters not be used for emergency generators. This is necessary to ensure emergency generator operation since an emergency generator may not have sufficient residual magnetism to activate a static exciter.

A new requirement that voltage regulator supply circuits must be taken from the generator side of the generator circuit breaker would be added in § 111.12–7(b). This is proposed to ensure that each generator is self-sustaining and not dependent on external sources to maintain operation.

The requirements for generator protection would be contained in §§ 111.12–11 and 111.12–13. The requirements have been rewritten for clarity and would be the same as those in existing Subpart 111.65 except:

a. It would be made clear that overcurrent protection is required for all generators; and

b. Proposed § 111.12–11(b) would require that the protection for ship's service generators on self-propelled vessels and all emergency generators be an open frame air circuit breaker, to prevent the use of molded case circuit breakers because they are not as reliable as open frame circuit breakers.

Section 111.15–1 now requires that a battery be constructed to prevent spillage at a 40° angle. The proposed amendment in § 111.15–2(b) would change that angle to 30° for consistency with similar requirements for other equipment.

A new § 111.15–30—*Battery Chargers* would require battery chargers to be dripproof and to meet Underwriters' Laboratories, Inc. Standard 1236. This section would make the Coast Guard battery charger requirements consistent with the generally accepted safety standards of Underwriters' Laboratories, Inc.

Section 111.25–5 would be amended to require motor markings in accordance with the National Electrical Code. The present regulations and the National Electrical Code requirements are very similar and there is no need for Coast Guard regulations to differ from the National Electrical Code.

Proposed § 111.30–1(e) would require the main switchboard to be in a machinery space that has a ship's service generator. The proposal is in conformance with IMCO Resolution A.325(IX).

Proposed § 111.30–1(d) would be added to require that each switchboard be protected by its location or by a shield from machinery and piping having steam or pressurized liquid. This proposed regulation was recommended by the National Transportation Safety Board following a recent marine casualty.

Existing § 111.30–1(e), requires switchboards with a voltage, between poles or to ground, greater than 55 volts, alternating-current or greater than 250 volts direct-current to be a dead front type. The substance of this requirement is proposed in § 111.30–7. The new section would require all switchboards to have a dead front because there is no reason to exclude lower voltage switchboards.

Proposed § 111.30–19(f) would require switchboard wire to be No. 18 AWG or larger. Existing regulations require that switchboard wire be No. 14 AWG or larger. The proposal to permit smaller sizes for switchboard wire would be consistent with wire sizes permitted for other vital equipment, such as steering control systems.

Proposed § 111.30–23 would add a new requirement for medium voltage switchboards, which are occasionally used on vessels. The proposed regulation would require switchboards having a root mean square (RMS) voltage of 1000 volts or more to meet ANSI C 37.25.

Proposed § 111.30–25(h) would add a new requirement that each self-propelled vessel that has a total capacity of the main generators greater than 3,000 kw must have the main bus subdivided into at least two parts connected by a sectionalizing device. This requirement would comply with IMCO Resolution A.325(IX).

A new Subpart 111.33—*Semiconductor Controlled Rectifiers (SCR)* would be added to prescribe safety requirements for these installations.

Subpart 111.50—*Overcurrent Protection* would be revised by including references to requirements for overcurrent protection of equipment in proposed § 111.50–1. Additionally, proposed § 111.50–3(b) would include a listing of circuits where general overcurrent protection requirements do not apply.

The requirement in existing § 111.50–1(d) that a branch switch or circuit breaker must open each conductor of the circuit, including grounded conductors, would be changed. Proposed § 111.50–3(g) would not require opening a grounded conductor. The existing regulation was intended to ensure that improper installation of overcurrent protective devices did not lead to an improperly protected ungrounded conductor. Proper quality control during installation will provide the necessary assurance.

Proposed Subpart 111.51—*Coordination of Overcurrent Protective Devices* would replace existing § 111.50–25 and would make it clear that selective operation of overcurrent protective devices is required only for vital equipment.

Proposed Subpart 111.52—*Calculation of Short-Circuit Current* would clarify the information in existing § 111.50–20 (c).

Proposed Subpart 111.53—*Fuses* would contain, in § 111.53–3 (b), (c), and (d), the method for determining the adequacy of a current limiting fuse used for protecting equipment. This proposal is derived from basic electrical formulas and is made to prevent confusion that has occurred in the past.

Proposed Subpart 111.54–*Circuit Breakers* would up-date the required standards and would add the following new requirements:

a. Section 111.54–1(d)(1) would require that no circuit breaker be dependent upon mechanical cooling means to operate within its rating. This is proposed because these installations are not generally accepted in standards and are not as reliable as installations not requiring cooling.

b. Section 111.54–1(d)(2) would prohibit a circuit breaker from having a trip element that is set above the continuous current rating of the trip element or of the circuit breaker frame. This is proposed because, although it is good engineering practice, there have been occasions when it has not been followed.

A new Subpart 111.59—*Busways* would be added to recognize busway installations.

Subpart 111.60—*Wiring Materials and Methods* would be revised as follows:

a. By substituting reference to IEEE Standard No. 45 requirements for similar requirements in the regulations.

b. By incorporating a cable construction that contains National Electrical Code Type THWN conductors. This type cable has been used extensively and successfully in marine applications since 1970.

c. By deleting § 111.60–10 which requires that cables be of a certain minimum size. Subpart 111.50 requires that cable be protected against overcurrent. If a cable is of insufficient size to safely carry its connected load, the overurrent device will operate and protect the cable. It is the responsibility of the designer to provide cables of adequate size to handle the connected loads. No safety hazard would result from undersized cables because they would be discovered by the overcurrent devices tripping before a vessel began operating. Should such a condition exist, the cable and overcurrent device would require replacement in order for the vessel to operate.

Existing § 111.75–15(g)(3)(i) requires navigation light indicator panels on vessels of 1600 or more gross tons. This requirement would be § 111.75–17(b)(2), and would be amended to apply to all self-propelled vessels because the panels which show that navigation lights are out are as necessary on vessels that are smaller than 1600 gross tons as on those vessels that are of 1600 or more gross tons.

Section 111.75–15(g)(7), containing intensity standards and recommended lamp wattages for navigation lights, would become § 111.75–17(d). The requirement would be changed to meet the navigation light and intensity standards required by the Convention on the International Regulations for Preventing Collisions at Sea, 1972.

Existing § 111.75–15(g)(6) containing requirements for light screens would become § 111.75–17(f). Light screens would be required to be painted with a matte black finish instead of the presently required glossy black finish to meet the Convention on International Regulations for Preventing Collisions at Sea, 1972.

Existing § 111.75–15(b)(2) is a signaling light requirement. This requirement would be renumbered as § 111.75–18 and would be amended to apply to all vessels to which the subchapter applies, including Great Lakes vessels and tank vessels, because the same safety considerations apply to all vessels. Section 33.50–1, which is a signaling light requirement for tank vessels, would be deleted.

Section 111.75–20(c) would delete the requirement for guards for lighting fixture globes made of high strength material. The use of high strength material makes the guards unnecessary.

Sections 111.75–25 *Appliance Circuits* and 111.80–65 *Electric Cooking Equipment and Motor Driven Commissary Equipment* would be deleted and replaced by a new Subpart 111.77—*Appliances and Appliance Circuits*. This proposed subpart would require that electric motor operated appliances, dishwashers, refrigerators, and refrigerated drinking water coolers meet Underwriters' Laboratories, Inc. standards. This amendment would update these requirements by adopting the safety provisions of the Underwriters' Laboratories standards.

A requirement for disconnect switches near receptacles for refrigerated containers would be added as § 111.79–15. This requirement is intended to ensure safe disconnection of a cable that is to be removed from a container.

Sections 111.80–5 *Wiring methods and materials for hazardous locations*, 111.80–8 *Intrinsically safe systems*, 111.80–20 *Hospital operating rooms*, and 111.80–25 *Locations where gasoline or other highly volatile motor fuel is carried in vehicles*, and Subpart 111.85—*Special Requirements for Tank Vessels*, would be combined in one new Subpart 111.105—*Hazardous Locations*.

The proposed changes in requirements in new Subpart 111.105 would make the regulations for installations in hazardous locations consistent with present practice.

Section 111.105–5 would require that electrical installations in hazardous locations meet Articles 500 through 503 of the National Electrical Code, with certain exceptions indicated. These exceptions are necessitated by the nature of shipboard installations and are currently contained in existing § 111.80–5.

Section 111.105–7 would require that, where the National Electrical Code requires approved equipment, the equipment be listed by Underwriters' Laboratories, Inc. or Factory Mutual Engineering Corporation for the hazardous location in which it is, except purged and pressurized equipment that meets NFPA No. 496. Laboratory testing of purged and pressurized equipment is unnecessary because the Coast Guard can determine if that equipment meets the NFPA standard by plan review or inspection.

Section 111.105–11 would require that intrinsically safe equipment be listed by Underwriters' Laboratories, Inc. or Factory Mutual Engineering Corp. and that cables for this equipment be shielded or separated by 2 in. (50mm) or more from other electric cables. Existing § 111.80–5(f)(2) requires the separation of these cables from other cables so that the intrinsically safe circuit is not compromised. The proposed regulation would state how to do this.

Existing § 111.80–5 has general requirements for hazardous locations. The Coast Guard has had to interpret these requirements for certain locations on vessels when these general requirements are not specific enough for practical application. The following proposed sections would establish specific requirements for those locations so that interpretation would be unnecessary:

a. Section 111.105–23 would contain requirements for electric motors for fans that ventilate hazardous locations.

b. Section 111.105–27 would allow belt drives in hazardous locations if a conductive belt is used and components are grounded to meet NFPA Recommend Practice No. 77.

c. Section 111.105–31 would apply the requirements for tank vessels carrying flammable cargo to vessels carrying liquid sulphur, ammonia, and inorganic acids.

d. Section 111.105–31(g)(1) would require that lenses for cargo handling room through-bulkhead lighting fixtures be wire inserted glass that is at least 0.25 in. (6.35 mm) thick to meet the recommendation for "A Class" pumproom boundaries of IMCO Resolution A.271 (VIII).

e. Section 111.105–33 would contain specific requirements for mobile offshore drilling units.

f. Section 111.105–35 would contain specific requirements for vessels that carry coal.

A new Subpart 111.85—*Electric Oil Immersion Heaters* would be added in this proposal. The purpose of this proposed subpart is to codify existing Coast Guard policy and to present uniform safety requirements for the installation of electric oil immersion heaters.

Existing § 111.80–70 *Electric steering gear* would be revised for clarity and would become Subpart 111.93—*Electric Steering Gear*. The following proposed amendments to the steering gear requirements would be made to incorporate the provisions of IMCO Resolution A.325 (IX) in the regulations:

a. Proposed § 111.93–5(c) would require that each ocean, Great Lakes, and coastwise vessel that has more than one steering power system have a feeder circuit from the emergency switchboard to one steering power system.

b. Proposed § 111.93–7(b) would require that each steering control system be capable of being operated from the pilothouse.

c. Proposed § 111.93–11(a) would require that a pilot light for each steering gear motor be in the pilothouse. Existing § 111.80–70(f)(1) requires such lights only at the propulsion control station.

d. Proposed § 111.93–11(b) would require that an alarm to indicate the opening of a steering gear feeder circuit breaker be in the pilothouse and at the main machinery control station. Existing § 111.80–70(f)(2) requires an alarm only at the propulsion control station.

e. Proposed § 111.93–9(c) would require motor overload alarms in the pilothouse and at the main machinery control station. Existing § 111.80–70(c)(2) requires motor overload alarms only at the propulsion control station.

f. Proposed § 111.93–11(c) would add the requirement that failure of any phase of a three phase supply be indicated by an audible and visual alarm in the pilothouse.

Existing § 111.80–55 would be redesignated Subpart 111.95—*Electric Power-Operated Boat Winches*. The application in existing § 111.80–55(a), proposed § 111.95–1, would be expanded from lifeboat winches to all boat winches. This proposal is made because the hazards are the same for all boat winches. Additionally, the last sentence of existing §111.80–55(e)(2), proposed §111.95–7(b), would be revised to clarify the position of the main line emergency switch, and existing § 111.80–55(f) and § 111.80–55(g), concerning approval and inspection of lifeboat winches, would be deleted since the provisions of existing § 111.05–10, proposed Subpart 110.30, are adequate.

Section 111.97–5(b) would require power supplies for watertight door systems be capable of operating all the doors simultaneously. At present, § 111.80–45(c)(2) permits sequential operation. This is proposed to comply with Regulation 13 (i)(ii) of Chapter II of SOLAS 1960 and SOLAS 1974.

A new Subpart 111.03—*Remote Stopping Systems* would be added. This subpart would incorporate the present regulations in §§ 111.80–10 and 111.80–13 for remote stopping requirments for ventilation systems and certain machinery. In addition, § 111.103–9 would clarify that the requlations apply to blowers for inert gas systems.

A new Subpart 111.107—*Mobile Offshore Drilling Unit Industrial Systems* would be added. A system used only for the industrial function of the unit and meeting the National Electrical Code would not be required to meet Subchapter J except for equipment standards, plan review, general considerations, grounding, and hazardous location requirements.

The following amendments concerning emergency systems are proposed to incorporate the provisions of Regulations 20, 21, and 22 of IMCO Resolution A.325 (IX) in the Coast Guard Electrical Engineering regulations:

a. Section 112.05–1(b) would be amended to state that no loads may be supplied from the emergency source except the loads required by Part 112 and a bus-tie to the main switchboard.

b. A new § 112.05–3—*Main-emergency bus-tie* would be added to describe how such a bus-tie must function.

c. Section 112.05–5(a) would be amended to state that the emergency source must have a capacity to supply all loads, except loads on a bus-tie to the main switchboard, that can be simultaneously connected to it.

d. Table 112.05–5(a) would be amended to require each ocean, Great Lakes, and coastwise vessel to have an automatic emergency source of power with an 18 hour period of operation. The present requirement permits a manually operated emergency source and requires only a 12 hour period of operation.

e. Section 112.05–5(d) would be amended to require that the emergency source be located above the uppermost continuous deck. The present requirement states that the emergency source must be above the bulkhead deck or freeboard deck, whichever is higher, on a passenger vessel, and above the freeboard deck or uppermost continuous deck, whichever is higher, on a cargo vessel.

f. Section 112.05–5(e) would be amended to require that the space containing the emergency source of power not adjoin a Category A machinery space.

g. Section 112.05–5(g) would be amended to require that the emergency switchboard not be in the same space as a battery emergency source.

h. Section 112.15–1(a) would be amended to require all navigation lights to be supplied from the emergency source of power. The present requirement is that only the navigation light indicator panel be supplied from the emergency source.

i. Section 112.15–1 would be amended in proposed paragraphs (m), (n), and (o) to require that daylight signaling lights, smoke detector systems, and ship's whistles be supplied from the temporary source of emergency power. The present regulations in § 112.15–5 (h) and (i) require only that daylight signaling lights and smoke detector systems be powered from the final source of emergency power and only recommend, in § 112.15–5(p), that electric whistle control be powered from the final emergency source of emergency power.

k. Section 112.15–5 would be amended to require each elevator in a passenger vessel, the rudder angle indicator, the radio, radio direction finder, loran, radar, gyro compass, depth sounder, and on an ocean, Great Lakes or coastwise vessel, a steering gear motor be supplied from the emergency source of power.

l. A new § 112.50–7 would be added with requirements for compressed air starting systems for emergency generators. Proposed § 112.05–5(f), would permit such systems.

Table 112.05–5(a), covering requirements for emergency sources of electrical power, would be amended to include Great Lakes vessels. This would codify in the regulations what has generally been required for these vessels.

Table 112.05–5(a) would be amended and § 112.15–1(p) would add requirements for emergency power supplies on a nuclear vessel. Similar requirements are contained in §§ 37.05–1(b), 79.05–1(b), and 99.05–1(b). The proposed requirements would better define these existing requirements. It is therefore proposed to delete §§ 37.05–1(b), 79.05–1(b), and 99.05–1(b).

Table 112.05–5(a) would be amended and § 112.05–15 would be deleted to remove requirements for passenger vessels of less than 100 gross tons that are not on international voyages. The requirements for emergency electrical installations for such vessels are contained in Part 184 of this chapter.

The requirements for vessels other than nuclear and passenger vessels above 300 gross tons on voyage that are not ocean, Great Lakes, or coastwise voyages would be amended to reduce the required period of operation of the emergency source from the present 12 hours to 8 hours. This would be consistent with the requirements for passenger vessels on similar routes.

Sections 112.05–5(c) and 112.50–1 would be amended to require the emergency installation on a vessel carrying liquefied gas cargo to be functional when the vessel is inclined 30 degrees. This would bring this requirement into agreement with the IMCO Gas Carrier Code.

Section 112.05–5(b) would be amended to require that stop controls for emergency generators be only in the space containing the emergency generator. This is proposed to elaborate on the existing requirement that the emergency source be independent of the vessel's ship's service lighting and power plant and propulsion plant.

Section 112.05–5(f) would be amended to require that emergency circuits in enginerooms and boiler rooms not supply equipment in other spaces. This would amplify the intent of the present section.

A new requirement for a lube oil pump to be supplied from the emergency source of power would be added in proposed § 112.15–5(g).

The requirement would be that a lube oil pump for propulsion turbines and ship's service generator turbines that require external lubricating means be supplied by the emergency source of power. This would prevent damage to the turbines in case of failure of the main source of electrical power.

A new § 112.15–5(p) would be added to require a blow-out preventer system on a mobile offshore drilling unit to be supplied by the emergency source of power. This requirement is proposed because this system is a vital system on a mobile offshore drilling unit.

Section 113.25–5(b) would add the requirement that a tank vessel have an additional contact maker for the general alarm system. The contact maker would be at the location of the operator for the

emergency means of stopping cargo transfer that is required by 33 CFR 155.780. The purpose of this proposed requirement is that in the event of a major spill, overflow, flash, or fire while loading or discharging cargo there would be a contact maker rapidly accessible to the person in charge.

Section 113.25–10(a)(3)(iii) would be replaced by proposed § 113.25–6(e)(3), requiring a temporary emergency source that is used for the general alarm system power supply to have the same capacity to power the general alarm system as other permitted sources. This would make the capacity of this source consistent with the capacity of other permitted sources.

Section 113.25–10(c)(2) would be replaced by § 113.25–9(b) to make it clear where general alarm bells are required.

Section 113.25–10(d) would be replaced by § 113.25–10 to clarify the requirements for flashing red lights in general alarm systems. Additionally, the emergency power source would be permitted to power flashing red lights in the main machinery space. This is proposed because lights necessary in many modern vessel machinery spaces require a higher voltage than that of the general alarm power supply and the lights are only needed when machinery in the space is operating, at which time the emergency switchboard is receiving power.

A new § 113.25–11(g) would be added requiring that general alarm contact makers be approved by the Commandant, which is present practice. Section 113.25–15(d)(3) would be replaced by § 113.25–15(c) and would require that general alarm distribution panels be approved by the Commandant, which is also present practice.

A new Subpart 113.27—*Engineers' Alarms* is proposed to implement Regulation 16 of IMCO Resolution A.325(IX) requiring an engineers' alarm.

Section 113.30–5(f) would be revised to require communication at fire detecting cabinets in addition to smoke detecting cabinets. This would bring the requirement into agreement with Regulation 61(a) of SOLAS 1960 and Regulation 13(i) of SOLAS 1974.

Subpart 113.35—*Engine Order Telegraph Systems* would be revised by deleting engine gong systems and mechanical engine order telegraph systems and the sections in the subpart would be renumbered. This is proposed because these systems are no longer installed on modern vessels. Subpart 113.35 would also be revised throughout to permit the use of pushbutton engine order telegraph instruments in enginerooms.

In § 113.35–7(a) an exception would be added for vessels with pilothouse throttle control, permitting telegraph instruments that are not in the weather to be dripproof rather than watertight due to lesser risks from loss of the telegraph than on other vessels.

The requirement in § 113.35–55 that a passenger vessel of 20,000 gross tons or over that has an electric engine order telegraph system also have a standby system would be deleted. This is proposed because the communication capability required by § 113.30–5 provides an adequate standby means to transmit engine orders in the case of failure of the telegraph system.

A new requirement for a positive mechanical stop on engine order telegraph instruments that prevents movement to the "Pilothouse Control" position without positive action of the operator would be added in proposed § 113.35–11. This is proposed as a result of a casualty where the operator intended to order "Full Astern" but placed the telegraph in the "Pilothouse Control" position.

A new requirement for approval by the Commandant of engine order telegraph instruments would be added in § 113.35–13. This is present practice.

Existing § 113.45–5(a), concerning refrigerated spaces alarm systems, would be revised by changing the applicability from ships to all vessels since the hazard is the same for a ship or a barge.

Table 113.50–15 and § 113.50–15(d) would be amended by adding the required sound level for emergency loudspeaker systems in accommodation and service spaces. Failure to include the sound level was an oversight when Subpart 113.50 was amended to include these spaces on December 20, 1967.

The following table listing old section numbers and the corresponding section numbers of similar items in the proposal is published as an aid to interested persons:

DERIVATIVE REFERENCE TABLE

Old section No.	*New section No.*
110.01–1—110.01–10	Deleted.
110.05–1—110.05–5	110.01–1—110.01–5.
110.10–1—110.10–5	110.10–1.
110.15–1—110.15–195	110.15–1.
110.20–1	Same.
110.25–1—110.25–5	Deleted.
111.01–1—111.01–5	Do.
111.05–1	Do.
111.05–5	110.25–1—110.25–7.
111.05–10	110.30–1—110.30–7.
111.05–15 (a)–(e), (g).	111.01–1—111.01–13.
111.05–15(f)	111.05–3—111.05–9.
111.05–20	111.01–15.
111.05–25	111.01–17.
111.05–30	Deleted.
111.10–1	111.10–1—111.10–11.
111.10–5—111.10–40	111.12–1—111.12–7.
111.15–1 (a)–(b)	111.15–1.
111.15–1(c)	111.15–3.
111.15–1(d)	111.15–5 (f).
111.15–5	111.15–5 (a)–(c).
111.15–6	111.15–5 (d)–(e).
111.15–10	Same.
111.15–15	111.15–5 (g)–(h).
111.15–20	Same.
111.15–25	Do.
111.20–1—111.20–5	Do.
111.25–1—111.25–5	Do.
111.25–10	111.25–1.
111.25–15	Same.
111.25–20—111.25–30(b).	111.25–1.
111.25–30(c)	111.01–9.
111.25–30(d)	111.01–3.
111.25–30(e)	111.105–5.
111.25–35	111.70–1.
111.30–1(a)	111.30–5(a)(3).
111.30–1(b)	111.30–1—111.30–3.
111.30–1(c)	111.30–9.
111.30–1(d)	111.30–5.
111.30–1(e)	111.30–7.
111.30–1 (f)–(g)	Deleted.
111.30–1(h)	111.30–15.
111.30–1(i)	111.30–17.
111.30–1(j)	111.30–13.
111.30–5	111.30–19.
111.30–10 (a)	111.30–21.
111.30–10 (b) and (c)	Deleted.
111.30–15(a)	Do.
111.30–15(b)	111.30–27.
111.30–15(c)	111.30–25.
111.30–20	111.30–29.
111.30–30	111.30–31.
111.35–1—111.35–5	111.35–1.
111.40–1(a)	111.40–7.
111.40–1(b)	111.40–5.
111.40–1(c)	111.40–9.
111.40–1(d)	111.40–13.
111.40–1(e)	Deleted.
111.40–1 (f) and (g)	111.40–1.
111.40–1(h)	111.40–11.
111.50–1	111.50–3.
111.50–5	Same.
111.50–10 (a) and (b)	111.50–7.
111.50–10 (c) and (d)	111.50–9.
111.50–15 (a)–(d)	111.53–1—111.53–3.
111.50–15(e)	111.54–1.
111.50–20(a)	111.53–1(b) and 111.54–1(a)(3).
111.50–20(b)	111.53–3.
111.50–20(c)	110.25–1(a)(6) and 111.52–1—111.52–3.
111.50–25	111.51–1—111.51–3.
111.55–1—111.55–5	111.55–1—111.55–9.
111.60–1 (a)–(c)	111.60–1—111.60–3.
111.60–1(d) —111.60–1(n).	111.60–5—111.60–7.
111.60–5	111.60–11—111.60–13.
111.60–10	Deleted.
111.60–15	111.60–7.
111.60–20	111.60–7.
111.60–25 (a)–(e)	111.60–7.
111.60–25(f)	111.05–11.
111.60–25(g)	111.20–10.
111.60–25(h)	111.60–15.
111.60–25(i)	Deleted.
111.60–25(m)	111.60–17.
111.60–25(n)	111.60–7.
111.60–25(o)	111.60–9.
111.60–30	111.05–11.
111.60–35	111.05–9.
111.60–40	111.60–19.
111.65–1	111.12–11.
111.65–5—111.65–10	111.05–17.
111.65–15	111.12–13.
111.70–1 — 111.70–20 (h).	111.70–1.
111.70–20 (i)–(q)	111.70–3.
111.70–25	111.70–3(d).
111.70–30	111.70–1.
111.70–35	111.70–5.
111.70–40	111.70–7.
111.75–1	Same.
111.75–3	111.20–15.
111.75–5	Same.
111.75–10	Deleted.
111.75–15 (a)–(d)	111.75–15 (a)–(e).
111.75–15(e)	111.76–16.
111.75–15(f)	Same.
111.75–15(g)	111.75–17.
111.75–15(h)	111.75–18.
111.75–20	Same.
111.75–25	111.77–1.
111.75–30	111.79–1—111.79–13.
111.75–35	111.81–1—111.81–13.
111.80–5	111.105–1—111.105–27.
111.80–8	111.105–11.
111.80–10—111.80–13	111.103–1—111.103–9.
111.80–15	111.83–1—111.83–5.
111.80–20	111.105–37.
111.80–25	111.105–39.
111.80–30	111.89–2.
111.80–35	111.91–1.

Old section No.	New section No.
111.80-40	111.101-1—111.101-3.
111.80-45	111.95-1—111.95-7.
111.80-50	111.99-1—111.99-5.
111.80-55	111.95-1—111.95-7.
111.80-60	111.87-1—111.87-3.
111.80-65	111.77-3—111.77-11.
111.80-70	111.93-1—111.93-11.
111.85-1—111.85-5	Deleted.
111.85-10	111.105-29—111.105-31.
111.85-90	110.01-3.
111.90-1—111.90-25	110.01-3.
112.01-1	Deleted.
112.05-1—112.05-5	Same.
112.05-10	112.07-1—112.07-15.
112.05-15	Deleted.
112.10-1—112.10-20	Same.
112.15-1—112.15-10	Do.
112.15-15	112.10-5.
112.20-1—112.20-15	Same.
112.25-1—112.25-10	Do.
112.30-1—112.30-10	Do.
112.35-1—112.35-5	112.35-3—112.35-5.
112.40-1	112.40-1.
112.45-1—112.45-5	112.445-1—112.45-5.
112.50-1	112.50-1—112.50-7.
112.51-1	112.50-1—112.50-7.
112.55-1	111.15-2.
112.55-5—112.55-15	Same.
112.90-1—112.90-10	110.01-3.
113.01-1—113.05-1	Deleted.
113.05-5	Same.
113.05-10	111.60-11.
113.10-1	Deleted.
113.10-5(a)	113.10-1.
113.10-5(b)	111.60-1.
113.10-5 (c)-(e)	113.10-3—113.10-7.
113.10-5(f)	111.01-9.
113.10-90	110.01-3.
113.15-1	Deleted.
113.15-5(a)	113.15-1.
113.15-5(b)	111.60-1.
113.15-5 (c)-(d)	113.15-3—113.15-7.
113.15-5(f)	111.01-9.
113.15-90	110.01-3.
113.20-1	Deleted.
113.20-5 (a) and (b)	113.20-1.
113.20-5(c)	111.60-1.
113.20-5(d)	113.20-3.
113.20-90	110.01-3.
113.25-1	Same.
113.25-5	Do.
113.25-10(a) (1)-(3)	113.25-6.
113.25-10(a) (4)-(5)	113.25-7.
113.25-10(b)	113.25-8.
113.25-10(c)	113.25-9.
113.25-10(d)	113.25-10.
113.25-15(a)	113.25-6(f).
113.25-15(b)	113.25-11.
113.25-15(c) (1) and (2).	113.25-12 (a) and (b).
113.25-15(c)(3)	113.25-13.
113.25-15(d)(1)	111.60-1.
113.25-15(d)(2)	113.25-14.
113.25-15(d)(3)	113.25-15.
113.25-15(d) (4) and (5).	113.25-16.
113.25-20—113.25-30	Same.
113.25-90	110.01-3.
113.30-1—113.30-10	Same.
113.30-15	113.30-10(b).
113.30-20—113.30-25	Same.
113.30-90	110.01-3.
113.35-1—113.35-5	113.35-3.
113.35-10—113.35-35	Deleted.
113.35-40—113.35-50	113.35-5—113.35-9.
113.35-55—113.35-90	110.01-3.
113.40-1—113.40-10	Same.
113.40-90	110.01-3.
113.45-1	Deleted.
113.45-5	Same.
113.45-90	110.01-3.
113.50-1—113.50-5	Same.
113.50-10	112.15-1(j).
113.50-15—113.50-20	Same.
113.50-25(a)	111.60-1.
113.50-25(b)	113.50-25.
113.50-90	110.30-3(n).
113.50-35	78.16-1(a).
113.50-90	110.01-3.
113.65-1	Deleted.
113.65-5	Same.
113.65-90	110.01-3.
113.70-1	Deleted.
113.70-5(a)	Same.
113.70-5(b)	111.60-1.
113.70-5(c)	113.70-5(b).
113.70-10	112.15-1(n).
113.70-90	110.01-3.

In consideration of the foregoing it is proposed to amend Chapter I of Title 46, Code of Federal Regulations, as follows:

PART 32—SPECIAL EQUIPMENT, MACHINERY, AND HULL REQUIREMENTS

§ 32.15 [Amended]

1. By deleting the last sentence in § 32.15-5(b).

§§ 32.15-20—32.15-25 [Amended]; §§ 32.25-1, 32.25-5 and 32.25-10 (Subpart 32.25) [Revoked]; §§ 32.30-1, 32.30-5 and 32.30-10 (Subpart 32.30) [Revoked]

2. By revoking § 32.15-20(b) and § 32.15-25(b), and Subparts 32.25, and 32.30.

§ 32.40-1 [Amended]

3. By deleting the last sentence in § 32.40-1(d)(4).

4. By revising § 32.45-1 to read as follows:

Subpart 32.45—Electrical Installations

§ 32.45-1 Installation and details.

The installation of all systems of an electrical engineering or interior communications nature, together with the details of design, construction, and installation, must meet the requirements of Subchapter J (Electrical Engineering) of this chapter.

PART 33—LIFESAVING EQUIPMENT

§ 33.20 [Amended]; § 33.50-1 (Subpart 33.50) [Revoked]

5. By revoking § 33.20-1(c)(3) and Subpart 33.50.

PART 35—OPERATIONS

§ 35.10-15 [Amended]

6. By revoking § 35.10-15(c).

7. By revising § 35.30-30 to read as follows:

§ 35.30-30 Portable electric equipment.

Portable electric equipment must not be used in a hazardous location described in Subpart 111.105 of this subchapter, except—

(a) Self-contained, battery-fed lamps and intrinsically safe equipment approved by Underwriters' Laboratories, Inc., or Factory Mutual Engineering Corporation for use in a Class I, Division I location and for the electrical group of the cargo; and—

(b) Any electrical equipment, if—

(1) The hazardous locations is—

(i) Enclosed; and

(ii) gas-free;

(2) The adjacent compartments are—

(i) Gas-free;

(ii) Inerted;

(iii) Filled with water;

(iv) Filled with Grade E liquid; or

(v) Spaces where flammable gases are not expected to accumulate; and—

(3) Each compartment where flammable gas is expected to accumulate is—

(i) Closed; and

(ii) Secured.

§§ 35.40-1, 35.40-5 and 35.40-6 [Revoked]

8. By revoking § 35.40-1, § 35.40-5, and § 35.40-6.

PART 37—SPECIAL CONSTRUCTION, ARRANGEMENT, AND OTHER PROVISIONS FOR NUCLEAR VESSELS

§ 37.05-1 [Amended]

9. By revoking § 37.05-1(b).

PART 72—CONSTRUCTION AND ARRANGEMENT

§ 72.20-45 [Amended]

10. By revoking § 72.20-45(b).

PART 75—LIFESAVING EQUIPMENT

§ 75.30-15 [Amended]

11. By deleting the last sentence in § 75.30-15(a).

§§ 75.50-10 and 75.50-15 [Revoked]

12. By revoking § 75.50-10 and § 75.50-15.

PART 77—VESSEL CONTROL AND MISCELLANEOUS SYSTEMS AND EQUIPMENT

§ 77.05-1 (Subpart 77.05) [Revoked]

13. By revoking Subpart 77.05.

PART 78—OPERATIONS

§§ 78.47-5, 78.47-7, 78.47-33 and 78.47-40. [Revoked]

14. By revoking § 78.47-5, § 78.47-7, § 78.47-33, and § 78.47-40.

15. By adding a new Subpart 78.16 to read as follows:

Subpart 78.16—Emergency Loudspeaker Systems

§ 78.16-1 Operation.

The emergency loudspeaker system must—

(a) Be used at the discretion of the master;

(b) Function entirely independent of any public address or music distribution system; and

(c) Not be used for entertainment purposes.

PART 79—SPECIAL CONSTRUCTION, ARRANGEMENTS, AND OTHER PROVISIONS FOR NUCLEAR VESSELS

§ 79.05-1 [Amended]

16. By revoking § 79.05-1(b).

PART 92—CONSTRUCTION AND ARRANGEMENT

§ 92.20–45 [Amended]

17. By revoking § 92.20–45(b).

PART 94—LIFESAVING EQUIPMENT

§ 94.30–15 [Amended]

18. By deleting the last sentence in § 94.30–15(a).

§§ 94.50–10 and 94.50–15 [Revoked]

19. By revoking § 94.50–10 and §94.50–15.

PART 96—VESSEL CONTROL AND MISCELLANEOUS SYSTEMS AND EQUIPMENT

§ 96.05–1 (Subpart 96.05) [Revoked]

20. By revoking Subpart 96.05.

PART 97—OPERATIONS

§§ 97.37–5, 97–37–7, and 97.37–25 [Revoked]

21. By revoking § 97.37–5, § 97–37–7, and § 97.37–25.

PART 99—SPECIAL CONSTRUCTION, ARRANGEMENTS, AND OTHER PROVISIONS FOR NUCLEAR VESSELS

§ 99.05–1 [Amended]

22. By deleting the last sentence in § 99.05–1(b).

SUBCHAPER J—ELECTRICAL ENGINEERING

23. By revising the entire subchapter to read as follows:

PART 110—GENERAL PROVISIONS

AUTHORITY: 46 U.S.C. 170, 367, 369, 375, 390(b), 391(a), 392, 408, 416, 445, 489, 526p; 49 U.S.C. 1655(b); 49 CFR 1.46.

Subpart 110.01—Applicability

§ 110.01–1 Applicability.

This subchapter applies to electric equipment and systems—

(a) on each vessel required by Subchapter D, H, I, II, O, or U of this chapter to meet this subchapter; and

(b) installed on the vessel after (the effective date of these regulations) (new installations) except repairs meeting § 110.01–5.

§ 110.01–3 Electric equipment and systems installed before (the effective date of these regulations).

Electric equipment and systems installed before (the effective date of these regulations) (existing installations) on a vessel required by Subchapter D, H, I, II, O, or U of this chapter to meet this subchapter must meet this subchapter's requirements in effect on the date of installation.

§ 110.01–5 Repairs to new and existing installations.

(a) Repairs to new installations must meet this subchapter.

(b) Repairs to existing installations must meet this subchapter's requirements in effect on the date—

(1) Of the original installation; or

(2) The repair is made.

Subpart 110.10—Reference Specifications, Standards, and Codes

§ 110.10–1 General.

(a) Each specification, standard, and code listed in paragraph (b) is incorporated by reference to the extent stated in the affected section in this subchapter. The specification, standard, or code incorporated is the one in effect on the date the electric equipment or system is—

(1) Contracted for by the parties to be bound; or

(2) If there is no contract, installed.

(b) The following are incorporated by reference:

(1) Rules for Building and Classing Steel Vessels, issued by the American Bureau of Shipping, 45 Broad Street, New York, N.Y. 10004.

(2) The following publications issued by the National Fire Protection Association, 470 Atlantic Avenue, Boston, Mass. 02110:

(i) The National Electrical Code (NFPA 70).

(ii) Standard for the Use of Inhalation Anesthetics (NFPA 56A).

(iii) Standard for Purged and Pressurized Enclosures for Electrical Equipment in Hazardous Locations (NFPA 496).

(iv) Recommended Practice for Static Electricity (NFPA 77).

(3) The following publications issued by the National Electrical Manufacturers Association, 155 East 44th Street, New York, N.Y. 10017:

(i) IPCEA–NEMA Standards Publication Rubber-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (NEMA WC 3).

(ii) IPEA–NEMA Standards Publication Ethylene Propylene Rubber-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy (NEMA WC 8).

(4) The following publications issued by the Institute of Electrical and Electronics Engineers. Inc., 345 East 47th Street, New York, N.Y. 10017:

(i) Recommended Practice for Electric Installations on Shipboard (IEEE Standard No.45).

(ii) IEEE Standard Dictionary of Electrical & Electronics Terms (IEEE Standard No. 100).

(5) The following standards issued by Underwriters' Laboratories, Inc., 207 East Ohio Street, Chicago Illinois 60011:

(i) Standard for General Use Snap Switches (UL 20).

(ii) Standard for Rubber-Insulated Wires and Cables (UL 44).

(iii) Standard for Electrical Cabinets and Boxes (UL 50).

(iv) Standard for Flexible Cord and Fixture Wire (UL 62).

(v) Standard for Electric Panelboards (UL 67).

(vi) Standard for Electrical Motor Operated Appliances (UL 73).

(vii) Standard for Thermoplastic-Insulated Wires (UL 83).

(viii) Standard for Enclosed Switches (UL 98).

(ix) Standard for Elevator Door Locking Devices and Contacts (UL 104).

(x) Standard for Commercial Electric Cooking Appliances (UL 197).

(xi) Standard for Fuses (UL 198).

(xii) Standard for Class H Fuses (UL 198B).

(xiii) Standard for Plug Fuses (UL 198F).

(xiv) Standard for High-Interrupting-Capacity Fuses, Current Limiting Type (UL 198.2).

(xv) Standard for High-Interrupting Capacity Fuses, Class K (UL 198.3).

(xvi) Standard for Class R Fuses (UL 198.4).

(xvii) Standard for Household Refrigerators and Freezers (UL 250).

(xviii) Standard for Automotive Glass Tube Fuses (UL 275B).

(xix) Standard for High Voltage Industrial Control Equipment (UL 347).

(xx) Standard for Knife Switches (UL 363).

(xxi) Standard for Refrigerated Drinking Water Coolers (UL 399).

(xxii) Standard for Commercial Refrigerators (UL 471).

(xxiii) Standard for Electric Wire Connectors and Soldering Lugs (UL 486).

(xxiv) Standard for Molded Case Circuit Breakers and Circuit Breaker Enclosures (UL 489).

(xxv) Standard for Special Fuses for Radio and Television Receiving Appliances and Other Electronic Equipment (UL 492.7).

(xxvi) Standard for Electrical Attachment Plugs and Receptacles (UL 498).

(xxvii) Standard for Electric Industrial Control Equipment (UL 508).

(xxviii) [Reserved].

(xxix) Standard for Electrical Outlet Boxes and Fittings (UL 514).

(xxx) Standard for Marine Type Electric Lighting Fixtures (UL 595).

(xxxi) Standard for Electric Motors and Generators for Use in Hazardous Locations, Class II, Groups F and G (UL 674A).

(xxxii) Standard for Electric Motors and Generators for Use in Hazardous Locations, Class I, Groups C and D (UL 674B).

(xxxiii) Standard for Industrial Control Equipment for Use in Hazardous Locations, Class I, Groups A, B, C, and D, and Class II, Groups E, F, and G (UL 698).

(xxxiv) Standard for Household Electric Dishwashers (UL 749).

(xxxv) Standard for Electric Heaters for Use in Hazardous Locations, Class I, Groups A, B, C, and D and Class II, Groups E, F, and G (UL 823).

(xxxvi) Standard for Electric Lighting Fixtures for Use in Hazardous Locations (UL 844).

(xxxvii) Standard for Electric Motor Control Centers (UL 845).

(xxxviii) Standard for Busways and Associated Fittings (UL 857).

(xxxix) Standard for Circuit Breakers and Circuit Breaker Enclosures for Use in Hazardous Locations, Class I, Groups A, B, C, and D, and Class II, Groups E, F, and G (UL 877).

(xl) Standard for Electrical Outlet Boxes and Fittings for Use in Hazardous Locations, Class I, Groups A, B, C, and D and Class II, Groups E, F, and G (UL 886).

(xli) Standard for Switches for Use in Hazardous Locations, Class I, Groups, A, B, C, and D, and Class II, Groups E, F, and G (UL 894).

(xlii) Standard for Intrinsically Safe Electrical Circuits and Equipment for Use in Hazardous Locations (UL 913).

(xliii) Standard for Commercial Electric Dishwashers (UL 921).

(xliv) Standard for Emergency Lighting Equipment (UL 924).

(xiv) Standard for Electrically Operated Valves for Use in Hazardous Locations, Class I, Groups A, B, C, and D, and Class II, Groups E, F, and G (UL 1002).

(xlvi) Standard for Electric Receptacle—Plug Combinations for Use in Hazardous Locations (UL 1010).

(xlvii) Standard for Electric Air Heaters (UL 1025).

(xlviii) Standard for Electric Baseboard Heating Equipment (UL 1042).

(xlix) Standard for Special-Use Switches (UL 1054).

(l) Standard for Electric Central Air Heating Equipment (UL 1096).

(li) Standard for Electric Battery Chargers (UL 1236).

(6) The following specifications and guides issued by the Commander, Naval Ship Engineering Center, Department of the Navy, Washington, D.C. 20362.

(i) Military Specifications, Wire, Electrical (MIL-W-16878).

(ii) Military Specification, Wire and Cable, Hook-up, Electrical, Insulated (MIL-W-76).

(iii) Military Specification, Cable and Cord, Electrical, for Shipboard Use (MIL-C-95).

(iv) Cable Comparison Guide (NAVSEA 0981-052-8090).

(7) American National Standard Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks (ANSI A17.1), issued by the American Society of Mechanical Engineers, 345 East 47th Street, New York, N.Y. 10017.

(8) Standard for Power Switchgear (ANSI C37), issued by the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018.

(9) Standard Specification for Nylon Injection Molding and Extrusion Materials (ASTM D 789), issued by the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.

Subpart 110.15—Terms Used in This Subchapter

§ 110.15-1 Definitions.

For the purpose of this subchapter:

(a) Electrical and electronic terms are used as defined in the "IEEE Standard Dictionary of Electrical & Electronics Terms" (IEEE Standard No. 100), issued by the Institute of Electrical and Electronics Engineers.

(b) In addition to the definitions in paragraph (a) of this section:

(1) "Boat deck" means a deck on which lifeboats are stowed.

(2) "Coastwise" means in the waters of any ocean or the Gulf of Mexico that are 20 nautical miles or less offshore.

(3) "Commandant" means the Commandant of the Coast Guard.

(4) "Corrosion-resistant finish" means one of the following treatments:

(i) Electroplated of cadmium, chromium, nickel, silver, or zinc.

(ii) Sherardized.

(iii) Galvanized.

(iv) An enameled finish over a zinc chromate primer that is over a surface that has been cleaned and degreased.

(5) "Corrosion-resistant material" and "noncorrodible material" mean silver, corrosion-resistant steel, copper, brass, bronze, copper-nickel, corrosion-resistant nickel alloys, corrosion-resistant aluminum alloys, or fiberglass reinforced plastics.

(6) "Corrosive location" means a location exposed to the weather on vessels operating in salt water.

(7) "Damp or wet location" means—

(i) A location exposed to the weather;

(ii) A machinery space;

(iii) A cargo space;

(iv) A refrigerated space;

(v) A galley;

(vi) A laundry;

(vii) A public washroom or toilet room that has a bath or shower;

(viii) An area directly inside of an access door to a weather deck if the access door is not protected against entrance of rain or spray by an overhanging deck or by other means; or

(ix) Other spaces with similar humidity.

(8) "Dripproof" means enclosed equipment so constructed or protected that falling drops of liquid or solid particles striking the enclosure at any angle from 0 to 15 degrees downward from the vertical do not interfere with the operation of the equipment.

NOTE.—A NEMA Type 1 enclosure with dripshield or a NEMA Type 2 enclosure meets this definition.

(9) "Dry location" means—

(i) An accommodation space;

(ii) A pantry;

(iii) A passageway adjacent to quarters;

(iv) A public washroom or toilet room that does not have a bath or shower;

(v) A radio room;

(vi) A gyro room;

(vii) A chart room; or

(viii) A control room on a mobile offshore drilling unit.

(10) "Embarkation deck" means a deck from which persons embark into lifeboats or are assembled before embarking into lifeboats.

(11) "Emergency squad" means the crew designated on the station bill as the nucleous of a damage control party.

(12) "Flashpoint" means the temperature at which a liquid gives off a flammable vapor when heated in a closed cup tester.

(13) "Great Lakes vessel" means a vessel that navigates exclusively on the Great Lakes.

(14) "Marine inspector" and "inspector" mean any person from the civilian or military branch of the Coast Guard assigned under an Officer in Charge, Marine Inspection, or any other person as may be designated for the duties of inspection, enforcement, and administration of R.S. 52, as amended and rules and regulations under its authority.

(15) "Nonsparking fan" means a fan that cannot produce sparks that ignite a flammable mixture and includes—

(i) Blades or housing of nonmetallic construction;

(ii) Blades and housing of nonferrous material;

(iii) Blades and housing of corrosion-resistant steel;

(iv) Ferrous blades and housing with one-half inch or more design tip clearance; or

(v) Blades of aluminum or magnesium alloy and a ferrous housing with a nonferrous insert ring at the periphery of the impeller.

NOTE: Any combination of an aluminum alloy or a magnesium alloy component and a ferrous component is considered by the Coast Guard to be a sparking hazard regardless of the material that is used as the fixed or rotating component.

(16) "Ocean vessel" means a vessel that navigates the waters of any ocean or the Gulf of Mexico more than 20 nautical miles offshore.

(17) "Qualified person" means a person who by his special knowledge, ability, and experience can competently

and safely perform required functions and duties.

(18) "Waterproof machine" means a totally enclosed machine so constructed that a stream of water from a hose not less than 1 inch in diameter under a head of 35 feet and from a distance of about 10 feet can be played on the machine from any direction for a period of not less than 5 minutes without leakage, except leakage that occurs around the shaft may be considered permissible, provided it is prevented from entering the oil reservoir and provision is made for automatically draining the machine.

(19) "Watertight" means enclosed so that equipment does not leak when tested at any angle with a stream of water from a hose with a one inch nozzle that delivers at least 65 gallons per minute from a distance of 10 feet for 5 minutes.

NOTE: NEMA Types 4 and 4X meet this definition.

Subpart 110.20—Equivalents

§ 110.20–1 Conditions under which equivalents may be used.

Where in this subchapter a fitting, material, apparatus, or equipment must be in a vessel, a provision must be made, or an arrangement must be adopted, the Commandant may accept in substitution any other fitting, material, apparatus, or equipment or any other provision or arrangement if he is satisfied that the fitting, material, apparatus, or equipment, or the provision or arrangement is at least as effective as that required and provides the degree of safety consistent with the requirements of this subchapter.

Subpart 110.25—Plan Submittal

§ 110.25–1 Plans and information for field technical offices.

The following must be submitted for Coast Guard review to a field technical office listed in § 110.25–3:

(a) Elementary one-line wiring diagram of the power system, supported, if necessary, by cable lists, panelboard summaries, and other information including:

(1) Type and size of generators;

(2) Type and size of generator cables, bus-tie cables, feeders, and branch circuit cables;

(3) Power, lighting, and interior communication panel boards with number of circuits and rating of energy consuming devices;

(4) Type and capacity of storage batteries;

(5) Rating of circuit breakers and switches, interrupting capacity of circuit breakers, and rating or setting of overcurrent devices; and

(6) Detailed computations of short circuit currents and studies of overcurrent protective device coordination for each system with an aggregate generating capacity of more than 750 kilowatts.

(b) Electric plant load analysis including connected loads and computed operating loads for each condition of operation.

(c) Elementary and isometric or deck wiring plans, including symbol lists, and manufacturer's name and identification of each item of electric equipment, of each—

(1) Steering gear circuit and steering motor controller;

(2) General alarm system;

(3) Sound powered telephone system;

(4) Power operated boat winch;

(5) Fire detecting and alarm system;

(6) Smoke detecting system;

(7) Alarm for a carbon dioxide extinguishing system;

(8) Electric watertight door system;

(9) Fire screen door holding system;

(10) Emergency loudspeaker system;

(11) Manual alarm system; and

(12) Supervised patrol system.

Each isometric and deck wiring plan must show the location of each cable splice.

(d) Switchboard wiring diagram.

(e) Switchboard material and nameplate list.

(f) Elementary wiring diagram of metering and automatic switchgear.

(g) Description of operation of propulsion control and bus transfer switchgear.

(h) Schematic or logic diagrams for automated or centrally controlled propulsion or auxiliary machinery.

(i) The operating maintenance and instruction manuals for automated or centrally controlled propulsion or auxiliary machinery systems that include operational test procedures for verifying the operation of the required safety devices and systems.

(j) For tank vessels and mobile offshore drilling units, plans showing the location of each item of electric equipment that is in a hazardous location under Subpart 111.105 of this subchapter, including symbol lists, and manufacturer's name and identification.

§ 110.25–3 Procedure for submitting plans to technical offices.

Plans must be submitted to one of the following field technical offices:

(a) Commander, 3rd Coast Guard District (mmt), Governor's Island, New York, N.Y. 10004, for the 1st and 3rd Coast Guard Districts.

(b) Commander, 5th Coast Guard District (mmt), Federal Building, 431 Crawford St., Portsmouth, Va. 23705, for the 5th Coast Guard District.

(c) Commander, 8th Coast Guard District (mmt), Room 1130, Hale Boggs Federal Building, 500 Camp Street, New Orleans, LA 70130, for the 2nd, 7th and 8th Coast Guard Districts.

(d) Commander, 9th Coast Guard District (mmt), Federal Office Building, 1240 East 9th Street, Cleveland, Ohio 44199, for the 9th Coast Guard District.

(e) Commander, 12th Coast Guard District (mmt), 630 Sansome Street, San Francisco, Calif. 94126, for the 11th, 12th, 13th, 14th, and 17th Coast Guard Districts.

§ 110.25–5 Number of plans required for technical offices.

(a) Three copies of each plan are required so that one can be returned to the submitter. If the submitter desires additional copies of approved plans, he should submit enough for the required distribution.

(b) If an applicant for plan review of a vessel that is classed by the American Bureau of Shipping (ABS) desires the Coast Guard to forward copies of approved plans to ABS, he must request in writing, with a copy to ABS, that the Coast Guard technical office that reviews the plans send copies of the approved plans to ABS and he must submit:

(1) 6 copies of each plan; or

(2) If the equipment is built at a place other than that of the shipbuilder, 7 copies of each plan.

§ 110.25–7 Plans and information for the Officer in Charge, Marine Inspection.

One copy of the following must be submitted for information to the Officer in Charge, Marine Inspection of the Marine Inspection Zone in which the vessel is to be built:

(a) Isometric or deck wiring plans of power systems and lighting systems, including symbol lists with manufacturer's name and identification of each item of electric equipment and showing:

(1) Locations of cables;

(2) Cable sizes and types;

(3) Location of each item of electric equipment; and

(4) Locations of cable spices.

(b) Plans and instructions for each intrinsically safe system approved by Underwriters' Laboratories, Inc. or Factory Mutual Engineering Corporation.

Subpart 110.30—Testing and Inspection

§ 110.30–1 General.

(a) The general requirements for inspection of vessels are in Parts 31, 71, 91, 107, 151, and 188 of this chapter. This section supplements the general requirements in other parts of this chapter.

(b) In the inspection of electric equipment and installations, the rules of the American Bureau of Shipping for materials and construction, and the certificate of classification that refers to them, except as otherwise provided by this subchapter, are accepted as standard.

(c) This subpart must not be construed to imply that shop tests or factory inspections of electric apparatus or equipment of the types conducted by the American Bureau of Shipping are conducted by the Coast Guard. Shop tests of electric apparatus or equipment are conducted by the Coast Guard only when required by this chapter or when requested, either by the manufacturer, shipbuilder, owner or the Coast Guard, and agreed to by all.

§ 110.30–3 Initial inspection.

(a) *Scope.* The initial inspection, which may be a series of inspections during the construction of the vessel, includes a complete inspection of the electric installation and electric equipment or apparatus. The inspection is to determine that the arrangement, materials, and their installations meet this chapter and the approved plans. The inspec-

tion also is to determine that the workmanship of all equipment and apparatus and the installation is satisfactory.

(b) *Inspections required.* The inspections described in this section are intended as suggestions to the marine inspector. It is not the intent of this section to require, for any particular vessel, any test that, in the opinion of the Officer in Charge, Marine Inspection, is unnecessary.

(c) *Electric cable.* Electric cable should be checked during installation for size and type as shown on the approved plans. The adequacy of cable supports should be checked, and it should be ascertained that no cable is near a pipe or other hot object and that the cables have not been damaged during the installation due to excessive pulling force having been applied, or due to sharp bends or sharp or rough edges of cable supports or bulkhead penetrations, or similar abrasions. Cable penetrations required to be watertight should be checked for proper packing of the terminal or stuffing tubes, including provisions for future takeup of gland units. (See Subpart 11.60 of this subchapter.)

(d) *Generators.* Generators should be checked for general condition, both electrical and mechanical, voltage regulation, parallel operation, operation of safety devices such as reverse-current or reverse-power trips, overcurrent trips, overspeed trips, low oil pressure trips, and similar devices. (See Subpart 111.12 of this subchapter.)

(e) *Rotating electric machinery.* Rotating electric machinery should be checked to ensure that rotating and uninsulated electric parts are adequately shielded from accidental contact by personnel.

(f) *Switchboards.* Switchboards should be checked for handrails, guard-rails, working spaces, insulating floor covering, drip covers, and enclosures for backs and ends. Switchboard mounted apparatus should be checked for identifying nameplates. Circuit nameplates should be compared with rating or setting of the overcurrent devices and with the approved plans. The accessibility of items requiring maintenance or adjustment should be checked. Meters should be checked for proper calibration. The operation of automatic switchgear and mechanical interlocks should be observed. (See Subpart 11.30 of this subchapter.)

(g) *Motor starters.* Motor starters should be checked to ensure proper starting of the motor under service conditions and to assure that there are properly rated motor running overcurrent protective devices. Enclosures should be checked to assure they are dripproof or watertight and that required door positioners are installed. Motor running overcurrent protective devices must not be set greater than allowed by Part C of Article 430 of the National Electrical Code, except for steering gear motors (see § 111.93–9(c) of this subchapter. A fixed heat resistant wiring diagram for each motor starter must be on the inside of its enclosure door. Each motor starter not disconnected from all sources of potential when the disconnect switch is opened, due to electrical interlocked circuits necessary for proper operation of the apparatus or for other valid reasons, should be checked to ensure that attention is directed to these conditions by a warning sign. (See Subpart 111.70 of this subchapter).

(h) *Disconnect switches.* The presence and location of disconnect switches required for motor starters, fuses, etc., should be checked. When a switch or circuit breaker or a switchboard or distribution panel is intended to serve as a motor and controller disconnect switch, it should be determined that the applicable requirements of the regulations in this subchapter have been met. (See Subparts 111.55 and 111.70 of this subchapter.)

(i) *Accessibility.* The accessibility of electric apparatus for inspection and maintenance should be observed. The accessibility of junction boxes and similar apparatus in way of paneling should be noted during construction of a vessel. Hinged doors of motor starters and similar apparatus should be checked for interference with adjacent structural parts or apparatus.

(j) *Panelboards.* The rating or setting of the overcurrent devices should be compared with the values given on the circuit directory and with the approved plans. The accuracy of the directory description of loads served by each circuit should be checked. (See Subpart 111.40 of this subchapter.)

(k) *Grounding.* It should be determined that metal enclosures for electric equipment are grounded, either by the method of mounting or by ground leads. Portable equipment should be checked for grounding through the grounding conductor of the supply cable. (See Subpart 111.05 of this subchapter).

(l) *Emergency lighting and exit lights.* The adequacy of emergency lights and exit lights should be checked at night with all general lighting turned off.

(m) *General alarm system.* The general alarm system should be checked with a sound level meter, the sound level of the bells being measured in each stateroom with doors closed. Where the background noise level is questionable, the sound level should be measured while the vessel is underway. For the required sound levels, see § 113.25–9(a) of this subchapter.

(n) *Emergency loudspeaker system.* The emergency loudspeaker system should be checked with a sound level meter, the sound level being measured at several locations in the vicinity of each lifeboat handling station, each lifeboat embarkation station, each passenger assembly station, and throughout crew quarters. Where the background noise level is questionable, the sound level should be measured while the vessel is underway. For the required sound levels, see Table 113.50–15 of this subchapter. It should be demonstrated that voice reproduction is highly intelligible. It should be demonstrated that grounding or opening either conductor or shorting both conductors to a typical lifeboat station loudspeaker or to a typical embarkation deck loudspeaker, each to be selected by an inspector, will not reduce the output of any one of the remaining loudspeakers by more than three decibels.

(o) *Fire detecting systems.* Fire detecting systems should be checked for compliance with the applicable regulations in this chapter and for conformance with the approved plans. Power supply circuits and thermostat circuits should be checked for supervision.

(p) *Communication systems.* All communciation systems should be checked for performance and for compliance with the regulations in this chapter.

(q) *Insulation resistance.* All electric power and lighting cable and equipment should be checked for proper insulation resistance to ground and between conductors. (See Section 46 of IEEE Standard No. 45)

(r) *Automated machinery.* All propulsion and auxiliary machinery control and safety systems for an automated or centralized control machinery system should be checked for material condition, operation and set point.

(s) *Electric installations in hazardous locations.* Electric equipment and wiring in hazardous locations should be checked for compliance with Subpart 111.105 of this subchapter. Intrinsically safe systems should be checked to assure they are installed in accordance with the plans and instructions approved by Underwriters' Laboratories, Inc. or Factory Mutual Engineering Corporation.

(t) *Fire screen doors.* Fire screen door releases should be checked for compliance with Subpart 111.99 of this subchapter.

(u) *Watertight doors.* Power operated watertight doors should be checked for compliance with Subpart 111.97 of this subchapter.

(v) *Electric power operated boat winches.* Controllers and limit switches on electric power operated boat winches should be checked for compliance with Subpart 111.95 of this subchapter.

(w) *Steering gear circuits.* Steering gear circuits should be checked to see that they are separated to meet §§ 111.93–5(d) and 111.93–7(d) of this subchapter. Steering gear motor controllers should be checked to see that they are in the steering gear room. (See Subpart 111.93 of this subchapter.)

(x) *Emergency fire pump circuits.* Circuits for the emergency firepump should be checked to see that they do not pass through the engineroom or boiler room. (See § 112.05–5(f) of this subchapter).

(y) *Low voltage release.* It should be determined that motor controllers required to have low voltage release by § 111.70–3(f) of this subchapter have low voltage release and motor controllers prohibited from having low voltage release have low voltage protection. All motors should be run simultaneously and then all generators tripped off the line. One generator should be placed back on the line and it should not trip because of the oncoming load. Motor controllers requiring low voltage release

should start their motors automatically. Motor controllers prohibited from having low voltage release should not start their motors automatically.

§ 110.30–5 Inspection for certification.

(a) *General.* The inspection of electric installations at the annual or biennial inspection incident to reissuance of a certificate of inspection includes an inspection of all item listed in § 110.30–3 to determine mechanical and electrical condition and performance. Particular note should be made of circuits added or modified after the initial inspection.

(b) *Fire detecting system.* Fire detecting thermostats should be tested at regular intervals (at least 25 percent of those installed tested annually) to detect any change in operating characteristics. A portable hand light with an open and sheet metal shield, such as a No. 3 fruit can, replacing the usual guard and globe, usually serves as a source of heat to operate the thermostat without damage to paint work or to the thermostat itself. Any thermostat requiring a time to operate significantly different from the average when covered with the heating device should be suspected of being defective and forwarded to Commandant (G–MMT–2) for further testing.

§ 110.30–7 Repairs or alterations.

A general or partial inspection, depending upon circumstances, should be made whenever any important repairs or alterations are undertaken.

PART 111—ELECTRIC SYSTEM—GENERAL REQUIREMENTS

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AUTHORITY: 46 U.S.C. 170, 367, 369, 375, 390(b), 391(a), 392, 408, 416, 445, 489, 526p; 49 U.S.C. 1655 (b); 49 CFR 1.46.

Subpart 111.01—General Considerations

§ 111.01-1 General.

Electric installations on vessels must ensure—

(a) That services necessary for safety are maintained under emergency conditions; and

(b) The safety of passengers, crew, other persons, and vessel from electrical hazards.

§ 111.01-3 Placement of equipment.

(a) Electric equipment must be arranged, as far as practicable, to prevent mechanical damage to the equipment from the accumulation of dust, oil vapors, steam, or dripping liquids.

(b) Apparatus that may arc must be ventilated or be in ventilated compartments in which flammable gases, acid fumes, and oil vapors cannot accumulate. Skylights and ventilators must be arranged to prevent flooding of the apparatus.

§ 111.01-5 Protection from bilge water.

Each generator, motor, and electric coupling must be arranged so that it cannot be damaged by bilge water.

§ 111.01-7 Accessibility.

(a) The design and arrangement of electric apparatus must allow accessibility to each part that needs inspection or adjustment.

(b) Each armature and field coil, rotor, and revolving field must be removable, and where there is an air duct, there must be a means of access.

§ 111.01-9 Watertight and waterproof equipment.

Electric equipment exposed to the weather or in a space where it is exposed to seas, splashing, or similar moisture conditions, must be watertight or be in a watertight enclosure that prevents exposure of the equipment to temperatures greater than those for which it has been designed, except that a motor may be a waterproof machine instead of being watertight.

§ 111.01-11 Corrosion-resistant parts.

Each enclosure and part of electric equipment that can be damaged by corrosion must be made of corrosion-resistant materials or of materials rendered corrosion resistant. Aluminum alloys with copper content greater than 0.4 percent must not be used.

§ 111.01-13 Limitations on porcelain use.

Porcelain must not be used for lamp sockets, switches, receptacles, fuse blocks, or other electric equipment where the material is fixed by machine screws or their equivalent.

§ 111.01-15 Temperature ratings.

In this subchapter, except as otherwise stated, an ambient temperature of 40° C is assumed. Where the ambient temperature is greater than 40° C, the total temperature stated must not be exceeded. Where equipment has been rated on ambient temperatures less than 40° C, this equipment may be used if the temperature for which the equipment is rated is not exceeded.

§ 111.01-17 Nature of electric supply.

(a) *Standard systems.* The following systems of distribution are standard:

(1) Two-wire with direct current or single-phase alternating current.

(2) Three-wire with direct current or single-phase alternating current.

(3) Three-wire, three-phase alternating current.

(4) Four-wire, three-phase alternating current.

(b) *Standard voltages.* The voltages given in Table 111.01-17(b) are standard.

TABLE 111.01-17(b)—*Standard voltages*

Equipment	Direct current (volts)	Alternating current (volts)
Lighting	115	115
Power	115 and 230	115, 200, 220, 230, 460, 2300, 4000
Generators	120 and 240	120, 208, 230, 240, 480, 2400, 4160
Propulsion	1,000	7,500

(c) *Standard frequency.* A frequency of 60 hertz is recognized as standard for alternating-current lighting and power systems.

(d) *Others.* Systems, voltages, or frequencies that differ from the standard may be specially approved by the Commandant.

Subpart 111.05—Grounding, Ground Detection, and Grounded Systems

§ 111.05–1 Purpose.

This subpart contains requirements for the grounding of circuits and electric equipment.

NOTE.—Circuits are grounded to limit excessive voltage from lightning, to line surges, and unintentional contact with higher voltage lines, and to limit the voltage to ground during normal operation. Conductive materials enclosing electric conductors and equipment, or forming part of that equipment, are grounded to prevent a voltage above ground on these materials.

EQUIPMENT GROUNDING

§ 111.05–3 Design, construction, and installation; general.

(a) Exposed metal parts of electric machines and equipment that are not "live" but may become "live" because of any condition must be grounded.

(b) An electric apparatus must be designed, constructed, and installed to protect any person who handles that apparatus from injury.

(c) If the installation of an electric appliance does not ensure positive grounding, the apparatus must be grounded with grounding—

(1) Conductors; or

(2) Straps.

§ 111.05–5 Equipment.

The following must be grounded:

(a) Metal frames of portable lamps, tools, and other portable ship's equipment through a conductor in the supply cable.

(b) An installed receptacle outlet through its grounding pole.

(c) Lighting equipment, including fixtures.

(d) Metal cases of instruments, relays, meters, instrument transformers, and secondary windings of instrument transformers.

(e) Controller covers, except the covers of snap switches.

(f) Outlet boxes.

(g) Enclosures for switches and circuit breakers.

(h) Exposed metal parts of electrically driven cranes and hoists.

(i) Mobile units through conductors in supply cables.

§ 111.05–7 Armored and metallic-sheathed cable.

(a) Each metallic-sheathed multiconductor multiphase cable and each multiconductor multiphase armored cable must have its metallic covering:

(1) Electrically and mechanically continuous;

(2) Grounded to the metal hull at the supply end on final sub-circuits; and

(3) Grounded to the metal hull at each end on other circuits.

(b) Single conductor alternating-current cable must be grounded only at the midpoint.

§ 111.05–9 Masts.

Each wooden mast and each wooden topmast must have a lightning ground conductor.

SYSTEM GROUNDING

§ 111.05–11 Hull return.

(a) A vessel's hull must not carry current as a conductor for a distribution system.

(b) A battery system for engine starting may be a one-wire system if the ground lead is connected to the engine.

§ 111.05–13 Grounding connection.

Each grounded system must have only one point of connection to ground regardless of the number of power sources operating in parallel in the system.

§ 111.05–15 Neutral grounding.

Each neutral of a propulsion, power, lighting, or distribution system must be grounded.

§ 111.05–17 Generation system grounding.

The neutral of each generation system must:

(a) Be grounded at the generator switchboard, except the neutral of an emergency power generation system must be grounded with—

(1) No direct ground connection at the emergency switchboard;

(2) The neutral bus permanently connected to the neutral bus of the main switchboard; and

(3) No switch, circuit breaker, or fuse in the neutral conductor of the bus-tie feeder connecting the emergency switchboard to the main switchboard;

(b) Have the ground connection accessible for checking the insulation resistance of the generator to ground before the generator is connected to the bus; and

(c) Have the grounding arrangement limit the full load current at full load voltage to 20 amperes or less upon a fault to ground.

§ 111.05–19 Tank vessels; grounded distribution systems.

(a) Except as allowed in paragraph (b) of this section, a tank vessel must not have a grounded distribution system.

(b) If the voltage of a distribution system on a tank vessel is 3000 volts or more, line-to-line, the tank vessel may have a grounded system if any resulting current does not flow through hazardous locations.

GROUND DETECTION

§ 111.05–21 Ground detection.

There must be ground detection for each:

(a) Electric propulsion system;

(b) Power system;

(c) Lighting system; and

(d) Distribution system that is isolated from the power and lighting systems by transformers, motor generator sets, or other devices.

§ 111.05–23 Location of ground indicators.

Ground indicators must:

(a) Be at the vessel's generator and distribution switchboard for the main power, main lighting, and emergency lighting systems;

(b) Be at the propulsion switchboard for propulsion systems; and

(c) Not be concealed.

§ 111.05–25 Ungrounded systems.

Ground detection for each ungrounded system must have:

(a) A lamp for each phase that is:

(1) Connected between the phase and ground; and

(2) More than 5 watts and less than 25 watts when operating at one-half voltage in the absence of a ground; and

(b) A normally-closed, spring return-to-normal switch between the lamps and the ground connection.

§ 111.05–27 Grounded neutral alternating-current systems.

Ground detection for each alternating-current system that has a grounded neutral must have the following equipment that can withstand the maximum available fault current without damage:

(a) An ammeter that:

(1) Indicates the current in the ground connection; and

(2) Has a full scale range of 10 amperes.

(b) An ammeter switch that is the spring return to "on" type.

§ 111.05–29 Dual voltage direct-current systems.

Ground detection for each dual voltage, direct-current system must have a zero center ammeter that:

(1) Is in the ground connection;

(2) Has a full scale range of 150 percent of the neutral current rating; and

(3) Has the polarity of the ground marked.

GROUNDED CONDUCTORS

§ 111.05–31 Grounding conductors for systems.

(a) A conductor for grounding a direct-current system must be the larger of:

(1) The largest conductor supplying the system; or

(2) No. 8 AWG.

(b) A conductor for grounding the neutral of an alternating-current system must meet Table 111.05–31(b).

TABLE 111.05–31(b)—NEUTRAL GROUNDING CONDUCTOR FOR ALTERNATING-CURRENT SYSTEM

Size (AWG) of the largest generator cable or equivalent for parallel generators:	*Size (AWG) of the system grounding conductor*
2 or less	8
1 or 0	6
2/0 or 3/0	4
Greater than 3/0 and less than or equal to 350 MCM	2
Greater than 350 MCM and less than or equal to 600 MCM	0
Greater than 600 MCM and less than or equal to 1100 MCM	2/0
Greater than 1100 MCM	3/0

§ 111.05–33 Equipment grounding conductors.

An equipment grounding conductor must be at least as large as the power conductor that supplies the equipment.

§ 111.05–35 Color coding of conductors.

(a) Each grounded conductor, except an equipment grounding conductor, must have a white or grey outer cover.

(b) A conductor that has a white or grey outer cover must not be an ungrounded conductor unless the color is changed at each connection.

(c) Each insulated grounding conductor of a cable must have green braid or insulation.

§ 111.05–37 Overcurrent device.

A permanently grounded conductor must not have an overcurrent device unless the overcurrent device:

(a) Simultaneously opens each ungrounded conductor of the circuit; or

(b) Meets Section 430–36 of the National Electrical Code.

§ 111.05–39 Switch and circuit breaker.

(a) The grounded conductor of a circuit must not be disconnected by a switch or circuit breaker, unless, the ungrounded conductors are simultaneously disconnected.

(b) The neutral conductor of the emergency-main switchboard bus-tie must not have a switch or circuit breaker.

Subpart 111.10—Power Supply

§ 111.10–1 Two generating sets.

In addition to the emergency generator sets required under Part 112 of this subchapter, each self-propelled vessel must have at least two electric generating sets.

§ 111.10–3 Power requirements: generating sets.

With the largest generating set stopped, the combined capacity of the remaining electric generating set or sets required in § 111.10–1 must be sufficient for the normal sea load, except full power to electric propulsion motors.

§ 111.10–5 Multiple energy sources.

Failure of any single energy source for the generating sets required in § 111.10–1 must not cause all generating sets to be inoperable.

§ 111.10–7 Dead ship.

(a) The generating plant of each self-propelled vessel must provide the electrical services necessary to start the main propulsion plant from a dead ship condition.

(b) The emergency generator may be used for part or all of the electric power necessary to start the main propulsion plant from a dead ship condition if the emergency generator can simultaneously provide power to all emergency lighting, emergency internal communications systems, and fire detection and alarm systems.

§ 111.10–9 Two transformers.

If transformers are an essential part of the power and lighting supply system required by this subpart for self-propelled vessels the system must have at least two transformers.

§ 111.10–11 Power requirements; transformers.

With the largest transformer deenergized, the remaining transformer or transformers required in § 111.10–9 must be sufficient for the normal sea load, except full power to electric propulsion motors.

Subpart 111.12—Generator Construction and Circuits

§ 111.12–1 Prime movers.

(a) Requirements for prime movers are in Subpart 58.10 of this chapter. Additional requirements for prime movers for emergency generators are in Subpart 112.50 of this subchapter.

(b) Each diesel engine prime mover must have an overspeed device that is independent of the normal operating governor and adjusted so that the speed can not exceed the maximum rated speed by more than 15 percent.

(c) Each prime mover must shut down automatically upon loss of lubricating pressure to the generator bearings.

§ 111.12–3 Excitation.

Excitation must meet Section 35.23 of the American Bureau of Shipping "Rules for Building and Classing Steel Vessels", except a static exciter must not be used for excitation of an emergency generator.

§ 111.12–5 Generator construction and testing.

(a) Each generator must meet Section 35 of the American Bureau of Shipping. "Rules for Building and Classing Steel Vessels".

(b) Each generator must be dripproof and protected machine and have dampers in each non-recirculating system air duct.

(c) Each emergency generator must have means to prevent moisture condensation in the machine.

(d) No steam heating coil may have a pipe joint in a generator casing.

§ 111.12–7 Voltage regulation and parallel operation.

(a) Generator voltage regulation and parallel operation must meet Sections 35.31 and 35.33 of the American Bureau of Shipping "Rules for Building and Classing Steel Vessels".

(b) Each voltage regulation supply circuit must:

(1) Be taken from the generator side of the generator circuit breaker; and

(2) Not be protected by an overcurrent device.

§ 111.12–9 Generator cables.

(a) The current carrying capacity of generator cables must be at least equal to the trip setting of the generator overcurrent device.

(b) If the ship's service generators are located in separate spaces, the generator cables between the circuit breakers and the switchboard must be separated as widely as practicable throughout their length.

(c) Generator cables must not be in the bilges.

§ 111.12–11 Generator protection.

(a) *Applicability.* This section applies to each generator except a propulsion generator.

(b) *25 kw and larger.* Each generator that is 25 kw or larger must be protected by an individual, trip-free, open frame, air circuit breaker, except that a generator that is not a ship's service generator on a self-propelled vessel or an emergency generator may be protected by a molded case circuit breaker.

(c) *Less than 25 kw.* Each generator that is smaller than 25 kw must be protected by an individual, trip-free, open frame or molded case, air circuit breaker.

(d) *Type of trips.* Each circuit breaker for a generator must have only inverse time overcurrent trips, except it must also have instantaneous trips if:

(1) Three or more alternating-current generators can be paralleled; or

(2) The circuit breaker is for a direct-current generator.

(e) *Setting of long-time trips.* The pickup setting of the long-time overcurrent trip of a generator circuit breaker must not be larger than:

(1) 115 percent of the generator rating rating for a continuous rated machine; and

(2) 115 percent of the overload rating for a machine with a 2 hour or greater overload rating.

(f) *Setting of instantaneous trips.* The instantaneous trip of a generator circuit breaker must be set:

(1) Above the maximum asymmetrical short circuit current available from the generator; and

(2) At the lowest setting that will coordinate with the trip settings of feeder circuit breakers supplied by the generator.

(g) *Reverse-power trips.* Each generator arranged for parallel operation must have a reverse-power trip.

(h) *Location.* The generator overcurrent protective device must be on the ship's service generator switchboard if the generator and switchboard are in the same space or if the generator and switchboard are in different spaces but not separated by more than 25 feet (7.6 m). If the generator and switchboard are in different spaces and separated by more than 25 feet (7.6 m), the generator overcurrent protective device must be in the same space as the generator.

(i) *Three-wire single-phase and four-wire three-phase generators.* There must be a circuit breaker pole for each generator lead, except that there need not be a circuit breaker pole in the neutral lead.

(j) *Three-wire direct-current generators.* Each three-wire direct-current generator must meet the following requirements:

(1) *Circuit breaker poles.* There must be a separate circuit breaker pole for each positive and negative lead, and, unless the main poles provide protection, for each equalizer lead. If there are equalizer poles for a three-wire generator, each overload trip must be of the "Algebraic" type. If there is a neutral pole in the generator circuit breaker,

there must not be an overload trip element for the neutral pole. There must be a neutral overcurrent relay and alarm system that is set to function at a current value equal to the neutral rating.

(2) *Equalizer buses.* For each three-wire generator, the circuit breaker must protect against a short circuit on the equalizer bus.

§ 111.12–13 Propulsion generator protection.

Protection of a propulsion generator requires special consideration in each case.

Subpart 111.15—Storage Batteries and Battery Chargers; Construction and Installation

§ 111.15–1 General.

Each battery must be a lead acid, alkaline, or other type of storage battery specially approved by the Commandant (G–MMT).

§ 111.15–2 Battery construction.

(a) Each battery must withstand vessel pitch, vibration, and roll, and exposure to a salt water atmosphere.

(b) Each battery cell must not spill electrolyte if the battery is inclined at 30° from the vertical.

(c) Each positive plate of a lead-acid battery for a general alarm system or for an emergency lighting and power system, except for an engine cranking system, must be at least 6.35 mm (0.25 in.) thick.

(d) Except as required under paragraph (c) of this section, each positive plate of a lead-acid battery must be at least 3.17 mm (0.125 in.) thick.

(e) Each fully charged lead-acid battery, except an engine cranking battery, must have a specific gravity of acid electrolyte of 1.210 to 1.220 at 25°C.

(f) Each fully charged, high watering space lead-acid type engine cranking battery must have a specific gravity of at most 1.260 at 25°C.

(g) Each fully charged normal watering space lead-acid type engine cranking battery must have a specific gravity of at most 1.285 at 25°C.

§ 111.15–3 Battery categories.

A battery is classified as one of three types, based upon power output of the battery charger, as follows:

(a) *Large.* A large size battery is one connected to a battery charger that has an output of more than 2 kw computed from the highest possible charging current and the rated voltage of the battery.

(b) *Moderate.* A moderate size battery is one connected to a batttery charger that has an output of between 0.2 kw and 2 kw computed from the highest possible charging current and the rated voltage of the battery.

(c) *Small.* A small size battery is one connected to a battery charger that has an output of less than 0.2 kw computed from the highest possible charging current and the rated voltage of the battery.

§ 111.15–5 Battery installation.

(a) *Large size batteries.* Each large size battery must be in a room that is only for batteries or in a box on deck. Electric equipment in a battery room must be approved by Underwriters' Laboratories, Inc. or Factory Mutual Engineering Corp. for a Class I, Division 1, Group B location. Devices that may arc, such as switches, battery charges, and similar devices, mut not be in a battery room. Except conductors for engine cranking batteries, each battery conductor must have an overcurrent protective device that is next to, but outside the battery room. Electric cables, other than those for the battery or battery room lighting, must not be in a battery room. A fixed danger notice must be on each door of a battery room and on each cover of a battery deck box, stating that a naked light or smoking in the room or in the area is not allowed.

(b) *Moderate size batteries.* Each moderate size battery must be in a battery room, in a box on deck, or in a box or locker in another space such as an engineroom, storeroom, or similar space, except this battery may be open in the engineroom or in a similar ventilated compartment, if protected from falling objects. A battery must not be in a sleeping space. An engine cranking battery for one or more engines must be as close as possible to the engine or engines.

(c) *Small size batteries.* Each small size battery may be in a place such as an open working space or engine compartment if the space is ventilated.

(d) *Battery trays.* Each battery tray must be chocked with wood strips or their equivalent to prevent movement, and each tray must have non-absorbent insulating supports on the bottom and similar spacer blocks at the sides, or equivalent provisions for air circulation space all around each tray. Each battery tray must be accessible, with at least 10 in. (254 mm) of head room.

(e) *Tiers.* When batteries are arranged in two or more tiers, each shelf must have at least 2 in. (50.8 mm) of space front and back for circulation of air.

(f) *Nameplates.* The battery manufacturer's name or trade mark and type designation, the ampere-hour rating at a specific rate of discharge, and, for a lead-acid battery when fully charged, the specific gravity of the electrolyte, must be on a fixed nameplate on each tray or molded on the tray case.

(g) *Lining in battery rooms and lockers.* Each battery room and locker must have a watertight lining that is:

(1) On:

(i) Each shelf to a height of at least 3 in. (76.2 mm); or

(ii) The deck to a height of at least 6 in (152.4 mm);

(2) For lead-acid batteries, $\frac{1}{16}$ in. (1.6 mm) thick lead or other material that is corrosion-resistant to the electrolyte of the battery; and

(3) For alkaline batteries, $\frac{3}{32}$ in. (0.8 mm) thick steel or other material that is corrosion-resistant to the electrolyte of the battery.

(h) *Lining of battery boxes.* Each battery box must have a watertight lining to a height of at least 3 in. (76.2 mm) that meets paragraphs (g)(2) and (g)(3) of this section.

§ 111.15–10 Ventilation.

(a) *General.* Each room, locker, and box for storage batteries must be arranged or ventilated to prevent accumulation of flammable gas.

(b) *Power ventilation.* If power ventilation is required, the following must be met:

(1) The power ventilation system must be separate from ventilation systems for other spaces.

(2) Electric motors must be:

(i) Outside the duct and compartment; and

(ii) Explosionproof motors for Class I, Division 1, Group B locations or be at least 10 ft. (3 m) from the duct end.

(3) Each blower must have a nonsparking fan.

(4) The power ventilation system must be interlocked with the battery charger so that the battery cannot be charged without ventilation.

(c) *Large size batteries.* Each battery room that has large size batteries must be ventilated by a power ventilation system with mechanical exhaust and have openings for air near the floor that allow the passage of the quantity of air that must be expelled. The quantity of the air expelled must be at least:

$$q=3.89(i)(n).$$

where:

q=quantity of expelled air in cubic feet per hour.

i=maximum charging current during gas formation, or one-fourth of the maximum obtainable charging current of the charging facility, whichever is greater.

n=number of cells.

(d) *Moderate and small size batteries.* Each battery room or battery locker that has moderate or small size batteries must have louvers near the bottom of the room or locker for air, and must be ventilated by:

(1) Ventilation that meets paragraph (c) of this section;

(2) A duct:

(i) That ends in a mechanically ventilated space;

(ii) From the top of the room or locker to at least 3 ft. (1 m) above the top of the room or locker;

(iii) That is at an angle of 45° or less from the vertical; and

(iv) That has no appliances, such as flame arresters, that impede free passage of air or gas mixtures;

(3) A duct that meets paragraph (d)(2), of this section, except that it ends in the weather; or

(4) A duct from the top of the room or locker to an exhaust ventilation duct.

(e) *Deck boxes.* Except for a deck box for small size batteries, each deck box must have a duct from the top of the

box to at least 4 ft. (1.2 m) above the box ending in a gooseneck or mushroom head that prevents entrance of water. Holes for air must be on at least two parallel sides of each box.

(f) *Weathertight.* Each deck box must be weathertight.

(g) *Boxes for small size batteries.* Each box for small size batteries must have openings near the top to allow escape of gas.

§ 111.15–20 Conductors.

(a) If a conductor enters a battery room, the hole must be made watertight.

(b) Each connection within a battery room must be resistant to the electrolyte.

(c) The end of each cable must be sealed to prevent the entrance of electrolyte by spray or creepage.

(d) The current-carrying capacity of a connecting cable must be at least as large as the maximum charging current or maximum discharge current, whichever is greater.

§ 111.15–25 Overload and reverse current protection.

(a) An overload protective device must be in each battery conductor, except that engine cranking batteries and batteries with a nominal potential of 6 volts or less need not be protected against overload. For large size storage batteries, the overcurrent protective devices must be next to, but outside of, the battery room.

(b) Except when a rectifier is used, the charging equipment for each battery with a nominal voltage more than 20 percent of line voltage must protect automatically against reversal of current.

§ 111.15–30 Battery chargers.

Each battery charger must be dripproof and meet UL 1236.

Subpart 111.20—Transformer Construction, Installation, and Protection

§ 111.20–1 General requirements.

Each transformer winding must be resistant to moisture, sea atmosphere, and oil vapor.

§ 111.20–5 Temperature rise.

(a) The temperature rise, based on an ambient temperature of 40°C, must not exceed the following:

(1) For Class A insulation, 55°C.
(2) For Class B insulation, 80°C.
(3) For Class F insulation, 115°C.
(4) For Clas H insulation, 150°C.

(b) If the ambient temperature is higher than 40°C, the transformer must be derated so that the total temperature stated in this section is not exceeded. The temperature must be taken by the resistance method.

§ 111.20–10 Autotransformers.

An autotransformer must not supply feeders or branch circuits.

§ 111.20–15 Transformer overcurrent and short-circuit protection.

Each transformer must have protection against overcurrent and short circuit that meets Article 450 of the National Electrical Code.

Subpart 111.25—Motors

§ 111.25–1 General requirements.

The requirements for generators contained in § 111.12–5 (a) and (b) apply to motors.

§ 111.25–3 Marking.

(a) Each motor must have a marking or nameplate that meets Section 430–7 of the National Electrical Code.

(b) The marking or nameplate for each motor that is in a corrosive location must be corrosion-resistant.

§ 111.25–15 Duty cycle.

Each motor must be rated for continuous duty, except that a motor for an application listed in Table 111.25–15 may be short-time rated as stated. Each other motor for similar duty may have a consistent short-time rating.

TABLE 111.25–15

Application of motor	*Minimum short-time rating of motor, in hour*
Deck winch and direct acting capstan.	Half.
Deck winch with hydraulic transmission.	Continuous at no load, followed by ½ hr. at full load.
Direct acting windlass.	One fourth.
Windlass with hydraulic transmission.	Half hour idle pump operation followed by ¼ hr. full load operation.
Steering gear, direct acting.	One.
Steering gear, indirect drive.	Continuous operation at 15 pct. load followed by 1 hr. at full load.
Watertight door operators.	One twelfth.
Lifeboat winches	One thirteenth.

Subpart 111.30—Switchboards

§ 111.30–1 Location and installation.

Each switchboard must:

(a) Be in a dry place;

(b) Have a working space of at least 3 ft. (1 m) in front of the switchboard;

(c) Have a working space behind the switchboard that is at least 24 in. (0.6 m) from the nearest bulkhead and at least 18 in. (0.5 m) from the nearest stiffener or frame, or have no rear access;

(d) Be protected, by location or a shield, from machinery and piping having steam or pressurized liquid; and

(e) If it is a main switchboard, be in a machinery space that has a ship's service generator.

§ 111.30–3 Switchboards without rear access.

Each component and bus bar connection on a switchboard without rear access, except a bus bar connection for a draw-out type circuit breaker, must be within 20 in. (0.5 m) of the front of the switchboard.

§ 111.30–5 Construction.

(a) Insulating material for panels, bases, and supports for a switchboard must be moisture resistant and incombustible.

(b) Each switchboard must have:

(1) Wood only in handrails and guardrails;

(2) Positioners and stops on hinged panels; and

(3) Wearing parts readily replaceable.

§ 111.30–7 Dead front type.

Each switchboard must have a dead front.

§ 111.30–9 Mechnical protection.

Each switchboard must have:

(a) Enclosed sides;

(b) A dripshield, except a switchboard that is in an environmentally controlled space;

(c) A door at each entrance to a rear working space;

(d) Front non-conducting handrails; and

(e) Rear non-conducting guardrails if the switchboard has a rear working space.

§ 111.30–11 Mats or gratings.

Non-conducting mats or gratings must be in each working area in front of and behind each switchboard.

§ 111.30–13 Grounding.

The following must be grounded:

(a) The metal case of each:

(1) Instrument;
(2) Relay;
(3) Meter; and
(4) Instrument transformer.

(b) The secondary winding of each instrument transformer.

§ 111.30–15 Nameplates.

(a) Each derive must have a nameplate showing the device's function.

(b) Each nameplate for a circuit breaker must show the electrical load served, and the setting of the circuit breaker.

§ 111.30–17 Protection of instrument circuits.

(a) Each circuit that supplies a device on a switchboard, except a circuit under paragraph (b) of this section, must have overcurrent protection.

(b) A circuit that supplies a device on a switchboard must have no overcurrent protection if it supplies—

(1) An electric propulsion control;
(2) A voltage regulator;
(3) A ship's service generator circuit breaker tripping control;
(4) A device that creates a hazard to the vessel if de-energized; or
(5) A secondary circuit of a current transformer.

(c) The circuit from a current transformer to a device that is not in the switchboard must have a high voltage protector to short the transformer during an open circuit.

§ 111.30–19 Buses and wiring.

(a) *Bus capacity.* Each bus must have the following current-carrying capacity, except the capacity of a feeder bus may be the same as the capacity of the generator bus to which the feeder bus is connected:

(1) Each bus and each bus connection must have a current-carrying capacity that is at least the total of 75 percent of the combined full-load rated currents of the equipment supplied and 50 percent of the combined ratings of the spare circuit breakers, except a bus under paragraphs (a)(2) through (a)(4) of this section.

(2) Each feeder bus must have the current-carrying capacity for the full-load rated currents supplied to units in continuous operation.

(3) Each generator bus that is supplied by a single generator must have a current-carrying capacity that is at least the total of:

(i) The continuous current rating of the generator; and

(ii) Any overload current rating of the generator that is more than 30 minutes.

(4) Each generator bus that is supplied by more than one generator and has all the generating capacity feeding through one section must have a current-carrying capacity that is at least the total of:

(i) The continuous current rating of the largest generator;

(ii) Any overload current rating of more than 30 minutes for the largest generator; and

(iii) 80 percent of the continuous current rating of each additional generator.

(b) *Bus rating.* The size and arrangement of each bus must be such that its rating in Table 34 (Appendix) of IEEE Standard No. 45 is not less than the capacity required in paragraph (a) of this section.

(c) *Bus bracing.* Each bus must be braced to prevent damage from the maximum available short-circuit current.

(d) *Spacing.* The spacing between live metal parts must meet Section 384–26 of the National Electrical Code.

(e) *Connections.* Each bus and wiring connections must have a locking device and must be accessible.

(f) *Wiring.* Instrument and control wiring must be:

(1) National Electrical Code Type TA, TBS, or SIS wire;

(2) Stranded copper;

(3) No. 18 AWG or larger;

(4) Flame-retardant meeting UL 83; and

(5) Extra flexible if used on a hinged panel.

§ 111.30–21 High temperature devices.

Each rheostat and other device that operates at high temperatures must be isolated by barriers and naturally ventilated.

§ 111.30–23 Medium voltage switchboards.

Each switchboard having a root-mean-square (RMS) voltage of 1000 volts or more must meet ANSI C37.20 for metal-clad switchgear.

§ 111.30–25 Alternating-current ship's service switchboards.

(a) Except as allowed in paragraph (g) of this section, each alternating-current ship's service switchboard must have the equipment required by paragraphs (b) through (f) of this section.

(b) For each connected generator, each switchboard must have the following:

(1) A circuit breaker that meets § 111.12–11, if required in § 111.50–5(a)(1).

(2) A disconnect switch or link for each generator conductor, except a switchboard having a draw-out or plug-in type generator circuit breaker that disconnects—

(i) Each generator conductor; or

(ii) If there is a switch in the generator neutral, each ungrounded conductor.

(3) A pilot lamp connected between the generator and the circuit breaker.

(4) An ammeter with a selector switch that connects the ammeter to show the current in each phase.

(5) A voltmeter with a selector switch that connects the voltmeter to show the—

(i) Generator voltage of each phase; and

(ii) Bus voltage of one phase.

(6) A voltage regulator and voltage regulator functional cut-out switch.

(c) For each generator that is not excited from a variable voltage or rotary amplifier that is controlled by a voltage regulator unit acting on the exciter field, each switchboard must have a—

(1) Generator field rheostat;

(2) Exciter field rheostat;

(3) Double-pole field switch;

(4) Discharge clips; and

(5) Discharge resistor.

(d) If generators are arranged for parallel operation, each switchboard must have—

(1) A speed control for the prime mover of each generator;

(2) An indicating wattmeter for each generator; and

(3) A synchroscope and synchronizing lamps that have a selector switch to show synchronization for paralleling generators.

(e) Each switchboard must have the following:

(1) Ground detection that meets Subpart 111.05 of this part for the—

(i) Main power system;

(ii) Main lighting system; and

(iii) Emergency lighting system.

(2) A frequency meter with a selector switch to connect the meter to each generator.

(f) For each shore power connection, each switchboard must have—

(1) A circuit breaker or fused switch;

(2) A pilot light connected to the shore side of the circuit breaker or fused switch; and

(3) One of the voltmeters under paragraph (b)(5) of this section connected to show the voltage of each phase of the shore power connection.

(g) The equipment under paragraphs (b), (d), (e), and (f) of this section, except the equipment under paragraphs (b)(1), (b)(2), and (f)(1) of this section, need not be on the ship's service switchboard if it is on a central control console that—

(1) Is in the same control area as the main ship's service switchboard;

(2) Has a generator section that has only generator functions;

(3) Has the generator section segregated from each other console section by a fire-resistant barrier; and

(4) Has cabling from the main switchboard to the generator section of the console that—

(i) Has only generator control and generator instrumentation circuits; and

(ii) Is protected from mechanical damage.

(h) Each alternating-current ship's service switchboard of a self-propelled vessel having a ship's service generating capacity of more than 3000 kw must have the following:

(1) At least two sections of the main bus that are connected by—

(i) A non-automatic circuit breaker;

(ii) A disconnect switch; or

(iii) Removable links.

(2) As far as practicable, the connection of generators and duplicated equipment equalized between the sections of the main bus.

§ 111.30–27 Direct-current ship's service switchboards.

(a) Each direct-current ship's service switchboard must have the equipment required by paragraphs (b) through (f) of this section.

(b) For each connected generator, each switchboard must have the following:

(1) A circuit breaker that meets § 111.12–11, if required in § 111.50–5(a)(1).

(2) A disconnect switch or link for each generator conductor, except a switchboard having a draw-out or plug-in type generator circuit breaker that disconnects—

(i) Each conductor; or

(ii) If there is a switch in the generator neutral, each ungrounded conductor.

(3) A field rheostat.

(4) A pilot lamp connected between the generator and circuit breaker.

(c) For each two-wire generator, each switchboard must have—

(1) An ammeter; and

(2) A voltmeter with a selector switch that connects the voltmeter to show—

(i) Generator voltage; and

(ii) Bus voltage.

(d) For each three-wire generator, each switchboard must have the following:

(1) An ammeter for—

(i) The positive lead; and

(ii) The negative lead.

(2) A center zero type ammeter for the neutral ground connection.

(3) A voltmeter with a selector switch that connects the voltmeter to show generator and bus voltage—

(i) Positive to negative;

(ii) Positive to neutral; and

(iii) Neutral to negative.

(e) Each switchboard must have ground detection that meets Subpart 111.05 of this part for the—

(1) Main power system;

(2) Main lighting system; and

(3) Emergency lighting system.

(f) For each shore power connection, each switchboard must have—

(1) A circuit breaker or fused switch; and

(2) A pilot light connected to the shore side.

(g) One of the voltmeters under paragraph (c)(2) or (d)(3) of this section must be connected to show—

(1) For each two-wire system, shore connection voltage; and

(2) For each three-wire system, shore connection voltage—

(i) Positive to negative;

(ii) Positive to neutral; and

(iii) Neutral to negative.

§ 111.30–29 Emergency switchboards.

(a) Each emergency generator must have an emergency switchboard.

(b) Each alternating-current emergency switchboard must have the equipment required by paragraphs (c) through (e) of this section.

(c) For each connected emergency generator, each emergency switchboard must have—

(1) A circuit breaker that meets § 111.12–11;

(2) A disconnect switch or link for each emergency generator conductor, except for a switchboard with a draw-out or plug-in type generator circuit breaker that disconnects—

(i) Each generator conductor; and

(ii) If there is a switch in the generator neutral, each ungrounded conductor; and

(3) A pilot lamp connected between the generator and circuit breaker.

(d) For each emergency generator that is not excited from a variable voltage or rotary amplifier exciter that is controlled by a voltage regulator unit acting on the exciter field, each emergency switchboard must have a—

(1) Generator field rheostat;

(2) Exciter field rheostat;

(3) Double-pole field switch;

(4) Discharge clips; and

(5) Discharge resistor.

(e) Each emergency switchboard must have the following:

(1) An ammeter with a selector switch that connects the ammeter to show the current for each phase.

(2) A voltmeter with a selector switch that connects the voltmeter to show—

(i) Generator voltage of each phase; and

(ii) Bus voltage of one phase.

(3) Ground detection that meets Subpart 111.05 for the emergency power and lighting system.

(4) A frequency meter.

(5) A voltage regulator and a voltage regulator functional cut-out switch.

(f) Each direct-current emergency switchboard must have the—

(1) Equipment under § 111.30–27(b) through (d); and

(2) Ground detection under Subpart 111.05 of this part for the emergency power and lighting system.

§ 111.30–31 Tests.

Each switchboard must meet the test requirements in Section 35 of the American Bureau of Shipping "Rules for Building and Classing Steel Vessels."

Subpart 111.33—Semiconductor Controlled Rectifiers (SCR)

§ 111.33–1 Switchboard requirements.

Each semiconductor controlled rectifier (SCR) must meet § 111.30–1 through 111.30–23.

§ 111.33–3 Heat sink and ventilation.

Each SCR must have a heat sink and a forced ventilation system that prevents overheating of the SCR.

§ 111.33–5 Ventilation exhaust.

The exhaust of each SCR ventilation system must—

(a) Terminate in a location other than a hazardous location under Subpart 111.105 of this part; and

(b) Not impinge upon any other electric device.

§ 111.33–7 Ventilation alarm.

There must be an alarm for failure of ventilation for an SCR.

§ 111.33–9 Temperature alarm.

There must be an alarm that is actuated by high SCR temperature.

§ 111.33–11 Propulsion systems.

Each SCR in a propulsion system must—

(a) Meet Subpart 111.35 of this part;

(b) Have a current-limiting circuit;

(c) Have fuses for overcurrent protection; and

(d) Have a system for detecting a blown fuse.

Subpart 111.35—Electric Propulsion

§ 111.35–1 Electric propulsion installations.

Each electric propulsion installation must meet Section 35 of the American Bureau of Shipping "Rules for Building and Classing Steel Vessels".

Subpart 111.40—Panelboards

§ 111.40–1 Panelboard; National Electrical Code.

Each panelboard must meet Article 384 of the National Electrical Code, except—

(a) Section 384–3(c);

(b) The neutral connection provision in Section 384–14;

(c) Section 384–16(d);

(d) Section 384–17; and

(e) Section 384–27.

§ 111.40–3 Grounding.

Each panelboard enclosure must be grounded.

§ 111.40–5 Enclosure.

Each panelboard enclosure must be—

(a) Watertight, if the panelboard is part of a general alarm system; or

(b) Dripproof, if the panelboard is where liquid might drip on it.

§ 111.40–7 Location.

Each panelboard must be accessible and must not be—

(a) In the weather; or

(b) In a cargo hold, bunker, or storeroom.

§ 111.40–9 Locking device.

Each panelboard enclosure that is accessible to any passenger must have a door locking device.

§ 111.40–11 Numbered switching unit and panelboard directory.

(a) Each panelboard switching unit must be numbered.

(b) Each panelboard must have—

(1) A circuit directory cardholder; and

(2) A circuit directory that has—

(i) The circuit designation of each circuit;

(ii) A description of the load of each circuit; and

(iii) The rating of the overcurrent protective device for each circuit.

§ 111.40–13 Panelboard standard.

Each panelboard must meet UL 67.

Subpart 111.50—Overcurrent Protection

§ 111.50–1 Protection of equipment.

Overcurrent protection of the following electric equipment must meet the listed subparts:

(a) Appliances, Subpart 111.77 of this part.

(b) Generators, Subpart 111.12 of this part.

(c) Motors, motor circuits, and controllers, Subpart 111.70 of this part.

(d) Transformers, Subpart 111.20 of this part.

§ 111.50–3 Protection of conductors.

(a) *Purpose.* The purpose of overcurrent protection for conductors is to open the electric circuit if the current reaches a value that will cause an excessive or dangerous temperature in the conductor or conductor insulation. A grounded conductor is protected from overcurrent if a protective device of a suitable rating or setting is in each ungrounded conductor of the same circuit.

(b) *Overcurrent protection of conductors.* Each conductor must be protected in accordance with its current-carrying capacity, except a conductor for the following circuits must meet the listed subparts:

(1) Propulsion circuits, Subpart 111.35 of this part.

(2) Steering circuits, Subpart 111.93 of this part.

(3) Motor circuits, Subpart 111.70 of this part.

(4) Flexible cord and fixture wire for lighting circuits, Subpart 111.75 of this part.

(5) Switchboard circuits, Subpart 111.30 of this part.

(c) *Fuses.* If the allowable current-carrying capacity of the conductor does not correspond to a standard size fuse that meets Section 240–6 of the National Electrical Code, the next larger size or rating may be used if it is not larger than 150 percent of the allowable current-carrying capacity of the conductor.

(d) *Circuit breakers.* If the allowable current-carrving capacity of the conductor does not correspond to a standard circuit breaker rating that meets Section 240–6 of the National Electrical Code, the next larger rating may be used if it is not larger than 150 percent of the allowable current-carrying capacity of the conductor. The effect of the heat on the operation of thermally controlled circuit breakers must be taken into consideration in the application of these circuit breakers if they are subjected to extremely low or extremely high temperatures.

(e) *Parallel overcurrent protective devices.* No overcurrent protective device may be connected in parallel with another overcurrent protective device.

(f) *Thermal devices.* No thermal cutout, thermal relay, or other device not designed to open a short circuit, may be used for protection of a conductor against overcurrent due to a short circuit or ground, except in a motor circuit as described in Article 430 of the National Electrical Code.

(g) *Ungrounded conductors.* A fuse or overcurrent trip unit of a circuit breaker must be in each ungrounded conductor. A branch switch or circuit breaker must open all conductors of the circuit, except grounded conductors. Single pole circuit breakers with operating handles yoked together may be used for the protection of a conductor of a two-wire circuit.

(h) *Grounded conductor.* No overcurrent device may be in a permanently grounded conductor, except—

(1) An overcurrent device that simultaneously opens all conductors of the circuit, unless prohibited by § 111.05–17 for the bus-tie feeder connecting the emergency and main switchboards; and

(2) For motor-running protection described in Article 430 of the National Electrical Code.

§ 111.50–5 Location of overcurrent protective devices.

(a) *Location in circuit.* Overcurrent devices must be at the point where the conductor to be protected receives its supply, except as follows:

(1) The generator overcurrent protective device must be on the ship's service generator switchboard if the generator and switchboard are in the same space, or if the generator and switchboard are in different spaces but not separated by more than 25 feet (7.6 m). If the generator and switchboard are in different spaces and separated by more than 25 feet (7.6 m), the generator overcurrent protective device must be in the same space as the generator.

(2) The overcurrent protection for shore connection conductors must be on the switchboard to which the shore connection conductors are connected.

(3) If the overcurrent device that protects the larger conductors also protects the smaller conductors, an overcurrent device is not required at the supply to the smaller conductors.

(4) If the overcurrent device protecting the primary side of a transformer also protects the conductors connected to the secondary side as determined by multiplying the current-carrying capacity of the secondary conductor by the secondary to primary transformer voltage ratio, an overcurrent device is not required at the supply to the secondary side conductors.

(b) *Location on vessel.* Each overcurrent device must be readily accessible, not exposed to mechanical damage, not near an easily ignitible material nor where explosive gas or vapor may accumulate, and be in a distribution panelboard, switchboard, motor controller, or similar electric equipment.

§ 111.50–7 Enclosures.

(a) Each enclosure of an overcurrent protective device must meet Sections 240–30 and 240–33 of the National Electrical Code.

(b) No enclosure may be exposed to the weather unless unavoidable.

§ 111.50–9 Disconnecting and guarding.

Disconnecting and guarding of overcurrent protective devices must meet Part D of Article 240 of the National Electrical Code.

Subpart 111.51—Coordination of Overcurrent Protective Devices

§ 111.51–1 Purpose.

The purpose of this subpart is to provide continuity of service for vital equipment under short-circuit conditions through coordination and selective operation of overcurrent protective devices.

§ 111.51–3 Protection of vital equipment.

Overcurrent protective devices must be installed so that—

(a) A short-circuit on a circuit that is not vital to the propulsion, control, or safety of the vessel does not trip equipment that is vital; and

(b) A short-circuit on a circuit that is vital to the propulsion, control, or safety of the vessel is cleared only by the protective device that is closest to the point of the short-circuit.

Subpart 111.52—Calculation of Short-Circuit Currents

§ 111.52–1 General.

The available short-circuit current must be computed—

(a) From the aggregate contribution of all generators that can simultaneously operate in parallel;

(b) From the largest probable motor load; and

(c) With a three phase fault on the load terminals of the protective device.

§ 111.52–3 Systems below 750 kilowatts.

For a system with an aggregate generating capacity below 750 kilowatts, the following short-circuit currents must be used, unless detailed computations are submitted:

(a) The maximum short-circuit current of a direct-current system must be assumed to be 10 times the aggregate normal rated generator currents plus six times the aggregate normal rated currents of all motors that may be in operation.

(b) The . maximum asymmetrical short-circuit current for an alternating-current system must be assumed to be 10 times the aggregate normal rated generator currents plus four times the aggregate normal rated currents of all motors that may be in operation.

(c) The average asymmetrical short-circuit current for an alternating-current system must be assumed to be 8½ times the aggregate normal rated generator currents plus 3½ times the aggregate normal rated currents of all motors that may be in operation.

Subpart 111.53—Fuses

§ 111.53–1 General.

Each fuse must—

(a) Meet Parts E and F of Article 240 of the National Electrical Code;

(b) Have an interrupting rating sufficient to interrupt the maximum asymmetrical RMS short-circuit current at the point of application; and

(c) Be listed by Underwriters' Laboratories, Inc.[1]

§ 111.53–3 Current-limiting fuses.

(a) The fault current at an overcurrent device that is protected by a current-limiting fuse may not be greater than 90 percent of the interrupting rating of the overcurrent device.

(b) The maximum peak let-through current of a current-limiting fuse that protects an overcurrent device must not be greater than that given by the following formula:

$$I_{peak} = I_{RMS} \times K \times 0.9$$

where:

I_{RMS} = RMS symetrical short-circuit current rating of the overcurrent device.

I_{peak} = maximum peak let-through current from the fuse.

$$K = \sqrt{2}\left[1 + \frac{\sin\theta}{e^{\pi/\tan\theta}}\right]$$

$\theta = \cos^{-1} pf$

pf = power factor of the short circuit test circuits of the protective device.

(c) For circuit breakers tested under UL 489, "K" in paragraph (b) of this section is as follows:

Circuit breaker interrupting rating (amperes):	K
10,000 or less	1.61
10,002 to 20,000	1.91
Over 20,000	2.14

(d) The I^2t let through by a current-limiting fuse that protects an overcur-

[1] Underwriters' Laboratories, Inc., standards for listing fuses are listed in § 111.10–1 (b) (5) of this subchapter.

rent device must not be greater than $0.01 \times I^2_{RMS}$.

(e) Current-limiting fuses in a three-phase motor circuit must be interlocked to prevent single-phase operation of the three-phase motor.

Subpart 111.54—Circuit Breakers

§ 111.54–1 Circuit breakers.

(a) Each circuit breaker must—

(1) Meet Part G of Article 240 of the National Electrical Code;

(2) Meet Subpart 111.55 of this part; and

(3) Have an interrupting rating sufficient to interrupt the average asymmetrical RMS short-circuit current of the three phases and the average symmetrical RMS short-circuit current of the three phases at the point of application.

(b) Each molded case circuit breaker must meet UL 489.

(c) Each circuit breaker that is not a molded case circuit breaker must meet ANSI C37.

(d) No circuit breaker may—

(1) Be dependent upon mechanical cooling to operate within its rating; or

(2) Have a long-time-delay trip element set above the continuous current rating of the trip element or of the circuit breaker frame.

Subpart 111.55—Switches

§ 111.55–1 General.

Each switch must meet Article 380 of the National Electrical Code, except each switch that is in the weather must, in addition, be in a watertight enclosure and be externally operable.

§ 111.55–3 Circuit connections.

Each circuit must be connected to the fuse end of a switch or to the coil end of a circuit breaker, except that a generator may be connected to either end of a circuit breaker.

§ 111.55–5 Knife switches.

Each knife switch must meet UL 363.

§ 111.55–7 Snap switches.

Each snap switch must meet UL 20.

§ 111.55–9 Enclosed switches.

Each enclosed switch must meet UL 98.

Subpart 111.59—Busways

§ 111.59–1 General.

Each busway must meet—

(a) Article 364 of the National Electrical Code; and

(b) UL 857.

§ 111.59–3 No mechanical cooling.

A busway must not need mechanical cooling to operate within its rating.

§ 111.59–5 Copper.

Each current-carrying part of a busway must be copper.

Subpart 111.60—Wiring Materials and Methods

§ 111.60–1 Cable construction and testing.

Each cable must meet Section 18 of IEEE Standard No. 45 or § 111.60–3.

§ 111.60–3 Type N cable.

Each type N cable must meet the requirements for polyvinyl chloride insulated cable in Section 18 of IEEE Standard No. 45 except—

(a) The thickness of the polyvinyl chloride insulation must meet UL 83 for type THWN wire;

(b) Each conductor must have a nylon jacket;

(c) The thickness of the nylon jacket must meet UL 83 for type THWN wire; and

(d) The material of the nylon jacket must meet ASTM D789 Type VIII.

§ 111.60–5 Cable application.

(a) Cable application must meet Section 19 of IEEE Standard No. 45.

(b) Cable application of Type N cable must meet Section 19 of IEEE Standard No. 45 for polyvinyl chloride insulated cable.

§ 111.60–7 Cable installations.

Each cable installation must meet Sections 20 and 22 of IEEE Standard No. 45.

§ 111.60–9 Segregation of vital circuits.

(a) *General.* A branch circuit that supplies vital equipment must not supply any other equipment.

(b) *Passenger vessels.* (1) Each passenger vessel with firescreen bulkheads that form main fire zones must have distribution systems arranged so that fire in a main fire zone does not interfere with essential services in another main fire zone.

(2) Main and emergency feeders passing through a main fire zone must be vertically and horizontally as far apart as possible.

§ 111.60–11 Wire.

(a) Wire must be in an enclosure.

(b) Wire in a lighting fixture must meet UL 595.

(c) Switchboard wire must meet Subpart 111.30.

(d) Wire, except in lighting fixtures and switchboards, must meet—

(i) MIL–W–76;

(ii) MIL–W–16878 type B, C, D, E, EE, or FF;

(iii) UL 44; or

(iv) UL 83.

(e) The installation of wire that meets UL 44 or UL 83 must meet Tables 310–13 and 310–17 of the National Electrical Code.

§ 111.60–13 Portable electric cord and cables.

(a) *Construction and testing.* Each portable electric cord and cable must meet—

(1) UL 62;

(2) NEMA WC 3;

(3) NEMA WC 8; or

(4) MIL–C–915.

(b) *Application.* A portable cord must be used—

(1) Only as allowed under Sections 400–7 and 400–8 of the National Electrical Code; and

(2) In accordance with Table 400–4 of the National Electrical Code.

(c) *Allowable current-carrying capacity.* A portable cord must not carry more current than allowed under Table 400–5 of the National Electrical Code, NEMA WC 3, NEMA WC 8, or Department of the Navy Cable Comparison Guide (NAVSEA 0981–052–8090).

(d) *Conductor size.* Each portable cord must be No. 18 AWG or larger.

(e) *Splices.* Each portable cord and cable must have no splices or taps except a cord or cable may be spliced for repairs in accordance with § 111.60–19.

(f) *Pull at joints and terminals.* Each portable cord and cable must be connected to a device or fitting by a knot, tape, or special fitting so that tension is not transmitted to joints or terminal screws.

§ 111.60–15 Color coding of conductors.

Color coding of conductors must meet § 111.05–35.

§ 111.60–17 Connections to terminals.

(a) Each connection to a terminal of a conductor that is larger than No. 10 AWG must have—

(1) A pressure-type connector;

(2) A solder lug; or

(3) A splice that is soldered, brazed or welded to flexible leads.

(b) Each connection to a terminal of a conductor that is No. 10 AWG or smaller must—

(1) Meet paragraph (a) of this section; or

(2) Have clamps or screws with terminal plates that have upturned lugs.

(c) A connector or lug of the setscrew type must not be used with stranded conductors smaller than No. 14 AWG except if there is a nonrotating follower that travels with the setscrew and makes pressure contact with the conductor.

(d) Each pressure-type wire connector, fixture splicing connector, and lug must meet UL 486.

(e) Each terminal block must have 6–32 terminal screws or larger and spacings that meet Table 111.60–17(e).

TABLE 111.60–17(e)—*Terminal block spacings in inches (millimeter)*

Voltage	Minimum spacing between opposite polarity and between live parts and ground	
	Through air	Over surface
0 to 250	¼ (6.4)	⅜ (9.5)
251 to 600	⅜ (9.5)	⅜ (9.5)

§ 111.60–19 Splices

(a) A cable may be spliced only under the following conditions:

(1) A cable installed in a subassembly may be spliced to a cable installed in another subassembly.

(2) For a vessel receiving alterations, a cable may be spliced to extend a circuit.

(3) A cable having a large size or exceptional length may be spliced to facilitate its installation.

(4) A cable may be spliced to replace a damaged section of the cable if, before replacing the damaged section, the in-

sulation resistance of the remainder of the cable is measured to determine the condition of the insulation.

(b) Each splice must be made by a qualified person with a one cycle compression tool and must have the following:

(1) A pressure-type butt connector that is listed by Underwriters' Laboratories, Inc. under UL 486.

(2) Replacement insulation that—

(i) Has the same or greater thickness than that of the cable insulation;

(ii) Has electrical properties that are the same as or better than the electrical properties of the cable insulation; and

(iii) Has a heat transfer capability that is the same as or better than that of the original cable insulation.

(3) A watertight replacement jacket that is heat shrinkable or prestretched tubing of the same or a greater thickness than that of the cable jacket and that has properties that are the same as or better than those of the cable jacket.

(4) For armored cable, replacement armor or a jumper that connects to the cable armor on each side of the splice and that maintains the electrical continuity of the cable armor.

(c) All material in a splice must be chemically compatible with all other material in the splice and with the materials of the cable.

Subpart 111.70—Motor Circuits, Controllers, and Protection

§ 111.70–1 General.

Each motor circuit, controller, and protection must meet Article 430 of the National Electrical Code, except—

(a) Each fire pump motor circuit and protection must meet the same requirements in the National Electrical Code as each other motor circuit and protection;

(b) Each steering gear motor circuit and protection must meet Subpart 111.93 of this part; and

(c) Each propulsion motor circuit and protection must meet Subpart 111.35 of this part.

§ 111.70–3 Motor controllers and motor control centers.

(a) *General.* Each controlling apparatus, except as allowed in paragraph (b), of this section, must be protected by an enclosing case that is either dripproof or watertight, depending on its location. If there is a cable entrance plate in a watertight enclosure or in the top of a dripproof enclosure, the plate must be at least ⅛ inch (3.18 mm) thick and have a gasket. Each watertight enclosure must have external feet or lugs for mounting.

(b) *Open type.* A control apparatus may be of the open type if it is in a compartment or enclosure that is only for electric control equipment and accessible only to qualified persons. If the compartment is used for other apparatus and an open controller is where it is subject to accidental contact, the controller must have guardrails.

(c) *Hinged doors.* Each controller hinged door with a height greater than 45 inches (1.14m), or a width greater than 24 inches (0.6 m), must have door positioners and stops. Equipment mounted on a hinged door must be constructed or shielded so that no live part of the doormounted equipment is exposed to accidental contact by a person when the door is open and the circuit energized.

(d) *Construction.* Each motor controller for use at 600 volts or less must meet UL 508. Each motor controller for use above 600 volts must meet UL 347. Each motor control center must meet UL 845.

(e) *Wearing parts.* Each wearing part of a controller must be accessible for inspection and renewal.

(f) *Low voltage release.* Each motor controller for a fire pump, elevator, steering gear, or auxiliary that is vital to the vessel's propulsion system, except a motor controller for a forced draft fan under paragraph (g) of this section, must have low voltage release if automatic restart after a voltage failure is not hazardous. If automatic restart is hazardous, the motor controller must have low voltage protection. Motor controllers for other motors must not have low voltage release unless the starting current and the short-time sustained current of the additional low voltage release load is within the capacity of one generator.

(g) *Forced draft fans.* Each motor controller for a forced draft fan for a propulsion boiler must have low voltage protection if—

(1) The vessel has no diesel or gas turbine-driven ship's service generator; and

(2) The vessel has a centralized engineroom control system that has a control for each forced draft fan and controls to start each propulsion boiler.

(h) *Low voltage protection.* Each motor controller must have low voltage protection, except—

(1) A motor controller that has low voltage release under paragraph (f) of this section; and

(2) A motor controller for a motor of less than 2 horsepower (1.5 kw).

(i) *Manually-operated controllers.* Each manually-operated controller must operate without the operator opening the enclosed case. In each panel-type manually-operated controller, the starting arm must be arranged so that the motor stops if the arm is left on a starting point. In each regulating drum controller, the resistor must be proportioned for the duty cycle.

(j) *Alternating-current manual autostarters.* Each alternating-current manual autostarter with a self-contained autotransformer must have a switch of the quick-make-and-break type, and the starter must be arranged so that it is impossible for an operator to throw the switch to the running position without having first thrown the switch to the starting position. If oil is necessary, the starter must not leak when tilted to an angle of 30 degrees and must be constructed to prevent the liquid from splashing out due to the rolling of the vessel.

(k) *Identification of controllers.* Each controller must be marked with the maker's name or identification symbol, the voltage, the current or horsepower rating, and data necessary to show the motor that it controls. The identification data necessary to show the motor that the controller controls must be on the external surface of the enclosure. A durable heat resistant wiring diagram of the controller must be fixed to the inside of the controller door.

§ 111.70–5 Heater circuits.

(a) If an enclosure for a motor, master switch, or other equipment, except a motor controller, has an electric heater inside the enclosure that is energized from a separate circuit, the heater circuit must be disconnected in the same manner as required for control, interlock, and indicator circuits under § 111.70–7(d)(2).

(b) If the location of the enclosure for a motor, master switch, or other equipment for deck machinery is remote from the motor and controller disconnect device, a sign may be fixed to the enclosure instead of the disconnect arrangement required under § 111.70–7(d)(2). The sign must warn the operator of the presence of two sources of potential within the enclosure and show the location of the heater circuit disconnect device.

§ 111.70–7 Remote control, interlock, and indicator circuits.

(a) *Overcurrent protection.* A conductor of a control, interlock, or indicator circuit of a motor controller need not be protected against overcurrent if the conductor is wholly within the controller enclosure. A conductor of a control, interlock, or indicator circuit external to the controller enclosure need not be protected against overcurrent if—

(1) The rating or setting of the branch circuit overcurrent device is not more than 300 percent of the current-carrying capacity of the control, interlock, or indicator circuit conductor;

(2) There is an overcurrent device in each side of the line that has a rating or setting of not more than 300 percent of the current carrying capacity of the control, electrical interlock, or indicator circuit conductor, except if under operating conditions there is no appreciable difference in potential between the external conductors, overcurrent protection need only be at the supply of that side of the line; or

(3) The opening of the control, interlock, or indicator circuit creates a hazard.

NOTE: For overcurrent protection of steering gear control and indicator circuits, see Subpart 111.93.

(b) *Accidental ground.* No motor may start by an accidental ground in a remote control circuit.

(c) *Source of potential.* The potential for a control, interlock, or indicator circuit must be derived from the load side of the motor and controller disconnect means, except if the control functions require circuits that must be common to two or more controllers, the switching arrangement in paragraph (d) of this section must be met.

(d) *Switching.* In the design of each control, interlock, or indicator circuit, all practicable steps must be taken to eliminate all but one source of potential in an enclosure. If the control functions make it impracticable to energize a control, interlock, or indicator circuit from the load side of a motor and controller disconnect means, there must be one of the following alternative methods of switching:

(1) If the potential of the control, interlock, or indicator circuit is limited to not more than 24 volts, no disconnecting means is necessary.

(2) Each conductor of a control, interlock, or indicator circuit must be disconnected from all sources of potential by a disconnect device independent of the motor and controller disconnect device. The two independent devices must be adjacent to each other, and a fixed sign, warning the operator to open both devices to disconnect completely the motor and controller, must be on the exterior of the door of the main disconnect device.

(3) Each conductor of a control, interlock, or indicator circuit must be disconnected from all sources of potential by a disconnect device actuated by the opening of the controller door. The disconnect device and its connections, including each terminal block for terminating the vessel's wiring, must have no electrically uninsulated or unshielded surface.

Subpart 111.75—Lighting Circuits and Protection

§ 111.75–1 Lighting feeders.

(a) *Passenger vessels.* On a passenger vessel with firescreen bulkheads forming fire zones, the lighting distribution system must be arranged so that fire in any main fire zone does not interfere with the lighting in any other main fire zone. This requirement is met if main and emergency feeders passing through any zone are separated both vertically and horizontally as widely as is practicable.

(b) *Machinery spaces.* Lighting for each engineroom, boiler room, and auxiliary machinery space must be supplied from two or more feeders, one of which may be an emergency feeder.

(c) *Cargo spaces.* There must be separate feeders for cargo space lighting. Distribution panels must be outside cargo spaces.

NOTE: Special requirements for emergency lighting, feeders, and branch circuits are in Subpart 112.07 of this subchapter.

§ 111.75–5 Lighting branch circuits.

(a) *General.* Each lighting branch circuit conductor must be No. 14 AWG or larger, except a tap to a lampholder within a lighting fixture and flexible cord may be No. 18 AWG or larger if the branch circuit is protected by an overcurrent device rated or set at not more than 15 amperes.

(b) *Limit on type of load.* Each lighting distribution panel may supply only—

(1) Lighting branch circuits; and

(2) Appliance branch circuits rated at 30 amperes or less.

(c) *Connected load.* The connected load on a lighting branch circuit must be not more than 80 percent of the rating of the overcurrent protective device, computed on the basis of the lamp sizes, but must me at least 50 watts for each outlet unless the design of the fixture prevents the use of a lamp of a higher wattage than the original lamp. Each circuit supplying electric discharge type lamps must be computed on the basis of ballast input current. A receptable outlet for the convenience of passengers or crew to which no ship's service apparatus, such as a room fan, desk lamp, or table lamp, is connected, is not considered a connected load.

(d) *Lighting fixtures on lighting circuits.* Each lighting fixture must be on a lighting branch circuit.

(e) *Overcurrent protection.* Each lighting branch circuit must be protected by an overcurrent device rated at 15 amperes or less, except as allowed under paragraphs (f) and (g) of this section.

(f) *20 ampere lighting branch circuits.* A lighting branch circuit supplying only fixed nonswitched lighting fixtures for cargo hold or deck lighting may be supplied by a 20 ampere branch circuit with No. 12 AWG or larger conductors if each fixture wire or portable cord used in each lighting fixture is No. 14 AWG or larger.

(g) *30 ampere lighting branch circuits.* A lighting branch circuit supplying only fixed nonswitched lighting fixtures having only lampholders of the mogul type, or other lampholding devices required for lamps of more than 300 watts, may be supplied by a 30 ampere branch circuit wired with at least No. 10 AWG conductors if each fixture wire used in wiring each lighting fixture is No. 12 AWG or larger.

(h) *Connections to screw-shell lampholders.* On each branch circuit with a grounded conductor, the screw shell of each lampholder must be connected to the grounded neutral.

§ 111.75–15 Lighting requirements.

(a) *Lights in passageways, public spaces, and berthing compartments.* The supply to lights in each passageway, public space, or berthing compartment accommodating more than 25 persons must be divided between two or more branch circuits, one of which may be an emergency branch circuit.

(b) *Lights in machinery spaces.* Alternate groups of lights in an engineroom, boiler room, or auxiliary machinery space must be arranged so that the failure of one branch circuit does not leave an area without light.

(c) *Illumination of passenger and crew spaces.* Each space used by passengers or crew must have illumination that is sufficient for reading .125 in. (3.18 mm) print.

(d) *Berth lights.* Each crew berth must have a fixed light that is not wired with a portable cord. The berth light must have minimum horizonal projection so that the light may not be covered with bedding.

(e) *Exit lights.* Each exit light required on passenger vessels under § 112.15–1 of this subchapter must have the word "Exit" in red block letters at least 2 inches (50.8 mm) high.

(f) *Pilot ladders.* There must be a means for lighting each pilot ladder on a vessel for voyages on which pilots are likely to embark at night.

§ 111.75–16 Lifeboat and liferaft floodlights.

Each vessel must have floodlights for illumination of lifeboat and liferaft launching that meet the following requirements:

(a) Floodlights must be where they can be directed to illuminate launching devices and the area for launching, from the stowage position to the water.

(b) Each floodlight must—

(1) Have a manual means of training that does not need tools;

(2) Connect to the supply circuit by a short length of Type S or Type SO portable cord without the use of a receptacle outlet; and

(3) Be supplied from the emergency source of lighting and power in accordance with Subpart 112.07 of this chapter.

§ 111.75–17 Navigation lights.

Each navigation light system must meet the following:

(a) *Overcurrent protection.* The feeder supplying a navigation light panel must be protected by overcurrent devices rated or set at 30 amperes or greater. The navigation light panel must have 10-ampere main fuses and 3-ampere branch circuit fuses.

(b) *Navigation light indicator panel.* Each self-propelled vessel must have a navigation light indicator panel in the wheelhouse to control electric side, masthead, range, and stern lights. The panel must visually and audibly signal the failure of each of these navigation lights. The power supply must meet § 112.07–13 of this subchapter. Recommended circuit diagrams for navigation light indicator panels are shown in Figure 111.75–17. Other circuit diagrams may be specially approved by the Commandant.

(c) *Construction of navigation lights.* Each navigation light must be of a type approved by the Commandant.

(d) *Light intensity standards.* Each navigation light must have the intensity in Table 111.75–17 for the required distance of visibility.

TABLE 111.75–17

Distance of visibility, in nautical miles:	*Luminous intensity, in candelas*
1	0.9
2	4.3
3	12
5	53
6	94

NOTE.—Table 111.75–17 is based upon

$$I = 3.43 \times 10^6 \times T \times D^2 \times K^{-D};$$

where:

I is the luminous intensity in candelas,
T is the threshold factor, 2×10^{-7} lux,
D is the range of visibility in nautical miles; and
$K = 0.8$, the atmospherice transmissivity corresponding to a meteorological visibility of approximately 13 nautical miles.

NOTE.—The following standard incandescent lamps are recommended for vessels with 115 volt electric systems:

Distance of visibility, in nautical miles	Color	With fresnel lens	Without fresnel lens
1	Red		25
1	Green	25	50
2	White		15
2	Amber		25
2	Red	40	75
2	Green	75	200
3	White		25
3	Amber	15	50
3	Red	75	200
3	Green	200	
5	White	25	75
6	do	40	100

The recommended lamp wattage is based upon: (1) For lights with fresnel lenses, a lamp-to-light ratio of 1 to 4. (2) Filter efficiencies: Amber 30 percent; red 5 percent; green 2 percent. (3) Lamp intensities: 15w.—11cd; 25w—21cd; 40w.—37cd; 50W.—50 cd; 75w.—90cd; 100w—130cd; 200w.—290 cd.

(e) *Installation of navigation lights.* Each navigation light must:

(1) Be installed so that its angle of visibility and its minimum height above the deck meet the applicable Rules of the Road;

(2) Be arranged so light from a nevigation light is not obstructed by any part of the vessel's structure or rigging;

(3) Be wired by a short length of heavy-duty, portable cable to a watertight receptacle outlet next to the light; and

(4) If it is a double lens, two-lamp type, have each lamp connected to its branch circuit conductors by an individual portable cable and receptacle plug.

(f) *Light screens.* Each light screen required by the Rules of the Road for port and starboard side lights must be painted with a flat black paint and must project at least 3 feet (1 m) forward of the center of the light source.

§ 111.75–18 Signaling lights.

Each ocean, Great Lakes, and coastwise self-propelled vessel of over 150 gross tons must have a daylight signaling light that meets the following:

(a) The signaling light must produce a narrow, high-intensity beam of light for daylight blinker communication at speeds up to 180 dots or dashes per minute.

(b) The axial luminous intensity of the beam must be at least 60,000 candela.

(c) The luminous intensity of the beam in every direction within an angle of 0.7° from the axial must be at least 50 percent of the axial luminous intensity.

(d) The signaling light must have a sighting arrangement that the operator can use to direct the beam to the receiving station.

(e) Signaling must be by keying the current through the lamp or by movement of shutters.

(f) Each signaling light must be:

(1) A fixed unit mounted on the top of the wheelhouse;

(2) A semi-fixed unit with arrangements for quick mounting at either wing of the navigating bridge; or

(3) A portable unit.

(g) Each fixed or semi-fixed signaling light must be energized from the emergency lighting and power system. Each portable signaling light must be energized from a self-contained storage battery that can operate the light continuously for two hours without recharging.

§ 111.75–20 Lighting fixtures.

(a) The construction of each lighting fixture must meet UL 595.

(b) An open-arc lamp may only be used in a searchlight or in a motion picture projector.

(c) Each fixture globe must have a guard or be made of high strength material, except in an accommodation space, wheelhouse, gyro room, radio room, galley, or similar space where it is not subject to damage.

(d) Each fixture must have a shade or guard so that adjacent combustible material is not subjected to temperatures higher than 90° C.

(e) No fixture may be used as a connection box for a circuit other than the branch circuit supplying the fixture.

(f) Lighting fixtures must be installed as follows:

(1) Each fixture in the weather or in another location where it may be exposed to splashing water must be watertight. Each fixture in another damp or wet location must at least be dripproof.

(2) Each combustible bulkhead or ceiling finish that is exposed between the edge of a fixture canopy or pan and the outlet box must be covered with noncombustible material.

(3) Each fixture and lampholder must be fixed. No fixture may be supported by the screw shell of a lampholder.

(4) Each pendent-type fixture must be suspended by and supplied through a threaded, rigid conduit stem.

(5) Each tablelamp, desklamp, floorlamp, and similar equipment must be secured in place so that it cannot be displaced by the roll or pitch of the vessel.

Subpart 111.77—Appliances and Appliance Circuits

§ 111.77–1 Overcurrent protection.

If a circuit supplies only one appliance or device, the rating or setting of the branch circuit overcurrent device must not be more than 150 percent of the rating of the appliance or device, or 15 amperes, whichever is greater.

§ 111.77–3 Electric cooking equipment.

(a) Each piece of equipment, attachment, and device must be designed to allow cleaning, maintenance, and repair.

(b) Each door must have heavy-duty hinges and securing devices.

(c) There must be grab rails where necessary for safety of personnel.

Each range must have sea rails with adjustable barriers that prevent cook pot movement.

(d) There must be a means for grease or fat collection and spillage prevention.

(e) All equipment must be mounted to prevent dislodgment by roll or pitch.

(f) Each equipment unit must have a means of disconnection from all circuit conductors. The open and closed circuit position of the means of disconnection must be marked. The means of disconnection must be in the same compartment with, and visible from its associated equipment. The means of disconnection may be an integral part of the equipment if the means is unaffected by the heat of that equipment. If the disconnection means is part of the equipment, it must be where it is accessible if there is a fire on the cooking surfaces.

(g) Each item of electric cooking equipment must meet UL 197.

§ 111.77–5 Electric motor-operated appliances.

(a) Each electric motor-operated appliance must meet UL 73.

(b) Each electric motor-operated commissary appliance motor and controller must be:

(1) In a watertight enclosure; or

(2) Totally enclosed.

§ 111.77–7 Dishwashers.

Each dishwasher must meet UL 749 or UL 921.

§ 111.77–9 Refrigerators.

Each refrigerator must meet UL 250 or UL 471.

§ 111.77–11 Refrigerated drinking water coolers.

Each refrigerated drinking water cooler must meet UL 399.

Subpart 111.79—Receptacles

§ 111.79–1 Receptacle outlets; general.

(a) There must be enough receptacle outlets throughout the crew's accommodations for electric razors, radios, and similar items.

(b) There must be enough receptacle outlets throughout each machinery space for lighting any machine that is necessary for the operation of the vessel with a portable light having a 75 foot (24 m) portable cord.

(c) The rating of each receptacle must meet Section 210–21 of the National Electrical Code.

(d) Each interior unit of a receptacle outlet or plug must meet UL 498.

§ 111.79–3 Grounding pole.

Each receptacle outlet that operates at 100 volts or more must have a ground-

ing pole connected to meet Section 250–74 of the National Electric Code.

§ 111.79–5 Damp or wet locations and weather locations.

(a) Each receptacle outlet in a damp or wet location must be designed so that when the plug is in, the plug is held in positive contact and establishes and maintains a watertight enclosure.

(b) Each receptacle outlet in a damp or wet location must be designed so that, when the plug is not in, the plug opening may be closed to establish and maintain a watertight enclosure. If a threaded cap is used for this purpose, the cap must be mechanically fastened to the cover or enclosure by a link or hinged strap.

(c) Each receptacle outlet and plug in a damp or wet location must be made of corrosion-resistant materials or of materials or of materials with corrosion-resistant finishes, except a receptacle outlet or plug for a corrosive location must be made of corrosion-resistant materials.

(d) Each receptacle outlet in a location in the weather must be designed so that, with the plug opening uncovered, water does not collect in the interior of the box.

§ 111.79–7 No live parts.

Each receptacle outlet in a location that is accessible to other than a qualified person must have no exposed live parts. Each screw, rivet, contact, or similar item that is accessible and in electrical connection with any live metal part, must be connected in a hole not more than 9/32 in. (7.2 mm) in diameter and recessed at least 3/16 in. (4.8 mm).

§ 111.79–9 Transmitting power between receptacles.

(a) If it is necessary to transmit current in one direction between two receptacle outlets by a portable cable with a plug on each end, such as a battery charging lead between a receptacle outlet on a ship and a receptacle outlet in a lifeboat, the plug that may be energized when not in the receptacle outlet must be female.

(b) If a receptacle outlet may be used as a source of power and as a receiver of power, such as the receptacles on barges that may have to supply power to adjoining barges in some makeups and receive power from the towboat or adjoining barge in other makeups, the receptacle must be male and reverse service. Plugs of portable cable must be female and must be at both ends of the portable lead. The female plug must meet § 111.79–7.

§ 111.79–11 Lifeboat receptacles.

Each receptacle outlet on a lifeboat for connection to a vessel's electrical system must allow the plug to pull free when the lifeboat is lowered.

§ 111.79–13 Different potentials on a vessel.

If receptacle outlets on a vessel are connected to different potentials or to different types of potential, each receptacle outlet must preclude the plugging of a portable device into a receptacle outlet of an incompatible potential.

§ 111.79–15 Receptacles for refrigerated containers.

Each group of receptacles for refrigerated containers must have:

(a) A switch near the receptacles that disconnects all power to those receptacles; and

(b) A sign stating that the switch should be opened before cables are disconnected from the receptacles or refrigerated containers.

Subpart 111.81—Outlet Boxes and Junction Boxes

§ 111.81–1 Outlet boxes and junction boxes; general.

(a) The requirements of this subpart apply to each outlet box used with a lighting fixture, wiring device, or similar item, including each separately installed connection and junction box.

(b) An outlet box must be at each outlet, switch, receptacle, or junction point.

(c) Each outlet or junction box must have a cover unless a fixture canopy, switch cover, receptacle cover, or other cover is used.

§ 111.81–3 Cables entering boxes.

Each cable entering a box or fitting much be protected from abrasion and must meet the following:

(a) Each opening through which a conductor enters must be closed.

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

(c) Each cable entrance in a damp or wet location must be made watertight by a terminal or stuffing tube.

§ 111.81–5 National Electrical Code.

Each outlet box and junction box installation must meet Section 370–6 of the National Electrical Code.

§ 111.81–7 Degree of enclosure.

Each outlet box in a damp or wet location must be watertight.

§ 111.81–9 Mounting.

(a) Each outlet box must be fixed.

(b) Each watertight outlet box must have external mounting feet.

§ 111.81–11 Penetration of walls.

A hole in a wall of a watertight outlet box for the attachment of a part on the exterior or interior of the box, for securing the cover, or for a similar purpose, must not penetrate the total thickness of the box wall.

§ 111.81–13 Construction.

The construction of each box must meet UL 50 or UL 514, except a sheet steel outlet box must not be installed in a corrosive location.

Subpart 111.83—Shore Connection Boxes

§ 111.83–1 General.

Each shore connection box must be of a size that accommodates the connections of the portable and fixed cables.

§ 111.83–3 Spacing; live parts and live parts and ground.

(a) The minimum spacing between live parts and between live parts and ground in each shore connection box must meet Section 384–26 of the National Electrical Code.

(b) A cable lug must not rotate.

(c) Paragraph (b) of this section must be met by means other than friction between parts.

§ 111.83–5 Bottom entrance and protected enclosures.

Each shore connection box must have a bottom entrance for portable cable and protect the shore connection when the connection is in use.

Subpart 111.85—Electric Oil Immersion Heaters

§ 111.85–1 Electric oil immersion heaters.

Each oil immersion heater must have the following:

(a) An operating thermostat.

(b) Heating elements that have no electrical contact with the oil.

(c) A high temperature limiting device that—

(1) Opens all conductors to the heater;

(2) Is manually reset; and

(3) Actuates at a temperature below the flashpoint of the oil.

(d) A low fluid level device that, if not submerged, opens all conductors to the heater, or a flow device that opens all conductors to the heater if there is inadequate flow.

Subpart 111.87—Electric Air Heating Equipment

§ 111.87–1 Applicability.

This subpart applies to electrically energized units or panels for heating a room or compartment. This subpart does not apply to electrically energized units for heating the air in an enclosed apparatus, such as a motor or controller.

§ 111.87–3 General requirements.

(a) Each electric heater must meet UL 1025 except—

(1) Each electric baseboard heater must meet UL 1042; and

(2) Each electric duct heater must meet UL 1096.

(b) Each heater element must be an enclosed type. The heater element case or jacket must be of a corrosion-resistant material.

(c) Each heater must have a thermal cutout of the manually-reset type that prevents overheating and must have a regulating switch.

(d) Each heater for bulkhead mounting must have its top slanted or otherwise designed to prevent hanging anything on the heater. If a heater is portable, it must have a clip or bracket to hold the heater in a fixed position.

Subpart 111.89—Motion Picture Projectors

§ 111.89–1 Motion picture projectors.

Each motion picture projector must be installed to meet Article 540 of the National Electrical Code.

Subpart 111.91—Elevators and Dumbwaiters

§ 111.91–1 Control and interlock circuits.

Each electric control and interlock circuit of an elevator or dumbwaiter must meet ANSI A17.1.

§ 111.91–3 Control switches.

The construction of each control switch must meet UL 104.

Subpart 111.93—Steering Systems

§ 111.93–1 Applicability.

This subpart applies to each steering gear installation that has an electrically-powered steering control system and that has—

(a) A main steering gear that is electrically or electro-hydraulically powered; or

(b) A main steering gear and an auxiliary steering gear both of which are electrically or electro-hydraulically powered.

§ 111.93–3 Definitions.

As used in the subpart:

"Steering control system" means a group of devices and cables forming a network that regulates and guides the operation of a steering gear.

"Steering power system" means a group of devices and cables forming a network that supplies mechanical energy to a steering gear.

"Steering gear" means the machinery and equipment, including motors and pumps, that apply torque to the rudder stock, tiller, or quadrant.

§ 111.93–5 Feeder circuits.

(a) If a vessel has only one steering gear, electric power to the steering gear must be supplied by—

(1) Two feeder circuits from the main switchboard; or

(2) One feeder circuit from the main switchboard and one feeder circuit from the emergency switchboard.

(b) If a vessel has two steering gears, electric power to—

(1) Each steering gear must be supplied by a separate feeder circuit from the main switchboard; or

(2) One steering gear must be supplied by a feeder circuit from the main switchboard and the other steering gear by a feeder circuit from the emergency switchboard.

(c) Each ocean, Great Lakes, or coastwise vessel that has more than one steering power system must have a feeder circuit from the emergency switchboard to one steering power system.

(d) Each feeder circuit for a steering power system must be separated as widely as practicable from each other feeder circuit for a steering power system.

(e) Each steering power system must be connected to its feeder circuit in the steering gear room.

(f) Each feeder circuit for a steering power system must have a disconnect switch in the steering gear room.

(g) If there is a feeder transfer panel, it must—

(1) Be in the steering gear room; and

(2) Have interlocks that prevent—

(i) More than one steering power system from being connected to the same feeder simultaneously; and

(ii) More than one feeder from being connected to the same steering power system simultaneously.

(h) Each feeder circuit for a steering power system must have a current-carrying capacity of the sum of the following:

(1) 125 percent of the full-load current rating of the largest motor supplied.

(2) 100 percent of the full-load current rating of all other motors that may be supplied simultaneously.

(3) 100 percent of the normal steering control system current.

§ 111.93–7 Steering control systems.

(a) Each steering power system must have a steering control system.

(b) Each steering control system must be one that can be operated from the pilothouse.

(c) Each main steering gear must be one that can be controlled in the steering gear room.

(d) The steering control system for a steering power system must be separated as widely as practicable from each other steering control system and each steering power system that it does not control.

(e) Each steering control system must have a switch that—

(1) Is in the pilothouse; and

(2) Automaticaly energizes the steering control system and associated steering power system for which the switch is provided.

(f) If there is more than one steering control system, the switches required by paragraph (e) of this section must be—

(1) Operated by one handle;

(2) Arranged so that not more than one steering control system and its associated steering power system can be energized at one time;

(3) Arranged so that the handle passes through an "off" position when transferring from one steering control system to another; and

(4) In separate enclosures or separated by fire resistant barriers.

(g) Each steering control system must be connected to the feeder circuit for its steering power system in the steering gear room.

(h) Each steering control system must have a switch that—

(1) Is in the steering gear room;

(2) Disconnects power to the steering control system; and

(3) Does not disconnect power to the steering power system.

(i) Each motor controller for a steering gear must—

(1) Be in the steering gear room; and

(2) Have low voltage release.

(j) A means to start and stop each motor for a steering gear must be in the steering gear room.

§ 111.93–9 Overcurrent protection for steering systems.

(a) *Feeder circuits.* Each steering feeder circuit must be protected by a circuit breaker that is on the switchboard from which it is supplied and has an instantaneous trip set at a current of at least—

(1) For a direct-current steering gear motor, 300 percent and not greater than 375 percent of the rated full-load current of one steering gear main motor; and

(2) For an alternating-current steering gear motor, 175 percent and not greater than 200 percent of the locked-rotor current of one steering gear main motor.

(b) *No other protection.* A steering feeder circuit must not have any overcurrent protection, except that required under paragraph (a) of this section.

(c) *Motor overloads.* Each main steering gear motor and each motor for a steering control system must not have a motor running overcurrent protective device. The motor starter must have a device that operates an audible and visual alarm in the pilothouse and at the main machinery control station if there is an overload that would cause overheating of the motor.

(d) *Short circuit protection.* Each control circuit of a motor controller, each steering control system, and each indicating and alarm system must have short circuit protection that is instantaneous and rated at 400 to 500 percent of the current-carrying capacity of the conductor. There may be no other protection.

(e) *Protection of steering control systems.* The short circuit protective device for each steering control system must be—

(1) In the steering gear room; and

(2) In the control circuit just after the steering control system disconnect switch.

§ 111.93–11 Indicating and alarm systems for steering installations.

(a) Each steering gear power motor and each auxiliary motor for control of the rudder must have a pilot light that lights in the pilothouse when the motor is energized.

(b) The opening of a steering gear feeder circuit breaker must actuate an audible and visual alarm in the pilothouse and at the main machinery control station.

(c) The failure of any phase of a three phase supply must actuate an audible and visual alarm in the pilothouse.

NOTE.—For requirements pertaining to overload indicating lights for steering gear motors, see § 111.93–9(c).

Subpart 111.95—Electric Power-Operated Boat Winches

§ 111.95–1 Applicability.

The electric installation of each electric power-operated boat winch must meet the requirements in this subpart, except that limit switches must be adapted to the installation if there are no gravity davits.

§ 111.95–3 General requirements.

(a) Each switch and motor controller must be designed to prevent corrosion of its working parts. Each structural part,

such as an enclosing case, if not made of corrosion-resistant materials, must have a corrosion-resistant finish.

(b) Insulating material must have low water absorption and little effect of such water absorption upon the dielectric properties consistent with the other necessary characteristics.

(c) If a gasket is used for a water seal between parts of an assembly, the gasket must be fixed to prevent its falling out or becoming loose when the unit is disassembled.

(d) A hole in a wall of an equipment housing for the purpose of providing means for the attachment of a part on its interior or for securing a cover or similar device must not penetrate the total thickness of the housing wall.

(e) Each totally enclosed unit must have a valve, or at least one hole closed by a ¼-inch pipe plug. The valve or hole must be at the bottom of the enclosure or as near the bottom as practicable.

(f) Each main line emergency disconnect switch, if accessible to an unauthorized person, must have a means to lock the switch in the open-circuit position with a padlock or its equivalent. The switch must not lock in the closed-circuit position.

§ 111.95–5 Detail construction requirements.

(a) *Enclosures.* Each enclosure for a motor controller or switching device must be watertight if in the weather.

TABLE 111.95–5(b)—*Minimum spacings in inches (millimeter)*

Location	Potential in volts		
	0 to 150	151 to 300	301 to 600
Between any uninsulated live part and an uninsulated live part of opposite polarity, an uninsulated grounded part other than the enclosure, or an exposed metal part:			
Through air	¼(6.4)	5/16(7.9)	3/8(9.5)
Over surface	½(12.7)	5/8(15.9)	¾(19.0)
Between any uninsulated live part and the walls of a metal enclosure, including fittings for cable entrance:			
Through air	½(12.7)	½(12.7)	½(12.7)
Over surface	¾(19.0)	¾(19.0)	¾(19.0)

(b) *Electrical clearances.* The creepage and air clearance distance between live parts of different polarity of motor controllers, master switches, and control circuit limit switches must be at least equal to the values in Table 111.95–5(b). The electrical clearances for power circuit limit switches and main line emergency disconnect switches must meet Subpart 111.55 of this part.

(c) *Motors.* Motors must be waterproof or watertight.

§ 111.95–7 Wiring of boat winch components.

(a) If the motor controller of a boat winch power unit is next to the winch, the main line emergency switch must disconnect all parts of the boat winch power unit, including the motor controller and limit switches, from all sources of potential. Other power circuit switches must be connected in series with the main line emergency switch and must be ahead of the motor controller. The main line emergency switch must be the motor and controller disconnect required by Subpart 111.70 of this part and must have a horsepower rating of at least that of the winch motor.

(b) If the motor controller of a boat winch power unit is remote from the winch, there must be a switch at the controller that can disconnect the entire winch electric installation from all sources of potential, and the main line emergency switch must be connected in series with, and after, this circuit disconnect switch and ahead of the power circuit limit switches, if any, and ahead of the motor controller.

(c) Each davit arm limit switch, whether connected in the power circuit or in the control circuit, must disconnect all ungrounded conductors of the circuit controlled.

(d) If one motor is used with two winches, there must be a main line emergency switch, a clutch interlock switch, and a master switch for each winch, except that a single main line emergency switch located as required by paragraph (e) of this section may be used for both winches. The main line emergency switches must be connected, in series, ahead of the motor controller. The master switches must be connected in parallel and each, in series, with the corresponding clutch interlock switch for that winch. Each clutch interlock switch must open the circuit to its master swith, except when the power unit is clutched to the associated winch. There must be a means to prevent the power unit from being clutched to both winches simultaneously.

(e) The main line emergency disconnect switch must be adjacent to the master switch, within reach of the winch operator, accessible to the person in charge of the boat stowage, and for a gravity davit installation, in a position from which the movement of boat davit arms can be observed as they approach the final stowed position.

NOTE.—Typical boat which wiring diagrams and arrangement drawings are shown in Figures 111.97–7(e)(1) through 111.97–7(e)(4). The arrangement of the equipment shown is diagrammatical. The fact that some show direct-current motors and some show alternating-current motors has no particular significance.

Subpart 111.97—Electric Power-Operated Watertight Door Systems

§ 111.97–1 Applicability.

This subpart applies to electric power-operated watertight door systems required under Subpart 73.35 of this chapter.

§ 111.97–3 General requirements.

Each watertight door operating system must meet Subpart 163.001 of this chapter.

§ 111.97–5 Electric and hydraulic power supply.

(a) Each electric motor-driven door operator must have the same source of power as the emergency lighting and power system.

(b) The temporary emergency power source and the final emergency power source must each be capable of operating all doors simultaneously.

(c) The power supply for each hydraulically operated watertight door system that uses a hydraulic system common to more than one water tight door must be an accumulator tank with enough capacity to open all doors twice and to close all doors three times and be supplied by one or more motor-driven hydraulic pumps that can operate from the final source of the emergency lighting and power system.

(d) The motor-driven hydraulic pumps must automatically maintain the accumulator tank pressure within the design limits, be above the uppermost continuous deck, and be controlled from above the uppermost continuous deck.

(e) The accumulator tank capacity required in paragraph (c) of this section must be available when the accumulator tank pressure is at the automaitc pump "cut-in" pressure.

(f) The source of power for each hydraulically operated watertight door system using an independent hydraulic system for each door operator must meet paragraphs (a) and (b) of this section.

(g) The power supply for other types of watertight door operators must be specially approved by the Commandant.

§ 111.97–7 Distribution.

(a) Each distribution panelboard for a watertight door system must be above the uppermost continuous deck and must have means for locking.

(b) Each feeder supplying watertight door operators must be above the uppermost continuous deck.

(c) Each watertight door operator must have a separate branch circuit.

§ 111.97–9 Overcurrent protection.

Overcurrent devices must be arranged to isolate a fault with as little disruption of the system as possible. The relationship between the load and the rating or setting of overcurrent devices must meet the following:

(a) The rating or setting of each feeder overcurrent device must be not less than 200 percent of its maximum load.

(b) The rating or setting of a branch circuit overcurrent device must be not more than 25 percent of that of the feeder overcurrent device.

Subpart 111.99—Firescreen Door Holding and Release Systems

§ 111.99–1 Applicability.

This subpart applies to firescreen doors on passenger vessels.

§ 111.99–3 Definitions.

As used in this subpart:

"Central control station" means a manually-operated device in the wheelhouse or fire control room for releasing one or more firescreen doors.

"Firescreen door" means a door that is in a stairway enclosure or main vertical

zone bulkhead and is not usually kept closed.

"Firescreen door holding magnet" means an electromagnet for holding a firescreen door open.

"Local control station" means a manually-operated device next to a firescreen door for releasing the door so that the firescreen door self-closing mechanism may close the door.

§ 111.99–5 General.

(a) Each fire screen door holding and release system must have—

(1) For each firescreen door—

(i) A firescreen door holding magnet;

(ii) A self-aligning armature plate on the door to be seized and held by the magnet when the firescreen door is fully open; and

(iii) A local control station; and

(2) A central control station.

(b) Each firescreen door holding circuit must be arranged so that loss of potential from any cause releases the doors, except that a momentary interruption of the circuit that results from the operation of an automatic bus-transfer device in connection with the emergency lighting and power system must not release the doors.

(c) The central control station must be an enclosed switch, circuit breaker, or magnetic contactor of a rating large enough to interrupt the connected load. The switching unit must be an externally operable, maintaining type.

(d) The local control station must be en enclosed, externally operable, fused switch having a T rating of not less than 10 amperes and 125 volts, and may be either the momentary contact type or the maintaining contact type. A single firescreen door holding magnet must be connected to the fuse end of this local control station. If several doors are near each other, a single local control station switch of ample rating may be used to release these doors simultaneously.

(e) Each firescreen door holding magnet must be designed to hold with a pull of 200 pounds (90.7 kg). If the arrangement of the electrical supply involves transfer relays to transfer the supply from a normal to a temporary source, a firescreen door holding magnet must be designed so that, with a pull on the armature of 110 pounds (50 kg), the armature is held in the sealed position for at least one-fourth of a second after the circuit to the magnet is opened. The firescreen door holding magnet must be designed for continuous duty in an ambient temperature of 40° C. with a temperature rise by thermometer measurement of not more than 55° C. for Class A insulation and not more than 80° C. for Class B insullation. The electromagnet coil must be vacuum-pressure impregnated and the magnet enclosure must be either dripproof or watertight.

(f) The source of power for the firescreen door holding and release system must be the emergency power source.

(g) On a large vessel, if the simultaneous closing of all firescreen doors would interfere with firefighting operations or with the evacuation of passengers, the firescreen door release system must be subdivided into two or more circuits. The circuits must be arranged so that it is possible to isolate any compartment in which a fire is reported by enough closed firescreen doors to stop drafts to the fire area by closing—

(1) Each firescreen door in the area between the main vertical zone bulkheads immediately forward and aft of the fire area;

(2) Each firescreen door in the main vertical zone bulkheads immediately forward and aft of the fire area; and

(3) Each firescreen door in the adjacent main vertical zones forward and aft of the fire area.

Subpart 111.101—Submersible Motor-Driven Bilge Pumps

§ 111.101–1 Applicability.

This subpart applies to each submersible motor-driven bilge pump required on certain vessels under § 56.50–55 of this chapter.

§ 111.101–3 General requirements.

(a) The electric motor driving each submersible bilge pump must be in an open end air bell of rugged construction and be of a size that does not allow water to enter the motor if the compartment that the motor is in is flooded to the uppermost continuous deck.

(b) The motor may be of the open type if it is protected from splashing water from the bottom.

(c) The cable to each motor must enter through the open bottom of the air bell.

(d) Each motor must be one that can operate continuously at rated load under any condition, dry or with water in the air bell at any level up to the maximum.

(e) Each motor controller must be above the uppermost continuous deck. There must be a master switch at the controller and a master switch at the motor. The master switch at the motor must be disconnected from the circuit when the motor is started or stopped from the master switch at the controller.

(f) Each motor must be energized from the final emergency power source.

Subpart 111.103—Remote Stopping Systems

§ 111.103–1 Power ventilation systems except machinery space and cargo hold ventilation systems.

Each power ventilation system must have—

(a) A control to stop the ventilation that is—

(1) Outside the space ventilated; and

(2) Grouped with the controls for every ventilation system; and

(b) In addition to the control required by paragraph (a) of this section, a stop control that is—

(1) As far as practicable from the control required by paragraph (a) of this section and grouped with the controls for every ventilation system; or

(2) The circuit breakers for ventilation grouped on the main switchboard and marked, "In Case of Fire Trip to Stop Ventilation."

NOTE.—The requirements of this section do not apply to closed ventilation systems for motors or generators, diffuser fans for refrigerated spaces, room circulating fans, or exhaust fans for private toilets of an electrical rating comparable to that of a room circulating fan.

§ 111.103–3 Machinery space ventilation.

(a) Each machinery space ventilation system must have two controls to stop the ventilation.

(b) The controls required in paragraph (a) of this section must be grouped so that they are operable from two positions, one of which must be outside the machinery space.

§ 111.103–5 Cargo hold ventilation.

Each cargo hold ventilation system must have a stop control that is located outside any cargo hold.

§ 111.103–7 Ventilation stop stations.

Each ventilation stop station must—

(a) Be protected by an enclosure with a glass-paneled door on the front;

(b) Be marked "In Case of Fire Break Glass and Operate Switch to Stop Ventilation";

(c) Have the "stop" position of the switch clearly identified;

(d) Have a nameplate that identifies the system controlled;

(e) Be of the undervoltage type; and

(f) Be arranged so that damage to the switch or cable automatically stops the equipment controlled.

§ 111.103–9 Machinery stop stations.

(a) Each forced draft fan, induced draft fan, blower of an inert gas system, fuel oil transfer pump, fuel oil unit, fuel oil service pump, and other fuel oil pump must have a stop control that is outside of the space containing the pump or fan.

(b) Each stop control must meet § 111.103–7.

Subpart 111.105—Hazardous Locations

§ 111.105–1 Applicability.

This subpart applies to installations in hazardous locations, as defined in the National Electrical Code.[2]

§ 111.105–5 National Electrical Code.

Each installation in a hazardous location must meet Articles 500 through 503 of the National Electrical Code, except—

(a) The first sentence of Sections 501–1, 502–1, and 503–1;

(b) Section 501–4, which § 111.105–15 replaces;

(c) Sections 502–14(a)(1) and 503–12 and each final sentence of Sections 502–4(a) 502–4(b), 503–3(a), and 503–3(b), which are replaced by § 111.105–17; and

(d) Section 502–14(a)(2), which § 111.105–35(d) modifies.

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[2] Chemicals and materials in addition to those listed in Table 500–2 of the National Electrical Code are listed in Subchapter O of this chapter.

§ 111.105–7 Approved equipment.

If the National Electrical Code states that an item of electric equipment is to be "approved", that item must be—

(a) One that is listed by Underwriters' Laboratories, Inc. or Factory Mutual Engineering Corporation for use in the hazardous location in which it is; or

(b) Purged and pressurized equipment that meets NFPA No. 496.

§ 111.105–9 Explosionproof equipment.

Each item of electric equipment that is required under this subpart to be explosion proof must be—

(a) Listed by Underwriters' Laboratories, Inc., or Factory Mutual Engineering Corporation for use—

(1) In a Class I Division 1 location;

(2) With the Group of the cargo carried; and

(3) If the cargo is inorganic acid, in a Group B atmosphere; or

(b) Purged and pressurized equipment that meets NFPA No. 496.

§ 111.105–11 Intrinsically safe systems.

(a) If a rule in this subpart states that electric equipment is to be intrinsically safe, the equipment must be listed as intrinisically safe by Underwriters' Laboratories, Inc. or Factory Mutual Engineering Corp. for use in the hazardous location in which it is.

(b) Each electric cable for an intrinsically safe system must—

(1) Be a shielded cable or be 2 in. (50 mm) or more from other non-intrinsically safe cables; and

(2) Have only intrinsically safe circuits.

§ 111.105–15 Class I wiring methods.

(a) Cable for a Class I installation must meet Subpart 111.60 of this part.

(b) Each explosionproof enclosure that is in a Class I location must have a seal fitting connected to it by a 18 in. (460 mm) or shorter rigid metal conduit for each cable connection.

§ 111.105–17 Class II and III wiring methods.

(a) Cable for a Class II or III installation must meet Subpart 111.60 of this part.

(b) Each cable entrance equipment in Class II and Class III locations must have a dust-tight terminal tube.

§ 111.105–19 Switches.

Each explosionproof switch and each switch controlling explosionproof equipment must have a pole for each circuit conductor.

§ 111.105–21 Fans.

Each fan for ventilation of a hazardous location must be a non-sparking fan.

§ 111.105–23 Fan motors.

Each electric motor for a fan that ventilates a hazardous location must be approved by Underwriters' Laboratories Inc. or Factory Mutual Engineering Corp. for the same class, division, and group as the ventilated location or be—

(a) Outside the ventilation duct;

(b) 10 ft. (3 m) from the ventilation duct termination; and

(c) In a non-hazardous location.

§ 111.105–25 Ventilation ducts.

For the purpose of this subpart, a ventilation duct that ventilates a hazardous space has the classification of that space.

§ 111.105–27 Belt drives.

Each belt drive in a hazardous location must have—

(a) A conductive belt; and

(b) Pulleys, shafts, and driving equipment grounded to meet NFPA No. 77.

§ 111.105–29 Combustible liquid cargo carriers.

Each vessel that carries combustible liquid cargo with a closed-cup flashpoint of 60° C (140° F), or higher must have—

(a) Only impressed-current cathodic protection system anodes and intrinsically safe electric equipment in cargo tanks; and

(b) No storage battery in any cargo handling room.

§ 111.105–31 Flammable cargo, combustible cargo with a flashpoint below 60° C (140° F), liquid sulphur, ammonia and inorganic acid carriers.

(a) *Applicability.* Each vessel that carries combustible or flammable cargo with a closed-cup flashpoint lower than 60° C (40° F), liquid sulfur cargo, ammonia cargo, or an inorganic acid cargo must meet the requirements of this section, except—

(1) a vessel carrying ammonia need not meet paragraph (a) (1) of this section; and

(2) a vessel carrying carbon disulfide must have only intrinsically safe electric equipment in the locations listed in paragraphs (e) through (m) of this section.

(b) *Cable location.* Electric cable must be as close as practicable to the centerline and must be away from cargo tank openings.

(c) *Lighting circuits.* An enclosed hazardous space that has explosionproof lighting fixtures must—

(1) Have at least two lighting branch circuits; and

(2) Be arranged so that there is light for relamping any deenergized lighting circuits.

(d) *Submerged cargo pump motors.* If a submerged cargo pump motor is in a cargo tank—

(1) Low liquid level, motor current, or pump discharge pressure must automatically shut down power to the motor if the pump loses suction;

(2) An audible and visual alarm must be actuated by the shutdown of the motor; and

(3) There must be a lockable circuit breaker or lockable switch that disconnects power to the motor.

(e) *Cargo tanks.* No electric equipment may be in a cargo tank, except—

(1) Intrinsically safe equipment;

(2) Submerged cargo pumps; and

(3) Supply cable for submerged cargo pumps.

(f) *Cargo handling rooms.* Each cargo handling room must have no electric cable or other electric equipment, except—

(1) Intrinsically safe equipment;

(2) Explosionproof general alarm bells;

(3) Explosionproof lighting fixtures;

(4) Cables supplying intrinsically safe equipment in the cargo handling room; and

(5) Armored cables that supply explosionproof lighting fixtures or general alarm bells that are in the cargo handling room.

(g) *Lighting of cargo handling rooms.* Lighting for each cargo handling room must meet one of the following:

(1) The cargo handling room must be lighted through fixed glass lenses in the bulkhead or overhead. Each fixed glass lens must be wire-inserted glass that is at least 0.25 in. (6.35 mm) thick and arranged to maintain the watertight and gastight integrity of the strucure. The fixed glass lens may form a part of a lighting fixture if the following are met:

(i) There is no access to the interior of the fixture from the cargo handling room.

(ii) The fixture is vented to the engineroom or a similar nonhazardous area.

(iii) The fixture is wired from outside the cargo handling room.

(iv) The temperature on the cargo handling room surface of the glass lens, based on an ambient temperature of 40° C., is not higher than 180° C.

(2) If the location of a cargo handling room precludes the lighting arrangement of paragraph (g) (1) of this section, or if the lighting arrangement of paragraph (g) (1) of this section does not give the required light, there may be explosionproof lighting fixtures.

(h) *Enclosed spaces.* Electric installations in an enclosed space that is immediately above, below, or next to a cargo tank must meet the requirements for cargo handling rooms in paragraphs (f) and (g) of this section, except the enclosed space may have—

(1) Through runs of cable;

(2) Depth sounding devices in gastight enclosures;

(3) Log devices in gastight enclosures; and

(4) Impressed-current cathodic protection system electrodes in gastight enclosures.

(i) *Cargo hose stowage space.* A cargo hose stowage space must have no electric equipment except exposionproof lighting fixtures and through runs of electric cable.

(j) *Cargo piping in a space.* A space that has cargo piping must have no electrical equipment except explosionproof lighting fixtures and through runs of electric cable.

(k) *Liquefied gas carriers.* For a liquefied gas carrier—

(1) A space next to a hold space that has a tank with a secondary barrier must have no electric equipment except intrinsically safe equipment and—

(i) Through runs of electric cable;
(ii) Explosionproof lighting fixtures;
(iii) Depth sounding devices in gastight enclosures;
(iv) Log devices in gastight enclosures;
(v) Impressed-current cathodic protection system electrodes in gastight enclosures;
(vi) Explosionproof motors that operate cargo valves or ballast valves; and
(vii) Explosionproof bells for the general alarm system; and

(2) No switch for lighting in an enclosed space on a liquefied gas carrier may be in a location under paragraphs (e), (f), or (h) through (m) of this section.

(l) *Weather locations.* A location in the weather must have no electric equipment except watertight intrinsically safe equipment, watertight explosionproof equipment, and through runs of cable if it is—

(1) Within 10 ft. (3 m) of—
(i) A cargo tank vent outlet;
(ii) A cargo tank ullage opening;
(iii) A cargo pipe flange;
(iv) A cargo valve;
(v) A cargo handling room entrance; or
(vi) A cargo handling room ventilation opening; or

(2) On a tank ship and—
(i) On the open deck over the cargo area[*] and 10 ft. (3 m) forward and aft of the cargo area on the open deck and up to 8 ft. (2.4 m) above the deck; or
(ii) Within 8 ft. (2.4 m) of the outer surface of a cargo containment system where this surface is exposed to the weather.

(m) *Other spaces.* Except for those spaces listed in paragraphs (e) through (k) of this section, a space that has a direct opening to any space listed in paragrapuhs (e) through (l) of this section must have only the electric installations that are allowed for the space to which it opens.

§ 111.105–33 Mobile offshore drilling units.

(a) This section applies to each mobile offshore drilling unit.

(b) The internal space of each pressure vessel, tank, and pipe for drilling mud and for gas venting must have only intrinsically safe electric equipment.

(c) The following are Class I Division 1 locations:

(1) An enclosed space that has—
(i) A shale shaker;
(ii) Mud processing equipment between the well and the location of final degassing; or
(iii) An open drilling mud tank or open ditch between the well and the location of final degassing.

(2) A location in the weather that is—
(i) Within 5 ft. (1.5 m) of any of the equipment listed in paragraph (c)(1) of this section;
(ii) Within 5 ft. (1.5 m) of a ventilation opening, door, or opening of a Class I Division 1 space; or
(iii) Within 5 ft. (1.5 m) of a gas vent outlet.

(3) A Division 2 location, under paragraph (d) of this section, where combustible or flammable gases might accumulate.

(4) All of the enclosure of an enclosed derrick substructure.

(5) Except as provided in paragraph (e) of this section, an enclosed space that has an opening to a location under paragraphs (c)(1) through (c)(4) of this section.

(d) The following are Class I, Division 2 locations:

(1) An enclosed space that has any open portion of the mud return system, from the location of final degassing to the mud pump suction connection at the mud pit.

(2) A location in the weather that is—
(i) Within 10 ft. (3 m) of the center of the bottom surface of the rotary table;
(ii) Within 5 ft. (1.5 m) of a ventilation opening or door for a Class I, Division 2 space; or
(iii) Within 5 ft. (1.5 m) of a Class I, Division 1 location in the weather.

(3) The surface of an enclosed derrick floor and all of the floor's enclosure above the drilling floor.

(4) Except as provided in paragraph (e) of this section, an enclosed space that has an opening to a location under paragraphs (d)(1) through (d)(3) of this section.

(e) An enclosed space that has direct access to a Division 1 or Division 2 location is the same division as that location, except—

(1) An enclosed space that has direct access to a Division 1 location is not a hazardous location if—
(i) The access has a self-closing gastight door that opens into the space and that has no hold-back device;
(ii) Ventilation causes greater pressure in the space than in the Division 1 location; and
(iii) Loss of pressure in the space to a lesser pressure than that in the Division 1 location actuates an alarm at a manned control station; and

(2) An enclosed space that has direct access to a Division 2 location is not a hazardous location if—
(i) The access has a gastight door that opens into the non-hazardous location;
(ii) Ventilation causes the air to flow with the door open from the space into the Division 2 location; and
(iii) Loss of ventilation actuates an alarm at a manned control station.

§ 111.105–35 Vessels carrying coal.

(a) The following are Class II, Division 1 locations on a vessel that carries bituminous coal:

(1) The interior of each coal bin and cargo hold.

(2) Each compartment that has a coal transfer point where coal is dropped or dumped.

(3) Each open area within 10 ft. (3 m) of a coal transfer point where coal is dropped or dumped.

(b) Each space that has a coal conveyor on a vessel that carries bituminous coal is a Class II, Division 2 space.

(c) Each location listed in paragraphs (a) and (b) of this section is a Class II Division 1 location on a vessel that carries anthracitic coal.

(d) A space that has a coal conveyor on a vessel that carries bituminous coal may have watertight general alarm bells.

§ 111.105–37 Flammable anesthetics.

Each electric installation where flammable anesthetic is used or stored must meet NFPA No. 56A.

§ 111.105–39 Gasoline or other highly volatile motor fuel carrier in vehicles.

(a) *Applicability.* This section applies to spaces that are "specially suitable for vehicles" as defined in §§ 70.10–44 and 90.10–38 of this chapter.

(b) *General requirements.* Electric equipment within 18 in. (460 mm) of the deck, must meet Article 501 of the National Electrical Code for Class I, Division 2, Group D locations. Electric equipment 18 in. (460 mm) or more above the deck must be totally enclosed or be dripproof, and protected by guards or screens to prevent escape of sparks or metal particles.

(c) *Loss of ventilation alarm.* Loss of ventilation in a space that is "specially suitable for vehicles" must actuate an audible and visual alarm at a manned location.

§ 111.105–41 Battery rooms.

Each electric installation in a battery room must meet Subpart 111.15 of this part.

§ 111.105–43 Paint stowage or mixing spaces.

A space for the stowage or mixing of paint must have no electric equipment, except—

(a) Intrinsically safe electric equipment;
(b) Explosionproof electric equipment; or
(c) Through runs of cable.

Subpart 111.107 Mobile Offshore Drilling Unit Industrial Systems

§ 111.107–1 Industrial systems.

A system on a mobile offshore drilling unit that is used only for the industrial function of the unit and meets the National Electrical Code need not meet this subchapter except—

(a) the Underwriters' Laboratories, Inc. standards in § 110.10–1(b)(5) of this subchapter;
(b) The Standard for Power Switchgear (ANSI C37);
(c) Subpart 110.25–Plan Submittal;
(d) Subpart 111.01–General Considerations;
(e) Subpart 111.05–Grounding, Ground Detection, and Grounded Systems; and
(f) Subpart 111.105–Hazardous Locations.

[*] Cargo area is defined in § 30.10–5a of this chapter.

PART 112—EMERGENCY LIGHTING AND POWER SYSTEMS

AUTHORITY: 46 U.S.C. 170, 367, 369, 375, 390(b), 391(a), 392, 408, 416, 445, 489, 526p; 49 U.S.C. 1655(b); 49 CFR 1.46.

Subpart 112.05—General

§ 112.05–1 Purpose.

(a) The purpose of this part is to ensure that a vessel has a dependable independent emergency power source with the capacity to supply all those services that are necessary for the safety of the passengers, crew, and other persons in an emergency.

(b) No load may be powered from an emergency power source, except a—

(1) Load required by this part to be powered from the emergency power source; and

(2) Bus-tie to the main switchboard that meets § 112.05–3.

§ 112.05–3 Main-emergency bus-tie.

Each bus-tie between a main switchboard and an emergency switchboard must—

(a) Disconnect automatically upon loss of potential at the emergency switchboard;

(b) Be arranged to prevent parallel operation of an emergency power source with any other source of electric power, except for interlock systems for momentary transfer of loads; and

(c) If arranged for feedback operation, open automatically upon overload of the emergency power source before the emergency power source is tripped off the line from the overload.

§ 112.05–5 Emergency power source.

(a) The emergency power source must meet Table 112.05–5(a) and have the capacity to supply all loads than can be simultaneously connected to it, except a load on a bus-tie to the main switchboard.

(b) The emergency power source must be independent of the vessel's ship's service lighting and power plant and propulsion plant, except for the compressed air starting means allow § 112.50–7(c)(3)(i). A stop control for an emergency generator must be only in the space that has the emergency generator.

(c) The complete emergency installation must function when the ship is inclined 22½ degrees (30 degrees for vessels carrying liquified gas cargo) and when the trim of the ship is 10 degrees.

(d) The emergency power source must be aft of the collision bulkhead, outside the machinery casing, and above the uppermost continuous deck.

(e) No compartment that has an emergency power source, or its vital components, may adjoin a Category A machinery space.

(f) Except for a cable for connecting equipment in the engineroom or boiler room, no cable that begins at an emergency switchboard may penetrate the boundaries of the engineroom, boiler room, or uptakes or casings of these spaces. These cables must be kept clear of the bulkheads and decks forming these boundaries. No emergency circuit in an engineroom or a boiler room may supply equipment in any other space.

(g) The emergency switchboard must be as near as practicable to the emergency power source but not in the same space as a battery emergency power source.

(h) If the emergency power source is a generator, the emergency switchboard must be in the same space as the emergency power source unless it interferes with the operation of the emergency switchboard.

Table 112.05–5(a)

Size of vessel and service	Type of emergency power source	Period of operation and minimum capacity of emergency power source
Nuclear vessels	An automatically started generator driven by a suitable prime mover with an independent fuel supply and an automatic load transfer from a temporary source of emergency power consisting of a storage battery of sufficient capacity to supply the temporary emergency source loads for not less than ½ hr.	The maximum amount of time that power for reactor cooldown is required but not less than 36 hr (generator) and ½ hr (battery).
Passenger vessels of 100 G.T. or more and passenger vessels on an international voyage:[1]		
Ocean, Great Lakes, or coastwide.	Storage battery	36 hr.
	Or an automatically started generator driven by a suitable prime mover with an independent fuel supply and an automatic load transfer from a temporary source of emergency power consisting of a storage battery of sufficient capacity to supply the temporary emergency source loads for not less than ½ hr.	36 hr (generator) and ½ hr (battery).
Other than Ocean, Great Lakes, or coastwise.	Storage battery with automatic transfer gear or diesel or gas turbine generator with automatic starting and transfer gear.	8 hr or twice the time of run, whichever is less.

Size of vessel and service	Type of emergency power source	Period of operation and minimum capacity of emergency power source
Cargo and miscellaneous self-propelled vessels and tank ships; barges with sleeping accommodations for more than 6 persons; mobile offshore drilling units; oceanographic vessels:		
Ocean, Great Lakes, or coastwise.	Storage battery or diesel or gas turbine generator with automatic operation.	18 hr.
Other than Ocean, Great Lakes, or coastwise, 300 G.T. or more.	Storage battery or diesel or gas turbine generator, automatic or manual operation, or relay-controlled battery-operated lanterns.[1]	8 hr or twice the time of run, whichever is less.[2]

[1] Battery-operated lanterns must have rechargeable batteries, must have an automatic battery charger that maintains the battery in a fully charged condition, and must not be readily portable.
[2] Minimum period of operation of relay-controlled, battery-operated lanterns may be less than 8 hr but not less than 6 hr. Relay controlled battery-operated lanterns must meet UL 924.
[3] For vessels less than 100 G.T., see 46 CFR part 184.

Subpart 112.07—Emergency Lighting Systems

§ 112.07–1 Switches.

An emergency lighting system must not have a switch, except—

(a) In a distribution panel; or

(b) As required in § 112.07–3.

§ 112.07–3 Controls; general.

(a) Except as allowed in paragraph (b) and § 112.07–5, emergency lights for the following must be controlled by switches in the wheelhouse:

(1) Lifeboat and liferaft launching operations.

(2) Wheelhouse.

(3) Chartroom.

(4) Navigation instruments.

(b) On a mobile offshore drilling unit, the switches required in paragraph (a) of this section may be in the control room.

§ 112.07–5 Controls on island type vessels.

On an island type vessel, such as a containership, emergency lights for illumination of lifeboat and liferaft launching operations may be controlled from a central location within the island nearest the launching operations.

§ 112.07–7 Wheelhouse distribution panel.

(a) Except as allowed in paragraph (b) of this section, the following emergency lights must be supplied from a distribution panel in the wheelhouse:

(1) Navigation lights not supplied by the navigation light indicator panel.

(2) Floodlights for lifeboat and liferaft launching operations.

(3) Signaling lights.

(4) Emergency lights—

(i) On open decks;

(ii) In the wheelhouse;

(iii) In the chartroom; and

(iv) In the fire control room.

(b) On a mobile offshore drilling unit, the distribution panels required in paragraph (a) of this section may be in the control room.

(c) Each distribution panel required in paragraphs (a) and (b) of this section must have a fused switch or circuit breaker for each branch circuit.

§ 112.07–9 Signaling lights.

Each signaling light must be supplied by a branch circuit that supplies no other equipment.

§ 112.07–11 Illumination for launching operations.

Branch circuits for floodlights for lifeboat and liferaft launching operations must—

(a) Supply no other equipment; and

(b) Be arranged so that floodlights for adjacent lifeboats and liferafts are supplied from different branch circuits.

§ 112.07–13 Navigation light indicator panel supply.

Each navigation light indicator panel must be supplied directly from the emergency switchboard.

§ 112.07–15 Emergency lighting feeders.

For a vessel with firescreen bulkheads forming fire zones, at least one emergency lighting feeder must supply only the emergency lights between two adjacent main vertical fire zone bulkheads. The emergency lighting feeder must be separated as widely as practicable from any general lighting feeder supplying the same space.

§ 112.07–17 Emergency light marking.

Each emergency light must be marked with the letter "E" that is at least ½ inch (12.7 mm) high.

Subpart 112.10—Definitions of Emergency Lighting and Power Systems

§ 112.10–1 Purpose.

The purpose of this subpart is to define types of emergency lighting and power systems.

§ 112.10–5 Manual emergency lighting and power system.

A manual emergency lighting and power system is one in which a single manual operation, such as the manual operation of a switch from an "off" to an "on" position, is necessary to cause the emergency power source to supply power to the emergency loads.

§ 112.10–10 Automatic emergency lighting and power system.

An automatic emergency lighting and power system is one in which a reduction in potential from the ship's service power and lighting plant causes the emergency power source to supply power to the emergency loads.

§ 112.10–15 Temporary emergency power source.

A temporary emergency power source is one of limited capacity that carries, for a short time, selected emergency loads while an emergency power source of larger capacity is being started.

§ 112.10–20 Final emergency power source.

A final emergency power source is one that functions after the temporary emergency power source is disconnected.

Subpart 112.15—Emergency Loads

§ 112.15–1 Temporary emergency loads.

The following emergency lighting and power loads must be arranged so that they can be energized from the temporary emergency power source:

(a) Navigation lights.

(b) Enough lights throughout machinery spaces to allow essential operations and observations under emergency conditions and to allow restoration of service.

(c) Lighting for passageways, stairways, and escape trunks in passenger quarters, crew quarters, public spaces, machinery spaces, and work spaces, to allow passengers and crew to find their way to open decks and to lifeboat and liferaft embarkation and assembly points with all watertight doors and fire screen doors closed.

(d) Illuminated signs with the word "EXIT" in red letters throughout a passenger vessel so the direction of escape to the open deck is obvious from any portion of the vessel usually accessible to the passengers or crew, except machinery spaces, and except stores and similar spaces where the crew are not normally employed, and with all fire doors in stairway enclosures and main vertical zone bulkheads closed and all watertight doors closed. For the purpose of this paragraph, an individual stateroom or other similar small room is not required to have a sign, but the direction of escape must be obvious to a person emerging from the room.

(e) Illumination to allow safe operation of each power operated watertight door.

(f) At least one light in each space where a person may be maintaining, repairing, or operating equipment, stowing or drawing stores or equipment, or transiting, such as public spaces, work spaces, machinery spaces, workshops, galleys, emergency fire pump rooms, bow thruster rooms, storage areas for paint, rope, and other stores, underdeck passageways in cargo areas, steering gear rooms, windlass rooms, normally accessible duct keels with valve operators, cargo handling rooms, and holds of roll-on roll-off vessels.

(g) Lighting for boat and embarkation decks and passenger assembly points. Lights must provide continuous illumination for—

(1) The launching gear of a lifeboat or a liferaft; and

(2) The launching of a lifeboat or a liferaft from its stowed position until waterborne.

(h) Electric communication systems that are necessary under temporary emergency conditions and that do not have an independent storage battery source of power.

(i) Each power operated watertight door system.

(j) Each emergency loudspeaker system.

(k) Each fire screen door holding and release system.

(l) Supply to motor-generator or other conversion equipment if a temporary emergency power source of alternating current is necessary for essential communication systems or emergency equipment.

(m) Each daylight signaling light.

(n) Each smoke detector system.

(o) Each electrically controlled or powered ship's whistle.

(p) Nuclear protection, control, and instrumentation systems.

§ 112.15–5 Final emergency loads.

The following emergency lighting and power loads must be arranged so that they can be energized from the final emergency power source:

(a) Each load under § 112.15–1.

(b) Each elevator in a passenger vessel.

(c) Each charging panel for—

(1) Temporary emergency batteries;

(2) Starting batteries for diesel engines or gas turbines that drive emergency generators; and

(3) General alarm batteries.

(d) One of the bilge pumps, if the emergency power source is its source of power to meet Part 56 of this chapter.

(e) One of the fire pumps, if the emergency power source is its source of power to meet Part 34 of Subchapter D (Tank Vessels), Part 76 of Subchapter H (Passenger Vessels), Part 95 of Subchapter I (Cargo and Miscellaneous Vessels), or Part 108 of Subchapter IA (Mobile Offshore Drilling Units) of this chapter.

(f) A sprinkler system pump or water spray extinguishing system pump, if the emergency power source is its source of power to meet Part 76 of Subchapter H (Passenger Vessels) of this chapter.

(g) A lube oil pump for propulsion turbines and ship's service generator turbines that need external lubrication.

(h) Each rudder angle indicator.

(i) Each radio installation.

(j) Each radio direction finder.

(k) Each loran.

(l) Each radar.

(m) Each gyrocompass.

(n) Each depth sounder.

(o) A steering gear motor on an ocean, Great Lakes, or coastwise vessel.

(p) Each electric blow-out preventer control system on a mobile offshore drilling unit.

§ 112.15–10 Loads on systems without a temporary emergency power source.

If there is no temporary emergency power source, the circuits under § 112.15–5 must be arranged so that they can be energized from the emergency power source.

Subpart 112.20—Emergency Systems Having a Temporary and a Final Emergency Power Source

§ 112.20–1 Normal source for emergency loads.

(a) The normal source of emergency loads must be the ship's service generating plant.

(b) The power from the ship's service generating plant for the emergency loads must be supplied to the emergency loads through automatic transfer switches.

§ 112.20–5 Failure of power from the normal source.

If there is a reduction of potential of the normal source by 15 to 40 percent, the loads under § 112.15–1 must be automatically supplied from the temporary emergency power source. For systems in which a reduction of frequency of the normal source of final emergency power source adversely affects the emergency system and emergency loads, there must be means to transfer the loads under § 112.15–1 to the temporary emergency power source.

§ 112.20–10 Diesel or gas turbine driven emergency power source.

Simultaneously with the operation of the transfer means under § 112.20–5, the diesel engine or gas turbine driving the final emergency power source must start automatically with no load on the final emergency power source.

§ 112.20–15 Potential of final emergency power source.

(a) When the potential of the final emergency power source is 85 to 95 percent of normal value, the emergency loads under § 112.15–5 must transfer automatically to the final emergency power source.

(b) When the potential from the normal source has been restored, the emergency loads may be manually or automatically transferred to the normal source, and the final emergency power source may be manually or automatically stopped.

(c) If the potential of the final emergency power source is less than 75 to 85 percent of normal value while supplying the emergency loads, the temporary emergency loads under § 112.15–1 must transfer automatically to the temporary emergency power source.

Subpart 112.25—Emergency Systems Having an Automatic Starting Diesel Engine or Gas Turbine Driven Emergency Power Source as the Sole Emergency Power Source

§ 112.25–1 Normal source for emergency loads.

(a) The normal source for emergency loads must be the ship's service generating plant.

(b) The power from the ship's service generating plant for the emergency loads must be supplied to the emergency loads through automatic transfer switches.

§ 112.25–5 Reduction of normal source potential.

If there is a reduction of potential of the normal source by 15 to 40 percent, the diesel engine or gas turbine driving the final emergency power source must start automatically with no load on the emergency power source.

§ 112.25–10 Potential of final emergency power source.

(a) When the potential of the final emergency source is 85 to 95 percent of normal value, the emergency loads under § 112.15–5 must transfer automatically to the final emergency power source.

(b) When the potential from the normal source has been restored, the emergency loads may be manually or automatically transferred to the normal source, and the final emergency power source may be manually or automatically stopped.

Subpart 112.30—Emergency Systems Having an Automatically Connected Storage Battery as the Sole Emergency Power Source

§ 112.30–1 Normal source for emergency loads.

(a) The normal source for emergency loads must be the ship's service generating plant.

(b) The power from the ship's service generating plant for the emergency loads must be supplied to the emergency loads through automatic transfer switches.

§ 112.30–5 Reduction of normal source potential.

If there is a reduction of potential of the normal source by 15 to 40 percent, the emergency loads under § 112.15–5 must transfer automatically from the normal source to the emergency power source.

§ 112.30–10 Restoration of normal source potential.

When the potential from the normal source is restored to 85 to 95 percent of its normal value, the emergency loads must transfer automatically to the normal source.

Subpart 112.35—Manually Controlled Emergency Systems Having a Storage Battery or a Diesel Engine or Gas Turbine Driven Generator as the Sole Emergency Power Source

§ 112.35–1 Normal source for emergency loads.

The normal source for emergency loads must be the ship's service generating plant.

§ 112.35–3 Manually started emergency systems.

Manually started emergency lighting and power systems must be activated by one manual operation, such as the manual operation of a switch from an "off" to an "on" position, to cause the emergency system to supply its connected loads.

§ 112.35–5 Activating means.

The activating means must be in the wheelhouse or in a location where the means can be controlled by the chief engineer.

Subpart 112.40—Installations Requiring an Alternating-Current Temporary Source of Supply

§ 112.40–1 General requirements.

Installations requiring alternating current for the operation of communication equipment or other apparatus essential under temporary emergency conditions must be provided with the necessary conversion equipment. If such conversion equipment will be operating both under normal conditions and under temporary emergency conditions, the conversion equipment must be provided in duplicate.

Subpart 112.45—Visible Indicators and Test Switch

§ 112.45–1 Visible indicators.

There must be visible indicators in the machinery space to show:

(a) When an emergency battery is discharging; and

(b) When the automatically controlled emergency power source is supplying the emergency loads.

§ 112.45–5 Test switch.

There must be a test switch at the emergency switchboard to simulate a failure of potential from the normal source and cause the emergency loads to be transferred.

Subpart 112.50—Emergency Diesel and Gas Turbine Engine Driven Generator Sets

§ 112.50–1 General.

(a) The prime mover of a generator set must have:

(1) All accessories necessary for operation and protection of the prime mover; and

(2) A self-contained cooling system of a size that ensures continuous operation with 100° F (37° C) air.

(b) The fuel used must have a flashpoint of not less than 110° F (43° C).

(c) The room that has the generator set must have intake and exhaust ducts to supply adequate cooling air.

(d) The prime mover must not have a starting aid, except there may be a thermostatically controlled electric water jacket heater connected to the final emergency bus.

(e) The generator set must carry its full rated load within 20 seconds after cranking it started with the intake air, room ambient temperature, and starting equipment at 32° F. (0° C).

(f) The generator set must start by hydraulic, compressed air, or electrical means.

(g) The generator set must lubricate and operate when inclined to an angle of 22½° athwartship (30° for vessels carrying liquefied gas cargo) and 10° fore and aft, and must be arranged so that it does not spill oil under a vessel roll of 30° each side of the vertical.

(h) The generator set must shut down automatically upon loss of lubricating oil pressure, overspeed, or operation of a fixed fire extinguishing system in the emergency generator room.

(i) If the prime mover is a diesel engine, there must be an audible alarm that sounds on low oil pressure and high cooling water temperature.

(j) If the prime mover is a gas turbine, it must meet the shutdown and alarm requirements in § 58.10–15(g) of this chapter.

§ 112.50–3 Hydraulic starting.

A hydraulic starting system must meet the following:

(a) The hydraulic starting system must be a self-contained system that provides the cranking torque and engine starting RPM recommended by the engine manufacturer.

(b) The stored hydraulic pressure must be automatically maintained within the predetermined pressure limits.

(c) The means of automatically maintaining the hydraulic system within the predetermined pressure limits must be electrical and energized from the final emergency bus.

(d) There must be a means to manually recharge the hydraulic system.

(e) Charging of the hydraulic starting system must not cause an absence of hydraulic pressure for engine starting.

(f) The hydraulic starting system must have capacity for at least six cranking cycles including the reserve capacity under paragraph (g) of this section.

(g) Capacity for three of the cranking cycles under paragraph (f) of this section must be held in reserve. The system must be arranged so that the operation of one control by one person isolates the discharged or initially used part of the system and allows the reserve capacity to be used.

§ 112.50–5 Electric starting.

An electric starting system must meet the following:

(a) The starting battery must have sufficient capacity for at least six cranking cycles. Each cycle must include at least one-half minute of battery rest.

(b) At the end of the sixth cranking cycle the battery voltage, while cranking the engine, must be at least 50 percent of nominal battery voltage.

§ 112.50–7 Compressed air starting.

A compressed air starting system must meet the following:

(a) The starting, charging, and energy storing devices must be in the emergency generator room, except as allowed under paragraph (c)(3)(i) of this section.

(b) The compressed air starting system must provide the cranking torque and engine starting RPM recommended by the engine manufacturer.

(c) The compressed air starting system must have an air receiver that meets the following:

(1) Has capacity for at least six cranking cycles.

(2) Supplies no other system.

(3) Is supplied from one of the following:

(i) The main or auxiliary compressed air receivers with a nonreturn valve in the emergency generator room and a hand-cranked, diesel-powered air compressor for recharging the air receiver.

(ii) An electrically driven air compressor that is automatically operated and is powered from the emergency power source. If this compressor supplies other auxiliaries, there must be a nonreturn valve at the inlet of the starting air receiver and there must be a hand-cranked diesel powered air compressor for recharging the air receiver.

(d) Capacity for three of the cranking cycles under paragraph (c)(1) of this section must be held in reserve. The system must be arranged so that the operation of one control by one person isolates the discharged or initially used part of the system and allows the reserve capacity to be used.

(e) The compressed air starting system must have a visual alarm at a manned control station that shows low starting air pressure.

Subpart 112.55—Storage Battery Installation

§ 112.55–1 General.

Each storage battery installation must meet Subpart 111.15 of this part.

§ 112.55–5 Emergency lighting loads.

When supplying emergency lighting loads, the storage battery initial voltage must not be higher than the standard system voltage by more than 5 percent.

§ 112.55–10 Storage battery charging.

(a) Each storage battery installation for emergency lighting and power, and starting batteries for an emergency diesel or gas turbine driven generator set, must have apparatus to automatically maintain the battery fully charged.

(b) When the ship's service generating plant is available, the battery must have a continuous trickle charge, except that after discharge the battery must be charged automatically at a higher rate.

(c) Charging operations must not cause an absence of battery power.

(d) There must be instruments to show the rate of charge.

§ 112.55–15 Capacity of storage batteries.

(a) A storage battery for an emergency lighting and power system must have capacity:

(1) To close all watertight doors three times;

(2) To open all watertight doors two times; and

(3) To carry the remaining emergency loads continuously for the time under § 112.05–5(a).

(b) At the end of the time specified in paragraph (a) of this section, the potential of the storage battery must be at least 88 percent of the standard system voltage.

(c) For the purposes of this subpart, the nominal potential of a lead-acid storage battery is 2.0 volts per cell, and the nominal potential of a nickel-alkaline storage battery is 1.2 to 1.4 volts per cell.

PART 113—COMMUNICATION AND ALARM SYSTEMS AND EQUIPMENT

AUTHORITY: 46 U.S.C. 170, 367, 369, 375, 390(b), 391(a), 392, 408, 416, 445, 489, 526p; 49 U.S.C. 1655(b); 49 CFR 1.46.

Subpart 113.05—General Provision

§ 113.05–5 Approved equipment.

If approved equipment is required in this part, that equipment must be specifically approved by the Commandant.

NOTE: Many specifications for equipment that must be approved are in Subchapter Q of this chapter.

Subpart 113.10—Automatic Fire Detecting and Alarm Systems

§ 113.10–1 Approved equipment.

Each alarm annunciator, power supply, fire detector, test station, and vibrating bell must be approved under Subpart 161.002 of this chapter.

§ 113.10–3 Cable runs.

Cable runs between the fire alarm annunciator and fire detecting zones must be as direct as practicable and, where practicable, must not be in staterooms, lockers, or other enclosed spaces where the cable could be damaged.

§ 113.10–5 Common return.

A conductor must not be used as a common return from two or more zones.

§ 113.10–7 Connection boxes.

Each connection box that has conductors for two or more fire detecting zones must be watertight and each cable entrance must have a terminal or stuffing tube.

Subpart 113.15—Manual Fire Alarm Systems

§ 113.15–1 Approved equipment.

Each manual fire alarm annunciator, power supply, manual station, and vibrating bell must be approved under Subpart 161.002 of this chapter.

§ 113.15–3 Cable runs.

Cable runs between the annunicator and fire alarm zones must be as direct as practicable, and, where practicable, must not be in staterooms, lockers, or other enclosed spaces where the cable could be damaged.

§ 113.15–5 Common return.

A conductor must not be used as a common return from two or more zones.

§ 113.15–7 Connection boxes.

Each connection box that has conductors for two or more fire alarm zones must be watertight and each cable entrance must have a terminal or stuffing tube.

Subpart 113.20—Automatic Sprinkler System

§ 113.20–1 Approved equipment.

Each sprinkler alarm system, including annunicator, power supply, alarm switches, and bells, must be approved and must meet Subpart 76.25 of this chapter.

§ 113.20–3 Watertight equipment.

Each connection box and each switch in an automatic sprinkler system must be watertight.

Subpart 113.25—General Alarm Systems

§ 113.25–1 Applicability.

(a) This subpart, except §§ 113.25–25 and 113.25–30, applies to each manned vessel of over 100 gross tons, except barges, scows, and similar vessels.

(b) Section 113.25–25 applies to each manned ocean and coastwise barge of over 100 gross tons if the crew is divided into watches for the purpose of steering.

(c) Section 113.25–30 applies to each barge of 300 or more gross tons that has sleeping accommodations for more than six persons.

§ 113.25–3 Requirements.

Each vessel must have a general alarm system that mets the requirements of this subpart.

§ 113.25–5 Location of contact makers.

(a) *Passenger vessels and cargo and miscellaneous vessels.* Each passenger vessel, cargo vessel, and miscellaneous vessel must have a manually operated contact maker for the general alarm system—

(1) In the wheelhouse; and

(2) At the feeder distribution panel if the general alarm power supply is not in or next to the wheelhouse.

(b) *Tank vessels.* Each tank vessel must have a manually operated contact maker for the general alarm system—

(1) In the wheelhouse;

(2) At the deck officers' quarters farthest from the engineroom;

(3) In the engineroom;

(4) At the location of the operator for the emergency means of stopping cargo transfer required under 33 CFR 155.780; and

(5) At the feeder distribution panel if the general alarm power supply is not in or next to the wheelhouse.

(c) *Mobile offshore drilling units.* Each mobile offshore drilling unit must have a manually operated contact maker for the general alarm system—

(1) In the main control room:

(2) At the drilling console;

(3) In the space that has the feeder distribution panel;

(4) In the wheelhouse; and

(5) In a location that is as far as practicable from each other contact maker

(d) *Additional contact maker.* A vessel may have only one more contact maker that operates the general alarm system in addition to those required under paragraph (a), (b), or (c), of this section.

(e) *Special system.* If a vsesel has an emergency squad when operating, has a manual fire alarm system, or is an ocean-going passenger vessel, it must have—

(1) An independent manually operated contact maker in the wheelhouse that is connected to operate only the general alarm bells in crew's quarters and machinery spaces; or

(2) A separate alarm system that sounds in the crew's quarters and machinery spaces.

§ 113.25–6 Power supply.

The power supply for the general alarm system must—

(a) Be above the uppermost continuous deck;

(b) Be outside the machinery casing;

(c) Not be in the weather;

(d) Have a nominal potential of not less than 6 volts and not more than 120 volts;

(e) Be—

(1) One storage battery that—

(i) Powers only the general alarm system and the engineers' emergency alarm required by Subpart 113.27 of this part;

(ii) Has an automatic charging panel that maintains the battery fully charged, except immediately following a discharge; and

(iii) Has the capacity to supply the general alarm system continuously for at least eight hours without being recharged;

(2) Duplicate storage batteries—

(i) With a manual two-position transfer switch that has no "off" position, connected so that one battery is charged while the other battery is available to power the system; and

(ii) Each having the capacity to supply without recharge—

(A) The general alarm system continuously for at least four hours; and

(B) All other connected loads at the normal demand for at least one week and at the maximum demand for at least eight hours;

(3) A circuit connected to the temporary emergency bus of an emergency switchboard, if the temporary emergency power source has the capacity to supply all connected loads for one half hour and the general alarm system for eight hours without being recharged; or

(4) A circuit from an interior communication switchboard, that is supplied by duplicate storage batteries—

(i) With a manual two-position transfer switch that has no "off" position, connected so that one battery is charged while the other battery is available to power the switchboard; and

(ii) Each having the capacity to supply without recharge—

(A) The general alarm system continuously for a period of four hours; and

(B) All other connected loads at the normal demand for at least one week and at the maximum demand for at least eight hours; and

(f) Have a potential at the end of the discharge period described in paragraph (e) of this section of at least 80 percent of the potential under load.

§ 113.25–7 Power supply overcurrent protection.

(a) If the general alarm system is the only load supplied by the general alarm system battery or batteries, the battery or batteries must have an enclosed fused switch or circuit breaker that has a means of locking. The fused switch or circuit breaker must be outside of and next to the battery room or battery locker and the capacity of the fuses or circuit breaker must be at least 200 percent of the connected load.

(b) If the general alarm system is supplied from an emergency or interior communication switchboard, or if duplicate general alarm batteries supply other loads as allowed under § 113.25–6(e)(2), there must be a fused switch or circuit breaker supplying the general alarm system that has a means of locking.

§ 113.25–8 Distribution of general alarm system feeders and branch circuits.

(a) Each system must have a feeder distribution panel to divide the system into the necessary number of zone feeders, except that the branch circuit distribution panel may be substituted for the feeder distribution panel if, because of the arrangement of the vessel, only one zone feeder is necessary.

(b) The feeder distribution panel must have fuses for each zone feeder, but there must be no disconnect switches.

(c) The feeder distribution panel must be in an enclosed space next to the general alarm battery enclosure.

(d) Each system must have at least one feeder for each vertical fire zone that has general alarm bells.

(e) Each system must have one or more branch circuit distribution panels for each zone feeder, with at least one fused branch circuit for each deck level. The distribution panel must be above the uppermost continuous deck, in the zone served, and there must be no disconnect switches for the branch circuits.

(f) No more than five general alarm bells must be connected to one branch circuit, and a branch circuit must not supply bells on more than one deck level.

(g) On a vessel not divided into fire zones by main vertical fire bulkheads, the vessel must be divided into vertical zones not more 150 feet (45.7 meters) long and there must be a general alarm feeder for each of these zones that has general alarm bells.

(h) General alarm feeders and branch circuit cables must be in passageways and must not be in staterooms, lockers, galleys, machinery spaces, or other enclosed spaces, unless it is necessary to supply general alarm bells in those spaces.

§ 113.25–9 Location of general alarm bells.

General alarm bells must be—

(a) In areas to give a sound level in each room with the door closed of at least—

(1) 75 decibels relative to 0.0002 microbar at 1,000 hertz (zero db); and

(2) 6 decibels above the ground noise level existing when the vessel is underway in moderate weather; and

(b) Where they can alert persons in spaces where those persons may be maintaining, repairing, or operating equipment, stowing or drawing stores or equipment, or transiting, such as public spaces, work spaces, machinery spaces, workshops, galleys, emergency fire pump rooms, bow thruster rooms, storage areas for paint, rope, and other stores, under-deck passageways in cargo areas, steering-gear rooms, windlass rooms, cargo handling rooms, holds of roll-on/roll-off vessels, and, except those that are accessible only through bolted manhole covers, duct keels with valve operators.

§ 113.25–10 Location of flashing red lights.

In a space described in § 113.25–9(b) where the bells cannot be heard over the noise, there must be a flashing red light, in addition to the bell, that—

(a) Alerts personnel in the space;

(b) Is activated whenever the general alarm bells in the space are activated; and

(c) Is supplied by the general alarm system power supply, except a flashing red light in the main machinery space may be supplied from the emergency source of power through a relay that is operated by the general alarm system.

§ 113.25–11 Contact makers.

Each contact maker must—

(a) Be a normally open, spring-return-to-normal, enclosed, watertight switch;

(b) Close its contacts when an operating handle rotates in a clockwise direction through an arc of approximately 60 degrees;

(c) Have a switch handle that has a spring-loaded locking pin to lock the contact maker in the "on" position;

(d) Have the "off" and "on" positions of the operating handle marked by raised letters;

(e) Have mechanical stops to limit the rotation of the operating handle;

(f) Have an inductive load rating not less than the connected load, except that, on large vessels, auxiliary devices to interrupt the load current may be used if approved; and

(g) Be approved.

§ 113.25–12 Vibrating bells.

Each vibrating bell must—

(a) Be approved; and

(b) Produce a signal or a tone distinct from any other signal on the vessel.

§ 113.25–13 Flashing red lights.

Each flashing red light must be approved.

§ 113.25–14 Electric cable and distribution fittings.

Each cable entrance to a bell or distribution fitting must be made watertight by a terminal or stuffing tube.

§ 113.25–15 Distribution panels.

Each distribution panel must—
(a) Be watertight;
(b) Need a tool to be opened; and
(c) Be approved.

§ 113.25–16 Fuses.

(a) Each fuse in a general alarm system must—
(1) Be a 250-volt, nonrenewable, cartridge fuse approved by Underwriters Laboratories Inc.; and
(2) Cause as wide a differential as possible between branch circuit fuses and feeder fuses.
(b) The capacity of a feeder fuse must be as near as practicable to 200 percent of the load supplied. The capacity of a branch circuit fuse must not be higher than 50 percent of the capacity of the feeder fuse.

§ 113.25–20 Marking of equipment.

(a) Each general alarm system fused switch and distribution panel must have a fixed nameplate on the outside of its cover that has a description of its function. The rating of fuses must also be shown on the outside of the cover of a fused switch.
(b) Each general alarm contact maker must be marked "GENERAL ALARM" in red letters on a corrosion-resistant plate or on a sign.
(c) A contact maker that operates only the general alarm bells in crew quarters, machinery spaces, and work spaces must be marked "CREW ALARM" by the method described in paragraph (b) of this section.
(d) Each general alarm bell must be marked "General Alarm—When Bell Rings Go To Your Station" in red letters at least ½ inch high.
(e) Each general alarm system distribution panel must have a directory attached to the inside of its cover giving the designation of each circuit, the area supplied by each circuit, and the rating of each circuit fuse.

§ 113.25–25 General alarm systems for manned ocean and coastwise barges.

A manned ocean or coastwise barge of more than 100 gross tons, if it is one that operates with the crew divided into watches for steering the vessel, must have an alarm bell installation.

§ 113.25–30 General alarm systems for barges of 300 or more gross tons with sleeping accommodations for more than six persons.

The general alarm system for a barge of 300 or more gross tons with sleeping accommodations for more than six persons must meet the requirements of Subpart 113.25 of this part, except as follows:
(a) The number and location of contact makers must be determined by the design, service, and operation of the barge.[4]
(b) If a distribution panel cannot be above the uppermost continuous deck because of the design of the barge, the panel may be below the deck, but must be as near the deck as practicable.

Subpart 113.27—Engineers' Alarms

§ 113.27–1 Engineers' alarm.

Each self-propelled ocean, Great Lakes, or coastwise vessel must have a manually-operated engineers' alarm that is—
(a) Operated from—
(1) The engine control room, if the vessel has an engine control room; or
(2) The maneuvering platform, if the vessel has no engine control room; and
(b) Audible in the engineers' accommodation spaces.

Subpart 113.30—Sound Powered Telephone and Voice Tube Systems

§ 113.30–1 Applicability.

This subpart applies to each self-propelled vessel.

§ 113.30–5 Requirements.

(a) *Communication.* A vessel must have a sound powered telephone system or a voice tube system between each of the following:
(1) Wheelhouse.
(2) Steering gear room, if outside the engineroom.
(3) Alternative steering station.
(4) Engine control room, if the vessel has an engine control room.
(5) Maneuvering platform, if the vessel has no engine control room.
(6) Control room, if the vessel is a mobile offshore drilling unit.
(b) *Gyro compass.* Each vessel that has a master gyro-compass that is not in or next to the wheelhouse must have a means of communication between the master gyro-compass and the wheelhouse repeater compass.
(c) *Radar.* Each vessel that has a radar plan position indicator that is not in or next to the wheelhouse must have a means of communication between the wheelhouse and the radar plan position indicator.
(d) *Emergency squad.* If the emergency squad equipment lockers or spaces are not next to the wheelhouse, there must be a means of communication between the wheelhouse and the emergency squad equipment lockers or spaces.
(e) *Radio and radio direction finder.* Communication to the radio and radio direction finder must meet the following requirements:
(1) Each vessel that has a radio installation must have a means of communication between the radio room, the wheelhouse, or, if the vessel is a mobile offshore drilling unit, the control room, and any other place from which the vessel may be navigated under normal conditions, other than a place that is only for emergency functions, a place that is only for docking or maneuvering, or a place that is for navigating the vessel in close quarters. A location that has the apparatus that is necessary to steer the vessel, give engine orders, and control the whistle, is a place from which the vessel may be navigated.
(2) If the operating position of the emergency radio installation is not in the compartment normally used for operating the main radio installation, there must be means of communication between the emergency radio room, the wheelhouse, or, if the vessel is a mobile offshore drilling unit, the control room, and any other place, from which the vessel may be navigated under normal conditions, other than a place that is only for emergency functions, a place that is only for docking or maneuvering, or a place that is for navigating vessel in close quarters.
(3) Each vessel equipped with radio direction-finding apparatus that is not in or next to the wheelhouse must have a means of communication between the wheelhouse and the direction-finding apparatus.
(4) The communication system required by this paragraph must be independent of each other system on the vessel, and the location of the termination of these systems is subject to approval by the Federal Communications Commission
(f) *Fire or smoke detecting systems.* Each vessel equipped with a fire or smoke detecting system, if control units are not in the wheelhouse, must have a means of communication betwen the wheelhouse and the stations where the control units are located.
(g) *Lookout.* Each vessel must have a sound powered telephone system or a voice tube system for communication between the wheelhouse and the bow or forward lookout station unless direct voice communication is possible. If there is a sound powered telephone, it must meet the requirements of § 113.30–20(c).

§ 113.30–10 Voice tubes.

Each voice tube must—
(a) Not be used to meet the requirements of this subpart if the required length of voice tube as installed is longer than 125 feet (38.1 meters); and
(b) Meet Section 37.57 of IEEE Standard No. 45.

§ 113.30–20 Sound powered telephone system; general requirements.

(a) If a voice tube longer than 125 feet (38.1 meters) is necessary or if a voice tube is ineffective, approved sound powered telephone equipment is required.
(b) The telephone stations listed in § 113.30–5(a) through (d), (f), and (g) and other stations for the operation of the vessel, such as the captain's and chief engineer's offices and staterooms, emergency power room, CO_2 control room, or fire pumproom, may be on the same circuit.

[4] Contact makers in the primary work area, quarters area, galley and mess area, machinery spaces, and the bridge or control area should be considered.

(c) If the bow or forward lookout telephone is in the weather and on the same circuit as other required stations, there must be a cut-out switch in the wheelhouse for this telephone.

(d) Except as provided in paragraph (c) of this section, a telephone station not required by this subpart that is in the weather must not be on a telephone circuit that includes any required telephone stations.

(e) Jack boxes or headsets must not be on a telephone system that includes any station required by this subpart.

§ 113.30–25 Sound powered telephone system; detailed requirements.

(a) Each item of sound powered telephone equipment on a circuit that includes any station required by this subpart must be approved.

(b) Each sound powered telephone station in the weather must be watertight and the audible signal device must be outside of the station enclosure.

(c) Each sound powered telephone station in a wheelhouse or a machinery space must be dripproof.

(d) In a noisy location, such as a diesel engine room, there must be a telephone booth or other equipment so that a telephone conversation is possible while the vessel is navigated or operated.

(e) In a location where the telephone station sound signal cannot be heard throughout the space, there must be an additional sound signal that is energized from the vessel's electric system and that is magneto-actuated.

(f) If two or more telephone stations are near each other, there must be a means that indicates the station called.

(g) Each sound powered telephone talking circuit must be electrically independent of each calling circuit. A short circuit, open circuit, or ground on either side of a calling circuit must not affect a talking circuit. Circuits must be insulated from ground.

(h) Each connection box must be watertight.

(i) Telephone cables must be run as close to the fore and aft centerline of the vessel as practicable. Cables must not run through such spaces as machinery rooms and galleys.

Subpart 113.35—Engine Order Telegraph Systems

§ 113.35–1 Definitions.

As used in this subpart—

"Indicator" means an instrument in the engine room to receive and acknowledge engine orders.

"Transmitter" means an instrument to send engine orders to the engineroom and receive acknowledgement from the engineroom.

§ 113.35–3 General requirements.

(a) Each self-propelled vessel, except as provided in paragraph (d) of this section, must have an electric engine order telegraph system from the wheelhouse to the engineroom.

(b) On a vessel with more than one propulsion engine, each engine must have this system.

(c) On a double-ended vessel that has two wheelhouses, this system must be between the engineroom and each wheelhouse.

(d) A small vessel that has the propulsion plant controlled entirely from the wheelhouse with no means of normal engine control from the engineroom need not have an engine order telegraph system between the wheelhouse and the engineroom.

§ 113.35–5 Electric engine order telegraph systems; general requirements.

(a) Each electric engine order telegraph system must have transmitters and indicators that are electrically connected to each other.

(b) Each transmitter and indicator face must be divided into sections with engine orders engraved on it.

(c) Movement of the transmitter handle and its pointer must cause the indicator to show the order corresponding to the order on the transmitter.

(d) Each engineroom indicator must have a handle or pushbuttons that actuate the pointer on the transmitter for acknowledgement of orders.

(e) There must be an audible signal that is a vibrating bell at each instrument. The vibrating bell at both the transmitter and the indicator must ring continuously when the transmitter and the indicator do not show the same order.

(f) Each dial of a transmitter instrument must be illuminated in such a manner as not to interfere with navigation of the vessel at night.

(g) Each transmitter operating handle must be large enough so that the engine order may be determined from a distance.

§ 113.35–7 Electric engine order telegraph systems, detail requirements.

(a) Each telegraph instrument must have a watertight enclosure for the electric components, except that an instrument under § 113.35–11 that is not in the weather must be watertight or dripproof.

(b) Each material for a telegraph instrument must be corrosion-resistant.

(c) Each transmitter dial must be arranged with the "STOP" order at the top vertical position of the operating handle. For "Ahead" orders, the operating handle must move toward the bow of the vessel, and for "Astern" orders, the operating handle must move toward the stern of the vessel.

(d) Each indicator face must have the "Stop" order—

(1) At the top of a pedestal or console mounted instrument;

(2) At the bottom on a bulkhead mounted instrument; and

(3) In the center on a pushbutton operated instrument.

(e) Each indicator face on a double-ended vessel must be parallel to the centerline and must not be marked with the designations "Ahead" and "Astern."

§ 113.35–11 Vessels with pilothouse control.

Each vessel with pilothouse throttle control must have a positive mechanical stop on each telegraph instrument that prevents movement to the "Pilothouse Control" position without positive action by the operator.

§ 113.35–13 Approval of telegraph instruments.

Each telegraph instrument must be approved.

Subpart 113.40—Rudder Angle Indicator Systems

§ 113.40–1 Applicability.

This subpart applies to self-propelled vessels.

§ 113.40–5 General requirements.

The position of the rudder, if power operated, must be shown at the principal steering station. If there is non-followup steering control at the alternative steering station, there must be a separate rudder angle indicator system for that station that is electrically independent from each other rudder angle indicator system.

§ 113.40–10 Detail requirements.

(a) Each rudder angle indicator system must have a transmitter at the rudder head that is actuated by movement of the rudder with the angular movements of the rudder transmitted to a remote indicator or indicators.

(b) Each indicator must have a fixed dial that shows the angular position of the rudder right and left of amidships. Indications of rudder angle must be made by a moving pointer.

(c) The movement of the indicator pointer must match the movement of the steering wheel or control.

(d) Each indicator must be—

(1) In the direct line of vision of the helmsman; and

(2) Have dial illumination that does not interfere with the navigation of the vessel at night.

(e) Each electric component of the system must be in a watertight enclosure.

(f) Each component material must be corrosion-resistant.

Subpart 113.45—Refrigerated Spaces Alarm Systems

§ 113.45–5 General requirements.

(a) Each refrigerated space that is accessible to a vessel's personnel and that can be locked from the outside so that it cannot be opened from the inside, must have an audible alarm system that can be operated from within the refrigerated space.

(b) The alarm activator must be in the refrigerated space at its exit.

(c) The audible signal must sound at a manned location.

(d) If there is a common audible signal for more than one lockable refrigerated space, there must be an annunicator for locating the space from which the signal was initiated.

Subpart 113.50—Emergency Loudspeaker System

§ 113.50–1 Applicability.

This subpart applies to each ocean and coastwise passenger vessel certificated to carry 500 or more persons, including officers and crew, and each passenger vessel that has lifeboats stowed more than 100 feet (30.5 meters) from the navigating bridge.

§ 113.50–5 General requirements.

(a) Each vessel must have an approved loudspeaker system that enables an officer on the bridge to broadcast separately or collectively to the following stations:

(1) Lifeboat stations, port.

(2) Lifeboat stations, starboard.

(3) Lifeboat embarkation stations, port.

(4) Lifeboat embarkation stations, starboard.

(5) Public spaces used for passenger assembly stations.

(6) Crew quarters.

(7) Accommodation spaces and service spaces.

(b) The system must be controlled from one location on the navigating bridge.

(c) Each loudspeaker at a lifeboat or embarkation station must allow two-way conversation with the navigating bridge.

(d) Each emergency loudspeaker system must be approved, and must meet the requirements of Subpart 161.004 of this chapter.

(e) If a vessel has a public address or music distribution system, there must be a means to silence that system. This means must be next to the loudspeaker system control panel.

§ 113.50–15 Location of loudspeakers and amplifiers.

(a) *General.* Loudspeakers must be located as follows:

(1) Loudspeakers must be located to minimize the effect of feedback and other interference.

(2) Each loudspeaker on an open deck must be directed toward the after end of the vessel and outboard by an angle of approximately 15 degrees.

(b) *Boat deck loudspeakers.* A loudspeaker must be at each lifeboat handling station. The axis of the loudspeaker must be directed aft and outboard so that the sound level at the lifeboat handling station is not less than the level given in Table 113.50–15.

(c) *Lifeboat embarkation and passenger assembly station loudspeakers.* Enough loudspeakers must be throughout the lifeboat embarkation deck and locations designated by the vessel's station bill for the assembly of passengers in an emergency to provide a distribution of sound of at least the level in Table 113.50–15, and with a variation that does not exceed plus or minus 3 decibels.

TABLE 113.50–15—*Minimum sound level requirements for loudspeaker systems*

[All data given in decibels [1]]

Location	Ground noise level minimum	Signal level		Voice level	
		Aboveground noise	Total	Aboveground noise	Total
Lifeboat station	80	20	[2] 100	15	[2] 95
Embarkation deck or exterior passenger assembly point	80	20	[2] 100	15	[2] 95
Interior passenger assembly point	75	20	[2] 95	15	[2] 90
Crew quarters, accomodation space or service space	60	18	[3] 78	12	[3] 72

[1] The zero decibel level is 0.0002 dyn per cm [2].
[2] Measured at a distance of 10 ft (3 m) from the loudspeaker and on its axis.
[3] Measured in rooms with the doors to the passageways closed.

(d) *Loudspeakers in quarters, accommodation spaces, and service spaces.* Enough loudspeakers must be in passageways throughout crew quarters, accommodation spaces, and service spaces to provide at least the sound level in Table 113.50–15 in each room with the doors closed.

(e) *Amplifier.* An emergency loudspeaker amplifier that is not in the same enclosure as the control panel must be in the wheelhouse or in a compartment next to the wheelhouse.

§ 113.50–20 Distribution of cable runs.

(a) Cable runs to the different loudspeaker groups must be as widely separated from each other as practicable. They must be distributed so that a casualty to the port or starboard supplies to loudspeakers on boat and embarkation decks will not render more than half of the loudspeakers in the group inoperative, such as by feeding the loudspeakers of a particular group alternately from a port and starboard multiconductor cable.

(b) Cables must be in passageways and must not run through staterooms, lockers, and other enclosed spaces.

§ 113.50–25 Equipment enclosures.

Each junction or connection box in the distribution system must be watertight.

Subpart 113.70—Smoke Detector Operators [4]

§ 113.65–5 General requirements.

Each whistle and siren operator must meet Section 37.45 of IEEE Standard No. 45.

[4] The general requirements for whistles, sirens, and fog horns are in Part 25 of Subchapter C (Uninspected Vessels), Part 32 of Subchapter D (Tank Vessels), Part 77 of Subchapter H (Passenger Vessels), Part 96 of Subchapter I (Cargo and Miscellaneous Vessels), Part 107 of Subchapter II (Mobile Offshore Drilling Units), and Part 195 of Subchapter U (Oceanographic Vessels) of this chapter.

Subpart 113.70—Smoke Detectors Systems

§ 113.70–5 General requirements.

(a) Each smoke detector control unit must be approved. Each smoke detector system must meet the requirements of Subpart 161.002 of this chapter.

(b) Cable runs between the smoke detector control unit and the supply switchboard must be as direct as practicable and must not run through staterooms, lockers, and other enclosed spaces where the cable could be damaged by a localized fire or by other causes.

PARTS 114–139—[RESERVED]

PART 190—CONSTRUCTION AND ARRANGEMENT

§ 190.20–45 [Revoked]

24. By revoking § 190.20–45.

PART 192—LIFESAVING EQUIPMENT

§ 192.30–15 [Amended]

25. By deleting the last sentence in § 192.30–15(a).

§§ 192.50–10 and 192.50–15 [Revoked]

26. By revoking § 192.50–10 and § 192.50–15.

PART 195—VESSEL CONTROL AND MISCELLANEOUS SYSTEMS AND EQUIPMENT

Subpart 195.05 [Revoked]

27. By revoking Subpart 195.05.

PART 196—OPERATIONS

§§ 196.37–5, 196.37–7 and 196.37–25 [Revoked]

28. By revoking § 196.37–5, § 196.37–7, and § 196.37–25.

(46 U.S.C. 170, 367, 369, 375, 390(b), 391(a), 392, 408, 416, 445, 489, 526p, 49 U.S.C. 1655 (b); 49 CFR 1.46.)

NOTE.—The Coast Guard has determined that this document does not contain a major proposal requiring preparation of an Economic Impact Statement under Executive Order 11821, as amended, and OMB Circular A–107.

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O. W. SILER,
Admiral, U.S. Coast Guard,
Commandant.

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