Old Subchapter "J"
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"Old" Subchapter J

Parts included in This Subchapter

SUBCHAPTER J—ELECTRICAL ENGINEERING

PART 110—GENERAL PROVISIONS

Subpart 110.01—Applicability

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Subpart 110.25—Plan Submittal

Subpart 110.30—Testing and Inspection

AUTHORITY: 33 U.S.C. 1509; 43 U.S.C. 1333; 46 U.S.C. 3306, 3703, 4104; E.O. 12234, 45 FR 58801, 3 CFR, 1980 Comp., p. 277; 49 CFR 1.45, 1.46; § 110.01-2 also issued under the authority of 44 U.S.C. 3507.

SOURCE: CGD 74-125A, 47 FR 15232, Apr. 8, 1982, unless otherwise noted.

Subpart 110.01—Applicability

§ 110.01-1 General.

(a) This subchapter applies to electric equipment and systems where subchapters D, H, I, IA, O, T, or U of this chapter require the installations to be in accordance with this subchapter.

(b) This subchapter applies to vessels and installations contracted for after May 31, 1982.

(c) Installations and equipment accepted by the Coast Guard as meeting the applicable requirements in this subchapter in effect on the date the installation was contracted for and which are maintained in good and serviceable condition to the satisfaction of the Officer in Charge, Marine Inspection, may be continued in use until replacement is ordered by the Officer in Charge, Marine Inspection, or as specified in the regulations.

(d) Requirements in this subchapter revised or added subsequent to May 31, 1982 will apply to installations contracted for after the effective date of such requirements or as specified in the regulation.

(e) Electrical systems internal to a pressure vessel for human occupancy (PVHO) need not meet the requirements of this subchapter, but must meet the requirements of Subpart B (Commercial Diving Operations) of part 197 of this chapter.

§ 110.01-2 OMB control numbers assigned pursuant to the Paperwork Reduction Act.

(a) *Purpose.* This section collects and displays the control numbers assigned to information collection and recordkeeping requirements in this subchapter by the Office of Management and Budget (OMB) pursuant to the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 et seq.). The Coast Guard intends that this section comply with the requirements of 44 U.S.C. 3507(f) which requires that agencies display a current control number assigned by the Director of the OMB for each approved agency information collection requirement.

(b) *Display.*

46 CFR part or section where identified or described	Current OMB control No.
Subpart 110.25	2115-0115

[49 FR 38121, Sept. 27, 1984]

§ 110.01-3 Repairs.

(a) Repairs must be done in accordance with the regulations in effect on the date:

(1) The original installation was contracted for; or

(2) The repair was contracted for.

§ 110.01–4 Right of appeal.

Any person directly affected by a decision or action taken under this subchapter, by or on behalf of the Coast Guard, may appeal therefrom in accordance with subpart 1.03 of this chapter.

[54 FR 50380, Dec. 6, 1989]

Subpart 110.10—Reference Specifications, Standards, and Codes

§ 110.10–1 Incorporation by reference.

(a) Certain materials are incorporated by reference into this part with the approval of the Director of the Federal Register. The Office of the Federal Register publishes a table, "Material Approved for Incorporation by Reference," which appears in the Finding Aids section of this volume. In that table is found the date of the edition approved, citations to the particular sections of this part where the material is incorporated, addresses where the material is available, and the date of the approval by the Director of the Federal Register. To enforce any edition other than the one listed in the table, notice of the change must be published in the FEDERAL REGISTER and the material made available. All approved material is on file at the Office of the Federal Register, Washington, DC 20408 and at the Office of Design and Engineering Standards Division (G–MMS), U.S. Coast Guard Headquarters Building, 2100 Second Street SW., Washington, DC 20593.

(b) The materials approved for incorporation by reference in this subchapter are:

(1) Rules for Building and Classing Steel Vessels, issued by the American Bureau of Shipping.

(2) The following publications issued by the National Fire Protection Association:

(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:

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

(ii) IPCEA–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.:

(i) Low-Voltage AC Power Circuit Breakers Used in Enclosures (ANSI/IEEE Standard No. C37.13).

(ii) Switchgear Assemblies Including Metal-Enclosed Bus (IEEE Standard No. 27, ANSI C37.20).

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

(iv) Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis (IEEE Standard No. 320, ANSI C37.010).

(v) Low-Voltage AC Non-Integrally Fused Power Circuit Breakers (Using Separately Mounted Current-Limiting Fuses) (IEEE Standard No. 331, ANSI C37.27).

(vi) Low-Voltage AC Integrally Fused Power Circuit Breakers (IEEE Standard No. 538, ANSI C37.13a).

(5) The following standards issued by Underwriters Laboratories Inc.:

(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 Panelboards (UL 67).

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

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

(xiii) Standard for Knife Switches (UL 375).

(xiv) Standard for Drinking Water Coolers (UL 399).

(xv) Standard for Commercial Refrigerators and Freezers (UL 471).

(xvi) Standard for Electric Wire Connectors and Soldering Lugs for Use with Copper Conductors (UL 486A).

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

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

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

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

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

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

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

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

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

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

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

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

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

(xxx) Standard for Marine Navigation Lights (UL 1104).

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

(6) The following specifications and guides issued by the Naval Sea Systems Command:

(i) Military Specification, Wire, Electrical (Insulated, High Temperature) (MIL-W-16878D).

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

(iii) Military Specification, Cable and Cord Electrical, for Shipboard Use (MIL-C-915E).

(iv) Electrical Cable, Ratings and Characteristics (NAVSEA Design Data Sheet DDS 304-2).

(v) A.C. Fault Current Calculations (NAVSEA Design Data Sheet DDS 9620-3).

(vi) Military Specification, Matting or Sheet, Floor Covering, Insulating for High Voltage Application (MIL-M-15562F).

(7) American National Standard Safety Code For Elevators, Dumbwaiters, Escalators, and Moving Walks (ANSI A17.1) (issued by the American Society of Mechanical Engineers).

(8) The following publications issued by the American National Standard Institute Inc. (ANSI):

(i) Low-Voltage DC Power Circuit Breakers Used in Enclosures (ANSI C37.14).

(ii) Rating Structure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis (ANSI C37.04).

(iii) AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis and a Total Current Basis (ANSI C37.12).

(9) The following publications issued by the American Society for Testing and Materials:

(i) Standard Methods of Salt Spray (Fog) Testing (ASTM B 117).

(ii) Standard Specification for Nylon Injection Molding and Extrusion Materials (ASTM D 789).

(10) Installation of Intrinsically Safe Instrument Systems in Class I Hazardous Locations (ISA RP 12.6) issued by the Instrument Society of America.

(c) The words "should" or "shall," when used in a reference, are to be considered the same as the word "must" in describing Coast Guard requirements.

[CGD 74-125A, 47 FR 15232, Apr. 8, 1982, as amended by CGD 82-063b, 48 FR 4781, Feb. 3, 1983; CGD 95-072, 60 FR 50465, Sept. 29, 1995; 60 FR 54106, Oct. 19, 1995]

EFFECTIVE DATE NOTE: At 60 FR 54106, Oct. 19, 1995, § 110.10-1 paragraph (a) was corrected by removing the words "Marine Safety, Security and Enviromental Protection" and adding in their place the words "Design and Engineering Standards Division", effective Oct. 19, 1995.

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 "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 Vessel* means a vessel that normally navigates the waters of any ocean or the Gulf of Mexico 20 nautical miles or less offshore and is certificated for coastwise navigation by the U.S. Coast Guard.

(3) *Commandant* means the Commandant of the U.S. Coast Guard (see §1.01 of this chapter for delegation of authority).

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

(i) Electroplated by 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.

(v) A finish that when tested in accordance with the American Society for Testing and Materials Standard Method of Salt Spray (Fog) Testing (B 117) for 200 hours does not show pitting, cracking, or other deterioration more severe than that resulting from a similar test on passivated AISI Type 304 stainless steel.

(5) *Corrosion-resistant material* and *noncorrodible material* means one of the following materials:

(i) Silver.

(ii) Corrosion-resistant steel.

(iii) Copper.

(iv) Brass.

(v) Bronze.

(vi) Copper-nickel.

(vii) Corrosion-resistant nickel alloys.

(viii) Aluminum alloys with a copper content of 0.4 percent or less.

(ix) Plastics.

(x) A material that when tested in accordance with the American Society for Testing and Materials Standard Method of Salt Spray (Fog) Testing (B 117) for 200 hours does not show pitting, cracking, of other deterioration more severe than that resulting from a similar test on passivated AISI type 304 stainless steel.

(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 location within a galley, a laundry, or a public washroom or toilet room that has a bath or shower normally exposed to splashing, water washdown, or other wet conditions;

(v) An area directly inside of an acess 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

(vi) Other spaces with similar moisture levels.

(8) *Deadship condition* means a situation in which the main propulsion plant, boiler, and ship's service generating plant are not in operation due to the absence of power.

(9) *Dripproof* means enclosed equipment so constructed or protected that falling drops or 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, a NEMA Type 2 enclosure, or a NEMA Type 12 enclosure meets this definition.

(10) *Dry location* means—

(i) An accommodation space;

(ii) A pantry;

(iii) A passageway adjacent to quarters;

(iv) A location within a galley, a laundry, or a public washroom or toilet that has a bath or shower not exposed to splashing, water washdown, or other wet conditions.

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

(vi) A radio room;

(vii) A gyro room;

(viii) A chart room; or

(ix) Other spaces with similar moisture levels.

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

(12) *Emergency squad* means the crew designated on the station bill as the nucleus of a damage control party.

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

(14) *Great Lakes vessel* means a vessel that navigates exclusively on the Great Lakes.

(15) *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 who is designated for the duties of inspection, enforcement, and administration of Title 46 U.S.C. and rules and regulations promulgated under its authority.

(16) *Nonsparking fan* means a fan that cannot produce sparks that ignite a flammable mixture and has:

(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.

(17) *Ocean vessel* means a vessel that navigates the waters of any ocean or the Gulf of Mexico more than 20 nautical miles offshore and is certificated for ocean navigation by the U.S. Coast Guard.

(18) *Qualified person* means a person who by his special knowledge, ability, and experience can competently and safely perform required functions and duties.

(19) *Waterproof machine* means a totally enclosed machine so constructed that a stream of water from a hose with a nozzle one inch in diameter that delivers at least 65 gallons per minute can be played on the machine from any direction from a distance of about 10 feet 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.

(20) *Watertight* means enclosed so that equipment does not leak when a stream of water from a hose with a nozzle one inch in diameter that delivers at least 65 gallons per minute is played on the enclosure from any direction from a distance of 10 feet for 5 minutes.

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

[CGD 74–125A, 47 FR 15232, Apr. 8, 1982, as amended by CGD 83–067b, 49 FR 18099, Apr. 27, 1984]

Subpart 110.20—Equivalents

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

The Commandant (G–MMS) may accept a fitting, material, apparatus, equipment, or arrangement in substitution for a fitting, material, apparatus, equipment, or arrangement required by this subchapter if the substituted item is at least as effective as the one required and provides the degree of safety consistent with the requirements of this subchapter.

[CGD 74–125A, 47 FR 15232, Apr. 8, 1982, as amended by CGD 82–063b, 48 FR 4781, Feb. 3, 1983; CGD 95–072, 60 FR 50465, Sept. 29, 1995]

Subpart 110.25—Plan Submittal

§ 110.25–1 Plans and information required for new construction.

The following plans, if applicable to the particular vessel, must be submitted for Coast Guard review in accordance with § 110.25–3:

NOTE: A Navigation and Vessel Inspection Circular on the Subject of "Coast Guard Review of Merchant Vessel Plans and Specifications" is available from the offices listed in § 110.25–3. The Circular recommends practices and procedures for plan submittals.

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

(1) Type and size of generators and prime movers;

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

(3) Power, lighting, and interior communication panelboards 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;

(6) Computations of short circuit currents in accordance with Subpart 111.52; and

(7) Overcurrent protective device coordination analysis for each generator distribution system of 1500 kilowatts or above that includes selectivity and shows that each overcurrent device has an interrupting capacity sufficient to interrupt the maximum asymmetrical short-circuit current available at the point of application.

(b) Electrical 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) Electric watertight door system;

(8) Fire screen door holding system;

(9) Emergency loudspeaker system;

(10) Manual alarm system; and

(11) Supervised patrol system.

Each isometric or deck wiring plan must show the location of any cable splice.

(d) Deck wiring or schematic 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) Locations of each item of electric equipment;

(4) Locations of cable splices.

(e) Switchboard wiring diagram.

(f) Switchboard material and nameplate list.

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

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

(i) For vessels with hazardous locations as defined in Subpart 111.105 of this chapter, plans showing the extent and classification of all hazardous locations. Information including manufacturer's name, model indentification, and equipment location must be submitted for all electrical equipment in these hazardous locations.

(j) Plans and installation instructions for each intrinsically safe system approved by Underwriters Laboratories Inc., Factory Mutual Research Corporation, or other independent laboratory recognized by the Commandant (see §111.105–11).

(k) Motor starter elementary wiring diagram, enclosure drawing, and starter application.

(l) Plans and information sufficient to evaluate equipment required by this subchapter to be approved or accepted by the Commandant.

NOTE: This equipment includes soundpowered telephones, navigation lights, submerged cargo pump motors, and equipment to be considered for equivalency under §110.20–1 of this part.

(m) Plans and information sufficient to evaluate equipment or systems required to meet the specifications of this Subchapter but not to be approved by the Commandant.

NOTE: This equipment evaluation is generally done by District Merchant Marine Technical Offices and includes cable splices, signaling lights, shore connection boxes, electric oil immersion heaters, submersible motor-driven bilge pumps, engine order telegraph systems, shaft speed and thrust indicator systems, rudder angle indicators, and steering failure alarm systems.

(n) Plans and information sufficient to evaluate equipment required by this

subchapter to meet a reference standard or military specification.

NOTE: This equipment evaluation is generally done by District Merchant Marine Technical Offices and includes circuit breakers, switches, lighting fixtures, electric cooking equipment, motor operated appliances, dishwashers, refrigerators, water coolers, air heating equipment, busways, and outlets and junction boxes. Items that are required to meet a UL standard will be considered acceptable based on indication of listing or labeling on a material list or plan. Items required by this subchapter to meet an IEEE, NEMA, or ANSI standard, or a military specification will be considered acceptable if manufacturer's certification of compliance is indicated on a material list or plan.

[CGD 74–125A, 47 FR 15232, Apr. 8, 1982, as amended by CGD 81–030, 53 FR 17846, May 18, 1988]

§ 110.25–3 Procedure for submitting plans.

(a) The plans required by § 110.25–1 must be submitted to one of the following Coast Guard offices:

(1) Commanding Officer, U.S. Coast Guard Marine Safety Center (G–MSC), 400 Seventh St., SW., Washington, DC 20590–0001.

(2) The Officer in Charge, Marine Inspection at or nearest the place where the vessel is to be built.

(3) Commandant (G–MMS), U.S. Coast Guard, Washington, D.C. 20593–0001.

(b) [Reserved]

(c) 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 necessary distribution.

NOTE: The Coast Guard and the American Bureau of Shipping (ABS) coordinate plan review for vessels classed by the ABS in order to eliminate duplication of effort. An applicant for plan review of a vessel that is classed by the ABS should consult a Coast Guard Technical Office to determine applicable procedures for submitting plans.

[CGD 74–125A, 47 FR 15232, Apr. 8, 1982, as amended by CGD 82–063b, 48 FR 4781, Feb. 3, 1983; CGD 85–048b, 51 FR 15498, Apr. 24, 1986; CGD 88–070, 53 FR 34534, Sept. 7, 1988; CGD 89–025, 54 FR 19571, May 8, 1989; CGD 95–072, 60 FR 50465, Sept. 29, 1995]

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.

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

§ 110.30–5 Inspection for certification.

The inspection of electric installations at the annual or biennial inspection incident to reissuance of a Certificate of Inspection includes an inspection of the electric installation and electric equipment to determine mechanical and electrical condition and performance. Particular note must be made of circuits added or modified after the initial inspection.

§ 110.30-7 Repairs or alterations.

(a) No extensive repairs or alterations affecting the safety of the vessel may be made without the knowledge of the Officer in Charge, Marine Inspection.

(b) Drawings of alterations must be approved before work is started unless considered unnecessary by the Officer in Charge, Marine Inspection. Drawings are not required for repairs involving no alterations.

PART 111—ELECTRIC SYSTEMS—GENERAL REQUIREMENTS

Subpart 111.01—General

Sec.

Subpart 111.05—Equipment Ground, Ground Detection, and Grounded Systems

EQUIPMENT GROUND

SYSTEM GROUNDING

GROUND DETECTION

GROUNDED CONDUCTORS

Subpart 111.10—Power Supply

Subpart 111.12—Generator Construction and Circuits

Subpart 111.15—Storage Batteries and Battery Chargers: Contruction, and Installation

Subpart 111.20—Transformer Construction, Installation, and Protection

Subpart 111.25—Motors

Subpart 111.30—Switchboards

Subpart 111.33—Power Semiconductor Rectifier Systems

Subpart 111.35—Electric Propulsion

Subpart 111.40—Panelboards

Subpart 111.50—Overcurrent Protection

Subpart 111.51—Coordination of Overcurrent Protective Devices

Subpart 111.52—Calculation of Short-Circuit Currents

Subpart 111.53—Fuses

Subpart 111.54—Circuit Breakers

Subpart 111.55—Switches

Subpart 111.57—Current-Limiting Devices

Subpart 111.59—Busways

Subpart 111.60—Wiring Materials and Methods

Subpart 111.70—Motor Circuits, Controllers, and Protection

Subpart 111.75—Lighting Circuits and Protection

Subpart 111.77—Appliances and Appliance Circuits

Subpart 111.79—Receptacles

AUTHORITY: 46 U.S.C. 2103, 3306, 3703; 49 CFR 1.46.

SOURCE: CGD 74-125A, 47 FR 15236, Apr. 8, 1982, as amended at CGD 90-051, 60 FR 24782, May 10, 1995.

Subpart 111.01—General

§ 111.01-1 General.

Electric installations on vessels must ensure:

(a) Maintenance of services necessary for safety under normal and emergency conditions; and

(b) Protection of passengers, crew, other persons, and the 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.

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

§ 111.01-9 Watertight, waterproof, and dripproof equipment.

(a) Electric equipment exposed to the weather or located in a space where it is exposed to seas, splashing, or similar moisture conditions must be watertight or be in a watertight enclosure, except a motor, which must be either watertight or waterproof. A watertight enclosure must be designed in such a way that the total rated temperature of the equipment inside the enclosure is not exceeded.

(b) Central control consoles and similar control enclosures must be dripproof, regardless of location.

[CGD 81-030, 53 FR 17846, May 18, 1988]

§ 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 having a corrosion resistant finish.

§ 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 item is solidly mounted by machine screws or their equivalent, unless the porcelain piece is resiliently mounted.

§ 111.01-15 Temperature ratings.

(a) In this subchapter an ambient temperature of 40 degrees C is assumed except as otherwise stated.

(b) A 50 degrees C ambient temperature is assumed for boilerrooms, enginerooms and auxiliary machinery spaces unless it can be shown that a 40 degrees C ambient temperature will not be exceeded in these spaces.

(c) If a machine is to be utilized in a space in which the machine's rated ambient temperature is below the assumed ambient temperature of the space, it must be used at a derated load. The assumed ambient temperature of the space plus the machine's actual temperature rise at its derated load must not exceed the machine's total rated temperature (machine's rated ambient temperature plus its rated temperature rise).

§ 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

Generation equipment	Utilization equipment[1]	Lighting devices[2]
Direct Current:		
120	115	115
240	230	—

TABLE 111.01–17(8)—STANDARD VOLTAGES—Continued

Generation equipment	Utilization equipment[1]	Lighting devices[2]
Alternating Current:		
120	115	120
208	200	208
230–240	220–230	240
450–480	440–460	480
600	575	—
2400	2300	—
4160	4000	—

[1] The standard voltages specified for the utilization devices are the ones usually used with the matched generation voltage; however, devices with other voltage ratings may be acceptable.
[2] Lighting devices are usually rated for the maximum permissible voltages.

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

(d) *Others.* Distribution systems, voltages, or frequencies that differ from the standard must be accepted by the Commandant.

Subpart 111.05—Equipment Ground, 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, transient 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 the enclosure materials.

EQUIPMENT GROUND

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

(a) An electric apparatus must be designed, constructed, and installed to prevent any person from accidentally contacting energized parts.

(b) Exposed, noncurrent-carrying metal parts of fixed equipment that may become energized because of any condition must be grounded.

(c) Exposed, noncurrent-carrying metal parts of portable equipment must be grounded through a conductor in the supply cable to the grounding pole in the receptacle.

(d) If the installation of the electrical equipment does not ensure a positive ground to the metal hull or equivalent conducting body, the apparatus must be grounded to the the hull with a grounding conductor.

§ 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 of final sub-circuits; and

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

(b) Single conductor alternating-current cable must have its metallic covering 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 except for the following systems:

(1) Impressed current cathodic protection systems.

(2) Limited and locally grounded systems, such as a battery system for engine starting that has a one-wire system and the ground lead connected to the engine.

(3) Insulation level monitoring devices if the circulation current does not exceed 30 milliamperes under the most unfavorable conditions.

(4) Welding systems with hull return except vessels subject to 46 CFR Subchapter D.

§ 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.

(a) Each propulsion, power, lighting, or distribution system having a neutral bus or conductor must have the neutral grounded.

(b) The neutral of a dual-voltage system must be solidly grounded at the generator switchboard.

§ 111.05–17 Generation and distribution system grounding.

The neutral of each grounded generation and distribution 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 on 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; and

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

§ 111.05–19 Tank vessels; grounded distribution systems.

(a) If the voltage of a distribution system is less than 3,000 volts, line-to-line, a tank vessel must not have a grounded distribution system.

(b) If the voltage of a distribution system on a tank vessel is 3,000 volts or more, line-to-line, and the distribution system is grounded, any resulting current must not flow through hazardous locations.

GROUND DETECTION

§ 111.05–21 Ground detection.

There must be ground detection for each:

(a) Electric propulsion system;

(b) Ship's service power system;

(c) Lighting system; and

(d) Power or lighting distribution system that is isolated from the ship's service power and lighting system by transformers, motor generator sets, or other devices.

§ 111.05–23 Location of ground indicators.

Ground indicators must:

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

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

(c) Be readily accessible.

§ 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 scale that accurately, and with clear definition, indicates current in the 0 to 10 ampere range; and

(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:

(a) Is in the ground connection;

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

(c) 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 (8.4mm²).

(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 of the largest generator cable or equivalent for parallel generators—AWG–MCM (mm²)		Size of the system grounding conductor—AWG(mm²)
Greater than	Less than or equal to	
.....	2 (33.6)	8 (8.4)
2 (33.6)	0 (53.5)	6 (13.3)
0 (53.5)	3/0 (85.0)	4 (21.2)
3/0 (85.0)	350 MCM (177)	2 (33.6)
350 MCM (177)	600 MCM (304)	0 (53.5)
600 MCM (304)	1100 MCM (557)	2/0 (67.5)
1100 MCM (557)	.....	3/0 (85.0)

§ 111.05–33 Equipment grounding conductors.

(a) Equipment grounding conductors must be sized in accordance with Section 250–95 of the National Electrical Code.

(b) 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 Definitions.

As used in this Subpart:

(a) *Ship's service loads* means all auxiliary services necessary for maintaining the ship or drill unit in a normal operational and habitable condition. Ship's service loads include, but are not limited to, all safety, lighting, ventilation, navigational, communications, habitability, cargo refrigeration, and auxiliary propulsion loads. Electrical propulsion motor, bow thruster motor, cargo transfer, drilling, and other industrial type loads are not included.

(b) *Drilling loads* means all loads associated exclusively with the drilling operation including power to the drill table, mud system, and positioning equipment.

§ 111.10–3 Two generating sets.

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

§ 111.10–4 Power requirements; generating sets.

(a) With any ship's service generating set stopped, the combined capacity of the remaining electric ship's service generating set or sets required in § 111.10–3 must be sufficient for the ship's service load.

(b) The capacity of the ship's service generating sets must be sufficient for supplying the ship's service loads without the use of a generating set that is dependent upon the speed or direction of the main propelling engines or shafting.

(c) Operating generators must provide a continuous and uninterrupted source of power for the ship's service load under normal operational conditions. Any vessel speed change or throttle movement must not cause a ship's service load power interruption.

(d) If the ship's service loads are supplied from the same generating plant as an electrical propulsion system, a cargo transfer load, a drilling load, or other industrial type load, the total generating capacity, exclusive of the emergency generator, must be sufficient to supply both the above-mentioned loads and the ship's service loads.

§ 111.10–5 Multiple energy sources.

Failure of any single generating set energy source such as a boiler, diesel,

gas turbine, or steam turbine must not cause all generating sets required in § 111.10-3 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) If the emergency generator is used for part or all of the electric power necessary to start the main propulsion plant from a dead ship condition, the emergency generator must be capable of providing power to all emergency lighting, emergency internal communications systems, and fire detection and alarm systems in addition to the power utilized for starting the main propulsion plant.

§ 111.10-9 Ship's service supply transformers; 2 required.

If transformers are used to supply the ship's service distribution system required by this subpart for ships and mobile offshore drilling units, there must be at least two separate ship's service supply systems.

NOTE: A ship's service supply system would consist of transformers, overcurrent protective devices, and cables, and would normally be located between a medium voltage bus and a low voltage ship's service switchboard.

§ 111.10-11 Power requirements; transformers.

With any one ship's service supply systems de-energized, the remaining supply system must have sufficient capacity to supply the ship's service loads.

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 cannot 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 unless otherwise accepted by the Commandant.

§ 111.12-3 Excitation.

Excitation must meet Section 35.23 of the American Bureau of Shipping's "Rules for Building and Classing Steel Vessels," except a static exciter must not be used for excitation of an emergency generator unless it is provided with a permanent magnet or a residual magnetism type exciter that has the capability of voltage build-up after two months of no operation.

§ 111.12-5 Generator construction and testing.

(a) Each generator must meet the applicable construction and test requirements of Section 35 of the American Bureau of Shipping's "Rules for Building and Classing Steel Vessels."

(b) Each generator must be a 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:

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

(2) Must not be protected by an overload device.

(c) If the voltage regulation supply circuit is provided with short circuit protection, the overcurrent device must be set at not less than 500 percent of the expected current.

§ 111.12-9 Generator cables.

(a) The current-carrying capacity of generator cables must not be:

(1) Less than 115 percent of the continuous generator rating; or

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

(b) 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) *General.* Each ship's service generator and emergency generator must be protected by an individual, tripfree, air circuit breaker whose tripping characteristics can be set or adjusted to closely match the generator capabilities and meet the coordination requirements of Subpart 111.51. Each circuit breaker must contain the trips required by this section.

(c) *Type of trips.* A circuit breaker for a generator must:

(1) Have inverse time overcurrent trips or relays set as necessary to coordinate with the trip settings of the feeder circuit breakers; and

(2) Not have an instantaneous trip with the exception that an instantaneous trip is required if:

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

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

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

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

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

(e) *Setting of instantaneous trips.* The instantaneous trip of a generator circuit breaker must be set above, but as close as practicable to, the maximum asymmetrical short circuit available from any one of the generators that can be paralleled.

(f) *Reverse-power and reverse-current trips.* Each generator arranged for parallel operation must have reverse-power or reverse-current trips.

(g) *Location.* A ship's service generator overcurrent protective device must be on the ship's service generator switchboard. The generator and its switchboard must be in the same space. (For the purposes of this section, the following are not considered separate from the machinery space: (1) A control room that is inside of the machinery casing and (2) a dedicated switchgear and semiconductor rectifier (SCR) compartment on a mobile offshore drilling unit that is separate from but directly adjacent to and on the same level as the generator room).

(h) *Three-wire, single-phase and four-wire, three-phase generators.* There must be circuit breaker poles for each generator lead, except in the neutral lead.

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

(1) *Circuit breaker poles.* There must be separate circuit breaker poles for the positive and negative leads, 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. In this case, there must be a neutral overcurrent relay and alarm system that is set to function at a current value not more than the neutral rating.

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

(j) *Circuit breaker reclosing.* Generator circuit breakers must not automatically close after tripping.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 81–030, 53 FR 17847, May 18, 1988]

§111.12–13 Propulsion generator protection.

For general requirements, see §111.35–1 of this chapter.

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

§111.15–1 General.

Each battery must be a lead-acid or alkaline type and meet the require-

ments of this subpart. Other types of storage batteries must be accepted by the Commandant.

§ 111.15–2 Battery construction.

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

(b) A battery cell must not spill electrolyte if the battery is inclined at 30 degrees 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), 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 must have a specific gravity that meets Section 16.2 of IEEE Standard No. 45.

§ 111.15–3 Battery categories.

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

(a) *Large.* A large battery installation 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 installation.

(b) *Moderate.* A moderate battery installation is one connected to a battery 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 installation.

(c) *Small.* A small battery installation 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 installation.

§ 111.15–5 Battery installation.

(a) *Large batteries.* Each large battery installation 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., Factory Mutual Research Corp., or other independent laboratory recognized by the Commandant for a Class I, Division 1, Group B location. Devices that may arc, such as switches, battery chargers, and similar devices, must 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 this room or in this area is not allowed.

(b) *Moderate batteries.* Each moderate battery installation 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 if a moderate battery installation is in a ventilated compartment such as the engineroom and is protected from falling objects, a box or locker is not required. A moderate battery installation 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 batteries.* Small size battery installations must be located in well-ventilated spaces. They must not be located in closets, storerooms, or similar spaces.

(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 254 mm (10 in.) of head room.

(e) *Tiers.* When batteries are arranged in two or more tiers, each shelf must have at least 50.8 mm (2 in.) 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, the specific gravity of the electrolyte when fully charged, 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, 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, 1/32 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).

§ 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 outside the duct and compartment and:

(i) Have an explosion-proof motor for a Class I, Division 1, Group B location; or

(ii) Be at least 10 ft. (3 m) from the exhaust end of the duct.

(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 battery installations.* Each battery room for large battery installations must have a power exhaust ventilation system and have openings for intake 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 battery installations.* Each battery room or battery locker for moderate or small battery installations 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) An exhaust duct:

(i) That ends in a mechanically ventilated space or in the weather;

(ii) That extends 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 degrees or less from the vertical; and

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

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

(e) *Deck boxes.* Except for a deck box for a small battery installation, 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 battery installation.* Each box for a small battery installation 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 conductors of engine cranking batteries and batteries with a nominal potential of 6 volts or less. For large storage battery installations, 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 all batteries 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 degrees C, must not exceed the following:

(1) For Class A insulation, 55 degrees C.

(2) For Class B insulation, 80 degrees C.

(3) For Class F insulation, 115 degrees C.

(4) For Class H insulation, 150 degrees C.

(b) If the ambient temperature is higher than 40 degrees 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 protection.

Each transformer must have protection against overcurrent 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.

§ 111.25–5 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 a motor for an application listed in Table 111.25–15 or a similar duty must meet the minimum short-time rating stated in the table.

TABLE 111.25–15

Application of motor	Minimum short-time rating of motor, in hours
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	1/12.
Boat winches	1/12.

Subpart 111.30—Switchboards

§ 111.30–1 Location and Installation.

(a) Each switchboard must:

(1) Be in as dry a location as possible;

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

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

(4) If it is a main switchboard, be in a machinery space that has a ship's service generator. (See § 111.12–11(g) for additional requirements).

(b) Piping must not be run over or in the vacinity of switchboards if practicable. When such runs of piping are necessary, welded joints only must be used and shielding must be installed to prevent spray from steam or pressurized liquids or any leakage from impinging on the switchboard from the top, bottom, or sides in the event of accidental spillage or piping failures.

§ 111.30–3 Accessibility of switchboard components and connections.

Each component and bus bar connection on a switchboard that is not accessible from the rear, except a bus bar connection for a draw-out type circuit breaker, must be within 0.5 m (20 in.) of the front of the switchboard.

§ 111.30–4 Circuit breakers removable from front.

Circuit breakers of the molded-case type, when installed on generator or distribution switchboards, must be mounted or arranged in such a manner that the circuit breaker may be removed from the front without first unbolting bus or cable connections or deenergizing the supply.

§ 111.30–5 Construction.

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

(b) A switchboard must have:

(1) No wood except in handrails and guardrails;

(2) Positioners and stops on hinged panels with a height greater than 45 inches (1.14m) or a width greater than 24 inches (0.6m); and

(3) Wearing parts readily replacable.

(c) Each switchboard must be of sturdy construction with a metal frame. Panels must not be made of metal unless the live parts mounted on it are properly insulated. The supporting framework for all panels must be of rigid construction.

(d) Each switchboard must be secured to a solid foundation and be:

(1) Self-supporting; or

(2) Braced to the bulkhead or deck above.

(e) If a switchboard is braced, the means of bracing must be flexible to allow deflection of the ships structure without buckling the control cell or assembly structure.

(f) Each switchboard must have a dead front.

§ 111.30–9 Mechanical protection.

Each switchboard must have:

(a) Enclosed sides;

(b) A dripshield;

(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.

Electric grade deck coverings meeting MIL–M–15562, non-conducting mats, or non-conducting 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 device 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 not have overload protection if it supplies:

(1) An electric propulsion control;

(2) A voltage regulator;

(3) A ship's service generator circuit breaker tripping control; or

(4) A device that creates a hazard to the vessel if deenergized.

(c) If short circuit protection is used in any of the circuits listed in paragraph (b) of this section, it must be set at not less than 500% of the expected current.

(d) A secondary circuit of a current transformer must not be fused, and 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 a feeder bus that has the same capacity as the capacity of the generator bus to which it 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).

(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 A27 (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 connection must have a locking device to prevent loosening due to vibration 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. 14 AWG (2.1 mm) 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 temperature 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.

§ 111.30–24 Generation systems greater than 3000 kw.

Except on a mobile offshore drilling unit, when the total installed electric power of the ship's service generation system is more than 3000 kw, the switchboard must have the following:

(a) At least two sections of the main bus that are connected by:

(1) A non-automatic circuit breaker;

(2) A disconnect switch; or

(3) Removable links.

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

§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 and §111.50-5.

(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:

(1) A generator field rheostat;

(2) A double-pole field switch;

(3) Discharge clips; and

(4) A 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 lamp 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 for the:

(i) Ship's service power system;

(ii) Normal lighting system; and

(iii) Emergency lighting system.

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

(3) An exciter field rheostat.

(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), must be on the ship's service switchboard or on a central control console that:

(1) Is in the same control area as the main ship's service switchboard or can remotely control the ship's service generator circuit breaker;

(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.

§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 and §111.50-5.

(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

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(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 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:

(1) A generator field rheostat;

(2) A double pole field switch;

(3) Discharge clips; and

(4) A 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 lighting system.

(4) A frequency meter.

(5) An exciter field rheostat.

(6) 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 for the emergency lighting system.

§ 111.30-31 Tests.

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

Subpart 111.33—Power Semiconductor Rectifier Systems

§ 111.33–1 General.

This subpart is applicable to all power semiconductor rectifier systems. In addition to the regulations contained in this subpart, the requirements of §§ 111.30–11, 111.30–19 and 111.30–21 of this part must be met, if applicable.

§ 111.33–3 Nameplate data.

(a) Each semiconductor rectifier system must have a nameplate containing the words "marine semiconductor rectifier," and the following information:

(1) Manufacturer's name and address.
(2) Manufacturer's serial number.
(3) Type.
(4) Rated AC volts.
(5) Rated AC amperes.
(6) Number of phases.
(7) Frequency.
(8) Rated DC volts.
(9) Rated DC amperes.
(10) Ambient temperature range.
(11) Duty cycle.
(12) Cooling medium.

(b) If, on small rectifiers, the information required by paragraph (a) of this section cannot be shown because of space limitations, the nameplate must be at least large enough to contain the manufacturer's name and serial number. The remaining information must be shown on the schematic diagram.

§ 111.33–5 Installation.

(a) Each semiconductor rectifier system must have an adequate heat-removal system that prevents overheating. Rectifiers may be naturally cooled, forced-air-cooled, or water-cooled. An immersed type rectifier must not be used unless:

(1) A non-flammable liquid is used; and

(2) The rectifier system is capable of operation without leakage when the ship is inclined to an angle of 30 degrees each side of the vertical.

(b) Semiconductor rectifier systems must not be located near sources of radiant heat such as steam pipes and engine exhausts.

(c) Semiconductor rectifier systems rated for continuous 50 degrees C ambient temperatures must be installed, except where provisions are made for ensuring an ambient temperature of 40 degrees C or less. Installed systems must be capable of satisfactory operation down to 0 degrees C ambient temperature.

(d) Naturally cooled rectifiers must be installed such that:

(1) The air circulation to and from the rectifier is not restricted; and

(2) The inlet air temperature does not exceed the values for which it was designed.

(e) Forced-air or water-cooled semiconductor rectifiers systems must be installed to prevent application or retention of power on the rectifier unless the cooling is maintained or the maximum operating temperature of the semiconductor rectifier system is not exceeded.

(f) Water-cooled semiconductor rectifiers must operate satisfactorily with an inlet cooling water temperature of 30 degrees C.

(g) Rectifier stacks must have an enclosure that is watertight or dripproof.

§ 111.33–7 Alarms and shutdowns.

Each power semiconductor rectifier must have a high temperature alarm or shutdown, except as provided in § 111.33–11.

§ 111.33–9 Ventilation exhaust.

The exhaust of each forced-air semiconductor rectifier 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.

§ 111.33–11 Propulsion systems.

(a) Each power semiconductor rectifier system in a propulsion system must:

(1) Meet section 35.84.4 of the American Bureau of Shipping's "Rules for Building and Classing Steel Vessels;"

(2) Have current limiting and current rate limiting circuits;

(3) Have external overcurrent protection;

(4) Have a high temperature alarm that activates prior to any high temperature shutdown;

(5) Have internal fuses or other acceptable overcurrent devices that:

(i) Do not operate under external faults; and

(ii) Are coordinated with thyristor capability to protect from internal faults involving only a fraction of the total number of branches in each leg;

(6) Have a system for detecting blown internal fuses; and

(7) Be installed in a place that is as dry as possible.

(b) Each power semiconductor rectifier system in a propulsion system must not have piping run over or in its vicinity, if practicable. If such runs of piping are necessary, welded joints only must be used and shielding must be installed to prevent spray from steam or pressurized liquids or any leakage from impinging on the power semiconductor rectifier from the top, bottom, or sides in the event of accidental spillage or piping failures.

Subpart 111.35—Electric Propulsion

§ 111.35–1 Electrical propulsion installations.

Each electric propulsion installation must meet sections 35.79, 35.81, 35.83, and 35.84 of the American Bureau of Shipping's "Rules for Building and Classing Steel Vessels".

Subpart 111.40—Panelboards

§ 111.40–1 Panelboard standard.

Each panelboard must meet UL 67, Standard for Panelboards, including the Marine Supplement.

§ 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 but not in:

(a) The weather;

(b) A cargo hold, except a cargo hold on a Roll on/Roll off vessel;

(c) A bunker; or

(d) A storeroom.

§ 111.40–9 Locking device.

The door of each panelboard enclosure that is accessible to any passenger must have a 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 or setting of the overcurrent protective device for each circuit.

§ 111.40–13 Rating.

Each panelboard must have a current rating not less than the feeder circuit capacity.

§ 111.40–15 Overcurrent device.

The total load on any overcurrent device located in a panelboard must not exceed 80 percent of its rating if, in normal operation, the load will continue for 3 hours or more; except if the assembly, including the overcurrent device, is rated for continuous duty at 100% of its rating.

Subpart 111.50—Overcurrent Protection

§ 111.50–1 Protection of equipment.

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

(a) Appliances, Subpart 111.77.

(b) Generators, Subpart 111.12.

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

(d) Transformers, Subpart 111.20.

§ 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 which must meet the following listed subparts of this chapter:

(1) Propulsion circuits, Subpart 111.35.

(2) Steering circuits, Subpart 111.93.

(3) Motor circuits, Subpart 111.70.

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

(5) Switchboard circuits, Subpart 111.30.

(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 and the next larger size or rating is used, it must not be larger than 150 percent of the allowable current carrying capacity of the conductor. The effect of heat on the operation of fuses must be taken into consideration in the application of the fuses if they are subjected to extremely low or high temperatures.

(d) *Circuit breakers.* If the allowable current-carrying capacity of the conductor does not correspond to a standard circuit breaker rating that meets Section 240-6 of the National Electrical Code and the next larger rating is used, it must not be 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.* An overcurrent protective device must not be connected in parallel with another overcurrent protective device.

(f) *Thermal devices.* A thermal cutout, thermal relay, or other device not designed to open a short circuit, must not 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.

(h) *Grounded conductor.* An overcurrent device must not 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. (See § 111.12-11(g) for additional requirements.)

(2) The overcurrent protection for the shore connection conductors must meet § 111.30-25.

(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 single phase transformer (two wire with single-voltage secondary) 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, and this protection meets § 111.20-15 of this chapter, an overcurrent device is not required at the supply to the secondary side conductors.

(b) *Location on vessel.* Each overcurrent device:

(1) Must be:

(i) Readily accessible; and

(ii) In a distribution panelboard, switchboard, motor controller, or similar enclosure; and

(2) Must not be:

(i) Exposed to mechanical damage; and

(ii) Near an easily ignitable material or where explosive gas or vapor may accumulate.

§ 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 accepted by the Commandant.

§ 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 equipment vital to the propulsion, control or safety of the vessel 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 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 1500 kilowatts.

The following short-circuit assumptions must be made for a system with an aggregate generating capacity below 1500 kilowatts, unless detailed computations in accordance with § 111.52–5 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.

§ 111.52–5 Systems 1500 kilowatts or above.

Detailed short-circuit calculations must be submitted for systems with an aggregate generating capacity of 1500 kilowatts or more utilizing one of the following calculation methods:

(a) An exact calculation utilizing actual impedances or reactances of the electrical equipment.

(b) An estimated calculation utilizing the Naval Sea Systems Command Design Data Sheet DDS 9620–3, "A.C. Fault Current Calculations."

Subpart 111.53—Fuses

§ 111.53–1 General.

(a) Each fuse must:

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

(2) Have an interrupting rating sufficient to interrupt the maximum asym-

metrical RMS short-circuit current at the point of application; and

(3) Be listed by Underwriters Laboratories Inc. or other independent laboratory recognized by the Commandant.

(b) Plug fuses of the Edison-base type and renewable link cartridge-type fuses must not be used.

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 chapter;

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

C ambient temperature. If the circuit breaker is located in an environmentally controlled machinery control room where provisions are made for ensuring an ambient temperature of 40 degree C or less, a circuit breaker must have at least the standard 40 degrees C ambient temperature calibration.

§ 111.54-3 Remote control.

Remotely controlled circuit breakers must have local manual means of operation.

[CGD 81-030, 53 FR 17847, May 18, 1988]

Subpart 111.55—Switches

§ 111.55-1 General.

(a) Each switch must meet Article

overcurrent device can withstand (Iw). This can be expressed by the formula:

$Ip < Iw \times 0.9$ amperes

where

Iw=Irms × K amperes

Irms=Symmetrical RMS short circuit current rating of the overcurrent device being protected

K=Ratio of maximum instantaneous peak amperage in one phase during the first cycle after short-circuit occurs to the symmetrical RMS short-circuit current the circuit breaker was tested at.

(b) Current-limiting devices must open in a maximum of ½ cycle, or the let-through energy (I^2t) must not be greater than that given by the following formula:

$I^2t < (Irms)^2 \times 0.01$ ampere^2 sec

(c) The values used in paragraphs (a) and (b) of this section are to be obtained as follows:

(1) "Ip" and "I^2t" from fuse manufacturer's curves.

(2) "Irms" from circuit breaker nameplate data.

(3) "K" of molded case circuit breakers meeting the requirments of UL 489 are as follows:

CIRCUIT BREAKER INTERRUPTING

Rating (amperes)	K
10,000 or less	1.61
10,001 to 20,000	1.91
Over 20,000	2.14

(4) "K" of low voltage power curcuit breakers meeting ANSI/IEEE Standard C37.13 is 2.3.

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

NOTE: A fused circuit breaker using current-limiting fuses meeting the requirements of UL 489, Standard for Molded Case Circuit Breakers or IEEE standard No. 538, Low Voltage AC Integrally Fused Power Circuit Breakers for such a combination can be considered as satisfactorily meeting paragraphs (a) and (b) of this section.

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 need mechanical cooling to operate within its rating.

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 be one of the following exceptions:

(a) Electric cable constructed in accordance with Military Specification MIL-C-915 if:

(1) It is substituted for the equivalent IEEE Standard No. 45 cable type or is a thermocouple or pyrometer cable;

(2) The particular type of cable can pass the flammability test contained in section 18.13.5 of IEEE Standard No. 45; and

(3) The maximum current for any conductor does not exceed the current carrying capacities specified in NAVSEA Design Data Sheet DDS 304-2.

(b) Electric cable which has a polyvinyl chloride insulation with a nylon jacket (Type N), if it meets the requirements for polyvinyl chloride insulated cable in Section 18 of IEEE Standard No. 45 except:

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

(2) Each conductor must have a nylon jacket;

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

(4) The material of the nylon jacket must meet ASTM D789 Type VIII; and

(5) The cable must have identification provided by a durable printing or embossing on the cable jacket, or a marker under the cable jacket that, at intervals not exceeding 24 inches (610 mm), gives:

(i) The information required by Section 18.8 of IEEE Standard No. 45;

(ii) The information required by Section 310-11 of the NEC; or

(iii) The manufacturer's name, identification code, voltage rating, number of conductors, and conductor size.

(c) Cable constructed in accordance with other standards if accepted for

specific applications by the Commandant.

§ 111.60–3 Cable application.

(a) Cable application must meet Section 19 except 19.6.1 and 19.6.4 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.

§ 111.60–4 Minimum cable conductor size.

(a) Each cable conductor must be No. 18 AWG (0.82 mm^2) or larger except:

(1) Each power and lighting cable conductor must be No. 14 AWG (2.08 mm^2) or larger; and

(2) Each thermocouple or pyrometer cable conductor must be No. 22 AWG (0.33 mm^2) or larger.

§ 111.60–5 Cable installation.

(a) Each cable installation must meet Sections 20 and 22, except 20.11, of IEEE Standard No. 45.

(b) Cable must not be located in any tanks except to supply equipment or instrumentation specially designed for and compatible with such location and whose function require its installation in the tank. The cable must be compatible with the liquid or gas in the tank or be protected by an enclosure.

§ 111.60–7 Demand loads.

Generator, feeder, and bus-tie cables must be selected on the basis of a computed load of not less than the demand load given in Table 111.60–7.

TABLE 111.60–7—DEMAND LOADS

Type of circuit	Demand load
Generator cables	115 percent of continuous generator rating.
Switchboard bus-tie, except ship's service to emergency switchboard bus-tie.	75 percent of generating capacity of the larger switchboard.
Emergency switchboard bus-tie	115 percent of continuous rating of emergency generator.
Motor feeders	Article 430, National Electrical Code.
Galley equipment feeder	100 percent of either the first 50 KW or one-half the connected load, whichever is the larger, plus 65 percent of the remaining connected load, plus 50 percent of the rating of the spare switches or circuit breakers on the distribution panel.
Lighting feeder	100 percent of the connected load plus the average active circuit load for the spare switches or circuit breakers on the distribution panels.
Grounded neutral of a dual voltage feeder	100 percent of the capacity of the ungrounded conductors when grounded netural is not protected by a circuit breaker overcurrent trip, or not less than 50 percent of the capacity of the ungrounded conductors when the grounded neutral is protected by a circuit breaker overcurrent trip or overcurrent alarm.

§ 111.60–9 Segregation of vital circuits.

(a) *General.* A branch circuit that supplies equipment vital to the propulsion, control, or safety of the vessel 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 separated vertically and horizontally as much as practicable.

§ 111.60–11 Wire.

(a) Wire must be in an enclosure.

(b) Wire must be of the stranded type.

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

(d) Switchboard wire must meet Subpart 111.30.

(e) Wire, except in lighting fixtures and switchboards, must meet:

(1) MIL–W–76;

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

(3) UL 44; or

(4) UL 83.

(f) The installation of wire that meets UL 44 or UL 83 must meet Tables

310–16 and 310–17 of the National Electrical Code.

(g) Each wire must be No. 18 AWG (0.82 mm²) or larger, except in switchboards where it must be No. 14 AWG (2.08 mm²) or larger.

§ 111.60–13 Flexible electric cord and cables.

(a) *Construction and testing.* Each flexible 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 flexible 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 flexible cord must not carry more current than allowed under Table 400–5 of the National Electrical Code, NEMA WC 3 or NEMA WC 8.

(d) *Conductor size.* Each flexible cord must be No. 18 AWG (0.82 mm²) or larger.

(e) *Splices.* Each flexible cord and cable must be without splices or taps except for a cord or cable No. 12 AWG (3.3 mm²) or larger spliced for repairs in accordance with § 111.60–19.

(f) *Pull at joints and terminals.* Each flexible 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.

§ 111.60–17 Connections and terminations.

(a) Each connection to a conductor or terminal part of a conductor that is larger than No. 10 AWG (5.3 mm²) must be made within an exclosure and have:

(1) A pressure-type connector on each conductor;

(2) A solder lug on each conductor;

(3) A splice made with a pressure-type connector to a flexible lead or conductor; or

(4) A splice that is soldered, brazed, or welded to a flexible lead or conductor.

(b) Each connection to a conductor or a terminal part of a conductor that is No. 10 AWG (5.3 mm²) or smaller must be made within an exclosure and:

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

(2) Have clamps or screws with terminal plates that have up turned lugs or other suitable means to capture the terminal.

(c) A connector or lug of the set screw type must not be used with stranded conductors smaller than No. 14 AWG (2.1 mm²) 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 and lug must meet UL 486A.

(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 (MILLIMETERS)

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)

(f) Wire connectors utilized in conjunction with screw-type terminal blocks must be of the captive type such as the ring or the flanged spade type.

§ 111.60–19 Cable splices.

(a) A cable must not be spliced except;

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

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

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

(4) A cable spliced to replace a damaged section of the cable if, before replacing the damaged section, the insulation resistance of the remainder of the cable is measured and it is determined that the condition of the insulation is unimpaired.

(b) Each cable 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 meets UL 486A.

(2) Replacement insulation that has:

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

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

(iii) 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. This includes meeting the jacket requirements of section 18.9 and Tables A11 and A12 of IEEE Standard No. 45.

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

(d) A cable must not be spliced in a hazardous location using the method of this section except in intrinsically safe circuits.

§ 111.60–21 Cable insulation tests.

All electric power and lighting cable and associated equipment must be checked for proper insulation resistance to ground and between conductors. The insulation resistance must not be less than that in paragraph 46.2.1 of IEEE Standard No. 45.

Subpart 111.70—Motor Circuits, Controllers and Protection

§ 111.70–1 General.

(a) Each motor circuit, controller, and protection must meet Article 430 of the National Electrical Code, except:

(1) Each fire pump motor circuit and protection must meet the same requirements in the National Electrical Code as each other motor circuit in lieu of the protection requirements contained in the fire pump portions of sections 430–31 and 430–72;

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

(3) Each propulsion motor circuit and protection must meet Subpart 111.35 of this chapter;

(b) In three phase alternating-current systems, only two motor-running protective devices need be utilized in any two ungrounded conductors in lieu of the three specified by Table 430–37 of the National Electrical Code except when a wye-delta or a delta-wye transformer is utilized.

(c) The motor disconnecting means must be an externally operable switch or circuit breaker.

§ 111.70–3 Motor controllers and motor control centers.

(a) *General.* Each controlling apparatus, except for those installed in a compartment meeting the requirements of paragraph (b) must be protected by an enclosure case that is either dripproof or watertight, depending on its location. Indoor metal enclosed switchgear must be installed in dry locations. If there is a cable entrance plate in a watertight enclosure or in the top of a dripproof enclosure, the plate must be a 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 of the open type must:

(1) Be in a compartment or enclosure that is:

(i) Only for electric control equipment; and

(ii) Accessible only to qualified persons; or:

(2) Have screens or guardrails, if the compartment in which it is installed is used for other apparatus and the location of the open controller is where it is subject to accidental contact.

(c) *Hinged doors.* Each controller hinged door with a height greater than 45 inches (1.14 m), 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 door-mounted equipment is exposed to accidental contact by a per-

son 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, including the marine supplement. 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 vital propulsion auxiliary that can be restarted from a central control station, 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.

NOTE: Automatic sequential starting of low voltage release controllers is acceptable to meet this requirement.

(g) *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).

(h) *Identification of controllers.* In addition to the markings required by UL Standards referenced in paragraph (d) of this section, each controller must:

(1) Identify on the external surface of its enclosure the motor that it controls; and

(2) Contain a durable heat-resistant elementary wiring diagram of the controller fixed to the inside of its door.

(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) *Heel angle.* Each controller contactor must be designed for satisfactory operation at a 22.5 degree angle of inclination in any direction, and any controller that utilizes liquid must not leak when inclined at a 30 degree angle.

§ 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 from its source of potential by a disconnect device independent of the enclosure containing the heater. The heater disconnecting device must be adjacent to the equipment disconnect device, and a fixed sign, warning the operator to open both devices, must be on the enclosure of the equipment disconnect device except as provided in paragraph (b) of this section.

(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 must be fixed to the enclosure if the disconnect arrangement required by paragraph (a) of this section is not used. 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 must be protected against overcurrent unless:

(1) The conductor is wholly within the controller enclosure;

(2) 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;

(3) 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

(4) 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 of this chapter.

(b) *Accidental ground.* The controller must be designed to prevent an accidental ground in a remote control circuit from causing the stop switches to fail to operate or causing the motor to start.

(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 device, 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 a 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 device and the potential of the control, interlock, or indicator circuit is more than 24 volts, there must be one of the following alternative methods of switching:

(1) 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.

(2) 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 not have any 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, to the extent possible, a 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 practicable.

(b) *Machinery spaces.* Lighting for enginerooms, boilerrooms, and auxiliary machinery spaces must be supplied from two or more feeders. One of these feeders must be a ship's service feeder.

(c) *Cargo spaces.* There must be separate feeders for cargo space lighting. Distribution panels must be outside cargo spaces except on roll on/roll off vessels.

NOTE: Special requirements for emergency lighting, feeders, and branch circuits are in Subpart 112.43 of this chapter.

§111.75-5 Lighting branch circuits.

(a) *Loads.* A lighting distribution panel must not supply branch circuits rated at over 30 amperes.

(b) *Voltages.* A lighting branch circuit voltage must not exceed 150 volts to ground, except a cargo hold or deck lighting branch circuit supplying only the ballasts of electric-discharge lamps

mounted in permanently installed fixtures which must not exceed 500 volts between conductors.

(c) *Connected load.* The connected load on a lighting branch circuit must not be more than 80 percent of the rating of the overcurrent protective device, computed on the basis of the lamp sizes, but must be 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 receptacle 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 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 20 amperes or less, except as allowed under paragraph (f) of this section. Each lighting branch circuit with an overcurrent device rated or set at:

(1) 15 amperes or less must have a No. 14 AWG (2.1 mm^2) or larger branch circuit conductor and fixture wire or flexible cord in each lighting fixture of No. 18 AWG (0.82 mm^2) or larger; and

(2) 20 amperes must have a No. 12 AWG (3.3 mm^2) or larger branch circuit conductor and fixture wire or flexible cord in each lighting fixture of No. 14 AWG (2.1 mm^2) or larger.

(f) *25 or 30 ampere lighting branch circuits.* Lighting branch circuits rated at 25 and 30 amperes supplying only fixed nonswitched lighting fixtures for cargo hold or deck lighting 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 (5.3 mm^2) conductors if each fixture wire used in wiring each lighting fixture is No. 12 AWG (3.3 mm^2) or larger.

(g) *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, boilerroom, 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 (3.2 mm) print throughout the normally occupied areas.

(d) *Berth lights.* Each crew berth must have a fixed berth light that is not wired with a flexible cord. The berth light must have minimum horizontal 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 mm) high.

(f) *Pilot ladders.* There must be a means for lighting each station from which a pilot may be deployed.

§ 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 flexible cord without the use of a receptacle outlet; and

(3) Be supplied from the emergency source of lighting and power.

§ 111.75–17 Navigation lights.

Each navigation light system must meet the following:

(a) *Feeders.* On vessels required to have a final emergency power source by §112.05–5(a) of this chapter, each navigation light panel must be supplied by a feeder from the emergency switchboard (see §112.43–13). The feeder must be protected by overcurrent devices rated or set at a value of at least twice that of the navigation light panel main fuses.

(b) *Navigation light indicator panel.* Each self-propelled vessel must have a navigation light indicator panel in the wheelhouse to control side, masthead, stern, and range lights. The panel must visually and audibly signal the failure of each of these navigation lights. Each light source must be connected to a separate fused branch circuit. The panel must have a fused feeder disconnect switch, and the fuses must have at least twice the rating of the largest branch circuit fuse and must be greater than the maximum panel load.

(c) *Dual light sources.* Each self-propelled vessel must have duplicate light sources for the side, masthead, stern, and range lights.

(d) *Navigation lights.* Each navigation light must:

(1) Be of a type approved by the Commandant;

(2) Meet the technical details in the applicable navigation rules;

(3) Meet UL 1104; and

(4) If it is a flashing light, have its intensity determined by the formula:

$$Ie=G/(0.2+t2-t1)$$

Where

Ie=Luminous Intensity.

G=Integral of Idt evaluated between the limits of t1 and t2.

t1=Time in seconds of the beginning of the flash.

t2=Time in seconds of the end of the flash.

I=Instantaneous intensity during the flash.

NOTE: The limits, t1 and t2, are to be chosen so as to maximize Ie.

(e) *Installation of navigation lights.* Each navigation light must:

(1) Be installed so that its location and its angle of visibility meet the applicable navigation rules;

(2) Except as permitted by the applicable navigation rules, be arranged so that light from a navigation light is not obstructed by any part of; the vessel's structure or rigging;

(3) Be wired by a short length of heavy-duty, flexible cable to a watertight receptacle outlet next to the light; and

(4) If is a double lens, two-lamp type, have each lamp connected to its branch circuit conductors by an individual flexible cable and receptacle plug.

(f) *Light screens.* Light screens must meet the applicable navigation rules.

§ 111.75–18 Signaling lights.

(a) Each self-propelled vessel of 300 gross tons and over on an international voyage must have a daylight signaling light that meets the following:

(1) 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.

(2) The axial luminous intensity of the beam must be at least 60,000 candelas.

(3) The luminous intensity of the beam in every direction within an angle of 0.7 degree from the axial must be at least 50 percent of the axial luminous intensity.

(4) The signaling light must have a sighting arrangement that the operator can use to direct the beam to the receiving station.

(5) Signaling must be by keying the current through the lamp or by movement of shutters.

(6) Each signaling light must be:

(i) A fixed unit mounted on the top of the wheelhouse;

(ii) A semi-fixed unit with arrangements for quick mounting at either wing of the navigating bridge; or

(iii) A portable unit.

(7) 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.

(b) Each self-propelled vessel of over 150 gross tons and less than 300 gross tons on an international voyage must have:

(1) A daylight signaling light that meets the requirements of §111.75–18(a); or

(2) A hand held portable light of at least 60,000 candelas with a means for rapidly switching on and off and 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) Each fixture globe, lens, or diffuser must have a high strength 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.

(c) No fixture may be used as a connection box for a circuit other than the branch circuit supplying the fixture.

(d) Lighting fixtures must be installed as follows:

(1) Each fixture in the weather or in a location exposed to splashing water must be watertight. Each fixture in a damp or wet location must at least be dripproof.

(2) Each fixture and lampholder must be fixed. A fixture must not be supported by the screw shell of a lampholder.

(3) Each pendent-type fixture must be suspended by and supplied through a threaded, rigid conduit stem.

(4) 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 item of electric cooking equipment must meet UL 197, including the Marine Supplement.

(b) All equipment must be mounted to prevent dislodgment by roll or pitch.

§ 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 in a damp or wet location 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 receptable 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) flexible 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 grounding pole.

§ 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 with corrosion-resistant finishes, except that 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.

A receptacle outlet in a location that is accessible to other than a qualified person must not have any exposed live parts with the plug opening uncovered. 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 flexible 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 makeup and receive power from the towboat or adjoining barge in other makeups, the receptacles must be male and reverse service. Plugs of flexible cable must be female and must be at both ends of the flexible 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 supplied by different potentials or by different types of potentials, 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.

Receptacles for refrigerated containers must meet one of the following:

(a) Each receptacle for refrigerated containers must have a switch interlocked in such a way that the receptacle's contacts are deenergized before the making or breaking of the connection between the plug and receptacle contacts.

(b) Each group of receptacles for refrigerated containers must have:

(1) A switch near the receptacles that disconnects all power to those receptacles; and

(2) A sign stating that the switch should be opened before cables are disconnected from the receptacles or refrigerated containers.

(c) Each receptacle for refrigerated containers must be designed for circuit breaking service.

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 must 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 similar purpose, must not penetrate the total thickness of the box wall.

§ 111.81-13 Construction.

(a) The construction of each box must meet UL 50 or UL 514.

(b) 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 flexible 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 the shore connection cable. The box must provide protection to 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 thermal 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.

(e) The external temperature of a heater enclosing case must not be over 125 degrees C, except that the external temperature of the enclosing case of a flush-mounted heater must not be over 100 degrees C. If a heater is mounted on or next to a deck or bulkhead, the heater must not cause the temperature of the nearest deck or bulkhead to be over 55 degrees C. For test purposes, an ambient temperature of 25 degrees C must be used.

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 111.95—Electric Power-Operated Boat Winches

§111.95–1 Applicability.

(a) 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.

(b) The provisions of this subpart supplement the requirements of §33.10–5 and Subparts 75.30, 94.35, and 160.015 of this chapter.

§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 the 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 purposes 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.

(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 chapter.

(c) *Motors.* Motors must be waterproof or watertight.

TABLE 111.95—MINIMUM SPACINGS IN INCHES (MILLIMETERS)

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)	⅜ (9.5)
Over surface	½ (12.7)	⅝ (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)

§ 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 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. The switch must be in series with and on the supply side of the main line emergency switch.

(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 switch, 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 gravity davit installations, in a position from which the movement of boat davit arms can be observed as they approach the final stowed position.

NOTE: Typical boat winch wiring diagrams and arrangement drawings are shown in Figures 111.95–7(e)(1) through 111.95–7(e)(5). The arrangment of the equipment shown is diagrammatical. The fact that some show direct-current motors and some show alternating-current motors has no particular significance.

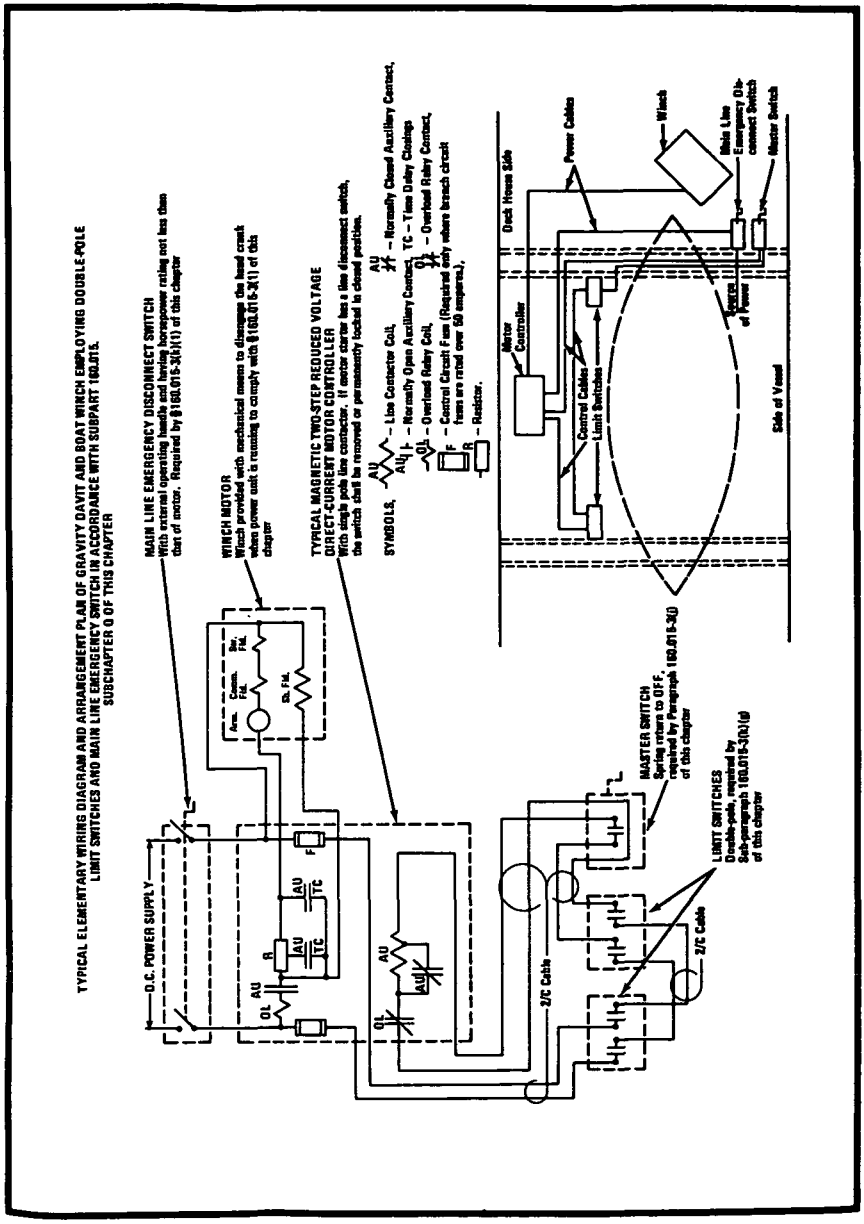

Figure 111.95-7(e)(1)

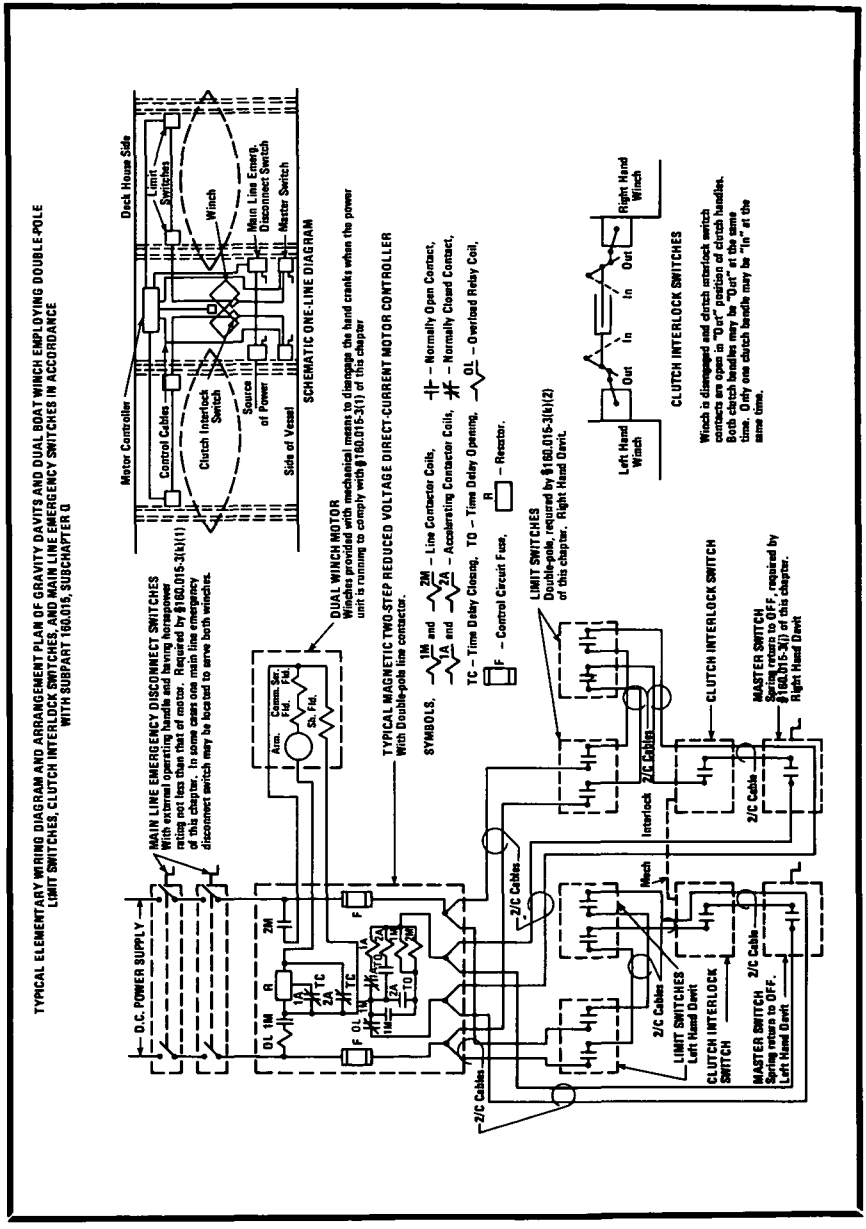

Figure 111.95-7(e)(2)

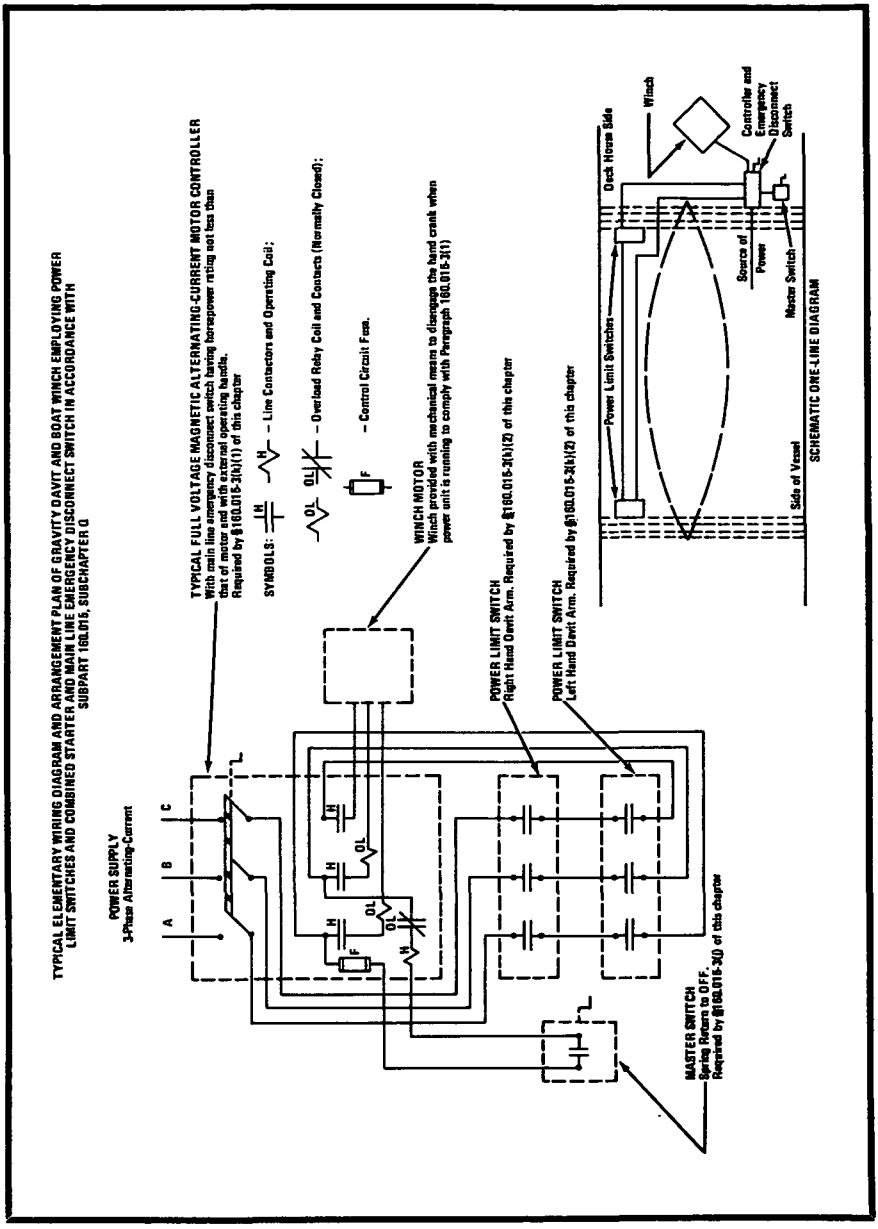

Figure 111.95–7(e)(3)

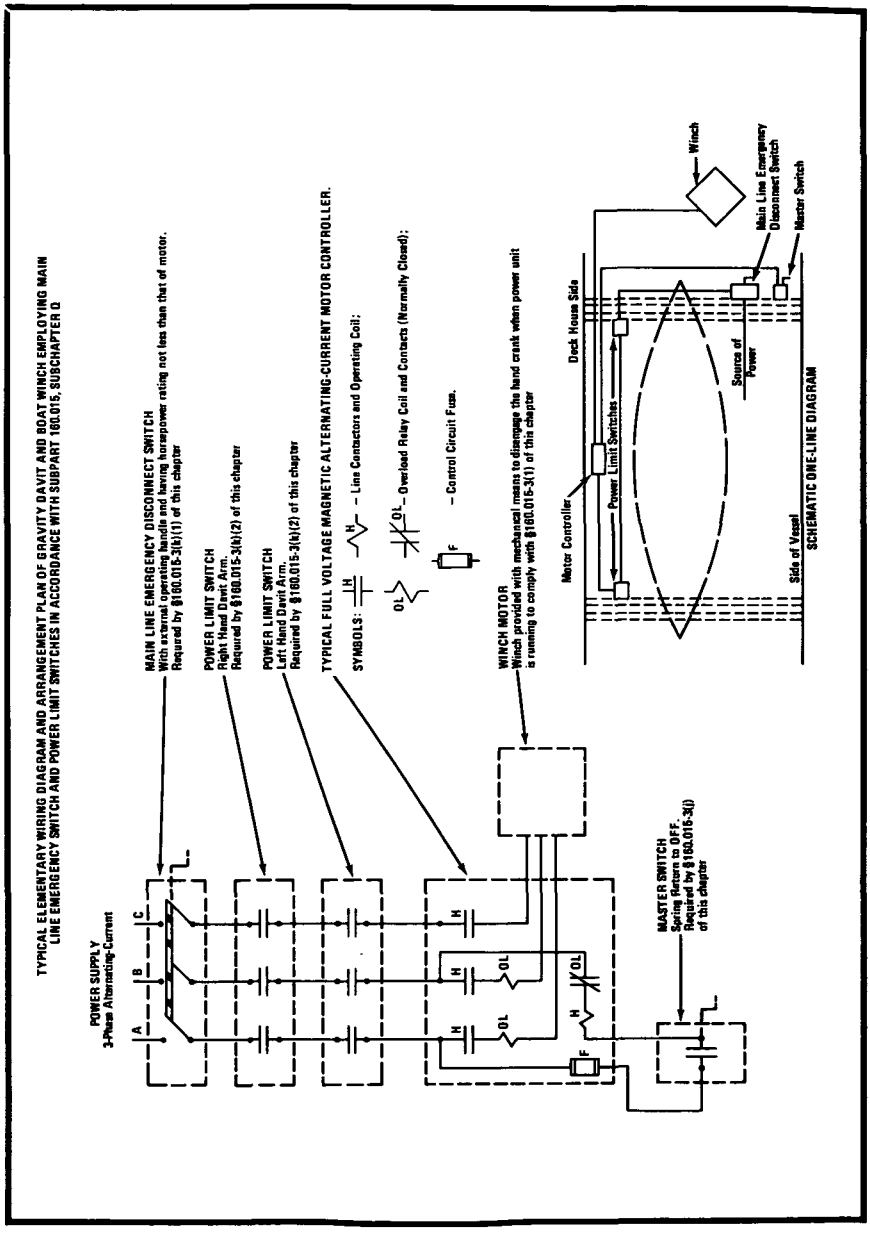

Figure 111.95-7(e)(4)

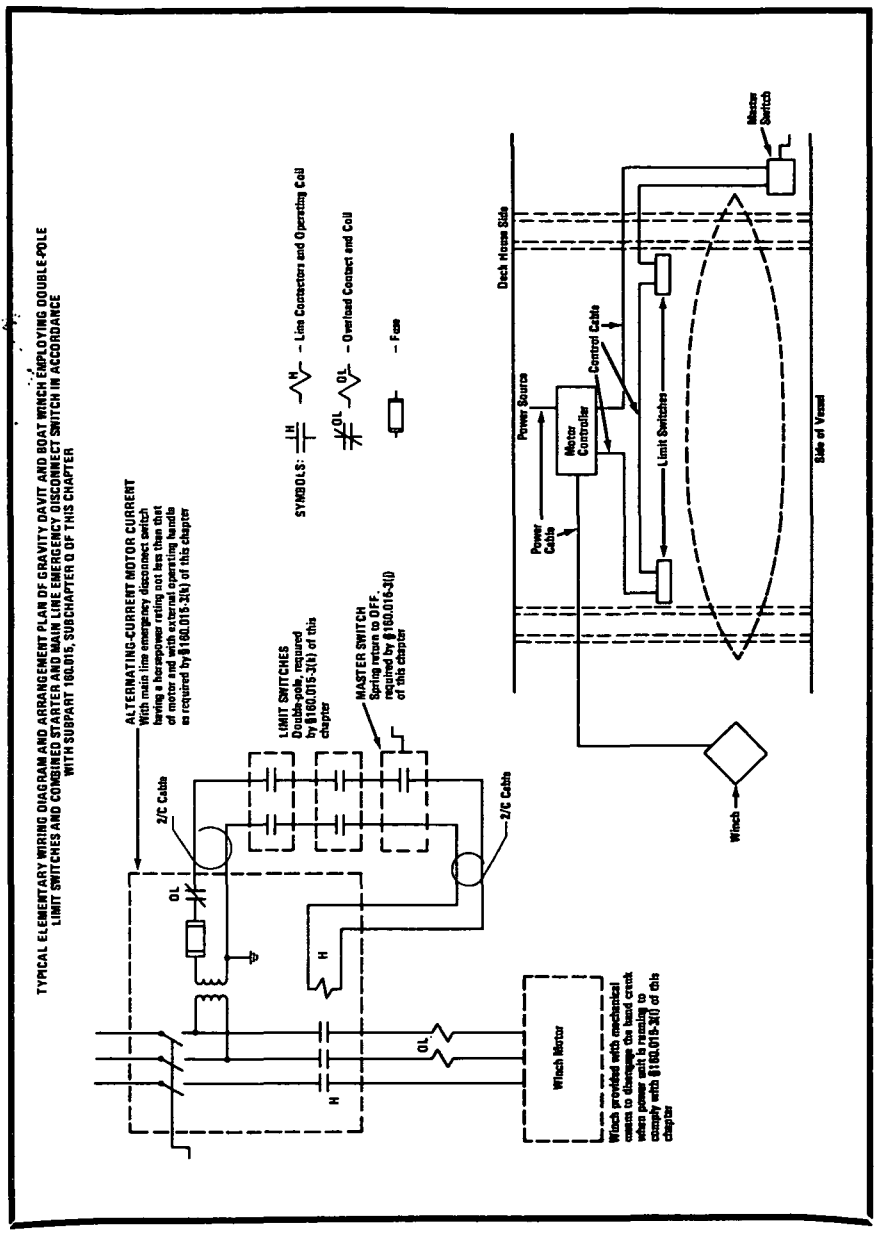

Figure 111.95-7(e)(5)

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 H of Part 170 of this chapter.

[CGD 79-023, 48 FR 51008, Nov. 4, 1983]

§ 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 operating system 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 or sequentially as allowed by § 163.001-5(b) of this chapter.

(c) The power supply for each hydraulically operated watertight door system that uses a hydraulic system common to more than one watertight 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 automatic 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 accepted 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 a watertight door operating system must be above the uppermost continuous deck.

(c) Each watertight door operating system 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:

(a) *Central control station* means a manually-operated device in the wheelhouse or fire control room for releasing one or more firescreen doors;

(b) *Firescreen door* means a door on a passenger vessel that is in a stairway enclosure or main vertical zone bulkhead and is not usually kept closed;

(c) *Firescreen door holding magnet* means an electromagnet for holding a firescreen door open; and

(d) *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 firescreen 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 an enclosed, externally operable, fused switch having a rating of not less than 10-T 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 except 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 degrees C with a temperature rise by thermometer measurement of not more than 55 degrees C for Class A insulation and not more than 80 degrees C for Class B insulation. 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 foward 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(a)(2)(i) of this chapter.

§ 111.101-3 General requirements.

(a) Each electric motor driving a 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, if of the open type, must be 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 able to operate continuously at rated load under any condition, dry or with water in the air bell at any level up to the maximum allowed under paragraph (a) of this section.

(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 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 power ventilation system to which this section is applicable; and

(b) In addition to the control required by paragraph (a), a stop control that is:

(1) As far as practicable from the control required by paragraph (a) and grouped with the controls for every power ventilation system to which this section is applicable; 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, one of which may be the supply circuit breaker.

(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.

§ 111.103–7 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; and

(e) 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 any other fuel oil pumps 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.

NOTE: 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.

§ 111.105–5 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.

§ 111.105–7 Approved equipment.

If the National Electrical Code states that an item of electrical equipment is to be "approved," that item must be:

(a) One that is listed by Underwriters Laboratories Inc., Factory Mutual Research Corp., or other independent laboratory recognized by the Commandant, for use in the hazardous location in which it is located; or

(b) Purged and pressurized equipment that meets NFPA No. 496.

§111.105–9 Explosion-proof equipment.

Each item of electric equipment that is required under this subpart to be explosion-proof must be listed by Underwriters Laboratories Inc., Factory Mutual Research Corp., or other independent laboratory recognized by the Commandant, for use:

(a) In a Class I Division 1 location;

(b) With the Group of the cargo carried; and

(c) In a Group B atmosphere, if the cargo is an inorganic acid.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 82–096, 49 FR 4947, Feb. 9, 1984]

§111.105–10 Purged and pressurized equipment.

Purged and pressurized equipment must meet the requirements of NFPA No. 496.

§111.105–11 Intrinsically safe systems.

(a) If a rule in this subpart states that an electric system is to be intrinsically safe, the system must be listed as intrinsically safe by Underwriters Laboratories Inc., Factory Mutual Research Corp., or other independent laboratory recognized by the Commandant, for use in the hazardous location in which it is located.

(b) Each electric cable for an intrinsically safe system must:

(1) Be 2 inches (50 mm) or more from cable of non-intrinsically safe circuits;

(2) Be partitioned by a grounded metal barrier from other non-intrinsically safe electric cables; or

(3) Be a shielded cable.

(c) The manufacturer must submit installation instructions and restrictions on the approved system. Typical restrictions that must be specified include:

(1) Voltage limitations;

(2) Allowable cable parameters;

(3) Maximum length of cable permitted; and

(4) Ability of system to accept passive devices.

(d) Intrinsically safe systems must not be interconnected unless the systems were approved with the particular arrangement.

(e) The deck wiring diagram required by Part 110 of this subchapter must specify:

(1) System identification as to manufacturer's model number;

(2) System use;

(3) Cable parameter including length and type of cable;

(4) Wiring and equipment locations; and

(5) Installation details.

§111.105–15 Wiring methods for Class I hazardous locations.

(a) Cable for a Class I, Division 1, hazardous locations, and locations designated in §§111.105–31 and 111.105–32, except as provided in paragraphs (b) and (c) of this section must:

(1) Be armored or MI type cable; and

(2) Meet Subpart 111.60 of this chapter.

(b) Cable for use in an intrinsically safe system must meet:

(1) Subpart 111.60 and §111.105–11(b) of this chapter; and

(2) The recommendations of ISA RP 12.6 "Installation of Intrinsically Safe Instrument Systems in Class I Hazardous Locations," except Appendix A.1.

(c) Flexible cords and cables must meet §111,60–13 of this chapter.

(d) Each explosion-proof enclosure that is in a Class I location must have an approved explosion-proof seal fitting that is:

(1) Treaded directly into the enclosure; or

(2) Connected to the enclosure by a piece of approved explosion-proof rigid metal conduit that is 18 inches (460 mm) or less in length.

§111.105–17 Wiring methods for Class II and Class III hazardous locations.

(a) Cable for a Class II or III hazardous location must:

(1) Be armored or MI type cable if installed in a Division 1 hazardous location; and

(2) Meet Subpart 111.60 of this part.

(b) Each cable entrance to electric equipment in Class II and Class III haz-

ardous locations must have a dust-tight terminal tube.

§ 111.105–19 Switches.

Each explosion-proof switch and each switch controlling explosion-proof equipment must have a pole for each ungrounded circuit conductor.

§ 111.105–21 Fans.

Each fan for ventilation of a hazardous location must be a nonsparking fan.

§ 111.105–23 Fan motors.

Each electric motor for a fan that ventilates a hazardous location must be listed by Underwriters Laboratories, Inc., Factory Mutual Research Corp., or other independent laboratory recognized by the Commandant, 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 degrees C (140 degrees F) or higher must have:

(a) Only intrinsically safe electric systems in cargo tanks; and

(b) No storage battery in any cargo handling room.

§ 111.105–31 Flammable or combustible cargo with a flashpoint below 60 degrees C (140 degrees F), liquid sulfur and inorganic acid carriers.

(a) *Applicability.* Each vessel that carries combustible or flammable cargo with a closed-cup flashpoint lower than 60 degrees C (140 degrees F) or liquid sulphur cargo, or inorganic acid cargo must meet the requirements of this section, except—

(1) A vessel carrying bulk liquefied flammable gases as a cargo, cargo residue, or vapor which must meet the requirements of § 111.105–32; and

(2) A vessel carrying carbon disulfide must have only intrinsically safe electric equipment in the locations listed in paragraphs (e) through (l) 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;

(2) Be arranged so that there is light for relamping any deenergized lighting circuit; and

(3) Not have the switch within the space for those spaces containing explosionproof lighting fixtures under paragraphs (g), (i) and (j) of this section.

(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 shutdown 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.* A cargo tank must not contain any electric equipment except:

(1) Intrinsically safe equipment;

(2) Submerged cargo pumps; and

(3) Supply cable for submerged cargo pumps.

(f) *Cargo handling rooms.* A cargo handling room must not have any electric cable or other electric equipment, except:

(1) Intrinsically safe equipment;

(2) Explosionproof lighting fixtures;

(3) Cables supplying intrinsically safe equipment in the cargo handling room; and

(4) Armored or MI type cables that supply explosionproof lighting fixtures that are in the cargo handling room.

(g) *Lighting of cargo handling rooms.* Lighting for a cargo handling room except a cargo handling room under paragraph (h) of this section, 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 .025 inches (6.35 mm) thick and arranged to maintain the watertight and gastight integrity of the structure. The fixed glass lens may form a part of a listing fixture if the following are met:

(1) There is no access to the interior of the fixture from the cargo handling room.

(2) The fixture is vented to the engineroom or a similar nonhazardous area.

(3) The fixture is wired from outside the cargo handling room.

(4) The temperature on the cargo handling room surface of the glass lens, based on an ambient temperature of 40 degrees C, is not higher than 180 degrees C.

(h) A cargo handling room which precludes the lighting arrangement of paragraph (g) of this section, or where the lighting arrangement of paragraph (g) of the section does not give the required light, must have explosionproof lighting fixtures.

(i) *Enclosed spaces.* An enclosed space that is immediately above, below, or next to a cargo tank must not contain any electric equipment except equipment allowed for cargo handling rooms in paragraphs (f) and (g), and:

(1) Through runs of armored or MI type cable; and

(2) Watertight enclosures with bolted and gasketed covers containing only:

(i) Depth sounding devices;

(ii) Log devices; and

(iii) Impressed-current cathodic protection system electrodes.

(j) *Cargo hose stowage space.* A cargo hose stowage space must not have any electric equipment except explosionproof lighting fixtures and through runs of armored or MI type cable.

(k) *Cargo piping in a space.* A space that has cargo piping must not have any electrical equipment except explosionproof lighting fixtures and through runs of armored or MI type cable.

(l) *Weather locations.* A location in the weather, except on an inorganic acid carrier, must have only explosionproof electrical equipment, purged and pressurized equipment, and through runs of armored or MI type cable if it is—

(1) Within 10 feet (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 tankship and on the open deck over the cargo area and 10 feet (3 m) forward and aft of the cargo area on the open deck and up to 8 feet (2.4 m) above the deck.

(m) *Other spaces.* Except for those spaces listed in paragraphs (e) through (k), a space that has a direct opening to any space listed in paragraphs (e) through (l) must have only the electric installations that are allowed for the space to which it opens.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 82–096, 49 FR 4947, Feb. 9, 1984]

§111.105–32 Bulk liquefied gas and ammonia carriers.

(a) Each vessel that carries bulk liquefied flammable gases or ammonia as a cargo, cargo residue, or vapor must meet the requirements of this section.

(b) As used in this section:

(1) The terms "gas-safe" and "gas-dangerous" spaces are used as defined in §154.7 of this chapter.

(2) The term "gas-dangerous" does not include the weather deck of an ammonia carrier.

(c) Each submerged cargo pump motor installation must be approved by the Commandant.

(d) Electrical equipment must not be installed in a gas-dangerous space or zone, except:

(1) Intrinsically safe electrical equipment and wiring, and

(2) Other equipment as allowed in this section.

(e) A submerged cargo pump motor, if installed in a tank, must meet the following requirements:

(1) Low liquid level, motor current, or pump discharge pressure must automatically shut down power to the pump motor if the pump loses suction.

(2) There must be an audible and visual alarm at the cargo-control station that activates if the motor shuts down under the requirements of subparagraph (1) of this paragraph.

(3) There must be a lockable circuit breaker or lockable switch that disconnects the power to the motor.

(f) Electrical equipment must not be installed in a hold space that has a tank that is not required to have a secondary barrier under §154.459 of this chapter, except:

(1) Through runs of armored or MI type cable;

(2) Explosionproof lighting fixtures;

(3) Depth sounding devices in gastight enclosures;

(4) Log devices in gastight enclosures;

(5) Impressed current cathodic protection system electrodes in gastight enclosures; and

(6) Armored or MI type cable for a submerged cargo pump motor.

(g) Electrical equipment must not be installed in a space that is separated by a gastight steel boundary from a hold space that has a tank that must have a secondary barrier under the requirements of §154.459 of this chapter, except:

(1) Through runs of armored or MI type cable;

(2) Explosionproof lighting fixtures;

(3) Depth sounding devices in gastight enclosures;

(4) Log devices in gastight enclosures;

(5) Impressed current cathodic protection system electrodes in gastight enclosures;

(6) Explosionproof motors that operate cargo system valves or ballast system valves;

(7) Explosionproof bells for general alarm systems; and

(8) Armored or MI type cable for a submerged cargo pump motor.

(h) A cargo-handling room must not have any installed electrical equipment, except explosionproof lighting fixtures.

(i) A space for cargo hose storage or a space that has cargo piping must not have any installed electrical equipment, except:

(1) Explosionproof lighting fixtures; and

(2) Through runs of armored or MI type cable.

(j) A gas dangerous zone on the open deck must not have any installed electrical equipment, except:

(1) Explosionproof equipment that is necessary for the operation of the vessel; and

(2) Through runs of armored or MI type cable.

(k) A space, except those named in paragraphs (f) through (i) of this section, that has a direct opening to gas-dangerous spaces or zones must have no electrical equipment except as allowed in the gas-dangerous space or zone.

(l) Each gas-dangerous space that has lighting fixtures must have at least two branch circuits for lighting.

(m) Each switch and each overcurrent protective device for any lighting circuit that is in a gas-dangerous space must open all conductors of the circuit simultaneously.

(n) Each switch and each overcurrent protective device for lighting in a gas-dangerous space must be in a gas-safe space.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 77–069, 52 FR 31626, Aug. 21, 1987]

§ 111.105–33 Mobile offshore drilling units.

(a) *Applicability.* This section applies to each mobile offshore drilling unit.

(b) *Definitions.* As used in this section:

(1) "Enclosed spaces" are locations delineated by floors, bulkheads, or decks which may have doors or windows.

(2) "Semi-enclosed spaces" are locations where natural conditions of ventilation are notably different from those on open deck due to the presence of structures such as roofs, windbreaks, and bulkheads which are so arranged that dispersion of gas may not occur.

(c) The internal space of each pressure vessel, tank, and pipe for drilling mud and for gas venting must have only intrinsically safe electric equipment.

(d) The following are Class I, Division 1 locations:

(1) An enclosed space that contains any part of the mud circulating system that has an opening into the space and is between the well and final degassing discharge.

(2) An enclosed or semi-enclosed location that is below the drill floor and contains a possible source of gas release such as the top of a drilling nipple.

(3) An enclosed space that is on the drill floor and is not separated by a solid, gas-tight floor from the spaces specified in paragraph (d)(2) of this section.

(4) A space that would normally be considered a Division 2 location under paragraph (e) of this section but where combustible or flammable gases might accumulate. This could include pits, ducts, and similar structures downstream of the final degassing discharge.

(5) A location in the weather or a semi-enclosed location, except as provided in paragraph (d)(2) of this section, that is within 5 feet (1.5 m) of the boundary of any:

(i) Equipment or opening specified in paragraph (d)(1) of this section;

(ii) Ventilation outlet, access, or other opening to a Class I, Division 1 space; or

(iii) Gas vent outlet.

(6) Except as provided in paragraph (f) of this section, an enclosed space that has an opening into a Class I, Division 1 location.

(e) The following are Class I, Division 2 locations:

(1) An enclosed space that has any open portion of the mud circulating system from the final degassing discharge to the mud suction connection at the mud pit.

(2) A location in the weather that is:

(i) Within the boundaries of the drilling derrick up to a height of 10 feet (3m) above the drill floor;

(ii) Below the drill floor and within a radius of 10 feet (3m) of a possible source of release, such as the top of a drilling nipple; or

(iii) Within 5 feet (1.5m) of the boundaries of any ventilation outlet, access, or other opening to a Class I, Division 2 space.

(3) A location that is:

(i) Within 5 feet (1.5m) of a semi-enclosed Class I, Division 1 location indicated in paragraph (d)(2) of this section; or

(ii) Within 5 feet (1.5m) of a Class I, Division 1 space indicated in paragraph (d)(5).

(4) A semi-enclosed area that is below and contiguous with the drill floor to the boundaries of the derrick or to the extent of any enclosure which is liable to trap gases.

(5) A semi-enclosed derrick to the extent of its enclosure above the drill floor, or to a height of 10 feet (3m) above the drill floor, whichever is greater.

(6) Except as provided in paragraph (f) of this section, an enclosed space that has an opening into a Class I, Division 2 location.

(f) 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 self-closing gas-tight doors that form an air lock;

(ii) The ventilation causes greater pressure in the space than in the Division 1 location; and

(iii) Loss of ventilation overpressure is alarmed at a manned station;

(2) An enclosed space that has direct access to a Division 1 location can be considered as a Division 2 location if:

(i) The access has a self-closing, gas-tight door that opens into the space and that has no hold-back device;

(ii) Ventilation causes the air to flow with the door open from the space into the Division 1 location; and

(iii) Loss of ventilation is alarmed at a manned control station; and

(3) An enclosed space that has direct access to a Division 2 location is not a hazardous location if:

(i) The access has a self-closing, gas-tight door that opens into the space and that has no hold-back device;

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(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.

(g) Electrical equipment and devices installed in spaces made non-hazardous by the methods indicated in paragraph (f) of this section must be limited to essential equipment.

§ 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 feet (3 m) of a coal transfer point where coal is dropped or dumped.

(b) Each space that has a coal conveyer on a vessel that carries bituminous coal is a Class II, Division 2 space.

(c) Each location listed in paragraphs (a) and (b) 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 must have electrical equipment approved for Class II, Division 2 hazardous locations, except watertight general alarm bells.

§ 111.105–37 Flammable anesthetics.

Each electric installation where a flammable anesthetic is used or stored must meet NFPA No. 56A.

§ 111.105–39 Gasoline or other highly volatile motor fuel carried 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 which is within 18 inches (460 mm) of the deck must meet Article 501 of the National Electrical Code for Class I, Division 2, Group D locations. Electric equipment which is 18 inches (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 chapter.

§ 111.105–43 Paint stowage or mixing spaces.

A space for the stowage or mixing of paint must not have any electric equipment, except:

(a) Intrinsically safe electric equipment approved for a Class I, Division 1, Group D location;

(b) Explosionproof electric equipment approved for a Class I, Division 1, Group D location; or

(c) Through runs of armored or MI type cable.

Subpart 111.107—Industrial Systems

§ 111.107–1 Industrial systems.

(a) 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 must meet only the following requirements in this subchapter:

(1) The Underwriters Laboratories Inc. standards in § 110.10–1(b)(5) of this subchapter.

(2) The switchgear standards in § 110.10(b)(4) and (b)(8).

(3) Subpart 110.25—Plan Submittal.

(4) Subpart 111.01—General Considerations.

(5) Subpart 111.05—Grounding, Ground Detection, and Grounded Systems.

(6) Subpart 111.105—Hazardous Locations.

(b) Cables that penetrate a deck or bulkhead must:

(1) Be installed in accordance with the requirements of § 111.60–5; and

(2) Meet the flammability test requirements of section 18.13.5 of IEEE Standard No. 45.

PART 112—EMERGENCY LIGHTING AND POWER SYSTEMS

Subpart 112.01—Definitions of Emergency Lighting and Power Systems

Subpart 112.05—General

Subpart 112.15—Emergency Loads

Subpart 112.20—Emergency Systems Having a Temporary and a Final 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

Subpart 112.30—Emergency Systems Having an Automatically Connected Storage Battery as the Sole Emergency Power 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

Subpart 112.37—Temporary Emergency Power Source

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Subpart 112.40—Alternating-Current Temporary Source of Supply

Subpart 112.43—Emergency Lighting Systems

Subpart 112.45—Visible Indicators and Test Switch

Subpart 112.50—Emergency Diesel and Gas Turbine Engine Driven Generator Sets

Subpart 112.55—Storage Battery Installation

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Subpart 112.01—Definitions of Emergency Lighting and Power Systems

§ 112.01-1 Purpose.

The purpose of this subpart is to define types of emergency lighting and power systems.

§ 112.01-5 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.

§ 112.01-10 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.

§ 112.01-15 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.

§ 112.01-20 Final emergency power source.

A final emergency power source is one that functions after the temporary emergency power source is disconnected.

Subpart 112.05—General

§ 112.05-1 Purpose.

(a) The purpose of this part is to ensure 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:

(1) A load required by this part to be powered from the emergency power source;

(2) A bus-tie to the main switchboard that meets § 112.05-3; and

(3) Emergency loads that may be necessary to maintain or restore the propulsion plant, such as control systems, controllable pitch propellers, hydraulic pumps, control air compressors, and machinery necessary for dead-ship start-up.

§ 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 that can be simultaneously connected to it, except a load on a bus-tie to the main switchboard.

TABLE 112.05-5(a)

Size of vessel and service	Type of emergency power source or lighting	Period of operation and minimum capacity of emergency power
Passenger vessels:		
Ocean, Great Lakes, or coastwise; or on an international voyage.	Temporary emergency power source; and final emergency power source (automatically connected storage battery or an automatically started generator).	36 hours.[1] [2]
Other than Ocean, Great Lakes, or coastwise and not on an international voyage.	Final emergency power source (automatically connected storage battery or an automatically started generator).	8 hours or twice the time of run, whichever is less.[2]
Cargo vessels; miscellaneous self-propelled vessels; tankships; barges with sleeping accommodations for more than 6 persons; mobile offshore drilling units; and oceanographic vessels:		
Ocean, Great Lakes, or coastwise and 500 GT or more; on an international voyage and 500 GT or more; or all waters and 1600 GT or more.	Final emergency power source (automatically connected storage battery or an automatically started generator).	18 hours.[1] [2]
Ocean, Great Lakes, or coastwise and less than 500 GT; or other than ocean, Great Lakes, or coastwise, 300 GT or more but less than 1600 GT, and not on an international voyage..	Emergency lighting provided by an automatically connected or manually controlled storage battery; automatically or manually started generator; or relay-controlled, battery-operated lanterns.[3] [4].	6 hours or twice the time of run, whichever is less.

[1] For a vessel on an international voyage of short duration, the time period may be reduced to twice the time of run but not less than 12 hours.
[2] The capacity for the operation of the steering gear, as required by §111.93, is for a period of 30 minutes continuous operation.
[3] The emergency lighting requirements of §112.15-1 (b), (c), (f), and (g) must be met.
[4] Requirements of Subpart 112.39 must be met by the relay-controlled, battery-operated lanterns.

(b) The emergency power source must be independent of the ship's service lighting and powerplant and propulsion plant, except for the compressed air starting means allowed in §112.50-7(c)(3)(i). A stop control for an emergency generator must be only in the space that has the emergency generator, except a remote mechanical reach rod is permitted for the fuel oil shut-off valve to an independent fuel oil tank located in the space.

(c) The complete emergency installation must function when the ship is inclined to the maximum angle of heel which results from the assumed damage required by Part 157 of Title 33 or by Parts 42, 74, 108, 153, and 154 of Title 46 of the Code of Federal Regulations for the specific vessel type or 22½ degrees, whichever is greater, 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 except when such an arrangement is not practicable. In such a case, the boundary between the compartment containing the emergency source and category A machinery space must have an A-60 fire classification as defined in Subpart 72.05 of this chapter.

(f) Except for a cable for connecting equipment in the engineroom or boilerroom, no cable supplied from the emergency switchboard may penetrate the boundaries of the engineroom, boilerroom, 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 boilerroom 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.

(i) The prime mover of an emergency generator must be either a diesel engine or a gas turbine.

Subpart 112.15—Emergency Loads

§ 112.15–1 Temporary emergency loads.

On vessels required by § 112.05–5(a) to have a temporary emergency power source, 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 sufficient 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. There must be sufficient signs so that the direction of escape is obvious, 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 pumprooms, 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 lifeboat and liferaft launching areas, embarkation decks and passenger assembly points. Lights must meet the requirements of §§111.75–16 and 112.43–11 of this chapter.

(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) Each fire detection system.

§ 112.15–5 Final emergency loads.

On vessels required to have a final emergency power source by § 112.05–5(a) of this chapter, 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) If necessary, the lube oil pump for each propulsion turbine and ship's service generator turbine that needs 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 feeder if required by Subpart 111.93 of this chapter.

(p) General alarm flashing lights required by § 113.25–10.

(q) Each electric blow-out preventer control system on a mobile offshore drilling unit.

(r) Any permanently installed diving system that is dependent upon the vessel's or drilling unit's electrical power.

(s) An emergency generator starting air compressor as allowed by § 112.50–7(c)(3)(ii) of this part.

(t) Each steering gear failure alarm required by Subpart 113.43 of this chapter.

§ 112.15–10 Loads on systems without a temporary emergency power source.

If there is no temporary emergency power source, the loads under § 112.15–1 must be arranged so that they can be energized from the final emergency power source.

Subpart 112.20—Emergency Systems Having a Temporary and a Final Emergency Power Source

§ 112.20–1 General.

This subpart contains requirements applicable to emergency power installations having both a temporary and a final emergency power source.

§ 112.20–3 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 switchboard through automatic transfer switches.

§ 112.20–5 Failure of power from the normal source or final emergency power source.

(a) 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.

(b) For systems in which a reduction of frequency of the normal source or 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 upon a reduction in the frequency of the normal source or final 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 Transfer of emergency loads.

(a) When the potential of the final emergency power source reaches 85 to 95 percent of normal value, the emergency loads under § 112.15–5 must transfer automatically to the final emergency power source and, on a passenger vessel, this transfer must be accomplished in no more than 45 seconds after failure of the normal source of power.

(b) When the potential from the normal source has been restored, the emergency loads must be manually or automatically transferred to the normal source, and the final emergency power source must 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 General.

This subpart contains requirements applicable to emergency power installations having an automatic starting diesel engine or gas turbine driven emergency power source as the sole emergency power source.

§ 112.25–3 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 switchboard by an automatic transfer switch located at the emergency switchboard.

§ 112.25–5 Failure of power from the normal source.

If there is a reduction of potential of the normal source by 15 to 40 percent, the 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 Transfer of emergency loads.

(a) When the potential of the final emergency source reaches 85 to 95 percent of normal value, the emergency loads under §112.15–5 must transfer automatically to the final emergency power source and this transfer must be accomplished in no more than 45 seconds after failure of the normal source of power.

(b) When the potential from the normal source has been restored, the emergency loads must be manually or automatically transferred to the normal source, and the final emergency power source must 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 General.

This subpart contains requirements applicable to emergency power installations having an automatically connected storage battery as the sole emergency power source.

§ 112.30–3 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 Transfer of emergency loads.

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 General.

This subpart contains requirements applicable to emergency power installations having a manually controlled storage battery, diesel engine, or gas turbine driven generator as the sole emergency power source.

§ 112.35-3 Normal source for emergency loads.

The normal source for emergency loads must be the ship's service generating plant.

§ 112.35-5 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.

§ 112.35-7 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 112.37—Temporary Emergency Power Source

§ 112.37-1 General.

Each temporary source of emergency power required by Table 112.05-5(a) must consist of a storage battery of sufficient capacity to supply the temporary emergency loads for not less than one-half hour.

Subpart 112.39—Battery Operated Lanterns

§ 112.39-1 General.

(a) Each battery-operated, relay-controlled lantern used in accordance with Table 112.05-5(a) must:

(1) Have rechargeable batteries;

(2) Have an automatic battery charger that maintains the battery in a fully charged condition;

(3) Not be readily portable; and

(4) Meet UL 924.

§ 112.39-3 Operation.

(a) The lanterns must be capable of providing light at least 6 hours.

(b) The lantern must be relay-controlled so that the loss of normal power causes the lanterns to light.

Subpart 112.40—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 the conversion equipment operates both under normal conditions and under temporary emergency conditions, the conversion equipment must be provided in duplicate.

Subpart 112.43—Emergency Lighting Systems

§ 112.43-1 Switches.

An emergency lighting system must not have a switch, except:

(a) In a distribution panel;

(b) As required in § 112.43-3; or

(c) In a circuit that serves a hazardous space such as a paint room or cargo handling room if the switch is located outside of the hazardous location.

§ 112.43-3 Controls; general.

(a) Except as allowed in paragraph (b) of this section and § 112.43-5, 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 equipment.

(b) On a mobile offshore drilling unit, the switches required in paragraph (a) of this section must be in the control room.

§ 112.43-5 Controls on island type vessels.

On an island type vessel, such as a containership, emergency lights for illumination of lifeboat and liferaft launching operations must be controlled from a central location within the island nearest the launching operations or from the wheelhouse.

§ 112.43-7 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, except as allowed in § 112.43-5 of this part.

(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) must 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.

§ 112.43-9 Signaling lights.

Each signaling light must be supplied by a branch circuit that supplies no other equipment.

§ 112.43-11 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.

§ 112.43-13 Navigation light indicator panel supply.

Each navigation light indicator panel must be supplied:

(a) Directly from the emergency switchboard; or

(b) Be a through feed, without switch or overcurrent protection, from the feeder supply the wheelhouse emergency lighting panel.

§ 112.43-15 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.

§ 112.43-17 Emergency light marking.

Each emergency light must be marked with the letter "E" that is at least ½ inch (12.7 mm) high.

Subpart 112.45—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 supplied from the emergency power source.

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 degrees F (37 degrees C) air.

(b) The fuel used must have a flashpoint of not less than 110 degrees F (43 degrees 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 that a thermostatically controlled electric water jacket heater connected to the final emergency bus is permitted.

(e) The generator set must be capable of carrying its full rated load within 20 seconds after cranking is started with

the intake air, room ambient temperature, and starting equipment at 32 degrees F (0 degrees 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 the angles specified §112.05-5(c), and must be arranged so that it does not spill oil under a vessel roll of 30 degrees 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 (see §111.12-1(b) for detailed overspeed trip requirements).

(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.

(k) An independent fuel supply must be provided for the prime mover.

§ 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 electrically 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 insufficient 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.

(c) Capacity for three of the cranking cycles under paragraph (a) of this section must be held in reserve. The system must be arranged so that the operation of one control by one person allows the reserve capacity to be used.

§ 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 for the main or auxiliary air compressors addressed in 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; and

(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 handcranked, 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 non-return valve at the inlet of the starting air receiver and there must be

a handcranked, 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.

Subpart 112.55—Storage Battery Installation

§ 112.55–1 General.

Each storage battery installation must meet Subpart 111.15 of this chapter.

§ 112.55–5 Emergency lighting loads.

When supplying emergency lighting loads, the storage battery initial voltage must not exceed 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 prescribed in Table 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 voltage.

PART 113—COMMUNICATION AND ALARM SYSTEMS AND EQUIPMENT

Subpart 113.05—General Provisions

Sec.

Subpart 113.10—Fire Detecting and Alarm Systems and Manual Fire Alarm Systems

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Subpart 113.30—Sound-Powered Telephone and Voice Tube Systems

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Subpart 113.05—General Provisions

§ 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 for this chapter.

Subpart 113.10—Fire Detecting and Alarm Systems and Manual Fire Alarm Systems

§ 113.10-1 Approved equipment.

Each alarm annunciator, fire detector, test station, manual station, and vibrating bell must be approved under Subpart 161.002 of this chapter and meet the requirements of this subpart.

§ 113.10-3 Cable runs.

Cable runs between the fire alarm annunciator and fire detecting or fire alarm zones must be as direct as practicable and, where practicable, must not be in staterooms, lockers, or other enclosed spaces in order to reduce the risk of damage by a localized fire or other cause.

§ 113.10-5 Common return.

A conductor must not be used as a common return from more than one zone.

§ 113.10-7 Connection boxes.

Each connection box that has conductors for more than one zone must be watertight.

§ 113.10-9 Power supply.

(a) *General.* There must be at least two sources of power for the electrical equipment of each fire detecting and alarm system. The normal source must be the main power source. The other source must be the emergency power source or an automatically charged battery. Upon loss of power to the system from the normal source, the sys-

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tem must be automatically supplied from the other source.

(b) *Batteries.* Each battery used in a fire detecting and alarm system must meet Subpart 111.15 of this chapter.

(c) *Capacity of storage battery.* The capacity of each system's storage battery must be sufficient to supply the fire detecting and alarm system for a period of not less than one week without recharging. At the end of the one-week discharge period, the battery potential must not be less than 80 percent of nominal potential under design load.

(d) *Capacity of power supply branch circuit.* The capacity of each branch circuit providing power to a fire detection or alarm system must not be less than 125 percent of the maximum load.

Subpart 113.20—Automatic Sprinkler Systems

§ 113.20–1 Sprinkler alarm system.

Each sprinkler alarm system, including annunciator, power supply, alarm switches, and bells, 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 meets 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 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) At the feeder distribution panel;

(4) In the wheelhouse, if a wheelhouse is installed; and

(5) In a routinely occupied space that is as far as practicable from all other contact makers.

(d) *Additional contact maker.* A vessel must not have more than one other contact maker that operates the general alarm system in addition to those required under paragraph (a), (b), or (c) of this section unless the installation of other contact makers has been accepted by the Commandant.

(e) *Special system.* If a vessel 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 chapter;

(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 charging 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 charging 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;

(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 at least 80 percent of the potential under design 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 switched 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 where, because of the arrangement of the vessel, only one zone feeder is necessary; then a branch circuit distribution panel or feeder distribution panel must be used.

(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 (with flashing lights as required) may be connected to one branch circuit. A branch circuit must not supply bells on more than one deck level, except for a single branch circuit supplying all levels of a single space containing more than one deck level if all other requirements of this section are met.

(g) On a vessel not divided into fire zones by main vertical fire bulkheads, the vessel must be divided into vertical zones not more than 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:

(a) Be located in passenger and crew quarters areas 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 firepump room, bow thruster rooms, storage areas for paint, rope, and other stores, underdeck passageways in cargo areas, steering gear rooms, windless rooms, holds of roll-on/roll-off vessels, and, except those that are accessible only through bolted manhole covers, duct keels with valve operators; and

(b) Have the sound level in the spaces specified in paragraph (a) of this section, 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 background noise level existing when the vessel is underway in moderate weather unless flashing red lights are utilized in accordance with § 113.25–10 of this subpart.

§ 113.25–10 Location of flashing red lights.

In a space described in § 113.25–9(a), where the bells cannot be heard over the background noise, there must be a flashing red light, in addition to the bell, that:

(a) Has sufficient intensity above the background lighting that would alert 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 for a flashing red light in the main machinery space 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 the operating handle is rotated in a clockwise direction through an arc of approximately 60 degrees;

(c) Have a switch handle that has a spring-loaded locking pin to automatically 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, or, on large vessels, auxiliary devices to interrupt the load current.

§ 113.25–12 Vibrating bells.

Each vibrating bell must produce a signal or a tone distinct from any other audible signal on the vessel.

§ 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.

§ 113.25-16 Fuses.

(a) Each fuse in a general alarm systems must:
(1) Be a 250-volt, nonrenewable, cartridge fuse approved by Underwriters Laboratories Inc. or other independent laboratory recognized by the Commandant; 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 corrision-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. The system must:

(a) Have an automatically charged battery as the power source;
(b) Have a manually operated contact maker at the steering station and in the crew accommodation area; and
(c) Must meet the requirements of § 113.25.7 and §§ 113.25-9 through 113.25-20 of this subpart.

§ 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, except as follows:
(a) The number and location of contact makers must be determined by the design, service, and operation of the barge.

NOTE: Contact makers in the primary work area, quarters area, galley and mess area, machinery spaces, and the bridge or control area should be considered.

(b) If a distribution panel cannot be above the uppermost continuous deck because of the design of the barge and is installed below the deck, it must be as near the deck as practicable.

Subpart 113.27—Engineers' Assistance-Needed Alarm

§ 113.27-1 Engineers' assistance-needed alarm.

Each self-propelled ocean, Great Lakes, or coastwise vessel must have a manually-operated engineers' assistance-needed 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;
(b) Audible in the engineers' accommodation spaces; and
(c) Powered from the general alarm power source.

Subpart 113.30—Sound-Powered Telephone and Voice Tube Systems

§ 113.30-1 Applicability.

This subpart applies to each self-propelled vessel.

§ 113.30-3 Means of communications.

The means of communication required by this subpart must be a sound-powered telephone system or voice tube system, except a voice tube system must not be used if it is longer than 125 feet (38.1 meters) or if it is ineffective.

§ 113.30-5 Requirements.

(a) *Communication.* Each vessel must have a sound powered telephone system or a voice tube system among the following:

(1) Wheelhouse.

(2) Steering gear room, if outside the engineroom.

(3) Alternative steering station if outside of the steering gear room.

(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) *Gyrocompass.* Each vessel that has a master gyrocompass that is not in or next to the wheelhouse must have a means of communication between the master gyrocompass 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 comunication 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 the 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 all other systems on the vessel. The location of the termination of these systems is subject to approval by the Federal Communication 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 means of communication between 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 communications 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(b).

(h) *Engineroom local control station.* On a vessel equipped with pilothouse control, each local control station in the engineroom must have a sound powered telephone station for communication to the engine control room or maneuvering platform, unless an engine order telegraph is installed in accordance with §113.35-3(e) of this chapter. Each

sound-powered telephone station at a local control station must:

(1) Not be on the same circuit as any other station required by this section, and

(2) Must provide the capability of carrying on a conversation while the vessel is in operation.

§ 113.30–10 Voice tubes.

Each voice tube must meet Section 37.31 of IEEE Standard No. 45.

§ 113.30–20 Sound-powered telephone system: general requirements.

(a) 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, carbon dioxide control room, and firepump room, must not be on the same circuit as telephone stations installed to meet §§ 113.30–5(e) and 113.30–5(h).

(b) 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 that can isolate this lookout telephone from the rest of the stations.

(c) Except as provided in paragraph (b) 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.

(d) Jack boxes or headsets must not be on a telephone system that includes any station required by this subpart, except for a station installed to meet § 113.30–5(h) of 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, except a system installed to meet § 113.30–5(h) of this subpart, must be approved by the Commandant.

(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 at least dripproof.

(d) In a noisy location, such as a diesel engine room, there must be a telephone booth or other equipment to permit telephone conversation during vessel operation.

(e) In a location where the telephone station audible signal device cannot be heard throughout the space, there must be an additional audible signal device or light 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:

(a) *Indicator* means an instrument in the engine room to receive and acknowledge engine orders; and

(b) *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 or mechanical 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) If a small vessel has no engine order telegraph system between the wheelhouse and the engineroom, the propulsion plant must be controlled entirely from the wheelhouse, with no means of normal engine control from the engineroom.

(e) On vessels equipped with pilothouse control, each local control station in the engineroom must have an indicator if:

(1) Manual operation from the local control station is an alternative means of control; and

(2) The local control station is not immediately adjacent to the engineroom control station; and

(3) Sound-powered telephone communication that meets the requirements of §113.30–5(h) of this chapter is not provided.

(f) Engine order telegraph and remote propulsion control systems must be electrically separate and independent, except that a single mechanical operator control device with separate transmitters and connections for each system may be used.

[CGD 74–125A, 47 FR 15272, Apr. 8, 1982, as amended by CGD 81–030, 53 FR 17847, May 18, 1988]

§ 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 permanently marked on it.

(c) Movement of the transmitter handle and its pointer must cause the indicator to show the order correspondinng to the order on the transmitter.

(d) Each engineroom indicator must have a knob, handle, or pushbuttons that actuates 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 the 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 equal to one-half the width of the wheelhouse.

§ 113.35–7 Electric engine order telegraph systems; detailed requirements.

(a) Each telegraph instrument must have a watertight enclosure for the electric components, except that an instrument under §113.35–17 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 on 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". The reply handle and indicator arrow must point in the direction in which it is desired that the engine operate.

(f) Each connection box that is in an electric telegraph system must be watertight.

(g) Each system must have an alarm that:

(1) Automatically sounds and visually signals a loss of power to the system;

(2) Is in the wheelhouse; and

(3) Has a means to silence the audible signal.

(h) If the supervisory power supply is a dry cell battery or other low capacity source, there must be a means that precludes electric drain on the supervisory power supply after the audible signal has been silenced such as a means to extinguish the visible signal. Upon reestablishment of power to the telegraph system, the audible signal must sound again until the alarm circuit is returned to normal, unless restoration of this alarm circuit is automatic.

§ 113.35-9 Mechanical engine order telegraph systems; general requirements.

(a) Each mechanical engine order telegraph system must consist of transmitters and indicators mechanically connected to each other by means of chains and wires.

(b) Each transmitter and indicator must have dials divided into sectors or divisions with the engine orders permanently marked on it.

(c) Rotation of the transmitter handle and its associated pointer must drive the indicator pointer in synchronism. The indicator pointer must have the same angular position as the transmitter handle and its associated pointer, and must point to the order corresponding to the order on the transmitter.

(d) The engineroom indicator must have a reply handle and associated pointer that drives a reply pointer in the wheelhouse transmitter for acknowledgement of orders.

(e) Each transmitter and each indicator must have an audible signal device to indicate, in the case of an indicator, the receipt of an order and, in the case of a transmitter, the acknowledgement of an order. The audible signal device must not be dependent upon any source of power for operation other than that of the movement of the transmitter or indicator handle.

(f) The dial of each transmitter must be illuminated in such a manner as not to interfere with navigating the vessel at night.

(g) Each transmitter and indicator handle must be large enough so that the engine order may be seen from a distance equal to one-half the width of the wheelhouse.

§ 113.35-11 Mechanical engine order telegraph systems; detailed requirements.

(a) A mechanical engine order telegraph system must use:

(1) Number 10 Stubs Gage (0.134 inch diameter) soft brass wire stretched approximately 20 percent prior to installation; or

(2) Corrosion-resistant aircraft-type cable of at least ⅛ inch diameter running over ball bearing sheaves.

(b) The following specific requirements are applicable to a soft brass wire installation;

(1) Pulleys must be provided whenever a bend in the run of the telegraph wire is made.

(2) A length of brass telegraph chain must be used in lieu of wire at each pulley sheave.

(3) Pulleys must be in line with the wire and chain.

(4) Each telegraph lead must have turnbuckles at:

(i) Each transmitter and indicator to adjust the handle and pointer to the central point of the order; and

(ii) Other locations where necessary to take up slack and to center the chains at the pulleys.

(5) Each long horizontal run of telegraph wire must be supported on roller bearers at approximately every five feet of run.

(6) Telegraph leads must be run through pipe where they are:

(i) Behind sheathing; or

(ii) Exposed to mechanical damage.

(c) Each telegraph lead must be in a stuffing tube where it passes through a watertight deck or bulkhead.

(d) Each transmitter dial must have the "STOP" order at the top vertical position of the operating handle. On ahead orders the handle must move toward the bow of the vessel, and on astern orders the operating handle must move toward the stern of the vessel.

(e) Each indicator dial must have the "STOP" order at either the bottom or top position of the reply handle to suit bulkhead or pedestal (console) mounting respectively.

(f) Indicator dials on double-ended vessels must not be marked with the designations "AHEAD" and "ASTERN." The reply handle and indi-

cator arrow must point in the direction in which it is desired that the engine operate.

(g) All fittings used in telegraph systems must be brass, bronze, or other corrosion-resistant material.

(h) Each handle, pointers, and similar part must be attached to its shaft by a key or similar positive locking device to ensure continuous operation of the shaft in response to movement of the handle.

§ 113.35–13 Mechanical engine order telegraph systems; operation.

If more than one transmitter operates a common indicator in the engineroom, all the transmitters must be mechanically interlocked and operate in synchronism. A failure of the transmission wire or chain at any transmitter must not interrupt or disable any other transmitter.

§ 113.35–15 Mechanical engine order telegraph systems; application.

If a mechanical engine order telegraph system is installed on any vessel to provide the communication required by this subpart, the length of cables or other mechanical limitations must not prevent the efficient operation of the system.

§ 113.35–17 Vessels with pilothouse control.

Each vessel with pilothouse throttle control must have a positive mechanical stop on each telegraph transmitter that prevents movement to the "Pilothouse Control" position without positive action by the operator.

§ 113.35–19 Electric engine order telegraphs systems; operation.

(a) Where two or more transmitters, located in the wheelhouse, the wings of the navigating bridge, or the top of the wheelhouse, operate a common indicator in the engineroom, the transmitters must:

(1) Operate in synchronism as required in paragraph (b) of this section; or

(2) Operate under the control of a transmitter transfer control in accordance with paragraph (c) of this section.

(b) All transmitter handles and pointers must operate in synchronism. Where the transmitters are mechanically interlocked to effect synchronous operation, the requirements of § 113.35–13 must be met.

(c) Except for a transmitter in an unattended wheelhouse on a double-ended vessel, each transmitter must operate under the control of a transmitter transfer control so that movement of any one transmitter handle automatically connects that transmitter electrically to the engineroom indicator and simultaneously disconnects electrically all other transmitters. The reply pointers of all transmitters must operate in synchronism at all times.

(d) On a double-ended vessel that has two wheelhouses, a manually operated transfer switch which will disconnect the system in the unattended wheelhouse must be provided.

Subpart 113.37—Shaft Speed and Thrust Indicators

§ 113.37–1 Applicability.

This subpart applies to all self-propelled vessels.

§ 113.37–5 General requirements.

(a) A vessel equipped with fixed pitch propellers must have in the wheelhouse and at the engineroom control station a propeller speed and direction indicator for each shaft.

(b) A vessel equipped with controllable pitch propellers must have in the wheelhouse and at the engineroom control station a propeller speed and pitch position indicator for each shaft.

§ 113.37–10 Detailed requirements.

(a) Each indicator must be independent of the propulsion control system. A failure of the propulsion control system must not affect the operation of the indicators.

(b) Indicators in the wheelhouse must be installed prominently near the rudder angle indicator and must have illumination that does not interfere with the navigation of the vessel at night.

(c) Each electric component of indicators in the wheelhouse must be watertight or be in a watertight or dripproof enclosure.

(d) Each component material of indicators in the wheelhouse must be corrosion-resistant.

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-follow-up 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 Detailed 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. This system must be independent of the steering gear control system.

(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 watertight or be in a watertight enclosure.

(f) Each component material must be corrosion-resistant.

Subpart 113.43—Steering Failure Alarm Systems

§ 113.43–1 Applicability.

This subpart applies to each vessel of 1600 gross tons and over that has power driven main or auxiliary steering gear.

§ 113.43–3 Alarm system.

(a) Each vessel must have a steering failure alarm system that actuates an audible and visible alarm in the pilothouse when the actual position of the rudder differs by more than 5 degrees from the rudder position ordered by the followup contol systems, required by §§ 58.25–45 and 111.93–9 of this chapter, for more than:

(1) 30 seconds for ordered rudder position changes of 70 degrees;

(2) 6.5 seconds for ordered rudder position changes of 5 degrees; and

(3) The time period calculated by the following formula for ordered rudder positions changes between 5 degrees and 70 degrees:

$t = (R/2.76)+4.64$

Where

t = maximum time delay in seconds

R = ordered rudder change in degrees

(b) The alarm system must be separate from, and independent of, each steering gear control system, except for input received from the steering wheel shaft.

§ 113.43–5 Power supply.

Each steering failure alarm system must be supplied by a circuit that:

(a) Is independent of other steering gear system and steering alarm circuits;

(b) Is fed from the final emergency power source through the emergency distribution panel in the wheelhouse, if installed; and

(c) Has no overcurrent protection except short-circuit protection by an instantaneous fuse or circuit breaker rated or set at 400 to 500 percent of:

(1) The current-carrying capacity of the smallest alarm system interconnecting conductors; or

(2) The normal load of the system.

Subpart 113.45—Refrigerated Spaces Alarm Systems.

§ 113.45–5 General requirements.

(a) Each refrigerated space that is accessible to the 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 annunciator for locating the space from which the signal was initiated.

Subpart 113.50—Emergency Loudspeaker Systems

§ 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 emergency 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 by the Commandant, 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.* (1) Loudspeakers must be located where there is no substantial 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.

TABLE 113.50-15—MINIMUM SOUND LEVEL REQUIREMENTS FOR LOUDSPEAKER SYSTEMS

[All data given in decibels [1]]

Location	Minimum assumed background noise level [2]	Signal level		Voice level	
		Above-background noise	Total (minimum)	Above-background noise	Total (minimum)
Lifeboat station	80	20	[3] 100	15	[3] 95
Embarkation deck or exterior passenger assembly point	80	20	[3] 100	15	[3] 95
Interior passenger assembly point	75	20	[3] 95	15	[3] 90
Crew quarters, accommodation space, or service space	60	18	[4] 78	12	[4] 72

[1] The zero decibel level is 0.0002 dyne per cm^2.
[2] Actual background noise level must be used but can be no less than the level in this table.
[3] Measured at a distance of 10 ft. (3 m) from the loudspeaker and on its axis.
[4] Measured in rooms with the doors to the passageways closed.

(c) *Lifeboat embarkation and passenger assembly station loudspeakers.* There must be enough loudspeakers throughout the lifeboat embarkation stations and passenger assembly stations 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.

(d) *Loudspeakers in quarters, accommodation spaces, and service spaces.* There must be enough loudspeakers in pas-

sageways, 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) *Amplifiers.* 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 alternatively from a port and starboard multi-conductor 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 113.65—Whistle Operators

§ 113.65–5 General requirements.

Each whistle operator must meet Section 37.25 of IEEE Standard No. 45.

NOTE: The general requirements for whistles and foghorns are in Part D of Section 2 of the Inland Navigational Rules Act of 1980, Pub. L. 96–591, December 24, 1980 (94 Stat. 3429 *et seq.*; 33 U.S.C. 2032 *et seq.*), 33 CFR Part 81, and 33 CFR Part 86.

(91 Stat. 310, 94 Stat. 3433; 33 U.S.C. 1607, 2071; 49 CFR 1.46(c)(11), (n)(14))

[CGD 74–125A, 47 FR 15272, Apr. 8, 1982, as amended by CGD 82–036, 48 FR 655, Jan. 6, 1983]

Subpart 113.70—Smoke Detector Systems

§ 113.70–5 General requirements.

(a) Each smoke detector control unit must be approved by the Commandant.

(b) Each smoke detector system must meet the requirements of Subpart 161.002 of this chapter.

(c) 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, or other enclosed spaces in order to reduce the risk of damage by a localized fire or other cause.

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EDITORIAL NOTE: This listing is provided for informational purposes only. It is compiled by and kept current by the Coast Guard, Department of Transportation.

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