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

§ 110.30–5 Inspection for certification.

Electric installations and electric equipment must be inspected at the inspection for certification and periodic inspection to determine mechanical and electrical condition and performance. Particular note must be made of circuits added or modified after the original issuance of the Certificate of Inspection.

[USCG 1999–4976, 65 FR 6504, Feb. 9, 2000]

§ 110.30–7 Repairs or alterations.

The Officer in Charge, Marine Inspection must be notified before—

(a) Alterations or modifications that deviate from approved plans; or

(b) Repairs, alterations, or modifications that affect the safety of the vessel.

[CGD 94–108, 61 FR 28275, June 4, 1996]

PART 111—ELECTRIC SYSTEMS—GENERAL REQUIREMENTS

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

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Subpart 111.105—Hazardous Locations

Subpart 111.107—Industrial Systems

AUTHORITY: 46 U.S.C. 3306, 3703; Department of Homeland Security Delegation No. 0170.1.

SOURCE: CGD 74–125A, 47 FR 15236, Apr. 8, 1982, unless otherwise noted.

Subpart 111.01—General

§ 111.01–1 General.

(a) Electric installations on vessels must ensure:

(1) Maintenance of services necessary for safety under normal and emergency conditions.

(2) Protection of passengers, crew, other persons, and the vessel from electrical hazards.

(3) Maintenance of system integrity through compliance with the applicable system requirements (IEEE, NEC, IEC, etc.) to which plan review has been approved.

(b) Combustible material should be avoided in the construction of electrical equipment.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28275, June 4, 1996; 62 FR 23907, May 1, 1997]

§ 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 of the following in or around the bilge area must be arranged or constructed so that it cannot be damaged by bilge water:

(a) Generators.

(b) Motors.

(c) Electric coupling.

(d) Electric cable.

[CGD 94–108, 61 FR 28275, June 4, 1996]

§ 111.01–7 Accessibility and spacing.

(a) The design and arrangement of electric apparatus must afford accessibility to each part as needed to facilitate proper inspection, adjustment, maintenance, or replacement.

(b) Within an enclosure, the spacing between energized components (or between an energized component and ground) must be to the appropriate industry standard for the voltage and current utilized in the circuit. Additionally, spacing within any enclosure must be sufficient to facilitate servicing.

[CGD 94–108, 61 FR 28275, June 4, 1996]

§ 111.01–9 Degrees of protection.

(a) Interior electrical equipment exposed to dripping liquids or falling solid particles must be manufactured to at least NEMA 250 or IEC 60529 (both incorporated by reference; see 46 CFR 110.10–1) IP 22 degree of protection as appropriate for the service intended.

(b) Electrical equipment in locations requiring exceptional degrees of protection as defined in 46 CFR 110.15–1 must be enclosed to meet at least the minimum degrees of protection in ABS Steel Vessel Rules (incorporated by reference; see 46 CFR 110.10–1), section 4–8–3, Table 2, or appropriate NEMA 250 type for the service intended. Each enclosure must be designed so that the total rated temperature of the equipment inside the enclosure is not exceeded.

(c) Central control consoles and similar control enclosures must be manufactured to at least NEMA 250 Type 2 or IEC 60529 IP 22 degree of protection regardless of location.

(d) Equipment for interior locations not requiring exceptional degrees of protection must be manufactured to at least NEMA 250 Type 1 with dripshield or IEC 60529 IP 11 as specified in IEC 60529.

[USCG–2003–16630, 73 FR 65195, Oct. 31, 2008]

§ 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°C (104°F) is assumed except as otherwise stated.

(b) A 50°C (122°F) ambient temperature is assumed for all rotating electrical machinery in boiler rooms, engine rooms, auxiliary machinery rooms, and weather decks, unless it can be shown that a 45°C (113°F) ambient temperature will not be exceeded in these spaces.

(c) A 45 °C (113 °F) ambient temperature is assumed for cable and all other non-rotating electrical equipment in boiler rooms, in engine rooms, in auxiliary machinery rooms, and on weather decks. For installations using UL 489 (incorporated by reference; see 46 CFR 110.10–1) SA marine type circuit breakers, the ambient temperature for that component is assumed to be 40 °C (104 °F). For installations using Navy type circuit breakers, the ambient temperature for that component is assumed to be 50 °C (122 °F).

(d) Unless otherwise indicated in this subchapter, a 55°C (131°F) ambient temperature is assumed for all control and instrumentation equipment.

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

[CGD 94–108, 61 FR 28276, June 4, 1996, as amended at 62 FR 23907, May 1, 1997; USCG–2004–18884, 69 FR 58348, Sept. 30, 2004; USCG–2003–16630, 73 FR 65196, Oct. 31, 2008]

§ 111.01–17 Voltage and frequency variations.

Unless otherwise stated, electrical equipment must function at variations of at least ±5 percent of rated frequency and +6 percent to −10 percent of rated voltage. This limitation does not address transient conditions.

[CGD 94–108, 61 FR 28276, June 4, 1996]

§ 111.01–19 Inclination of the vessel.

(a) All electrical equipment must be designed and installed to operate for the particular location and environment in which it is to be used. Additionally, electrical equipment necessary for the maneuvering, navigation, and safety of the vessel or its personnel must be designed and installed to operate under any combination of the following conditions:

(1) 15 degrees static list, 22.5 degrees dynamic roll; and

(2) 7.5 degrees static trim.

(b) All emergency installations must be designed and installed to operate when the vessel is at 22.5 degrees list and 10 degrees trim.

[CGD 94–108, 61 FR 28276, June 4, 1996, as amended at 62 FR 23907, May 1, 1997]

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

§ 111.05–1 Purpose.

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

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28276, June 4, 1996]

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 hull with a grounding conductor.

§ 111.05–7 Armored and metallic sheathed cable.

When installed, the metallic armor or sheath must meet the installation requirements of Section 25 of IEEE 45–2002 (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65196, Oct. 31, 2008]

§ 111.05–9 Masts.

Each nonmetallic mast and topmast must have a lightning-ground conductor in accordance with section 10 of IEC 92–401 (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65196, Oct. 31, 2008]

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 1,000 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 1,000 volts or greater, line to line, and the distribution system is grounded (including high-impedance grounding), any resulting current must not flow through a hazardous (classified) location.

[CGD 94–108, 61 FR 28276, June 4, 1996, as amended at 62 FR 23907, May 1, 1997]

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.

(d) Be provided (at the distribution switchboard or at another location, such as a centralized monitoring position for the circuit affected) for each feeder circuit that is isolated from the main source by a transformer or other device.

NOTE TO PARAGRAPH (d): An alarm contact or indicating device returned to the main switchboard via a control cable, that allows the detecting equipment to remain near the transformer or other isolating device for local troubleshooting, is allowed.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28276, June 4, 1996; 62 FR 23907, May 1, 1997]

§ 111.05–25 Ungrounded systems.

Each ungrounded system must be provided with a suitably sensitive ground detection system located at the respective switchboard which provides continuous indication of circuit status to ground with a provision to momentarily remove the indicating device from the reference ground.

[CGD 94–108, 61 FR 28276, June 4, 1996]

§ 111.05–27 Grounded neutral alternating current systems.

Grounded neutral and high-impedance grounded neutral alternating current systems must have a suitably sensitive ground detection system which indicates current in the ground connection, is able to withstand the maximum available fault current without damage, and provides continuous indication of circuit status to ground. A provision must be included to compare indications under fault conditions with those under normal conditions.

[CGD 94–108, 62 FR 23907, May 1, 1997]

§ 111.05–29 Dual voltage direct current systems.

Each dual voltage direct current system must have a suitably sensitive ground detection system which indicates current in the ground connection, has a range of at least 150 percent of neutral current rating and indicates the polarity of the fault.

[CGD 94–108, 61 FR 28276, June 4, 1996]

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 (8.4mm^2).

(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 (mm^2)		Size of the system grounding conductor—AWG(mm^2)
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 safety grounding (bonding) conductors.

(a) Each equipment-grounding conductor must be sized in accordance with Section 250.122 of NFPA NEC 2002 (incorporated by reference; see 46 CFR 110.10–1).

(b) Each equipment-grounding conductor (other than a system-grounding conductor) of a cable must be permanently identified as a grounding conductor in accordance with the requirements of Section 250.119 of NFPA NEC 2002.

[USCG–2003–16630, 73 FR 65196, Oct. 31, 2008]

§ 111.05–37 Overcurrent devices.

(a) A permanently grounded conductor must not have an overcurrent device unless the overcurrent device simultaneously opens each ungrounded conductor of the circuit.

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

[CGD 94–108, 61 FR 28276, June 4, 1996]

Subpart 111.10—Power Supply

§ 111.10–1 Definitions.

As used in this Subpart:

(a) *Ships's service loads* mean electrical equipment for all auxiliary services necessary for maintaining the vessel in a normal, operational and habitable condition. Ship's service loads include, but are not limited to, all safety, lighting, ventilation, navigational, communications, habitability, and propulsion auxiliary loads. Electrical propulsion motor, bow thruster motor, cargo transfer, drilling, cargo refrigeration for other than Class 5.2 organic peroxides and Class 4.1 self-reactive substances, 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.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28276, June 4, 1996; 62 FR 23907, May 1, 1997]

§ 111.10–3 Two generating sources.

In addition to the emergency power sources required under part 112 of this chapter, each self-propelled vessel and each mobile offshore drilling unit must have at least two electric generating sources.

[CGD 94–108, 61 FR 28276, June 4, 1996]

§ 111.10–4 Power requirements, generating sources.

(a) The aggregate capacity of the electric ship's service generating sources required in §111.10–3 must be sufficient for the ship's service loads.

(b) With the ship's service generating source of the largest capacity stopped, the combined capacity of the remaining electric ship's service generating source or sources must be sufficient to supply those services necessary to provide normal operational conditions of propulsion and safety, and minimum comfortable conditions of habitability. Habitability services include cooking, heating, air conditioning (where installed), domestic refrigeration, mechanical ventilation, sanitation, and fresh water.

(c) The capacity of the ship's service generating sources must be sufficient for supplying the ship's service loads without the use of a generating source which is dependent upon the speed or direction of the main propelling engines or shafting.

(d) 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.

(e) Vessels with electric propulsion that have two or more constant-voltage generators which supply both ship's service and propulsion power do not need additional ship's service generators provided that with any one propulsion/ship's service generator out of service the capacity of the remaining generator(s) is sufficient for the electrical loads necessary to provide normal operational conditions of propulsion and safety, and minimum comfortable conditions of habitability.

(f) A generator driven by a main propulsion unit (such as a shaft generator) which is capable of providing electrical power continuously, regardless of the speed and direction of the propulsion shaft, may be considered one of the ship's service generating sets required by §111.10–3. A main-engine-dependent generator which is not capable of providing continuous electrical power may be utilized as a supplemental generator provided that a required ship's service generator or generators having sufficient capacity to supply the ship's service loads can be automatically brought on line prior to the main-engine-dependent generator tripping offline due to a change in the speed or direction of the main propulsion unit.

[CGD 94–108, 61 FR 28277, June 4, 1996; 61 FR 36787, July 12, 1996]

§ 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. Additional requirements are in §112.05–3(c) of this chapter.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28277, June 4, 1996]

§111.10–9 Ship's service supply transformers; two 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 installed, independent power transformers. With the largest transformer out of service, the capacity of the remaining units must be sufficient to supply the ship service loads.

NOTE TO §111.10–9: A ship's service supply system would consist of transformers, overcurrent protection devices, and cables, and would normally be located in the system between a medium voltage bus and a low voltage ship's service switchboard.

[CGD 94–108, 61 FR 28277, June 4, 1996; 61 FR 33045, June 26, 1996]

Subpart 111.12—Generator Construction and Circuits

§111.12–1 Prime movers.

(a) Prime movers must meet section 58.01–5 and 46 CFR subpart 58.10 except that those for mobile offshore drilling units must meet Part 4, Chapter 3, sections 4/3.17 and 4/3.19 of the ABS MODU Rules (incorporated by reference; see 46 CFR 110.10–1). Further requirements for emergency generator prime movers are in 46 CFR subpart 112.50.

(b) Each generator 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 if the generator is directly coupled to the engine. If the generator is operating from a power take-off, such as a shaft driven generator on a main propulsion engine, the generator must automatically declutch (disconnect) from the prime mover upon loss of lubricating pressure to generator bearings.

[CGD 94–108, 61 FR 28277, June 4, 1996; 61 FR 33045, June 26, 1996, as amended at 62 FR 23907, May 1, 1997; USCG–2003–16630, 73 FR 65196, Oct 31, 2008]

§111.12–3 Excitation.

In general, excitation must meet sections 4–8–3/13.2(a), 4–8–5/5.5.1, 4–8–5/5.5.2, and 4–8–5/5.17.6 of the ABS Steel Vessel Rules (incorporated by reference; see 46 CFR 110.10–1), except that those for mobile offshore drilling units must meet Part 4, Chapter 3, sections 4/3.21.1 and 4/3.23.1 of the ABS MODU Rules (incorporated by reference; see 46 CFR 110.10–1). In particular, no static exciter may 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.

[USCG–2003–16630, 73 FR 65196, Oct. 31, 2008]

§111.12–5 Construction and testing of generators.

Each generator must meet the applicable requirements for construction and testing in section 4–8–3 of the ABS Steel Vessel Rules (incorporated by reference; see 46 CFR 110.10–1) except that each one for a mobile offshore drilling unit must meet the requirements in part 4, chapter 3, section 4 of the ABS MODU Rules (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65196, Oct. 31, 2008]

§ 111.12–7 Voltage regulation and parallel operation.

Voltage regulation and parallel operation must meet:

(a) For AC systems: sections 4–2–3/7.5.2, 4–2–4/7.5.2, 4–8–3/3.13.2, and 4–8–3/3.13.3 of the ABS Steel Vessel Rules (incorporated by reference; see 46 CFR 110.10–1);

(b) For DC systems: section 4–8–3/3.13.3(c) of the ABS Steel Vessel Rules, and IEC 92–202 and IEC 92–301 (both incorporated by reference; see 46 CFR 110.10–1); and

(c) For mobile offshore drilling units: Part 4, Chapter 3, section 4/3.21.2, 4/3.21.3, 4/3.23.2, and 4/3.23.3 of the ABS MODU Rules (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65196, Oct. 31, 2008]

§ 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) Open upon the shutting down of the prime mover;

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

(3) 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 longtime overcurrent 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; CGD 94–108, 61 FR 28277, June 4, 1996; 62 FR 23908, May 1, 1997]

§ 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 meet the requirements of this subpart.

[CGD 94–108, 61 FR 28277, June 4, 1996]

§ 111.15–2 Battery construction.

(a) A battery cell, when inclined at 40 degrees from the vertical, must not spill electrolyte.

(b) Each fully charged lead-acid battery must have a specific gravity that meets section 22 of IEEE 45–2002 (incorporated by reference; see 46 CFR 110.10–1).

(c) Batteries must not evolve hydrogen at a rate exceeding that of a similar size lead-acid battery under similar charging condition.

(d) Batteries must be constructed to take into account the environmental conditions of a marine installation, including temperature, vibration, and shock.

[CGD 94–108, 61 FR 28277, June 4, 1996, as amended by USCG–2003–16630, 73 FR 65196, Oct. 31, 2008]

§ 111.15–3 Battery categories.

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

(1) *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.

(2) *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.

(3) *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.

(b) Batteries that generate less hydrogen under normal charging and discharging conditions than an equivalent category of lead-acid batteries (e.g., sealed batteries) may have their battery category reduced to an equivalent category of lead-acid batteries.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28278, June 4, 1996]

§ 111.15–5 Battery installation.

(a) *Large batteries.* Each large battery installation must be in a room that is only for batteries or a box on deck. Installed electrical equipment must meet the hazardous location requirements in subpart 111.105 of this part.

(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 not be located in poorly-ventilated spaces, such as closets, or in living spaces, such as staterooms.

(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 provide adequate accessibility for installation, maintenance, and removal of the batteries.

(e) *Nameplates.* Each battery must be provided with the name of its manufacturer, model number, type designation, either the cold cranking amp rating or the amp-hour rating at a specific discharge and, for a lead-acid battery, the fully charged specific gravity value. This information must be permanently fixed to the battery.

(f) *Lining in battery rooms and lockers.* (1) Each battery room and locker must have a watertight lining that is—

(i) On each shelf to a height of at least 76 mm (3 inches); or

(ii) On the deck to a height of at least 152 mm (6 inches).

(2) For lead-acid batteries, the lining must be 1.6 mm (1/16 inch) thick lead or other material that is corrosion-resistant to the electrolyte of the battery.

(3) For alkaline batteries, the lining must be 0.8 mm (1/32 inch) thick steel or other material that is corrosion-resistant to the electrolyte of the battery.

(g) *Lining of battery boxes.* Each battery box must have a watertight lining to a height of at least 76 mm (3 inches) that meets paragraphs (f)(2) and (f)(3) of this section.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28278, June 4, 1996; 61 FR 36787, July 12, 1996; 62 FR 23908, May 1, 1997]

§ 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 non-sparking 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 installations.* Each box for a small battery installation must have openings near the top

to allow escape of gas. If the installation is in a non-environmentally-controlled location, the installation must prevent the ingress of water.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28278, June 4, 1996]

§ 111.15–20 Conductors.

(a) Each conductor penetration to a battery room must be made watertight.

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

(c) Each connecting cable must have sufficient capacity to carry the maximum charging current or maximum discharge current, whichever is greater, while maintaining the proper voltage at the load end.

[CGD 94–108, 61 FR 28278, June 4, 1996, as amended at 62 FR 23908, May 1, 1997]

§ 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 enclosure must meet § 111.01–9. Additionally, each charger must be suitable for the size and type of battery installation that it serves. Chargers incorporating grounded autotransformers must not be used. Except for rectifiers, chargers with a voltage exceeding 20 percent of the line voltage must be provided with automatic protection against reversal of current.

[CGD 94–108, 61 FR 28278, June 4, 1996; 61 FR 36787, July 12, 1996]

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, unless special precautions are taken, such as enclosing the winding in an enclosure with a high degree of ingress protection.

[CGD 94–108, 61 FR 28278, June 4, 1996]

§ 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 Protection of transformers against overcurrent.

Each transformer must have protection against overcurrent that meets Article 450 of NFPA NEC 2002 or IEC 92–303 (both incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65196, Oct. 31, 2008]

Subpart 111.25—Motors

§ 111.25–1 General requirements.

The requirements for generators contained in § 111.12–5 apply to motors.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 62 FR 23908, May 1, 1997]

§ 111.25–5 Marking.

(a) Each motor must have a marking or nameplate that meets either Section 430.7 of NFPA NEC 2002 or clause 16 of IEC 92–301 (both incorporated by reference; see 46 CFR 110.10–1).

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

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28278, June 4, 1996; USCG–2003–16630, 73 FR 65196, Oct. 31, 2008]

§ 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.

Each switchboard must meet the location and installation requirements in section 8.2 of IEEE 45–2002 or IEC 60092–302 (both incorporated by reference; see 46 CFR 110.10–1), as applicable.

[USCG–2003–16630, 73 FR 65196, Oct. 31, 2008]

§ 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 the front.

Circuit breakers, 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 unbolting bus or cable connections or deenergizing the supply, unless the switchboard is divided into sections, such that each section is capable of providing power to maintain the vessel in a navigable condition, and meets §111.30–24 (a) and (b).

[CGD 94–108, 61 FR 28278, June 4, 1996]

§ 111.30–5 Construction.

(a) All low voltage and medium voltage switchboards (as low and medium are determined within the standard used) must meet—

(1) For low voltages, either section 8.3 of IEEE 45–2002 or IEC 60092–302 (both incorporated by reference; see 46 CFR 110.10–1), as appropriate.

(2) For medium voltages, either section 8.4 of IEEE 45–2002 or IEC 92–503 (incorporated by reference; see 46 CFR 110.10–1), as appropriate.

(b) Each switchboard must be fitted with a dripshield unless the switchboard is a deck-to-overhead mounted type which cannot be subjected to leaks or falling objects.

[CGD 94–108, 61 FR 28278, June 4, 1996, as amended at 62 FR 23908, May 1, 1997; USCG–2003–16630, 73 FR 65196, Oct. 31, 2008]

§ 111.30–11 Deck coverings.

Non-conducting deck coverings, such as non-conducting mats or gratings, suitable for the specific switchboard voltage must be installed for personnel protection at the front and rear of the switchboard and must extend the entire length of, and be of sufficient width to suit, the operating space.

[CGD 94–108, 62 FR 23908, May 1, 1997]

§ 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) *General.* Each bus must meet the requirements of either—

(1) Section 7.10 of IEEE 45–1998 (incorporated by reference; see 46 CFR 110.10–1); or

(2) IEC 60092–302 (clause 7) (incorporated by reference; see 46 CFR 110.10–1).

(b) *Wiring.* Instrumentation and control wiring must be—

(1) Suitable for installation within in a switchboard enclosure and be rated at 90 °C or higher;

(2) Stranded copper;

(3) No. 14 AWG (2.10 mm^2) or larger or must be ribbon cable or similar conductor size cable recommended for use in low-power instrumentation, monitoring, or control circuits by the equipment manufacturer;

(4) Flame-retardant meeting test VW–1 of UL 1581 or IEC 332–1 (both incorporated by reference; see 46 CFR 110.10–1); and

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

[CGD 94–108, 61 FR 28278, June 4, 1996, as amended at 62 FR 23908, May 1, 1997; USCG–2003–16630, 73 FR 65197, Oct. 31, 2008]

§ 111.30–24 Generation systems greater than 3000 kw.

Except on a non-self-propelled mobile offshore drilling unit (MODU) and a non-self-propelled floating Outer Continental Shelf facility, 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.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28279, June 4, 1996]

§ 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

(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) There must be a test switch at the emergency switchboard to simulate a failure of the normal power source and cause the emergency loads to be supplied from the emergency power source.

(c) 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.

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

(e) 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.

(f) 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.

(g) 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.

(h) 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.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28279, June 4, 1996]

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 of durable material affixed to the unit that meets the requirements of—

(1) Section 10.20.12 of IEEE 45–2002 (incorporated by reference; see 46 CFR 110.10–1); or

(2) Clause 8 of IEC 92–304 (incorporated by reference; see 46 CFR 110.10–1).

(b) 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.

(c) 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.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28279, June 4, 1996; USCG–2003–16630, 73 FR 65197, Oct. 31, 2008]

§ 111.33–5 Installation.

Each semiconductor rectifier system must meet the installation requirements, as appropriate, of—

(a) Sections 10.20.2, 10.20.7, and 10.20.8 of IEEE 45–2002 (incorporated by reference; see 46 CFR 110.10–1); or

(b) IEC 92–304 (incorporated by reference; see 46 CFR 110.10–1).

[CGD 94–108, 61 FR 28279, June 4, 1996, as amended by USCG–2003–16630, 73 FR 65197, Oct. 31, 2008]

§ 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.

Each power semiconductor rectifier system in a propulsion system must meet sections 4–8–5/5.17.9 and 4–8–5/5.17.10 of ABS Steel Vessel Rules (incorporated by reference; see 46 CFR 110.10–1), except that each one for mobile offshore drilling units must meet the requirements in Part 4, Chapter 3, section 4/3.5.3 of ABS MODU Rules (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65197, Oct. 31, 2008]

Subpart 111.35—Electric Propulsion

§ 111.35–1 Electrical propulsion installations.

Each electric propulsion installation must meet sections 4–8–5/5.5, 4–8–5/5.11, 4–8–5/5.13, 4–8–5/5.17.8(e), 4–8–5/5.17.9, and 4–8–5/5.17.10 of ABS Steel Vessel Rules (incorporated by reference; see 46 CFR 110.10–1), except that each one for mobile offshore drilling units must meet the requirements in part 4, chapter 3, section 4/3.5.3 of ABS MODU Rules (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65197, Oct. 31, 2008]

Subpart 111.40—Panelboards

§ 111.40–1 Panelboard standard.

Each panelboard must meet section 17.1 of IEEE 45–2002 (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65197, Oct. 31, 2008]

§ 111.40–5 Enclosure.

Each panelboard must have a noncombustible enclosure that meets §§ 111.01–7 and 111.01–9.

[CGD 94–108, 61 FR 28279, June 4, 1996]

§ 111.40–7 Location.

Each panelboard must be accessible but not in a bunker or a cargo hold, except a cargo hold on a roll-on/roll-off vessel.

[CGD 94–108, 61 FR 28279, June 4, 1996]

§ 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.

§ 111.50–2 Systems integration.

The electrical characteristics of each overcurrent protective device must be compatible with other devices and its coordination must be considered in the design of the entire protective system.

NOTE TO § 111.50–2: The electrical characteristics of overcurrent protective devices may differ between standards. The interchangeability and compatibility of components complying with differing standards cannot be assumed.

[CGD 94–108, 61 FR 28279, June 4, 1996]

§ 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, subchapter F of this chapter.

(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 and circuitbreakers.* If the allowable current-carrying capacity of the conductor does not correspond to a standard rating for fuses or circuitbreakers that meets Section 240.6 of NFPA NEC 2002 or IEC 92–202 (both incorporated by reference; see 46 CFR 110.10–1), then the next larger such rating is acceptable, except that:

(1) This rating must not be larger than 150 percent of the current-carrying capacity of the conductor; and

(2) The effect of temperature on the operation of fuses and thermally controlled circuitbreakers must be taken into consideration.

(d) *Parallel overcurrent protective devices.* An overcurrent protective device must not be connected in parallel with another overcurrent protective device.

(e) *Thermal devices.* No thermal cutout, thermal relay, or other device not designed to open a short circuit may be used for protection of a conductor against overcurrent due to a short circuit or ground, except in a motor circuit as described in Article 430 of NFPA NEC 2002 or in IEC 92–202.

(f) *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.

(g) *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 NFPA NEC 2002 or in IEC 92–202.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28279, June 4, 1996; CGD 97–057, 62 FR 51047, Sept. 30, 1997; USCG–2003–16630, 73 FR 65197, Oct. 31, 2008]

§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 NFPA NEC 2002 (incorporated by reference; see 46 CFR 110.10–1).

(b) No enclosure may be exposed to the weather unless accepted by the Commandant.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by USCG–2003–16630, 73 FR 65197, Oct. 31, 2008]

§111.50–9 Disconnecting and guarding.

Disconnecting and guarding of overcurrent protective devices must meet Part IV of Article 240 of NFPA NEC 2002 (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65197, Oct. 31, 2008]

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.

(a) The coordination of overcurrent protective devices must be demonstrated for all potential plant configurations.

(b)Overcurrent protective devices must be installed so that:

(1) 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

(2) 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.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 62 FR 23908, May 1, 1997]

Subpart 111.52—Calculation of Short-Circuit Currents

§ 111.52–1 General.

The available short-circuit current must be computed—

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

(b) From the largest probable motor load; and

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

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28279, June 4, 1996]

§ 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.

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

(a) Exact calculations using actual impedance and reactance values of system components.

(b) Estimated calculations using NAVSEA DDS 300–2 (incorporated by reference, see 46 CFR 110.10–1).

(c) Estimated calculations using IEC 61363–1 (incorporated by reference; see 46 CFR 110.10–1).

(d) The estimated calculations using a commercially established analysis procedure for utility or industrial applications.

[CGD 94–108, 61 FR 28279, June 4, 1996, as amended by USCG–2003–16630, 73 FR 65197, Oct. 31, 2008]

Subpart 111.53—Fuses

§ 111.53–1 General.

(a) Each fuse must—

(1) Meet the general provisions of Article 240 of NFPA NEC 2002 or IEC 92–202 (both incorporated by reference; see 46 CFR 110.10–1) as appropriate.

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

(3) Be listed by an independent laboratory.

(b) Renewable link cartridge-type fuses must not be used.

(c) Each fuse installation must provide for ready access to test the condition of the fuse.

[CGD 94–108, 61 FR 28279, June 4, 1996, as amended by61 FR 33045, June 26, 1996; USCG–2003–16630, 73 FR 65197, Oct. 31, 2008]

Subpart 111.54—Circuit Breakers

§ 111.54–1 Circuit breakers.

(a) Each Circuit breaker must—

(1) Meet the general provision of Article 240 of NFPA NEC 2002 or IEC 92–202 (both incorporated by reference; see 46 CFR 110.10–1) as appropriate;

(2) Meet subpart 111.55 of this part; and

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

(b) No molded-case circuitbreaker may be used in any circuit having a nominal voltage of more than 600 volts (1,000 volts for a circuit containing a circuitbreaker manufactured to the standards of the IEC). Each molded-case circuitbreaker must meet section

9 and marine supplement SA of UL 489 (incorporated by reference, see 46 CFR 110.10–1) or part 2 of IEC 60947–2 (incorporated by reference; see §110.10–1), except as noted in paragraph (e) of this section.

(c) Each circuitbreaker, other than a molded-case one, that is for use in any of the following systems must meet the following requirements:

(1) An alternating-current system having a nominal voltage of 600 volts or less (1,000 volts for such a system with circuitbreakers manufactured to the standards of the IEC) must meet:

(i) IEEE C37.13 (incorporated by reference; see 46 CFR 110.10–1);

(ii) ANSI/IEEE C37.27 (incorporated by reference; see 46 CFR 110.10–1); or

(iii) IEC 60947–2.

(2) A direct-current system of 3,000 volts or less must meet IEEE C37.14 (incorporated by reference; see 46 CFR 110.10–1) or IEC 60947–2.

(3) An alternating-current system having a nominal voltage greater than 600 volts (or greater than 1,000 volts for IEC standard circuitbreakers) must meet:

(i) IEEE C37.04, IEEE C37.010, and ANSI/IEEE C37.12 (all three standards incorporated by reference; see 46 CFR 110.10–1); or

(ii) IEC 62271–100 (incorporated by reference; see 46 CFR 110.10–1).

(d) A circuit breaker must not:

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

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

(e) Each circuit breaker located in an engineroom, boilerroom, or machinery space must be calibrated for a 50 degree 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.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28279, June 4, 1996; 61 FR 33045, June 26, 1996; 62 FR 23908, May 1, 1997; USCG–2003–16630, 73 FR 65197, Oct. 31, 2008]

§ 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 404 of NFPA NEC 2002 (incorporated by reference; see 46 CFR 110.10–1).

(b) Each switch that is in the weather must be in a watertight enclosure and be externally operable.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by USCG–2003–16630, 73 FR 65198, Oct. 31, 2008]

§ 111.55–3 Circuit connections.

The load side of each circuit must be connected to the fuse end of a fused-switch or to the coil end of a circuit breaker, except a generator which is connected to either end of a circuit breaker.

Subpart 111.59—Busways

§ 111.59–1 General.

Each busway must meet Article 368 of NFPA NEC 2002 (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65198, Oct. 31, 2008]

§ 111.59–3 No mechanical cooling.

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

[CGD 94–108, 61 FR 28280, June 4, 1996]

Subpart 111.60—Wiring Materials and Methods

§ 111.60–1 Construction and testing of cable.

(a) Each marine shipboard cable must meet all the requirements for construction and identification of either IEEE 1580, UL 1309, IEC 92–353, or NPFC MIL–C–24640A or NPFC MIL–C–24643A (all five standards incorporated by reference; see 46 CFR 110.10–1), including the respective flammability tests contained therein, and must be of a copper-stranded type.

(b) Each cable constructed to IEC 92–353 must meet the flammability requirements of Category A of IEC 60332–3–22 (incorporated by reference; see 46 CFR 110.10–1).

(c) Medium-voltage electric cable must meet the requirements of IEEE 1580 and UL 1072 (incorporated by reference; see 46 CFR 110.10–1), where applicable, for cables rated above 5,000 volts.

(d) Electrical cable that has a polyvinyl-chloride insulation with a nylon jacket (Type T/N) must meet either UL 1309, IEEE 1580, or section 8 of IEEE 45–2002 (incorporated by reference; see 46 CFR 110.10–1).

(e) Electrical cable regardless of construction must meet, at a minimum, all of the performance and marking requirements of section 5.13 of IEEE 1580.

[USCG–2003–16630, 73 FR 65198, Oct. 31, 2008]

§ 111.60–2 Specialty cable for communication and RF applications.

Specialty cable such as certain coaxial cable that cannot pass the flammability test contained in IEEE 1580, test VW–1 of UL 1581, or Category A of IEC 60332–3–22 (all three standards incorporated by reference; see 46 CFR 110.10–1) because of unique properties of construction, must:

(a) Be installed physically separate from all other cable; and

(b) Have fire stops installed—

(1) At least every 7 meters (21.5 feet) vertically, up to a maximum of 2 deck heights;

(2) At least every 15 meters (46 feet) horizontally;

(3) At each penetration of an A or B Class boundary;

(4) At each location where the cable enters equipment; or

(5) In a cableway that has an A–60 fire rating.

[CGD 94–108, 61 FR 28280, June 4, 1996, as amended by USCG–2003–16630, 73 FR 65198, Oct. 31, 2008]

§ 111.60–3 Cable application.

(a)(1) Cable constructed according to IEEE 1580 must meet the provisions for cable application of section 24 of IEEE 45–2002 (both incorporated by reference; see 46 CFR 110.10–1).

(2) Cable constructed according to IEC 92–353 or UL 1309 (both incorporated by reference; see 46 CFR 110.10–1) must meet section 24 of IEEE 45–2002, except 24.6.1, 24.6.7, and 24.8.

(3) Cable constructed according to IEC 92–353 must be applied in accordance with IEC 60092–352 (incorporated by reference; see 46 CFR 110.10–1), Table 1, for ampacity values.

(b)(1) Cable constructed according to IEEE 1580 must be applied in accordance with Table 25, Note 6, of IEEE 45–2002.

(2) Cable constructed according to IEC 92–353 must be derated according to IEC 60092–352, clause 8.

(3) Cable constructed according to NPFC MIL–C–24640A or NPFC MIL–C–24643A must be derated according to NAVSEA MIL–HDBK–299 (SH) (all three standards incorporated by reference; see 46 CFR 110.10–1).

(c) Cable for special applications defined in section 24 of IEEE 45–2002 must meet the provisions of that section.

[USCG–2003–16630, 73 FR 65198, Oct. 31, 2008]

§ 111.60–4 Minimum cable conductor size.

Each cable conductor must be #18 AWG (0.82 mm^2) or larger except—

(a) Each power and lighting cable conductor must be #14 AWG (2.10 mm^2) or larger; and

(b) Each thermocouple, pyrometer, or instrumentation cable conductor must be #22 AWG (0.33 mm^2) or larger.

[CGD 94–108, 61 FR 28280, June 4, 1996]

§ 111.60–5 Cable installation.

(a) Each cable installation must meet—

(1) Sections 25, except 25.11, of IEEE 45–2002 (incorporated by reference; see 46 CFR 110.10–1); or

(2) Cables manufactured to IEC 92–353 must be installed in accordance with IEC 60092–352 (both incorporated by reference; see 46 CFR 110.10–1), including clause 8.

(b) Each cable installation made in accordance with clause 8 of IEC 60092–352 must utilize the conductor ampacity values of Table I of IEC 60092–352.

(c) No cable may be located in any tank unless—

(1) The purpose of the cable is to supply equipment or instruments especially designed for and compatible with service in the tank and whose function requires the installation of the cable in the tank;

(2) The cable is either compatible with the liquid or gas in the tank or protected by an enclosure; and

(3) Neither braided cable armor nor cable metallic sheath is used as the grounding conductor.

(d) Braided cable armor or cable metallic sheath must not be used as the grounding conductor.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28280, June 4, 1996; USCG–2003–16630, 73 FR 65198, Oct. 31, 2008]

§ 111.60–6 Fiber optic cable.

Each fiber optic cable must—

(a) Be constructed to pass the flammability test contained in IEEE 1202, test VW–1 of UL 1581, or Category A of IEC 60332–3–22 (all three standards incorporated by reference; see 46 CFR 110.10–1); or

(b) Be installed in accordance with § 111.60–2.

[CGD 94–108, 61 FR 28280, June 4, 1996, as amended by USCG–2003–16630, 73 FR 65198, Oct. 31, 2008]

§ 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, NFPA NEC 2002 (incorporated by reference; see 46 CFR 110.10–1).
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 neutral 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.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by USCG–2004–18884, 69 FR 58348, Sept. 30, 2004; USCG–2003–16630, 73 FR 65198, Oct. 31, 2008]

§ 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 component insulated.

(c) Wire, other than in switchboards, must meet the requirements in sections 24.6.7 and 24.8 of IEEE 45–2002, NPFC MIL–W–76D, UL 44, UL 83 (all

four standards incorporated by reference; see 46 CFR 110.10–1), or equivalent standard.

(d) Switchboard wire must meet subpart 111.30 of this part.

(e) Wire must be of the copper stranded type.

[CGD 94–108, 61 FR 28281, June 4, 1996, as amended at 62 FR 23908, May 1, 1997; 62 FR 27659, May 20, 1997; USCG–2003–16630, 73 FR 65198, Oct. 31, 2008]

§ 111.60–13 Flexible electric cord and cables.

(a) *Construction and testing.* Each flexible cord and cable must meet the requirements in section 24.6.1 of IEEE 45–2002, Article 400 of NFPA NEC 2002, NEMA WC–3, NEMA WC–70, or UL 62 (all five standards incorporated by reference; see 46 CFR 110.10–1).

(b) *Application.* No flexible cord may be used except:

(1) As allowed under Sections 400–7 and 400–8 of NFPA NEC 2002; and

(2) In accordance with Table 400–4 in NFPA NEC 2002.

(c) *Allowable current-carrying capacity.* No flexible cord may carry more current than allowed under Table 400–5 in NFPA NEC 2002, NEMA WC–3, or NEMA WC–70.

(d) *Conductor size.* Each flexible cord must be No. 18 AWG (0.82 mm^2) 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 mm^2) 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.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28281, June 4, 1996; USCG–2003–16630, 73 FR 65198, Oct. 31, 2008]

§ 111.60–17 Connections and terminations.

(a) In general, connections and terminations to all conductors must retain the original electrical, mechanical, flame-retarding, and, where necessary, fire-resisting properties of the cable. All connecting devices must be suitable for copper stranded conductors.

(b) If twist-on type of connectors are used, the connections must be made within an enclosure and the insulated cap of the connector must be secured to prevent loosening due to vibration.

(c) Twist-on type of connectors may not be used for making joints in cables, facilitating a conductor splice, or extending the length of a circuit.

[CGD 94–108, 61 FR 28281, June 4, 1996]

§ 111.60–19 Cable splices.

(a) A cable must not be spliced in a hazardous location, except in intrinsically safe systems.

(b) Each cable splice must be made in accordance with section 25.11 of IEEE 45–2002 (incorporated by reference; see 46 CFR 110.10–1).

[CGD 94–108, 61 FR 28281, June 4, 1996, as amended by USCG–2003–16630, 73 FR 65198, Oct 31, 2008]

§ 111.60–21 Cable insulation tests.

All cable for electric power and lighting 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 section 34.2.1 of IEEE 45–2002 (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65199, Oct. 31, 2008]

§ 111.60–23 Metal-clad (Type MC) cable.

(a) Metal-clad (Type MC) cable permitted on board a vessel must be continuous corrugated metal-clad cable.

(b) The cable must have a corrugated gas-tight, vapor-tight, and watertight sheath of aluminum or other suitable metal that is close-fitting around the conductors and fillers and that has an overall jacket of an impervious PVC or thermoset material.

(c) The cable is not allowed in areas or applications exposed to high vibration, festooning, repeated flexing, excessive movement, or twisting, such as in engine rooms, on elevators, or in the area of drill floors, draw works, shakers, and mud pits.

(d) The cable must be installed in accordance with Article 326 of NFPA NEC 2002 (incorporated by reference; see 46

CFR 110.10–1). The ampacity values found in table 25 of IEEE 45–2002 (incorporated by reference; see 46 CFR 110.10–1) may not be used.

(e) The side wall pressure on the cable must not exceed 1,000 pounds per foot of radius.

(f) Equipment grounding conductors in the cable must be sized in accordance with Section 250.122 of NFPA NEC 2002. System grounding conductors must be of a cross-sectional area not less than that of the normal current carrying conductors of the cable. The metal sheath must be grounded but must not be used as a required grounding conductor.

(g) On an offshore floating drilling and production facility, the cable may be used as interconnect cable between production modules and between fixed distribution panels within the production modules, except that interconnection between production and temporary drilling packages is prohibited. Also, the cable may be used within columns, provided that the columns are not subject to the conditions described in paragraph (c) of this section.

(h) When the cable is used within a hazardous (classified) location, terminations or fittings must be listed, and must be appropriate, for the particular Type MC cable used and for the environment in which they are installed.

[CGD 94–108, 62 FR 23908, May 1, 1997, as amended by USCG–2003–16630, 73 FR 65199, Oct. 31, 2008]

Subpart 111.70—Motor Circuits, Controllers, and Protection

§ 111.70–1 General.

(a) Each motor circuit, controller, and protection must meet the requirements of ABS Steel Vessel Rules, sections 4–8–2/9.17, 4–8–3/5.7.3, 4–8–4/9.5, and 4–8–3/5; ABS MODU Rules, Part 4, Chapter 3, sections 4/7.11 and 4/7.17; or IEC 92–301 (all three standards incorporated by reference; see 46 CFR 110.10–1), as appropriate, except for the following circuits:

(1) Each steering gear motor circuit and protection must meet part 58, subpart 58.25, of this chapter.

(2) Each propulsion motor circuit and protection must meet subpart 111.35 of this part.

(b) In ungrounded three-phase alternating current systems, only two motor-running protective devices (overload coil or heater type relay within the motor and controller) need be used in any two ungrounded conductors, except when a wye-delta or a delta-wye transformer is used.

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

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28281, June 4, 1996; 62 FR 23909, May 1, 1997; USCG–2003–16630, 73 FR 65199, Oct. 31, 2008]

§ 111.70–3 Motor controllers and motor-control centers.

(a) *General.* The enclosure for each motor controller or motor-control center must meet either NEMA ICS 2 and NEMA ICS 2.3, or Table 5 of IEC 92–201 (all three standards incorporated by reference; see 46 CFR 110.10–1), as appropriate, for the location where it is installed. In addition, each such enclosure in a hazardous location must meet subpart 111.105 of this part. NEMA ICS 2.4 (incorporated by reference; see 46 CFR 110.10–1) provides guidance on the differences between devices meeting NEMA and those meeting IEC for motor service.

(b) *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 which can be restarted from a central control station, must have low-voltage release if automatic restart after a voltage failure or its resumption to operation 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 ship's service generator. Automatic sequential starting of low-voltage release controllers is acceptable to meet this paragraph.

(c) *Low-voltage protection.* Each motor controller must have low-voltage protection, except for the following motor controllers:

(1) A motor controller that has low-voltage release under paragraph (b) of this section.

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

(d) *Identification of controllers.* (1) Each motor controller and motor control center must be marked externally with the following information:

(i) Manufacturer's name or identification.

(ii) Voltage.

(iii) Number of phases.

(iv) Current.

(v) kW (Horsepower).

(vi) Identification of motor being controlled.

(vii) Current rating of trip setting.

(2) Each controller must be provided with heat durable and permanent elementary wiring/schematic diagrams of the controller located on the door interior.

[CGD 94–108, 61 FR 28281, June 4, 1996; 61 FR 33045, June 26, 1996, as amended by USCG–2003–16630, 73 FR 65199, Oct. 31, 2008]

§ 111.70–5 Heater circuits.

(a) If an enclosure for a motor, master switch, or other equipment 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 disconnecting device. A fixed sign, warning the operator to open both devices, must be on the enclosure of the equipment disconnect device, except as 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.

(c) Electric heaters installed within motor controllers and energized from a separate circuit must be disconnected in the same manner as required by paragraph (a) of this section or by §111.70–7(d).

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28282, June 4, 1996]

§ 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 power 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 voltage 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 power by a disconnect device actuated by the opening of the controller door, or the power must first be disconnected to allow opening of the door. The disconnect device and its connections, including each terminal block for terminating the vessel's wiring, must have no electrically uninsulated or unshielded surface. When this type of disconnect device is used for vital auxiliary circuits, a nameplate must be affixed to the vital auxiliary motor controller door that warns that opening the door will trip a vital auxiliary offline.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28282, June 4, 1996; 62 FR 23909, May 1, 1997]

Subpart 111.75—Lighting Circuits and Protection

§ 111.75–1 Lighting feeders.

(a) *Passenger vessels.* On a passenger vessel with fire bulkheads forming main vertical and horizontal fire zones, the lighting distribution system, including low location egress lighting where installed, must be arranged so that, to the maximum extent possible, a fire in any main vertical and horizontal fire zone does not interfere with the lighting in any other 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.

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

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28282, June 4, 1996; 61 FR 33045, June 26, 1996]

§ 111.75–5 Lighting branch circuits.

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

(b) *Connected Load.* The connected loads 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 fixture ratings and in accordance with IEEE 45–2002 (incorporated by reference; see 46 CFR 110.10–1), section 5.4.2.

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

(d) *Overcurrent protection.* Each lighting branch circuit must be protected by an overcurrent device rated at 20 amperes or less, except as allowed under paragraph (e) of this section.

(e) *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.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28282, June 4, 1996; 62 FR 23909, May 1, 1997; USCG–2003–16630, 73 FR 65199, Oct. 31, 2008]

§ 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.* (1) Each space used by passengers or crew must be fitted with lighting that provides for a safe habitable and working environment under normal conditions.

(2) Sufficient illumination must be provided by the emergency lighting source under emergency conditions to effect damage control procedures and to provide for safe egress from each space.

(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.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28282, June 4, 1996]

§ 111.75–16 Lighting of survival craft and rescue boats.

(a) During preparation, launching, and recovery, each survival craft and rescue boat, its launching appliance, and the area of water into which it is to be launched or recovered must be adequately illuminated by lighting supplied from the emergency power source.

(b) The arrangement of circuits must be such that the lighting for adjacent launching stations for survival craft or rescue boats is supplied by different branch circuits.

[CGD 94–108, 61 FR 28282, June 4, 1996]

§ 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 navigating bridge to control side, masthead, and stern 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, and stern lights.

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

(1) Meet the technical details of the applicable navigation rules.

(2) Be certified by an independent laboratory to the requirements of UL 1104 (incorporated by reference; see 46 CFR 110.10–1) or an equivalent standard under 46 CFR 110.20–1. Portable battery powered lights need meet only the requirements of the standard applicable to those lights.

(3) Be labeled with a label stating the following:

(i) ''MEETS _____.'' (Insert the identification name or number of the standard under paragraph (d)(2) of this section to which the light was type-tested.)

(ii) ''TESTED BY _____.'' (Insert the name or registered certification mark of the independent laboratory that tested the fixture to the standard under paragraph (d)(2) of this section).

(iii) Manufacturer's name.

(iv) Model number.

(v) Visibility of the light in nautical miles.

(vi) Date on which the fixture was type-tested.

(vii) Identification of bulb used in the compliance test.

(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 or, for permanently mounted fixtures, by direct run of fixed cable; and

(4) If it is a double-lens, two-lamp type, have each lamp connected to its branch circuit conductors either by an individual flexible cable and watertight receptacle plug or, for permanently mounted fixtures, by an individual direct run of fixed cable.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28282, June 4, 1996; 61 FR 33045, June 26, 1996; 62 FR 23909, May 1, 1997; USCG–2003–16630, 73 FR 65199, Oct. 31, 2008]

§ 111.75–18 Signaling lights.

Each self-propelled vessel over 150 gross tons when engaged on an international voyage must have on board an efficient daylight signaling lamp that may not be solely dependent upon the vessel's main source of electrical power and that meets the following:

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

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

[CGD 94–108, 61 FR 28282, June 4, 1996]

§ 111.75–20 Lighting fixtures.

(a) The construction of each lighting fixture for a non-hazardous location must meet UL 1598A or IEC 92–306 (both incorporated by reference; see 46 CFR 110.10–1).

(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, navigating bridge, 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.

(e) Nonemergency and decorative interior-lighting fixtures in environmentally protected, nonhazardous locations need meet only the applicable UL type-fixture standards in UL 1598 (incorporated by reference; see 46 CFR 110.10–1) and UL 1598A marine supplement or the standards in IEC 92–306. These fixtures must have vibration clamps on fluorescent tubes longer than 102 cm (40 inches), secure mounting of glassware, and rigid mounting.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28283, June 4, 1996; 61 FR 36787, July 12, 1996; 62 FR 23909, May 1, 1997; USCG–2003–16630, 73 FR 65199, Oct. 31, 2008]

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 Appliances.

All electrical appliances, including, but not limited to, cooking equipment, dishwashers, refrigerators, and refrigerated drinking water coolers, must meet UL safety and construction standards or equivalent standards under §110.20-1 of this chapter. Also, this equipment must be suitably installed for the location and service intended.

[CGD 94–108, 61 FR 28283, June 4, 1996; 61 FR 33045, June 26, 1996]

Subpart 111.79—Receptacles

§ 111.79–1 Receptacle outlets; general.

(a) There must be a sufficient number of receptacle outlets in the crew accommodations for an adequate level of habitability.

(b) There must be a sufficient number of receptacle outlets throughout the machinery space so that any location can be reached by a portable power cord having a length not greater than 24 meters (75 feet).

(c) Each receptacle outlet must be compatible with the voltage and current of the circuit in which it is installed.

(d) Each receptacle outlet must be suitable for the environment in which it is installed and constructed to the appropriate NEMA or IEC protection standard as referenced in §111.01–9. Special attention must be given to outlets in hazardous locations.

(e) A receptacle outlet must not have any exposed live parts with the plug opening uncovered.

[CGD 94–108, 61 FR 28283, June 4, 1996]

§ 111.79–3 Grounding pole.

Each receptacle outlet that operates at 100 volts or more must have a grounding pole.

§ 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 §111.79–1(d) or §111.79–3.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by USCG–2011–0618, 76 FR 60754, Sept. 30, 2011]

§ 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 voltages and power types.

If receptacle outlets on a vessel are supplied by different voltages (e.g., 110 volts and 220 volts) or by different types of power (e.g., AC and DC), each receptacle outlet must preclude the plugging of a portable device into a receptacle outlet of an incompatible voltage or type of power.

[CGD 94–108, 61 FR 28283, June 4, 1996]

§ 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.

(d) As appropriate, each outlet-box or junction-box installation must meet the following standards, all of which are incorporated by reference (see 46 CFR 110.10–1): Article 314 of NFPA NEC 2002; UL 50; UL 514A, UL 514B, and UL 514C; IEC 60092–101; IEC 92–201; IEC 92–306; IEC 60092–352; IEC 92–401; and IEC 60092–502.

(e) Each outlet or junction box must be securely attached to its mounting and be affixed so as to maintain its designated degree of protection.

(f) Each outlet and junction box must be suitable for the environment in which it is installed and be constructed to the appropriate NEMA or IEC standard.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28283, June 4, 1996; USCG–2003–16630, 73 FR 65199, Oct. 31, 2008]

§ 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.

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.

§ 111.83–5 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) Either—

(1) A low-fluid-level device that opens all conductors to the heater if the operating level drops below the manufacturer's recommended minimum safe level; or

(2) A flow device that opens all conductors to the heater if there is inadequate flow.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28283, June 4, 1996]

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 applicable UL 484 or UL 1042 construction standards (both incorporated by reference; see 46 CFR 110.10–1) or equivalent standards under § 110.20–1 of this chapter

(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.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28283, June 4, 1996; 61 FR 33045, June 26, 1996; 61 FR 36608, July 11, 1996; USCG–2003–16630, 73 FR 65199, Oct. 31, 2008]

Subpart 111.91—Elevators and Dumbwaiters

§ 111.91–1 Power, control, and interlock circuits.

Each electric power, control, and interlock circuit of an elevator or dumbwaiter must meet ASME A17.1 (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65199, Oct. 31, 2008]

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 for boat winches in other parts of this chapter under which vessels are certificated and in subchapter Q, Equipment approvals.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28283, June 4, 1996]

§ 111.95–3 General requirements.

(a) Each electrical component (e.g., enclosure, motor controller, or motor) must be constructed to the appropriate NEMA or IEC degree of protection requirement for the service and environment in which it is installed.

(b) 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.

[CGD 94–108, 61 FR 28283, June 4, 1996]

§ 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.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28283, June 4, 1996]

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 H, §170.270 of this chapter.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by USCG–2000–7790, 65 FR 58462, Sept. 29, 2000]

§ 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 §170.270(c) 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 once and to close all doors two 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.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28283, June 4, 1996; USCG–2000–7790, 65 FR 58462, Sept. 29, 2000]

§ 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—Fire Door Holding and Release Systems

§ 111.99–1 Applicability.

This subpart applies to fire door holding and release systems, if fitted.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28284, June 4, 1996]

§ 111.99–3 Definitions.

As used in this subpart—

Central control panel means a manually-operated device on the navigating bridge or in the fire control room for releasing one or more fire doors.

Fire door means a door that is in a fire boundary, such as a stairway enclosure or main vertical zone bulkhead, that is not usually kept closed.

Fire door holding magnet means an electromagnet for holding a fire door open.

Local control panel means a manually-operated device next to a fire door for releasing the door so that the fire door self-closing mechanism may close the door.

[CGD 94–108, 61 FR 28284, June 4, 1996; 61 FR 33045, June 26, 1996; as amended by USCG–2004–18884, 69 FR 58348, Sept. 30, 2004]

§ 111.99–5 General.

Fire door release systems, if installed, must meet regulation II–2/30.4.3 of IMO SOLAS 74 (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65199, Oct. 31, 2008]

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 46 CFR 56.50–55.

[USCG–2003–16630, 73 FR 65199, Oct. 31, 2008]

§ 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; definition.

This subpart applies to installations in hazardous locations as defined in NFPA NEC 2002 and in IEC 60079–0 (both incorporated by reference; see 46 CFR 110.10–1). As used in this subpart, ''IEC 60079 series'' means IEC 60079–0, IEC 60079–1, IEC 60079–2, IEC 60079–5, IEC 79–6, IEC 60079–7, IEC 60079–11, IEC 60079–15, and IEC 79–18 (all incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 65199, Oct. 31, 2008]

§ 111.105–3 General requirements.

All electrical installations in hazardous locations must comply with the general requirements of section 33 of IEEE 45–1998 (incorporated by reference; see 46 CFR 110.10–1), and with either Articles 500 through 505 of NFPA NEC 2002 (incorporated by reference; see 46 CFR 110.10–1) or with the IEC 60079 series (as defined in 46 CFR 111.105–1 and incorporated by reference; see 46 CFR 110.10–1). When installations are made in accordance with NFPA NEC 2002 articles, and when installed fittings are approved for the specific hazardous location and the cable type, marine shipboard cable that complies with 46 CFR subpart 111.60 may be used instead of rigid metal conduit.

[USCG–2003–16630, 73 FR 65199, Oct. 31, 2008]

§ 111.105–5 System integrity.

In order to maintain system integrity, each individual electrical installation in a hazardous location must comply specifically with Articles 500–505 of NFPA NEC 2002 (incorporated by reference; see 46 CFR 110.10–1), as modified by 46 CFR 111.105–3, or with the IEC 60079 series (as defined in 46 CFR 111.105–1 and incorporated by reference; see 46 CFR 110.10–1), but not in combination in a manner that will compromise system integrity or safety. Hazardous location equipment must be approved as suitable for use in the specific hazardous atmosphere in which it

is installed. The use of nonapproved equipment is prohibited.

[USCG–2003–16630, 73 FR 65200, Oct. 31, 2008]

§ 111.105–7 Approved equipment.

When this subpart or NFPA NEC 2002 (incorporated by reference; see 46 CFR 110.10–1) states that an item of electrical equipment must be approved, or when IEC 60079–0 (incorporated by reference; see 46 CFR 110.10–1) states that an item of electrical equipment must be tested or approved in order to comply with the IEC 60079 series (as defined in §111.105–1 and incorporated by reference; see 46 CFR 110.10–1), that item must be—

(a) Listed or certified by an independent laboratory as approved for use in the hazardous locations in which it is installed; or

(b) Purged and pressurized equipment that meets NFPA 496 (incorporated by reference; see 46 CFR 110.10–1) or IEC 60079–2.

[CGD 94–108, 61 FR 28284, June 4, 1996, as amended by USCG–2003–16630, 73 FR 65200, Oct. 31, 2008]

§ 111.105–9 Explosion-proof and flameproof equipment.

Each item of electrical equipment required by this subpart to be explosion-proof under the classification system of NFPA NEC 2002 (incorporated by reference; see 46 CFR 110.10–1) must be approved as meeting UL 1203 (incorporated by reference; see 46 CFR 110.10–1). Each item of electrical equipment required by this subpart to be flameproof must be approved as meeting IEC 60079–1 (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65200, Oct. 31, 2008]

§ 111.105–11 Intrinsically safe systems.

(a) Each system required by this subpart to be intrinsically safe must use approved components meeting UL 913 or IEC 60079–11 (both incorporated by reference; see 46 CFR 110.10–1).

(b) Each electric cable of an intrinsically safe system must—

(1) Be 50 mm (2 inches) or more from cable of non-intrinsically safe circuits, partitioned by a grounded metal barrier from other non-intrinsically safe electric cables, or a shielded or metallic armored cable; and

(2) Not contain conductors for non-intrinsically safe systems.

(c) As part of plan approval, the manufacturer must provide appropriate installation instructions and restrictions on approved system components. Typical instructions and restrictions include information addressing—

(1) Voltage limitations;

(2) Allowable cable parameters;

(3) Maximum length of cable permitted;

(4) Ability of system to accept passive devices;

(5) Acceptability of interconnections with conductors or other equipment for other intrinsically safe circuits; and

(6) Information regarding any instructions or restrictions which were a condition of approval of the system or its components.

(d) Each intrinsically safe system must meet ISA RP 12.6 (incorporated by reference, see 46 CFR 110.10–1), except Appendix A.1.

[CGD 94–108, 61 FR 28284, June 4, 1996, as amended at 62 FR 23909, May 1, 1997; USCG–2003–16630, 73 FR 65200, Oct. 31, 2008]

§ 111.105–15 Additional methods of protection.

Each item of electrical equipment that is—

(a) A powder-filled apparatus must meet IEC 60079–5 (incorporated by reference; see 46 CFR 110.10–1);

(b) An oil-immersed apparatus must meet either IEC 79–6 (incorporated by reference; see 46 CFR 110.10–1) or Article 500.7(I) of NFPA NEC 2002 (incorporated by reference; see 46 CFR 110.10–1);

(c) Type of protection ''e'' must meet IEC 60079–7 (incorporated by reference; see 46 CFR 110.10–1);

(d) Type of protection ''n'' must meet IEC 60079–15 (incorporated by reference; see 46 CFR 110.10–1); and

(e) Type of protection ''m'' must meet IEC 79–18 (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65200, Oct. 31, 2008]

§ 111.105–17 Wiring methods for hazardous locations.

(a) Through runs of marine shipboard cable meeting subpart 111.60 of this

part are required for all hazardous locations. Armored cable may be used to enhance ground detection capabilities. Additionally, Type MC cable may be used subject to the restrictions in §111.60–23.

(b) Where conduit is installed, the applicable requirements of either NFPA NEC 2002 (incorporated by reference; see 46 CFR 110.10–1) or the IEC 60079 series (as defined in §111.105–1 and incorporated by reference; see 46 CFR 110.10–1) must be followed.

(c) Each cable entrance into explosionproof or flameproof equipment must be made with approved seal fittings, termination fittings, or glands that meet the requirements of §111.105–9.

(d) Each cable entrance into Class II and Class III (Zone 10, 11, Z, or Y) equipment must be made with dust-tight cable entrance seals approved for the installation.

[CGD 94–108, 61 FR 28284, June 4, 1996, as amended at 62 FR 23909, May 1, 1997; USCG–2003–16630, 73 FR 65200, Oct. 31, 2008]

§111.105–19 Switches.

A switch that is explosionproof or flameproof, or that controls any explosionproof or flameproof equipment, under §111.105–19 must have a pole for each ungrounded conductor.

[CGD 94–108, 61 FR 28284, June 4, 1996]

§111.105–21 Ventilation.

A ventilation duct which ventilates a hazardous location has the classification of that location. Each fan for ventilation of a hazardous location must be nonsparking.

[CGD 94–108, 61 FR 28285, June 4, 1996]

§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 77 (incorporated by reference, see 46 CFR 110.10–1).

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by USCG–2003–16630, 73 FR 65200, Oct. 31, 2008]

§111.105–29 Combustible liquid cargo carriers.

(a) Each vessel that carries combustible liquid cargo with a closed-cup flashpoint of 60 degrees C (140 degrees F) or higher must have:

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

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

(b) If a submerged cargo pump motor is in a cargo tank, it must meet the requirements of §111.105–31(d).

(c) Where the cargo is heated to within 15°C of its flashpoint, the cargo pumproom must meet the requirements of §111.105–31(f) and the weather locations must meet §111.105–31(l).

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28285, June 4, 1996; 61 FR 36787, July 12, 1996; 61 FR 39695, July 30, 1996]

§111.105–31 Flammable or combustible cargo with a flashpoint below 60 °C (140 °F), carriers of liquid-sulphur or inorganic acid.

(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 is a Class I, Division 1 (IEC Zone 0) location that has additional electrical equipment restrictions outlined in section 33 of IEEE 45–1998 and IEC 60092–502 (both incorporated by reference; see 46 CFR 110.10–1). Cargo tanks must not contain any electrical equipment except the following:

(1) Intrinsically safe equipment; and

(2) Submerged cargo pump motors and their associated cable.

(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) Marine shipboard 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 marine shipboard 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 electrical equipment except explosionproof lighting fixtures and through runs of marine shipboard 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 marine shipboard cable.

(l) *Weather locations.* The following locations in the weather are Class I, Division 1 (Zone 1) locations (except the open deck area on an inorganic acid carrier which is considered a nonhazardous location) and may have only approved intrinsically safe, explosionproof, or purged and pressurized electrical equipment, and through runs of marine shipboard cable if the location 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.

(3) Within 5 meters (16 ft) of cargo pressure/vacuum valves with an unlimited height; or

(4) Within 10 meters (33 ft) of vent outlets for free flow of vapor mixtures and high velocity vent outlets for the passage of large amounts of vapor, air or inert gas mixtures during cargo loading and ballasting or during discharging.

(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.

(n) *Duct keel ventilation or lighting.* (1) The lighting and ventilation system for each pipe tunnel must meet ABS Steel Vessel Rules (incorporated by reference; see 46 CFR 110.10–1), section 5–1–7/31.17.

(2) If a fixed gas detection system is installed, it must meet the requirements of IMO SOLAS 74 (incorporated by reference; see 46 CFR 110.10–1) and Part 4, Chapter 3 of ABS Steel Vessel Rules.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 82–096, 49 FR 4947, Feb. 9, 1984; CGD 94–108, 61 FR 28285, June 4, 1996; 61 FR 33045, June 26, 1996; 62 FR 23909, May 1, 1997; USCG–2003–16630, 73 FR 65200, Oct. 31, 2008]

§ 111.105–32 Bulk liquefied flammable 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 design must receive concept approval by the Commandant (CG–521) and its installation must receive plan approval by the Commanding Officer, Marine Safety Center.

(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 cargo tank, must meet § 111.105–31(d).

(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 marine shipboard 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 marine shipboard 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 marine shipboard 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 marine shipboard 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; CGD 94–108, 61 FR 28285, June 4, 1996; 62 FR 23909, May 1, 1997; USCG–2009–0702, 74 FR 49234, Sept. 25, 2009]

§ 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 gastight 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, gastight 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, gastight 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 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, (Zone 10 or Z) locations on a vessel that carries coal:

(1) The interior of each coal bin and hold.

(2) Each compartment that has a coal transfer point where coal is transferred, dropped, or dumped.

(3) Each open area within 3 meters (10 ft) of a coal transfer point where coal is dropped or dumped.

(b) Each space that has a coal conveyer on a vessel that carries coal is a Class II, Division 2, (Zone 11 or Y) space.

(c) A space that has a coal conveyer on a vessel that carries coal must have electrical equipment approved for Class II, Division 2, (Zone 11 or Y) hazardous locations, except watertight general emergency alarm signals.

[CGD 94–108, 61 FR 28285, June 4, 1996]

§ 111.105–37 Flammable anesthetics.

Each electric installation where a flammable anesthetic is used or stored must meet NFPA 99 (incorporated by reference, see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65200, Oct. 31, 2008]

§ 111.105–39 Additional requirements for vessels carrying vehicles with fuel in their tanks.

Each vessel that carries a vehicle with fuel in its tank must meet the requirements of ABS Steel Vessel Rules (incorporated by reference; see 46 CFR 110.10–1), section 5–10–4/3, except as follows:

(a) If the ventilation requirements of ABS Steel Vessel Rules section 5–10–4/3 are not met, all installed electrical equipment must be suitable for a Class I, Division 1; Zone 0; or Zone 1 hazardous location.

(b) If the vessel is fitted with an approved fixed gas detection system set at 25 percent the LEL, each item of the installed electrical equipment must meet the requirements for a Class I, Division 1; Class I, Division 2; Zone 0; Zone 1; or Zone 2 hazardous location.

[CGD 94–108, 61 FR 28285, June 4, 1996, as amended at 62 FR 23909, May 1, 1997; USCG–2003–16630, 73 FR 65200, Oct. 31, 2008]

§ 111.105–40 Additional requirements for RO/RO vessels.

(a) Each RO/RO vessel must meet ABS Steel Vessel Rules (incorporated by reference; see 46 CFR 110.10–1), section 4–8–4/27.3.2.

(b) Each item of installed electrical equipment must meet the requirements for a Class I, Division 1; Class I, Division 2; Zone 0; Zone 1; or Zone 2 hazardous location when installed 460 mm (18 inches) or more above the deck of closed cargo spaces. Electrical equipment installed within 460 mm (18 inches) of the deck must be suitable for either a Class I, Division 1; Zone 0; or Zone 1 hazardous location.

(c) Where the ventilation requirement of ABS Steel Vessel Rules section 4–8–4/27.3.2 is not met—

(1) All installed electrical equipment must be suitable for a Class I, Division 1; Zone 0; or Zone 1 hazardous location; or

(2) If fitted with an approved fixed gas detection system (set at 25 percent of the LEL), each item of installed electrical equipment must meet the requirements for either a Class I, Division 1; Class I, Division 2; Zone 0; Zone 1; or Zone 2 hazardous location.

[CGD 94–108, 61 FR 28285, June 4, 1996; 61 FR 33045, June 26, 1996, as amended at 62 FR 23909, May 1, 1997; USCG–2003–16630, 73 FR 65200, Oct. 31, 2008]

§ 111.105–41 Battery rooms.

Each electrical installation in a battery room must meet 46 CFR subpart 111.15 and IEEE 45–1998 (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65201, Oct. 31, 2008]

§ 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 (Zone 0 or Zone 1) location;

(b) Explosionproof electric equipment approved for a Class I, Division 1, Group D (Zone 0 or Zone 1) location; or

(c) Through runs of marine shipboard cable.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28285, June 4, 1996; 62 FR 23909, May 1, 1997]

§ 111.105–45 Vessels carrying agricultural products.

(a) The following areas are Class II, Division 1, (Zone 10 or Z) locations on vessels carrying bulk agricultural products that may produce dust explosion hazards:

(1) The interior of each cargo hold or bin.

(2) Areas where cargo is transferred, dropped, or dumped and locations within 1 meter (3 feet) of the outer edge of these areas in all directions.

(b) The following areas are Class II, Division 2, (Zone 11 or Y) locations on vessels carrying bulk agricultural products that may produce dust explosion hazards:

(1) All areas within 2 meters (6.5 feet) of a Division 1 (Zone 10 or Z) location in all directions except when there is an intervening barrier, such as a bulkhead or deck.

NOTE TO §111.105–45: Information on the dust explosion hazards associated with the carriage of agricultural products is contained in Coast Guard Navigation and Vessel Inspection Circular 9–84 (NVIC 9–84) ''Electrical Installations in Agricultural Dust Locations.''

[CGD 94–108, 61 FR 28285, June 4, 1996]

Subpart 111.107—Industrial Systems

§ 111.107–1 Industrial systems.

(a) For the purpose of this subpart, an industrial system is a system that—

(1) Is not a ship's service load, as defined in §111.10–1;

(2) Is used only for the industrial function of the vessel;

(3) Is not connected to the emergency power source; and

(4) Does not have specific requirements addressed elsewhere in this subchapter.

(b) An industrial system that meets the applicable requirements of NFPA NEC 2002 (incorporated by reference, see 46 CFR 110.10–1) must meet only the following:

(1) The switchgear standards in part 110, subpart 110.10, of this chapter.

(2) Part 110, subpart 110.25, of this chapter—Plan Submittal.

(3) Subpart 111.01 of this part—General.

(4) Subpart 111.05 of this part—Equipment Ground, Ground Detection, and Grounded Systems.

(5) Sections 111.12–1(b) and 111.12–1(c)—Prime movers.

(6) Subpart 111.105 of this part—Hazardous Locations.

(c) Cables that penetrate a watertight or fire boundary deck or bulkhead must—

(1) Be installed in accordance with 46 CFR 111.60–5 and meet the flammability-test requirements of either IEEE 1202 or Category A of IEC 60332–3–22 (both incorporated by reference; see 46 CFR 110.10–1); or

(2) Be specialty cable installed in accordance with §111.60–2.

[CGD 94–108, 61 FR 28286, June 4, 1996, as amended at 62 FR 23910, May 1, 1997; USCG–2003–16630, 73 FR 65201, Oct. 31, 2008]

PART 112—EMERGENCY LIGHTING AND POWER SYSTEMS

Subpart 112.01—Definitions of Emergency Lighting and Power Systems

Sec.

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