



MARINAS AND BOATYARDS 1963



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NATIONAL FIRE PROTECTION ASSOCIATION

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National Fire Protection Association

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Fire Protection Standard for Marinas and Boatyards

NFPA No. 303 — 1963

1963 Edition of No. 303

The 1963 edition of this standard is a complete revision of recommendations adopted and published by the Association in 1960. The form of presentation has been altered as well as some of the technical content. It was adopted by the Association at its 1963 annual meeting on recommendation of the Sectional Committee on Marinas and Boatyards and the Committee on Marine Fire Protection.

Origin and Development of No. 303

The first NFPA standard on the subject of marinas was adopted by the Association in 1940 on recommendation of the Committee on Boat Basins and Municipal Marinas of the then NFPA Marine Section. The following year the scope of the recommendations was enlarged to include boat service and storage yards. Minor amendments were adopted in 1952 and 1957. An extensive revision was adopted in 1960 on recommendation of the Committee on Motor Craft and Marinas. In 1961 the Sectional Committee on Marinas and Boatyards was established to deal exclusively with these matters, thus permitting the Sectional Committee on Motor Craft to concentrate on boats.

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Fire Protection Standard for Marinas and Boatyards

NFPA No. 303 — 1963

FOREWORD

The following standard is intended to provide a minimum acceptable level of safety to life and property from fire and related hazards at establishments used for the construction, repair, storage, launching, berthing and fueling of small craft. Where additional facilities are operated in conjunction therewith, reference to other applicable standards should be made.

Management is responsible for planning and implementing a program for fire prevention and fire protection and its attitude toward such matters will inevitably be reflected in the attitudes and behavior of employees and boat owners.

10. GENERAL

101. Management must establish and enforce fire prevention regulations and is responsible for the provision and maintenance of fire protection equipment. It is essential that all applicable federal, state and local laws, ordinances and regulations be understood and complied with.

(a) Management is responsible for the training of employees in fire prevention and the proper emergency action in event of fire, for providing the necessary equipment to control the spread of fire and to handle any necessary movement or evacuation of boats.

102. Water Supply: An adequate water supply for fire fighting shall be provided to all areas of the property in a manner acceptable to the authority having jurisdiction.

103. Fire Extinguishers: Portable fire extinguishers of approved types and suitable to the hazards and circumstances shall be provided throughout the property and so located that an extinguisher is within 50 feet of any point. Additional equipment shall be provided in areas where there are permanent or seasonal obstructions to the regular units, or wherever the danger of fire is particularly great.

NOTE: See "Standard for Installation, Maintenance and Use of Portable Fire Extinguishers" (NFPA No. 10).

104. Fire Alarm: Immediate notification of the nearest fire department in the event of fire shall be the established operating procedure. Approved means for sounding an alarm of fire for notification of yard personnel and others on the premises shall be provided.

105. Fire Brigade: Yard employees shall be instructed in fire emergency procedures, including the sounding of an alarm, notification of the fire department and operation of fire extinguishing equipment.

106. Access: Where provided, fencing shall be so arranged as to permit prompt access in an emergency by fire fighting forces and apparatus.

107. Cleanliness: Systematic procedures for the maintenance of clean premises shall be adopted.

(a) Adequate, covered metal cans shall be provided for oily and soiled rags and other combustible refuse. Similar receptacles shall be provided at convenient locations throughout the facility for rubbish and debris.

(b) All wood shavings, sawdust, light wood waste and other readily ignitable refuse shall be cleared away and disposed of in a safe manner daily.

(c) Weeds, tall grass, brush and other similar dry weather fire hazards shall be destroyed by approved weed killers or by other fire-safe methods and removed after destruction. Weed burners shall not be used.

(d) Congestion in the storage of combustible equipment and supplies shall be avoided.

(e) Public areas shall be inspected at regular frequent intervals for the express purpose of eliminating hazardous conditions.

108. Smoking: Smoking shall be prohibited and "no smoking" signs posted in such locations as fueling stations, areas used for the storage and handling of fuel or other flammable liquids, boat storage sheds, paint and woodworking shops, sail lofts, battery charging rooms, boat locker rooms, storage rooms, and such other locations as management may designate.

109. Fueling Boats: All boat fueling operations shall be carefully accomplished in accordance with Fire Protection Standard for Motor Craft (NFPA No. 302).

(a) No tank barge or other fuel supply boat shall be permitted within the berthing area.

(b) Fueling from cans shall be prohibited at berths, but may be permitted at the fueling station.

20. BERTHING AND REPAIR FACILITIES

201. Design: Congestion shall be avoided in the berthing area by locating an entrance and an exit remote from each other, plus enough space between main piers and sufficient width of roadstead to allow for convenient maneuvering at all times. If a separate entrance and exit is not feasible, locate the single opening so as to be accessible from all parts within the berthing and mooring area and large enough for two lines of boats to move rapidly during emergencies. The space between main pierhead lines shall be not less than twice the over-all length of the largest boat to be berthed. The design shall specifically provide:

(a) Access to all parts for the operation of fire fighting apparatus.

(b) Access to each boat afloat for emergency removal without the necessity of moving any other boat.

(c) A system of electrically powered lighting of type and arrangement to assure adequate illumination of all exterior areas to prevent accidents and permit normal use of the premises. Outdoor lighting fixtures located on shore shall be of the enclosed and gasketed type, installed pendent unless designed for installation otherwise, and equipped with guards and reflectors as may be required by the location in which installed.

202. Construction: Except for service piers, ordinary catwalk construction is suitable for mooring piers provided they are not less than 2 feet in width and not more than 50 feet in length. Mooring piers exceeding 50 feet in length shall be not less than 4 feet wide.

203. Heating: Heating equipment shall be installed in accordance with local ordinances and the following standards as appropriate:

- Oil Burning Equipment (NFPA No. 31)
- Gas Appliances and Gas Piping (NFPA No. 54)
- Residence Type Warm Air Heating Systems (NFPA No. 90B)
- Chimneys, Flues and Vents (NFPA No. 211)
- Smoke Pipes and Stove Pipes (NFPA No. 212)

(a) Adequate and suitable fire extinguishing equipment shall be supplied, installed, and maintained in an approved manner in proximity to heating equipment.

(b) Heat generating plants for steam, hot water or forced air systems shall be located in detached buildings or rooms separated from other areas by fire walls.

(c) All heating equipment shall be approved for the purpose of its use.

(d) Coal and wood burning stoves are not recommended unless such installations are periodically checked and found to possess adequate safeguards by the local fire authority having jurisdiction. If such stoves are used, the following precautions shall be in effect unless the authority having jurisdiction modifies the precautions specifically for each installation:

1. A radial clearance of 36 inches shall be maintained from any combustible material unless such material is effectively protected.

2. Combustible flooring under stoves shall be protected by a sheet of $\frac{1}{4}$ -inch asbestos covered by a sheet of metal at least 24 U. S. Gage and extended at least 12 inches beyond each stove on all sides. Stoves shall have legs of sufficient length to raise ash pit bottoms at least 6 inches above the metal.

3. Chimney connectors shall be substantially supported and have a clearance of at least 18 inches from all combustible material. Double metal ventilating thimbles shall be used where chimney connectors pass through combustible partitions or roofing and these should be at least twice the diameter of the chimney connector. Chimney connectors shall not pass through concealed spaces.

4. Ready fuel supplies, particularly if scrap wood is used, shall be neatly stowed to maintain safe clearance from stoves.

5. Substantial metal cans shall be provided for handling ashes. These cans shall not be used as receptacles for combustible waste.

(e) Heating devices employing a flame or exposed hot wires shall not be used in areas where flammable vapors or combustible dusts may be present.

30. OPERATIONAL HAZARDS

301. Conditions on Individual Boats:

(a) The management shall have an inspection made of boats received for repair, servicing, or storage. This shall be

accomplished as soon as practicable after arrival of a boat and before commencement of any work aboard for the purpose of determining:

1. Presence of combustible vapors in any compartment.
2. General maintenance and cleanliness, and location of any combustible materials which require removal or protection for the safe accomplishment of the particular work involved.
3. Quantity, type, and apparent condition of fire extinguishing equipment on board.

The resulting information, along with directions covering necessary precautions, shall be made known to the employees responsible for accomplishing the servicing work, and any basically unsafe conditions and desirable corrections shall be discussed with the boat owner.

(b) The following general precautions shall be observed:

1. Smoking in the working area shall be prohibited.
2. Loose combustibles in way of any hazardous work shall be removed.
3. Unprotected battery terminals shall be suitably covered to prevent inadvertent shorting from dropped tools or otherwise. The ungrounded battery lead shall be disconnected.
4. Only experienced personnel shall be employed in the removal or installation of storage batteries.
5. Protective coverings or shields, used to protect engines, accessories or combustibles, shall be of fire resistant materials.
6. Precautions recommended elsewhere herein for specific kinds of work shall be followed.

302. Storage and Handling of Fuels: The fueling station shall be so located as to minimize the exposure of all other plant facilities. Where tide and weather exposure conditions permit, all fuel handling shall be outside the main berthing area.

NOTE: Floating fueling stations are subject to the Tank Vessel Regulations of the United States Coast Guard.

(a) Inside fueling stations shall be located near an exit by water from the berthing area or at some other location from which, in case of fire aboard a boat alongside, the stricken craft may be quickly removed without endangering other boats nearby.

(b) Outside berths and connections shall be provided for the use of tank barges or fuel supply boats when filling storage tanks.

(c) Fuel storage tanks shall be installed in accordance with the Flammable Liquids Code (NFPA No. 30) and in accordance with all state and local ordinances.

(d) Fuel storage tanks shall be securely anchored where they are located subject to flooding or tidal conditions, and the applicable precautions outlined in Protection of Tanks Containing Flammable Liquids in Location, That May Be Flooded (NFPA No. 30, Appendix A), shall be observed.

(e) Fuel storage tanks and pumps, other than those integral with approved dispensing units, supplying gasoline, Class I, or Class II flammable liquids at marine service stations, shall be located only on shore, or with express permission of the authority having jurisdiction, on a pier of solid-fill type. Approved dispensing units with or without integral pumps may be located on shore, piers of solid-fill type, or open piers, wharves or floating piers.

(f) Tanks and pumps supplying diesel Class III flammable liquids at marine service stations may be located on shore, on piers of solid-fill type or on open piers, wharves or floating piers. Class III flammable liquid tanks which are located elsewhere than on shore or on piers of the solid-fill type shall be limited to 550 gallons aggregate capacity. Pumps not a part of the dispensing unit shall be located adjacent to the tanks.

(g) Fuel pipelines shall be installed in accordance with the provisions of the Flammable Liquids Code (NFPA No. 30, Paragraphs 6430 and 6431).

(h) Dispensing units for transferring fuels from storage tanks shall be in accordance with provisions of the Flammable Liquids Code (NFPA No. 30). Every fuel delivery nozzle shall be equipped with a self-closing control valve, which will shut off the flow of fuel when the operator's hand is removed from the nozzle. The use of any automatic nozzle with a latch-open device is prohibited.

(i) Gasoline and other flammable liquids stored in drums or cans shall be kept separated from other plant facilities, and stored and dispensed in accordance with applicable requirements of the Flammable Liquids Code (NFPA No. 30). Fueling operations involving systems using portable tanks shall be in accordance with provisions set forth for outboard boats in Fire Protection Standard for Motor Craft (NFPA No. 302).

(j) Hand carriage of gasoline within the plant area shall be restricted to approved safety containers of sound metal construction having a tight closure with screwed or spring cover and fitted with a spout or so designed that the contents can be poured without spilling. Open buckets, cans or glass jars shall not be used.

(k) Gasoline shall not be used as a cleaner on the premises or on board boats. Only soaps, detergents and approved solvents shall be used.

303. Storage and Handling of Paints and Spirits: Paint storage and mixing shall be segregated from other working and storage areas preferably by provision of a well separated and ventilated building of noncombustible construction but otherwise by provision of a ventilated fire-resistive room with properly protected openings.

304. Paint Removal and Painting: Removal of paint or other finishes by means of a blowtorch or use of flammable solvents shall be restricted to exterior surfaces of boats and shall be conducted only out of doors and well separated from other craft.

(a) Only trained yard personnel shall be permitted to perform paint removal by means of a blowtorch.

(b) All fuel tank vents shall be effectively plugged before burning operations are begun and the plugs removed upon completion of the burning operations.

(c) An adequate supply of approved fire extinguishing equipment of suitable type shall be readily accessible to all areas where paint removal, painting or refinishing is in process.

(d) The operation of open flame or spark producing equipment shall not be permitted where painting, sanding, scraping, or wire brushing is being performed in confined areas such as boat interiors.

(e) Portable electric lamps used in areas where flammable vapors may be encountered such as in paint removal and painting locations, shall be of the "explosion proof" type and shall be equipped with guards.

(f) Only such quantities of paint and thinner as required for one day's operations shall be permitted in the work area.

(g) Where spray finishing is performed indoors repeatedly at a fixed location, it shall be conducted in accordance with the Standard for Spray Finishing Using Flammable Materials

(NFPA No. 33). Where such spray finishing is performed but occasionally and in varying locations either indoors or outdoors, suitable precautions shall be taken to assure that all possible sources of ignition are eliminated throughout and near to the area wherein the spray finishing is to be performed. Ample ventilation of the area shall be provided.

305. Lumber Storage: Main stocks of lumber shall be stored in a segregated area for this specific purpose whether outdoors or in a separate shed.

(a) Piles of lumber shall be neatly stacked and unobstructed aisles of adequate width shall be maintained between individual piles to limit spread of fire and permit access for fire fighting.

306. Welding, Brazing, Soldering and Cutting: These operations shall be restricted to a shop specifically provided for the purpose or in an open area. The shop shall be of noncombustible or fire-resistive construction including its flooring, and all combustibles shall be kept well away from the shop or area.

(a) Only experienced personnel shall be permitted to perform welding, brazing, soldering, and cutting work.

(b) When welding or cutting in or on a boat, the following precautions shall be taken:

1. All combustible materials in proximity to hazardous repair work shall, if possible, be moved to a safe location aboard or ashore. Protect combustible materials which cannot be moved with noncombustible material or properly flameproofed tarpaulins.
2. The area must be absolutely free of combustible vapor, and flammable liquids.
3. All hatches, ports, tank openings, etc., through which sparks might pass shall be protected.
4. Noncombustible or properly flame-proofed tarpaulins or metal shields shall be set around the work in process to restrict the travel of sparks.
5. Before welding or cutting is begun on decks or bulkheads, careful check shall be made of conditions on the opposite side thereof to eliminate the possibility of damage by heat or fire.

(c) Neither welding nor cutting shall be attempted on a fuel tank unless one of the following provisions has been complied with:

1. The tank has been freed of flammable vapor or inerted in

accordance with NFPA Standard for the Control of Gas Hazards on Vessels To Be Repaired (NFPA No. 306) and a certificate obtained from a certificated Marine Chemist.*

2. The tank has been cleaned or otherwise safeguarded in accordance with NFPA Standard Procedures for Cleaning or Safeguarding Small Tanks and Containers (NFPA No. 327).

(d) All welding and cutting equipment shall be maintained in the best condition. Oxy-acetylene hose shall be neatly coiled and stored in a cool location, free from grease, oil, etc. Spare gas cylinders shall be limited to five and be kept in a well-ventilated locker. Electric welding equipment shall conform to the provisions of the National Electrical Code (NFPA No. 70).

(e) Wherever welding or cutting operations are in process, adequate and suitable fire extinguishing equipment shall be supplied, installed, and maintained in an approved manner.

NOTE: For additional information, see NFPA pamphlets "Preventing Cutting and Welding Fires" and "Sparks Astray."

307. Woodworking: Woodworking equipment and machinery shall be arranged in a manner to prevent accumulations of sawdust, shavings and wood waste, and the following precautions shall be observed:

(a) Waste and refuse shall be removed daily and safely disposed of.

(b) Sawdust shall not be permitted to accumulate on any electrical equipment.

(c) Blowers shall be installed for automatic removal of sawdust and shavings from saws and planers.

NOTE: The NFPA Standard for Blower and Exhaust Systems (NFPA No. 91), should be consulted on this subject.

(d) Machines shall never be left unattended while in operation.

(e) The area provided to accommodate boats undergoing repair shall be large enough to permit free access around and under them. A check shall be made of all boats in this area to make certain the area is free of flammable vapors and other hazards.

*The holder of a valid certificate issued by the NFPA establishing his qualifications to determine whether repairs and alterations may be undertaken with safety from hazards associated with flammable vapor-air mixtures.

(f) All volatile liquids required shall be kept to a minimum and handled only in approved safety cans.

(g) Adequate and suitable fire extinguishing equipment shall be supplied, installed and maintained in an approved manner.

308. Machine Shop: The machine shop shall be housed in a separate noncombustible or fire-resistive building or effectively segregated by means of a firewall when it shares a building with other facilities.

(a) Machines and motors shall be kept clean and in good repair at all times.

(b) All flammable liquids required shall be kept to a minimum and handled only in approved safety cans.

(c) Engine test stands shall be segregated from other shop activities in either a separate building or in a cutoff area near an exterior wall to permit a short, direct exhaust system and external location of fuel supplies. The exhaust piping and silencing equipment shall be suitably lagged with a clearance of at least 30 inches from all woodwork, with suitable provisions against the emission of sparks and the following:

1. Fuel supply tanks for diesel oil or gasoline shall be located outside buildings, well separated from engine exhaust discharge. Fuel feed lines from tanks shall be installed in accordance with good practice and be equipped with stop valves at tank and at stand. Extreme care must be taken to ground fuel systems at all times. Use of approved flexible fuel line connectors at engine bed end of fuel feed lines is recommended. Gravity flow of fuel from exterior tanks to test stands is not recommended.

2. The engine test stand equipment shall include a permanent engine cooling system which can be adjusted to meet the requirements of various engine types.

(d) An adequate supply of approved portable fire extinguishers of suitable type shall be installed and maintained in an approved manner.

309. Battery Service and Storage: Precautions shall be taken to avoid the accumulation and ignition of hydrogen gas liberated by wet cell storage batteries.

(a) A separate room, or properly enclosed space for battery charging operations shall be provided. The area shall be reserved

for that use only and shall not contain other materials.

1. The battery room shall be ventilated in the following manner: Provide air inlets at, or below, the level of the battery racks with adequate exhausts at ceiling. Install a vent stack equipped with natural draft exhaust head to aid in providing an upward draft.

(b) The room and the electrical system and equipment within it shall conform to the requirements of the National Electrical Code (Sections 503-15 and 511-7).

(c) Battery charges used shall have separate control switches in addition to a master switch to control all units.

(d) Charging equipment shall be well secured, protected from physical damage and so located as to permit good ventilation all around it.

(e) Racks for storing and charging use shall be substantial, suitably insulated, reasonably open and permit the setting of batteries so that no pockets, in which gases might accumulate, can be formed.

(f) Insulated tools and battery clips equipped with rubber cuffs shall be used to avoid short circuits.

(g) All battery servicing work shall be conducted by experienced personnel only. The following specific precautions shall be followed:

1. Prohibit smoking in the battery room.
2. No open flame or spark producing work shall be undertaken in the battery room.
3. No volatile liquids shall be stored or used in the battery room.
4. Cell caps shall be kept tight while connecting or disconnecting batteries.
5. Battery tongs or other appropriate carrying devices shall be used when removing or lifting batteries.
6. Leads shall never be connected or disconnected if power is being supplied to or released by batteries.

(h) Adequate and suitable fire extinguishing equipment shall be supplied, installed and maintained in an approved manner.

310. Servicing Liquefied Petroleum Gas Systems: Utmost care shall be exercised at all times in the servicing of liquefied

petroleum gas systems and equipment.

(a) Changing of cylinders shall be performed in accordance with Fire Protection Standard for Motor Craft (NFPA No. 302).

(b) Checks for leaks in liquefied petroleum gas systems must never be made with flame. Use of liquid detergent or soapy water solution is recommended.

NOTE: For further information, see Standard on Liquefied Petroleum Gases. (NFPA No. 58).

311. Boat Storage:

(a) It is imperative that hazardous conditions within boats be detected and corrected.

1. All loose combustibles shall be removed and stored in suitable lockers or segregated areas.

2. Liquefied petroleum gas cylinders, alcohol or kerosene from galley fuel tanks and any reserve fuel supplies for the galley shall be removed.

3. Batteries shall be removed.

4. Removal of fuel from tanks, lines, and accessories, must be conducted with due regard for the hazards involved. If facilities or personnel are not adequate for the safe handling of this work, it shall not be undertaken. In any event, stop valves at tanks shall be tightly closed.

5. Extreme care must be taken to check tanks and fuel systems for leaks.

6. Good ventilation shall be provided for hulls, especially bilges.

(b) Each boat in storage shall be readily accessible. Subject to control by the physical features of shed, wet basins or outside areas, boats shall be located with adequate separation between hulls at deck level wide enough to permit movement of fire equipment.

1. Smoking shall be prohibited in storage sheds and within boats.

2. Covers placed over boats stored in the open shall be of noncombustible materials or properly flameproofed.

3. Suitable lockers or facilities shall be provided for boat gear, with care exercised to see that no items subject to spontaneous heating are included, such as oilskin clothing, etc.

4. Ground, floor surfaces, and boat cradles shall be kept free of combustible rubbish.
5. No flammable liquids or materials shall be kept in boat storage areas.
6. Shore electrical power shall be disconnected whenever boats are unattended.

40. ELECTRICAL WIRING AND EQUIPMENT

401. Many hazards arising from the presence of electrical systems and electrical equipment in the marina and boatyard requiring special precautions are:

(a) Wet or continuously damp areas, exposed to rain, wind-driven spray and atmospheric moisture.

(b) Areas subject to flooding by abnormally high water.

(c) Areas in which flammable liquids or gases are stored, dispensed or used.

(d) The use of electrical equipment and facilities by persons not under the control of the management, many of whom are unfamiliar with the hazards which can be created by such use, and the means of avoiding them.

402. The National Electrical Code (NFPA No. 70) provides basic provisions to be observed in the design, selection and installation of electrical wiring and equipment. The recommendations set forth herein supplement and relate the requirements of the National Electrical Code to the specific hazards and combinations of hazards found in marinas, boatyards, boat basins and establishments of similar type.

403. General: All electrical wiring, conduit, enclosures and equipment, and the provision of circuit protective devices, shall conform to the applicable requirements of the National Electrical Code and to the applicable requirements of this standard.

404. Power Supply: Incoming power supply from a public utility system shall be designed and installed in relation to the calculated demand load.

(a) Primary service feeders shall be supported on poles or structures reserved for that purpose.

(b) In multiphase power supply facilities particular care shall be taken to arrange for equally balanced phase loads to the extent possible.

(c) Primary power, when introduced in excess of 250 volts, shall be transformed to reduce the private system to not in excess of 250 volts.

(d) Transformers shall be installed, when located within the private property area, in compliance with the requirements of National Electrical Code (Article 450); with the additional requirement that all transformers reducing the voltage of the main power supply shall be located above the level of possible flooding by abnormally high water.

(e) Main service equipment, including service disconnecting equipment, meters and associated equipment and main panel installed outdoors shall be suitably protected from the weather; located above the level of possible flooding by abnormally high water and protected against access by unauthorized persons. In other respects the main service installation shall conform to the requirements of the National Electrical Code (Article 230).

(f) When auxiliary stand-by power supply equipment is provided and driven by an internal combustion engine, it shall be separately housed in a ventilated fire-resistive structure located above the level of possible flooding by abnormally high water and containing only the auxiliary power unit and the necessary controls for the engine. Interior lighting shall be connected to the public utility circuit with a standard battery-powered emergency lighting fixture permanently installed. The fuel supply tank or tanks for this equipment shall be located outside of the structure, and shall fully comply with the requirements of this standard related to the storage and handling of flammable liquid fuels.

(g) The transfer switch for use in connecting an auxiliary emergency generator to the selected load circuits shall be a manually operated double throw switch, with wiring arranged to disconnect the selected circuits from the normal power source before the auxiliary source is connected to these circuits, and shall be of proper rating to make and break the full load current for all the selected circuits. The transfer switch shall be mounted on the exterior of the structure containing the auxiliary power generating equipment, within a cast metal enclosure having a gasketed cover and an external operating handle arranged to be locked in either position. Wiring connections to the transfer switch shall be made through full weight rigid metal conduit threaded into the enclosure, which shall be adequately grounded. The transfer switch installation shall otherwise comply with the requirements of the National Electrical Code (Section 373-2).

405. Grounding: Effective grounding of all noncurrent carrying metal parts of the electrical system, and provision of suitable

equipment-grounding facilities at all outlets provided for the connection of portable equipment, including outlets provided for the connection of shore power to vessels afloat, are of utmost importance in marinas, boatyards, boat basins and similar establishments. This is due to the exposure of electrical systems and equipment to water, damp or wet earth and to other grounded or partially grounded conductive parts and the consequent danger to life and possibility of high energy sparking adjacent to combustible materials.

(a) The means and methods of providing an effective ground to the noncurrent-carrying metal parts of the electrical system, and for equipment and portable appliances connected thereto, shall comply with the requirements of the National Electrical Code. (Article 250)

(b) In addition to the grounding provided by the conduit system there shall be installed a common grounding conductor of not less than No. 14 AWG arranged in accordance with the requirements of the National Electrical Code (Article 250), properly attached to the interior of all metallic boxes, housings and enclosures and properly connected to the grounding facility of the receptacle. Said grounding conductor shall terminate at the distribution panel ground.

(c) The partial or complete burial of a metal enclosure in earth shall not be accepted as a substitute for the grounding requirements as provided herein with respect to such enclosure.

(d) In any slip or berthing space where metal hulls are stored or berthed, an anode of suitable material and capacity connected to the equipment ground conductor of the electrical system shall be suspended in the water.

406. Damp or Wet Locations: Due to the many areas of marinas, boatyards, boat basins and similar establishments which consist of sheds or shed-like structures having large openings exposed to the weather and to flying spray and atmospheric moisture, and the continuous danger of abnormally high water and the extension of electrical systems into exposed areas in direct contact with water, wet or damp atmosphere, all areas of a marina, boatyard, boat basin or similar establishment which are subject to tidal flooding or submersion, shall, for the purposes of this standard, be considered "Wet Locations" as defined in the National Electrical Code (Article 100). Other areas shall be considered "Damp Locations" as defined in that Code. Exceptions are such buildings and structures as are so constructed and used as to be normally sealed against the weather by standard doors and windows and located above tidal flooding.

(a) The entire electrical system shall be of weather-proof or watertight design as defined in the National Electrical Code (Article 100), subject to location considerations as required above. To provide the best possible assurance that water or moisture will not enter conduits, boxes or enclosures only full weight rigid metallic conduit, enclosures and boxes of cast metal with threaded conduit connections and cast metal gasketed covers shall be used except that where there is need for continuous flexibility the use of nonmetallic sheathed cable, Type NMC will be permitted. At the point of entrance of Type NMC cable into boxes and enclosures protection against the entrance of water or moisture shall be provided by the use of packed glands or terminal tubes of marine types.

1. Boxes and enclosures having "knock-out" type conduit entrances shall not be used.

(b) Metal parts of conduit, boxes, enclosures, hangers, straps, screws, etc., shall be of corrosion resistant materials or shall be protected against corrosion by corrosion resistant materials. In locations exposed to immersion in salt water or to salt water spray the metal parts shall be of brass or bronze. Where practicable, the use of dissimilar metals anywhere in the system, in contact with each other, shall be avoided to eliminate the possibility of galvanic action.

(c) Switches, circuit breakers and panels shall be enclosed in cast metal housings with cast metal gasketed covers provided with external operating handles, and shall be installed in conformity with the requirements of the National Electrical Code (Section 373-2).

(d) Overcurrent protection equipment shall be provided by the use of circuit breakers instead of fuses to avoid the difficulty of fuse replacement in gasketed enclosures.

(e) Lighting fixtures shall conform to the requirements of the National Electrical Code (Sections 410-4 and 410-5), and additionally shall be located to prevent damage by contact with stored or moving material.

(f) Receptacles installed for the purpose of attachment of portable equipment or appliances, including receptacles to be used for providing shore power to vessels afloat, and rated not in excess of 20 amperes at 150 volts, shall be of the grounding type conforming to the National Electrical Code (Sections 410-54 and 410-55). Attachment plugs for use with such receptacles shall conform to the requirements of the National Electrical Code (Section 410-56).

(g) Receptacles installed for the purpose of attachment of portable equipment or appliances, including receptacles to be used for providing shore power to vessels afloat, and rated in excess of 20 amperes, shall be rated specifically for the required current. Such receptacles shall have, in addition to the current carrying contacts, an extra grounding contact so arranged that the matching attachment plug can enter the receptacles only in a manner to connect the grounding contacts of the plug and receptacles and not otherwise.

(h) All receptacles installed in Wet Locations shall be enclosed in cast metal housings having cast metal gasketed covers, arranged with a threaded metal cap to close the receptacle opening. The cap shall be attached to the enclosure by a substantial link type chain or by a permanent arm. The use of self draining enclosures arranged with conduit connection at the top is recommended. The threaded cap shall be put in place and maintained tight whenever the receptacle is not in use.

(i) Attachment plugs for use with receptacle outlets rated in excess of 20 amperes shall be equipped with threaded metal collars to engage the threaded opening of receptacle enclosures to close the receptacle opening when the plug is inserted into the receptacle.

(j) Portable cords used in Wet Locations shall be either Type SO or Type ST rated water resistant with stranded conductors not smaller than No. 14 AWG and including an equipment ground conductor in addition to the current-carrying conductors. The equipment ground conductor in each portable cord used in a Wet Location shall be attached to the grounding pin of the attachment plug and shall be arranged at the other end of the portable cord for attachment by a screw or bolt to any metallic housing or other exposed noncurrent-carrying metal part of the appliance or equipment which is to receive power through the portable cord. The required connection of the equipment ground conductor to the exposed metal part or parts of the equipment to be served by the portable cord shall be made before the attachment plug is inserted into the receptacle.

(k) Shore power service connections to vessels afloat shall be protected by a circuit breaker located at and protecting that outlet only and which is calibrated to trip at the rated capacity of the outlet.

(l) A special sign, stating the maximum voltage and current (in amperes) available from the shore service connection outlets shall be permanently located at the shore end of each pier on

which electrical outlets for shore service connections are provided, and on a wall visible to all within the office where arrangements are made for berthing facilities. Each such sign shall contain the following additional message in large letters:

"CAUTION": "CONNECTION SHALL NOT BE MADE TO ANY SHORE POWER OUTLET WITHOUT PERMISSION OF THE MANAGEMENT."

407. Wiring: Where impractical to install all wiring underground, exterior overhead wiring construction shall be arranged to avoid possibility of contact with equipment or vessels being moved through the yard. Minimum clearances shall be provided as follows:

Above open areas: 18 feet above grade.

Above buildings: 8 feet above highest point of roof.

Above roadways or driveways leading to vessel storage areas: a minimum of 18 feet and at least 3 feet, 6 inches above the maximum height of any moving equipment in use in the yard.

Proper warning signs shall be placed in suitable locations to warn operators of moving equipment, boat carriers, etc., of the wire clearance to be encountered.

(a) Metal poles, lighting standards and other metal supports which carry or enclose electrical wiring shall be effectively grounded.

(b) Overhead wiring of branch circuits and feeders shall be installed in a manner to comply fully with the requirements of the National Electrical Code (Article 730), except that clearances shall conform to those required by this standard.

(c) Wiring on piers, wharves and bulkheads, permanently supported by driven piles or other solid foundations shall be installed to conform to the requirements of this standard for Wet Locations. Attachment of electrical cable, conduit and equipment shall be made to permanent structural members of such structures.

(d) Wiring on piers constructed of a series of floating sections shall be of the flexible cable type containing the necessary number of properly sized conductors including an adequate equipment grounding conductor of gage not less than the current carrying conductors. The cable shall be not less than No. 8 AWG Type SO or ST with RW or TW grade insulation, and the jacket shall be water resistant and so marked. Where the cable passes through structural members of the floating section of the

pier, or is otherwise subject to abrasion or chafing, it shall be protected by a sleeve of heavy rubber or neoprene permanently attached to the structure.

1. To avoid long runs of cables containing a multiplicity of conductors on floating piers, such cables shall be considered as feeders, and branch circuits shall be taken off at junction boxes to provide service to shore power receptacle outlets and to pier lighting fixtures. Branch circuits shall be equipped with overcurrent protection at the location of the equipment served by the branch circuit.

2. A cast metal junction box with a cast metal gasketed cover and containing the required number of properly sized and arranged terminals shall be installed on each individual floating section. The point of entrance of the cable into each junction box shall be protected by a marine type gland or terminal tube, threaded into the wall of the junction box and packed to prevent entrance of water or moisture into the box. The conductors shall be fitted with proper terminal lugs and the equipment ground conductor shall be attached by a suitable screw or bolt to the interior of each junction box.

3. The cable connection from shore to a floating pier shall be arranged with sufficient slack, properly located and supported, to accommodate pier movement due to waves, traffic on the pier and tidal action. Arrangements shall be provided to prevent vessels and other floating objects from making contact with the cable.

408. Hazardous Locations: Only qualified persons, as defined in the National Electrical Code (Article 100), shall be permitted to use, handle, install or repair electrical systems or facilities within any area classed as "hazardous."

(a) When fuel storage and dispensing stations are located indoors the electrical system and equipment shall conform to the requirements of the National Electrical Code (Article 500); when located outdoors an area within 20 feet in all directions from the limits of the fuel storage or dispensing equipment shall be considered a hazardous area and the same requirements as related to indoor locations shall apply.

1. Only the electrical equipment and wiring necessary for the handling and dispensing of the fuels shall be installed within the hazardous area at any outdoor storage or dispensing station. Lighting fixtures for such locations, and the

switches controlling them shall be located beyond the hazardous area unless of a type approved for the location.

2. The equipment ground wire of the electrical system, or other approved ground connection, shall be arranged to extend adequate grounding protection to the metal nozzle of each fuel dispensing apparatus.

3. Wiring within the hazardous area where gasoline or other fuels are stored, pumped or dispensed shall be of the approved gasoline and oil resistant type TW installed in conduit.

4. There shall be no shore power receptacle outlet located within any hazardous area.

(b) The storage of lacquers, solvents, paints, varnishes and alcohol, when in sealed containers shall not cause the area of such storage to be classed as "hazardous." Areas wherein such volatile and flammable materials are dispensed from containers, mixed or used, as described in Paragraph 303, shall be considered Hazardous Locations and the electrical wiring and equipment therein shall conform to the requirements of the National Electrical Code (Article 500), for Class I, Group D, Division 1 atmospheres.

(c) Where Class I Hazardous Areas, as described in the National Electrical Code (Article 500), exist on piers served by non-metallic sheathed cable necessary for flexibility, entrances of the cable into boxes and enclosures by such cable shall be protected by the use of standard approved Class I sealing fittings, with approved packing and compound, located next to the box or enclosure, in addition to the marine type gland or terminal tube required for wet locations, as described elsewhere in this standard, which gland or terminal tube shall be threaded into the Class I sealing fitting and the Class I sealing fitting shall be threaded into the box or enclosure.

409. Marine Hoists, Railways, Cranes and Monorails: Motors and controls for marine hoists and railways shall be located above the possibility of flooding by abnormally high water. Wiring and equipment located in an area described herein as a Wet Location shall conform to the requirements of this standard for such locations.

(a) Where cranes or monorails are installed inside buildings for hoisting or transporting vessels or heavy equipment, the power shall be supplied by a system of enclosed trolley busway of the required ampere rating, located parallel to the crane track or monorail and above the level of possible flooding by ab-

normally high water. Open wire conductors or cable reels for supplying power to any hoist or motor operated on a crane or monorail shall not be used. The trolley busway system shall be of metal enclosed type, with the enclosure properly grounded as described elsewhere herein and protected by over-current devices as required by the National Electrical Code (Sections 610-41 and 610-42). The insulating members of the trolley busway system, including those in the trolleys shall be of nonmoisture-absorbing materials, or treated to prevent moisture absorption, and shall be arc-resistant.

(b) Where it is necessary to provide electric power to a mobile crane or hoist in the yard, and a trailing cable is involved, it shall consist of the parallel Type W cable with a jacket of distinctive color for safety.

410. Circuit Breakers for Use in Outdoor Locations: Circuit breakers having a trip rating of not in excess of 50 amperes, and installed outdoors in cast metal housings with gasketed covers, in locations exposed to the direct rays of the sun, shall be of the fully magnetic type with no thermally operated elements.

411. Tests: On completion of the installation of the electrical system it shall be subjected to an insulation test in the presence of the representative of the authority having jurisdiction. The test shall meet the requirements of the National Electrical Code (Section 110-19).

412. Maintenance of Electrical Wiring and Equipment: A complete inspection of all electrical wiring, ground connections, conduit, hangers, supports, connections, outlets, appliances, devices and portable cords installed or used in a marina, boatyard, boat basin or similar establishment shall be made, at intervals of not more than 30 days, by an assigned representative of the management. All corroded, worn, broken or improper materials shall be replaced or repaired immediately. The use of tape to repair broken or cracked insulation or sheathing on portable cords shall not be tolerated. The inspection shall take particular notice of the following conditions:

(a) Areas being used for purposes not originally contemplated and which introduce hazards greater than those for which the electrical system was designed.

(b) Locked or otherwise restricted areas or equipment being left open.

(c) The use of portable electrical equipment which is not properly and adequately grounded as required by this standard. Special attention to be given to portable cords used by vessels for connection to shore power outlets. Such cords shall meet the requirements of this standard and should not be permitted to lie on or across pier walkways or to trail into the water.

(d) Portable cords used for permanent wiring.

(e) Damaged or inoperative switches, lighting fixtures and receptacle outlets.

(f) Receptacle outlets on which closure caps have been left off when the receptacle is not in use.

(g) Overloading of electrical circuits.

(h) The use of "jumpers" between special types of receptacles and common connectors which defeats the purpose for which special receptacles were installed.

(i) The introduction into hazardous areas of unsuitable appliances.

APPENDIX

Supplementary Recommendations

A10. Despite the most careful vigilance and effort, fire has many opportunities to strike active boat servicing establishments. Woodworking, paint removing and spraying, welding and cutting, handling gasoline and other highly flammable liquids, etc., are all continuing operations, and all are extra hazardous. Further, the facilities are frequently in locations quite isolated from public protection. Hence, the selection, location and maintenance of the proper type of fire fighting equipment is essential.

A101. Classification of Fires: For all practical purposes there are three general classes of fires. Marinas and boatyards are exposed to all three.

Class A fires, defined as fires in ordinary combustible materials such as wood, cloth and paper where the "quenching-cooling" effect of quantities of water or solutions containing large percentages of water is most effective in reducing the temperature of the burning material below the ignition temperature and is, therefore, of first importance.

Class B fires, defined as fires in flammable petroleum products or other flammable liquids, greases, etc., where the "blanketing-smothering" effect of oxygen-excluding media is most effective. Among the extinguishing agents for Class B fires are carbon dioxide, dry chemical, and foam.

Class C fires, defined as fires involving electrical equipment where the electrical nonconductivity of the extinguishing media is of first importance. Among the extinguishing agents for Class C fires are carbon dioxide and dry chemical.

A20. PRIVATE FIRE PROTECTION

Immediate transmission of an alarm to the municipal fire department upon the first discovery of a fire should be a basic rule. Then make the most prompt and effective use of the equipment at hand.

A201. Analysis of Hazards: The means and methods desirable for adequate first aid in fire protection will vary considerably for individual boat servicing establishments. Factors which

should influence the type and extinguishing power of fire fighting equipment selected include:

1. life and property values at risk
2. class, rapidity of spread, and intensity of fire anticipated
3. accessibility of area to be protected
4. temperature to which fire equipment may be exposed
5. time interval between transmission of alarm and arrival of public fire department.

A202. Division of Plant into Fire Protection Areas: Due to the extreme variation of hazards present in the course of operations, it is recommended that a layout plan be prepared and maintained. This plan should be used to determine the fire protection required by the various separated working areas. The plan should be descriptive and include:

1. area, type of construction, usage, sub-division and spacing of all buildings
2. entries, internal roadways, and passages
3. outside boat storage areas
4. marine railways and lifts
5. docks and piers
6. fueling facilities including fuel storage
7. adjacent premises and their occupancies

(a) Consideration of the fire potential existing in adjacent premises is essential in measuring the degree of exposure from fire originating within those premises.

(b) When the fire protection provisions required are determined, they should be incorporated in the completed layout plan, which can then be effectively used to educate and familiarize employees with the location and use of the equipment.

A203. Fixed Fire Extinguishing Equipment: Both automatic and hand operated devices of approved types are available which, when properly installed, maintained and handled, will provide means for controlling and extinguishing incipient fires. Among these are the following: