NFPA No.

303

MARINAS AND BOATYARDS 1969

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NATIONAL FIRE PROTECTION ASSOCIATION
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Official NFPA Definitions

Adopted Jan. 23, 1964: Revised Dec. 9, 1969. Where variances to these definitions are found, efforts to eliminate such conflicts are in process.

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Fire Protection Standard for Marinas and Boatyards

NFPA No. 303 — 1969

This edition incorporates extensive amendments to the 1966 edition, particularly in the area of electrical wiring and facilities. It was adopted by the Association at its annual meeting in New York, N. Y., May 12–16, 1969 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. A revised edition was produced in 1960 by the Committee on Motor Craft and Marinas. In 1961 the Sectional Committee on Marinas and Boatyards was established to deal exclusively with these matters. A complete revision of No. 303 was developed and adopted in 1963, amendments to which were adopted in 1966.

Sectional Committee on Marinas and Boatyards

SCOPE: To develop standards for fire prevention and protection in the design, construction and operation of marinas and boatyards.

Committee on Marine Fire Protection

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H. O. Buchanan, Canada Department of Transport.

Braxton B. Carr, The American Waterways Operators, Inc.

Joseph E. Choate, National Assn. of Engine & Boat Mfrs.

R. Cox, Fire Equipment Manufacturers Assn.

Frank W. Dunham, Jr., American Assn. of Port Authorities.

Frank Grafton, U. S. Department of Commerce.

George A. Hale, Marine Chemists Assn.

Vice Admiral James A. Hirschfield, USCG (ret.), Lake Carriers' Assn.

Edwin M. Hood (ex-officio), Chairman, Sectional Committee on Shipbuilding, Repair and Lay-Up.

J. R. Lindgren, United States Salvage Assn., Inc.

C. T. Mallory, National Automatic Sprinkler & Fire Control Assn.

Rear Admiral C. P. Murphy, Office of Merchant Marine Safety, United States Coast Guard.

E. S. Terwilliger (ex-officio), Chairman, Sectional Committee on Motor Craft.

Pierre R. Vallet (ex-officio), Chairman, Sectional Committee on Marinas and Boatyards.

T. T. Wilkinson, American Petroleum Institute.

Parker S. Wise, American Institute of Merchant Shipping.

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Alternates.

J. H. Birtwhistle, Canada Dept. of Transport. (Alternate to H. O. Buchanan.)

B. H. Lord, Jr., American Petroleum Institute. (Alternate to T. T. Wilkinson.)

SCOPE: This committee, together with the several sectional committees listed below, is organized to encourage the application of fire protection engineering to marine vessels and watercraft of all types and to develop such standards and recommendations as may be appropriate to this objective. The sectional committees are responsible for the initial development and revision of standards and recommendations dealing with their respective subjects and report to the Association through the Committee on Marine Fire Protection.

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Fire Protection Standard for

Marinas and Boatyards

NFPA No. 303 — 1969

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 of Portable Fire Extinguishers (NFPA No. 10), and Maintenance and Use of Portable Fire Extinguishers (NFPA No. 10A).

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 ignitible 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.

1. If an auxiliary power supply, arranged to provide lighting for pier and dock areas is not provided, an approved battery powered emergency lighting fixture conforming to the requirements of Article 700–22 National Electrical Code, and of weatherproof type, should be installed at the outboard end and the shore end of each pier.

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, Fireplaces and Venting Systems (NFPA No. 211)

(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 ¼-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 and Combustible 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 B), 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 and Combustible Liquids Code (NFPA No. 30).

(h) Dispensing units for transferring fuels from storage tanks shall be in accordance with provisions of the Flammable and Combustible 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. In the construction of the fuel hose assembly, provision shall be made so the fuel delivery nozzle is properly bonded to the shore electric grounding facilities as required in Section 406 (b) of this standard.

(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 and Combustible 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 and Combustible 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.

*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.

(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.

(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 chargers 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.

7. When nickel-cadmium batteries are to be charged or serviced in the reserved area, the work shall be done in a separate work area from which servicing or charging is done on lead-acid types of storage batteries. Tools and equipment used in servicing or charging nickel-cadmium batteries shall be distinguished by an appropriate color applied to them and shall be at all times reserved only for such usage.

(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: When boats are placed in dry storage it is imperative that hazardous conditions within boats be detected and corrected.

(a) All loose combustibles shall be removed and stored in suitable lockers or segregated areas.

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

(c) Batteries of the lead-acid type should be removed for storage and recharging wherever practicable. Where, for reasons of size and weight, it is impractical to remove batteries for storage and recharging, they may be permitted to remain on board provided:

1. the compartment in which the batteries are located is so arranged as to provide adequate ventilation to prevent entrapment of released gases;

2. an approved type battery charger is permanently installed on the boat, so arranged as to provide a suitable trickle charge;

3. the power connection to the trickle charger consists of a 3-wire circuit of not less than No. 12 AWG conductors, connected to a source of 110 to 125 volts single phase, with a control switch and approved circuit protection device arranged to trip at not more than 125% of the rated amperage of the charger;

4. there is no connection on the load side of the circuit protection device from this circuit to any other device;

5. the electrical wiring complies with all of the requirements of this Standard, and the National Electrical Code;

6. the battery is permanently connected to the outlet terminals of the charger and the grounding conductor effectively grounds the charger enclosure.

(d) 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.

40. ELECTRICAL WIRING AND EQUIPMENT

401. 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. Classification of Locations within Marinas and Boatyards: All areas of marinas, boatyards, boat basins and similar establishments shall be properly related to one of the location classifications as herein described for the purpose of determining suitable arrangements of electrical wiring, and electrical equipment. The classification of all areas shall be related to a datum-level which shall be calculated for each establishment according to the following formula:

(a) In areas subject to tidal fluctuation the datum-level shall be established at a point two feet above the highest tide level recorded by the U.S. Coast Guard in the area. (See Exception 1 below.)

(b) In areas inland and not subject to tidal fluctuation, the datum-level shall be established at a point two feet above the highest water level recorded by local sources at that area, or if no reliable record is available, the datum-level shall be established at a point six feet above normal high water level. (See Exception 1 below.)

Exception 1. — In both tidal and non-tidal areas, floating piers and landing stages which are installed to permit rise and fall responsive to water level, without lateral movement, and which are so equipped that they may rise to the datum-level established for the area in 404(a) and 404(b) such floating piers and landing stages will have a datum-level at the deck surface of the pier landing stage of two feet above the water.

Standard Location: The interior area of any building or structure constructed with standard doors and windows to normally seal the interior from weather, and with no usable portion of the building extending below the datum-level. The portion of any building which is usable and is located below the datum-level shall be considered a Wet Location.

Damp Location: All exterior areas, including open sheds, covered passageways, the area above the decks of piers and landing stages which are located at, or above the datum-level.

Wet Location: All interior and exterior areas which are located below the datum-level, including underground areas in which electrical wiring may be installed.

Hazardous Location: For the purpose of this section shall be as defined in Article 500, National Electrical Code. A Hazardous Location may also be a Standard, Damp or Wet Location and will be subject to detailed requirements applicable to both locations.

405. 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 Article 450, National Electrical Code, with the additional requirement that transformers shall not be located in a Wet Location as herein described, and if located in a Damp Location shall be of type approved for use in such locations.

(e) Main service equipment, including service disconnecting equipment, meters and associated equipment, and the main switchboard or panel, if not installed in a Standard Location, shall be installed in a Damp Location and be protected from the weather in an approved manner, and shall be protected against access by unauthorized persons. Main service equipment shall not be installed in Wet Locations. In other respects the main

service installation shall be in compliance with the requirements of Article 230, National Electrical Code.

(f) When auxiliary emergency stand-by power supply equipment with an output rating in excess of 5 kw is provided and is driven by an internal combustion engine, the emergency electric system shall be arranged as required by Article 700, National Electrical Code and shall also be arranged as follows:

1. The engine and generator shall be housed in a well-ventilated fire resistive enclosure not located in a Wet Location and which shall contain only the auxiliary power unit and the necessary controls for the engine. Interior areas of the enclosure shall be lighted by a fixture connected to the normal power supply. An approved battery-powered emergency lighting fixture conforming to the requirements of Article 700–22, National Electrical Code, shall be permanently installed in the enclosure, arranged to illuminate the engine control equipment. The fuel supply tank or tanks for the auxiliary power 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.

2. The requirements for automatic starting of the emergency generator as included in Section 700–8, National Electrical Code, may be waived if the starting battery for the prime mover is maintained on a reliable trickle-charge and is tested by actually starting the prime mover at monthly intervals, as required by Section 700–4, National Electrical Code.

(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).

406. 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. 12 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 all receptacles. Metal inserts and metal attachments which are externally and internally exposed on nonmetallic boxes and enclosures shall be connected to the common ground. 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.

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

407. Standard Locations: The entire electrical system installed in a Standard Location shall comply with the requirements of the National Electrical Code.

408. Damp Locations: The entire electrical system installed

in a Damp Location shall be composed of materials approved for use in areas exposed to the weather with equipment approved as Weatherproof (as defined in Article 100, National Electrical Code).

409. Wet Locations: The entire electrical system in a Wet Location shall be composed of materials suitable for compliance with the definition of "Watertight" as given in Article 100, National Electrical Code.

410. Hazardous Locations: The entire electrical system installed in a Hazardous Location shall comply with the requirements as given in Article 500, National Electrical Code, and in addition, when required by the conditions, to the requirements of this Standard related to Damp and Wet Locations.

411. Wiring Methods and Materials (Damp and Wet Locations):

(a) The wiring method shall be rigid metal conduit or rigid non-metallic conduit. Exception No. 1: Where flexibility is required the wiring method shall be other approved types. Exception No. 2: As permitted by Article 730, National Electrical Code for outside branch circuits and feeders.

(b) It is recommended that service conductors and main feeder conductors be installed underground to avoid possible contact with masts and other parts of boats being moved in the yard. Underground electrical installations shall comply with the requirements of Sections 230–32 and 230–33, National Electrical Code.

(c) Where it is impractical to install wiring underground the exterior wiring shall be arranged to avoid, to the extent practical, contact with moving equipment and vessels. Minimum clearance to be provided shall be 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 the yard.

Wiring installed over navigable waterways shall be approved by the authority in charge of specific waterway.

Proper warning signs to warn operators of the wire clearance to be encountered shall be placed in suitable locations.

(d) Where flexibility is necessary in accord with Exception 1, Sec. 411(a), as on piers composed of floating sections, the feeder

conductors if installed in a Wet Location shall be of Type W or Type G cable, or other approved type which is rated at not less than 75° C, 600 volts, of the required ampacity and including a common grounding conductor, with an outer jacket rated to be resistant to temperature extremes, oil, gasoline, ozone, abrasion, acids and chemicals. The cable shall be securely fastened by nonmetallic clips to structural members of the pier other than the deck planking.

1. Where flexible cable passes through structural members it shall be protected against chafing by a permanently installed oversized sleeve of nonmetallic material.

2. There shall be an approved junction box of corrosive resistant construction with permanently installed terminal blocks, on each pier section to which the feeder and feeder extensions are to be connected. Boxes shall have gasketed covers of the same material as the box. The cable entrances to pier junction boxes shall be capable of preventing the entrance of water or splash when the cable is in place. Metal junction boxes and their covers, and metal screws and parts which are exposed externally to the boxes shall be of corrosive resisting materials, or protected by materials resistant to corrosion.

412. Circuit Breakers, Switches and Panels (Damp and Wet Locations):

(a) Overcurrent protection as required by the National Electrical Code shall be provided by the use of circuit breakers, to avoid the difficulty of fuse replacement in gasket enclosures. Exception No. 1: Fuses, rated at not in excess of 5 amperes, may be located in a panel enclosure for protection of a circuit to a single lighting fixture which is installed as part of a panel assembly on a pier.

(b) Circuit breakers installed in gasketed enclosures which are located where exposed to the direct rays of the sun shall be of the fully magnetic type, with no thermal elements.

(c) Circuit breakers and switches installed in gasketed enclosures shall be arranged to permit required manual operation without exposing the interior of the enclosure. All such enclosures shall be arranged with a weep-hole to discharge condensation.

(d) Circuit breakers, switches and panels shall not be installed in Wet Locations.

(e) Devices which contain one or more circuit breakers and one or more receptacles intended for use as power outlets for boats shall be considered to be panels for the purposes of this Standard.

(f) Circuit breakers, switches and panels permanently installed on piers shall be located to provide a height of not less than thirty (30) inches nor more than forty (40) inches for the bottom of the enclosure above the deck below.

(g) All electrical enclosures installed on piers above deck level shall be securely and substantially supported by structural members, independent of any conduit connected to it. If enclosures are not attached to mounting surfaces by means of external ears or lugs, the internal screw heads must rest on gaskets to prevent seepage of water through mounting holes.

(h) It is recommended that a mooring bitt be located on pier decks in front of supports as mooring or warping means.

413. Feeders and Branch Circuits on Piers:

(a) Conductors in pier circuits shall be of the ampacity required by Tables 310 and 312 of the National Electrical Code related to the calculated load which shall be no less than 25 watts per lineal foot of pier or dock space for boat outlet service, plus lighting and other loads, with voltage drop requirements in accordance with Section 215–3 of the National Electrical Code.

(b) Feeder circuits extending from the main service equipment, which are intended for use in providing shore power to one or more boats, should preferably be of the 3 wire, grounded neutral, single phase type of 110/220, 115/230 or 120/240 volts, according to availability from the local public power source. The minimum feeder conductor size shall be No. 10 AWG; the minimum service conductor size shall be No. 8 AWG.

(c) Where feeder circuits extend on a pier to serve a group of shore power receptacles, the connecting wiring leading to individual devices which contain one or more such receptacles shall be considered feeder taps, coming under Exception No. 5, Sec. 240–15, National Electrical Code. The branch circuits connecting the receptacles to the feeder tap shall be equipped with circuit breakers for overcurrent protection, located at the receptacle, with not more than one receptacle connected beyond the required circuit breaker. Rigid metallic or nonmetallic conduit shall be installed to protect wiring above the deck of piers and landing stages and below the enclosure which it serves. The conduit shall be connected to the enclosure by full standard threads. The use of special fittings of nonmetallic material to provide a threaded connection into enclosures on rigid nonmetallic conduit, employing joint design as recommended by the conduit manufacturer for attachment of the fitting to the con-

duit will be acceptable provided, the equipment and method of attachment are approved and the assembly meets the requirements of installation in a Damp Location.

414. Receptacles (Damp Locations):

(a) Receptacles shall not be installed in Wet Locations or Hazardous Locations.

(b) 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).

(c) Receptacles installed for the purpose of attachment of portable equipment, or appliances, including receptacles intended to provide shore power to boats, and rated in excess of 20 amperes shall be of the grounding type and shall be rated specifically for the required current and voltage. Exception 1: Receptacles rated above 30 amperes shall be of the grounding type and approved for use at the rated voltage and amperes.

(d) To promote standardization in the use of receptacles on piers which will receive the shore power line plugs carried by boats, it is recommended that receptacles having configurations shown in USA Standard C-73, for the various voltage, and ampere ratings, of varied numbers of poles, be used to the extent available.

(e) All receptacles shall be installed in enclosures and shall be equipped with an approved means of preventing the entrance of water by rain or splash to the receptacle contacts when the receptacle is not in use. The receptacle shall be designed to receive a plug having an approved means of locking to the receptacle and completing the sealing of the receptacle opening.

(f) 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."

415. Lighting Fixtures:

(a) Lighting fixtures shall conform to the requirements of the National Electrical Code (Sections 410–4, 410–5 and 410–6), and additionally shall be located to prevent damage by contact with stored or moving material.

(b) Lighting fixtures which are located where the light rays are transmitted offshore shall be suitably shielded to comply with the safety regulations of the U. S. Coast Guard.

(c) Switches for control of individual lighting fixtures located where exposed to the weather or splash shall be of a type approved for that use.

416. Hazardous Locations:

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

(b) 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.

(c) The grounding wire of the electrical system, or other approved grounding connection shall be arranged to provide adequate grounding protection to the metal nozzle of all fuel dispensing equipment.

(d) Where fuel dispensing stations are located on piers, the Hazardous Location will extend 20 feet in all directions from the nozzle when it is fully extended to the length of its hose. When such station is located on a pier, the area below the pier down to the water level within the limits as described, shall be considered as included in the Hazardous Location.

(e) When electrical equipment is installed in a location which is classified as both Hazardous and Damp, the construction shall include approved methods of meeting the requirements of both Locations.

417. Tests: On completion of the electrical system it shall be subjected to an insulation test in the presence of the representative of the authority having jurisdiction. Such tests shall meet the requirements of Section 110–20, National Electrical Code.

418. Marine Hoists, Railways, Cranes and Monorails: Motors and controls for marine hoists and railways shall be lo-

cated above the possibility of flooding by abnormally high water. Wiring and equipment located in an area described herein as a Damp 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 abnormally 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.

419. 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) Overloading of electrical circuits.

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

(h) 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: