

NFPA No.

312

FIRE PROTECTION OF

**VESSELS DURING
CONSTRUCTION
AND REPAIR
1976**



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SC-AM-76

Standard for
Fire Protection of Vessels
During Construction, Repair and Lay-Up
NFPA No. 312-1976

1976 Edition of No. 312

This standard was prepared by the Sectional Committee on Shipbuilding, Repair and Lay-Up with the concurrence of the Committee on Marine Fire Protection. It was adopted by the Association at its 74th annual meeting in May, 1970. This edition supersedes that of 1968, of which it is a revision.

Origin and Development of No. 312

The first standard on these subjects was adopted by the NFPA in 1933 on recommendation of its Marine Committee, predecessor of the Marine Section. It was further considered in 1935, 1936, and 1937, and was finally adopted by the Association in 1938 on recommendation of the Marine Section Committee on Builders' Risk, Repair and Lay-Up. Editorial changes were made in 1942.

With the reorganization of NFPA marine activities in 1948, responsibility for the standard fell to the Committee on Shipbuilding, Repair and Lay-Up. Their recommendations were adopted by the Association in 1950 (Parts I and II), 1951 (Part III), and revised editions were adopted in 1964 and 1968.

The current edition represents only changes to the sections covering construction and repair. The sections pertaining to lay-up remain unchanged.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

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Those desiring an interpretation shall supply the Chairman with five identical copies of a statement in which shall appear specific reference to a single problem, paragraph, or section. Such a statement shall be on the business stationery of the inquirer and shall be duly signed.

When applications involve actual field situations they shall so state and all parties involved shall be named.

The Interpretations Committee will reserve the prerogative to refuse consideration of any application that refers specifically to proprietary items of equipment or devices. Generally inquiries should be confined to interpretation of the literal text or the intent thereof.

Requests for interpretations should be addressed to the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

TABLE OF CONTENTS

Chapter 1 Introduction	312- 5
1- 1 Scope	312- 5
Chapter 2 Construction and Repair	312- 6
2- 1 Inspection	312- 6
2- 2 Rubbish, Waste Materials, Oil Spills and General Care	312- 6
2- 3 Smoking	312- 7
2- 4 Storage of Explosives, Flammable Material and Dangerous Cargo	312- 7
2- 5 Use of Open Flame or Spark Emitting Device ..	312- 7
2- 6 Temporary Electrical Installations	312- 9
2- 7 Application of Paints and Other Flammable Compounds	312-10
2- 8 Protection to Door Openings	312-10
2- 9 Staging and Miscellaneous Structures	312-11
2-10 Watch Service	312-11
2-11 Fire Alarm Service	312-12
2-12 Fire Protection Equipment	312-12
2-13 Fire Brigade	312-13
2-14 Fire Fighting and Stability	312-13
Chapter 3 Lay-Up	312-15
3-1 Application	312-15
3-2 Lay-Up Berth	312-15
3-3 Ground Tackle	312-16
3-4 General Care and Cleanliness	312-16
3-5 Ventilation—Closure or Openings	312-16
3-6 Storage of Explosive and Flammable Materials ..	312-17
3-7 Temporary Heating Arrangements	312-17
3-8 Temporary Electrical Wiring	312-17
3-9 Fire Protection.	312-17

Standard for Fire Protection of Vessels During Construction, Repair and Lay-Up

NFPA 312-1976

Chapter 1 Introduction

Due to the quantity and character of combustible materials used in the construction of many vessels, such vessels in course of construction, conversion, during repair *and while laid up* are readily vulnerable to fire. Long passageways, unenclosed stairways, hatches and hoistways facilitate the rapid spread of fire throughout the vessel. The location of the shipyard is frequently so isolated that dependence for fire fighting is mainly on the private protection provided. Even where major municipal protection is available, the possible delayed response due either to lateness in the discovery of the fire or the absence of means for quick notification, lack of special equipment in many municipal fire departments for combating shipboard fires, or an unfamiliarity with ship construction due to the transitory nature of the risk may cause material damage or complete destruction before effective means of extinguishment can be brought into action. It is, therefore, obvious that every reasonable means of preventing fire shall be provided and supplemented by such means of detection and protection equipment as will permit the prompt discovery, retard the spread and permit extinguishment of any fire before it has passed the incipient stage.

1-1 Scope. This standard applies to vessels during the course of construction, conversion, repairs, or while laid up. It does not apply to situations where it is in conflict with or superseded by requirements of any government regulatory agency.

1-1.1 Emergency Exception. Nothing in this document *shall* be construed as prohibiting the immediate drydocking of a vessel whose safety is imperiled as by being in a sinking condition or by having been seriously damaged. In such cases, all necessary precautionary measures shall be taken as soon as practicable.

Chapter 2 Construction and Repair

2-1 Inspection.

2-1.1 Regular inspections *shall* be made by a responsible person representing the shipyard during the entire construction or repair period to note and initiate action to eliminate fire hazards or to implement work procedures to keep these hazards to a minimum.

2-1.2 As soon as practicable after a vessel enters a repair yard, but before any work is started, an inspection of the vessel shall be made by a yard representative to evaluate the potential fire hazard. It shall be made jointly with a representative of the owner, if available. Such inspection shall note housekeeping conditions, including location of dunnage and trash; the kind and amount of cargo aboard; and the type, amount and condition of the vessel's fire protection equipment.

2-1.3 The types and approximate amounts of fuel oils and other flammable liquids in all cargo, bunker, deep, settler and double bottom tanks shall be determined. Such determination shall include all associated piping systems and any condition changes thereto.

2-1.4 The information obtained *shall* be distributed to the departments responsible for the fire safety of vessels while in the yard, and to the various production departments involved.

2-1.5 For minor repairs, the inspection may be limited to the actual working area and adjacent compartments. Supplementary information necessary for fire and explosion prevention shall be obtained.¹

2-2 Rubbish, Waste Materials, Oil Spills and General Care.²

2-2.1 Work areas *shall* be kept clean. All accumulations, and particularly combustible rubbish, refuse and waste materials shall be collected and safely disposed of as they accumulate.

2-2.2 Furniture and other equipment crated or packed in excelsior or similar packing materials *shall* be uncrated or removed from packing in a safe location preferably well removed from vessels. All packing shall be disposed of promptly and safely.

¹ Ref. OSHA 1915.12-14.

² Ref. OSHA 29 CFR 1915.51-58.

2-2.3 Temporary coverings such as tarpaulins which may be used to protect machinery, equipment, combustible stores or similar materials *shall* either be of approved noncombustible material or flameproofing. For hot work, see 2-5.2.1.

2-3 Smoking. Smoking shall be prohibited in designated hazardous areas.

2-4 Storage of Explosives, Flammable Material and Dangerous Cargo.¹

2-4.1 The storage of explosive, highly flammable² or combustible materials, excepting ships fuel and standard ships stores stowed in certified spaces, shall not be permitted on nor in close proximity to vessels in course of construction or repair.

2-4.2 Vessels carrying explosives or other dangerous cargo such as flammable gases, hazardous chemicals and flammable liquids,² but excepting ships' fuel and storage in certified spaces,³ *shall* not be permitted to enter a repair yard until such materials have been removed. NFPA 306, *Control of Gas Hazards on Vessels to be Repaired*, outlines the circumstances under which exceptions to this requirement may be exercised with respect to gas hazards.

2-5 Use of Open Flame or Spark Emitting Devices.⁴

2-5.1 It shall be the responsibility of yard management to determine that any hot work or other fire or spark producing operations may proceed with safety.⁵

2-5.2 The opposite sides of the bulkheads or decks on which hot work is to be done shall be checked to be certain that there are no combustible materials, painted surfaces, wiring runways, etc., in contact with or in close proximity to such bulkheads or decks, which may be damaged by heat or fire. Where there is any danger of starting fires in the way of hot work, despite the fact that ordinary precautions are employed, a fire watch shall be provided to stand by during such operations with portable fire fighting equipment ready to extinguish any incipient fire that

¹ Ref. OSHA 29 CFR 1915.10-15.

² Flammable and inflammable have the same meaning. The term "flammable liquids" in this instance includes all flammable and combustible liquids having a flash point below 200°F closed cup test.

³ Ammunition on armed vessels shall be considered standard ships' stores.

⁴ Ref. OSHA 29 CFR 1915.13, 1915.14, 1915.31-37.

⁵ Special attention is called to the danger of hot work in freshly painted areas, in close proximity to combustible stores or other materials and similar locations. Ref. OSHA 29 CFR 1915.19-24.

may occur. The employees acting as fire watchmen shall be instructed as to the fire hazards anticipated and how to use the fire extinguishing equipment provided.

2-5.2.1 When it is necessary to remove combustible insulation for a safe distance from the location where welding or burning is to be done, special care shall be taken to prevent sparks or hot slag from entering exposed insulated spaces. Equipment and materials in way of hot work which cannot be moved shall be protected as prescribed in 2-2.3. Doorways, hatch and tank openings, portholes, etc., shall be protected where there is a danger of sparks or hot slag dropping or ricocheting into such openings and igniting combustible materials. Hot work shall not be done on vessels where there is a danger of sparks or hot slag falling into oil slicks on the waters beneath.

2-5.2.2 Where hot work processes cannot be properly safeguarded in making necessary repairs, such repairs shall be accomplished by safer means, such as by drilling, sawing, bolting or other appropriate means.¹

2-5.3 Riveting furnaces shall not be permitted in confined spaces or in close proximity to combustible materials.

2-5.4 Before any hot work involving riveting, welding, burning, heating or other fire or spark producing operations are started in or on any fuel spaces or other areas which contain or have contained flammable or combustible liquids or vapors, certification shall be obtained in accordance with the *Standard for the Control of Gas Hazards on Vessels to be Repaired*, NFPA 306.²

2-5.5 Equipment such as blow torches, cutting and welding apparatus *shall* be so stored as to prevent tampering by unauthorized persons. Oxygen, acetylene and other flammable gas lines shall be disconnected at the source of supply at the end of each working shift, and the discharge end of the hose removed from below decks or enclosed spaces. During lunch periods, lines shall be disconnected at the source of supply.

2-5.5.1 Only oxygen, acetylene and other flammable gas hose in good repair *shall* be used. Where gases are supplied from portable cylinders, the latter shall not be placed below the main deck, in confined spaces or under overhanging decks. Portable outlet headers from piped systems shall comply with the provisions of NFPA 51, *Standard for the Installation and Operation of Oxygen-Fuel Gas Systems for Welding and Cutting*.

¹ Ref. OSHA 29 CFR 1915.12.

² Attention is called to the hazards of fuel in the tanks of motor driven life boats.

2-5.6 Electric welding cables *shall* be inspected frequently and cables with damaged insulation shall be reinsulated or replaced. Cables shall be triced up off steel decks, bulkheads, etc., wherever possible to reduce the possibility of short-circuiting or grounding. When not in use, electrodes shall be removed from holders and the holders so placed that they will not *cause arcing* or electrical short circuits.

2-5.7 Vessels in drydock shall be suitably grounded.

2-5.8 Heating for the personal comfort of employees, or for other reasons, shall be done by means of steam, hot water or electricity, using the vessel's heating facilities as far as practicable. Where salamanders must be used, they shall be mounted on 4-inch legs, and shall be permitted only where someone is constantly in attendance. They shall be located a safe distance from combustible materials and so arranged as to avoid any danger of upset. Use of wood kindling fuel shall not be permitted. Under no conditions shall compressed air or oxygen be discharged into salamanders to increase the rate of burning.¹

2-5.9 Temporary, appropriately worded danger markings or warning signs shall be posted throughout vessels in course of construction or under repair wherever required.²

2-6 Temporary Electrical Installations.³

2-6.1 Electrical wiring and equipment of a temporary nature shall be substantially installed in such manner as to be safe from physical damage and be frequently inspected. Defects in wiring, fixtures, or equipment of a type liable to create dangerous conditions shall be promptly remedied. Portable equipment shall be grounded and provided with overcurrent protection such as fuses or circuit breakers and shall be disconnected when not in use.

2-6.2 Except where lights are required for inspection and safety purposes, electric current to the vessel's lighting system shall be cut off when no work is being done. All electric lines shall be kept triced up off the decks wherever possible.

2-6.3 The vessel's permanent lighting system shall be used when conditions permit.

¹ Attention is called to the need for adequate ventilation in confined spaces where salamanders are used.

² Sample wordings of such signs are: Smoking Prohibited; Danger, Fuel Oil; Paint Storage, Positively No Hot Work; Cork Insulation, No Welding or Burning; Carbon Dioxide, Do Not Enter. Ref. OSHA CFR 1915.15.

³ Ref. OSHA CFR 1915.24, 36, 52.

2-6.4 Where temporary portable electric lights must be used, they *shall* be in accordance with NFPA 70, *The National Electrical Code*.

2-6.5 Temporary electrical wiring *shall* be installed and maintained in a safe manner and be properly fused. Such wiring and lamps shall not be placed in direct contact with combustible materials. Makeshift hangers, such as nails, which might damage wiring insulations, *shall* not be used. *Protective* guards shall be installed on all lights subjected to physical damage.

2-6.6 Where temporary lighting is needed in hazardous areas, only explosion-proof lighting fixtures shall be used.

2-7 Application of Paints and Other Flammable Compounds.¹

2-7.1 No welding, burning or other open flames or spark-producing machines or operations such as chipping, grinding, etc., shall be permitted in close proximity to the application of flammable paints or other flammable compounds. Adequate ventilation shall be provided to maintain the atmosphere at not more than 10 percent of the lower explosive limit or below the lower limit of toxicity for that particular material, as determined by a Certificated Marine Chemist. In all instances, precautions and application instructions of the manufacturer shall be obtained and observed.

2-8 Protection to Door Openings.

2-8.1 As work advances, so far as practicable, all door openings shall be provided with their permanent doors.

2-8.2 In order to minimize the spread of fire, all doors and personnel accesses shall be kept closed except as required by the work. All other openings, such as vent ducts, shall be kept closed wherever practicable.²

2-8.3 Where doors are kept locked to prevent theft or unauthorized entry, the keys shall be made available to the watchman and fire brigade, or shall be located at a designated place aboard where they can be obtained without delay in emergencies by such personnel.

¹ Ref. OSHA CFR 1915.25.

² Care should be taken that the closing of these openings is not obstructed or prevented by hose or pipe lines, electrical connections or other lines. Provisions for disconnecting such lines should not be considered as a satisfactory alternative.

2-9 Staging and Miscellaneous Structures.

2-9.1 Staging other than metal or fire retardant treated wood shall be removed as soon as its purpose has been served.¹

2-9.2 All fire retardant treated wood shall be periodically tested to assure its flame-proof quality.

2-9.3 Small buildings on or under shipways shall be restricted to those absolutely necessary and shall be of noncombustible construction.

2-10 Watch Service.

2-10.1 During the outfitting of new vessels, or in the case of vessels berthed for conversion or repair operations, a competent watchman shall be on duty at all times when the vessel is unattended.²

2-10.2 Where central station systems are not feasible or are not deemed necessary, an approved watchman's portable clock system shall be provided on the vessel during the outfitting, repair or conversion period.

2-10.3 Watch service shall also be provided on the shipways during earlier stages of construction if a fire hazard exists due to completion of a vessel, combustibility of ways, stocks and staging, and any significant obstruction or congestion caused by the proximity of adjacent structures.

2-10.4 Before going on duty, watchmen shall be informed of locations where riveting, welding, burning or other hot work has been carried on in the vicinity of combustible material during the previous work period. They shall also be advised of the locations of freshly painted areas, tanks containing oil or other hazardous conditions. All such locations shall be inspected during the progress of work and as soon as practicable after work has been stopped. The regular watch force shall be assisted by other competent persons when necessary in order to complete the inspection within a reasonable period. The watchmen shall be required to give further special attention to these locations during their rounds so as to ensure against the spread of any previously undetected fires.

¹ All combustible staging material should be treated with an approved flame retardant compound to resist ignition from sparks and to retard the spread of fire.

² It is recommended that there be installed on the vessel an approved watchman supervisory system of watch boxes connected to a central office where watchman's signals will be received.

2-10.5 Watchmen shall be familiar with the location of all items of fire equipment on vessels, inspect them during their daily tours of inspection, and have a knowledge of their use.¹

2-11 Fire Alarm Service.

2-11.1 A suitable means of alerting all persons aboard the vessel shall be provided and clearly identified.

2-11.2 Where central station or fire alarm supervised watchman's service is not provided, telephones shall be available at convenient locations on or near vessels and connected to a central office where someone is constantly on duty.

2-11.3 Provisions *shall* be made for the establishment, marking and maintenance of proper fire lanes at ways and berths.

2-11.4 Ways, hulls, and berths *shall* be prominently identified. Yard layout diagrams shall be provided for public fire fighting whenever the yard is primarily dependent upon those facilities for fire protection.

2-12 Fire Protection Equipment.

2-12.1 Water with adequate pressure for fire extinguishing purposes shall be available to all parts of vessels in course of construction, conversion, and under repair. One and one half-inch and 2½-inch lines of adequate length connected to shore hydrants for hose connections shall lead to points on vessels convenient for use in an emergency. Adequate supplies of spare hose and nozzles shall be readily available. Due regard shall be given to the capacity of existing shore hydrants to assure that an adequate water supply is available.

2-12.2 Temporary pipe risers with hose connections supplied by shore lines shall be installed at the shipways and a supply of hose be available at such connections on the various decks of vessels under construction. These risers shall be installed in the ratio of one for each 200 feet of length of the vessel.

2-12.3 While vessels are at berths or in drydock, temporary hose lines supplied by shore connections *shall* be placed aboard the vessels connected and ready for use, in the ratio of at least one hose line for each 200 feet of length of vessel.²

¹ Careful selection of watchmen is emphasized. Alertness, quick reaction, hearing and sense of smell, good eyesight, bodily agility and good health are indispensable requirements for a competent watchman.

² Where this may be deemed unnecessary due to the size and type of vessel involved, hose lines shall be provided at the berthing spaces or drydocks. These lines should be nominal 1½ inch or 2½ inch in size, or a combination of both sizes, and of sufficient length so that any part of the vessel may be reached by at least one line. Ref. Coast Guard 227, Chap. 2 (use CFR).

2-12.4 Hose line connections or hydrants shall be provided with adapters to permit the connection of shore fire department hose.

2-12.5 On vessels under repair, the vessel's fire system piping shall be connected to water supplies from the yard by means of temporary shore to ship connections.¹

2-12.6 Hose lines or approved portable fire fighting and extinguishing appliances such as hand extinguishers, in suitable numbers for Class A, B, and C fires, shall be provided at convenient locations throughout vessels.²

2-12.7 Alternate means shall be available for extinguishing Class A, Class B and Class C fires, which cannot be controlled by the limited capacity of portable hand extinguishers.

2-13 Fire Brigade. Designated employees shall form the nucleus of a fire brigade, and shall be thoroughly drilled in the use of extinguishing equipment provided, including the laying of hose lines, the handling of hose streams and special extinguishing equipment, and the use of self-contained breathing apparatus. Drills shall be held at least once a month. For further details, refer to NFPA 27, *Private Fire Brigades*.

Exception: This does not apply where a shipyard fire department with paid members is maintained.

2-14 Fire Fighting and Stability.

2-14.1 On all vessels afloat, all practicable measures shall be taken to ensure stability.³

¹ Caution should be used in turning on these water supplies at shore connections until it is determined that the vessel's fire system is intact and will not result in flooding any portion of the vessel.

² More detailed information on portable fire extinguishers may be found in NFPA 10, *Standard for the Installation of Portable Fire Extinguishers*.

³ After an outbreak of fire, at the first indication of lack of stability, the discharge of fire streams shall be reduced to the minimum necessary to prevent the spread of fire. Effective means to prevent capsizing of the vessel shall be taken as soon as the extent of the flooding indicates there may be danger of lack of stability.

In locations where carbon dioxide gas is readily available in adequate quantities, this medium of extinguishment should be employed when practicable in order that the vessel's stability not be endangered.

2-14.2 On vessels under repair, the vessel's pumping facilities, or a shore substitute, shall be in condition and ready to free the bilges of water whenever it tends to accumulate. Scuppers leading from all decks below the main deck to the bilge shall be maintained free.

2-14.3 Provision shall be made for the withdrawal of any vessel in the event that fire makes withdrawal necessary.

Chapter 3 Lay-Up

3-1 Application. This standard applies to vessels temporarily in an idle status, without a full crew, but with equipment either in operable condition or requiring a minimum of work to restore it to service.

3-1.1 Lay-up locations and procedures shall conform with the current U.S. Coast Guard Captain of the Port requirements.

3-2 Lay-Up Berth. Where the lay-up berth is contiguous to a wharf, pier, or other land-connected structure, it shall be free from exposure to potential fire and explosion hazards, provide ready access for fire fighting equipment, and be within convenient proximity of adequate fire fighting facilities and water supply.

3-2.1 The lay-up berth shall have sufficient depth of water at all stages of the tide to permit removal of the vessel in the event of fire.

3-2.2 The wharf or pier shall be in good repair and provided with adequate means for the safe mooring of a vessel.¹

3-2.3 Ample-sized fenders or camels shall be provided alongside at areas of possible or actual contact with other vessels or land structures.

3-2.4 Vessels shall be moored singly at the lay-up berth unless all necessary arrangements have been made to provide full access for shore-based fire fighting and salvage equipment to the outboard vessel.

3-2.5 A fire alarm box, telephone, voice radio or other reliable means of communication shall be readily accessible to each vessel.

3-2.6 Mooring of vessels, whether singly or in groups, shall be effected in such manner as to facilitate their quick removal in the event of fire. Tow wires shall be secured at the bow and stern of each vessel and paid out through suitable hawse pipes or chocks so that the free end of the wire is readily accessible to tug boats for towing purposes.

¹ Piers and wharves constructed and protected in accordance with NFPA 87, *Standard for the Construction and Protection of Piers and Wharves*, are recommended for vessel lay-up.

3-2.7 Where vessels are to be laid up some distance from shore facilities, e.g., at anchor, the site shall be chosen with due regard to the availability of adequate fire fighting forces and equipment.

3-3 Ground Tackle.

3-3.1 Vessels in lay-up shall have both anchors available for emergency if they are not already in use.

3-3.2 Vessels laid up at an anchorage shall maintain a readily accessible means of parting or slipping the chain.

3-4 General Care and Cleanliness.

3-4.1 Vessels laid up shall be kept thoroughly clean throughout.¹ Any accumulations, particularly combustible rubbish, refuse, and waste material shall be collected and disposed of promptly.

3-4.2 Protective coverings, such as tarpaulins, which may be used to protect machinery and equipment, shall be either of noncombustible or fire retardant approved material.

3-4.3 Smoking shall be prohibited aboard laid-up vessels except at locations specifically designated and approved as smoking areas.

3-4.4 Vessels shall be certified gas free in accordance with the *Standard for the Control of Gas Hazards on Vessels to be Repaired*, NFPA 306, immediately prior to being laid up, and weekly thereafter until conditions are stabilized, subject to requirements of regulatory authorities.

3-5 Ventilation—Closure of Openings.

3-5.1 Holds and bilges shall be ventilated, and accessible for ready inspection.

3-5.2 All double bottom, deep, peak, and settling tanks used for fuel oil shall have their manhole cover plates closed and secured, and all exterior traces of residual oil removed.

3-5.3 All fuel tank vents shall be fitted with flame arresters and left open.

3-5.4 All closures in the ducts of mechanical ventilating systems shall be in the closed position.

¹ All mattresses, blankets, carpets, and similar combustible materials should either be removed from the vessel or stored on board in ventilated compartments.