NFPA 307

Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves

2006 Edition



NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
An International Codes and Standards Organization

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NFPA 307

Standard for the

Construction and Fire Protection of Marine Terminals, Piers, and Wharves

2006 Edition

This edition of NFPA 307, *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*, was prepared by the Technical Committee on Marine Terminals and acted on by NFPA at its June Association Technical Meeting held June 6–10, 2005, in Las Vegas, NV. It was issued by the Standards Council on July 29, 2005, with an effective date of August 18, 2005, and supersedes all previous editions.

This edition of NFPA 307 was approved as an American National Standard on August 18, 2005.

Origin and Development of NFPA 307

This document originated in 1980 from the combination of the 1967 edition of NFPA 307, *Recommendations for the Operation of Marine Terminals*, and the 1975 edition of NFPA 87, *Standard for the Construction and Protection of Piers and Wharves*.

NFPA 87 was withdrawn by the Standards Council in October 1980, and the 1980 edition of NFPA 307 was re-titled *Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves*.

NFPA 87 was first initiated by the Committee on Piers and Wharves from 1915 to 1925, and was adopted by NFPA in 1925. Revised editions were adopted in 1931, 1935, 1954, 1963, 1968, 1971, and 1975.

NFPA 307 was first adopted by NFPA in 1951. Revised editions were adopted in 1961, 1967, 1980 (when NFPA 87 was incorporated), 1985, 1990, and 1995.

The 2000 edition of NFPA 307 consisted of amendments to the 1995 edition. The Technical Committee identified a need for the standard to reflect current marine terminal operating procedures and updated methods of material handling and storage.

In 2005, the entire standard was revised in accordance with the *Manual of Style for NFPA Technical Committee Documents*. Under design criteria for sprinkler systems, the Technical Committee changed "Extra Hazard (Group 1)" to "Group A Plastics." The Committee amended fire protection requirements for marine terminal buildings where specific cargoes other than Group A plastics, or hazardous materials, are handled or stored.

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NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Committee Scope: This Committee shall have primary responsibility for documents relating, generally, to the fire safe construction and fire protection of piers and wharves and of structures thereon. It shall also be responsible for documents relating to the fire safety that is unique to marine terminal facilities and operations but avoiding duplicating and overlapping the scopes of other NFPA Committees that may have primary jurisdiction.

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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex E. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex E.

Chapter 1 Administration

1.1 Scope.

1.1.1 This standard shall provide general principles for the construction and fire protection of marine terminals, piers, and wharves.

1.1.2 Nothing in this standard shall supersede any of the regulations of governmental or other regulatory authority.

1.1.3 The provisions of this standard shall reflect situations and state-of-the-art techniques at the time the standard was issued.

1.2 Purpose. The provisions of this standard shall be considered necessary to provide a reasonable level of protection from loss of life and property from fire and explosion in marine terminals, piers, and wharves.

1.3 Application. This standard shall apply to marine terminals as defined herein.

1.3.1 In addition to the requirements of this standard, special use piers and wharf structures that are not marine terminals, such as public assembly, residential, business, or recreational occupancies, that differ in design and construction from cargo handling piers and wharves, shall require special consideration.

1.3.2* This standard shall not apply to marinas and boatyards.

1.3.3 This standard shall not apply to the handling of the following:

(1)*Flammable or combustible liquids in bulk
(2)*Liquefied gases in bulk

1.4 Retroactivity. Unless otherwise noted, it shall not be intended that the provisions of this document be applied to facilities, equipment, structures, or installations that were existing or approved for construction or installation prior to the effective date of the document, except in those cases in which it shall be determined by the authority having jurisdiction that the existing situation involves a distinct hazard to life or property.

1.5 Units.

1.5.1 All weights and measures used in this standard shall be in accordance with the modernized metric system known as the International System of Units (SI), followed by approximate conversions in U.S. customary units.

1.5.2 The liter unit, which is outside of but recognized by SI, shall commonly be used in international fire protection.

1.5.3 Although some rounded SI values are slightly more stringent than existing values, this change shall not be intended to apply to existing installations.

1.5.4 In addition, actual numerical values obtained directly from referenced documents, such as NFPA 70, *National Electrical Code*, shall not be changed or rounded, although the SI equivalent is placed first in the text.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 10, *Standard for Portable Fire Extinguishers,* 2002 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2002 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* 2003 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection,* 2003 edition.

NFPA 22, *Standard for Water Tanks for Private Fire Protection,* 2003 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances,* 2002 edition.

NFPA 31, *Standard for the Installation of Oil-Burning Equipment,* 2001 edition.

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work,* 2003 edition.

NFPA 54, *National Fuel Gas Code,* 2006 edition.

NFPA 70, *National Electrical Code®,* 2005 edition.

NFPA 80, *Standard for Fire Doors and Fire Windows,* 1999 edition.

NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment,* 2004 edition.

NFPA *101®, Life Safety Code®,* 2006 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances,* 2003 edition.

NFPA 230, *Standard for the Fire Protection of Storage,* 2003 edition.

NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials,* 2006 edition.

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NFPA 495, *Explosive Materials Code,* 2006 edition.

NFPA 498, *Standard for Safe Havens and Interchange Lots for Vehicles Transporting Explosives,* 2006 edition.

NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response,* 2001 edition.

NFPA 1124, *Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles,* 2006 edition.

NFPA 5000®, Building Construction and Safety Code®, 2006 edition.

2.3 Other Publication. *Merriam-Webster's Collegiate Dictionary,* 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 472, *Standard for Professional Competence of Responders to Hazardous Materials Incidents,* 2002 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary,* 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.4 Shall. Indicates a mandatory requirement.

3.2.5 Should. Indicates a recommendation or that which is advised but not required.

3.2.6 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

3.3 General Definitions.

3.3.1 Approach Way. A structure used to gain access to a pier or wharf but not used to moor barges or vessels.

3.3.2* Bent. A main supporting framework consisting of a transverse row of piling with interconnecting pile cap and bracing.

3.3.3 Berth. The waterside area adjacent to a pier, wharf, or bulkhead where vessels are moored.

3.3.4 Bulkhead Building. A structure generally having a solid-fill-type substructure and forming the land end of one or more piers.

3.3.5 Bulkhead Wall. A retaining wall of timber, stone, concrete, steel, or other material built along, or parallel to, navigable waters.

3.3.6 Cargo. Commodities in transit.

3.3.6.1 *Breakbulk Cargo.* Commodities packaged in bags, drums, cartons, crates, and so forth, commonly, but not always, palletized and conventionally stevedored and stowed.

3.3.6.2 *Bulk Cargo.* Unpackaged commodities carried in the holds or tanks of cargo vessels and tankers and generally transferred by such means as conveyors, clamshells, and pipeline.

3.3.6.3 *Containerized Cargo.* Commodities stowed and transported in an intermodal freight container.

3.3.7 Chassis. Special trailer or wheeled undercarriage on which containers or roll-on/roll-off (RO/RO) cargoes are moved.

3.3.8 Container. A reusable, intermodal boxlike structure of rigid construction fitted with devices to permit lifting and handling particularly transfer from one mode of transportation to another mode of transportation.

3.3.9* Container Freight Station (CFS). A transload facility used primarily for loading and unloading cargo from containers.

3.3.10 Hazardous Material. A substance (solid, liquid, or gas) that when released is capable of creating harm to people, the environment, and property. [**472,** 2002]

3.3.11* Low Water Level. A tidal datum that is a long-term arithmetic mean of the named tidal levels as promulgated for a given location in the tables and charts of the National Ocean Survey of the National Oceanic and Atmospheric Administration.

3.3.12 Marine Terminal. A facility comprised of one or more berths, piers, wharves, loading and unloading areas, warehouses, and storage yards and used for transfer of people and/or cargo between waterborne and land transportation modes.

3.3.13* Pier. A structure, usually of greater length than width and projecting from the shore into a body of water with direct access from land, that can be either open deck or provided with a superstructure.

3.3.14 Protected Steel. Structural steel protected by the application of a material such as concrete to maintain the stability of the steel under fire conditions for a specified period of time.

3.3.15 Roll-On/Roll-Off (RO/RO). A form of cargo handling utilizing a vessel designed to load or unload cargo by using wheeled vehicles that roll on or roll off.

3.3.16 Substructure. The portion of the construction of a pier or wharf below, and including, the deck. *(See Annex B.)*

3.3.17 Superstructure. The portion of the construction of a pier or wharf above the deck.

3.3.18 Terminal Operator. The owner or other person, such as the leasee, who is responsible for the operation of the facility.

3.3.19* Terminal Yard. Open areas at a marine terminal site that are provided for the temporary storage of cargo, containers, and cargo-handling equipment.

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3.3.20 Tidal Range. The difference in height between mean lower low water and mean higher high water or, in places having only one tide daily, between mean low water and mean high water.

3.3.21 Transit Shed. A transload facility for cargoes usually located on a pier or wharf and primarily used for transfer of breakbulk-type cargo.

3.3.22 Transload Facility. A building or structure used for loading and unloading cargo from containers, trucks, railcars, and vessels; the classification and consolidation of commodities; and the temporary storage of commodities, such as a transit shed or container freight station.

3.3.23 Warehouse. A building used for long-term storage of commodities in contrast to temporary storage in container freight stations and transit sheds.

3.3.24* Wharf. A structure at the shoreline that has a platform built along and parallel to a body of water with either an open deck or a superstructure.

Chapter 4 Piers and Wharves

4.1 General. Design, materials, and workmanship of pier and wharf construction shall conform to standards and construction practices that ensure a durable and safe structure that can withstand the forces of nature to which piers and wharves are likely to be exposed, including the deteriorating influences of the environment and the expected wear and tear of operation and use, so that a safe place is provided for all occupants.

4.2 Substructure Construction.

4.2.1* General. Construction and protection standards for the three basic pier substructure construction types — fire resistive, noncombustible, and combustible — and also any combination of these materials in a fourth construction type defined herein as composite construction shall conform to the requirements outlined in this chapter. *[See also Figure B.1(a) through Figure B.1(c).]*

4.2.2 Protection Against Mechanical Damage.

4.2.2.1 Concrete or other portions of pier or wharf structures that are exposed to impact or abrasion by vessels, or are subject to damage by floating ice or debris, shall be protected by an open-fender system constructed of wood or other material approved by the authority having jurisdiction.

4.2.2.2 Provisions shall be made to reduce the impact force exerted on the pier with details of construction that prevent excessive damage from ordinary operations.

4.2.3 Support for Walls. When piers or wharves are located in soft or yielding bottoms where unequal loading results in unequal settlement, the substructure for supporting division walls and walls enclosing stairs, elevators, escalators, and chutes shall be separate and distinct from the structure of the pier or wharf.

4.2.4 Fire-Resistive Substructures.

4.2.4.1 General. A fire-resistive substructure shall be one having a fire resistance rating in all of its parts of not less than 4 hours.

4.2.4.2 Wood and Unprotected Substructures. If wood piles, wood cribwork, or unprotected steel piles are used, they shall not extend above low water.

4.2.4.3 Pier Deck. Pier decks shall be reinforced concrete or equivalent construction to provide a 4-hour fire resistance rating.

4.2.4.3.1 Where railroad tracks extend onto the pier deck at a lower level than the deck, the sides and bottom of the depressed section shall be of the same construction as the pier deck or of an equivalent fire resistance rating.

4.2.4.3.2 When used on the underside of the pier deck, vapor barriers, moisture shields, coatings, or finishes shall conform to the definition of noncombustible or limited-combustible as defined in *NFPA 5000, Building Construction and Safety Code*.

4.2.4.4 Aprons. Pier aprons or platforms built along the sides or ends of the pier shall have the substructure and deck constructed to have a 4-hour fire resistance rating.

4.2.5 Noncombustible Substructures.

4.2.5.1* General. A noncombustible substructure shall be one that does not meet the requirements for fire-resistive substructures in accordance with 4.2.4, such as structural steel and steel piles that are not provided with fireproofing equivalent to a 4-hour fire resistance rating, or one of reinforced concrete for which a 4-hour fire resistance rating has not been established by standard testing.

4.2.5.2 Pier Deck. Pier decks shall conform to the requirements of 4.2.4.3, except that the fire resistance rating requirement of fire-resistive substructures shall not apply to noncombustible pier decks.

4.2.5.3 Aprons. Pier aprons or platforms built along the sides or ends of the pier shall have the substructure and deck constructed so as to have a fire resistance rating equal to that of the pier substructure and deck.

4.2.6 Combustible Substructures.

4.2.6.1 Piles and Stiffening Members. The substructure shall be constructed of wood piles extending to the pier deck.

4.2.6.1.1 Stiffening of the piling shall be by the use of inclined bracing piles or cross braces of timber of not less than 100 mm (4 in.) nominal minimum dimension and 20,000 mm^2 (32 $in.^2$) minimum cross-sectional area.

4.2.6.1.2 The cross bracing shall be designed to offer a minimal surface exposed to fire and the smallest possible obstruction to the distribution of water in fighting fires under the pier deck.

4.2.6.1.3* Deep narrow spaces between timbers shall be firestopped over each bent or at least once in each timber length.

4.2.6.2 Pier Deck and Supports.

4.2.6.2.1 Pile caps shall consist of sawed timber not less than 200 mm (8 in.) nominal minimum dimension and 62,000 mm^2 (96 $in.^2$) minimum cross-sectional area, and the deck stringers of not less than 150 mm (6 in.) nominal minimum dimension and 46,000 mm^2 (72 $in.^2$) minimum cross-sectional area.

4.2.6.2.2 Deck planking on stringers shall be not less than 100 mm (4 in.) in thickness, and on this planking shall be laid a wearing surface of 50 mm (2 in.) of wood sheathing or a layer of concrete, asphalt, or other material of equivalent durability.

4.2.6.2.3 The sheathing and deck planks shall be laid at right angles, except that in the driveways the sheathing shall be permitted to be laid diagonally.

4.2.6.2.4 Joists 100 mm (4 in.) or less in thickness shall not be used in this type of construction.

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4.2.6.2.5 Pier decks without superstructures shall have deck planking not less than 76 mm (3 in.) thick.

4.2.6.2.6 Pier decks of composite laminated timber and concrete construction shall be acceptable, provided that timbers used shall be not less than 50 mm (2 in.) in nominal thickness and shall be treated for protection against decay, termites, or attack by marine life. *[See Figure B.1(a) and Figure B.1(c) in Annex B.]*

4.2.6.2.7 Any openings in pier decks, such as spaces between bull rail and pier deck, alongside railroad or crane tracks, and others made necessary for operations or equipment, shall be closed to prevent debris from falling through and accumulating on substructure members. *[See Figure B.1(a) and Figure B.1(c) in Annex B.]*

4.2.6.2.8 Steel angle iron, steel plate, or equivalent noncombustible material of a thickness that resists damage and fire spread shall be used for closures and shall be permanently installed in such a manner as to accommodate operations and accomplish these objectives.

4.2.6.2.9 Where railroad tracks extend onto a pier at a lower level than the deck, the sides and bottom of the depressed section shall be of the same construction as the pier deck or of equal or greater fire resistance than the pier deck.

4.2.6.2.10 Side hatches shall be permitted in the walls of the depressed sections in 4.2.6.2.9 for fire-fighting purposes, with openings normally closed by hatch covers having a fire resistance rating equivalent to the walls.

4.2.6.3 Aprons.

4.2.6.3.1 Pier aprons or platforms built along the sides or ends of the pier shall have the substructure and deck constructed to have fire-resistive qualities equal to that of the pier substructure and deck, except that at every fire wall of the substructure and superstructure, a section of the apron or platform and its substructure shall be of fire-resistive construction as defined in 4.2.4.

4.2.6.3.2 The fire-resistive section shall extend for a distance of at least 3 m (10 ft) on each side of the fire wall.

4.2.7 Composite Substructures.

4.2.7.1 General. Composite construction shall be any combination of combustible and noncombustible materials (with or without fire resistance rating), described in 4.2.4, 4.2.5, and 4.2.6, not meeting the limitations in 4.2.4.2.

4.2.7.2 Pier Decks, Supports, Bracings, and Aprons. Pier decks, supports, bracings, and aprons shall conform to the construction requirements of 4.2.4, 4.2.5, and 4.2.6 for the type of construction used for the various portions of substructure.

4.3 Substructure Protection and Subdivision.

4.3.1 Noncombustible Substructures. The provision of fire walls, firestops, automatic sprinklers, and other fire-extinguishing facilities under the pier deck shall depend upon the amount of exposed steel, the fire resistance ratings of reinforced concrete construction or assemblies, and the fire hazard as determined by the authority having jurisdiction.

4.3.2* Composite Substructures.

4.3.2.1 The provision of fire walls and firestops, automatic sprinklers, and other fire-extinguishing facilities shall conform to the requirements for combustible substructures as provided in 4.3.3 except as stated in 4.3.2.2.

4.3.2.2 Where exposed combustible structural materials are limited to piling and intrabent bracing, and the height from low water to the top of combustible construction does not exceed the typical distance between bents, the provision of fire walls and firestops and the installation of automatic sprinklers or other fire-extinguishing facilities under the pier deck shall depend upon the amount and concentrations of all exposed combustible materials, fire resistance rating of the pier deck, configuration of and access to the substructure, and the fire hazard.

4.3.3 Combustible Substructures.

4.3.3.1 Automatic Sprinklers. A complete system of automatic sprinklers shall be installed for the protection of all combustible substructures.

4.3.3.1.1 Exemption. Requiring the installation of a complete automatic sprinkler system shall be permitted to be waived for those existing substructures specified in 4.3.3.2.5 and for piers and wharves that have all of the following characteristics:

(1) Solid decking that is 7.5 m (25 ft) or less in width
(2) Area that is 465 m^2 (5000 ft^2) or smaller, exclusive of approach ways that are 7.5 m (25 ft) or less in width
(3) Separation distance of at least 9 m (30 ft) from other structures
(4) Superstructures that do not exceed 46.5 m^2 (500 ft^2) in individual area or 140 m^2 (1500 ft^2) in aggregate area
(5) Superstructures that are not less than 9 m (30 ft) apart

4.3.3.1.2 Installation of Sprinklers.

4.3.3.1.2.1 Installation of sprinkler equipment shall be in accordance with the applicable provisions of NFPA 13, *Standard for the Installation of Sprinkler Systems.*

4.3.3.1.2.2 Where there is danger of damage to sprinkler equipment by floating objects, physical barriers shall be provided to exclude such objects.

4.3.3.1.3 Installation Requirements in Addition to NFPA 13.

4.3.3.1.3.1* Upward Projecting Sprinklers. Where narrow horizontal channels or spaces are caused by caps, stringers, ties, and other structural members and where the standard upright sprinkler does not project sufficient water upward to extinguish or control fires on the underside of the pier or wharf deck, a sprinkler that projects water upward to wet the overhead shall be used.

(A) Location, spacing, and deflector position shall be governed by the discharge pattern of the sprinkler and the structure being protected.

(B) The following design and installation guides shall apply where pendent sprinklers in the upright position or old-style sprinklers are to be utilized:

(1) The maximum coverage per sprinkler head shall be limited to 7.5 m^2 (80 ft^2).
(2) Where spacing or arrangement of stringers constitutes typical open-joist construction directly supporting the deck, sprinkler branch lines shall be installed between the bents at right angles to the stringers and shall meet the following requirements:

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(a) Spacing between branch lines shall not exceed 3 m (10 ft).
(b) Sprinklers on branch lines shall be staggered and spaced not to exceed 2.5 m (8 ft) on center.

(3)*Where crisscross construction is involved, closer spacing of sprinklers shall be permitted as necessary to provide wetting of the entire structure.

(4) The deflectors of sprinklers on lines under stringers shall be located not less than 100 mm (4 in.) nor more than 250 mm (10 in.) below the bottom plane of the stringer, and not more than 450 mm (18 in.) below the underside of the pier or wharf deck.

(5)*The sprinkler system shall be hydraulically designed in accordance with the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*, and shall meet the following requirements:
(a) Sprinkler orifice shall be 12.7 mm (½ in.) and shall discharge at a minimum pressure of 85 kPa (12.5 psi).
(b) Design area shall be based upon the largest area between firestops plus an additional area embracing at least two branch lines on opposite sides of the firestop.
(c) Minimum design area shall be not less than 465 m^2 (5000 ft^2).

(6) The temperature rating of the sprinkler shall not exceed 74°C (165°F).

(7) The maximum area to be protected by any one system shall be limited to 2325 m^2 (25,000 ft^2).

4.3.3.1.3.2 Combustible Substructures. Sprinklers designed and approved specifically for protection of combustible substructures shall be installed in conformity with their listing.

4.3.3.1.3.3 Pipe Hangers.

(A) The pipe hangers shall be placed in a location where they will be in the wetting pattern of the sprinkler to prevent the lag screws from burning or charring out, dropping sprinkler piping, and bleeding the system.

(B) The distance from the sprinkler to the hanger shall not exceed 460 mm (18 in.).

4.3.3.1.3.4 Bracing. Horizontal and vertical bracing shall be provided at not more than 6 m (20 ft) intervals on all sprinkler piping 76 mm (3 in.) or larger that is parallel to and within 15 m (50 ft) of the face of the pier or wharf and where bracing has the possibility of being subjected to heavy fireboat nozzle streams.

4.3.3.1.3.5 Underdeck Areas. Sprinkler systems, including hanger assemblies and bracing, in underdeck areas shall be protected against corrosion throughout the structure.

(A) Sprinklers shall be of corrosion-resistant type.

(B) Detector elements and wiring systems of smoke or heat detectors or other electrical equipment used for fire protection of substructures shall be moisture- and corrosion-proof to protect against unfavorable atmospheric conditions that exist beneath these structures.

(C) Frequent inspection and testing of these systems shall be conducted in accordance with applicable NFPA standards.

4.3.3.1.3.6 Protection Against Physical Damage. Water supply systems, hydrants, fire hose valves, and sprinkler systems shall be installed with protection against freezing and physical damage.

4.3.3.2 Other Extinguishing Facilities.

4.3.3.2.1 Deck Openings. Deck openings to permit the use of revolving nozzles and other fire-fighting devices shall be provided for all combustible substructures in accordance with the specifications of 4.3.3.2.1.1 through 4.3.3.2.1.6.

4.3.3.2.1.1 Openings in the pier deck shall be provided at intervals not exceeding 7.5 m (25 ft) on center to enable the fire department to place in operation, with the least possible delay, devices for extinguishing underdeck fires.

4.3.3.2.1.2 Openings in the pier deck shall be over clear spaces to avoid interference by the substructure with effective operation of extinguishing devices.

4.3.3.2.1.3 The effective arrangement of openings in the pier deck shall not exceed 64,500 mm^2 (100 $in.^2$) and shall be not less than 230 mm (9 in.) in the smallest dimension, so as to pass the appliances for which they are intended.

4.3.3.2.1.4 Openings in the pier deck shall be provided with covers that can be removed.

4.3.3.2.1.5 Covers for openings in the pier deck shall be constructed of, or be insulated with, material that resists the passage of heat and fire in a manner equivalent to that of the pier deck.

4.3.3.2.1.6 The location of openings in the pier deck shall be conspicuously indicated.

4.3.3.2.2 Deck. All parts of the deck, including aprons, where fire fighters shall be expected to work, shall be solid and continuous, have no uncovered openings, and be smoketight.

4.3.3.2.3 Extinguishing Equipment.

4.3.3.2.3.1 A sufficient number of revolving nozzles, cellar pipes, and other devices of appropriate type shall be maintained on the pier or wharf, preferably at the land end, in readily accessible locations, with the necessary supply of hose to permit establishing two complete water curtains across the pier or wharf and at least two additional nozzles for extinguishing purposes.

4.3.3.2.3.2 In determining the number of devices that are required, consideration shall be given to the amount of such equipment carried on fire apparatus due to respond.

4.3.3.2.4 Water Supply. To supply water for the devices covered by 4.3.3.2.3, a water supply system with hydrants or hose connections shall be installed that meets the requirements of the authority having jurisdiction.

4.3.3.2.5* Existing Substructures.

4.3.3.2.5.1 In existing substructures where, in the opinion of the authority having jurisdiction, it is clearly impractical to install and maintain an automatic sprinkler system, deck openings, and revolving nozzles, as specified in 4.3.3.2 in conjunction with the required structural barriers of 4.3.3.3 through 4.3.3.6, shall be permitted to be provided as alternate protection.

4.3.3.2.5.2 Partial automatic sprinkler equipment, manual sprinkler equipment, or any built-in extinguishing equipment that is practical to install and maintain shall be capable of preserving the integrity of the required structural barriers under fire conditions.

4.3.3.3 Subdivision of Combustible Substructures. All substructures of combustible construction shall have the underdeck area subdivided by transverse fire walls in accordance with 4.3.3.3.1, transverse firestops in accordance with 4.3.3.3.2, or other protection in accordance with 4.3.3.3.3.

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4.3.3.3.1 Transverse Fire Walls. Transverse fire walls shall extend to low water and the full width of the pier, including aprons or platforms, at intervals not exceeding 137 m (450 ft).

4.3.3.3.1.1 A section of the entire pier deck over the fire wall, including any aprons or platforms, shall be of fire-resistive construction, as defined in 4.2.4, to preserve the effectiveness of the fire wall.

4.3.3.3.1.2 The fire-resistive section shall extend for a distance of at least 3 m (10 ft) on each side of the fire wall.

4.3.3.3.1.3 The 6 m (20 ft) fire-resistive cap that is 3 m (10 ft) on each side of the fire wall is not required when the fire walls constitute a continuation of the fire walls in a superstructure.

4.3.3.3.2 Transverse Firestops. Transverse firestops shall be located between fire walls.

4.3.3.3.2.1 Spacing between fire walls and firestops or between firestops shall not exceed 46 m (150 ft).

4.3.3.3.2.2 Firestops shall fit tightly against the pier deck and around any structural members or pipes that pass through the firestop so that an effective barrier to fire and draft is maintained.

4.3.3.3.2.3 Firestops shall extend to the low water line.

4.3.3.3.2.4 Where aprons or platforms are built along the sides of the pier, firestops shall extend to the outside edge of such platforms.

4.3.3.3.3 Other Protection. The requirements set forth in 4.3.3.3.1 and 4.3.3.3.2 shall be permitted to be modified where floods, tidal action, or wave action render such fire walls or firestops structurally impracticable, provided equivalent protection is obtained by other means.

4.3.3.4 Types of Fire Walls.

4.3.3.4.1 Substructure fire walls shall have a fire resistance rating of at least 4 hours and shall be constructed of reinforced concrete or of other materials that are equivalent in stability and fire resistance rating.

4.3.3.4.2 Walls shall be free of holes and shall extend to low water.

4.3.3.5* Types of Firestops. Firestops shall have a fire resistance rating of not less than 1 hour and shall be constructed of 150 mm (6 in.) of reinforced concrete or other materials that are equivalent in stability and resistance to physical damage.

4.3.3.6 Existing Substructures. For existing substructures where, in the opinion of the authority having jurisdiction, the standard fire walls required in 4.3.3.4 are impractical, approved firestops installed every 46 m (150 ft) and constructed as specified in 4.3.3.5, shall be permitted to be used as alternate protection.

4.4 Superstructure Construction.

4.4.1* Material Requirements. The type of material or combination of materials used in superstructure construction shall meet the general construction provisions of Section 4.1 and, when protected in accordance with this standard, shall be of any of the types of construction described in *NFPA 5000, Building Construction and Safety Code*.

4.4.2 Exterior Wall Requirements.

4.4.2.1 Exterior walls that are less than 9 m (30 ft) from other buildings or from property lines shall be constructed of not less than 4-hour fire-resistive construction, and openings in such walls shall be protected by labeled protective devices in accordance with NFPA 80, *Standard for Fire Doors and Fire Windows*.

4.4.2.2 Exterior walls shall be provided with access to the building interior at intervals not exceeding 60 m (200 ft) for the use of fire fighters, guards, and workers.

4.5 Superstructure Protection.

4.5.1 Automatic Sprinklers.

4.5.1.1 All superstructures shall be provided with a complete system of automatic sprinklers installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

4.5.1.2 Automatic sprinklers shall not be required in small superstructures located over unsprinklered fire-resistive substructures if the following criteria are met:

(1) Superstructures do not exceed 46.5 m^2 (500 ft^2) in individual area.
(2) Total area of all structures does not exceed 139.4 m^2 (1500 ft^2).
(3) Separation between any two structures is not less than 9 m (30 ft).

4.5.2* First Aid Fire Appliances. Portable fire appliances and 38 mm (1½ in.) standpipe connections shall be installed and distributed, and their locations marked in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*; NFPA 13, *Standard for the Installation of Sprinkler Systems*; and NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*.

Chapter 5 Terminal Buildings

5.1 General. This chapter shall apply to buildings and structures located on marine terminal premises other than the piers and wharves and their superstructures described in Chapter 4.

5.2 Construction Requirements. The construction or modification of marine terminal buildings shall conform to the requirements of *NFPA 5000, Building Construction and Safety Code*.

5.3* Additional Requirements.

5.3.1 All terminal buildings shall be separated from other buildings as necessary to minimize the effects of fire exposure, giving consideration to the construction, protection, and separation distances of the respective buildings.

5.3.2 Outside storage of cargo shall not be within 6 m (20 ft) of the exterior of the building unless the containers, railroad cars, and vehicles are parked for the purpose of loading or unloading cargo.

5.3.3 Containers, railroad cars, and vehicles shall only remain parked within 6 m (20 ft) of a building as long as is necessary to meet cargo loading, unloading, and handling requirements.

5.4 Automatic Sprinklers.

5.4.1 General. Buildings used for the handling or storage of combustible cargo, including warehouses and lockers rented as secured spaces and not directly controlled by the terminal operator, shall be protected in accordance with the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*.

5.4.2 Design Criteria.

5.4.2.1* Unless the requirements of 5.4.2.2 apply, automatic sprinkler systems shall be designed based upon the design criteria for the protection of Group A plastics.

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5.4.2.2 With the approval of the authority having jurisdiction, the requirements of 5.4.2.1 shall not apply to buildings used exclusively for the handling or storage of specific cargoes and commodities that are defined as commodity classes less than Group A plastics by NFPA 13, *Standard for the Installation of Sprinkler Systems*.

5.4.2.3 Buildings consistent with 5.4.2.2 shall be protected in accordance with the design criteria for the applicable commodity as required by NFPA 13, *Standard for the Installation of Sprinkler Systems*.

5.4.2.4 Buildings used for the storage of hazardous materials shall be protected in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*, and the applicable codes and standards for the type of hazardous material being stored.

5.4.3 Installation Requirements. Automatic sprinkler systems shall be installed so that all drains and alarms of control valves are accessible to terminal personnel for inspection, testing, maintenance, and operation.

5.5 Temporary Storage of Explosives. Buildings used for the temporary storage of explosives or fireworks shall conform to the appropriate provisions of NFPA 495, *Explosive Materials Code*; NFPA 1124, *Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles*; NFPA 498, *Standard for Safe Havens and Interchange Lots for Vehicles Transporting Explosives*; and regulations of the United States Bureau of Alcohol, Tobacco, and Firearms.

5.6 Miscellaneous Service Operations. Where miscellaneous service operations such as office operations, maintenance and repair, and vehicle service are conducted in buildings used for receiving, delivering, and storage of cargo, the requirements of NFPA *101*, *Life Safety Code*, shall apply when they are appropriate and are not covered by this standard. *(See also Chapter 9 and Chapter 10.)*

5.7 Manufacturing and Processing Operations. Manufacturing and processing operations conducted on the premises of marine terminals shall be confined to separate buildings that are designed, constructed, and protected for that purpose.

5.8 Structures Located Inside Terminal Buildings. Structures, permanent or temporary, placed inside larger terminal buildings, such as those used for offices and tool sheds, shall be sprinklered.

Chapter 6 Terminal Yards

6.1* General. This chapter shall apply to marine terminal yards, which are those open areas, yards, and lots provided for the temporary storage of cargo and cargo-handling equipment and areas devoted to the maintenance of the terminal and equipment.

6.1.1 Solid-fill-type wharves that are contiguous to, and form a part of, yard areas shall be considered a part of the terminal yard.

6.1.2 As used herein, the term *marine terminal yards* shall not include pier and wharf areas.

6.2 Terminal Yard Surfaces and Markings. Yards shall be paved or otherwise surfaced for the following purposes:

(1) To permit all-weather operations of heavy equipment with appropriate marking of roadways, access lanes, parking, and storage areas
(2) To facilitate the confinement and recovery of spills
(3) To control the growth of vegetation and minimize upkeep and maintenance

6.3 Containment and Access.

6.3.1 The entire property shall be surrounded by a fence or other means to prevent access by unauthorized persons.

6.3.2 The number of gates shall be provided in the surrounding fence or other barriers to permit access of fire apparatus in case of fire.

6.4 Vehicular Routes, Traffic, and Parking.

6.4.1 Vehicular routes, traffic rules, and parking areas shall be established, identified, and used.

6.4.2 Private vehicle parking in marine terminals shall be permitted only in designated areas.

6.5 Fire Lanes.

6.5.1 Location. Access for fire-fighting operations shall be provided by means of fire lanes spaced at intervals so that no portion of any storage or parking area is over 15 m (50 ft) from the fire lane.

6.5.2 Specifications.

6.5.2.1 Fire lanes that are U-shaped, do not exceed 90 m (300 ft) in length, and are adjacent to cargo piled less than 5 m (16 ft) high shall be a minimum of 4 m (12 ft) wide.

6.5.2.2 All fire lanes other than those in 6.5.2.1 shall be a minimum of 6 m (20 ft) wide.

6.5.2.3 A fire lane shall not dead-end unless designed with a turnaround at the end.

6.5.2.4 The turnaround in 6.5.2.3 shall have an inside radius of not less than 7.5 m (25 ft) and an outside radius of not less than 15 m (50 ft).

6.5.3 Alternative Arrangements. Where practical difficulties exist in meeting the requirements of Section 6.5, the authority having jurisdiction shall be permitted to approve alternative fire lane arrangements, provided the intent of reasonable emergency access is achieved.

6.6 Container Storage.

6.6.1 Storage in excess of five containers high shall be permitted only with the coordination of the local authority having jurisdiction.

6.6.2 The local authority having jurisdiction shall consider the need for aerial fire-fighting techniques, improved access for mobile fire-fighting apparatus, and pile stability before permitting the arrangement in 6.6.1.

Chapter 7 Water Supply for Fire Protection

7.1 Hydrants and Hose Connections.

7.1.1 A sufficient number of accessible hydrants or 64 mm (2½ in.) hose outlets shall be provided on or immediately adjacent to every pier, wharf, or marine terminal yard for use by public or private fire departments for extinguishing large structure and contents fires and for use in providing exposure protection.

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7.1.2 The number and location of hydrants and hose connections shall be determined by the authority having jurisdiction but shall not be spaced further apart than 90 m (300 ft) or more than 45 m (150 ft) from a dead-end area.

7.2 Water Supply.

7.2.1 The water supply requirement for hydrants shall be in addition to that required for automatic sprinklers.

7.2.2 The capacity of the water system shall be sufficient to deliver the quantity of water determined by the authority having jurisdiction, giving due consideration to the relative fire hazard to the property involved and the availability of marine fire-fighting equipment.

7.2.3 Fire flow shall be designed for not less than a 4-hour duration.

7.2.4 Piping, pumps, and other facilities shall be designed and installed in accordance with the requirements of NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*; NFPA 22, *Standard for Water Tanks for Private Fire Protection*; and NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*.

7.2.5* Fire department pumper connections and similar supplemental or auxiliary supplies that utilize nonpotable water or water sources other than the public water system shall conform to local and state laws and regulations.

Chapter 8 Hazardous Materials Storage

8.1 Hazardous Material. The term *hazardous material* shall include any substance or material that has been determined to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce and that has been so designated.

8.2 Processing and Placarding. Hazardous materials shall not be processed for further shipment at marine terminals unless packed, labeled, and placarded in accordance with all applicable laws, ordinances, and regulations.

8.3* Handling, Storage, and Loading. Hazardous materials at terminals shall be handled, stored, loaded, and unloaded in accordance with all applicable laws, ordinances, and regulations, the authority having jurisdiction, and NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*.

8.4* Bulk and General Cargo Operations. Combined bulk cargo and general cargo operations shall not be permitted where, in the opinion of the authority having jurisdiction, joint operations increase the fire hazard inherent in each operation.

8.5* Written Procedures.

8.5.1 A written plan shall be developed and implemented for the handling and temporary storage of hazardous materials at all general cargo terminals, unless the terminals are those where operations are limited to specific types of commodities and no hazardous materials are being received or delivered.

8.5.2 The plan shall be developed in cooperation with the authority having jurisdiction, and the location, quantity, methods, and time of handling and storing hazardous materials shall be limited and controlled in accordance with such plan. *(See plan samples in Annex D.)*

8.6 Designated Storage Areas. The written plan described in Section 8.5 shall require establishment and use of designated areas for temporary storage of hazardous materials, except that containerized cargo operations can intersperse individual containers containing hazardous materials with containers containing general cargo, provided that storage conforms to the requirements of Section 8.7, and unless the hazardous materials are those materials specified in 8.8.1.

8.7 Hazardous Material and General Cargo Containers. The procedure to be followed where containers with hazardous materials are interspersed with general cargo containers shall be detailed in the written plan described in Section 8.5 and shall be based upon the following general guidelines:

(1) To minimize concentration and exposure problems, the interspersion plan shall ensure that containers of incompatible materials and containers of the more highly combustible, toxic, or reactive materials are kept well separated from each other as indicated by material stability and compatibility information and requirements of the authority having jurisdiction.
(2) Sufficient access space shall be provided for effective use of hose streams and for movement of exposed containers under emergency conditions.

8.8 Designated Hazardous Materials Storage Areas.

8.8.1* Containers with the following types of hazardous materials shall not be interspersed with general cargo containers:

(1) Explosive materials as defined in NFPA 495, *Explosive Materials Code (see also 8.15 and 8.16)*
(2) Organic peroxides
(3) Liquid oxygen
(4) Oxidizing materials
(5) Poisonous gases (Division 2.3 materials)
(6) Chlorine, fluorine, sulfur dioxide, and anhydrous ammonia
(7) Flammable solids that are dangerous when wet
(8) Radioactive materials
(9) Other types of hazardous materials as designated by the authority having jurisdiction

8.8.1.1 Storage shall be confined to designated hazardous materials storage areas.

8.8.1.2 Alternative storage location and handling procedures shall be authorized by the authority having jurisdiction where equivalent safety can be provided by such alternatives.

8.8.1.3 Outside hazardous materials storage areas designated under the provisions of Sections 8.5 and 8.6 shall be located on land, not less than 15 m (50 ft) from buildings and other cargo storage areas, 6 m (20 ft) from property lines, and 30 m (100 ft) from other designated hazardous materials storage areas.

8.8.1.4 Separation distances to buildings and property lines shall be maintained as open space and kept clear of storage of any kind at all times.

8.8.2 Access to designated outside hazardous materials storage areas shall be by means of fire lanes.

8.8.2.1 Fire lanes shall be not less than 6 m (20 ft) wide and shall be located in such a manner that no part of the storage area is over 15 m (50 ft) from a fire lane.

8.8.2.2 Fire lanes shall not come to a dead end.

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8.8.3 Designated hazardous materials storage areas shall not be located within the vicinity of electrical installations unless such installations comply with the requirements of NFPA 70, *National Electrical Code*, and the authority having jurisdiction.

8.8.4 Designated outside hazardous materials storage areas shall be constructed and situated to prevent runoff or drainage toward buildings and storage areas.

8.8.5 Designated outside hazardous materials storage areas shall be enclosed with a 1.8 m (6 ft) high-wire or chain-link fence unless the entire terminal is surrounded by such a fence and the fence is in sound condition.

8.8.6 Signage.

8.8.6.1 Designated hazardous materials storage areas shall be posted with signs.

8.8.6.2 Signs shall be easily visible, not obstructed by cargo storage, and contain the words "hazardous materials — no smoking" in capital letters not less than 150 mm (6 in.) in height.

8.9 Storage of Liquid Hazardous Materials.

8.9.1 Areas used to store hazardous materials in a liquid state shall have materials available for blocking drains.

8.9.2 Hazardous materials shall not be permitted to enter waterways.

8.10 General Condition of Hazardous Materials Storage Areas. Areas used to store hazardous materials shall be free of grass, weeds, debris, and other combustible waste matter.

8.11 Stacking of Containers Loaded with Hazardous Materials. Containers loaded with hazardous materials shall not be stacked except as permitted by the authority having jurisdiction and all applicable laws, ordinances, and regulations.

8.12 Placards. Placards shall be removed from containers that no longer contain hazardous materials.

8.13 Hazardous Materials Emergency Operations Plan. Terminals handling hazardous materials shall prepare a hazardous materials emergency operations plan.

8.13.1 This plan shall detail the actions to be taken by responsible managers, employees, and agents of the terminal in the event of a leak, spill, explosion, fire, or damage to a container.

8.13.2 This plan shall be prepared with the authority having jurisdiction and shall comply with all applicable laws, ordinances, and regulations.

8.14 Location of Hazardous Materials Information.

8.14.1 Information concerning the location, amount, and type of hazardous materials located within the confines of the marine terminal yard, buildings, piers, and wharves shall be available for reference by responding emergency personnel.

8.14.2 The information required in 8.14.1 shall be kept at the main gate security office or other location approved by the authority having jurisdiction and as permitted by all applicable laws, ordinances, and regulations.

8.15 Explosive Materials. Marine terminals that receive and deliver explosive materials shall establish and operate an explosives interchange lot and, if transload operations are performed, a less-than-truckload explosives lot, in accordance with the requirements of NFPA 498, *Standard for Safe Havens and Interchange Lots for Vehicles Transporting Explosives*, and NFPA 495, *Explosive Materials Code*.

8.16 Vehicles Transporting Explosive Materials. No vehicles or containers transporting hazardous materials other than explosives shall be parked in an explosives interchange lot except as permitted by NFPA 498, *Standard for Safe Havens and Interchange Lots for Vehicles Transporting Explosives*, the authority having jurisdiction, and all applicable laws, ordinances, and regulations.

Chapter 9 General Terminal Operations

9.1 General.

9.1.1 The period of time necessary for cargo to be temporarily stored on the pier or wharf in a transit shed, in a transfer building, or in the terminal yard shall be kept as short as possible.

9.1.2 Attention shall be directed to the safe storage and handling of highly combustible or hazardous materials.

9.2 Terminal Operator.

9.2.1* The terminal operator shall establish and enforce fire prevention regulations and be responsible for the provision and maintenance of fire protection equipment.

9.2.2 The terminal operator shall have the following responsibilities:

(1) Train employees in fire prevention and the proper emergency action in the event of fire or other emergency
(2) Provide the necessary equipment to control the spread of fire
(3) Handle any necessary movement or evacuation of vessels
(4) Prepare and implement an emergency operations plan detailing action to be taken in the event of fire, explosion, leak, spill, or damage to container or cargo

9.3* Fire Organization. The terminal operator shall designate a competent and reliable employee(s) who shall be responsible for ensuring that all standpipe, fire hose, sprinkler equipment, portable fire extinguishers, and other fire protection devices and equipment are maintained in accordance with applicable NFPA standards.

9.3.1 The designated employee(s) shall be familiar with maintenance procedures and standards.

9.3.2 The designated employee(s) shall be familiar with the location of all telephones, valves, alarm boxes, fire hose stations, portable fire extinguishers, and other fire-fighting equipment.

9.3.3 The designated employee(s) shall have access to information concerning the fire hazard characteristics of the cargoes in the terminal and the location of all cargo that is exceptionally hazardous.

9.3.4 The designated employee(s) shall enforce all fire safety regulations and instruct employees in the use of fire alarm boxes.

9.4 Vessels.

9.4.1 Maneuverability.

9.4.1.1 All vessels shall be moored in an orderly manner.

9.4.1.2 When mooring vessels, due regard shall be given to rapid removal in the event of a fire originating on either the pier or the vessel.

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9.4.2 Mooring of Vessels. Vessels that, in the opinion of the authority having jurisdiction, pose a substantial potential fire hazard due to the cargo they are carrying or the location they are moored in, shall rig fire warps.

9.4.2.1 Fire warps shall consist of hawsers of sufficient size to take the vessels under tow in the event of an emergency.

9.4.2.2 Fire warps shall be secured to the decks of the vessels and shall hang over the outboard side to within 1.8 m (6 ft) of the surface of the water.

9.4.2.3 An eye shall be spliced into the outboard end of the warp of sufficient size to permit the rapid attachment of a towing shackle.

9.4.3 Mooring of Vessels Carrying Hazardous Materials. Vessels carrying hazardous materials capable of posing a risk to the terminal, as determined by the authority having jurisdiction, shall not moor in a manner that would require turning the vessel prior to an emergency movement.

9.4.4 Cutting, Welding, or Other Hot Work.

9.4.4.1 Repairs involving cutting, welding, or other hot work shall be limited, as far as practical, to when the vessel is at a marine terminal.

9.4.4.2 Hot work shall not be permitted when the vessel is fueling, loading, or unloading hazardous materials, or when Division 1.1, 1.2, or 1.3 explosives are on board or within 30 m (100 ft) of the hot work. *(See Section 10.11.)*

9.4.4.3 When hot work is performed, it shall be conducted in accordance with the authority having jurisdiction and all applicable laws, ordinances, and regulations.

9.4.5 Bunkering (Refueling). Bunkering of vessels at a marine terminal shall be done in accordance with all applicable laws, ordinances, and regulations, and the authority having jurisdiction.

9.4.6 Shipboard Cargo Handling.

9.4.6.1 Smoking shall be prohibited except in designated areas.

9.4.6.2 Cargo-handling equipment (lifts, carriers, conveyors) used aboard ship, and the refueling of such equipment, shall conform to all applicable laws, ordinances, and regulations as prescribed for the type of cargo handled and the requirements of the authority having jurisdiction.

9.5 Terminal Cargo Handling and Storage.

9.5.1 All placement of cargo shall be in accordance with applicable laws, ordinances, and regulations, and the authority having jurisdiction.

9.5.2 Traffic.

9.5.2.1 Container-handling and storage areas shall be identified, including marking of travel lanes to indicate direction of travel.

9.5.2.2 All necessary traffic control measures shall be taken.

9.5.3 Transload Facilities. At least one main aisle shall extend the length of the pier or transit shed.

9.5.3.1 General.

9.5.3.1.1 As a minimum, the aisle shall be of sufficient width to permit trucks to maneuver and pass one another.

9.5.3.1.2 Where cargo is transferred directly to or from railroad cars or vehicles and it is unnecessary to use trucks within the structure, an aisle shall not be required.

9.5.3.2 Aisle Arrangement.

9.5.3.2.1 Aisle spaces shall be established between cargo piles extending from the main aisle to the sides of the transit shed or transload facility.

9.5.3.2.2 Aisles shall be arranged so that, in addition to separating the cargo piles, the aisles will give ready access to sprinkler control valves, fire hose stations, portable fire extinguishers, and the deck openings for fire-fighting purposes.

9.5.3.2.3 Aisle or access space of at least 600 mm (2 ft) shall be maintained between cargo piles and the side walls, fire walls, or firestops in transit sheds, container freight stations, or similar transload structures.

9.5.4 Clearance between cargo piles and sprinkler deflectors, roof supports, and other building structural members and ignition sources, such as lighting equipment, heating devices, and ductwork, shall be maintained in conformity with the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems.*

9.5.5 Fire Protection Systems.

9.5.5.1 Fire protection facilities, such as automatic sprinklers, shall not be overtaxed in the event of fire due to the concentration, high-piling, and palletizing of combustible cargoes.

9.5.5.2 The adequacy of the sprinkler system shall be reevaluated when the fire hazard of the commodity in storage or the method of storage changes.

9.5.5.3 If the sprinkler system is found to be deficient, the system shall be brought into compliance as determined by the authority having jurisdiction.

9.5.6* Fibers. Sisal or other combustible fibers shall be handled in the open or in buildings protected by automatic sprinklers.

9.5.6.1 Fibers shall be piled with at least a 600 mm (2 ft) clear space to side walls and a 300 mm (1 ft) space at supporting columns for material expansion.

9.5.6.2 Aisle space shall be provided for fire department access for fire control by sprinklers, and hose stream water penetration shall be maintained.

9.5.6.3 Block piling shall not exceed 12 m × 15 m (40 ft × 50 ft) with stacks no higher than 4 m (12 ft), and palletized storage shall be limited to three pallets high unless the sprinkler system is designed to protect other configurations.

9.5.6.4 Access to the fiber and to the aisles between the fiber stacks shall be restricted to the personnel handling the fiber and to other authorized personnel.

9.6 Time Limitation of Storage. A pier or wharf shall not be used as a warehouse unless the structure was specifically designed for that purpose.

9.7 Separation of Passenger and Cargo Service. Where piers are used for both passengers and cargo, the movement of passengers in or near any cargo area shall be regulated to eliminate any additional fire hazard, and passengers shall be subject to the same no smoking rule as terminal personnel.

9.8 International Shore Connection.

9.8.1 International shore connection, as required by the International Safety of Life at Sea Convention, shall be available

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at the marine terminal to enable local fire-fighting equipment to be connected to a vessel's fire main system.

9.8.2 The threads on the shoreside connection shall be provided by the terminal operator with adapters to permit the connection of shore fire department hose.

9.9* Watch Service. Security personnel shall be provided by the terminal for the protection of the terminal in such numbers and of such qualifications as to ensure adequate surveillance, prevent unauthorized entrance, and detect fire hazards.

9.10 Notification.

9.10.1 The terminal shall have a means to rapidly notify the fire department in the event of an emergency.

9.10.2 If a telephone is used for this purpose, the phone shall not require the use of a coin.

Chapter 10 Miscellaneous Installations and Operations

10.1 Tractors, Lift Trucks, Dock Cranes, and Other Material-Handling Equipment.

10.1.1 Material-handling equipment operated by internal combustion engines shall be of approved design and construction and be stored in a separate designated location, not on a combustible pier or wharf.

10.1.2 Unless fire extinguishers are readily accessible, each vehicle shall be provided with an extinguisher approved for Class B and Class C fires.

10.1.3* All fueling and repairs shall be conducted at designated and protected locations.

10.1.3.1 All fueling shall be from approved dispensing devices.

10.1.3.2 Emergency refueling shall not be performed on a combustible pier or wharf or inside buildings where combustible cargo is stored or handled.

10.1.4 Electrically operated equipment shall be permitted to be stored on the pier or wharf in a segregated area.

10.1.5 Battery-charging equipment shall be installed in accordance with NFPA 70, *National Electrical Code*.

10.1.6 Material-handling equipment operated aboard ships or in areas where hazardous materials are being stored or handled shall be approved for such use by all applicable laws, ordinances, regulations, and the authority having jurisdiction.

10.1.7 Material-handling cranes with power distribution, windlass rooms, or internal combustion engines, located greater than 30 m (100 ft) above the pier or wharf surface, shall be provided with automatic detection and extinguishing systems.

10.2 Automotive and Railroad Equipment.

10.2.1 Transient trucks and automobiles shall be permitted to remain on piers and wharves only long enough to load and unload cargo.

10.2.1.1 The number of vehicles permitted on the pier or wharf at any one time shall be limited to a number that enables free traffic flow.

10.2.1.2 Vehicles shall not be permitted to interfere with the access of emergency response equipment.

10.2.1.3 Vehicles shall be parked in such a way that they can be promptly driven off the pier in the event of emergency.

10.2.1.4 Fueling and repair operations shall conform to 10.1.3.

10.2.2 Roll-on/roll-off (RO/RO) operations involving self-propelled motor vehicle cargo shall conform to all applicable laws, ordinances, regulations, and the authority having jurisdiction.

10.2.3 Locomotives operated within the area of a marine terminal where combustible fibers or lumber are stored shall be fitted with approved and maintained spark arresters.

10.2.4 Diesel locomotives shall not be fueled within a marine terminal except at a properly located and designed fueling station.

10.2.5 Rail cars or trucks containing hazardous materials prohibited for shipment over the pier or wharf of a marine terminal shall not be permitted within the marine terminal.

10.2.6 Fueling and servicing of vehicles and equipment shall conform to 10.1.3.

10.3 Electrical Installations.

10.3.1 Electrical installations shall be in accordance with NFPA 70, *National Electrical Code*.

10.3.2 Temporary lighting, where required, shall be obtained from battery-powered hand lamps or floodlights powered by portable generators.

10.3.2.1 Generators shall be operated outside the building, warehouse, pier, or transit shed, and temporary heavy-duty wiring shall be run into the area served.

10.3.2.2 The temporary wiring shall be supported and fused in accordance with NFPA 70, *National Electrical Code*.

10.4 Heating.

10.4.1 Gas-burning equipment shall be installed in accordance with NFPA 54, *National Fuel Gas Code*.

10.4.2 Electric heaters shall be of approved design and installed in accordance with NFPA 70, *National Electrical Code*.

10.4.3 Oil-burning heaters shall be installed in accordance with NFPA 31, *Standard for the Installation of Oil-Burning Equipment*.

10.4.4 Solid fuel-burning equipment shall be installed in accordance with the requirements of NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*.

10.4.5 Boilers and heating equipment used for power or heat shall be located in buildings detached from the pier or shall be enclosed on the pier by wall, floor, and ceiling materials having not less than a 2-hour fire resistance rating, except hot water heaters, space heaters, and other small appliances if such appliances are of a type listed for mounting on a combustible floor or a protected combustible floor.

10.4.5.1 Floors or decks immediately beneath and extending for a distance of 1 m (3 ft) from boilers, furnaces, and other heat-producing appliances shall be entirely noncombustible.

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10.4.5.2 No combustible material shall be permitted to be in contact with the top or bottom surfaces of the portion of a floor or deck in 10.4.5.1.

10.4.6 Portable Heaters.

10.4.6.1 Portable heaters shall be used only when the device is approved for the specified use by the authority having jurisdiction.

10.4.6.2 Portable heaters shall not be used in cargo-handling or storage areas except for emergencies.

10.5 Processes.

10.5.1 Processes involving the use of flammable liquids shall be prohibited except when permitted by the authority having jurisdiction.

10.5.2 Ripening or coloring of fruits or vegetables by means of direct heat or flammable gas shall not be conducted on the pier or wharf unless the process is segregated and protected by automatic sprinklers.

10.5.3 Warm rooms or areas temporarily heated to protect cargo from freezing shall be arranged with heating facilities as described in Section 10.4.

10.5.3.1 Where a temporary form of closure is used, the enclosing material shall have a flame spread rating not exceeding 50 when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*.

10.5.3.2 Electric, gas-fueled, or oil-fueled heating equipment used for warm rooms or areas temporarily heated to protect cargo from freezing shall be located with proper clearance to combustible materials.

10.5.3.3 The heaters shall be approved for space or construction heating.

10.5.3.4 Fuel-fired heaters shall have a listed flame failure shutoff device and temperature controls.

10.5.3.5 Heaters shall not be refueled while operating and shall be fueled from approved fuel-handling devices only.

10.6* Fumigation.

10.6.1 Location.

10.6.1.1 Fumigation shall, where practical, be conducted in buildings designed and constructed for that purpose.

10.6.1.2 Where conducted in warehouses, transit sheds, or piers, the fumigation shall be conducted in rooms segregated from the balance of the area by a wall or partition having a fire resistance rating of not less than 1 hour.

10.6.2 Fumigating gases or chemicals shall be stored outside in a labeled noncombustible building and secured from fire exposure or accidental release.

10.6.3 The authority having jurisdiction shall be notified in advance of any fumigation operation.

10.7 Pallets and Dunnage. Where pallets and dunnage shall be stored, the storage shall be in accordance with NFPA 230, *Standard for the Fire Protection of Storage*.

10.8 Packaging and Recoopering.

10.8.1 All packaging shall be done in a segregated area.

10.8.2 Incidental recoopering and repackaging shall be conducted in an area other than cargo working areas.

10.8.3 Refuse materials resulting from recoopering shall be removed from the recoopering area.

10.9 Incinerators. Incinerators shall be constructed as required in NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment*.

10.10 Maintenance, Repairs, and Housekeeping.

10.10.1 Below Pier Deck.

10.10.1.1 Periodic inspections shall be made beneath the pier deck to determine conditions relating to fire prevention and protection in the substructure.

10.10.1.2 Heavy incrustation of oil shall be removed from all combustible members.

10.10.1.3 Floating combustible debris shall be removed.

10.10.1.4 Fire protection devices shall be examined and, if necessary, repaired.

10.10.1.5 Covers for nozzle openings in the pier deck for the use of substructure fire protection equipment shall be kept accessible and in good order so that they will not stick when speedy removal is essential.

10.10.2 Buildings and Yard Areas.

10.10.2.1 All buildings and yard areas shall be kept free of debris and waste materials.

10.10.2.2 Debris and waste materials shall be kept in metal containers and removed or emptied at sufficiently frequent intervals to prevent dangerous accumulations.

10.10.2.3 Yard areas shall be kept free of grass and weeds.

10.11 Cutting, Welding, or Other Hot Work.

10.11.1 Repairs involving cutting, welding, or other hot work shall be limited, as far as practical, at a marine terminal.

10.11.2 Hot work shall not be permitted under the following circumstances:

(1) During gas-freeing operations
(2) Within 30 m (100 ft) of bulk cargo operations involving the loading or unloading of flammable or combustible materials
(3) Within 30 m (100 ft) of fueling (bunkering) operations
(4) Within 30 m (100 ft) of explosives or 15 m (50 ft) of other hazardous materials

10.11.3 Hot work shall be conducted in accordance with NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, and all applicable laws, ordinances, and regulations, and the authority having jurisdiction.

10.11.4 Open flame lights or lanterns using kerosene, gasoline, LP-Gas, or calcium carbide fuel shall not be used.

10.11.5 Smoking and Open Flame.

10.11.5.1 Smoking shall be permitted only in posted designated areas as approved by the authority having jurisdiction.

10.11.5.2 Smoking and open flames shall not be permitted within 15 m (50 ft) of hazardous materials storage.

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Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.3.2 See NFPA 303, *Fire Protection Standard for Marinas and Boatyards.*

A.1.3.3(1) See NFPA 30, *Flammable and Combustible Liquids Code.*

A.1.3.3(2) See NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)*, or NFPA 58, *Liquefied Petroleum Gas Code.*

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase "authority having jurisdiction," or its acronym AHJ, is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A.3.2.3 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.3.3.2 Bent. A bent normally extends the full width across the pier. Depending upon deck design and load requirements, bents are usually spaced 3 m to 4 m (10 ft to 13 ft) apart. Short bents, not extending across the full width of the pier, used for intermediate or supplementary supports for concentrated loads, rail or crane tracks, and so forth, are commonly referred to as pony bents.

A.3.3.9 Container Freight Station (CFS). A CFS is used for temporary storage, receipt, and delivery of cargo as well.

A.3.3.11 Low Water Level. In nontidal locations, the normal low water level; in single tidal areas, mean low water; and in dual tidal areas, mean lower low water.

A.3.3.13 Pier. The terms *pier* and *wharf* are used interchangeably.

A.3.3.19 Terminal Yard. As used herein, the term does not include open pier and wharf areas, except that solid-fill-type wharves that are contiguous to and form a part of yard areas are considered part of the terminal yard.

A.3.3.24 Wharf. The terms *wharf* and *pier* are used interchangeably.

A.4.2.1 Combustible substructures, due to their inherent combustibility and structural configuration, present substructure fire protection problems different from those of fire-resistive or noncombustible construction. This standard requires properly designed and installed fixed fire-extinguishing equipment and appropriate structural barriers to minimize the spread of fire.

It is essential that all equipment be continuously maintained in good working condition. Similar fire protection problems might exist with composite construction. Special provisions have accordingly been provided in 4.3.2 for such construction.

A.4.2.5.1 See NFPA 251, *Standard Methods of Tests of Fire Resistance of Building Construction and Materials.*

A.4.2.6.1.3 Deep narrow spaces between timbers present ideal conditions for the accumulation of extraneous material, making them natural channels for the rapid spread of fire.

A.4.3.2 The provisions of 4.3.2 are based on consideration of the amount and arrangement of exposed combustible materials. When the underside of the pier deck is combustible or when the pier deck is noncombustible on combustible supports, with the distance from low water to top of combustible material exceeding the typical distance between bents, the requirements for protection and subdivision of combustible substructures apply. When the above distance to low water is equal to or less than the typical distance between bents, and the pier deck and pile caps are noncombustible with no exposed combustible intrabent bracing, protection and subdivision requirements for combustible substructures would normally apply only if other combustible materials, unusual conditions, or hazards were present. If other combustible materials (e.g., catwalks, decks, vapor barriers, fender systems) are present or unusual conditions or hazards (e.g., concentrations of combustible structural supports or flammable liquid hazards) exist, consideration should be given to the type, quantity, and arrangement of all exposed combustible material, the fire resistance rating of the pier deck, and the configuration and access to the substructure for manual fire-fighting operations.

A.4.3.3.1.3.1 Examples of sprinklers that project water upward are pendent sprinklers installed in an upright position or old-style sprinklers.

A.4.3.3.1.3.1(B)(3) An example of crisscross construction (ties on stringers) is illustrated in Figure B.1(a) in Annex B.

A.4.3.3.1.3.1(B)(5) The use of firestops for draft control (e.g., to bank heat, facilitate the opening of sprinkler heads, and prevent the overtaxing of the sprinkler system) is particularly important in the design of sprinkler protection for combustible substructures. The fire walls and firestops of 4.3.3.4 and 4.3.3.5 should be incorporated into the sprinkler system design for draft control to the maximum extent practical; however, due to limitations in the size of the design area for the sprinkler system, additional firestops normally are needed. These additional or supplemental firestops need only have limited fire resistance, but they should be as deep as possible and be of substantial construction,

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such as double 76.2 mm (3 in.) planking, where exposed to the elements. Where not exposed to the possibility of physical damage, 19.05 mm (¾ in.) treated plywood extending 1219.2 mm (48 in.) below stringers with solid blocking between stringers should provide adequate durability and reasonable effectiveness.

A.4.3.3.2.5 It should be recognized, however, that this alternate protection contemplates manual fire-fighting operations that are effective only under the most favorable of physical arrangements and conditions at the time of the fire.

A.4.3.3.5 Firestops can be constructed from wood planking built up to a thickness of 150 mm (6 in.), from wrought iron plate 12.7 mm (½ in.) thick, or other equivalent materials, provided that each side of the wood or exposed metal firestops is protected by automatic sprinklers and by deck openings for the use of revolving nozzles.

A.4.4.1 The installation of fire walls is recommended for the subdivision of superstructures. The area between fire walls is recommended not to exceed 4650 m^2 (50,000 ft^2). These walls should be continuous with the substructure fire walls required in 4.3.3.4. In addition, curtain boards or draft stops of noncombustible construction are recommended in open area superstructures to be installed between the fire walls at intervals not exceeding 30 m (100 ft). When construction permits, these curtain boards should be carried down to the lower chord of the roof trusses.

A.4.5.2 If hose lines needed for fire fighting on the pier cannot be adequately supplied from hydrants located in the yard or adjacent city streets, pipelines equipped with approved 64 mm (2½ in.) outlets for fire department use should be extended onto the pier. In such cases, the 38 mm (1½ in.) standpipe connections should also be made to this pipeline.

For evaluation of the hazards of fire exposure and protection methods, refer to NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*.

A.5.3 For guidance on construction, protection, and separation distances, refer to NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*.

A.5.4.2.1 Group A plastics represent the most challenging commodities that can be protected by a sprinkler system designed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*. Due to the widely varying nature of commodities that pass through transit sheds, container freight stations, transload facilities, and similar buildings used for handling and temporary storage of general cargo, a minimum automatic sprinkler design based upon the protection of Group A plastic commodity under the provisions of NFPA 13, *Standard for the Installation of Sprinkler Systems*, provides an appropriate level of fire protection.

A.6.1 Yard storage of logs, lumber, and other forest products should be in accordance with NFPA 230, *Standard for the Fire Protection of Storage*.

A.7.2.5 Water can be supplied through connections to public water systems and the installation of additional water supplies, such as private pumping systems and dry hydrants (as described in NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*).

A.8.3 The loading, unloading, handling, and storage of hazardous materials is an inherent part of most marine terminal operations. Particular attention should be given to facilities, procedures, and operations that minimize dangerous concentrations, avoid the mixing of incompatible materials, ensure safe operations, and permit effective fire control in the event of an accident. Over the years a large body of regulations has evolved that is specifically applicable to such operations.

Marine terminal owners and operators, shippers, and others responsible for the transportation and handling of hazardous materials, as well as local authorities responsible for the regulation of such operations for public safety, should be familiar with all applicable federal regulations. Detailed references to U.S. Coast Guard regulations, hazardous materials regulations of the U.S. Department of Transportation, occupational safety and health standards of the U.S. Department of Labor, and the regulations of the U.S. Department of the Treasury, along with recommended good practice in administration of local regulations, are found in Annex D.

A.8.4 Operations involving the loading, unloading, handling, and storage of bulk cargoes of certain hazardous materials present special problems, especially if conducted at a general cargo marine terminal. Such general cargo terminals regularly handle a variety of other hazardous materials, including explosives and chemicals, that are subject to explosive decomposition.

Handling of the following is incompatible with general cargo marine terminal operations:

(1) Bulk "cargo of particular hazard," as defined in U.S. Coast Guard Regulations 33 CFR 126.10(d), "Navigation and Navigable Waters"
(2) Tanker moorage
(3) Pipeline transfer and storage of flammable liquids
(4) Liquefied natural gas and similar products

Separate terminal facilities that are designed, constructed, operated, and protected as required for the particular bulk cargo are needed.

A.8.5 Compliance with the provisions of this chapter should include, as a minimum, means by which to provide ready access to information concerning the quantity, location, and nature of any hazardous material stored at terminal facilities.

A.8.8.1 The list of hazardous materials in 8.8.1 includes generic names that embrace a range of hazards. Individual container shipments of such materials involve various quantities that are subject to differing local conditions. An exception to required storage in a designated hazardous materials storage area is provided to permit recognition of these differences for such shipments. It is recommended that approval of any alternative by the authority having jurisdiction be based upon the principles of Chapter 8 and the procedures outlined in Annex D.

A.9.2.1 This responsibility requires an understanding of all applicable laws, ordinances, and regulations.

A.9.3 Fire problems involving marine terminals and vessels present significantly different challenges from those normally faced by land-based fire-fighting organizations. Prefire plans, routine drills, and coordination with local mutual-aid organizations are all essential to effective fire fighting in marine facilities. *(See NFPA 1405, Guide for Land-Based Fire Fighters Who Respond to Marine Vessel Fires.)*

Where a trained public fire department is not readily available, a fire brigade consisting of selected employees should be organized. The efficiency of the brigade depends on thorough drilling in the location and proper use of fire-fighting equipment, including operation of portable fire extinguishers, laying of hose lines, and application of hose streams. It is recommended

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that a special detail is assigned to close all fire doors in times of fires and drills. *(See NFPA 600, Standard on Industrial Fire Brigades.)*

A.9.5.6 The storage of cotton should comply with NFPA 230, *Standard for the Fire Protection of Storage.*

A.9.9 See NFPA 601, *Standard for Security Services in Fire Loss Prevention.*

A.10.1.3 See NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations*; NFPA 30, *Flammable and Combustible Liquids Code*; and NFPA 58, *Liquefied Petroleum Gas Code.*

A.10.6 The following procedures should be used during fumigation:

(1) It is recommended that, wherever possible, nonflammable fumigants be used.
(2) Fumigation of imported cargo should be conducted in detached buildings under competent supervision.
(3) No fumigant should be used that has a flammability rating greater than 2, a reactivity rating greater than 1 as outlined in NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*, or a flashpoint less than 60°C (140°F).
(4) All flammable or combustible fumigants should be stored in sealed metal containers and in accordance with the requirements of NFPA 30, *Flammable and Combustible Liquids Code.*
(5) Where other than nonflammable fumigants are used, electric wiring and equipment for fumigating chambers or enclosures should be installed in accordance with NFPA 70, *National Electrical Code.*
(6) Adequate ventilation facilities should be provided to remove the fumigant from the chamber or enclosure; and the ventilation facilities must be of good design and arranged to safely vent or release spent gases after dilution at altitudes or locations that protect persons and property in the area.
(7) Fumigants should be used only as recommended by the manufacturer.
(8) Where other than nonflammable fumigants are used, piping valves and fittings should conform to the requirements of NFPA 30, *Flammable and Combustible Liquids Code.*
(9) Where pesticides are required to be stored on the premises, especially for long periods of time, such storage should conform to the requirements of NFPA 434, *Code for the Storage of Pesticides.*
(10) Pesticides should be stored so as to prevent deleterious contact with moisture.
(11) Pesticides should be stored in a manner to prevent accidental release.
(12) Suitable gas masks should be provided for fumigation operations, and the gas masks should be prominently displayed and adequately labeled.
(13) Federal, state, or local governmental regulatory agencies, such as the U.S. Department of Labor, could have additional requirements that should be followed when applicable.
(14) The use of products generally distributed with instructions for use in households, such as paradichlorobenzene or naphthalene crystals or pellets used for fabric pest control, is acceptable as fumigants not needing any special requirements other than those recommended by the manufacturer.

Annex B Substructure Nomenclature

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 Because no typical construction of substructures exists, they vary widely by the type and the combination of materials used and the arrangement of structural members. Figure B.1(a) through Figure B.1(c) are provided to illustrate installation procedures and to clarify terminology used.

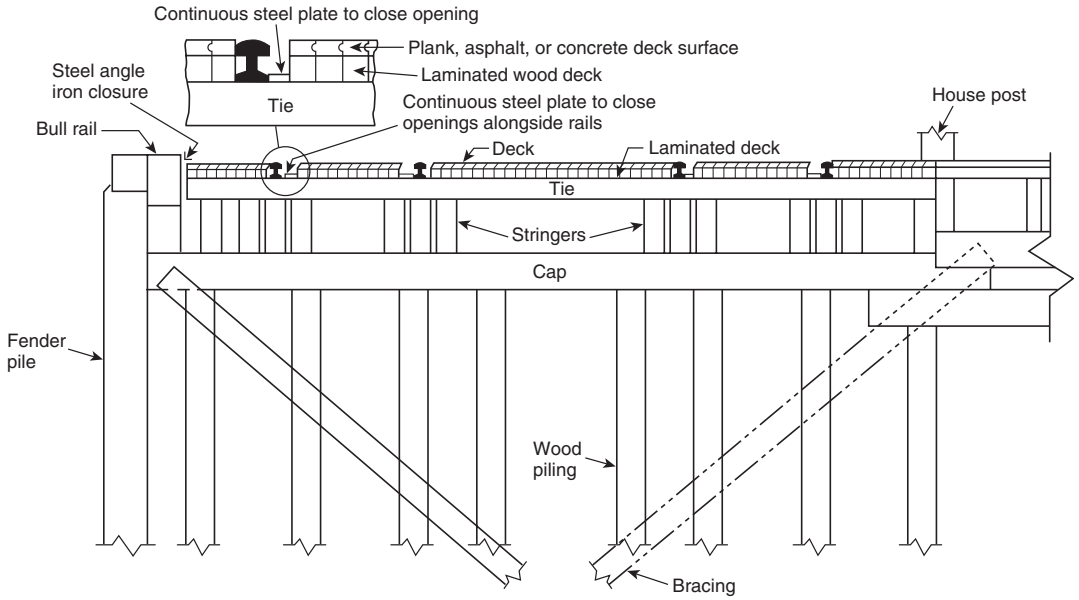


FIGURE B.1(a) Combustible Substructure with Railroad Tracks.

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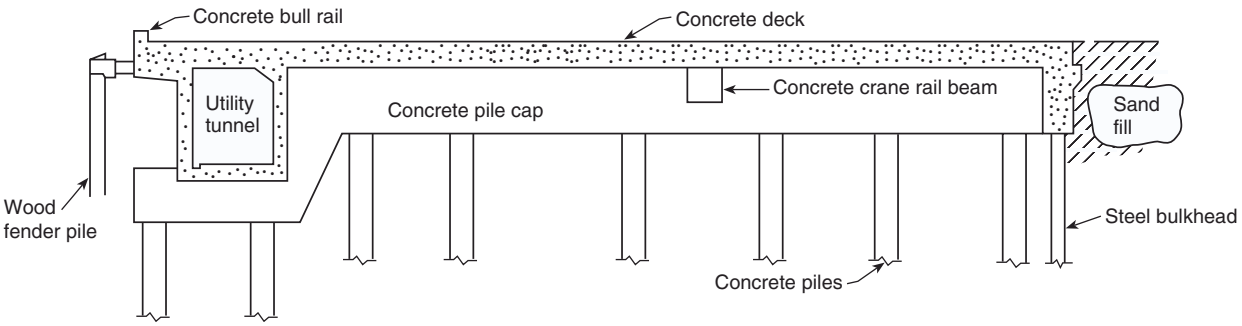


FIGURE B.1(b) Fire-Resistive Concrete Wharf Substructure.

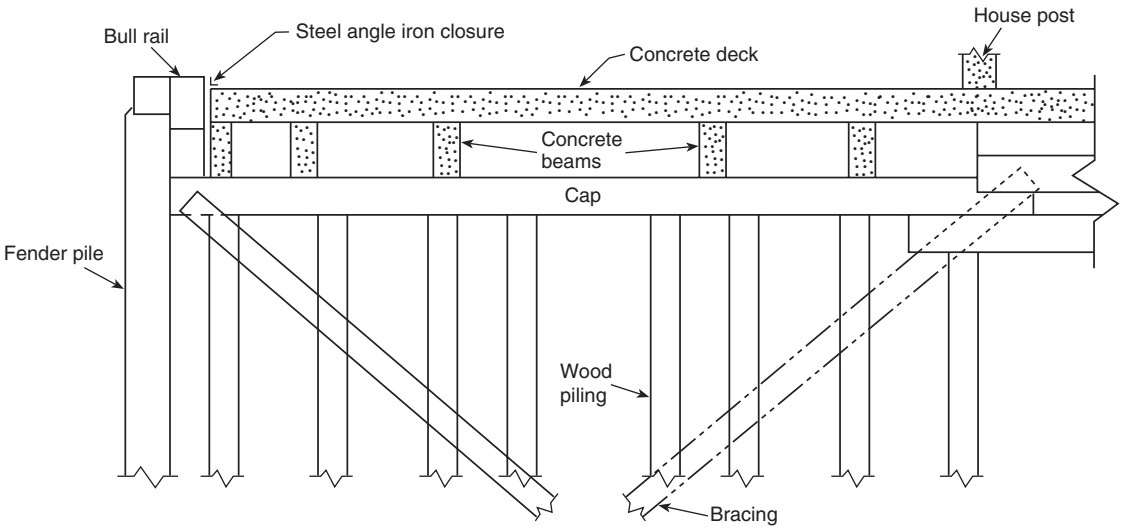


FIGURE B.1(c) Wharf Substructure with Fire-Resistive, Reinforced Concrete Deck and Beams over Combustible Piles and Pile Caps.

Annex C Additional Fire Protection Facilities

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

C.1 Sprinkler Supervision and Alarm. It is recommended that sprinkler systems be provided with sprinkler supervisory and water flow alarm service through a central station where available, and as remote station, auxiliary, or proprietary systems where not available. *(See NFPA 72, National Fire Alarm Code.)*

C.2 Fire Alarm. It is recommended that an approved system of manual fire alarms arranged to sound local alarms and summon the private brigade and public fire department be installed at marine terminals. *(See NFPA 72, National Fire Alarm Code, and NFPA 1221, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems.)*

The installation of automatic fire alarm equipment in substructures should be approached with due regard to maintenance and the possibility of false alarms.

U.S. Coast Guard Regulations, 33 CFR 126.16, requires "designated waterfront facilities" authorized to handle cargo of particular hazard, as defined in Part 126.10, to be equipped with approved warning alarms at the waterside of the facility to warn approaching or transiting water traffic of immediate danger in the event of fire or cargo release.

Annex D Regulations and References

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

D.1 International Regulations.

D.1.1 International Maritime Dangerous Goods (IMDG) Code. The *IMDG Code* is accepted as an international guide to the transport of dangerous goods by sea and is recommended to governments for adoption or for use as the basis for national regulations.

D.2 U.S. Federal Regulations.

D.2.1 U.S. Coast Guard, 33 CFR 126, contains regulations covering the handling of explosives or other dangerous cargoes within or contiguous to waterfront facilities.

U.S. Coast Guard, 46 CFR 147–148 contains regulations covering dangerous cargoes including hazardous ship's stores and carriage of solid hazardous materials in bulk.

D.2.2 U.S. Department of Transportation, 49 CFR 170–179, Chapter I, covers preparation of hazardous materials for transportation by common carriers by rail freight, rail express, rail baggage, highway, or water; construction of containers, packaging, weight, marking, and labeling when required; billing;

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and shippers' certificate of compliance with these regulations; also covers cars, loading, storage, billing, placarding, and movement thereof by carriers by rail.

D.2.3 Federal Highway Administration, U.S. Department of Transportation, 49 CFR 390–397, Chapter III, applies to every common carrier by motor vehicle, contract carrier by motor vehicle, and private carrier of property by motor vehicle engaged in interstate or foreign commerce, with respect to the transportation by motor vehicle of explosives and other dangerous articles. Parts 390–397 cover qualifications of drivers, driving rules, parts and accessories for safe operation, recording and reporting accidents, hours of service of drivers, and inspection and maintenance of motor vehicles.

D.2.4 Occupational Safety and Health Standards of the U.S. Department of Labor, 29 CFR 1910, 1917, and 1918, Chapter XVII. The Occupational Safety and Health Act of 1970 (PL 91-596) authorizes the secretary of labor to set mandatory occupational safety and health standards applicable to businesses affecting interstate commerce. These parts contain safety and health standards that were established under federal or national consensus rules, adopted under Section 6(a) of the Act and standards of specific design, and adopted under Section 6(b) of the Act.

D.2.5 Commerce in Explosives Regulations of the U.S. Department of the Treasury, 26 CFR 181, contains regulations promulgated to implement Title XI, Regulations of Explosives of the Organized Crime Control Act of 1970. It contains requirements pertaining to interstate and foreign commerce in explosive materials; licensing of manufacturers and importers of, and dealers in, explosive materials; the issuance of user permits; the conduct of business by licensees and operations by permittees; the storage of explosive materials; the records and reports required by licensees and permittees; relief from disabilities under this part; and exemptions, unlawful acts, penalties, seizures, and forfeitures.

D.3 Local Regulations.

D.3.1 The administration of local codes, ordinances, and regulations is usually handled under various permit systems with the authority having jurisdiction granting permission to load, unload, transport, store, handle, and use hazardous materials in accordance with specific provisions stipulated in the permit. Because marine terminal operations involve such a wide range of hazardous materials and large number of movements, it is impractical to issue individual permits for each movement. Accordingly, it is recommended that local regulations be adopted authorizing a master harbor permit system for marine terminal operators.

D.3.2 Under such a system, the marine terminal is issued a master permit that is renewed annually or when conditions at the terminal change substantially. The master permit should specify maximum limitations on the quantities for specific types of hazardous materials that can be handled at the terminal, and should set forth conditions under which the materials can be moved and stored. Such permits should have provisions under which the authority having jurisdiction can issue excess quantity permits for the handling of occasional shipments that exceed master permit quantity limits and special handling permits for shipments of exceptional hazard. Because the master permit is a long-term device intended to assist day-to-day safe operations in the storage and handling of hazardous cargoes, it is important for the authority having jurisdiction to monitor operations through frequent inspections.

D.3.3 In determining the maximum quantities and the storage and handling conditions for the various hazardous materials to be specified in the master permit for a given marine terminal, due consideration should be given to the following:

(1) The location of the terminal in relation to large population centers, in conjunction with the types and quantities of hazardous materials that are proposed to be stored
(2) The speed and direction of prevailing winds
(3) The type of construction of the terminal and its condition and maintenance, including items such as the following:
  (a) The condition of the superstructure and substructure
  (b) The condition of electrical services and water and fuel lines
  (c) The level of difficulty in gaining access to the structure for purposes of fire fighting
(4) Emergency access to the terminal and the hazardous materials storage area
(5) The physical size of the marine terminal and whether or not sufficient room is available for proper segregation of incompatible materials
(6) The provisions that have been made for the fire protection of the terminal, including whether or not the terminal is sprinklered and has fire-fighting access and water supplies
(7) The capability of the local emergency services agencies, including available equipment, manpower, and training

D.3.4 It would be appropriate to make the written storage plan described in Section 8.5 a part of the master permit details, either by reference or otherwise. These details of storage, handling, quantities, and types of hazardous materials vary by terminal, by locality, and by systems or procedures adopted, pursuant to the general considerations listed in D.3.3. All such plan and permit details should be based on the goal of safe handling, with storage quantities and types controlled so as to prevent an unmanageable situation in the event of fire or accident.

D.3.5 The following examples of plan and master permit details in use at certain terminals illustrate methods that can be of assistance to those responsible for developing such plans. Sample plans cover both container yard and breakbulk operations. Quantities specified in these examples reflect availability of strong public and private fire control facilities.

D.3.5.1 Sample Plans for Container Yard Operations. The terminal should designate three hazardous materials storage areas known as Areas A, B, and C. Each area should be positioned as follows:

(1) Located 15 m (50 ft) from buildings and other general cargo storage areas
(2) Located 6 m (20 ft) from property lines
(3) Located 30 m (100 ft) from other hazardous materials temporary storage areas

The maximum dimensions for these areas should be the following:

(1) Area A is 12.5 m × 40 m (40 ft × 125 ft), with access for fire department vehicles.
(2) Area B is 12.5 m × 44 m (40 ft × 144 ft), with access for fire department vehicles.
(3) Area C is 12.5 m × 10.5 m (40 ft × 34 ft) with access for fire department vehicles.

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Containers should be placed no closer than 1.5 m (5 ft) from any other container in the storage area. Unoccupied space in the hazardous material storage area can be used to store empty chassis. Designated separation distances between storage areas should be kept open at all times, and storage of any kind should be prohibited.

Storage areas should be surrounded by a 75 mm (3 in.) wide painted line 6 m (20 ft) out from the storage area. Such lines should be of contrasting color to the surface. The words "hazardous cargo area — no smoking — no flames" should be painted on the surface in capital letters not less than 150 mm (6 in.) high, every 9 m (30 ft), adjacent to the perimeter line.

The terminal operator should be responsible for all hazardous materials at the terminal, regardless of ownership. Operating plans should identify the individuals who have this responsibility and the authority for liaison with authorities having jurisdiction.

Table D.3.5.1 provides an example of master harbor permit system limitations for the outside storage of hazardous materials in containers. Except as permitted by the authority having jurisdiction, the terminal should not exceed the maximum quantities set forth in the column designated Maximum Quantities. Nor should the terminal accept hazardous materials labeled Call for Permit, in the same column of the table, without first obtaining a permit to accept such hazardous materials.

If the terminal operator wishes to apply for an exempted commodity classification for a commonly transported hazardous material, a letter should be sent to the authority having jurisdiction. Letters are reviewed annually for possible inclusion in the exempted commodity category.

D.3.5.2 Sample Plan for Breakbulk Operations. This section provides an example of storage requirements for the storage of hazardous materials in breakbulk form. See Table D.3.5.1 for storage or operating provisions that might also be appropriate.

Indoor storage and handling of hazardous materials should be confined to structures that are sprinklered as required in Section 5.4. Sprinkler systems having more than 100 heads should be supervised by an approved central, proprietary, or remote station service, or provided with a local alarm that gives an audible signal at a constantly attended location.

Overnight indoor storage of hazardous materials, as indicated in the Table D.3.5.2, should be stored in predesignated locations or areas within the building. These areas should be posted with signs. Such signs should contain the words "hazardous materials — no smoking" in red capital letters 150 mm (6 in.) or more in height.

Smoking within such buildings should be limited to predesignated locations. In no case should smoking or open flames be allowed within 15 m (50 ft) of the hazardous materials storage locations.

Buildings used for the storage of hazardous materials should be secured when not occupied or under the interior surveillance of security personnel. *(See Section 9.9.)*

Storage (including general cargo) should be so placed as to provide at least one aisle, 6 m (20 ft) wide, running the length of the building and cross aisles, 1.5 m (5 ft) wide, at least every 23 m (75 ft).

Designated separation distances between storage areas should be kept open at all times, and storage of any kind should be prohibited.

Table D.3.5.2 is an example of master permit specification limitations for the storage of hazardous materials in breakbulk form.

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Table D.3.5.1 Temporary Storage Conditions and Limitations of Hazardous Materials Container Yards

Hazardous Material D.O.T. Class	Maximum Quantities*	Storage Area	Additional Conditions
Flammable liquids	Not to exceed 45,400 kg (100,000 lb)	A	No other commodity can be stored in Area A. Can stack containers two high.
Flammable compressed gas	20 containers	B	No other hazardous material can be stored within 15 m (50 ft).
Combustible liquids	Unlimited	—	Can be stored with general cargo.†
Flammable solids	3 containers not to exceed 20,450 kg (45,000 lb)	B, C	No other hazardous material can be stored within 30 m (100 ft). Can stack two high.
Flammable solids — dangerous when wet	Call for Permit	—	—
Oxidizing material	10 containers	B, C	No other hazardous material can be stored within 15 m (50 ft). Can stack containers two high.
Corrosive material	10 containers	B, C	No other hazardous material can be stored within 15 m (50 ft). Can stack containers two high.
Nonflammable compressed gas	10 containers	B, C	No other hazardous material can be stored within 15 m (50 ft). Can stack containers two high EXCEPT nitrogen, argon, and carbon dioxide. Helium can be stored with general cargo.†
Chlorine, fluorine, sulfur dioxide or ammonia (can be one type or any combination of)	3 containers	B, C	Maximum container size for chlorine is 910 kg (1 ton). No other hazardous material can be stored within 30 m (100 ft).
Poisonous Gases, Division 2.3	Call for Permit	—	—
Poisons, Division 6.1	2 containers not to exceed 18,150 kg (40,000 lb)	B, C	No other hazardous material can be stored within 15 m (50 ft). Can stack containers two high.
Irritating material	2 containers not to exceed 4550 kg (10,000 lb)	B, C	No other hazardous material can be stored within 15 m (50 ft). Can stack containers two high.
Radioactive material	Call for Permit	—	—
Explosives: Divisions 1.1 and 1.2	1 container not to exceed 91 kg (200 lb)	C	—
Explosives: Division 1.3	1 container not to exceed 910 kg (2000 lb)	C	No other commodity can be stored in this area at the same time.
Explosives: Division 1.4	3 containers not to exceed 45,400 kg (100,000 lb)	C	Remove from terminal within 48 hr.
Explosives: Division 1.5	3 containers not to exceed 45,400 kg (100,000 lb)	C	—
Oxygen, liquid	3 containers not to exceed 18,150 kg (40,000 lb)	B, C	No other commodity can be stored in this area at the same time.
Organic peroxides	1 container not to exceed 45.5 kg (100 lb)	B, C	No other commodity can be stored in this area at the same time.
ORM A ORM B ORM C ORM D	No restriction	—	Can be stored with general cargo.†
Other: pyrophoric materials, etiologic agent, cryogenic material	Call for Permit	—	—

Note: Placarded containers containing less than 455 kg (1000 lb) gross weight of a hazardous material listed in 49 CFR 172.101, "Hazardous Materials Table," can be stored with the general cargo, provided the hazardous materials temporary storage areas are full.

* Maximum total quantities are listed by the total number of containers allowed in an area and the maximum total gross weight of the hazardous material in kilograms (pounds) permitted in the area. The total gross weight figure is the sum of all containers in the area and must not be exceeded.

† Exempted commodities by proper shipping name can be stored with the general cargo. All other conditions of this permit and city, state, and federal law should be strictly adhered to.

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Table D.3.5.2 Temporary Storage Conditions and Limitations of Breakbulk Cargo

Hazardous Materials D.O.T. Class	Outdoor Maximum Quantities	Indoor Maximum Quantities	Comment	Separations Outside	Separations Inside
Flammable liquids	Not to exceed 22,700 kg (50,000 lb)	20,850 L (5500 gal) business hours, 685 L (180 gal) nonbusiness hours unless sprinkler system is supervised, then 9465 L (2500 gal)		15 m (50 ft) from other hazardous storage, 7.5 m (25 ft) from general cargo. Breakbulk configurations to comply with the following: *55 gal drums* — In piles, 2 high, 100 drums per pile, 18 m (60 ft) from property lines and occupied buildings, 12 m (40 ft) between piles. *5 gal pails* — In piles, 5 high, 500 pails per pile, same separation distances as required for 55 gal drum storage.	General.
Flammable compressed gas	2 groupings of 100 cylinders	20 cylinders		15 m (50 ft) from other hazardous storage, 7.5 m (25 ft) from general cargo. Breakbulk storage to comply with the following: cylinders to be placed in groupings of no greater than 100 per group, 6 m (20 ft) aisles between groups, 15 m (50 ft) from property lines and occupied buildings.	General.
Combustible liquids	Not to exceed 45,400 kg (100,000 lb)	62,500 L (16,500 gal) business hours, 2000 L (500 gal) non-business hours unless sprinkler system is supervised, then 30,300 L (8000 gal)		Breakbulk storage to comply with the following: *5 gal drums* — In piles, 3 high, maximum 300 drums per pile, 18 m (60 ft) from property lines and occupied buildings, 12 m (40 ft) between piles. *5 gal pails* — In piles, 5 high, no limit on pile size, same separation distances as required for 55 gal drum storage.	General.
Flammable solids	Not to exceed 6810 kg (15,000 lb)	455 kg (1000 lb)		General.	General.
Flammable solids — dangerous when wet	Call for Permit	Call for Permit		—	—
Oxidizing material	Not to exceed 4550 kg (10,000 lb)	910 kg (2000 lb)		Breakbulk storage to be 15 m (50 ft) from hazardous cargo, 7.5 m (25 ft) from general cargo. Dry storage should be protected from moisture. Liquid storage should not be stored over organic surfaces, to include wooden surfaces.	General. Note: Liquid oxidizers should not be stored on or over organic surfaces (e.g., pallets). Dry material should be stored in a manner to prevent moisture contamination.
Corrosive material	Not to exceed 11,400 L (3000 gal)	2300 L (600 gal)	General. Dry commodities permitted unlimited amounts in storage.	General. Dry commodities can be stored with general cargo, to be protected from moisture.	General. Dry storage to be protected from moisture.

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Table D.3.5.2 *Continued*

Hazardous Materials D.O.T. Class	Outdoor Maximum Quantities	Indoor Maximum Quantities	Comment	Separations Outside	Separations Inside
Nonflammable compressed gas	5 groupings of 100 cylinders per grouping	100 cylinders		Can be stored with general cargo except the following: oxygen (oxidizer), chlorine, fluorine, sulfur dioxide, ammonia.	General.
Chlorine, fluorine, sulfur dioxide, ammonia (can be one type or any combination of)	50 cylinders chlorine, maximum cylinder size: 910 kg (1 ton)	10 cylinders aggregate, maximum size: 140 kg (300 lb)		General. Storage can be placed with Poisons, Division 6.1. Note: Chlorine cylinder maximum size: 910 kg (1 ton).	General. Cylinder maximum size: 140 kg (300 lb).
Poisonous gases, Division 2.3	Call for Permit	Call for Permit		—	—
Poisons, Division 6.1 and irritants	Not to exceed 9100 kg (20,000 lb)	910 kg (2000 lb)		General.	General.
Radioactive material	Call for Permit	Call for Permit		—	—
Explosives: Divisions 1.1 and 1.2	Not to exceed 91 kg (200 lb)	Storage limit to 2 hrs, 91 kg (200 lb)	Call for Permit	To be stored in an approved magazine or other location approved by the AHJ.	None allowed over 4 hr. Cargo to remain on loading dock area. No other hazardous cargo on the loading dock within 15 m (50 ft) at the same time. No flame or spark-producing devices within 15 m (50 ft) of loading or unloading operation. Storage in excess of 4 hr should be within an approved magazine or other outside location approved by the AHJ.
Explosives: Division 1.4	Not to exceed 45,400 kg (100,000 lb)	18,200 kg (40,000 lb)		To be stored at least 15 m (50 ft) from property lines, occupied buildings, and other hazardous storage. Individual class and type separation should be in accordance with 49 CFR 171–180.	Cargo to remain on loading dock area. No other hazardous cargo on the loading dock within 15 m (50 ft) at the same time. No flame or spark-producing devices within 15 m (50 ft) of loading, unloading operation. No other explosive material (including ammonium nitrate, fertilizer grade) in the building at the same time. Storage limited to 24 hr.
Explosives: Division 1.5	Not to exceed 45,400 kg (100,000 lb)	18,200 kg (40,000 lb)		—	—
Ammonium nitrate, fertilizer grade	Not to exceed 140,000 kg (300,000 lb)	18,200 kg (40,000 lb)		—	—
Organic peroxides	Call for Permit	Call for Permit		—	—

(continues)

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Table D.3.5.2 *Continued*

Hazardous Materials D.O.T. Class	Outdoor Maximum Quantities	Indoor Maximum Quantities	Comment	Separations Outside	Separations Inside
ORM A ORM B ORM C ORM D ORM E	No restriction	No restriction		Storage with general cargo.	Storage with general cargo.
Other: Pyrophoric materials, etiologic agent, cryogenic material	Call for Permit	Call for Permit		—	—
Oxygen liquid	Not to exceed 4540 kg (10,000 lb)	3 cylinders	Not to remain inside enclosed buildings overnight.	Nonliquefied oxygen cylinders in breakbulk form should be stored with oxidizers. Liquefied oxygen should be segregated from all other hazardous materials by at least 15 m (50 ft), from general cargo by 7.5 m (25 ft). Combustible material and debris should not be stored within 7.5 m (25 ft) of liquid oxygen cylinders.	Nonliquefied oxygen storage should meet general storage conditions. Liquefied oxygen should be stored on loading dock, only. All other hazardous materials and combustible materials, debris, organic materials, etc., should be stored at least 7.5 m (25 ft) away. All inside storage should be removed from premises before close of business.

Notes:
(1) Where the term *general* is listed under storage conditions, the following separations should be adhered to: Breakbulk — Outside — 6 m (20 ft) from fence lines, property lines; 7.5 m (25 ft) from other hazardous cargo; 3 m (10 ft) from general cargo. Inside — 7.5 m (25 ft) from other hazardous cargo, 3 m (10 ft) from general cargo. Storage should be placed along outside walls.
(2) For those hazard classes listed as Call for Permit and Explosives, Divisions 1.1, 1.2, and 1.3, a special permit is required. Specific storage conditions and restrictions should be established based on the relative hazard of the actual commodity and the facility's capability to handle that commodity.

Annex E Informational References

E.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

E.1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2002 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 2003 edition.

NFPA 58, *Liquefied Petroleum Gas Code*, 2004 edition.

NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)*, 2006 edition.

NFPA 70, *National Electrical Code®*, 2005 edition.

NFPA 72®, *National Fire Alarm Code®*, 2002 edition.

NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*, 2001 edition.

NFPA 230, *Standard for the Fire Protection of Storage*, 2003 edition.

NFPA 251, *Standard Methods of Tests of Fire Resistance of Building Construction and Materials*, 2006 edition.

NFPA 303, *Fire Protection Standard for Marinas and Boatyards*, 2006 edition.

NFPA 434, *Code for the Storage of Pesticides*, 2002 edition.

NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations*, 2006 edition.

NFPA 600, *Standard on Industrial Fire Brigades*, 2005 edition.

NFPA 601, *Standard for Security Services in Fire Loss Prevention*, 2005 edition.

NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*, 2001 edition.

NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*, 2001 edition.

NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*, 2002 edition.

NFPA 1405, *Guide for Land-Based Fire Fighters Who Respond to Marine Vessel Fires*, 2001 edition.

E.1.2 Other Publications.

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E.1.2.1 IMO Publication. International Maritime Organization, 4 Albert Embankment, London, SE1 7SR, U.K.

International Maritime Dangerous Goods (IMDG) Code, 2002.

E.1.2.2 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402.

Title 26, Code of Federal Regulations, Part 181.

Title 29, Code of Federal Regulations, Parts 1910, 1917, 1918.

Title 33, Code of Federal Regulations, Part 126.

Title 46, Code of Federal Regulations, Parts 147–148.

Title 49, Code of Federal Regulations, Parts 170–179.

Title 49, Code of Federal Regulations, Parts 171–180.

Title 49, Code of Federal Regulations, Part 172.

Title 49, Code of Federal Regulations, Parts 390–397.

E.2 Informational References. (Reserved)

E.3 References for Extracts in Informational Sections. (Reserved)

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