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NFPA 307 Construction and Fire Protection of Marine Terminals, Piers, and Wharves 1990 Edition

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Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

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NFPA 307

Standard for the

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

1990 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, released by the Correlating Committee on Marine Fire Protection, and acted on by the National Fire Protection Association, Inc. at its Annual Meeting held May 21-24, 1990 in San Antonio, TX. It was issued by the Standards Council on July 20, 1990, with an effective date of August 17, 1990, and supersedes all previous editions.

The 1990 edition of this document has been approved by the American National Standards Institute.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

Origin and Development of NFPA 307

This document replaces NFPA 307-1967, which was withdrawn by the Standards Council in October of 1980, and NFPA 87-1980. NFPA 307-1967, *Recommendations for the Operation of Marine Terminals*, was adopted by NFPA in 1951 with amendments adopted in 1961 and 1967.

NFPA 87-1980, *Standard for the Construction and Protection of Piers and Wharves*, was first initiated by the Committee on Piers and Wharves during the period from 1919 to 1925, and was first adopted by the NFPA in 1925. Revised editions were adopted in 1931, 1935, 1954, 1963, 1968, 1971, 1975, and 1980. NFPA 307-1985 represents a combination of NFPA 307-1967 and NFPA 307-1980 including amendments to both. NFPA 307-1990 consists of amendments to NFPA 307-1985.

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

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.

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

Information on referenced publications can be found in Chapter 10 and Appendix E.

Chapter 1 Introduction

1-1 Scope.

1-1.1 This standard applies to marine terminals as defined herein. 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, require special consideration. The general principles of this standard for the construction and fire protection of piers and wharves are applicable to such structures.

1-1.2 This standard does not apply to marinas and boatyards. (*See NFPA 303, Fire Protection Standard for Marinas and Boatyards.*)

1-1.3 This standard does not apply to the handling of flammable or combustible liquids in bulk. (*See NFPA 30, Flammable and Combustible Liquids Code.*)

1-1.4 This standard does not apply to the handling of liquefied gases in bulk. (*See NFPA 59A, Standard for the Production, Storage, and Handling of Liquefied Natural Gas [LNG], or NFPA 58, Standard for the Storage and Handling of Liquefied Petroleum Gases.*)

1-2 Purpose. The provisions of this document are 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. They reflect situations and the state of the art at the time the standard was issued.

Unless otherwise noted, it is not 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 is determined by the authority having jurisdiction that the existing situation involves a distinct hazard to life or property.

Chapter 2 Definitions

2-1 Definitions. The following terms are used herein with the meanings indicated. See illustrations in Appendix B for additional definitions.

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

Approved. Acceptable to the "authority having jurisdiction."

NOTE: 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 or 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 concerned with product evaluations which is in a position to determine compliance with appropriate standards for the current production of listed items.

Authority Having Jurisdiction. The "authority having jurisdiction" is the organization, office or individual responsible for "approving" equipment, an installation or a procedure.

NOTE: The phrase "authority having jurisdiction" 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, 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 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."

Bent. A main supporting framework consisting of a transverse row of piling with interconnecting pile cap and bracing. A bent normally extends the full width across the pier. Depending upon deck design and load requirements, bents are usually spaced 10 to 12 ft (3.05 to 3.66 m) 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, etc., are commonly referred to as pony bents.

Berth. The water area at the side of a pier or wharf in which vessels may remain afloat when moored at the pier or wharf.

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

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

Cargo. Commodities in transit.

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

Breakbulk. Commodities packaged in bags, drums, cartons, crates, etc., commonly but not always palletized and conventionally stevedored and stowed.

Containerized. Commodities stowed and transported in a container.

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

Container. A standard reusable box-like structure (usually 8 × 8 × 20 ft or 8 × 8 × 40 ft) (2.44 × 2.44 × 6.1 m or 2.44 × 2.44 × 12.2 m) into which commodities are packed for transportation. Commonly termed a container or box and used in more than one mode of transportation.

Container Freight Station (CFS). A transload facility used primarily for loading and unloading cargo from containers. Also used for temporary storage, receipt, and delivery of cargo.

Hazardous Material. A substance or material that has been determined by the secretary of transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce and which has been so designated.

Listed. Equipment or materials included in a list published by an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

NOTE: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which 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.

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

Pier. A structure, usually of greater length than width, and projecting from the shore into a body of water. A pier may be either open deck or provided with a superstructure. Used interchangeably with "wharf."

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.

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.

Shall. Indicates a mandatory requirement.

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

Slip. A berth formed by an extension, artificial or otherwise, of a navigable water into the space between adjacent structures, within which vessels may be moored.

Substructure. That portion of the construction of a pier or wharf below and including the deck. (*See Appendix B.*)

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

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

Terminal Yard. Those open areas at a marine terminal site provided for the temporary storage of cargo, containers, and cargo handling equipment, and areas devoted to the maintenance of the terminal and equipment. 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 shall be considered part of the terminal yard.

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

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 (e.g., a transit shed or container freight station).

Warehouse. A building used for long-term storage of commodities as contrasted with temporary storage in container freight stations and transit sheds.

Water Level and Tide Terminology:

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

Mean Low Water, Mean High Water, Mean Lower Low Water, or Mean Higher High Water. A tidal datum. 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.

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.

Wharf. A structure having a platform built along and parallel to a body of water. A wharf may be either open deck or provided with a superstructure. Used interchangeably with "pier."

Chapter 3 Piers and Wharves

3-1 General.

3-1.1 Design, all materials, and the workmanship elements of pier and wharf construction shall conform to standards and construction practices that will assure a durable and safe structure that will withstand the forces of nature to which it is likely to be exposed, the deteriorating influences of its environment, the expected wear and tear of operation and use, and will provide a safe place for its occupants. In regions known to be subject to earthquakes, pier and wharf structures, their water and utility pipes, and fire protection equipment shall be designed and installed to resist earthquake forces.

3-2 Substructure Construction.

3-2.1* Substructure Construction. This chapter contains construction and protection standards for pier substructures of the three basic construction types: namely, fire-resistive, noncombustible, and combustible substructures, and also any combination of these materials in a fourth construction type defined herein as composite construction.

3-2.2 Protection Against Mechanical Damage. 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. Provisions shall be made to reduce the impact force exerted on the pier with such details of construction as will reduce damage from ordinary operations to a reasonable minimum.

3-2.3 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.

3-2.4 Fire-Resistive Substructures.

3-2.4.1 General. A fire-resistive substructure shall be one having a fire resistance rating in all of its parts of not less than 4 hr.

Exception: If wood piles or wood cribwork or unprotected steel piles are used they shall not extend above low water or, in tidal waters, they shall not extend more than one-half the tidal range or a maximum of 3 ft (.91 m) above low water.

3-2.4.2 Pier Deck. Pier decks shall be reinforced concrete or equivalent construction to afford a 4-hr fire resistance rating. Where railroad tracks extend onto the pier deck and are 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 equivalent fire resistance rating.

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 220, *Standard on Types of Building Construction*.

3-2.4.3 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-hr fire resistance rating.

3-2.5 Noncombustible Substructures.

3-2.5.1 General. A noncombustible substructure is one that meets the requirements for fire-resistive substructures in accordance with 3-2.4, except that structural steel and steel piles above the critical level in relation to low water specified in 3-2.4.1 are not provided with fireproofing equivalent to a 4-hr fire resistance rating; or one of reinforced concrete for which a 4-hr resistance rating has not been established by standard test. (*See NFPA 251, Standard Methods of Fire Tests of Building Construction and Materials*.)

3-2.5.2 Pier Deck. Pier decks shall conform to the requirements of 3-2.4.2 except as to fire resistance rating.

3-2.5.3 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 fire resistance rating equal to that of the pier substructure and deck.

3-2.6 Combustible Substructures.

3-2.6.1* Piles and Stiffening Members. The substructure may be of wood piles extending to the pier deck. Stiffening of the piling shall be by the use of inclined bracing piles or cross braces of timber of not less than 4 in. (101.6 mm) nominal minimum dimension and 32 sq in. (20,645.12 mm^2) minimum cross-sectional area. The cross bracing shall be designed to offer the minimum surface exposed to fire and the smallest possible obstruction to the distribution of water in fighting fires under the pier deck. Deep narrow spaces between timbers shall be fire-stopped over each bent or at least once in each timber length.

3-2.6.2 Pier Deck and Supports.

(a) Pile caps shall consist of sawed timber not less than 8 in. (203.2 mm) nominal minimum dimension and 96 sq in. (61,935.36 mm^2) minimum cross-sectional area, and the deck stringers of not less than 6 in. (152.4 mm) nominal minimum dimension and 72 sq in. (46,451.52 mm^2) minimum cross-sectional area. Deck planking on stringers shall be not less than 4 in. (101.6 mm) in thickness, and on this shall be laid a wearing surface of 2 in. (50.8 mm) of wood sheathing, or a layer of concrete or asphalt, or other material of equivalent durability. The sheathing and deck planks shall be laid at right angles, except that in the driveways the sheathing may be laid diagonally. Joists 4 in. (101.6 mm) or less in thickness shall not be used in this type of construction.

(b) Pier decks without superstructures shall have deck planking not less than 3 in. (76.2 mm) thick.

(c) Pier decks of composite laminated timber and concrete construction shall be acceptable, provided that timbers used shall be not less than 2 in. (50.8 m) in nominal thickness and shall be treated for protection against decay, termites, or attack by marine life.

(d) Any openings in pier decks, such as spaces between bullrail and pier deck, alongside railroad or crane tracks, and others made necessary for operations or equipment, shall be suitably closed to prevent debris from falling through and accumulating on substructure members. Steel angle iron, steel plate, or equivalent noncombustible material of a thickness that will resist 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. (*See examples in Appendix B.*)

(e) 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. Side hatches shall be permitted in the walls of such depressed sections for fire fighting purposes with openings normally closed by hatch covers having a fire resistance rating equivalent to the walls.

3-2.6.3 Aprons. 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 3-2.4. This fire-resistive section shall extend for a distance of at least 10 ft (3.05 m) on each side of the fire wall.

3-2.7 Composite Substructures.

3-2.7.1 General. Composite construction shall mean any combination of combustible and noncombustible materials (with or without fire resistance rating) described in 3-2.4, 3-2.5, and 3-2.6 not meeting the limitations of the Exception under 3-2.4.1.

3-2.7.2 Pier deck, supports, bracing, and aprons shall conform to the construction requirements of 3-2.4, 3-2.5, and 3-2.6 for the respective type of construction used for the various portions of the substructure.

3-3 Substructure Protection and Subdivision.

3-3.1 Protection and Subdivision of Noncombustible Substructures. The provision of fire walls, fire-stops, 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.

3-3.2* Protection and Subdivision of Composite Substructures.

3-3.2.1 Except as provided in 3-3.2.2 below, the provision of fire walls and fire-stops, automatic sprinklers, and other fire extinguishing facilities shall conform to the requirements for combustible substructures as provided in 3-3.3.

3-3.2.2 Where exposed combustible structural materials are limited to piling and intrabent bracing, and the height from low water to top of combustible construction does not exceed the typical distance between bents, the provision of fire walls and fire-stops and 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.

3-3.3 Protection and Subdivision of Combustible Substructures.

3-3.3.1 Automatic Sprinklers. A complete system of automatic sprinklers shall be installed for the protection of all combustible substructures.

Exception: The requirement of a complete automatic sprinkler system may be waived for those existing substructures as specified in 3-3.3.5 and for piers and wharves that:

(a) have solid decking 25 ft (7.6 m) or less in width; and that

(b) are 5,000 sq ft (465 m^2) in area or smaller, exclusive of approach ways 25 ft (7.6 m) or less in width; and that

(c) are separated by at least 30 ft (9.2 m) from other structures; and that

(d) have no superstructures exceeding 500 sq ft (46.5 m^2) in individual area nor 1,500 sq ft (139.5 m^2) in aggregate area, and such superstructures are not less than 30 ft (9.2 m) apart.

3-3.3.2 Installation of sprinkler equipment shall be in accordance with the applicable provisions of NFPA 13, *Standard for the Installation of Sprinkler Systems*. Where there is danger of damage to sprinkler equipment by floating objects, physical barriers shall be provided to exclude such objects.

3-3.3.3 In addition to the applicable provisions of NFPA 13, *Standard for the Installation of Sprinkler Systems*, the following provisions shall apply:

(a) Where narrow horizontal channels or spaces are caused by caps, stringers, ties, and other structural members, the standard upright sprinkler may not project sufficient water upward to extinguish or control fires on the underside of the pier or wharf deck. In these cases a sprinkler that projects water upward to wet the overhead, such as a standard pendent sprinkler installed in an upright position, or the old-style sprinkler shall be used. Location, spacing, and deflector position shall be governed by the discharge pattern of the sprinkler and the structure being protected. The following design and installation guides apply where standard 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 80 sq ft (7.44 m^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. Spacing between branch lines shall not exceed 10 ft (3.05 m). Sprinklers on branch lines shall be staggered and spaced not to exceed 8 ft (2.44 m) on centers.

(3) Where crisscross construction (typically ties on stringers — see diagram in Appendix B) is involved, closer spacing of sprinklers shall be as necessary to provide wetting of the entire structure.

(4) Deflector of sprinklers on lines under stringers shall be located not less than 4 in. (101.6 mm) nor more than 10 in. (254 mm) below the bottom plane of the stringer, and not more than 18 in. (457.2 mm) 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*. Sprinklers shall be $^1/_2$-in. (12.7 mm) orifice and shall discharge at a minimum pressure of 12.5 psi (86.1875 kPa). Design area shall be based upon the largest area between fire-stops plus an additional area embracing at least two branch lines on opposite sides of the fire-stop. Minimum design area shall be not less than 5,000 sq ft (465 m^2).

(6) The temperature rating of the sprinkler shall not exceed 165°F (73.9°C).

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

(b) Sprinklers designed and approved specifically for protection of combustible substructures shall be installed in conformity with their listing.

(c) The pipe hangers shall be placed 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. The distance from the sprinkler to the hanger shall not exceed 18 in. (457.2 mm).

(d) Horizontal and vertical bracing shall be provided at not more than 20-ft (6.1-m) intervals on all sprinkler piping 3 in. (76.2 mm) or larger, which is parallel to and within 50 ft (15.3 m) of the face of the pier or wharf and where it may be subjected to heavy fireboat nozzle streams.

(e) Sprinkler systems, including hanger assemblies and bracing, in underdeck areas shall be properly protected throughout against corrosion. Sprinklers shall be of corrosion-resistant type. When the fire protection design for substructures involves the use of detectors or other electrical equipment for smoke or heat detection, preaction or deluge-type sprinkler protection, all detectors and wiring systems shall be moisture- and corrosion-proof to protect against unfavorable atmospheric conditions that exist beneath these structures. Frequent inspection and testing of these systems shall be conducted in accordance with applicable NFPA standards.

(f) Water supply systems, hydrants, fire hose valves, and sprinkler systems shall be installed with adequate protection against freezing and physical damage.

3-3.3.4 Other Extinguishing Facilities. 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 following:

(a) Openings in the pier deck shall be provided at intervals not exceeding 25 ft (7.6 m) on centers to enable the fire department to place in operation with the least possible delay devices suitable for extinguishing underdeck fires. Openings shall be over clear spaces to avoid interference by substructure of effective operation of extinguishing devices. The effective arrangement of these openings shall not exceed 100 sq in. (64,516 mm^2) and shall be not less than 9 in. (228.6 mm) in the smallest dimension so as to readily pass the appliances for which they are intended. The openings shall be provided with covers that can be removed easily. Covers shall be constructed of such material or so insulated that they will resist the passage of heat and fire in a manner equivalent to that of the pier deck. Location of openings shall be conspicuously indicated. [*See also 3-2.6.2(e).*]

(b) All parts of the deck, including aprons, upon which fire fighters may be expected to work shall be solid and continuous, have no uncovered openings, and be virtually smoketight.

(c) There shall be maintained on the pier or wharf, preferably at the land end, in readily accessible locations, a sufficient number of revolving nozzles, cellar pipes, and other devices of appropriate type 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. 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.

(d) To supply water for the devices covered by this section, there shall be installed an adequate water supply and adequate hydrants or hose connections.

3-3.3.5* Other Extinguishing Facilities — Existing Substructures. 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 3-3.3.4 in conjunction with the required structural barriers of 3-3.3.6 through 3-3.3.9 may be provided as alternate protection. Consideration shall be given to any built-in extinguishing equipment that is practical to install and maintain, such as partial automatic sprinkler equipment or manual sprinkler equipment with particular emphasis on preserving the integrity of the required structural barriers under fire conditions.

3-3.3.6 Subdivision of Combustible Substructures. All substructures of combustible construction shall have the underdeck area subdivided by the following:

(a) Transverse fire walls extending to low water and the full width of the pier including aprons or platforms at intervals not exceeding 450 ft (137.3 m). 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 3-2.4, constructed to preserve the effectiveness of the fire wall. This fire-resistive section shall extend for a distance of at least 10 ft (3.05 m) on each side of the fire wall.

Exception: The 20-ft (6.1-m) fire-resistive cap [10 ft (3.05 m) on each side of the fire wall] is not required when the fire walls constitute a continuation of the fire walls in a superstructure.

(b) Transverse fire-stops located between fire walls. Spacing between fire walls and fire-stops or between fire-stops shall not exceed 150 ft (45.8 m). Fire-stops shall fit tightly up against the pier deck and around any structural members or pipes that pass through the fire-stop so that an effective barrier to fire and draft will be maintained. Fire-

stops shall extend to the low water line. Where aprons or platforms are built along the sides of the pier, fire-stops shall extend to the outside edge of such platforms.

NOTE: The requirements set forth in subsections (a) and (b) above may be modified where floods, tidal or wave action render such fire walls or fire-stops structurally impracticable, provided equivalent protection is obtained by other means.

3-3.3.7 Types of Fire Walls. Substructure fire walls shall have a fire resistance rating of at least 4 hr and shall be constructed of reinforced concrete or of other materials that are equivalent in stability and have an equivalent fire resistance rating. Walls shall be free of holes and shall extend to low water.

3-3.3.8* Types of Fire-Stops. Fire-stops shall have a fire resistance rating of not less than 1 hr and shall be constructed of 6 in. (152.4 mm) of reinforced concrete or other materials that are equivalent in stability and resistance to physical damage.

3-3.3.9 Existing Substructures. For existing substructures where, in the opinion of the authority having jurisdiction, the standard fire walls required in 3-3.3.7 are impractical, approved fire-stops installed every 150 ft (45.8 m) and constructed as specified in 3-3.3.8 may be used as alternate protection.

3-4 Superstructure Construction.

3-4.1* The type of material or combination of materials used in superstructure construction shall meet the general construction provisions of 3-1.1, and when protected in accordance with this standard may be of any of the types of construction described in NFPA 220, *Standard on Types of Building Construction*.

3-4.2 Exterior walls that are less than 30 ft (9.2 m) from other buildings or from property lines shall be constructed of not less than 4-hr fire resistive construction, and openings in such walls shall be protected by labeled protective devices as per NFPA 80, *Standard for Fire Doors and Windows*. Exterior walls shall be provided with suitable access to the building interior at intervals not exceeding 200 ft (61 m) for the use of fire fighters, guards, and workers.

3-5 Superstructure Protection.

3-5.1 Automatic Sprinklers. 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*.

Exception: Sprinklers shall not be required in small superstructures located over unsprinklered fire-resistive substructures (a) if such superstructures do not exceed 500 sq ft (46.5 m^2) in individual area, (b) if the total area of all such structures does not exceed 1,500 sq ft (139.5 m^2), and (c) if the separation between any two such structures is not less than 30 ft (9.2 m).

3-5.2* First Aid Fire Appliances. Portable fire appliances and 1½-in. standpipe connections shall be installed, 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 4 Terminal Buildings

4-1 General. This chapter applies to buildings and structures located on marine terminal premises other than the piers and wharves and their superstructures described in Chapter 3.

4-2 NFPA 220, *Standard on Types of Building Construction*, shall be referred to when constructing or modifying marine terminal buildings.

4-3* 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. Outside storage of cargo shall not be within 20 ft (6.1 m) of the exterior of the building.

Exception: This section does not apply to containers, railroad cars, and vehicles that are parked for the purpose of loading or unloading cargo. Containers, railroad cars, and vehicles shall only remain parked within 20 ft (6.1 m) of a building as long as is necessary to meet cargo loading, unloading, and handling requirements.

4-4 Automatic Sprinklers.

4-4.1 Buildings used for the handling or storage of combustible cargo shall be provided with a complete system of automatic sprinklers.

Exception: Buildings not exceeding 5000 sq ft (465 m^2) total floor area.

4-4.2 Due to the widely varying nature of commodities that may pass through transit sheds, container freight stations, transload facilities, and similar buildings used for handling and temporary storage of general cargo, minimum sprinkler design criteria shall be based upon Ordinary Hazard Group 3 classification under the provisions of NFPA 13, *Standard for the Installation of Sprinkler Systems*.

4-4.3 If maximum storage height that the building will permit exceeds 12 ft (3.7 m), the requirements of NFPA 231, *Standard for General Storage*, shall be followed for protection of Class IV commodities piled to the maximum height permitted by building construction and the clearance requirements of 8-5.6.

4-4.4 If racks or shelving are present or likely to be present, the requirements of NFPA 231C, *Standard for Rack Storage of Materials*, shall be followed for protection of Class IV commodities. Protection in warehouses for the long-term storage of specific commodities shall be designed for the specific use.

Exception: Buildings not exceeding 5000 sq ft (465 m^2) total floor area.

4-4.5 Warehouses used for the storage of hazardous materials shall be protected by a complete system of automatic sprinklers installed in conformity with the standard applicable to the type of hazardous material being stored.

4-4.6 Warehouses and lockers rented as secured spaces and not directly controlled by the terminal operator shall be protected by a complete system of automatic sprinklers installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*. Such systems shall be designed and installed with all control valves, drains, and alarms located in an area accessible to terminal personnel for inspection and operation.

4-5 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, and Storage of Fireworks*; NFPA 498, *Standard for Explosives Motor Vehicle Terminals*; and regulations of the United States Bureau of Alcohol, Tobacco and Firearms.

4-6 Where miscellaneous service operations such as office, maintenance and repair, vehicle service, etc. are conducted in buildings used for receiving, delivering, and storage of cargo, the requirements of NFPA 513, *Standard for Motor Freight Terminals*, apply when they are appropriate and are not covered by this standard. In addition, see Chapter 8.

4-7 Manufacturing and processing operations conducted on the premises of marine terminals shall be confined to separate buildings, designed, constructed, and protected for that purpose.

4-8 Structures, permanent or temporary, placed inside larger terminal buildings, such as those used for offices, tool sheds, etc., shall be sprinklered.

Chapter 5 Terminal Yards

5-1* Marine terminal yards 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. As used herein, the term does not include pier and wharf areas except that solid-fill-type wharves that are contiguous to and form a part of yard areas shall be considered a part of the terminal yard.

5-2 Yards shall be paved or otherwise suitably surfaced to permit all-weather operations of heavy equipment with appropriate marking of roadways, access lanes, parking and storage areas; to facilitate the confinement and recovery of spills; and to control the growth of vegetation and minimize upkeep and maintenance. (For yard areas used for the storage of forest products, see Section 5-6.)

5-3 The entire property shall be surrounded by a fence or other suitable means to prevent access by unauthorized persons. An adequate number of gates shall be provided in the surrounding fence or other barriers to permit ready access of fire apparatus in case of fire.

5-4 Vehicular routes, traffic rules, and parking areas shall be established, identified, and used. Private vehicle parking in marine terminals shall be allowed only in designated areas.

5-5 Fire Lanes.

5-5.1 Access for fire fighting operations shall be provided by means of fire lanes spaced at such intervals that no portion of any storage or parking area will be over 50 ft (15.25 m) from the fire lane.

Exception: Block stowage of empty containers, provided containers with combustible exteriors are interspersed to reduce fire spread.

5-5.2 Fire lanes that are U-shaped, do not exceed 300 ft (91.5 m) in length, and are adjacent to cargo piled less than 16 ft (4.9 m) high shall be a minimum of 12 ft (3.7 m) wide. All other fire lanes shall be a minimum of 20 ft (6.1 m) wide. Fire lanes shall not dead-end unless designed with a turnaround at the end. Such turnarounds shall have an inside radius of not less than 25 ft (7.6 m) and an outside radius of not less than 50 ft (15.25 m).

Exception: Where there are practical difficulties in meeting the requirements of Section 5-5, the authority having jurisdiction may approve alternative fire lane arrangements, provided the intent of reasonable emergency access is achieved.

Chapter 6 Water Supply for Fire Protection

6-1 Hydrants and Hose Connections. There shall be provided on, or immediately adjacent to, every pier, wharf, or marine terminal property a sufficient number of accessible hydrants or 2½-in. (63.5-mm) hose outlets for use by public or private fire departments for extinguishing large structure and contents fires and for use in providing exposure protection. 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 300 ft (91.5 m) nor more than 150 ft (45.8 m) from a dead-end area.

6-2 Water Supply. The water supply requirement for hydrants shall be in addition to that required for automatic sprinklers. 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. Fire flow shall be designed for not less than 4 hr duration. Piping, pumps, and other facilities shall be designed and installed in accordance with the requirements of NFPA 20, *Standard for the Installation of Centrifugal Fire Pumps*; 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*. When water is supplied through connections to public water systems, the installation of additional water supplies, such as private pumping systems, dry hydrants as described in Appendix B of

NFPA 1231, *Standard on Water Supplies for Suburban and Rural Fire Fighting*, 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 7 Hazardous Materials Storage

7-1 Hazardous Materials. Includes any substance or material that has been determined by the secretary of transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce and which has been so designated.

7-2 Hazardous materials shall not be processed for further shipment at marine terminals unless packed, labeled, and placarded in accordance with applicable regulations of the U.S. Department of Transportation.

7-3* Hazardous materials at terminals shall be handled, stored, loaded, and unloaded in accordance with applicable federal regulations as well as the authority having jurisdiction.

7-4* 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.

7-5 A written plan shall be developed and implemented for the handling and temporary storage of hazardous materials at all general cargo terminals, except those terminals where operations are limited to specific types of commodities only and no hazardous materials are being received or delivered. 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 Appendix D example.

7-6 The plan of Section 7-5 shall require establishment and use of designated areas for temporary storage of hazardous materials except that containerized cargo operations may intersperse individual containers containing hazardous materials with containers containing general cargo, provided storage conforms to the requirements of Section 7-7.

Exception: Hazardous materials specified in 7-8.1.

7-7 The procedure to be followed when containers with hazardous materials are interspersed with general cargo containers shall be detailed in the written plan of Section 7-5 and shall be based upon the following general guidelines:

(a) To minimize concentration and exposure problems, the interspersal 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.

(b) Sufficient access space shall be provided for effective use of hose streams and for movement of exposed containers under emergency conditions. Containers of hazardous materials shall remain parked or stored on chassis where operations permit.

7-8 Designated Hazardous Materials Storage Areas.

7-8.1* Containers with the following types of hazardous materials shall not be interspersed with general cargo containers. Storage shall be confined to designated hazardous materials storage areas.

(1) Explosive materials as defined in NFPA 495, *Explosive Materials Code*. (*Also see Sections 7-15 and 7-16.*)

(2) Organic peroxides.

(3) Liquid oxygen.

(4) Strong oxidizing materials.

(5) Class "A" poisons.

(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 may be designated by the authority having jurisdiction.

Exception: Alternative storage location and handling procedures may be authorized by the authority having jurisdiction where in his/her judgment equivalent safety can be provided by such alternatives.

7-8.2 Outside hazardous materials storage areas designated under the provisions of Sections 7-5 and 7-6 shall be located on land, not less than 50 ft (15.3 m) from buildings and other cargo storage areas, 20 ft (6.1 m) from property lines, and 100 ft (30.5 m) from other designated hazardous materials storage areas. Separation distances to buildings and property lines shall be maintained as open space, kept clear of storage of any kind at all times.

7-8.3 Access to designated outside hazardous materials storage areas shall be by means of fire lanes. Such fire lanes shall be not less than 20 ft (6.1 m) wide, and located in such a manner that no part of the storage area is over 50 ft (15.3 m) from a fire lane. Such fire lanes shall not dead-end.

7-8.4 Designated hazardous materials storage areas shall not be located within the following distances of electrical installations, unless such installations comply with the requirements for Class I Division 2 of Articles 500-501 of NFPA 70, *National Electrical Code®*: horizontal separation distances shall not be less than 20 ft (6.1 m); and vertical separation distance shall not be less than 20 ft (6.1 m), or 10 ft (3.05 m) above the highest point of storage, whichever is greater.

Exception: Areas where the materials stored or handled are limited to a type or class of cargo not requiring the foregoing electrical installation classification as determined by the authority having jurisdiction. See Articles 500-1, 2 and 3 of NFPA 70, National Electrical Code.

7-8.5 Designated outside hazardous materials storage areas shall be constructed and situated to prevent runoff or drainage toward building, storage, and storage areas.

7-8.6 Designated outside hazardous materials storage areas shall be enclosed with a 6-ft (1.8-m) high wire or chain link fence, unless the entire terminal is surrounded by such a fence and the fence is in sound condition.

7-8.7 Designated hazardous materials storage areas shall be posted with signs. Such signs shall be easily visible, not obstructed by cargo storage, and contain the words HAZARDOUS MATERIALS — NO SMOKING in capital letters not less than 6 in. (152.4 mm) in height.

7-9 Areas used to store hazardous materials in a liquid state shall have materials available for blocking drains. Hazardous materials shall not be permitted to enter waterways.

7-10 Areas used to store hazardous materials shall be free of grass, weeds, debris, and other combustible waste matter.

7-11 Containers loaded with hazardous materials shall not be stacked except as permitted by the authority having jurisdiction.

7-12 Placards shall be removed from containers that no longer contain hazardous materials.

7-13 Terminals handling hazardous materials shall prepare a "Hazardous Materials Emergency Operations Plan." 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. This plan shall be prepared in cooperation with the authority having jurisdiction.

7-14 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 readily available for reference by responding emergency personnel. This information shall be kept at the main gate security office or other location approved by the authority having jurisdiction.

7-15 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 Explosives Motor Vehicle Terminals*, and NFPA 495, *Explosive Materials Code*.

7-16 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 Explosives Motor Vehicle Terminals*, and the authority having jurisdiction.

Chapter 8 General Terminal Operations

8-1 General. A certain period of time is necessary during which cargo is temporarily stored upon the pier or wharf in a transit shed, transfer building, or the terminal yard. This period of time shall be kept as short as possible, and particular attention directed to the safe storage and handling of highly combustible or hazardous materials.

8-2 The Terminal Operator.

8-2.1 The terminal operator shall establish and enforce fire prevention regulations and be responsible for the provision and maintenance of fire protection equipment. This responsibility requires an understanding of all applicable laws, ordinances, and regulations.

8-2.2 The terminal operator shall be responsible for the training of employees in fire prevention and the proper emergency action in the event of fire or other emergency, and for providing the necessary equipment to control the spread of fire and to handle any necessary movement or evacuation of vessels. The terminal operator shall 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.

8-3 Fire Organization.

8-3.1 Firesafety Plan.

8-3.1.1* The terminal operator shall designate a competent and reliable employee or employees who shall be responsible to assure that all standpipe, fire hose, sprinkler equipment, portable fire extinguishers, and other fire protection devices and equipment are properly maintained. This employee or employees shall be familiar with proper maintenance procedures and standards. Such devices shall be maintained in accordance with applicable NFPA standards.

8-3.1.2 The designated employee or employees shall be familiar with the location of all telephones, valves, alarm boxes, fire hose stations, portable fire extinguishers, and other fire fighting equipment.

8-3.1.3 The designated employee or employees shall have ready access to information concerning the fire hazard characteristics of the cargoes in the terminal and the location of all cargo that is exceptionally hazardous.

8-3.1.4 The designated employee or employees shall enforce all firesafety regulations and instruct employees in the proper use of fire alarm boxes.

8-4 Vessels.

8-4.1 Maneuverability. All vessels shall be moored in an orderly manner. When mooring the vessel due regard shall be given to rapid removal in the event of a fire originating on either the pier or the vessel.

8-4.2 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 shall rig fire warps. Fire warps shall consist of hawsers of sufficient size to take the vessel under tow in the

event of an emergency. Fire warps shall be secured to the deck of the vessel and shall hang over the outboard side to within 6 ft (1.8 m) of the surface of the water. An eye shall be spliced into the outboard end of the warp of sufficient size to permit the rapid attachment of a towing shackle.

8-4.3 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.

8-4.4 Cutting, Welding, or Other Hot Work.

8-4.4.1 Repairs involving cutting, welding, or other hot work shall be limited as far as practical while the vessel is at a marine terminal. Such hot work is prohibited while the vessel is fueling, loading, or unloading hazardous materials, or when Class "A" or "B" explosives are on board or within 100 ft (30.5 m). (*See 9-9.3.1 for terminal hot work requirements.*)

Exception: When approved by the authority having jurisdiction.

8-4.4.2 When such hot work is performed, it shall be conducted in accordance with the regulations of the U.S. Department of Transportation, U.S. Department of Labor, U.S. Coast Guard, and the authority having jurisdiction.

8-4.5 Bunkering (Refueling). Bunkering of vessels at a marine terminal shall be done in accordance with regulations of the U.S. Coast Guard, the authority having jurisdiction, or both.

8-4.6 Shipboard Cargo Handling.

8-4.6.1 Smoking shall be prohibited except in designated areas.

8-4.6.2 Cargo handling equipment (lifts, carriers, conveyors, etc.) used aboard ship and their refueling shall conform to regulations of the U.S. Department of Labor and U.S. Coast Guard as prescribed for the type of cargo handled and the requirements of the authority having jurisdiction.

8-5 Terminal Cargo Handling and Storage.

8-5.1 All placement of cargo shall be in accordance with the regulations of the U.S. Coast Guard, the authority having jurisdiction, and terminal operating orders.

8-5.2 Container handling and storage areas shall be suitably identified, including marking of travel lanes, to indicate direction of travel. All necessary traffic control measures shall be taken.

8-5.3 Transload Facilities. At least one main aisle shall extend the length of the pier or transit shed except where cargo is transferred directly to or from railroad cars or vehicles and it is unnecessary to use trucks within the structure. As a minimum, the aisle shall be of sufficient width to allow trucks to maneuver and pass one another.

8-5.4 Aisle spaces shall be established between cargo piles extending from the main aisle to the sides of the transit shed or transload facility. Aisles shall be so arranged that, in addition to separating the cargo piles, they will give ready access to sprinkler control valves, fire hose stations, portable fire extinguishers, and the deck openings for fire fighting purposes. Cargo shall not interfere with ready access to such equipment.

8-5.5 Aisle or access space of at least 2 ft (.61 m) shall be maintained between cargo piles and the side walls, fire walls, or fire-stops in transit sheds, container freight stations, or similar transload structures.

8-5.6 Clearance between cargo piles and sprinkler deflectors, roof supports, and other building structural members and ignition sources, such as lighting equipment, heating devices, ductwork, etc., shall be maintained in conformity with the requirements of NFPA 231, *Standard for General Storage.*

8-5.7 Care shall be exercised to assure that fire protection facilities such as automatic sprinklers will not be overtaxed in the event of fire due to the concentration and high-piling and palletizing of combustible cargoes. The adequacy of the sprinkler system shall be reevaluated when the fire hazard of the commodity in storage or the method of storage changes. If found deficient, such system shall be brought into compliance as determined by the authority having jurisdiction.

8-5.8* Fibers. Sisal or other combustible fibers shall be handled in the open or in buildings protected by automatic sprinklers.

8-5.8.1 Fibers shall be piled with at least a 2-ft (.61-m) clear space to side walls and 1-ft (.305-m) space at supporting columns for material expansion. Proper aisle space for fire department access and fire control by sprinklers and hose stream water penetration shall be maintained. Block piling shall not exceed 40 × 50 ft (12.2 × 15.25 m) with stacks no higher than 12 ft (3.7 m), and palletized storage shall be limited to three pallets high unless the sprinkler system is designed to protect other configurations.

8-5.8.2 Access to the fiber and to the aisles between the fiber stacks shall be restricted to the personnel handling the fiber and other authorized personnel.

8-6 Time Limitation of Storage. A pier or wharf shall not be used as a warehouse unless the structure was specifically designed for that purpose.

8-7 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.

8-8 International Shore Connection. International shore connection as required by the International Safety of Life at Sea Convention shall be available at the marine terminal to enable local fire fighting equipment to be connected to a vessel's fire main system. The threads on the shore-side connection shall conform to NFPA 1963, *Standard for Screw Threads and Gaskets for Fire Hose Connections.*

8-9 Guard Service. Security personnel shall be provided by the terminal for the protection of the terminal in such numbers and of such qualifications as to assure adequate surveillance, prevent unauthorized entrance and detect fire hazards. (*See NFPA 601, Standard for Guard Service in Fire Loss Prevention, and NFPA 602, Standard for Guard Operations in Fire Loss Prevention.*)

8-10 Notification. The terminal shall have a means to rapidly notify the fire department in the event of an emergency. If a telephone is used for this purpose, such phone shall not require the use of a coin.

Chapter 9 Miscellaneous Installations and Operations

9-1 Tractors, Lift Trucks, Dock Cranes, and Other Material-Handling Equipment.

9-1.1 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.

9-1.2 Unless fire extinguishers are readily accessible, each vehicle shall be provided with an extinguisher approved for Class B and Class C fires.

9-1.3 All fueling and repairs shall be conducted at designated and properly protected locations. All fueling shall be from approved dispensing devices. Emergency refueling shall not be performed on a combustible pier or wharf nor inside buildings where combustible cargo is stored or handled. (*See NFPA 505, Fire Safety Standard for Powered Industrial Trucks; NFPA 30, Flammable and Combustible Liquids Code; and NFPA 58, Standard for the Storage and Handling of Liquefied Petroleum Gases.*)

9-1.4 Electrically operated equipment may be stored on the pier or wharf in a segregated area. Battery charging equipment shall be installed in accordance with NFPA 70, *National Electrical Code.*

9-1.5 Material-handling equipment operated aboard ships or in areas where hazardous materials are being stored or handled shall be suitable for such use, as required by the regulations of the U.S. Department of Transportation, the U.S. Coast Guard, the U.S. Department of Labor, and the authority having jurisdiction.

9-2 Automotive and Railroad Equipment.

9-2.1 Trucks and Automobiles. Transient trucks and automobiles shall be allowed to remain on piers and wharves only long enough to load and unload cargo. The number of vehicles permitted upon the pier or wharf at any one time shall be limited to a number that permits free traffic flow. Such vehicles shall not be permitted to interfere with the access of emergency response equipment. They shall be parked in such a way that they can be promptly driven off the pier in the event of emergency. Fueling and repair operations shall conform to 9-1.3.

9-2.2 RO/RO operations involving self-propelled motor vehicle cargo shall conform to requirements of the U.S. Coast Guard and the authority having jurisdiction.

9-2.3 Locomotives operated within the area of a marine terminal where combustible fibers or lumber are stored shall be fitted with approved and properly maintained spark arresters.

9-2.4 Diesel locomotives shall not be fueled within a marine terminal except at a properly located and designed fueling station.

9-2.5 Rail cars or trucks containing hazardous materials not permitted for shipment over the pier or wharf of a marine terminal shall not be permitted within the marine terminal.

9-2.6 Fueling and service of vehicles and equipment shall conform to the applicable requirements of NFPA 513, *Standard for Motor Freight Terminals.*

9-3 Electrical Installations.

9-3.1 Electrical installations shall be in accordance with NFPA 70, *National Electrical Code.*

9-3.2 Temporary lighting, when required, shall be obtained from battery-powered hand lamps or floodlights powered by portable generators. Generators shall be operated outside the building, warehouse, pier, or transit shed, and temporary heavy-duty wiring shall be run into the area served. The temporary wiring shall be adequately supported and properly fused.

9-4 Heating.

9-4.1 Gas-burning equipment shall be installed in accordance with NFPA 54, *National Fuel Gas Code.*

9-4.2 Electric heaters shall be of approved design and installed in accordance with NFPA 70, *National Electrical Code.*

9-4.3 Oil burning heaters shall be installed in accordance with NFPA 31, *Standard for the Installation of Oil Burning Equipment.*

9-4.4 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.*

9-4.5 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-hr fire resistance rating. Floors or decks immediately beneath and extending for a distance of 3 ft (.915 m) from boilers, furnaces, and other heat-producing appliances shall be entirely noncombustible, and no combustible material shall be permitted in contact with the top or bottom surfaces of such portion of a floor or deck.

Exception: 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.

9-4.6 Portable heaters shall be used only when the device is approved for the specified use by the authority having jurisdiction. Portable heaters shall not be used in cargo handling or storage areas except for emergencies.

9-5 Processes.

9-5.1 Processes involving the use of flammable liquids shall be prohibited except as permitted by the authority having jurisdiction.

9-5.2 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.

9-5.3 Warm rooms or areas temporarily heated to protect cargo from freezing shall be arranged with heating facilities as described in Section 9-4. Where a temporary form of closure is used, the enclosing material shall have a flamespread rating not exceeding 50 when tested in accordance with NFPA 255, *Standard Method of Test of Surface Burning Characteristics of Building Materials*. Heating equipment for the temporary area shall be electric, gas, or fuel oil fired, with proper clearance to combustible materials. The heaters shall be approved for space or construction heating. Fuel-fired heaters shall have a listed flame failure shutoff device and temperature controls. Heaters shall not be refueled while operating and shall be fueled from approved fuel handling devices only.

9-5.4 Fumigation.

9-5.4.1* Fumigation shall, where practical, be conducted in buildings designed and constructed for that purpose. When 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 hr. Fumigating gases or chemicals shall be stored outside in a properly marked noncombustible building, secured from fire exposure or accidental release.

9-5.4.2 The authorities having jurisdiction shall be notified in advance of any fumigation operation.

9-6 Pallets and Dunnage.

9-6.1 Pallets and dunnage shall, where practical, be stored outdoors, arranged to minimize the exposure hazard to other property, and be readily accessible for fire fighting. Such storage shall conform to the requirements of NFPA 231, *Standard for General Storage*.

9-6.2 Where pallets and dunnage must be stored indoors that storage shall be in accordance with NFPA 231, *Standard for General Storage*.

9-7 Packaging and Recoopering. All packaging shall be done in a segregated area. Incidental recoopering and repackaging shall be conducted at a safe distance from other cargo working areas. Refuse materials resulting from recoopering shall be promptly removed.

9-8 Incinerators. Incinerators shall be constructed as required in NFPA 82, *Standard on Incinerators, Waste, and Linen Handling Systems and Equipment*.

9-9 Maintenance, Repairs, and Housekeeping.

9-9.1 Special periodic inspections shall be made beneath the pier deck to determine conditions relating to fire prevention and protection in the substructure. Heavy incrustation of oil shall be removed from all combustible members. Floating combustible debris shall be removed. Fire protective devices such as automatic sprinklers, nonautomatic sprinklers, piping, fire-stops, etc. shall be carefully examined and promptly repaired, if repairs are necessary. Covers for nozzle openings in the pier deck for 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.

9-9.2 All buildings and yard areas shall be kept free of debris and waste materials. Such materials shall be kept in metal containers and removed or emptied at sufficiently frequent intervals to prevent dangerous accumulations. Yard areas shall be kept free of grass and weeds.

9-9.3 Cutting, Welding, or Other Hot Work.

9-9.3.1 Repairs involving cutting, welding, or other hot work shall be limited as far as practical at a marine terminal. Such hot work is prohibited:

(a) During gas freeing operations;

(b) Within 100 ft (30.5 m) of bulk cargo operations involving the loading or unloading of flammable or combustible materials;

(c) Within 100 ft (30.5 m) of fueling (bunkering) operations; or

(d) Within 100 ft (30.5 m) of explosives or 50 ft (15.3 m) of other hazardous materials.

9-9.3.2 When such hot work is performed, it shall be conducted in accordance with NFPA 51B, *Standard for Fire Prevention in Use of Cutting and Welding Processes*, and with the regulations of the U.S. Department of Transportation, U.S. Department of Labor, U.S. Coast Guard, and the authority having jurisdiction.

9-9.4 Open flame lights or lanterns using kerosene, gasoline, LPG, or calcium carbide fuel shall not be used.

9-9.5 Smoking shall be allowed only in posted designated areas as approved by the authority having jurisdiction. Smoking and open flames shall not be permitted within 50 ft (15.3 m) of hazardous materials storage.

Chapter 10 Referenced Publications

10-1 The following documents or portions thereof are referenced within this standard and shall be considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

10-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10-1990, *Standard for Portable Fire Extinguishers*

NFPA 13-1989, *Standard for the Installation of Sprinkler Systems*

NFPA 14-1990, *Standard for the Installation of Standpipe and Hose Systems*

NFPA 20-1990, *Standard for the Installation of Centrifugal Fire Pumps*

NFPA 22-1987, *Standard for Water Tanks for Private Fire Protection*

NFPA 24-1987, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*

NFPA 30-1990, *Flammable and Combustible Liquids Code*

NFPA 31-1987, *Standard for the Installation of Oil Burning Equipment*

NFPA 51B-1989, *Standard for Fire Prevention in Use of Cutting and Welding Processes*

NFPA 54-1988, *National Fuel Gas Code*

NFPA 58-1989, *Standard for the Storage and Handling of Liquefied Petroleum Gases*

NFPA 59A-1990, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)*

NFPA 70-1990, *National Electrical Code*

NFPA 80-1990, *Standard for Fire Doors and Windows*

NFPA 82-1990, *Standard on Incinerators, Waste, and Linen Handling Systems and Equipment*

NFPA 211-1988, *Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances*

NFPA 220-1985, *Standard on Types of Building Construction*

NFPA 231-1990, *Standard for General Storage*

NFPA 231C-1986, *Standard for Rack Storage of Materials*

NFPA 251-1990, *Standard Methods of Fire Tests of Building Construction and Materials*

NFPA 255-1990, *Standard Method of Test of Surface Burning Characteristics of Building Materials*

NFPA 495-1990, *Explosive Materials Code*

NFPA 498-1990, *Standard for Explosives Motor Vehicle Terminals*

NFPA 505-1987, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Maintenance and Operation*

NFPA 513-1990, *Standard for Motor Freight Terminals*

NFPA 601-1986, *Standard for Guard Service in Fire Loss Prevention*

NFPA 602-1986, *Standard for Guard Operations in Fire Loss Prevention*

NFPA 1124-1988, *Code for the Manufacture, Transportation, and Storage of Fireworks*

NFPA 1231-1989, *Standard on Water Supplies for Suburban and Rural Fire Fighting*

NFPA 1963-1985, *Standard for Screw Threads and Gaskets for Fire Hose Connections*

Appendix A

This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only.

A-3-2.1 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 may exist with composite construction. Special provisions have accordingly been provided in 3-3.2 for such construction.

A-3-2.6.1 Deep narrow spaces between timbers present ideal conditions for the accumulation of extraneous material and are also natural channels for the rapid spread of fire.

A-3-3.2 Protection and Subdivision of Composite Substructures. The provisions of 3-3.2 are based upon 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, then 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 inter-bent 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, etc.) are present, or unusual conditions or hazards (e.g., concentrations of combustible structural supports, flammable liquid hazards, etc.) exist, then 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-3-3.3.3(a)(5) The use of fire-stops for draft control 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 fire-stops of 3-3.3.6 should be incorporated into the sprinkler system design for this purpose to the maximum extent practical; however, due to limitations in the size of the design area for the sprinkler system,

additional fire-stops will normally be needed. These additional or supplemental fire-stops need only have limited fire resistance but should be as deep as possible and be of substantial construction, such as double 3-in. (76.2-mm) planking where exposed to the elements. Where not exposed to physical damage, 3/4-in. (19.05-mm) treated plywood extending 48 in. (1219.2 mm) below stringers with solid blocking between stringers should provide adequate durability and reasonable effectiveness.

A-3-3.3.5 It should be recognized, however, that this alternate protection contemplates manual fire fighting operations that will be effective only under the most favorable of physical arrangements and conditions at the time of the fire.

A-3-3.3.8 Fire-stops may be of wood planking built up to a thickness of 6 in. (152.4 mm), or of wrought iron plate 1/2 in. (12.7 mm) thick, or other equivalent construction, provided that each side of wood or exposed metal fire-stops are protected by automatic sprinklers and by deck openings for the use of revolving nozzles.

A-3-4.1 Subdivision of Pier Superstructures. It is recommended that fire walls be installed for the subdivision of superstructures and that the area between fire walls not exceed 50,000 sq ft (4650 m^2). These walls should be continuous with the substructure fire walls required in 3-3.3.6. In addition, it is recommended that, in open area superstructures, curtain boards or draft stops of noncombustible construction be installed between the fire walls at intervals not exceeding 100 ft (30.5 m). When construction permits, these curtain boards should be carried down to the lower chord of the roof trusses.

A-3-5.2 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 2 1/2-in. (63.5-mm) outlets for fire department use should be extended onto the pier. In such cases, the 1 1/2-in. (38.1-mm) 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-4-3 For guidance on construction, protection, and separation distances refer to NFPA 80A, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures.*

A-5-1 Yard storage of logs, lumber, and other forest products should be in accordance with NFPA 46, *Recommended Safe Practice for Storage of Forest Products.*

A-7-3 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 will minimize dangerous concentrations, avoid the mixing of incompatible materials, assure 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. A summary of 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 Treasury, along with recommended good practice in administration of local regulations, will be found in Appendix D.

A-7-4 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 subject to explosive decomposition. The handling of bulk "cargo of particular hazard" as defined in U.S. Coast Guard Regulations Title 33 Part 126.10(d), tanker moorage, pipeline transfer and storage of flammable liquids, liquefied natural gas and similar products is incompatible with general cargo marine terminal operations. Separate terminal facilities are needed that are designed, constructed, operated, and protected as required for the particular bulk cargo.

U.S. Coast Guard regulations define "cargo of particular hazard" as follows:

§ 126.10 Cargo of Particular Hazard. "Cargo of particular hazard" means any of the following:

(a) Class A explosive as defined in 46 CFR 146.20-7 and 49 CFR 173.53.

(b) Oxidizing material or blasting agent for which a permit is required under 49 CFR 176.415.

(c) Large quantity radioactive material, as defined in 49 CFR 173.389(b) or Fissile Class III shipments of fissile radioactive material, as defined in 49 CFR 173.389(a)(3).

(d) The following cargoes when carried in bulk:

Acetaldehyde
Acetone cyanohydrin
Acrylonitrile
Allyl chloride
Ammonia, anhydrous
Butadiene
Butane
Butene
Butylene oxide
Carbon disulfide
Chlorine
Chlorosulfonic acid
Dimethylamine
Epichlorohydrin
Ethane
Ethylene
Ethylene oxide
Ethyl ether
Methane
Methyl acetylene, propadiene mixture, stabilized
Methyl bromide

Methyl chloride
Motor fuel antiknock compounds containing lead alkyls
Oleum
Phosphorus, elemental
Propane
Propylene
Propylene oxide
Sulfur dioxide
Toluene diisocyanate
Vinyl chloride
Vinyl ethyl ether

A-7-8.1 The hazardous materials listed in 7-8.1 include generic names that embrace a range of hazard. Individual container shipments of such materials will involve various quantities and will be 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 7 and the procedures outlined in Appendix D.

A-8-3.1.1 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 that there be a special detail assigned to close all fire doors at times of fires and drills. (*See NFPA 600, Recommendations for Organization, Training and Equipment of Private Fire Brigades.*)

A-8-5.8 The storage of cotton should comply with NFPA 231E, *Recommended Practice for the Storage of Baled Cotton.*

A-9-5.4.1 Fumigation.

1. It is recommended that wherever possible nonflammable fumigants be used.

2. Fumigation of imported cargo should preferably be conducted in detached buildings under competent supervision.

3. No fumigant should be used that has a flammability rating greater than 2 or a reactivity rating greater than 1, as outlined in NFPA 704, *Standard System for the Identification of the Fire Hazards of Materials*, or a flashpoint less than 140°F (60°C).

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 Chapter 5 of NFPA 70, *National Electrical Code.*

6. Adequate ventilation facilities should be provided to remove the fumigant from the chamber or enclosure and 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 Chapter 3 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 43D, *Code for Storage of Pesticides in Portable Containers.*

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. 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, may 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.

Appendix B Substructure Nomenclature

This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only.

Substructures vary widely by type and combination of materials used and arrangement of structural members, there being no so-called typical construction. The following illustrations are provided to clarify terminology used:

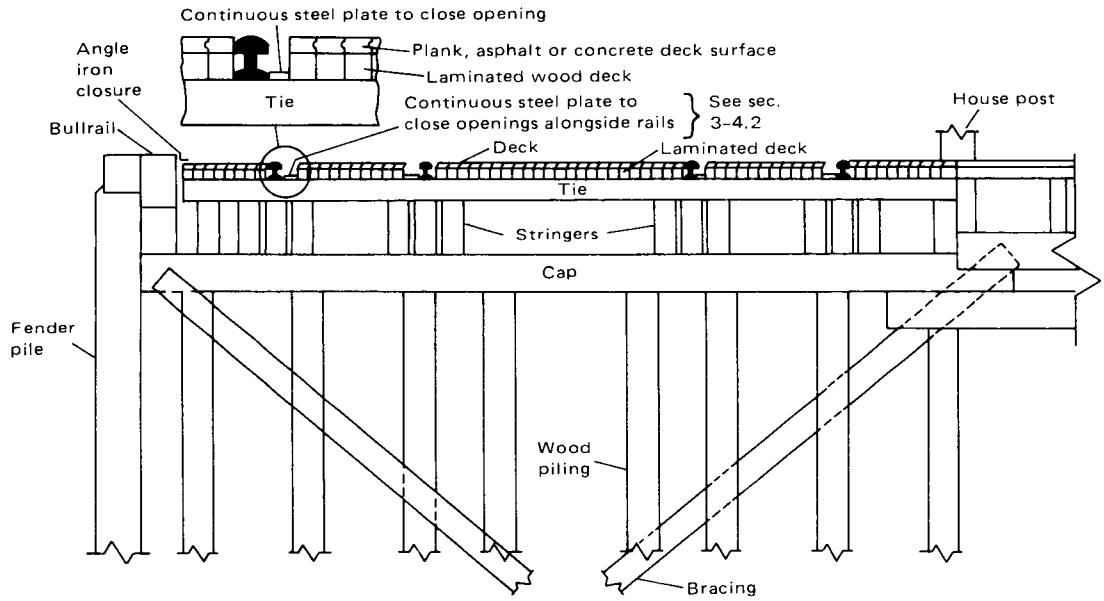

Figure B-1 Illustration of a Combustible Substructure with Railroad Tracks.

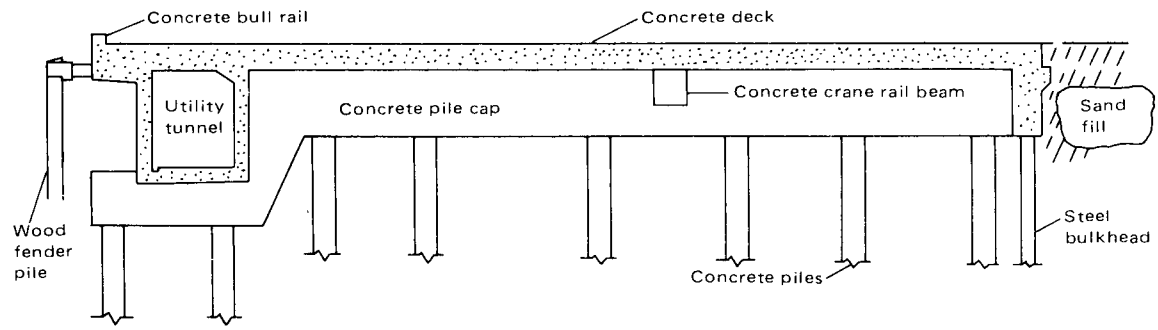

Figure B-2 Fire-resistive Concrete Wharf Substructure.

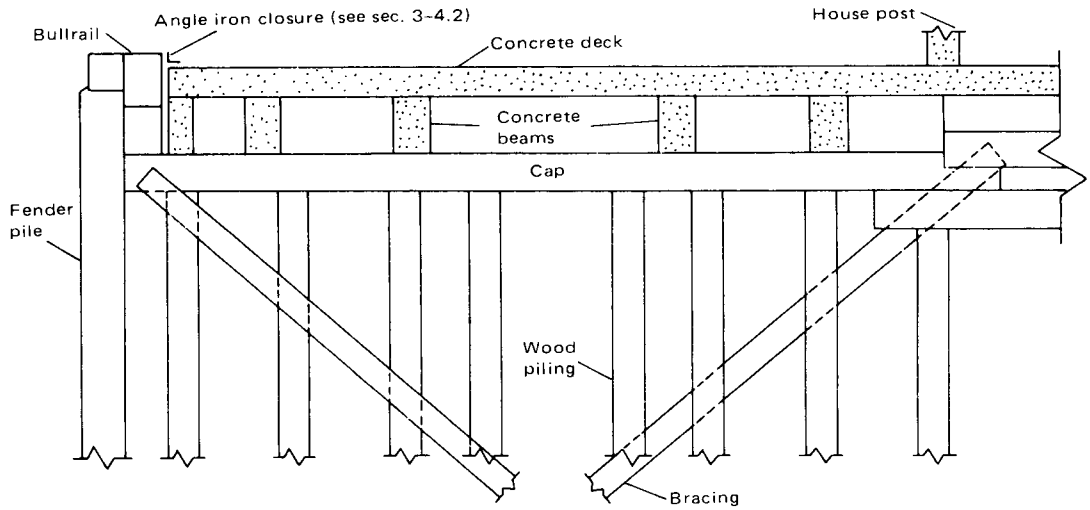

Figure B-3 Wharf Substructure with Fire-resistive, Reinforced Concrete Deck and Beams over Combustible Piles and Pile Caps.

Appendix C Additional Fire Protection Facilities

This Appendix is not a part of the requirements of this NFPA document, but is included for information 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, otherwise as remote station, auxiliary, or proprietary systems. (*See NFPA 71, Standard for Signaling Systems for Central Station Service and NFPA 72, Standard for Protective Signaling Systems.*)

C-2 Fire Alarm. It is recommended that an approved system of manual fire alarms be installed at marine terminals arranged to sound local alarm and summon the private brigade and public fire department. (*See NFPA 71, Standard for Signaling Systems for Central Station Service; NFPA 72, Standard for Protective Signaling Systems; NFPA 72E, Automatic Fire Detectors; and NFPA 1221, Public Fire Service Communication Systems.*)

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

U.S. Coast Guard Regulations Title 33, Part 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.

Appendix D Regulations — References

This Appendix is not a part of the requirements of this NFPA document, but is included for information purposes only.

D-1 Federal Regulations.

D-1.1 Code of Federal Regulations: Title 33, Part 126 issued by the U.S. Coast Guard contains regulations covering the handling of explosives or other dangerous cargoes within or contiguous to waterfront facilities.

D-1.2 Code of Federal Regulations: Title 49, Chapter I, Parts 170-179 issued by the U.S. Department of Transportation 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; and shippers' certificate of compliance with these regulations; also covers cars, loading, storage, billing, placarding, and movement thereof by carriers by rail.

D-1.3 Code of Federal Regulations: Title 49, Chapter III, Parts 390-397 administered by Federal Highway Administration, U.S. Department of Transportation, 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, inspection and maintenance of motor vehicles.

D-1.4 Occupational Safety and Health Standards of the U.S. Department of Labor. Code of Federal Regulations: Title 29, (Labor), Chapter XVII, Parts 1910, 1917 and 1918. The Occupational Safety and Health Act of 1970 (Public Law 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 federal or national consensus rules, adopted under Section 6(a) of the Act and standards of specific design, adopted under Section 6(b) of the Act.

D-1.5 Commerce in Explosives Regulations of the U.S. Department of the Treasury. Code of Federal Regulations: Title 26, Part 181. This part 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-2 Local Regulations.

D-2.1 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-2.2 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 may 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. Since 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-2.3 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:

(a) 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.

(b) The speed and direction of prevailing winds.

(c) The type of construction of the terminal and its condition and maintenance. This factor should consider such items as the condition of the superstructure and substructure, the condition of electrical services, water and fuel lines, and the level of difficulty in gaining access to the structure for purposes of fire fighting.

(d) Emergency access to the terminal and the hazardous materials storage area.

(e) The physical size of the marine terminal and whether or not there is sufficient room for proper segregation of incompatible materials.

(f) The provisions that have been made for the fire protection of the terminal. These would include whether or not the terminal is sprinklered, fire fighting access, and water supplies.

(g) The capability of the local emergency services agencies, including available equipment, manpower, and training.

D-2.4 It would be appropriate to make the storage plan of section 7-5 a part of the master permit details either by reference or otherwise. These details of storage, handling, quantities, and types of hazardous materials will vary by terminal, by locality, and by systems or procedures adopted pursuant to the general considerations listed above. All such plan and permit details should be based upon 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-2.5 The following examples of plan and master permit details being used at certain terminals illustrate methods that may be of assistance to those responsible for developing such plans. Illustrations cover both container yard and break-bulk operations. Quantities specified in these examples reflect availability of strong public and private fire control facilities.

Container Yard Operations

The terminal should designate three hazardous materials storage areas known as Areas A, B, and C. Each area should be located:

(a) 50 ft (15.3 m) from buildings and other general cargo storage areas.

(b) 20 ft (6.1 m) from property lines.

(c) 100 ft (30.5 m) from other hazardous materials temporary storage area.

The maximum dimensions for these areas should be:

(a) Area A: 40 ft × 125 ft (12.2 × 38.1 m) with access for fire department vehicles.

(b) Area B: 40 ft × 144 ft (12.2 × 43.9 m) with access for fire department vehicles.

(c) Area C: 40 ft × 34 ft (12.2 × 10.4 m) with access for fire department vehicles.

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

Storage areas should be surrounded by a 3-in. (76.2-mm) wide painted line 20 ft (6.1 m) 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 letters not less than 6 in. (152.4 mm) high every 30 ft (9.15 m) 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.

The chart on page 23 is 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" in the chart. Nor should the terminal accept hazardous materials labeled as "Call for Permit" in the same column of the chart, 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 will be reviewed annually for possible inclusion into the exempted commodity category.

HAZARDOUS MATERIALS
CONTAINER YARDS

Temporary Storage Conditions and Limitations

HAZARDOUS MATERIAL D.O.T. CLASS	MAXIMUM QUANTITIES	STORAGE AREA	ADDITIONAL CONDITIONS
Flammable liquids	Not to exceed 100,000 lb (45360 kg)	A	May stack containers 2 high. No other commodity may be stored in Area "A"
Flammable compressed gas	20 containers	B	No other hazardous material may be stored within 50 ft (15.3 m)
Combustible liquids	Unlimited	*	*May be stored with general cargo. See Note 2
Flammable solids	3 containers not to exceed 45,000 lb (20412 kg)	B and/or C	No other hazardous material may be stored within 100 ft (30.5 m). May stack 2 high
Flammable solids — dangerous when wet	Call for a permit		
Oxidizing material	10 containers	B and/or C	No other hazardous material may be stored within 50 ft (15.3 m). May stack containers 2 high
Corrosive material	10 containers	B and/or C	No other hazardous material may be stored within 50 ft (15.3 m). May stack containers 2 high
Nonflammable compressed gas	10 containers	B and/or C	No other hazardous material may be stored within 50 ft (15.3 m). May stack containers 2 high EXCEPT: nitrogen, argon, and carbon dioxide. Helium may be stored with general cargo. See Note 2
Chlorine, fluorine, sulfur dioxide or ammonia (may be one type or any combination of)	3 containers	B and/or C	Maximum container size for chlorine is 1 ton (907 kg). No other hazardous material may be stored within 100 ft (30.5 m)
Poisons — Class A	Call for a permit		
Poisons — Class B	2 containers not to exceed 40,000 lb (18140 kg)	B and/or C	No other hazardous material may be stored within 50 ft (15.3 m). May stack containers 2 high
Irritating material	2 containers not to exceed 10,000 lb (4536 kg)	B and/or C	No other hazardous material may be stored within 50 ft (15.3 m). May stack containers 2 high
Radioactive material	Call for a permit		
Explosives: Class A	1 container not to exceed 200 lb (90.8 kg)	C	
Class B	1 container not to exceed 2,000 lb (907 kg)	C	No other commodity may be stored in this area at the same time
Class C	3 containers not to exceed 100,000 lb (45360 kg)	C	Remove from terminal within 48 hours
Blasting agent	3 containers not to exceed 100,000 lb (45360 kg)	C	
Oxygen, liquid	3 containers not to exceed 40,000 lb (18140 kg)	B and/or C	No other commodity may be stored in this area at the same time
Organic Peroxides	1 container not to exceed 100 lb (45.4 kg)	B and/or C	No other commodity may be stored in this area at the same time
ORM A ORM B ORM C ORM D	No restriction	*	*May be stored with general cargo. See Note 2
Other: Pyrophoric materials Etiologic agent Cryogenic material	Call for a permit		

Exception: Placarded containers containing less than 1,000 lb (453.6 kg) gross weight of a hazardous material listed in 49 CFR 172.504 Table #2 may be stored with the general cargo, provided the hazardous materials temporary storage areas are full.

Note 1: 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 pounds (kilograms) permitted in the area. The total gross weight figure is the sum of all containers in the area and must not be exceeded.

Note 2: Exempted commodities by proper shipping name may be stored with the general cargo. All other conditions of this permit and city, state, and federal law should be strictly adhered to.

Breakbulk Operations

The following is an example of storage requirements for the storage of hazardous materials in breakbulk form. See preceding example for storage or operating provisions that may also be appropriate.

Indoor storage and handling of hazardous materials should be confined to structures that are sprinklered as required in section 4-5. 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 will give an audible signal at a constantly attended location.

Overnight indoor storage of hazardous materials as indicated in the following table 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 6 or more in. (152.4 mm) in height.

Smoking within such buildings should be limited to predesignated locations. In no case should smoking or open flames be allowed within 50 ft (15.3 m) 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 8-9.*)

Storage (including general cargo) should be so placed as to provide at least one aisle 20 ft (6.1 m) wide running the length of the building, and cross aisles 5 ft (1.5 m) wide at least every 75 ft (22.9 m).

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

The chart on pages 24 and 25 is an example of master permit specification limitations for the storage of hazardous materials in breakbulk form.

BREAKBULK CARGO
TEMPORARY STORAGE CONDITIONS AND LIMITATIONS

HAZARDOUS MATERIAL D.O.T. CLASS	OUTDOOR MAXIMUM QUANTITIES	INDOOR MAXIMUM QUANTITIES	COMMENT	SEPARATIONS OUTSIDE	SEPARATIONS INSIDE
Flammable liquids	Not to exceed 50,000 lb	5,500 gal business hours, 180 gal non-business hours unless sprinkler system is supervised, then 2500 gal		50 ft from other hazardous storage, 25 from general cargo. Breakbulk configurations to comply with the following: *55 gal drums* — In piles, 2 high, 100 drums per pile, 60 ft from property lines and occupied buildings, 40 ft between piles. *5 gal pails* — In piles, 5 high, 500 pails per pile, same separation distance as required for 55 gal drum storage	General
Flammable compressed gas	2 groupings of 100 cylinders	20 cylinders		50 ft from other hazardous storage, 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: 20-ft aisles between groups 50 ft from property lines and occupied buildings	General
Combustible liquids	Not to exceed 100,000 lb	16,500 gal business hours, 500 gal non-business hours unless sprinkler system is supervised, then 8,000 gal		Breakbulk storage to comply with the following: *5 gal drums* — In piles, 3 high, maximum 300 drums per pile; 60 ft from property lines and occupied buildings, 40 ft between piles. *5 gal pails* — In piles, 5 high, no limit on pile size, same separation distance as required for 55 gal drum storage	General
Flammable solids	Not to exceed 15,000 lb	1,000 lb		General	General
Flammable solids—dangerous when wet	Call for a permit	Call for a permit			
Oxidizing material	Not to exceed 10,000 lb		2,000 lb	Breakbulk storage to be 50 ft from hazardous cargo, 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 (pallets, etc.). Dry material should be stored in a manner to prevent moisture contamination
Corrosive material	Not to exceed 3,000 gal	600 gal	General. Dry commodities-permitted unlimited amounts in storage	General. Dry commodities may be stored with general cargo, to be protected from moisture	General. Dry storage to be protected from moisture
Nonflammable compressed gas	5 groupings of 100 cylinders per grouping	100 cylinders		May be stored with general cargo except the following: oxygen (oxidizer), chlorine, fluorine, sulfur dioxide, ammonia	General

continued

HAZARDOUS MATERIAL D.O.T. CLASS	OUTDOOR MAXIMUM QUANTITIES	INDOOR MAXIMUM QUANTITIES	COMMENT	SEPARATIONS OUTSIDE	SEPARATIONS INSIDE
Chlorine, fluorine, sulfur dioxide, ammonia (may be one type or any combination of)	50 cylinders chlorine, max. cylinder size: 1 ton	10 cylinders aggregate, max. size: 300 lb		General. Storage may be placed with Poison B. Note: Chlorine cylinder maximum size is 1 ton	General. Cylinder maximum size: 300 lb
Poisons — Class A	Call for a permit	Call for a permit			
Poisons — Class B & irritants	Not to exceed 20,000 lb	2,000 lb		General	General
Radioactive material	Call for a permit	Call for a permit			
Explosives Class A	Not to exceed 200 lb	Storage limit to 2 hrs, 200 lb	Call for a permit	To be stored in an approved magazine or other location approved by the authority having jurisdiction	None allowed over 4 hrs. Cargo to remain on loading dock area. No other hazardous cargo on the loading dock within 50 ft at the same time. No flame or spark producing devices within 50 ft of loading, unloading operation. Storage in excess of 4 hrs. should be within an approved magazine or other outside location approved by the authority having jurisdiction.
Explosives Class C	Not to exceed 100,000 lb	40,000 lb		To be stored at least 50 ft from property lines, occupied buildings and other hazardous storage. Individual class and type separation should be in accordance with Title 49, Code of Federal Regulations	Cargo to remain on loading dock area. No other hazardous cargo on the loading dock within 50 ft at the same time. No flame or spark producing devices within 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 hours
Blasting agent	Not to exceed 100,000 lb	40,000 lb			
Ammonium nitrate, fertilizer grade	Not to exceed 300,000 lb	40,000 lb			
Organic peroxides	Call for a permit	Call for a permit			
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 a permit	Call for a permit			
Oxygen liquid	Not to exceed 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 50 ft, from general cargo by 25 ft. Combustible material and and debris should not be stored within 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 25 ft away. All inside storage should be removed from premises before close of business

General — Where general is listed under storage conditions, the following separations should be adhered to: Outside - Breakbulk - 20 ft from fence lines, property lines; 25 ft from other hazardous cargo, 10 ft from general cargo. Inside - 25 ft from other hazardous cargo, 10 ft from general cargo. Storage should be placed along outside walls.

Note: For those hazard classes listed as "Call for a permit" and Class A and B explosives, 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.

For SI Units: 1 gal = 0.00379 m^3, 1 lb = 0.454 kg, 1 ft = .305 m.

Appendix E Referenced Publications

E-1 The following documents or portions thereof are referenced within this standard for informational purposes only and thus are not considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

E-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 43D-1986, *Code for Storage of Pesticides in Portable Containers*

NFPA 46-1990, *Recommended Safe Practice for Storage of Forest Products*

NFPA 71-1989, *Standard for the Installation, Maintenance, and Use of Signaling Systems for Central Station Service*

NFPA 72-1990, *Standard for the Installation, Maintenance and Use of Protective Signaling Systems*

NFPA 72E-1990, *Standard on Automatic Fire Detectors*

NFPA 80A-1987, *Recommended Practice for Protection of Buildings from Exterior Fire Exposures*

NFPA 231E-1989, *Recommended Practice for the Storage of Baled Cotton*

NFPA 600-1986, *Recommendations for Organization, Training and Equipment of Private Fire Brigades*

NFPA 704-1985, *Standard System for the Identification of the Fire Hazards of Materials*

NFPA 1221-1988, *Standard for the Installation, Maintenance and Use of Public Fire Service Communication Systems*

NFPA 1405-1989, *Guide for Land-Based Fire Fighters Who Respond to Marine Vessel Fires.*

E-1.2 U.S. Government Publications. U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402.

Title 33, *Code of Federal Regulations*, Part 126

Title 49, *Code of Federal Regulations*, Parts 170-179

Title 49, *Code of Federal Regulations*, Parts 390-397

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

Title 26, *Code of Federal Regulations*, Part 181

Title 46, *Code of Federal Regulations*, Part 146

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