

**NFPA<sup>®</sup>**

# 307

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

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**2021**



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**NFPA® 307****Standard for the****Construction and Fire Protection of Marine Terminals, Piers, and Wharves****2021 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. It was issued by the Standards Council on October 11, 2019, with an effective date of October 31, 2019, and supersedes all previous editions.

This edition of NFPA 307 was approved as an American National Standard on October 31, 2019.

**Origin and Development of NFPA 307**

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

NFPA 87 was withdrawn by the Standards Council in October 1980, and the 1980 edition of NFPA 307 was retitled *Standard for the Construction and Fire Protection of Marine Terminals,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

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

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

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

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

The 2011 edition revised the definition of *hazardous material* and the requirements for wood and unprotected substructures and for piles and stiffening members of piers and wharves. The standard permitted the use of corrosion-resistant types of pipes, fitting, hangers, or listed protective corrosion resistant coatings on fixed extinguishing system components that are subject to corrosion in a marine environment. The standard also recommended consideration of alternative hydrant spacing in locations where standard spacing is impractical due to container-handling equipment.

In the 2016 edition, the Technical Committee referenced *NFPA 5000, Building Construction and Safety Code*, wherever possible, particularly for requirements related to the design, materials, and workmanship of pier and wharf construction and other structures within the facility. However, the standard lets the AHJ consider other codes or standards when approving marine terminal construction plans. Previous editions of the standard only addressed cargo-handling facilities. The 2016 edition also included construction requirements that apply to marine terminals designed for passenger vessels.

During the first draft meeting for the 2021 edition, the committee heard a presentation from the U.S. Coast Guard that emphasized a need to increase awareness throughout the public sector and private industry about federal requirements that pertain to firefighting on commercial vessels in U.S. ports. The committee developed a new annex to inform municipal and industrial firefighters about marine firefighting (MFF) requirements that vessel owners or operators (plan holders) must meet in

their respective vessel response plans (VRPs). The intent of the new annex is to familiarize municipal and industrial firefighters on plan holder actions in the event of fire onboard commercial vessels at marine terminals, piers, and wharves. The annex also provides details on specific responsibilities of plan holders and their contracted MFF service providers.

The 2021 edition also directs users to NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, for requirements relating to standpipes and hose systems for marine terminals. NFPA 307 now requires that fire protection water supplies be inspected, tested, and maintained in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, to ensure that water supply systems are operational when needed in the event of a fire or other emergency.

Because marine terminal structures have specific fire safety challenges, a fire risk assessment should be performed in the design phase of construction. The 2021 edition now provides a list of resources to facilitate this assessment process.

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*This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.*

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

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

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NFPA 307

Standard for the

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

2021 Edition

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

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

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

Chapter 1 Administration

1.1 Scope.

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

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

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

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

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

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

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

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

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

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

1.5 Units.

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

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

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

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

Chapter 2 Referenced Publications

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

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

NFPA 1, *Fire Code*, 2018 edition.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2018 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2019 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 2019 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection*, 2019 edition.

NFPA 22, *Standard for Water Tanks for Private Fire Protection*, 2018 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 2019 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 2020 edition.

NFPA 31, *Standard for the Installation of Oil-Burning Equipment*, 2020 edition.



NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, 2014 edition.

NFPA 54, *National Fuel Gas Code*, 2018 edition.

NFPA 70®, *National Electrical Code*®, 2020 edition.

NFPA 80, *Standard for Fire Doors and Other Opening Protectives*, 2019 edition.

NFPA 82, *Standard on Incinerators and Waste and Linen Handling Systems and Equipment*, 2019 edition.

NFPA 101®, *Life Safety Code*®, 2021 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, 2019 edition.

NFPA 495, *Explosive Materials Code*, 2018 edition.

NFPA 498, *Standard for Safe Havens and Interchange Lots for Vehicles Transporting Explosives*, 2018 edition.

NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*, 2017 edition.

NFPA 5000®, *Building Construction and Safety Code*®, 2021 edition.

### 2.3 Other Publications.

- ▲ 2.3.1 **ASTM Publications.** ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, 2018b.

- ▲ 2.3.2 **UL Publications.** Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 723, *Test for Surface Burning Characteristics of Building Materials*, 2018.

### 2.3.3 Other Publications.

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

### 2.4 References for Extracts in Mandatory Sections.

NFPA 1006, *Standard for Technical Rescuer Professional Qualifications*, 2017 edition.

## Chapter 3 Definitions

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

### 3.2 NFPA Official Definitions.

**3.2.1\* Approved.** Acceptable to the authority having jurisdiction.

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

**3.2.3\* Listed.** Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of

production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

**3.2.4 Shall.** Indicates a mandatory requirement.

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

**3.2.6 Standard.** An NFPA Standard, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase “standards development process” or “standards development activities,” the term “standards” includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

### 3.3 General Definitions.

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

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

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

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

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

**3.3.6 Cargo.** Commodities in transit.

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

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

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

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

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

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

**N 3.3.10\* External Firefighting Systems.** Firefighting resources (i.e., personnel and equipment), from other than aboard the vessel, capable of combating a fire.

**N 3.3.11 External Firefighting Teams.** Trained firefighting personnel, aside from the crew, with the capability of boarding and combating a fire on a vessel.

**3.3.12\* Hazardous Material.** A substance or material that has been determined to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated. [1006, 2017]

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

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

**N 3.3.15 On-Site Fire Assessment.** A marine firefighting professional on scene, at a safe distance from the vessel or on the vessel, who can determine the steps needed to control and extinguish a marine fire in accordance with a vessel's stability and structural integrity assessment, if necessary.

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

**3.3.17 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.

**N 3.3.18\* Remote Assessment and Consultation.** Contacting the salvage and marine firefighting (SMFF) resource providers by phone or other means of communications to discuss and assess the situation.

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

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

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

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

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

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

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

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

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

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

## Chapter 4 Piers and Wharves

**4.1\* General.** Design, materials, and workmanship of pier and wharf construction shall conform to *NFPA 5000*.

### 4.2 Substructure Construction.

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

#### 4.2.2 Protection Against Physical Damage.

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

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

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

#### 4.2.4 Fire-Resistive Substructures.

##### Δ 4.2.4.1 General.

**N 4.2.4.1.1** A fire-resistive substructure shall be one having a fire resistance rating in all of its parts of not less than 4 hours.

**N 4.2.4.1.2\*** If a performance-based design is used, the analysis design process shall be acceptable to the AHJ.

**4.2.4.2 Wood and Unprotected Substructures.** If piles or cribwork are constructed of wood or other material acceptable to the AHJ, or unprotected steel piles are used, they shall not extend above low water.

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

**4.2.4.3.1** Where railroad tracks extend onto the pier deck at a lower level than the deck, the sides and bottom of the

depressed section shall be of the same construction as the pier deck or of an equivalent fire resistance rating.

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

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

#### **4.2.5 Noncombustible Substructures.**

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

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

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

#### **4.2.6 Combustible Substructures.**

**4.2.6.1 Piles and Stiffening Members.** The substructure shall be constructed of wood piles or other material acceptable to the AHJ extending to the pier deck.

**4.2.6.1.1** Construction material other than wood shall maintain its structural integrity under fire exposure and have heat, flame, and smoke characteristics that are equivalent to wood pilings.

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

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

**4.2.6.1.4\*** Deep narrow spaces between timbers shall be fire-stopped over each bent or at least once in each timber length.

#### **4.2.6.2 Pier Deck and Supports.**

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

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

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

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

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

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

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

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

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

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

#### **4.2.6.3 Aprons.**

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

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

#### **4.2.7 Composite Substructures.**

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

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

#### **4.3 Substructure Protection and Subdivision.**

**4.3.1 Noncombustible Substructures.** The provision of fire walls, firestops, automatic sprinklers, and other fire-extinguishing facilities under the pier deck shall depend upon the amount of exposed steel, the fire resistance ratings of rein-



forced concrete construction or assemblies, and the fire hazard as determined by the authority having jurisdiction.

#### 4.3.2\* Composite Substructures.

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

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

#### 4.3.3 Combustible Substructures.

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

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

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

##### 4.3.3.1.2 Installation of Sprinklers.

**4.3.3.1.2.1** Installation of sprinkler equipment shall be in accordance with the applicable provisions of NFPA 13.

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

##### 4.3.3.1.3 Installation Requirements in Addition to NFPA 13.

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

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

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

- (1) The maximum coverage per sprinkler shall be limited to 7.5 m<sup>2</sup> (80 ft<sup>2</sup>).

- (2) Where spacing or arrangement of stringers constitutes typical open-joist construction directly supporting the deck, sprinkler branch lines shall meet the following requirements:

- (a) Sprinkler branch lines shall be installed between the bents at right angles to the stringers.
- (b) Spacing between branch lines shall not exceed 3 m (10 ft).
- (c) Sprinklers on branch lines shall be staggered and spaced not to exceed 2.5 m (8 ft) on center.

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

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

- (5)\* The sprinkler system shall meet the following requirements:

- (a) Sprinkler system shall be hydraulically designed in accordance with the requirements of NFPA 13.
- (b) Sprinkler orifice shall be 12.7 mm (½ in.).
- (c) Sprinkler orifice shall discharge at a minimum pressure of 85 kPa (12.5 psi).

- (d) Design area shall be based upon the largest area between firestops plus an additional area embracing at least two branch lines on opposite sides of the firestop.

- (e) Minimum design area shall be not less than 465 m<sup>2</sup> (5000 ft<sup>2</sup>).

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

- (7) The maximum area to be protected by any one system shall be limited to 2325 m<sup>2</sup> (25,000 ft<sup>2</sup>).

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

##### 4.3.3.1.3.3 Pipe Hangers.

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

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

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

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

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

(B) Detector elements and wiring systems of smoke or heat detectors or other electrical equipment used for fire protection of substructures shall be moisture- and corrosion-proof to

protect against unfavorable atmospheric conditions that exist beneath these structures.

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

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

#### **4.3.3.2 Other Extinguishing Facilities.**

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

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

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

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

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

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

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

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

#### **4.3.3.2.3 Extinguishing Equipment.**

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

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

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

#### **4.3.3.2.5\* Existing Substructures.**

**4.3.3.2.5.1** In existing substructures where, in the opinion of the authority having jurisdiction, it is clearly impractical to install and maintain an automatic sprinkler system, deck open-

ings, and revolving nozzles, as specified in 4.3.3.2 in conjunction with the required structural barriers of 4.3.3.3 through 4.3.3.6, shall be permitted to be provided as alternate protection.

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

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

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

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

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

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

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

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

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

**4.3.3.3.2.3** Firestops shall extend to the low water line.

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

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

#### **4.3.3.4 Types of Fire Walls.**

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

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

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

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

#### 4.4 Superstructure Construction.

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

#### 4.4.2 Exterior Wall Requirements.

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

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

#### 4.5 Superstructure Protection.

##### 4.5.1 Automatic Sprinklers. See also A.4.3.3.1.

**4.5.1.1** All superstructures shall be provided with a complete system of automatic sprinklers installed in accordance with NFPA 13.

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

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

**4.5.2\* First Aid Fire Appliances.** Portable fire appliances and 38 mm (1½ in.) standpipe connections shall be installed and distributed, and their locations marked in accordance with NFPA 10, NFPA 13, and NFPA 14.

### Chapter 5 Terminal Buildings

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

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

#### 5.3\* Additional Requirements.

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

**5.3.2** Outside storage of cargo shall not be within 6 m (20 ft) of the exterior of the building unless the containers, railroad

cars, and vehicles are parked for the purpose of loading or unloading cargo.

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

**5.3.4 Passenger Terminals.** Passenger terminals located on piers or wharves shall be considered assembly occupancies and shall meet all applicable requirements of Chapter 16 of *NFPA 5000*.

#### 5.4 Automatic Sprinklers. See also A.4.3.3.1.

**5.4.1 General.** Buildings used for the handling or storage of combustible **cardoor** passenger terminals located on piers or wharves shall be protected in accordance with the requirements of NFPA 13.

#### 5.4.2 Design Criteria.

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

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

**5.4.2.3** Buildings consistent with 5.4.2.2 shall be protected in accordance with the design criteria for the applicable commodity as required by NFPA 13.

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

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

**5.5 Temporary Storage of Explosives.** Buildings used for the temporary storage of explosives or fireworks shall conform to the appropriate provisions of NFPA 495, NFPA 498, and regulations of the U.S. Bureau of Alcohol, Tobacco, and Firearms.

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

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

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

## Chapter 6 Terminal Yards

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

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

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

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

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

### 6.3 Containment and Access.

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

**6.3.2** Gates or other such openings shall be provided in the surrounding fence or other barriers used to enclose the property to permit access of fire and emergency apparatus in case of fire or other emergency.

### 6.4 Vehicular Routes, Traffic, and Parking.

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

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

### 6.5 Fire Lanes.

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

#### 6.5.2 Specifications.

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

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

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

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

**6.5.3 Alternative Arrangements.** Where practical difficulties exist in meeting the requirements of Section 6.5, the authority

having jurisdiction shall be permitted to approve alternative fire lane arrangements, provided the intent of reasonable emergency access is achieved.

## 6.6 Container Storage.

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

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

**6.7 Other Uses.** All buildings within the marine terminal such as hotels, office buildings, or structures devoted to repair and maintenance shall comply with *NFPA 5000*.

## Chapter 7 Water Supply for Fire Protection

### 7.1\* Standpipes, Hydrants, and Hose Connections.

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

#### Δ 7.1.2\* Number and Location.

**N 7.1.2.1** The number and location of hydrants and hose connections shall be determined by the authority having jurisdiction.

**N 7.1.2.2** Hydrants and hose connections shall not be spaced further apart than 90 m (300 ft) or more than 45 m (150 ft) from a dead-end area.

### 7.2 Water Supply.

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

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

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

**7.2.4** Piping, pumps, and other facilities shall be designed and installed in accordance with the requirements of NFPA 20, NFPA 22, and NFPA 24.

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

**N 7.2.6** Water supplies for fire protection shall be inspected, tested, and maintained in accordance with NFPA 25.



## Chapter 8 Hazardous Materials Storage

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

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

**8.3\* Handling, Storage, and Loading.** Hazardous materials at terminals shall be handled, stored, loaded, and unloaded in accordance with all applicable laws, ordinances, and regulations, the authority having jurisdiction, and NFPA 704.

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

### 8.5\* Written Procedures.

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

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

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

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

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

### 8.8 Designated Hazardous Materials Storage Areas.

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

- (1) Explosive materials as defined in NFPA 495 (*see also Sections 8.15 and 8.16*)

- (2) Organic peroxides
- (3) Liquid oxygen
- (4) Oxidizing materials
- (5) Poisonous gases (Division 2.3 materials)
- (6) Chlorine, fluorine, sulfur dioxide, and anhydrous ammonia
- (7) Flammable solids that are dangerous when wet
- (8) Radioactive materials
- (9) Other types of hazardous materials as designated by the authority having jurisdiction

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

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

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

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

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

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

**8.8.2.2** Fire lanes shall not come to a dead end.

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

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

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

### 8.8.6 Signage.

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

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

### 8.9 Storage of Liquid Hazardous Materials.

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

**8.9.2** Hazardous materials shall not be permitted to enter waterways.

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

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

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

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

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

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

**8.14 Location of Hazardous Materials Information.**

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

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

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

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

## Chapter 9 General Terminal Operations

### 9.1 General.

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

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

### 9.2 Terminal Operator.

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

**9.2.2** The terminal operator shall have the following responsibilities:

- (1) Train employees in fire prevention and the proper emergency action in the event of fire or other emergency

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

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

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

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

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

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

### 9.4 Vessels.

#### 9.4.1 Maneuverability.

**9.4.1.1** All vessels shall be moored in an orderly manner.

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

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

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

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

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

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

#### 9.4.4 Cutting, Welding, or Other Hot Work.

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

**9.4.4.2** Hot work shall not be permitted when the vessel is fueling, loading, or unloading hazardous materials, or when

Division 1.1, 1.2, or 1.3 explosives are on board or within 30 m (100 ft) of the hot work. (See Section 10.11.)

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

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

#### **9.4.6 Shipboard Cargo Handling.**

**9.4.6.1** Smoking shall be prohibited except in designated areas.

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

### **9.5 Terminal Cargo Handling and Storage.**

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

#### **9.5.2 Traffic.**

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

**9.5.2.2** All necessary traffic control measures shall be taken.

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

#### **9.5.3.1 General.**

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

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

#### **9.5.3.2 Aisle Arrangement.**

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

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

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

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

### **9.5.5 Fire Protection Systems.**

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

**9.5.5.2** The adequacy of the sprinkler system shall be re-evaluated when the fire hazard of the commodity in storage or the method of storage changes.

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

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

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

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

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

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

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

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

### **9.8 International Shore Connection.**

**9.8.1** International shore connection, as required by the International Safety of Life at Sea Convention, shall be available at the marine terminal to enable local fire-fighting equipment to be connected to a vessel's fire main system.

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

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

### **9.10 Notification.**

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

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

## Chapter 10 Miscellaneous Installations and Operations

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

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

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

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

**10.1.3.1** All fueling shall be from approved dispensing devices.

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

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

**10.1.5** Battery-charging equipment shall be installed in accordance with *NFPA 70*.

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

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

### 10.2 Automotive and Railroad Equipment.

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

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

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

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

**10.2.1.4** Fueling and repair operations shall conform to 10.1.3.

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

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

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

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

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

### 10.3 Electrical Installations.

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

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

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

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

### 10.4 Heating.

**10.4.1** Gas-burning equipment shall be installed in accordance with *NFPA 54*.

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

**10.4.3** Oil-burning heaters shall be installed in accordance with *NFPA 31*.

**10.4.4** Solid fuel-burning equipment shall be installed in accordance with the requirements of *NFPA 211*.

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

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

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

### 10.4.6 Portable Heaters.

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

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

### 10.5 Processes.

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



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

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

**Δ 10.5.3.1** Where a temporary form of closure is used, the enclosing material shall have a flame spread index of 50 or less when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*, or ANSI/UL 723, *Standard for Test for Surface Burning Characteristics of Building Materials*.

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

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

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

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

## **10.6\* Fumigation.**

### **10.6.1 Location.**

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

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

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

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

**10.7 Pallets and Dunnage.** Where pallets and dunnage shall be stored, the storage shall be in accordance with NFPA 1.

## **10.8 Packaging and Recoopering.**

**10.8.1** All packaging shall be done in a segregated area.

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

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

**10.9 Incinerators.** Incinerators shall be constructed as required in NFPA 82.

## **10.10 Maintenance, Repairs, and Housekeeping.**

### **10.10.1 Below Pier Deck.**

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

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

**10.10.1.3** Floating combustible debris shall be removed.

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

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

### **10.10.2 Buildings and Yard Areas.**

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

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

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

### **10.11 Cutting, Welding, or Other Hot Work.**

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

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

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

**10.11.3** Hot work shall be conducted in accordance with NFPA 51B and all applicable laws, ordinances, and regulations, and the authority having jurisdiction.

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

### **10.11.5 Smoking and Open Flame.**

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

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

## **Annex A Explanatory Material**

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

**A.1.3.2** See NFPA 303.

**A.1.3.3(1)** See NFPA 30.

**A.1.3.3(2)** See NFPA 59A or NFPA 58.

**A.3.2.1 Approved.** The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority

having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

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

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

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

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

**■ A.3.3.10 External Firefighting Systems.** Firefighting resources include, but are not limited to, fire tugs, portable fire pumps, airplanes, helicopters, and shore side fire trucks.

**A.3.3.12 Hazardous Material.** For the purposes of consistency, the preferred definition for the term *hazardous material* is adopted. Users of this standard can also refer to the definition that is found in 49 CFR Part 171.8.

**A.3.3.13 Low Water Level.** In nontidal locations, the normal low water level; in single tidal areas, mean low water; and in dual tidal areas, mean lower low water.

**A.3.3.16 Pier.** The terms *pier* and *wharf* are used interchangeably.

**■ A.3.3.18 Remote Assessment and Consultation.** The person contacted must be competent to consult on a determination of the appropriate course of action and initiation of a response plan.

**A.3.3.23 Terminal Yard.** As used herein, the term does not include open pier and wharf areas, except that solid-fill-type wharves that are contiguous to and form a part of yard areas are considered part of the terminal yard.

**A.3.3.28 Wharf.** The terms *wharf* and *pier* are used interchangeably.

**A.4.1** The authority having jurisdiction can refer to other standards and construction practices for design, materials, and workmanship of pier and wharf construction that ensure a durable and safe structure that can withstand the forces of nature to which piers and wharves are likely to be exposed, including the deteriorating influences of the environment and the expected wear and tear of operation and use. Because of the unique design of these structures, in many cases a fire risk assessment is needed.

Examples of other standards include, but are not limited to, the SFPE *Engineering Guide for Fire Risk Assessment*, which provides a methodology on how to conduct a fire risk assessment; and the following U.S. Department of Defense Standards, which are publicly available: UFC 3-600-01, *Fire Protection Engineering for Facilities*; UFC 4-150-02, *Dockside Utilities for Ship Service*; and UFC 4-152-01, *Design: Piers and Wharves*.

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

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

**■ A.4.2.4.1.2** If a performance-based approach is used to design the fire-resistant substructure required in 4.2.4.1, SFPE S.01, *Engineering Standard on Calculating Fire Exposures to Structures*, provides methodologies to predict the effects of fire exposures to structures and SFPE S.02, *Engineering Standard on Calculation Methods to Predict the Thermal Performance of Structural and Fire Resistive Assemblies*, provides methodologies that determine the heat transfer to the structure.

**A.4.2.6.1.4** Deep narrow spaces between timbers present ideal conditions for the accumulation of extraneous material, making them natural channels for the rapid spread of fire.

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

and access to the substructure for manual fire-fighting operations.

**A.4.3.3.1** Where fixed fire-extinguishing system components are installed in areas subjecting these components to corrosion or other atmospheric damage, special considerations might be necessary. Listed corrosion-resistant types of pipe, fittings, and hangers or listed protective corrosion-resistant coatings should be used where corrosive conditions exist.

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

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

**A.4.3.3.1.3.1(B)(5)** The use of firestops for draft control (e.g., to bank heat, facilitate the opening of sprinklers, and prevent the overtaxing of the sprinkler system) is particularly important in the design of sprinkler protection for combustible substructures. The fire walls and firestops of 4.3.3.4 and 4.3.3.5 should be incorporated into the sprinkler system design for draft control to the maximum extent practical; however, due to limitations in the size of the design area for the sprinkler system, additional firestops normally are needed. These additional or supplemental firestops need only have limited fire resistance, but they should be as deep as possible and be of substantial construction, such as double 76.2 mm (3 in.) planking, where exposed to the elements. Where not exposed to the possibility of physical damage, 19.05 mm (¾ in.) treated plywood extending 1219.2 mm (48 in.) below stringers with solid blocking between stringers should provide adequate durability and reasonable effectiveness.

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

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

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

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

Where standpipe system components are installed in areas subjecting these components to corrosion or other atmospheric damage, special considerations might be necessary.

Listed corrosion-resistant types of pipe, fittings, and hangers or listed protective corrosion-resistant coatings should be used where corrosive conditions exist.

For evaluation of the hazards of fire exposure and protection methods, refer to NFPA 80A.

**A.5.3** For guidance on construction, protection, and separation distances, refer to NFPA 80A.

**N A.5.3.1** SFPE S.01, *Engineering Standard on Calculating Fire Exposures to Structures*, provides methodologies to predict the effects of fire exposures from fully developed fires.

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

**A.6.1** Yard storage of logs, lumber, and other forest products should be in accordance with NFPA 1.

**N A.7.1** Standpipe and hose system requirements for marine terminals, piers, and wharves are covered in NFPA 14.

**A.7.1.2** The AHJ should consider alternative hydrant spacing in conjunction with large-diameter fire hose and portable nozzles in the container stacking areas where the standard spacing is not compatible with the container handling equipment.

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

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

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

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



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

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

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

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

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

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

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

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 a special detail is assigned to close all fire doors in times of fires and drills. (*See NFPA 600.*)

**A.9.5.6** The storage of cotton should comply with NFPA 1.

**A.9.9** See NFPA 601.

**A.10.1.3** See NFPA 505, NFPA 30, and NFPA 58.

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

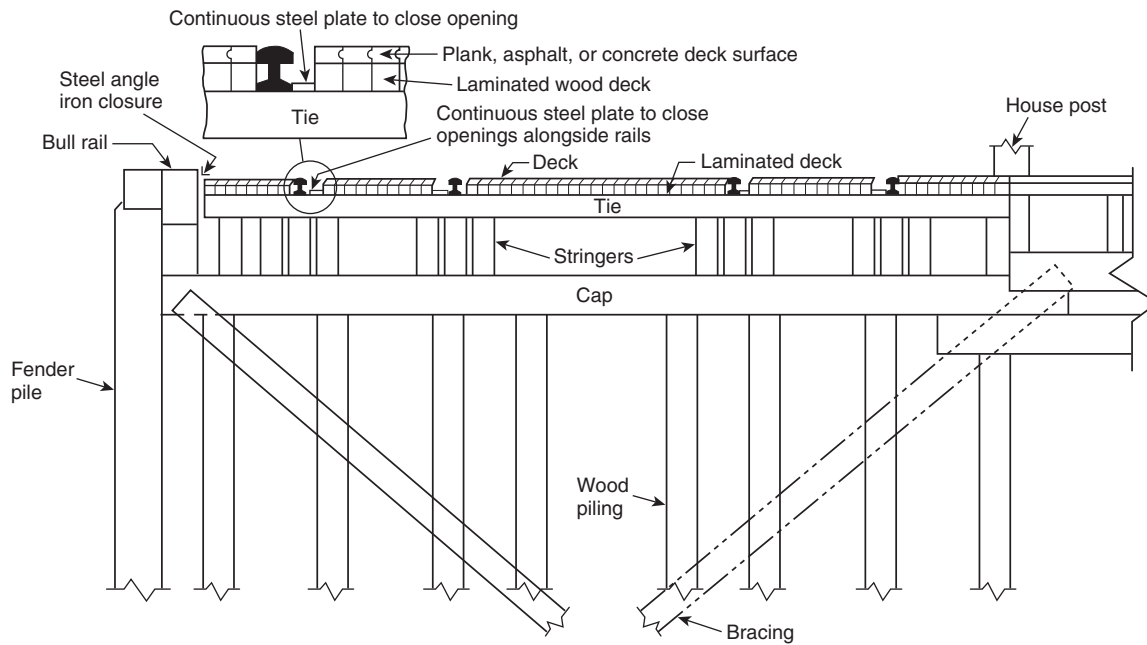
- (1) It is recommended that, wherever possible, nonflammable fumigants be used.
- (2) Fumigation of imported cargo should be conducted in detached buildings under competent supervision.

- (3) No fumigant should be used that has a flammability rating greater than 2, a reactivity rating greater than 1 as outlined in NFPA 704, or a flashpoint less than 60°C (140°F).
- (4) All flammable or combustible fumigants should be stored in sealed metal containers and in accordance with the requirements of NFPA 30.
- (5) Where other than nonflammable fumigants are used, electric wiring and equipment for fumigating chambers or enclosures should be installed in accordance with NFPA 70.
- (6) Adequate ventilation facilities should be provided to remove the fumigant from the chamber or enclosure; and the ventilation facilities must be of good design and arranged to safely vent or release spent gases after dilution at altitudes or locations that protect persons and property in the area.
- (7) Fumigants should be used only as recommended by the manufacturer.
- (8) Where other than nonflammable fumigants are used, piping valves and fittings should conform to the requirements of NFPA 30.
- (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 400.
- (10) Pesticides should be stored so as to prevent deleterious contact with moisture.
- (11) Pesticides should be stored in a manner to prevent accidental release.
- (12) Suitable gas masks should be provided for fumigation operations, and the gas masks should be prominently displayed and adequately labeled.
- (13) Federal, state, or local governmental regulatory agencies, such as the U.S. Department of Labor, could have additional requirements that should be followed when applicable.
- (14) The use of products generally distributed with instructions for use in households, such as paradichlorobenzene or naphthalene crystals or pellets used for fabric pest control, is acceptable as fumigants not needing any special requirements other than those recommended by the manufacturer.

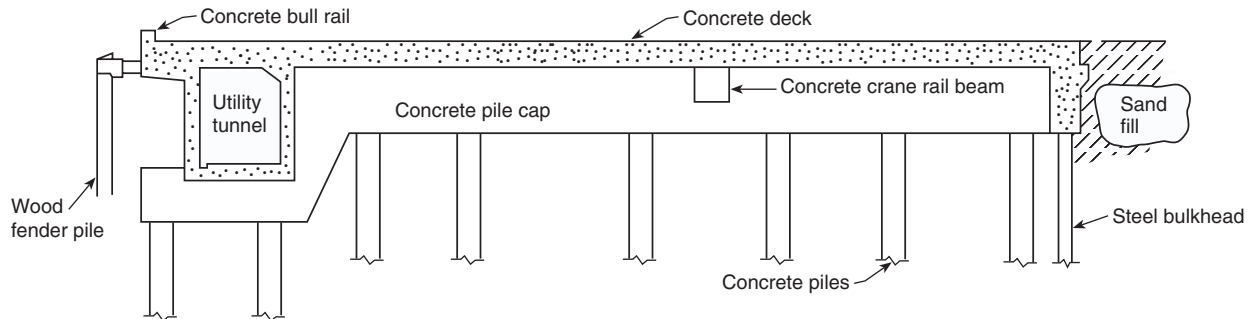
## Annex B Substructure Nomenclature

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

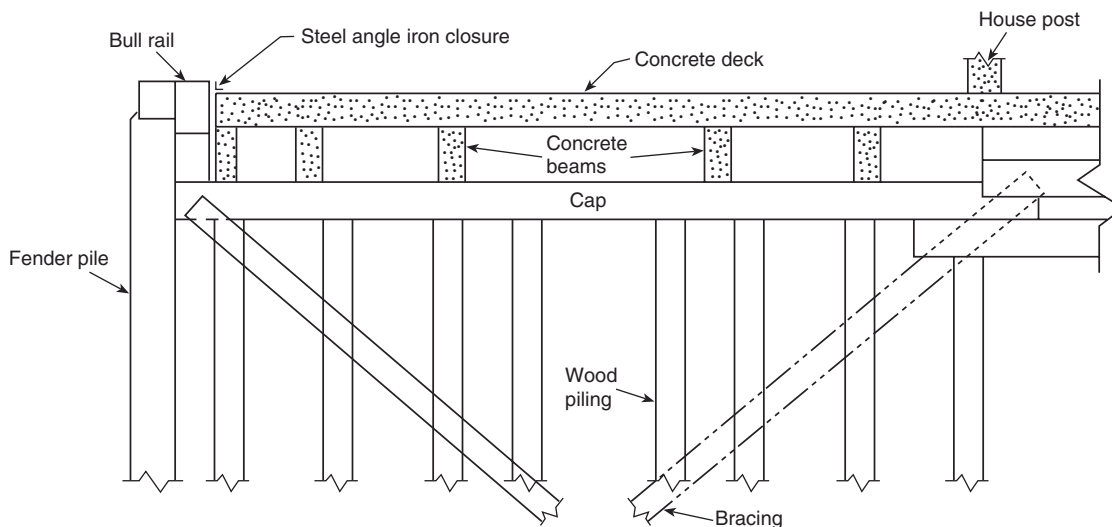
**B.1** Because no typical construction of substructures exists, they vary widely by the type and the combination of materials used and the arrangement of structural members. Figure B.1(a) through Figure B.1(c) are provided to illustrate installation procedures and to clarify terminology used.



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



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



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

### Annex C Additional Fire Protection Facilities

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

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

**C.2 Fire Alarm.** It is recommended that an approved system of manual fire alarms arranged to sound local alarms and summon the private brigade and public fire department be installed at marine terminals. (See NFPA 72 and NFPA 1221).

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

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

### Annex D Regulations and References

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

#### D.1 International Regulations.

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

#### D.2 U.S. Federal Regulations.

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

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

**D.2.2** U.S. Department of Transportation, 49 CFR 170–179, Chapter I, covers preparation of hazardous materials for transportation by common carriers by rail freight, rail express, rail baggage, highway, or water; construction of containers, packaging, weight, marking, and labeling when required; billing; and shippers’ certificate of compliance with these regulations; also covers cars, loading, storage, billing, placarding, and movement thereof by carriers by rail.

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

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

Act and standards of specific design, and adopted under Section 6(b) of the Act.

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

### D.3 Local Regulations.

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

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

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

- (1) The location of the terminal in relation to large population centers, in conjunction with the types and quantities of hazardous materials that are proposed to be stored
- (2) The speed and direction of prevailing winds
- (3) The type of construction of the terminal and its condition and maintenance, including items such as the following:
  - (a) The condition of the superstructure and substructure
  - (b) The condition of electrical services and water and fuel lines
  - (c) The level of difficulty in gaining access to the structure for purposes of fire fighting

- (4) Emergency access to the terminal and the hazardous materials storage area
- (5) The physical size of the marine terminal and whether or not sufficient room is available for proper segregation of incompatible materials
- (6) The provisions that have been made for the fire protection of the terminal, including whether or not the terminal is sprinklered and has fire-fighting access and water supplies
- (7) The capability of the local emergency services agencies, including available equipment, manpower, and training

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

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

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

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

The maximum dimensions for these areas should be the following:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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

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

(continues)



**Table D.3.5.2** *Continued*

Hazardous Materials D.O.T. Class	Outdoor Maximum Quantities	Indoor Maximum Quantities	Comment	Separations Outside	Separations Inside
Corrosive material	Not to exceed 11,400 L (3000 gal)	2300 L (600 gal)	General. Dry commodities permitted unlimited amounts in storage.	General. Dry commodities can be stored with general cargo, to be protected from moisture.	General. Dry storage to be protected from moisture.
Nonflammable compressed gas	5 groupings of 100 cylinders per grouping	100 cylinders		Can be stored with general cargo except the following: oxygen (oxidizer), chlorine, fluorine, sulfur dioxide, ammonia.	General.
Chlorine, fluorine, sulfur dioxide, ammonia (can be one type or any combination of)	50 cylinders chlorine, maximum cylinder size: 910 kg (1 ton)	10 cylinders aggregate, maximum size: 140 kg (300 lb)		General. Storage can be placed with Poisons, Division 6.1. Note: Chlorine cylinder maximum size: 910 kg (1 ton).	General. Cylinder maximum size: 140 kg (300 lb).
Poisonous gases, Division 2.3	Call for Permit	Call for Permit		—	—
Poisons, Division 6.1 and irritants	Not to exceed 9100 kg (20,000 lb)	910 kg (2000 lb)		General.	General.
Radioactive material	Call for Permit	Call for Permit		—	—
Explosives: Divisions 1.1 and 1.2	Not to exceed 91 kg (200 lb)	Storage limit to 2 hrs, 91 kg (200 lb)	Call for Permit	To be stored in an approved magazine or other location approved by the AHJ.	None allowed over 4 hr. Cargo to remain on loading dock area. No other hazardous cargo on the loading dock within 15 m (50 ft) at the same time. No flame or spark-producing devices within 15 m (50 ft) of loading or unloading operation. Storage in excess of 4 hr should be within an approved magazine or other outside location approved by the AHJ.
Explosives: Division 1.4	Not to exceed 45,400 kg (100,000 lb)	18,200 kg (40,000 lb)		To be stored at least 15 m (50 ft) from property lines, occupied buildings, and other hazardous storage. Individual class and type separation should be in accordance with 49 CFR 171–180.	Cargo to remain on loading dock area. No other hazardous cargo on the loading dock within 15 m (50 ft) at the same time. No flame or spark-producing devices within 15 m (50 ft) of loading, unloading operation. No other explosive material (including ammonium nitrate, fertilizer grade) in the building at the same time. Storage limited to 24 hr.
Explosives: Division 1.5	Not to exceed 45,400 kg (100,000 lb)	18,200 kg (40,000 lb)		—	—
Ammonium nitrate, fertilizer grade	Not to exceed 140,000 kg (300,000 lb)	18,200 kg (40,000 lb)		—	—

(continues)

**Table D.3.5.2** *Continued*

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

**Notes:**

(1) Where the term *general* is listed under storage conditions, the following separations should be adhered to: Breakbulk — Outside — 6 m (20 ft) from fence lines, property lines; 7.5 m (25 ft) from other hazardous cargo; 3 m (10 ft) from general cargo. Inside — 7.5 m (25 ft) from other hazardous cargo, 3 m (10 ft) from general cargo. Storage should be placed along outside walls.

(2) For those hazard classes listed as Call for Permit and Explosives, Division 1.1, 1.2, and 1.3, a special permit is required. Specific storage conditions and restrictions should be established based on the relative hazard of the actual commodity and the facility's capability to handle that commodity.

## **Annex E Marine Firefighting Onboard Vessels Within Municipal Jurisdictions**

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

**E.1 Introduction.** The purpose of this annex is to inform municipal and industrial firefighters of marine firefighting (MFF) requirements that vessel owners or operators (i.e., “plan holders”) must meet within their respective vessel response plans (VRP). The intent is to familiarize municipal and industrial firefighters on plan holder actions in the event of fire aboard commercial vessels at marine terminals, piers, and wharves. This annex provides detail on specific responsibilities of plan holders and their contracted MFF service providers.

Marine firefighting actions can save lives and property; and prevent an incident from escalating, further disrupting facility or port functionality. Title 33 Code of Federal Regulations (CFR) Part 155 Subpart I establishes the regulatory definition of MFF, and means any firefighting-related act undertaken to assist a vessel with a potential or actual fire; prevent loss of life, damage, or destruction of the vessel; prevent damage to the marine environment.

**E.2 Context for Marine Firefighting (MFF) Aboard Vessels.** Whereas the Federal Fire Prevention and Control Act of 1974 (PL93-498) declared that firefighting is and should remain a

state and local function, the U.S. federal government must help if a significant reduction in fire losses is to be achieved. For fires aboard commercial vessels in the U.S., the U.S. Coast Guard provides assistance. The basis for U.S. Coast Guard firefighting activities is articulated in the Ports and Waterways Safety Act of 1972 (PWSA), section 4202 of the Oil Pollution Act of 1990 (OPA 90), and 14 U.S.C 88(b).

The PWSA acknowledges that increased supervision of port operations is necessary to prevent damage to structures in, on, or adjacent to the navigable waters of the U.S., and to reduce the possibility of vessel or cargo loss, or damage to life, property, and the marine environment. OPA 90 mandates that the Coast Guard maintain an Area Contingency Plan (ACP) of pollution response equipment, including firefighting equipment, within each port. The traditional functions and powers of the U.S. Coast Guard to render aid and save property are provided in 14 U.S.C. 88(b).

The U.S. Coast Guard provides firefighting equipment and training to protect its own vessels and property, but is occasionally called upon to provide assistance at fires aboard other vessels, including commercial vessels at marine terminals, piers, and wharves. Although the U.S. Coast Guard clearly has an interest in fighting fires involving vessels, primary responsibility for maintaining necessary firefighting capabilities in U.S. ports and harbors lies with local authorities. The U.S. Coast Guard

renders assistance as available based on the level of personnel training and the adequacy of equipment, as U.S. Coast Guard units do not normally have advanced firefighting capabilities, technical expertise, and long-term training programs. As such, the U.S. Coast Guard is not prepared to relieve local fire departments of their responsibilities. It is U.S. Coast Guard policy neither to actively engage in firefighting aboard commercial vessels except in support of a regular firefighting agency under the supervision of a qualified fire officer, nor to engage in independent firefighting operations, except to save a life or in the early stages of a fire to avert a significant threat without undue risk.

The functions generally carried out by the U.S. Coast Guard in MFF situations include the following:

- (1) Participating in MFF contingency planning
- (2) Conducting traditional U.S. Coast Guard response measures, such as restricting access to the affected area and controlling marine traffic, conducting emergency search and rescue activities, notifying affected parties, and coordinating with local emergency services
- (3) Conducting a preliminary assessment of the incident as follows:
  - (a) Evaluate the magnitude of the threat to the public health and welfare and the environment
  - (b) Determine if response actions by the plan holder are adequate
  - (c) Collect information for the development of a response plan
- (4) Contacting the owner or operator to explain the U.S. Coast Guard's role and to gather information for response purposes
- (5) Based on the preliminary assessment and commensurate with the level of personnel, equipment, and training, conducting actions necessary to address immediate concerns prior to the arrival of local firefighters or actions by a vessel owner or operator
- (6) Monitoring response actions and providing assistance as available

The U.S. Coast Guard can also do the following:

- (1) Establish and enforce a safety or security zone at the scene
- (2) Issue Captain of the Port (COTP) orders influencing regulated facility operations, as well as to direct the movement or deny entry of vessels
- (3) Assume the role of Incident Commander (IC) if the MFF response is inadequate or nonexistent
- (4) Be prepared to assume the role of IC following conclusion of MFF operations if the incident involves pollution or is classified as a marine casualty

Plan holders are ultimately responsible for the safety of the vessel under their control, which includes providing adequate firefighting protection, per 33 CFR 155. During a vessel fire, the vessel master is responsible for initiating a safe and appropriate response. The vessel master assesses the situation, mobilizes shipboard teams, and oversees the process of shipboard emergency response while the vessel's crew responds per the fire plan initiating steps to contain and extinguish the fire. For a description of actions by shipboard personnel for a fire aboard a tanker at a terminal, refer to Chapter 26.5.2 of the *International Safety Guide for Oil Tankers and Terminals*. For a description of general shipboard firefighting equipment, refer

to Chapter 8.1 of the *International Safety Guide for Oil Tankers and Terminals*.

Though public authorities are responsible to provide and maintain the necessary firefighting capabilities within U.S. ports and harbors, individual municipalities have different policies for responding to marine fires; for example, most will respond only at the pier and some will not go aboard a vessel. The presence of public firefighters neither relieves the vessel master of command of a vessel, nor transfers the master's responsibility for overall safety aboard the vessel. However, the vessel master should not normally countermand any orders given by local firefighters in the performance of firefighting activities aboard the vessel, unless the action taken or planned clearly endangers the safety of the vessel or crew. The vessel master can provide advice on the use of public firefighting personnel and equipment.

The vessel master has ultimate responsibility for initiating all shipboard incident response activities per the VRP. The purpose of a VRP is to provide guidance to the vessel master and crew with respect to actions necessary to respond to an incident aboard a vessel, to include a shipboard fire where firefighting actions are consistent with the vessel's fire control plan. The VRP also provides notification procedures and a description of shoreside activities under conditions of emergency response to a vessel fire. The vessel master is responsible for conducting required notifications. Among those required to be notified by the vessel master of a shipboard emergency resulting in the activation of the VRP is the qualified individual (QI).

**E.3 The Qualified Individual (QI).** The QI has a standing contract with plan holders to provide continuous response services during marine casualties. The QI is familiar with implementation of the VRP and provides rapid communications with authorities, engages response resources, and commits funds on behalf of the plan holder. The QI will generally conduct other required notifications on behalf of the vessel master and, during a vessel fire, will notify the salvage and marine firefighting (SMFF) service provider listed in the VRP.

**E.4 The Salvage and Marine Firefighting (SMFF) Service Provider.** The SMFF is an external firefighting team made up of trained firefighting personnel, aside from the vessel crew, with the capability of boarding and combating a fire aboard a vessel. The SMFF brings external vessel firefighting systems, meaning firefighting resources (i.e., personnel and equipment) that are capable of combating a fire from other than aboard the vessel, as well as other needed support. At present, there are currently four SMFF providers nationwide that meet the U.S. Coast Guard's regulatory standards of 15 selection criteria and 19 services.

**E.4.1 SMFF Selection Criteria.** Plan holders are responsible for determining the adequacy of the SMFF service provider listed in the VRP. When determining adequacy, plan holders must select a resource provider that meets 15 selection criteria to the maximum extent possible. A resource provider need not meet all of the selection criteria for a plan holder to choose them as a provider; however, an SMFF provider must be selected on the basis of meeting the criteria to the maximum extent possible. (See Table E.4.1.)

**Table E.4.1 SMFF Selection Criteria**

SMFF selection criteria	
1	Resource provider is currently working in response service needed.
2	Resource provider has documented history of participation in successful salvage or marine firefighting operations, including equipment deployment.
3	Resource provider owns or has contracts for equipment needed to perform response services.
4	Resource provider has personnel with documented training certification and (educational) degree experience (e.g., naval architecture or fire science).
5	Resource provider has 24-hour availability of personnel and equipment, and history of response times compatible with the time requirements in the regulation.
6	Resource provider has on-going continuous training program. For marine firefighting providers, they meet the training guidelines in NFPA 1001, 1005, 1021, 1405, and 1561; show equivalent training; or demonstrate qualification through experience.
7	Resource provider has successful record of participation in drills and exercises.
8	Resource provider has salvage or marine firefighting plans used and approved during real incidents.
9	Resource provider has membership in relevant national or international organizations.
10	Resource provider has insurance that covers the salvage or marine firefighting services, which they intend to provide.
11	Resource provider has sufficient up-front capital to support an operation.
12	Resource provider has equipment and experience to work in the specific regional geographic environment(s) that the vessel operates in (e.g., bottom type, water turbidity, water depth, sea state, and temperature extremes).
13	Resource provider has the logistical and transportation support capability required to sustain operations for extended periods of time in arduous sea states and conditions.
14	Resource provider has the capability to implement the necessary engineering, administrative, and personal protective equipment controls to safeguard the health and safety of their workers when providing salvage and marine firefighting services.
15	Resource provider has familiarity with the salvage and marine firefighting protocol contained in the local ACPs for each COTP area for which they are contracted.

**N E.4.2 SMFF Services Provided.** Plan holders must list in the VRP the contracted SMFF resource providers who will deliver the services outlined in Table E.4.2(a) 33 CFR Table 155.4030(b), as well as methods of contact. Though multiple resource providers for each service might be listed, the VRP must identify the primary resource provider for each COTP zone in which the vessel operates. Table E.4.2(a) shows an excerpt from 33 CFR Table 155.4030(b), which lists the required MFF services and response timeframes, and Table E.4.2(b) shows an excerpt from 33 CFR Table 155.4040(c), which lists response timeframe end points for MFF. The response timeframe starts when the SMFF service provider receives notification of a potential or actual incident and ends when the SMFF service provider reaches the vessel for emergencies aboard vessels moored to facilities within the continental U.S. The response criteria specified in the regulations are planning criteria, not performance standards, and are based on assumptions that might not exist during an actual incident. Definitions of terms used within the tables are provided in E.4.3.

#### **N E.4.3 Definitions.**

**N E.4.3.1 External Firefighting Systems.** Firefighting resources (i.e., personnel and equipment), from other than aboard the vessel, capable of combating a fire. These resources include, but are not limited to, fire tugs, portable fire pumps, airplanes, helicopters, and shore side fire trucks.

**N E.4.3.2 External Firefighting Teams.** Trained firefighting personnel, aside from the crew, with the capability of boarding and combating a fire on a vessel.

**N E.4.3.3 On-Site Fire Assessment.** A marine firefighting professional on scene, at a safe distance from the vessel or on the vessel, who can determine the steps needed to control and extinguish a marine fire in accordance with a vessel's stability and structural integrity assessment, if necessary.

**N E.4.3.4 Remote Assessment and Consultation.** Contacting the SMFF resource providers by phone or other means of communications to discuss and assess the situation. The person contacted must be competent to consult on a determination of the appropriate course of action and initiation of a response plan.

**N E.4.4 SMFF Equipment.** The SMFF resource provider must supply resources external to the vessel's own firefighting system. Plan holders must ensure external SMFF firefighting equipment is compatible with their vessel. The VRP must list the proper type and amount of extinguishing agent needed to combat a fire involving the vessel's cargo, other contents, and superstructure. If the primary extinguishing agent is foam or water, the VRP must identify resources that are able to pump, for a minimum of 20 minutes, at least 0.016 gpm/ft<sup>2</sup> (0.6733 L/min/m<sup>2</sup>) of the deck area of the vessel, or an appropriate rate for spaces to which this rate is not suitable. The VRP must also identify adequate sources of foam if needed. For a discussion on appropriate extinguishing agents for different types of fire on a tanker, refer to Chapter 5.3 of the *International Safety Guide for Oil Tankers and Terminals*.



**Table E.4.2(a) Required MFF Services and Response Timeframes**

<b>33 CFR Table 155.4030(b) — Marine Firefighting Services and Response Timeframes</b>			
Marine Firefighting	At pier (hours)	CONUS*: Nearshore area; inland waters; Great Lakes; and OCONUS†: < or = 12 miles from COTP city (hours)	CONUS: Offshore area; and OCONUS: < or = 50 miles from COTP city (hours)
1. <i>Assessment and Planning:</i>	—	—	—
(a) Remote assessment and consultation	1	1	1
(b) On-site assessment	2	6	12
2. <i>Fire Suppression:</i>	—	—	—
(a) External firefighting teams	4	8	12
(b) External vessel firefighting systems	4	12	18

\*CONUS: Continental United States.

†OCONUS: Outside Continental United States.

Other external resources and necessary support provided by the SMFF service provider include, but are not limited to, fire team leader, firefighters, firefighting assessor, naval architect, vessel plans, bunker gear and other PPE, portable fire pump systems, dewatering pumps, fire hoses, foam eductors, supplemental firefighting foam, hand and foam nozzles, infrared imagers and heat sensors, fire tugs, emergency towing, airplanes, helicopters, and shoreside fire trucks. Plan holders are required by federal regulation to ensure by contract or other approved means that SMFF resources are available for response to a marine casualty.

**E.4.5 Contract or Other Approved Means.** Contract or other approved means is a written contractual agreement between a plan holder and SMFF resource provider named in the VRP. *Resource provider* means an entity that provides personnel, equipment, supplies, and other capabilities necessary to perform SMFF services identified in the VRP. The resource provider must be selected according to the 15 criteria. For MFF services, resource providers can include public firefighting resources, as long as they are able and willing to provide the services needed. By that logic, a plan holder can name more than one resource provider; however, the plan holder is obligated to name a primary resource provider. *Primary resource provider* means a resource provider listed in the VRP as the principal entity contracted for providing specific SMFF services and resources, when multiple resource providers are listed for that service, for each of the COTP zones in which a vessel operates. The primary resource provider will be the point of contact for the plan holder, the federal on-scene coordinator, and the unified command, in matters related to specific resources and services.

The contract must articulate that the resource provider is capable of and intends to commit to meeting VRP requirements. The agreement can also be a written certification demonstrating the plan holder already has direct control over SMFF personnel, equipment, and capabilities and therefore need not contract with an SMFF resource provider. Each contract developed and signed by the plan holder and resource provider must accompany a funding agreement. The funding agreement identifies agreed-upon rates for specific equipment

**Table E.4.2(b) Response Timeframe End Points for MFF**

<b>33 CFR Table 155.4040(c) — Response Timeframe End Points</b>	
Marine Firefighting:	—
1. Remote assessment and consultation	Firefighter in voice contact with QI/Master/Operator.
2. On-site assessment	Firefighter representative on site
3. External firefighting teams	Team and equipment on scene.
4. External vessel firefighting systems	Personnel and equipment on scene.

and services to be made available by the resource provider ensuring that SMFF responses are not delayed for funding negotiations.

**E.4.6 Public Firefighting Resources.** Public MFF agencies can be listed as resource providers by agreeing in writing to be included in the VRP. Whereas public MFF resources could agree to respond beyond their jurisdiction it is considered unreasonable by regulatory agencies to expect public MFF resources to do this; however, nothing in regulation precludes public emergency responders from executing their duties, nor does federal law or regulation support or encourage public firefighting agencies to respond outside of their jurisdictions. Public MFFs can only respond out to the maximum extent of their jurisdiction, unless other agreements are in place. Other agreements could reflect the public firefighter's commitment to respond beyond their jurisdictional limits such as through membership with a mutual-aid association, in which an agency has agreed, as a member of the association, to respond outside their jurisdictional boundaries. In this case, the public agency can agree in writing to do so as a plan holder's resource provider. Should the public MFFs and plan holder come to an acceptable agreement regarding when and where the public resource(s) can be used beyond jurisdictional limits, then that agreement must be included in the VRP.