NFPA 122 Storage of Flammable and Combustible Liquids Within Underground Metal and Nonmetal Mines (Other than Coal) 1986

National Fire Protection Association Batterymarch Park, Quincy, MA 02269

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

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

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

Statement on NFPA Procedures

This material has been developed under the published procedures of the National Fire Protection Association, which are designed to assure the appointment of technically competent Committees having balanced representation. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accepts any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

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NFPA 122

Standard for the

Storage of Flammable and Combustible Liquids

Within Underground Metal and Nonmetal Mines (Other than Coal)

1986 Edition

This edition of NFPA 122, *Storage of Flammable and Combustible Liquids Within Underground Metal and Nonmetal Mines (Other than Coal)*, was prepared by the Technical Committee on Mining Facilities, and acted on by the National Fire Protection Association, Inc. at its Fall Meeting held November 18-20, 1985 in Baltimore, Maryland. It was issued by the Standards Council on January 17, 1986, with an effective date of February 7, 1986, and supersedes all previous editions.

Origin and Development of NFPA 122

In 1978 the Technical Committee on Mining Facilities through its membership and current Mine Safety and Health Administration regulations identified the need for guidance in storage and handling of flammable and combustible liquids in underground nonmetal mines. This new document, NFPA 122, was developed through several subcommittee and Committee meetings.

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John Nagy, Library, PA
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William T. Trinker, The Mill Mutuals
Robert L. Vines, Bituminous Coal Operators Assn. Inc.

Alternates

Paul H. Dobson, Factory Mutual Research Corp.
(Alternate to J. L. Buckley)
Don MacQueen, Gypsum Assn.
(Alternate to D. Brackett)
Irwin G. Patch, Compressed Gas Assn. Inc.
(Alternate to CGA Rep.)
Harold F. Shultz, Caterpillar Tractor Co.
(Alternate to R. W. Harper)

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

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

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NFPA 122

Standard for the

Storage of Flammable and Combustible Liquids Within Underground Metal and Nonmetal Mines (Other than Coal)

1986 Edition

NOTICE: Information on referenced publications can be found in Chapter 5 and Appendix A.

Chapter 1 Introduction

1-1 Scope. This standard covers minimum requirements for safeguarding life and property against fire and related hazards associated with the storage of flammable and combustible liquids within underground mines other than coal. Storage of flammable and combustible liquids produced in underground mines, such as shale oil mines, are not covered in this standard. Surface storage and handling of flammable and combustible liquids are not covered in this standard. Self-propelled and mobile mining equipment are not covered in this standard.

1-2 Purpose. This standard is prepared for use by those charged with mine fire prevention and fire protection or with responsibility for purchasing, designing, installing, testing, inspecting, approving, listing, operating, or maintaining facilities and equipment for the storage and handling of flammable and combustible liquids within underground mines other than coal.

1-3 General. Because of the uniqueness of underground metal and nonmetal mines other than coal, provisions in this standard may differ from commonly accepted fire protection standards and guides devised for other types of occupancies.

1-3.1 Only those skilled in fire protection are competent to design and supervise the installation of mine fire protection systems. It may be necessary for those charged with the storing of flammable and combustible liquids within underground mines, other than coal, to consult an experienced fire protection specialist.

1-3.2 Nothing in this document is intended to restrict new technologies or alternative arrangements, providing the level of safety, protection, or both, prescribed by this standard is not lowered.

1-4 Definitions.

Approved. Acceptable to the authority having jurisdiction.

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

Atmospheric Tank. A storage tank which has been designed to operate at pressures from atmospheric through 0.5 psig (3.5 kPa).

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

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

Boiling Point. The boiling point of liquid at a pressure of 14.7 psia (760 mm). Where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, for purposes of this standard the 10 percent point of a distillation performed in accordance with ASTM D 86-72, *Standard Method of Test for Distillation of Petroleum Products*, may be used as the boiling point of the liquid.

Closed Container. A container as herein defined, sealed by means of a lid or other device that neither liquid nor vapor will escape from it at ambient temperatures.

Combustible Liquid. See Liquid.

Combustible Liquid Storage Area — Small. Area used for storage of Class II and III combustible liquids where the aggregate quantity present is from 60 to 1,000 gal (0.23 to 3.79 m^3). Handling of liquids incidental to transfer can take place within a storage area.

Combustible Liquid Storage Area — Large. Area used for storage of Class II and III combustible liquids where the aggregate quantity present is greater than 1,000 gal (3.79 m^3). Handling of liquids incidental to transfer can take place within a storage area.

Container. Any vessel of 60 gal (0.23 m^3) or less capacity.

Flammable Liquid. See Liquid.

Flammable Liquid Storage Area — Small. Area used for storage of Class I liquids where the aggregate quantity present is 10 gal (0.038 m²) or less.

Flammable Liquid Storage Area — Large. Area used for storage of Class I liquids where the aggregate quantity present is greater than 10 gal (0.038 m²).

Flash Point of a Liquid. The minimum temperature at which a liquid gives off vapor in sufficient concentration to form an ignitible mixture with air near the surface of the liquid with the vessel as specified by appropriate test procedure and apparatus as follows:

The flash point of a liquid having a viscosity less than 45 SUS at 100°F (37.8°C) or a flash point of 200°F (93.4°C) or higher shall be determined in accordance with ASTM D 56-79, *Standard Method of Test for Flash Point by the Tag Closed Cup Tester.*

The flash point of a liquid having a viscosity of 45 SUS or more at 100°F (37.8°C) or a flash point of 200°F (93.4°C) or higher shall be determined in accordance with ASTM D 93-79, *Standard Method of Test for Flash Point by the Pensky-Martens Closed Tester.*

As an alternative, ASTM D 3243-77, *Standard Method of Tests for Flash Point of Aviation Turbine Fuels by Setaflash Closed Tester*, may be used for testing aviation turbine fuels within the scope of this procedure.

As an alternative, ASTM D 3278-73, *Standard Method of Tests for Flash Point of Liquids by Setaflash Closed Tester*, may be used for paints, enamels, lacquers, varnishes, and related products and their components having flash points between 32°F (0°C) and 230°F (110°C), and having a viscosity lower than 150 stokes at 77°F (25°C).

Labeled. Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization acceptable to the "authority having jurisdiction" and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Liquid. For the purpose of this standard, any material which has a fluidity greater than that of 300 penetration asphalt when tested in accordance with ASTM D 5-73, *Test for Penetration of Bituminous Materials* (1978). When not otherwise identified, the term "liquid" shall mean both flammable and combustible liquids.

Combustible liquids shall be subdivided as follows:

Class II liquids shall include those having flash points at or above 100°F (37.8°C) and below 140°F (60°C).

Class IIIA liquids shall include those having flash points at or above 140°F (60°C) and below (94.4°C).

Class IIIB liquids shall include those having flash points at or above 200°F (93.4°C).

Flammable Liquid. A liquid having a flash point below 100°F (37.8°C) and having a vapor pressure not exceeding 40 lb per sq in. (absolute) (276 kPa) at 100°F (37.8°C) and shall be known as Class I liquid.

Class I liquids shall be subdivided as follows:

Class IA shall include those having flash points below 73°F (22.8°C) and having a boiling point below 100°F (37.8°C).

Class IB shall include those having flash points below 73°F (22.8°C) and having a boiling point at or above 100°F (37.8°C).

Class IC shall include those having flash points at or above 73°F (22.8°C) and below 100°F (37.8°C)

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

NOTE: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognized 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.

Low Pressure Tank. A storage tank designed to withstand an internal pressure above 0.5 psig (3.5 kPa) but not more than 15 psig (102.4 kPa).

Mobile. Any equipment in use without its own motive power train and normally moved by self-propelled equipment.

Operator. The highest-ranking person responsible for conduct of work at a mine.

Portable Tank. Any closed vessel having a liquid capacity over 60 gal (0.23 m³) but less than 1,000 gal (3.79 m³) and not intended for fixed installation.

Pressure Vessel. Any fired or unfired vessel within the scope of the applicable section of the *ASME Boiler and Pressure Vessel Code.*

Safety Can. An approved container, of not more than 5 gal (0.019 m³) capacity, having a spring-closing lid and spout cover and so designed that it will safely relieve internal pressure when subjected to fire exposure.

Self-Closing Door. A door which, when opened and released, returns to the closed position.

Self-Propelled Equipment. Any unit that contains a motive power train as an integral part of the unit and is not rail mounted.

Suitable. That which fits and has the qualities or qualifications to meet a given purpose, occasion, condition, function, or circumstance.

Tank. Any vessel over 60 gal (0.23 m³) in capacity.

Chapter 2 Flammable Liquid Storage

2-1 General.

2-1.1 Whenever possible, the storage of Class I flammable liquids underground shall be avoided as those liquids are inherently hazardous.

2-1.2 Electrical equipment in large flammable liquid storage areas shall be Class I, Division 1, as specified in NFPA 70, *National Electrical Code®*, or Bureau of Mines or Mine Safety and Health Administration classified "permissible" electrical equipment.

2-1.3 Class I flammable liquids shall be kept in closed containers when not in use.

2-1.4 Class I flammable liquids may be used only where there are no open flames or other sources of ignition within the possible path of vapor travel in flammable concentrations.

2-1.5 Flammable liquid containers shall be returned to a flammable liquid storage area after use.

2-2 Flammable Liquid Containers.

2-2.1 Safety cans or containers for flammable liquids authorized by the U.S. Department of Transportation shall be acceptable as storage containers.

2-2.2 Containers for flammable liquids shall conform to the capacity limitations listed in Table 2-1.

Table 2-1
Maximum Allowable Size of Containers for Flammable Liquids

Container Type	Class IA gal	Class IB gal	Class IC gal
Metal containers (other than DOT containers) or approved plastic containers	1	5	5
Safety cans	2	5	5
Containers, other than safety cans, meeting the requirements of 2-2.1	60	60	60

For SI Units: 1 gal = 3.785 L

2-2.3 All flammable liquid containers, except approved safety cans, shall be clearly labeled with the word "flammable."

2-2.4 Flammable liquid containers shall be stored in a stable manner.

2-3 Small Flammable Liquid Storage Areas.

2-3.1 Small flammable liquid storage areas shall be separated from other small flammable or combustible liquid storage areas by at least 50 ft (14.2 m) or from large flammable liquid storage areas by a distance of at least 100 ft (30.5 m), or separated by unexcavated rock or masonry bulkheads.

2-3.2 Storage of flammable liquids in small flammable liquid storage areas shall be in cabinets specifically designed and constructed for such purpose.

2-4 Large Flammable Liquid Storage Areas.

2-4.1 The total aggregate quantity of Class I flammable liquids to be stored in any one storage area shall not exceed 165 gal (0.62 m^3).

2-4.2 Large flammable liquid storage areas shall be separated from other flammable or combustible liquid storage areas by at least 100 ft (30.5 m) or separated by unexcavated rock or masonary bulkhead and shall be located a minimum of 100 ft.(30.5 m) away from any shaft station or explosives magazine or electrical substation and transformers. Electrical equipment within 50 ft (15.2 m) from the storage area shall be Class I, Division 1 as specified in NFPA 70, *National Electrical Code*, or Bureau of Mines or Mine Safety and Health Administration classified permissible electrical equipment.

2-4.2.1 Large flammable liquid storage areas shall be located a minimum of 100 ft (30.5 m) away from any working face and out of the line of sight of blasting, or a minimum of 500 ft (152.4 m) in line of sight of any working face.

2-4.2.2 Large flammable liquid storage areas shall not be constructed in an area bounded at any point by self-igniting ore.

2-4.3 Large flammable liquid storage areas shall be of noncombustible construction. Combustible rock shall be covered with noncombustible material, such as Gunite, shotcrete, or preformed masonry units.

2-4.3.1 Masonry bulkheads shall be tightly sealed and have a minimum 2-hr fire rating.

2-4.3.2 Each opening into a large flamamble liquid storage area shall be limited to a maximum area of 100 sq ft (9.2. m^2).

2-4.3.3 Openings shall be equipped with self-closing fire doors with a minimum 1½-hr fire rating.

2-4.3.4 The entire storage area below the sill shall be capable of containing the total amount of flammable liquids stored, or means shall be provided to remove the spilled flammable liquid safely.

2-4.3.5 Large flammable liquid storage areas shall have exhaust directed to an exhaust ventilating system, or an approved fire protection system shall be installed. Where exhaust ventilation is used, the air movement shall have a velocity of at least 10 ft per minute (0.05 m/sec).

2-4.4 Storage cabinets meeting requirements specified in Section 4-3 "Design, Construction and Capacity of Storage Cabinets," of NFPA 30 shall be considered to meet construction requirements for large flammable liquid storage areas.

2-5 Dispensing Class I Flammable Liquids.

2-5.1 Class I flammable liquids shall be drawn from or

transferred into containers within a storage area only: (1) from safety cans, (2) from a container by means of a device drawing through an opening in the top of the container, or (3) by gravity through a listed or approved self-closing valve or self-closing faucet.

2-5.2 Transferring flammable liquids by means of pressurizing a container with air is prohibited. Transferring flammable liquids by pressure of inert gas is permitted only if controls, including pressure relief devices, are provided to limit the pressure so it cannot exceed the design pressure of the container.

2-5.3 Where electrically powered pumps are used to transfer flammable liquids, a clearly identified and accessible switch or circuit breaker shall be provided at a location remote from dispensing devices, including remote pumping systems, to shut off the power to all dispensing devices in the event of an emergency.

2-6 Housekeeping.

2-6.1 Maintenance and operating practices within a flammable liquids storage area shall minimize leakage and prevent the accidental escape of flammable liquids from the storage area.

2-6.2 Where flammable liquids are used or handled, means shall be provided to safely dispose of leakage or spills.

2-6.3 Combustible material shall not be allowed to accumulate in quantities sufficient to create a fire hazard within a flammable liquids storage area.

2-6.4 Access routes shall be kept clear of obstruction to permit ready access to and use of fire protection equipment.

2-7 Personnel Safety.

2-7.1 Precautions shall be taken to prevent the ignition of flammable vapors. Sources of ignition include but are not limited to: open flames; smoking; cutting and welding; hot surfaces; frictional heat; static, electrical, and mechanical sparks; spontaneous ignition, including heat-producing chemical reactions; and radiant heat.

Chapter 3 Combustible Liquid Storage

3-1 General.

3-1.1 This chapter shall apply to the storage of combustible liquids in containers, portable tanks, and tanks intended for fixed installations. Combustible liquids in use are not covered by this standard.

3-1.2 Combustible liquids in the quanitities described in paragraphs (a) and (b) do not require any special consideration and are exempt from the requirements for storage areas:

(a) Class II combustible liquids stored in containers meeting requirements of this chapter and not exceeding 60 gal (0.23 m^3).

(b) Class III combustible liquids stored in containers or approved tanks as specified in this chapter and not exceeding 660 gal (2.5 m^3).

3-1.2.1 To qualify for exemption, containers and tanks shall be located at least 50 feet (15.2 m) from a working face, explosives magazines, electrical substations, shafts, "other exempt containers or tanks," or any storage area, and shall be out of the line of sight of blasting, and shall be located out of the way of vehicular traffic.

3-2 Combustible Liquid Containers and Tanks.

3-2.1 Shipping containers and portable tanks of combustible liquids authorized by the U.S. Department of Transportation, or conforming to the requirements of NFPA 386, *Standard for Portable Shipping Tanks for Flammable and Combustible Liquids*, shall be acceptable as storage containers.

3-2.1.1 Containers and portable tanks for combustible liquids shall conform to the capacity limitations as defined in Section 1-4.

3-2.2 Combustible liquid stoarage tanks intended for fixed installation and engineered portable tanks shall be of materials compatible with the liquid stored, and designed and built in accordance with good engineering practices.

3-2.3 Atmospheric Tanks.

3-2.3.1 Atmospheric tanks shall be built in accordance with good engineering practices. Useful information on the design and construction of atmospheric tanks may be found in American Petroleum Institute 650, *Standard for Welded Steel Tanks for Oil Storage*, or UL-142, *Standard for Steel Above-Ground Tanks for Flammable and Combustible Liquids*, or UL-80, *Standard for Steel Inside Tanks for Oil Burner Fuel.*

NOTE: Low pressure tanks and pressure vessels may be used as atmospheric tanks.

3-2.3.2 Atmospheric tanks shall not be used for storage of a combustible liquid at a temperature above its boiling point.

3-2.4 Low Pressure Tanks.

3-2.4.1 The operating pressure of the tanks shall not exceed the design working pressure.

3-2.4.2 Low pressure tanks shall be built in accordance with good engineering practices. Useful information on the design and construction of atmosperic tanks may be found in American Petroleum Institute 620, *Recommended Rules for the Design and Construction of Large, Welded, Low-Pressure Storage Tanks*, or the principles of the *Code for Unfired Pressure Vessels*, Section VIII, Division I, of the *ASME Boiler and Pressure Vessel Code*, 1974.

3-2.5 Pressure Vessels.

3-2.5.1 The operating pressure of the vessel shall not exceed the design working pressure.

3-2.5.2 Pressure vessels shall be built in accordance

with good engineering practices. Useful information on the design and construction of pressure vessels may be found in the principles of the *Code for Unfired Pressure Vessels*, Section VIII, Division I of the *ASME Boiler and Pressure Vessel Code*, 1974.

3-2.6 Venting Atmospheric and Low Pressure Combustible Liquid Storage Tanks.

3-2.6.1 Storage tanks shall be vented to prevent the development of vacuum or pressure sufficient to distort the shell or roof of the tank as a result of filling or emptying and atmospheric temperature changes. Protection shall also be provided to prevent overpressure from any filling source exceeding the design pressure of the tank.

3-2.6.2 Vents shall be at least as large as the filling or withdrawing lines but no less that 1¼ in. (21.8 mm) nominal inside diameter. If more than one fill or withdraw line can be simultaneously used, the vent capacity shall be based on the maximum anticipated simultaneous flow. Useful information on venting may be found in American Petroleum Institute 2000, *Standard for Venting Atmospheric and Low Pressure Storage Tanks*.

3-2.6.3 Vent pipes shall be constructed so as to drain toward the tank without sags or traps to collect liquid.

3-2.7 Additional Considerations.

3-2.7.1 Connections for all tank openings shall be liquidtight.

3-2.7.2 Each connection to a tank through which liquid can normally flow shall be provided with an internal or external valve located as close as practical to the shell of the tank.

3-2.7.3 Tanks for Class II liquids shall be provided with a means for quick cutoff of flow in the event of fire in the vicinity of the tank.

3-2.7.4 Openings for manual gaging, if independent of the fill pipe, shall be kept closed when not gaging. Each such opening for any liquid shall be protected against liquid overflow and possible vapor release by means of a spring-loaded check valve or other appropriate device. Substitutes for manual gaging are acceptable.

3-3 Small Combustible Liquid Storage Areas.

3-3.1 Ventilation shall be provided to prevent the accumulation of flammable vapors.

3-3.2 Small combustible liquid storage areas shall be a minimum of 100 ft (30.5 m) away from explosives magazines, electrical substations, working faces, or other combustible liquid storage areas, or separated by unexcavated rock, or a masonry bulkhead. The storage area, unless equipped with an approved fire protection system, shall be a minimum of 100 ft (30.5 m) away from any shaft station.

3-3.3 A small combustible liquid storage area shall be recessed or otherwise located and protected from accidental damage by mobile equipment or blasting.

3-3.4 Small combustible liquid storage areas shall not be constructed in an area bounded at any point by self-igniting ore.

3-3.5 Where small combustible liquid storage areas are constructed of combustible materials or in rock capable of self-propagating combustion, the material or rock shall be covered with noncombustible materials such as Gunite, shotcrete, or performed masonry units.

3-3.6 Electrical equipment within small combustible liquid storage areas containing Class II combustible liquids shall be Class I, Division 2, Group C and D, as specified in NFPA 70, *National Electrical Code*, or Bureau of Mines or Mine Safety and Health Administration classified permissible electrical equipment.

3-3.7 When tanks are used, a means small be provided to safely confine within or remove from the small combustible liquid storage area the contents of the largest tank in the event of a tank rupture.

3-4 Large Combustible Liquid Storage Areas.

3-4.1 The total quantity of combustible liquids in storage tanks intended for fixed installation shall not be restricted.

3-4.2 In areas not protected by automatic fire suppression systems, the total quantity of combustible liquids in containers and portable tanks shall be restricted in accordance with Table 3-1, but in no case shall the aggregate quantity exceed 50,000 gal (189 m^3) in one storage area. The use of racks shall not be permitted in unprotected areas.

3-4.3 Where combustible liquid storage areas are protected by automatic fire suppression systems, the total quantity of combustible liquids in containers and portable tanks shall be unrestricted. Within a combustible liquid storage area, the quantity stored in a single pile shall be in accordance with Table 3-1. Where racks are used, the heights and quantities per rack shall be in accordance with Table 3-2.

3-4.4 For mixed storage of Class II and Class III liquids in a single pile or rack, the maximum quantity and maximum height in that pile or rack shall be that for Class II liquids (*see Tables 3-2 and 3-3*), as applicable.

3-4.5 Individual piles (*see Tables 3-1 and 3-2*) shall be arranged so that piles are separated from each other by at least 4 ft (1.22 m).

3-4.6 Single-row or double-row rack storage (*see Table 3-3*) shall be separated by a minimum of 8-ft (2.44-m) aisles from other rows of rack storage or other pile storage.

3-4.7 Empty or idle combustible pallet storage within the combustible liquid storage area shall be limited to a maximum pile size of 250 sq ft (23.2 m^2) and maximum storage height of 7 ft (2.13 m). Idle pallet storage shall be separated from combustible liquids by at least 4 ft (1.22 m).

Table 3-1
Unprotected Storage of Combustible Liquids in Containers and Portable Tanks

	Container Storage			Portable Tank Storage		
Class	Max. Pile Hgt. (ft)	Max. Quan. per pile (gal)	Max. Total Quan. (gal)	Max Pile Hgt. (ft)	Max. Quan. per pile (gal)	Max. Total Quan. (gal)
II	7	2,000	4,000	10	3,000	6,000
IIIA	7	7,000	14,000	10	11,000	22,000
IIIB	7	7,000	28,000	10	11,000	44,000

For SI Units: 1 ft = 0.3048 m, 1 gal = 3.785 L

Table 3-2
Storage Arrangements for Protected Palletized or Solid Pile Storage of Combustible Liquids in Containers and Portable Tanks

	Max. Storage Height (ft)		Max. Quan. per pile (gal)	
Class	Containers	Portable Tanks	Containers	Portable Tanks
II	7	10	7,500	20,000
III	10	15	10,000	20,000

For SI Units: 1 ft = 0.3048 m, 1 gal = 3.785 L

Table 3-3
Storage Arrangements for Protected Rack Storage of Combustible Liquids in Containers

Class	Type Rack	Max. Storage Hgt. (ft)	Max. Quan. per rack (gal)
II	Double Row or Single Row	15	9,000
III	Multi-Row Double Row or Single Row	20	24,000

For SI Units: 1 ft = 0.3048 m, 1 gal = 3.785 L

3-4.8 Large combustible liquid storage areas shall be a minimum of 100 ft (30.5 m) away from explosives magazines or electrical substations.

3-4.9 Large combustible liquid storage areas shall be a minimum of 100 ft (30.5 m) away from any shaft station, unless equipped with an approved fire protection system.

3-4.10 Large combustible liquid storage areas shall be a minimum of 100 ft (30.5 m) away from any working face and out of the line of sight of blasting or a minimum of 500 ft (152 m), line of sight, away from any working face to avoid damage from fly rock.

3-4.11 Large combustible liquid storage areas shall be separated from other flammable or combustible liquid storage areas by a distance of at least 100 ft (30.5 m), or separated by unexcavated rock or masonry bulkhead.

3-4.12 Large combustible liquid storage areas which are enclosed shall be built of noncombustible materials. Combustible rock within all large combustible liquid storage areas shall be covered with noncombustible materials such as Gunite, shotcrete, or preformed masonry. No storage areas shall be constructed in a location bounded at any point by self-igniting ore.

3-4.13 If enclosed, each opening into a large combustible liquid storage area shall be equipped with a self-closing metal door.

3-4.14 Bulkheads, if used, shall be tightly sealed and shall be built or covered with noncombustible materials.

3-4.15 Tanks shall rest on the ground or on foundations made of concrete, masonry, piling, or steel. Tank foundations shall be designed to minimize the possibility of uneven settling of the tank and to minimize corrosion in any part of the tank resting on the foundation. Useful information on tank foundations may be found in Appendix E of API 650, *Standard for Welded Steel Tanks for Oil Storage*, and Appendix B of API 620, *Recommended Rules for the Design and Construction of Large, Welded, Low-Pressure Storage Tanks.*

3-4.16 The entire large combustible liquid storage area below the door sill shall be capable of containing the total amount of combustible liquid or means shall be provided to remove the combustible liquid safely.

3-4.17 Electrical equipment within large combustible liquid storage areas containing Class II combustible liquids shall be Class I, Division 2, as specified in NFPA 70, *National Electrical Code*, or Bureau of Mines or Mine Safety and Health Administration classified permissible electrical equipment.

3-4.18 All piping, valves, and fittings shall be suitable for the expected working pressures and structural stresses.

3-4.19 Large combustible liquid storage areas shall have exhaust directed to an exhaust ventilating system. This requirement does not apply to buried tanks or areas equipped with automatic fire protection systems.

3-4.20 Adequate ventilation shall be provided to prevent the accumulation of flammable vapors.

3-5 Dispensing Combustible Liquids.

3-5.1 When combustible liquids are transferred within a storage area, means to control the flow to minimize leakage or accidental discharge shall be provided.

3-5.2 Combustible liquids may be dispensed by applying positive pressure to drums and similar vessels only when these vessels are approved for the purpose. Otherwise, pumps taking suction through the top of the container or gravity feed with self-closing faucets shall be used.

3-5.3 Where electrically powered pumps are used to transfer combustible liquids, a clearly identified and accessible switch or circuit breaker shall be provided at a location remote from dispensing devices, including remote pumping systems, to shut off the power to all dispensing devices in the event of an emergency.

3-6 Housekeeping.

3-6.1 Maintenance and operating practices within a combustible liquids storage area shall minimize leakage and prevent the accidental escape of combustible liquids from the storage area.

3-6.2 Combustible material shall not be allowed to accumulate in quantities sufficient to create a fire hazard within a combustible liquids storage area.

3-6.3 Approved metal receptacles shall be provided within a combustible liquids storage area for the storage of oil-soaked waste or cloths until removed to a safe place for disposal.

3-6.4 Access routes shall be kept clear of obstruction to permit ready access and use of fire protection equipment.

3-7 Personnel Safety.

3-7.1 Precautions shall be taken to prevent the ignition of flammable vapors. Sources of ignition include, but are not limited to: open flames; smoking; cutting and welding; hot surface, frictional heat; electrical; heat-producing chemical reactions; and radiant heat.

Chapter 4 Fire Suppression

4-1 Flammable Liquid Storage Areas.

4-1.1 At least one portable fire extinguisher having a nominal capacity of 10 lb (4.55 kg) with a minimum rating of 4A-40B:C shall be readily accessible to small flammable liquid storage areas.

4-1.2 At least one portable fire extinguisher having a nominal capacity of 30 lb (11.3 kg) with a minimum rating of 20A-80B:C shall be readily accessible to large flammable liquid storage areas. The installation of manual or automatic fire suppression systems shall not eliminate the requirement for a portable fire extinguisher.

4-2 Combustible Liquid Storage Areas.

4-2.1 Suitable portable fire extinguishers, or fire suppression systems, or preconnected hoselines shall be provided in combustible liquid storage areas.

4-2.2 At least one portable fire extinguisher having a nominal capacity of 20 lb (9.1 kg) with a minimum rating of 10A-60B:C shall be located outside of, but not more than 10 ft (3 m) from, the opening into any separate storage area.

4-3 Portable Fire Extinguishers.

4-3.1 Hand portable and wheeled extinguishers shall be in accordance with Chapters 1, 2, 4, and 5 of NFPA 10, *Standard for Portable Fire Extinguishers*.

4-3.2 Where portable fire extinguishers are provided within storage areas, travel distance to a portable extinguisher shall not exceed 40 ft (12.2 m).

4-4 Preconnected Hoselines.

4-4.1 Preconnected hoselines shall be in accordance with sections 4-1, 4-2, Chapter 5, and Chapter 7 of NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, and shall be a minimum of either 1½ in. (38.1 mm) lined or 1 in. (25.4 mm) hard rubber.

4-5 Fire Suppression Systems.

4-5.1 Fire suppression systems, other than automatic sprinkler systems, shall be in accordance with NFPA 11, 11A, 12, 12A, 15, 16, and 17.

4-5.2 Automatic sprinkler systems shall be installed in accordance with NFPA 13, *Standard for Installation of Sprinkler Systems*.

4-5.3 Where the fire suppression requirements of this standard are met by means other than an automatic sprinkler system, but an automatic sprinkler system is installed to supplement such means, the water supply requirements for automatic sprinkler systems contained in Section 2-2 of NFPA 13 need not be met.

4-6 Inspection and Maintenance.

4-6.1 Portable extinguishers shall be maintained in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*.

4-6.2 Any fire suppression system, including sprinklers installed to satisfy the requirements of this standard, shall be properly maintained in accordance with the applicable standards for the system.

4-7 Training.

4-7.1 All persons who may be expected to inspect, test, operate, or maintain fire suppression systems shall be thoroughly trained in the functions they are expected to perform with periodic refresher instructions.

Chapter 5 Referenced Publications

5-1 The following documents of portions thereof are referenced within this standard and shall be considered part of the requirements of this document. The edition indicated for each reference is current as of the date of the NFPA issuance of this document. These references are listed separately to facilitate updating to the latest edition by the user.

5-1.1 NFPA Publications. National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

NFPA 10-1984, *Standard for Portable Fire Extinguishers*

NFPA 11-1983, *Standard for Low Expansion Foam and Combined Agent Systems*

NFPA 11A-1983, *Standard for Medium and High Expansion Foam Systems*

NFPA 12-1985, *Standard on Carbon Dioxide Extinguishing Systems*

NFPA 12A-1985, *Standard on Halon 1301 Fire Extinguishing Systems*

NFPA 13-1985, *Standard for Installation of Sprinkler Systems*

NFPA 14-1983, *Standard for the Installation of Standpipe and Hose Systems*

NFPA 15-1985, *Standard for Water Spray Fixed Systems for Fire Protection*

NFPA 16-1980, *Standard for the Installation of Deluge Foam-Water Sprinkler Systems and Foam-Water Spray Systems*

NFPA 17-1985, *Standard for Dry Chemical Extinguishing Systems*

NFPA 30-1984, *Flammable and Combustible Liquids Code*

NFPA 70-1984, *National Electrical Code*

NFPA 386-1985, *Standard for Portable Shipping Tanks for Flammable and Combustible Liquids.*

5-1.2 ASTM Publications. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D 5-1973 (1978), *Standard Method of Test for Penetration of Bituminous Materials*

ASTM D 56-1979, *Standard Method of Test For Flash Point by the Tag Closed Cup Tester*

ASTM D 86-1972, *Standard Method of Test for Distillation of Petroleum Products*

ASTM D 93-1973, *Standard Method of Test for Flash Point by the Pensky-Martens Closed Tester*

ASTM D 3243-1977, *Standard Method of Tests for Flash Point of Aviation Turbine Fuels by Setaflash Closed Tester*

ASTM D 3278-1973, *Standard Method of Tests for Flash Point of Liquids by Setaflash Closed Tester.*

5-1.3 ASME Publication. American Society for Mechanical Engineers, 234 East 47th St., New York, NY 10017.

ASME Boiler and Pressure Vessel Code, 1980.

5-1.4 API Publications. American Petroleum Institute, 2101 L Street NW, Washington DC 20037.

API-620, *Recommended Rules for the Design and Construction of Large, Welded, Low-Pressure Storage Tanks* (Sixth Edition 1978, Revison 2)

API-650, *Standard for Welded Steel Tanks for Oil Storage* (Seventh Edition, 1980)

API-2000, *Standard for Venting Atmospheric and Low-Pressure Storage Tanks* (Second Edition, 1973).

5-1.5 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL-80, *Standard for Steel Inside Tanks for Oil Burner Fuel* (Eighth Edition, September, 1974)

UL-142, *Standard for Steel Above-Ground Tanks for Flammable and Combustible Liquids* (Fourth Edition, December, 1972).

Appendix A Referenced Publications

A-1 This Appendix lists publications which were not referenced within this NFPA document but are included as sources of additional information.

The following Bureau of Mines research contract final reports are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA, 22161.

Christensen, B.C. and G. R. Reid. "Improved Fire Protection System for Underground Fueling Areas - Volume I." U.S. Bureau of Mines/Ansul Co. Final Report for Contract H0262023. U.S. Bureau Open File Report OFR-120-78. NTIS No. PB-288-298-AS.

McDonald, L., D. Kennedy, and G. Reid. "Improved Fire Protection System for Underground Fueling Areas - Volume II." U.S. Bureau of Mines/Ansul Co. Final Report for Contract H0262023. U.S. Bureau of Mines Open File Report OFR-160-82. NTIS No. PB-83-113-744.

The following Bureau of Mines Reports are available from the U.S. Bureau of Mines, Branch of Production and Distribution, Division of Publication, 4800 Forbes Ave., Pittsburgh, PA, 15213.

Information Circular 8865, "Underground Metal and Nonmetal Mine Fire Protection."

Technology News No. 160, "Automatic Fire Protection Systems for Underground Fueling Areas."

SUBMITTING PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Contact NFPA Standards Administration for final date for receipt of proposals on a specific document.

INSTRUCTIONS

Please use the forms which follow for submitting proposed amendments. Use a separate form for each proposal.

1. For each document on which you are proposing amendment indicate:
   (a) The number and title of the document
   (b) The specific section or paragraph.

2. Check the box indicating whether or not this proposal recommends new text, revised text, or to delete text.

3. In the space identified as "Proposal" include the wording you propose as new or revised text, or indicate if you wish to delete text.

4. In the space titled "Statement of Problem and Substantiation for Proposal" state the problem which will be resolved by your recommendation and give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If a statement is more than 200 words in length, the technical committee is authorized to abstract it for the Technical Committee Report.

5. Check the box indicating whether or not this proposal is original material, and if it is not, indicate source.

6. If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee.

NOTE: The NFPA Regulations Governing Committee Projects in Paragraph 10-10 state: Each proposal shall be submitted to the Council Secretary and shall include:

(a) identification of the submitter and his affiliation (Committee, organization, company) where appropriate, and

(b) identification of the document, paragraph of the document to which the proposal is directed, and

(c) a statement of the problem and substantiation for the proposal, and

(d) proposed text of proposal, including the wording to be added, revised (and how revised), or deleted.

FORM FOR PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Mail to: Secretary, Standards Council
National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269

Date 5/18/85 Name John B. Smith Tel. No. 617-555-1212

Address 9 Seattle St., Seattle, WA 02255

Representing (Please indicate organization, company or self) Fire Marshals Assn. of North America

1. a) Document Title: Protective Signaling Systems NFPA No. & Year NFPA 72D

   b) Section/Paragraph: 2-7.1 (Exception)

2. Proposal recommends: (Check one) ☐ new text
   ☐ revised text
   ☐ deleted text.

3. Proposal (include proposed new or revised wording, or identification of wording to be deleted):

   Delete exception.

4. Statement of Problem and Substantiation for Proposal:

   A properly installed and maintained system should be free of ground faults. The occurrence of one or more ground faults should be required to cause a "trouble" signal because it indicates a condition that could contribute to future malfunction of the system. Ground fault protection has been widely available on these systems for years and its cost is negligible. Requiring it on all systems will promote better installations, maintenance and reliability.

5. ☒ This Proposal is original material.
   ☐ This Proposal is not original material; its source (if known) is as follows: _____

(Note: Original material is considered to be the submitter's own idea based on or as a result of his own experience, thought, or research and, to the best of his knowledge, is not copied from another source.)

I agree to give NFPA all and full rights, including rights of copyright, in this Proposal and I understand that I acquire no rights in any publication of NFPA in which this Proposal in this or another similar or analogous form is used.

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