

NFPA®

704

Standard System for the
Identification of the
Hazards of Materials
for Emergency Response

2022



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NFPA® 704

Standard System for the

Identification of the Hazards of Materials for Emergency Response

2022 Edition

This edition of NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*, was prepared by the Technical Committee on Classification and Properties of Hazardous Chemical Data. It was issued by the Standards Council on October 14, 2020, with an effective date of November 3, 2020, and supersedes all previous editions.

This edition of NFPA 704 was approved as an American National Standard on November 3, 2020.

Origin and Development of NFPA 704

Work on this standard originated in 1957. A great deal of the development work had been done by the NFPA Sectional Committee on Classification, Labeling, and Properties of Flammable Liquids starting in 1952. Background data were published by the association in its quarterly magazine in 1954, 1956, and 1958. The material in its present form was first tentatively adopted in 1960. Official adoption was secured in 1961, and revisions were adopted in 1964, 1966, 1969, 1975, 1980, and 1985. In the 1987 and 1990 editions, the Committee on Fire Hazards of Materials introduced quantitative guidelines for assigning the Health Hazard and Reactivity Hazard Ratings. The 1996 edition introduced additional quantitative guidelines and an amended definition for *instability hazard rating*, formerly *reactivity hazard rating*.

The 2001 edition clarified numerous topics, including the following: rating of mixtures; three options of how to rate areas with multiple chemical storage and use; location of signs; more quantitative criteria for flammability ratings for solids; and quantitative criteria for a flammability rating of zero, including introduction of a new test method. Guidance material was added for quantifying the degree of water reactivity. An annex was added to cover water reactivity and identification criteria, as well as additional information on flash point test methods.

The 2007 edition clarified topics including the special hazards quadrant and placement and hierarchy of symbols. The new simple asphyxiant (SA) designation and other optional symbols, as well as requirements for the classification of flammability rating for dusts, were added.

The 2012 edition included reinstatement of the differential scanning calorimetry (DSC) hazard criterion to Table 7.2 as well as new guidance on the flammability hazard classification for aerosol products. The 2012 edition also included new text in Table 6.2 that emphasized the use of Annex D to classify the flammability hazard of a finely divided solid.

In 2017 information related to differential scanning calorimetry (DSC) exotherm onset temperature criteria was removed from Table 7.2. Chapter 8 was modified to require the use of the SA symbol for liquefied carbon dioxide vapor withdrawal systems and where large quantities of dry ice are used in confined areas. Annex G was added to explain key differences between the OSHA HazCom 2012 and NFPA 704. Annex H was added to provide sample placards that can be extracted into emergency response publications and training materials.

The 2022 edition of the standard includes revisions to Figures 9.1(b) and 9.1(c) that provide guidance on NFPA 704 placard and numeral dimension and size requirements.

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

Committee Scope: This Committee shall have primary responsibility for documents on the classification of the relative hazards of all chemical solids, liquids and gases and to compile data on the hazard properties of these hazardous chemicals.

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

Chapter 1 Administration

1.1 Scope. This standard shall address the health, flammability, instability, and related hazards that are presented by short-term, acute exposure to a material under conditions of fire, spill, or similar emergencies.

1.2 Purpose.

1.2.1 This standard shall provide a simple, readily recognized, and easily understood system of markings that provides a general idea of the hazards of a material and the severity of these hazards as they relate to emergency response.

1.2.2 The objectives of the system shall be as follows:

- (1) To provide an appropriate signal or alert and on-the-spot information to safeguard the lives of both public and private emergency response personnel
- (2) To assist in planning for effective fire and emergency control operations, including cleanup
- (3) To assist all designated personnel, engineers, and plant and safety personnel in evaluating hazards

1.2.3 This system shall provide basic information to fire-fighting, emergency, and other personnel, enabling them to easily decide whether to evacuate the area or to commence emergency control procedures.

1.2.4 This system also shall provide those personnel with information to assist in selecting fire-fighting tactics and emergency procedures.

1.2.5 Local conditions can have a bearing on evaluation of hazards; therefore, discussion shall be kept in general terms.

1.3 Application.

1.3.1 This standard shall apply to industrial, commercial, and institutional facilities that manufacture, process, use, or store hazardous materials.

1.3.2* This standard shall not apply to transportation or use by the general public and is not intended to address the following:

- (1) Occupational exposure
- (2) Explosive and blasting agents, including commercial explosive material as defined in NFPA 495
- (3) Chemicals whose only hazard is one of chronic health hazards
- (4) Teratogens, mutagens, oncogens, etiologic agents, and other similar hazards

1.4 Retroactivity. The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

1.4.1 Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

1.4.2 In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this standard deemed appropriate.

1.4.3 The retroactive requirements of this standard shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction and only where it is clearly evident that a reasonable degree of safety is provided.

1.5 Equivalency. Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

1.5.1 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

1.5.2 The system, method, or device shall be approved for the intended purpose by the authority having jurisdiction.

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 70®, *National Electrical Code*®, 2020 edition.
NFPA 495, *Explosive Materials Code*, 2018 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 D92, *Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester*, 2018.

ASTM D3065, *Standard Test Methods for Flammability of Aerosol Products*, 2001, reapproved 2013.

ASTM D6668, *Standard Test Method for the Discrimination Between Flammability Ratings of F = 0 and F = 1*, 2001, reapproved 2016.

2.3.2 UN Publications. United Nations, 799 United Nations Plaza, New York, NY 10017.

Manual of Tests and Criteria, 6th revised edition.

Recommendations on the Transport of Dangerous Goods, Model Regulations, 19th revised edition.

2.3.3 US Government Publications. US Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001.

Title 16, Code of Federal Regulations, “Method for Determining Flammable and Extremely Flammable Contents of Self-Pressurized Containers,” Part 1500.45.

Title 49, Code of Federal Regulations, “Method of Testing for Sustained Combustibility,” Part 173, Appendix H.

2.3.4 Other Publications.

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

2.4 References for Extracts in Mandatory Sections.

NFPA 1, *Fire Code*, 2018 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 2018 edition.

NFPA 55, *Compressed Gases and Cryogenic Fluids Code*, 2020 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 Shall. Indicates a mandatory requirement.

3.2.4 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* Boiling Point. The temperature at which the vapor pressure of a liquid equals the surrounding atmospheric pressure. [30, 2018]

3.3.2 Cryogenic Fluid. A fluid with a boiling point lower than –130°F (–90°C) at an absolute pressure of 14.7 psi (101.3 kPa). [55, 2020]

3.3.3 Fire Point. The lowest temperature at which a liquid will ignite and achieve sustained burning when exposed to a test flame in accordance with ASTM D92, *Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester*. [30, 2018]

3.3.4* Flash Point. The minimum temperature at which a liquid or a solid emits vapor sufficient to form an ignitable mixture with air near the surface of the liquid or the solid.

3.3.5* Frostbite. Frostbite is a localized condition that occurs when the layers of the skin and deeper tissue freeze.

3.3.6 Materials.

3.3.6.1 Stable Materials. Those materials that normally have the capacity to resist changes in their chemical composition, despite exposure to air, water, and heat as encountered in fire emergencies.

3.3.6.2 Unstable Materials. A material that, in the pure state or as commercially produced, will vigorously polymerize, decompose or condense, become self-reactive, or otherwise undergo a violent chemical change under conditions of shock, pressure, or temperature.

3.3.7 Simple Asphyxiant Gas. A gas that does not provide sufficient oxygen to support life and that has none of the other physical or health hazards. [1, 2018]

Chapter 4 General

4.1 Description.

4.1.1 This system of markings shall identify the hazards of a material in terms of the following three principal categories:

- (1) Health
- (2) Flammability
- (3) Instability

4.1.2 The system shall indicate the degree of severity by a numerical rating that ranges from 4, indicating severe hazard, to 0, indicating minimal hazard.

4.1.3 The information shall be presented by a spatial arrangement of numerical ratings, with the health rating always at the nine o'clock position, the flammability rating always at the twelve o'clock position, and the instability rating always at the three o'clock position.

4.1.4* Each rating shall be located in a square-on-point field (commonly referred to as a diamond), each of which is assigned a color as follows:

- (1) Blue for health hazard
- (2) Red for flammability hazard
- (3) Yellow for instability hazard

4.1.5 Alternatively, the square-on-point field shall be permitted to be any convenient contrasting color and the numbers themselves shall be permitted to be colored. (See Figure 9.1(a) through Figure 9.1(c) for examples of the spatial arrangements.)

4.1.6 The fourth quadrant, at the six o'clock position, shall be reserved for indicating special hazards and shall be in accordance with Chapter 8. No special color is associated with this quadrant.

4.2 Assignment of Ratings.

4.2.1 The hazard evaluation required to determine the correct hazard ratings for a specific material shall be performed by persons who are technically competent and experienced in the interpretation of the hazard criteria set forth in this standard.

4.2.2* Assignment of ratings shall be based on factors that encompass a knowledge of the inherent hazards of the material, including the extent of change in behavior to be anticipated under conditions of exposure to fire or fire control procedures.

4.2.3 The system shall be based on relative rather than absolute values, requiring that considerable judgment be exercised.

4.2.3.1 Based on professional judgment, the hazard rating shall be permitted to be either increased or decreased to more accurately assess the likely degree of hazard that will be encountered.

4.2.3.2* It shall be anticipated that different physical forms of the material or conditions of storage and use could result in different ratings being assigned to the same material.

4.2.3.3* Where more than one chemical is present in a building or specific area, professional judgment shall be exercised to indicate ratings using the following methods:

- (1) *Composite Method.* Where many chemicals are present, a single sign shall summarize the maximum ratings contributed by the material(s) in each category and the special hazard category for the building and/or the area.
- (2) *Individual Method.* Where only a few chemicals are present or where only a few chemicals are of concern to emergency responders (taking into account factors including physical form, hazard rating, and quantity), individual

signs shall be displayed. The chemical name shall be displayed below each sign.

- (3) *Composite-Individual Combined Method.* A single sign shall be used to summarize the ratings via the Composite Method for buildings or other areas containing numerous chemicals. Signs based on the Individual Method shall be used for rooms or smaller areas within the building containing small numbers of chemicals.

4.2.3.4* When mixtures of chemicals are being rated, actual data on the mixture itself shall be used to obtain the ratings for health, flammability, and instability.

4.3* Location of Signs. Signs shall be in locations approved by the authority having jurisdiction and as a minimum shall be posted at the following locations:

- (1) Two exterior walls or enclosures containing a means of access to a building or facility
- (2) Each access to a room or area
- (3) Each principal means of access to an exterior storage area

Chapter 5 Health Hazards

5.1 General.

5.1.1* This chapter shall address the capability of a material to cause personal injury due to contact with or entry into the body via inhalation, skin contact, eye contact, or ingestion.

5.1.2 Injury resulting from the heat of a fire or from the force of an explosion shall not be considered.

5.1.3* Health hazards that can result from chronic or repeated long-term exposure to low concentrations of a hazardous material shall not be considered.

5.1.4* If the oral toxicity values indicate a health hazard rating that is significantly different from other, more likely routes of exposure or if the oral toxicity values would tend to either exaggerate or minimize the hazards likely to be encountered, then professional judgment shall be exercised in assigning the health hazard rating.

5.1.5* For purposes of assigning the health hazard rating, only the inherent physical and toxic properties of the material shall be considered. However, if the combustion or decomposition products are known, are generated in significant quantities, and present a significantly greater degree of risk, they shall be rated accordingly.

5.1.6 The degree of hazard shall indicate to fire-fighting and emergency response personnel one of the following:

- (1) They can work safely in the area only with specialized protective equipment.
- (2) They can work safely in the area with suitable respiratory protective equipment.
- (3) They can work safely in the area with ordinary clothing.

5.2* Degrees of Hazard. The degrees of health hazard shall be ranked according to the probable severity of the effects of exposure to emergency response personnel detailed in Table 5.2.

5.2.1 Data from all routes of exposure shall be considered when applying professional judgment to assign a health hazard rating.

Table 5.2 Degrees of Health Hazards

Degree of Hazard*	Criteria†
4 — Materials that, under emergency conditions, can be lethal	Gases whose LC₅₀ for acute inhalation toxicity is less than or equal to 1000 parts per million (ppm) Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater than 10 times its LC₅₀ for acute inhalation toxicity, if its LC₅₀ is less than or equal to 1000 ppm Dusts and mists whose LC₅₀ for acute inhalation toxicity is less than or equal to 0.5 milligram per liter (mg/L) Materials whose LD₅₀ for acute dermal toxicity is less than or equal to 40 milligrams per kilogram (mg/kg) Materials whose LD₅₀ for acute oral toxicity is less than or equal to 5 mg/kg
3 — Materials that, under emergency conditions, can cause serious or permanent injury	Gases whose LC₅₀ for acute inhalation toxicity is greater than 1000 ppm but less than or equal to 3000 ppm Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater than its LC₅₀ for acute inhalation toxicity, if its LC₅₀ is less than or equal to 3000 ppm, and that does not meet the criteria for degree of hazard 4 Dusts and mists whose LC₅₀ for acute inhalation toxicity is greater than 0.5 mg/L but less than or equal to 2 mg/L Materials whose LD₅₀ for acute dermal toxicity is greater than 40 mg/kg but less than or equal to 200 mg/kg Materials that are corrosive to the respiratory tract Materials that are corrosive to the eye or cause irreversible corneal opacity Materials that are corrosive to skin Cryogenic fluids that cause frostbite and irreversible tissue damage Compressed liquefied gases with boiling points at or below -55°C (-66.5°F) that cause frostbite and irreversible tissue damage Materials whose LD₅₀ for acute oral toxicity is greater than 5 mg/kg but less than or equal to 50 mg/kg
2 — Materials that, under emergency conditions, can cause temporary incapacitation or residual injury	Gases whose LC₅₀ for acute inhalation toxicity is greater than 3000 ppm but less than or equal to 5000 ppm Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater than one-fifth its LC₅₀ for acute inhalation toxicity, if its LC₅₀ is less than or equal to 5000 ppm, and that does not meet the criteria for either degree of hazard 3 or degree of hazard 4 Dusts and mists whose LC₅₀ for acute inhalation toxicity is greater than 2 mg/L but less than or equal to 10 mg/L Materials whose LD₅₀ for acute dermal toxicity is greater than 200 mg/kg but less than or equal to 1000 mg/kg Compressed liquefied gases with boiling points between -30°C (-22°F) and -55°C (-66.5°F) that can cause severe tissue damage on contact, depending on duration of exposure Materials that are respiratory irritants Materials that cause severe but reversible irritation to the eyes or lacrimators Materials that are primary skin irritants or sensitizers Materials whose LD₅₀ for acute oral toxicity is greater than 50 mg/kg but less than or equal to 500 mg/kg

(continues)

Shaded text = Revisions.  = Text deletions and figure/table revisions. • = Section deletions.  = New material

Table 5.2 *Continued*

Degree of Hazard*	Criteria†
1 — Materials that, under emergency conditions, can cause significant irritation	Gases and vapors whose LC₅₀ for acute inhalation toxicity is greater than 5000 ppm but less than or equal to 10,000 ppm Dusts and mists whose LC₅₀ for acute inhalation toxicity is greater than 10 mg/L but less than or equal to 200 mg/L Materials whose LD₅₀ for acute dermal toxicity is greater than 1000 mg/kg but less than or equal to 2000 mg/kg Materials that cause slight to moderate irritation to the respiratory tract, eyes, and skin Materials whose LD₅₀ for acute oral toxicity is greater than 500 mg/kg but less than or equal to 2000 mg/kg
0 — Materials that, under emergency conditions, would offer no hazard beyond that of ordinary combustible materials	Gases and vapors whose LC₅₀ for acute inhalation toxicity is greater than 10,000 ppm Dusts and mists whose LC₅₀ for acute inhalation toxicity is greater than 200 mg/L Materials whose LD₅₀ for acute dermal toxicity is greater than 2000 mg/kg Materials whose LD₅₀ for acute oral toxicity is greater than 2000 mg/kg Materials that are essentially nonirritating to the respiratory tract, eyes, and skin

*For each degree of hazard, the criteria are listed in a priority order based on the likelihood of exposure.

†See Section B.3 for definitions of LC₅₀ and LD₅₀.

Chapter 6 Flammability Hazards

6.1 General.

6.1.1 This chapter shall address the degree of susceptibility of materials to burning.

6.1.2* Because many materials will burn under one set of conditions but will not burn under others, the form or condi-

tion of the material shall be considered, along with its inherent properties.

6.2* Degrees of Hazard. The degrees of flammability hazard shall be ranked according to the susceptibility of materials to burning detailed in Table 6.2.

Table 6.2 Degrees of Flammability Hazards

Degree of Hazard	Criteria
4 — Materials that rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air and burn readily	Flammable gases Flammable cryogenic materials Any liquid or gaseous material that is liquid while under pressure and has a flash point below 22.8°C (73°F) and a boiling point below 37.8°C (100°F) (i.e., Class IA liquids) Materials that ignite spontaneously when exposed to air Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent.
3 — Liquids and solids (including finely divided suspended solids) that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures or, though unaffected by ambient temperatures, are readily ignited under almost all conditions. See Annex D for more information on ranking of combustible dusts.	Liquids having a flash point below 22.8°C (73°F) and a boiling point at or above 37.8°C (100°F) and those liquids having a flash point at or above 22.8°C (73°F) and below 37.8°C (100°F) (i.e., Class IB and Class IC liquids) Finely divided solids, typically less than 75 micrometers (µm) (200 mesh), that present an elevated risk of forming an ignitable dust cloud, such as finely divided sulfur; <i>NFPA 70®</i>, Group E dusts (e.g., aluminum, zirconium, and titanium); and bis-phenol A Materials that burn with extreme rapidity, usually by reason of self-contained oxygen (e.g., dry nitrocellulose and many organic peroxides) Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent.
2 — Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Under normal conditions, these materials would not form hazardous atmospheres with air, but under high ambient temperatures or under moderate heating they could release vapor in sufficient quantities to produce hazardous atmospheres with air. Materials in this degree also include finely divided suspended solids that do not require heating before ignition can occur. See Annex D for more information on ranking of combustible dusts.	Liquids having a flash point at or above 37.8°C (100°F) and below 93.4°C (200°F) (i.e., Class II and Class IIIA liquids) Finely divided solids less than 420 µm (40 mesh) that present an ordinary risk of forming an ignitable dust cloud Solid materials in a flake, fibrous, or shredded form that burn rapidly and create flash fire hazards, such as cotton, sisal, and hemp Solids and semisolids that readily give off flammable vapors Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated by the closed cup flash point of the solvent.

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