NFPA® 400

Hazardous Materials Code

2025 Edition

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NFPA® 400

Hazardous Materials Code

2025 Edition

This edition of NFPA 400, *Hazardous Materials Code*, was prepared by the Technical Committee on Hazardous Chemicals. It was issued by the Standards Council on April 22, 2024, with an effective date of May 12, 2024, and supersedes all previous editions.

This edition of NFPA 400 was approved as an American National Standard on May 12, 2024.

Origin and Development of NFPA 400

For the first edition of NFPA 400, four separate documents — NFPA 430, NFPA 432, NFPA 434, and NFPA 490 — were withdrawn in 2010 and included in their entirety in NFPA 400. This edition covered hazardous material categories found in building and fire codes such as corrosives, flammable solids, pyrophoric substances, toxic and highly toxic materials, unstable materials, and water-reactive materials. NFPA 400 also included compressed gases and cryogenic fluids by extracting NFPA 55, *Compressed Gases and Cryogenic Fuels Code*, into Chapter 21.

The code established the need for additional fire protection based on quantity limits for various occupancies using the maximum allowable quantity (MAQ) concept.

In the 2013 edition, the MAQ tables in Chapter 5 were updated to be consistent with changes in fire and building codes and coordinated with requirements for industrial and medical gases based on changes to NFPA 55. The Committee updated the table establishing MAQ values for hazardous materials stored or used in outdoor control areas. The results of the Fire Protection Research Foundation (FPRF) project, "Oxidizer Classification Research Project: Tests and Criteria," were used to establish an alternative method for assigning classifications to oxidizing solids. To accomplish that, the committee modified definitions for Class 1, Class 2, and Class 3 oxidizers based on the test protocol and criteria presented in the completely revised Annex G.

The oxidizer table in Annex G was updated for specific oxidizer solids based on the test results. The Committee also incorporated edits consistent with the *Manual of Style for NFPA Technical Committee Documents*.

The 2016 edition incorporated a number of significant changes to the requirements for ammonium nitrate in Chapter 11. Highlights included the addition of sprinkler requirements for existing buildings of combustible construction and content, the requirement for new buildings and storage bins to be of noncombustible construction, and emergency planning and public notification/alert systems for both new and existing facilities.

Additional changes further protected ammonium nitrate from becoming contaminated or from becoming molten and confined, conditions that can lead to an explosion during fires involving ammonium nitrate. Clear guidance for emergency responders on the conditions under which ammonium nitrate can explode, when to fight such fires, and when to evacuate were added to Annex E, which also included information on the properties and uses of ammonium nitrate. A number of oxidizers were reclassified in Annex G based on work performed under the auspices of the FPRF. In Annex F, the tables were revised based on new test data provided by the Organic Peroxide Producers' Safety Division (OPPSD) of the Society of the Plastics Industry (SPI). Terminology and content throughout the document have been modified to correlate with OSHA's revised *Hazard Communication Standard*. A new annex, Annex J, Hazardous Material Definitions Comparison Table, compared the hazardous materials definitions in the new OSHA standard with those in NFPA 400. Finally, the MAQ tables in Chapter 5 were modified to reflect a change in typical container sizes from 50 lb to 55 lb (22.7 kg to 24.9 kg).

In the 2019 edition, multiple terms relating to aisles were revised for consistent use throughout the code. A major revision was made to the MAQ tables in Chapter 5 that deleted most of the occupancy-specific tables in an effort to consolidate information and reduce repetition. MAQ values

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for assembly, educational, day care, health care, ambulatory health care, detention and correctional, certain residential, and business occupancies were consolidated, and annex material was added to provide clarification on amounts needed to be stored within and outside of cabinets when allowed to have increases based on the table footnotes. A new table was also added to the code to extract common path of travel distance limits from NFPA 5000®, *Building Construction and Safety Code®*.

Further revisions were made to the requirements for ammonium nitrate in Chapter 11. Text was added to clarify which sections applied retroactively, and language was revised to clarify that molten ammonium nitrate needs to be able to flow away from storage areas to open, unconfined areas free from incompatible materials. Revisions were made to the fire protection system requirements so that automatic fire sprinkler systems are not required in Type I or Type II construction buildings unless they also have combustible content. Requirements for ammonium nitrate storage in railcars were added to cover non–transportation-regulated storage.

Class II organic peroxides were divided into Class IIA and Class IIB based on small-scale burn rate data and alignment with international classifications. Definitions were added, MAQ tables were updated to include these two classes, and some of the assignments of organic peroxide formulation classifications in Annex F were changed accordingly. Changes were made to the requirements for fire protection systems, and to remove MAQs for segregated storage and cutoff storage, since these are addressed through the protection level and control area concepts.

Finally, new annex material was added to show an example of a storage layout in a typical sprinklered warehouse storing Class 1 oxidizers.

For the 2022 edition, Chapter 14, Organic Peroxide Formulations, was heavily revised to reflect current industry practices, definitions for the organic peroxide classifications were updated, and definitions for dosing vessel and protected storage room were added to supplement the revisions. Calcium ammonium nitrate complying with specific manufacturing specifications was exempted from complying with the ammonium nitrate chapter, and a definition for calcium ammonium nitrate was added to aid in application of this exemption. The MAQ values for Class 3 oxidizers in mercantile, storage, and industrial occupancies were increased. Terminology for ignitible (flammable or combustible) liquids was updated throughout the code to align with NFPA 30.

For the 2025 edition, a new definition for *Ammonium Nitrate Emulsion (ANE)* was added in Chapter 3. New requirements for ANE with supporting annex material were added to Chapters 11, and a new section on the properties of ammonium nitrate emulsions was added to Annex E. The tables in Annex G, Oxidizers, were updated to include the CAS numbers for the listed Class 1, Class 2, Class 3, and Class 4 oxidizers. Table J.1, Hazardous Material Definitions Comparison, was updated to include new hazardous material definitions found in OSHA's *Hazard Communication Standard* (Rev 7).

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Technical Committee on Hazardous Chemicals

Robert J. James, *Chair*
Ione Rose Consulting, LLC, AZ [SE]

Mohamed Talal Al-Marri, Qatar Civil Defence MOI, Qatar [E]

Elizabeth C. Buc, Fire & Materials Research Laboratory, LLC, MI [RT]

Timothy Burchett, Starr Technical Risks Agency, Inc., NV [I]

Michael Carolan, Dekra Process Safety - Chilworth Technology, NJ [RT]

Edwin D. Cope, Cope Engineering, TX [SE]

William V. F. Cosey, Savannah River Nuclear Solutions, LLC, SC [U]

Robert deLeyos, Lawrence Livermore National Laboratory, CA [U]

Dirk Der Kinderen, US Department of Transportation, DC [E]

Jeffrey J. Foisel, Dow, MI [U]

Martin T. Gresho, FP2Fire, Inc., CO [SE]

Edward M. Hawthorne, DFW Dynamics, TX [U]
Rep. American Petroleum Institute

Joshua Hoffman, Institute of Makers of Explosives (IME), DC [U]

Peter Paul Howell, Mark V, Inc., WV [SE]

Noel Hsu, Orica USA Inc., CO [M]
Rep. The Fertilizer Institute

Paul A. Iacobucci, Nouryon, IL [M]
Rep. SPI/Organic Peroxide Producers Safety Division

Alwin A. Kelly, JENSEN HUGHES, MD [SE]

William E. Koffel, Koffel Associates, Inc., MD [M]
Rep. Compressed Gas Association

Kevin Kreitman, Albany Fire Department, OR [E]

Todd LaBerge, TLB Fire Protection Engineering, Inc., CA [SE]

Howard G. Lagomarsino, Jr., Albemarle County Fire Rescue, VA [E]
Rep. Virginia Fire Prevention Association

R. Kenneth Lee, Axiall LLC, TX [M]

Joyce Miles, ExxonMobil Research & Engineering, TX [U]
Rep. American Chemistry Council

Kirk Mitchell, Kirk Mitchell & Associates, LLC, FL [M]
Rep. Isocyanurates Industry Adhoc Committee

Philip Myers, PEMY Consulting LLC, CA [SE]

Anthony M. Ordile, Haines Fire & Risk Consulting Corporation, NJ [SE]

Leonard J. Ramo, Telgian Corporation, GA [U]

John Louis Schumacher, Advanced Engineering Investigations, CO [SE]

Milton R. Shefter, Miljoy Ent. Incorporated, CA [U]

Jonathan Thomas Shriner, US Architect of the Capitol, DC [U]

Robert Suarez, Des Moines Fire Department, IA [L]
Rep. International Association of Fire Fighters

Irene Uriarte-Villanueva, FM Global, RI [I]
Rep. FM Global

James O. Vigerust, Jr., CB&I, NM [SE]
Rep. NFPA Industrial Fire Protection Section

Jerry W. Wallace, Safety Engineering Laboratories, Inc., MI [SE]

Alternates

Pranav Bagaria, The Dow Chemical Company, TX [U]
(Alt. to Jeffrey J. Foisel)

Peter Dluzneski, Arkema Inc., PA [M]
(Alt. to Paul A. Iacobucci)

Benjamin Drullinger, Safety Engineering Laboratories. Inc., MI [SE]
(Alt. to Jerry W. Wallace)

Rob Early, Compressed Gas Association, NY [M]
(Alt. to William E. Koffel)

Steve Ferrara, Carolina Eastern - Vail Inc., NY [U]
(Voting Alt.)

Amy Gay, Oxychem (Occidental Chemical Corporation), TX [M]
(Alt. to Kirk Mitchell)

Zachary John Jason, Advanced Engineering Investigations Corporation (AEI Corporation), CO [SE]
(Alt. to John Louis Schumacher)

Lynne M. Kilpatrick, LMK Associates LLC, WA [SE]
(Voting Alt.)

John A. LeBlanc, FM Global, MA [I]
(Alt. to Irene Uriarte-Villanueva)

Milton L. Norsworthy, Fire and Materials Research Laboratories LLC(F&MRL), TN [RT]
(Alt. to Elizabeth C. Buc)

Todd Bradley Oliver, JENSEN HUGHES, TX [SE]
(Alt. to Alwin A. Kelly)

David S. Shatzer, Shatzer & Associates Consulting, PA [SE]
(Alt. to Edwin D. Cope)

Amy Theis, AcuTech Group Inc., VA [SE]
(Alt. to James O. Vigerust, Jr.)

Casey L. Wagner, Haines Fire & Risk Consulting, NJ [SE]
(Alt. to Anthony M. Ordile)

Nonvoting

David Chicca, Occupational Safety & Health Administration (OSHA), DC [E]
Rep. Occupational Safety & Health Administration

Matthew Barker, NFPA Staff Liaison

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Chapter 1 Administration

1.1 Scope.

1.1.1* Applicability. This code shall apply to the storage, use, and handling of the following hazardous materials in all occupancies and facilities:

(1) Ammonium nitrate solids and liquids
(2) Corrosive solids and liquids
(3) Flammable solids
(4) Organic peroxide formulations
(5) Oxidizer — solids and liquids
(6) Pyrophoric solids and liquids
(7) Toxic and highly toxic solids and liquids
(8) Unstable (reactive) solids and liquids
(9) Water-reactive solids and liquids
(10)* Compressed gases and cryogenic fluids as included within the context of NFPA 55

1.1.1.1 Occupancies. Unless otherwise specified in this code, all occupancy definitions and classifications shall be in accordance with the building code.

1.1.1.2 Multiple Hazards. Hazardous materials that are classified in more than one hazard category, as set forth in Section 4.1, shall conform to the code requirements for each hazard category.

1.1.2 Exemptions.

1.1.2.1 The quantity and arrangement limits in this code shall not apply to facilities that use ammonium perchlorate in the commercial manufacture of large-scale rocket motors.

1.1.2.2 This code shall not apply to the following:

(1) Storage or use of hazardous materials for individual use on the premises of one- and two-family dwellings
(2) Explosives or blasting agents, which are regulated by NFPA 495, and fireworks
(3) Refrigerants and refrigerant oil contained within closed-cycle refrigeration systems complying with the fire code and the mechanical code adopted by the jurisdiction
(4) High-hazard contents stored or used in farm buildings or similar occupancies and in remote locations for on-premises agricultural use
(5) Corrosive materials in stationary batteries utilized for facility emergency power or uninterrupted power supply, or similar purposes, in accordance with NFPA 1
(6) Aerosols complying with NFPA 30B
(7) Corrosive materials displayed in original packaging in mercantile occupancies and intended for personal or household use or as building materials
(8) Ignitible (flammable or combustible) liquids having no other physical or health hazard properties covered by this code
(9) Organic peroxide formulations that are capable of detonation as manufactured or when unpackaged or in authorized shipping containers under conditions of fire exposure, when stored, manufactured, or used in accordance with NFPA 495
(10) Combustible metals, as defined in NFPA 484
(11) LP-Gas complying with NFPA 58 or NFPA 59
(12) Where approved, materials that have been satisfactorily demonstrated not to present a potential danger to public health, safety, or welfare, based upon the quantity or condition of storage
(13) The off-site transportation of hazardous materials when in accordance with Department of Transportation (DOT) regulations
(14) Cellulose nitrate film complying with NFPA 40

1.2* Purpose. The purpose of this code shall be to provide fundamental safeguards for the storage, use, and handling of hazardous materials as listed in 1.1.1.

1.3 Application. Administrative, operational, and maintenance provisions of this code shall apply to the following:

(1) Conditions and operations arising after the adoption of the code
(2) Existing conditions and operations

1.3.1 Conflicts.

1.3.1.1 Where requirements between this code and a referenced NFPA document differ, the requirements of this code shall apply.

1.3.1.2 Where a conflict between a general requirement of this code and a specific requirement of this code exists, the specific requirement shall apply.

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1.3.2 Multiple Occupancies. Where two or more classes of occupancy occur in the same building or structure and are so intermingled that separate safeguards are impracticable, means of egress facilities, construction, protection, and other safeguards shall comply with the most restrictive fire safety requirements of the occupancies involved.

1.3.3 Vehicles and Marine Vessels. Vehicles, marine vessels, or other similar conveyances, where in fixed locations and occupied as buildings, as described by Section 11.6 of NFPA *101* shall be treated as buildings and comply with this code.

1.3.4 Buildings.

1.3.4.1 Buildings permitted for construction after the adoption of this code shall comply with the provisions stated herein for new buildings.

1.3.4.2 Repairs, renovations, alterations, reconstruction, change of occupancy, and additions to buildings shall conform with NFPA *101* and the building code.

1.3.4.3 Newly introduced equipment, materials, and operations regulated by this code shall comply with the requirements for new construction or processes.

1.3.5 Severability. If any provision of this code or the application thereof to any person or circumstance is held invalid, the remainder of the code and the application of such provision to other persons or circumstances shall not be affected thereby.

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

1.4.1 Unless otherwise specified, the provisions of this code 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 code. Where specified, the provisions of this code shall be retroactive.

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

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

1.5 Equivalency. Nothing in this code 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 code.

1.5.1 Technical documentation shall be submitted to the AHJ to demonstrate equivalency.

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

1.5.3 Alternatives. The specific requirements of this code shall be permitted to be altered by the AHJ to permit alternative methods that will secure equivalent fire safety, but in no case shall the alternative afford less fire safety than, in the judgment of the AHJ, that which would be provided by compliance with the provisions contained in this code.

1.5.4 Modifications. The AHJ shall be authorized to modify any of the provisions of this code upon application in writing by the owner, a lessee, or a duly authorized representative where there are practical difficulties in carrying out the provisions of the code, provided that the intent of the code is met, public safety is secured, and substantial justice is done.

1.5.5 Buildings with equivalency, alternatives, or modifications approved by the AHJ shall be considered as conforming with this code.

1.5.6 Each application for an alternative fire protection feature shall be filed with the AHJ and shall be accompanied by such evidence, letters, statements, results of tests, or other supporting information as required to justify the request.

1.5.7 The AHJ shall keep a record of the actions on the applications specified in 1.5.6, and a signed copy of the AHJ's decision shall be provided for the applicant.

1.5.8 Approval. The AHJ shall approve alternative construction systems, materials, or methods of design when it is substantiated that the proposed alternative provides an equivalent level of protection of this code.

1.5.9 Tests.

1.5.9.1 Where there is insufficient evidence of compliance with the requirements of this code, or where there is evidence that any material or method of construction does not conform to the requirements of this code, or where there is insufficient evidence to substantiate claims for alternative construction systems, materials, or methods of construction, the AHJ shall be permitted to require tests for proof of compliance at the expense of the owner or the owner's agent.

1.5.9.2 Test methods shall be as specified by this code for the material in question.

1.5.9.3 If no appropriate test methods are specified in this code, the AHJ shall be authorized to accept an applicable test procedure from another recognized source.

1.5.9.4 Copies of the results of all tests specified in 1.5.9.2 and 1.5.9.3 shall be retained in accordance with local AHJ guidance.

1.6 Units and Formulas.

1.6.1 The units of measure in this code are presented first in US customary units (inch-pound units), followed by International System (SI) of Units in parentheses.

1.6.2 Either system of units shall be acceptable for satisfying the requirements in the code.

1.6.3 Users of this code shall apply one system of units consistently and shall not alternate between units.

1.6.4 The values presented for measurements in this code are expressed with a degree of precision appropriate for practical application and enforcement. It is not intended that the application or enforcement of these values be more precise than the precision expressed.

1.6.5 Where extracted text contains values expressed in only one system of units, the values in the extracted text have been retained without conversion to preserve the values established by the responsible technical committee in the source document.

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1.7 Enforcement. This code shall be administered and enforced by the AHJ designated by the governing authority. See Annex K for sample wording for enabling legislation.

1.8* Permits. Permits and the permit process shall comply with the requirements of NFPA 1.

1.8.1 Plans and Specifications.

1.8.1.1 The AHJ shall have the authority to require plans and specifications to ensure compliance with applicable codes and standards.

1.8.1.2 Information that is identified by the owner as confidential shall not be made part of the public record.

1.8.2 Stop Work or Evacuation.

1.8.2.1 The AHJ shall have the authority to order an operation or use stopped and the immediate evacuation of any occupied building or area when such building or area has hazardous conditions that present imminent danger.

1.8.2.2 Whenever any work is being done contrary to provisions of this code, the AHJ is hereby authorized to order such work stopped.

1.8.2.3 The work specified in 1.8.2.2 shall immediately stop until authorized by the AHJ to proceed.

1.9 Facility Closure.

1.9.1 Where required by the AHJ, no facility storing hazardous materials listed in 1.1.1 shall close or abandon an entire storage facility without notifying the AHJ at least 30 days prior to the scheduled closing.

1.9.2 The AHJ shall be permitted to reduce the 30-day period specified in 1.9.1 when there are special circumstances requiring such reduction.

1.9.3 Facilities Out of Service.

1.9.3.1 Facilities Temporarily Out of Service. Facilities that are temporarily out of service shall continue to maintain a permit and be monitored and inspected.

1.9.3.2 Facilities Permanently Out of Service. Facilities for which a permit is not kept current or that are not monitored and inspected on a regular basis shall be deemed to be permanently out of service and shall be closed in accordance with 1.9.4.1 through 1.9.4.2.

1.9.4 Closure Plan.

1.9.4.1 Where required by the AHJ, the permit holder or applicant shall submit a closure plan to the fire department to terminate storage, dispensing, handling, or use of hazardous materials at least 30 days prior to facility closure.

1.9.4.2 The plan shall demonstrate that hazardous materials that were stored, dispensed, handled, or used in the facility have been transported, disposed of, or reused in a manner that eliminates the need for further maintenance and any threat to public health and safety.

1.10 Emergency Planning.

1.10.1 Emergency Action Plan. An emergency action plan, consistent with the available equipment and personnel, shall be established to respond to fire and other emergencies in accordance with requirements set forth in NFPA 1.

1.10.2 Activation. The facility responsible for an unauthorized release shall activate the emergency action element of the Hazardous Materials Management Plan.

1.11 Hazardous Materials Management Plan (HMMP).

1.11.1* When required by the AHJ, new or existing facilities that store, use, or handle hazardous materials covered by this code in amounts above the MAQ specified in 5.2.1.2 through 5.2.1.5 and 5.4.1.2 shall submit a hazardous materials management plan (HMMP) to the AHJ.

1.11.2 The HMMP shall be reviewed and updated as follows:

(1) Annually
(2) When the facility is modified
(3) When hazardous materials representing a new hazard category not previously addressed are stored, used, or handled in the facility

1.11.3 The HMMP shall comply with the requirements of Chapter 6.

1.12* Hazardous Materials Inventory Statement (HMIS).

1.12.1 When required by the AHJ, a hazardous materials inventory statement (HMIS) shall be completed and submitted to the AHJ.

1.12.2 The HMIS shall comply with the requirements in NFPA 1.

1.13 Plan Review.

1.13.1 Where required by the AHJ for new construction, modification, or rehabilitation, construction documents and shop drawings shall be submitted, reviewed, and approved prior to the start of such work as provided in Section 1.13.

1.13.2 The applicant shall be responsible for ensuring that the following conditions are met:

(1) The construction documents include all of the fire protection requirements.
(2) The shop drawings are correct and in compliance with the applicable codes and standards.
(3) The contractor maintains an approved set of construction documents on-site.

1.13.3 It shall be the responsibility of the AHJ to promulgate rules that cover the following:

(1) Criteria to meet the requirements of Section 1.13
(2) Review of documents and construction documents within established time frames for the purpose of acceptance or providing reasons for nonacceptance

1.13.4 Review and approval by the AHJ shall not relieve the applicant of the responsibility of compliance with this code.

1.13.5 When required by the AHJ, revised construction documents or shop drawings shall be prepared and submitted for review and approval to illustrate corrections or modifications necessitated by field conditions or other revisions to approved plans.

1.14 Technical Assistance.

1.14.1 The AHJ shall be permitted, upon prior written notification to the applicant, building owner, or owner's agent, to require a review by an independent third party with expertise in the matter to be reviewed at the submitter's expense.

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1.14.2 The independent reviewer shall provide an evaluation and recommend necessary changes to the proposed design, operation, process, or new technology to the AHJ.

1.14.3 The AHJ shall be authorized to require design submittals to bear the stamp of a professional engineer.

1.14.4 The AHJ shall make the final determination as to whether the provisions of this code have been met.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this code 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,* 2024 edition.

NFPA 2, *Hydrogen Technologies Code,* 2023 edition.

NFPA 10, *Standard for Portable Fire Extinguishers,* 2022 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2025 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection,* 2022 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* 2024 edition.

NFPA 30B, *Code for the Manufacture and Storage of Aerosol Products,* 2023 edition.

NFPA 40, *Standard for the Storage and Handling of Cellulose Nitrate Film,* 2025 edition.

NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals,* 2024 edition.

NFPA 51, *Standard for the Design and Installation of Oxygen–Fuel Gas Systems for Welding, Cutting, and Allied Processes,* 2023 edition.

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work,* 2024 edition.

NFPA 52, *Vehicular Natural Gas Fuel Systems Code,* 2023 edition.

NFPA 55, *Compressed Gases and Cryogenic Fluids Code,* 2023 edition.

NFPA 58, *Liquefied Petroleum Gas Code,* 2024 edition.

NFPA 59, *Utility LP-Gas Plant Code,* 2024 edition.

NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG),* 2023 edition.

NFPA 68, *Standard on Explosion Protection by Deflagration Venting,* 2023 edition.

NFPA 69, *Standard on Explosion Prevention Systems,* 2024 edition.

NFPA 70®, National Electrical Code®, 2023 edition.

NFPA 72®, National Fire Alarm and Signaling Code®, 2025 edition.

NFPA 79, *Electrical Standard for Industrial Machinery,* 2024 edition.

NFPA 99, *Health Care Facilities Code,* 2024 edition.

NFPA *101®, Life Safety Code®,* 2024 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems,* 2025 edition.

NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems,* 2025 edition.

NFPA 259, *Standard Test Method for Potential Heat of Building Materials,* 2023 edition.

NFPA 318, *Standard for the Protection of Semiconductor Fabrication Facilities,* 2025 edition.

NFPA 484, *Standard for Combustible Metals,* 2022 edition.

NFPA 495, *Explosive Materials Code,* 2023 edition.

NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations,* 2024 edition.

NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response,* 2022 edition.

NFPA 780, *Standard for the Installation of Lightning Protection Systems,* 2023 edition.

NFPA 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials,* 2025 edition.

NFPA 5000®, Building Construction and Safety Code®, 2024 edition.

2.3 Other Publications.

2.3.1 ASCE Publications. American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400.

ASCE/SEI 7, *Minimum Design Loads for Building and Other Structures,* 2022.

2.3.2 ASME Publications. American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

ASME A13.1, *Scheme for the Identification of Piping Systems,* 2020.

ASME B31.3, *Process Piping,* 2022.

Boiler and Pressure Vessel Code, 2023.

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

ASTM D56, *Standard Test Method for Flash Point by Tag Closed Cup Tester,* 2021a.

ASTM D86, *Standard Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure,* 2023.

ASTM D93, *Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester,* 2020.

ASTM D323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method),* 2020a.

ASTM D3278, *Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus,* 2021.

ASTM D3828, *Standard Test Methods for Flash Point by Small Scale Closed Cup Tester,* 2016a, reapproved 2021.

ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* 2023a.

ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C,* 2022.

ASTM E681, *Standard Test Method for Concentration Limits of Flammability of Chemicals (Vapors and Gases),* 2009, reapproved 2023.

ASTM E1591, *Standard Guide for Obtaining Data for Fire Growth Models,* 2020.

ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-Shaped Airflow Stabilizer, at 750°C,* 2022.

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ASTM E2965, *Standard Test Method for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Consumption Calorimeter*, 2022a.

Δ **2.3.4 CGA Publications.** Compressed Gas Association, 8484 Westpark Drive, Suite 220, McLean, VA 22102.

CGA C-7, *Guide to Classification and Labeling of Compressed Gases,* 2020.

ANSI/CGA G-13, *Storage and Handling of Silane and Silane Mixtures*, 2023.

ANSI/CGA M-1, *Standard for Medical Gas Supply Systems at Health Care Facilities,* 2018.

CGA P-1, *Safe Handling of Compressed Gases in Containers,* 2022.

ANSI/CGA P-18, *Bulk Inert Gas Systems,* 2020.

CGA P-20, *Standard for the Classification of Toxic Gas Mixtures,* 2017.

CGA P-23, *Standard for Categorizing Gas Mixtures Containing Flammable and Nonflammable Components,* 2015.

CGA S-1.1, *Pressure Relief Device Standards — Part 1 — Cylinders for Compressed Gases,* 2022.

CGA S-1.2, *Pressure Relief Device Standards — Part 2 — Portable Containers for Compressed Gases,* 2019.

CGA S-1.3, *Pressure Relief Device Standards — Part 3 — Stationary Storage Containers for Compressed Gases,* 2020.

Δ **2.3.5 CTA Publications.** Canadian Transportation Agency, Ottawa, Ontario, K1A 0N9, Canada. (Available from the Canadian Communications Group Publication Centre, Ordering Department, Ottawa, K1A 0S9, Canada.)

Transportation of Dangerous Goods Regulations.

2.3.6 IAPMO Publications. International Association of Plumbing and Mechanical Officials, 4755 E. Philadelphia Street, Ontario, CA 91761.

Uniform Mechanical Code, 2024.

2.3.7 IME Publications. Institute of Makers of Explosives, 1212 New York Avenue, NW, Suite 650, Washington, DC 20005.

IME SLP 2, "American Table of Distances (ATD)," June 1991 (incorporates changes through April 2017).

Δ **2.3.8 ISO Publications.** International Organization for Standardization, ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland.

ISO 10156, *Gas Cylinders — Gases and Gas Mixtures — Determination of Fire Potential and Oxidizing Ability for the Selection of Cylinder Valve Outlets,* 2017.

ISO 10298, *Gas Cylinders — Gases and Gas Mixtures — Determination of Toxicity for the Selection of Cylinder Valve Outlets,* 2018.

2.3.9 TC Publications. Transport Canada, 330 Sparks Street, Ottawa, ON K1A 0N5, Canada.

Canadian Ministry of Transport Regulations.

2.3.10 UN Publications. United Nations Publications, Sales and Marketing Section, 405 East 42nd Street, S-09FW001, New York, NY 10017.

Manual of Tests and Criteria, Part II, 7th edition, 2019.

2.3.11 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

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

Δ **2.3.12 US Government Publications.** US Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401.

Resource Conservation and Recovery Act (RCRA), 1976.

Title 18, United States Code, Part 40, "Importation, Manufacture, Distribution and Storage of Explosive Materials."

Title 29, Code of Federal Regulations, Part 1910.1000, "Air Contaminants."

Title 49, Code of Federal Regulations, Parts 100–199, "Pipeline and Hazardous Materials, Safety Administration, Department of Transportation."

Title 49, Code of Federal Regulations, Part 173.115, "Shippers — General Requirements for Shipments and Packagings."

2.3.13 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster Inc., Springfield, MA, 2020.

Δ **2.4 References for Extracts in Mandatory Sections.**

NFPA 1, *Fire Code,* 2021 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* 2024 edition.

NFPA 52, *Vehicular Natural Gas Fuel Systems Code,* 2023 edition.

NFPA 55, *Compressed Gases and Cryogenic Fluids Code,* 2023 edition.

NFPA 58, *Liquefied Petroleum Gas Code,* 2020 edition.

NFPA 68, *Standard on Explosion Protection by Deflagration Venting,* 2023 edition.

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

NFPA 318, *Standard for the Protection of Semiconductor Fabrication Facilities,* 2022 edition.

NFPA 495, *Explosive Materials Code,* 2023 edition.

NFPA 652, *Standard on the Fundamentals of Combustible Dust,* 2019 edition.

NFPA 1140, *Standard for Wildland Fire Protection,* 2022 edition.

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

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Chapter 3 Definitions

Δ **3.1* General.**

N **3.1.1** The definitions contained in this chapter shall apply to the terms used in this code.

N **3.1.2** 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.

N **3.1.3** *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* Code. A standard that is an extensive compilation of provisions covering broad subject matter or that is suitable for adoption into law independently of other codes and standards.

3.2.4 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is 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.

3.2.5* 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.

3.2.6 Shall. Indicates a mandatory requirement.

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

3.3 General Definitions.

3.3.1* Absolute Pressure [Gas]. Pressure based on a zero reference point, the perfect vacuum. [**55,** 2023]

3.3.2* Access Aisle. Limited-width spaces used to move between storage piles.

3.3.3* Aisle. A clear area between the faces of two storage piles or the faces of two storage racks providing access to the storage with material-handling equipment.

N **3.3.4* Ammonium Nitrate Emulsion (ANE).** An emulsion created by ammonium nitrate dissolved in water and suspended in fuel oil. Ammonium nitrate emulsions are oxidizing agents used to manufacture a range of blasting agents. The mixture for emulsions has the following composition: 60-85 percent ammonium nitrate, 5-30 percent water, 2-8 percent fuel, 0.5-4 percent emulsifier agent, 0-10 percent soluble flame suppressants and trace additives. Other inorganic nitrate salts may replace part of the ammonium nitrate.

3.3.5 Area.

3.3.5.1 ***Control Area.*** A building or portion of a building or outdoor area within which hazardous materials are allowed to be stored, dispensed, used, or handled in quantities not exceeding the MAQ.

3.3.5.2 ***Indoor Area [Gas].*** An area that is within a building or structure having overhead cover, other than a structure qualifying as "weather protection." [**55,** 2023] *(See also 3.3.5.4, Outdoor Area.)*

3.3.5.3 ***Organic Peroxide Storage Area.*** An area used for the storage of organic peroxide formulations.

3.3.5.4 ***Outdoor Area [Gas].*** An area that is not an indoor area. [**55,** 2023]

3.3.5.5 ***Outdoor Control Area.*** An outdoor area within which hazardous materials are allowed to be stored, dispensed, used, or handled in quantities not exceeding the MAQ.

3.3.6 ASME. American Society of Mechanical Engineers. [**58,** 2020]

3.3.7 ASTM [Gas]. American Society for Testing and Materials, now known as "ASTM International." [**55,** 2023]

3.3.8 Basement. Any story of a building wholly or partly below grade plane that is not considered the first story above grade plane. [**5000,** 2021]

3.3.9 Boiling Point (BP). The temperature at which the vapor pressure of a liquid equals the surrounding atmospheric pressure. [**30,** 2024]

3.3.10 Building. Any structure used or intended for supporting or sheltering any use or occupancy. [***101,*** 2021]

3.3.11 Building Code. The building or construction code adopted by the jurisdiction.

3.3.12 Bulk Ammonium Nitrate. Ammonium nitrate solids in the form of a pile, not divided into parts or packaged into separate units.

3.3.13* Bulk Hydrogen Compressed Gas System [Gas]. A gaseous hydrogen (GH_2) system with a storage capacity of more than 5000 scf (141.6 Nm^3) of compressed hydrogen gas. [**55,** 2023]

Δ **3.3.14* Bulk Inert Gas System.** An assembly of equipment that consists of, but is not limited to, storage containers, pressure regulators, pressure relief devices, vaporizers, manifolds, and piping, with a storage capacity of more than 20,000 scf (566 m^3) of inert gas, and that terminates at the source valve. [**55,** 2023]

3.3.15* Bulk Liquefied Hydrogen System [Gas]. A liquefied hydrogen (LH_2) system with a storage capacity of more than 39.7 gal (150 L) of liquefied hydrogen. [**55,** 2023]

3.3.16* Bulk Oxygen System. An assembly of equipment, such as oxygen storage containers, pressure regulators, pressure relief devices, vaporizers, manifolds, and interconnecting piping, that has a storage capacity of more than 20,000 scf (566 Nm^3) of oxygen and that terminates at the source valve. [**55,** 2023]

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3.3.17* Calcium Ammonium Nitrate (CAN). A dry fertilizer prill or granule prepared as a homogeneous mixture that contains as its essential ingredients only ammonium nitrate and calcium carbonate (e.g., limestone) and/or magnesium carbonate and calcium carbonate (e.g., dolomite) uniformly integrated throughout each prill or granule.

3.3.18 CFR. The Code of Federal Regulations of the United States Government. [**1,** 2021]

3.3.19 CGA [Gas]. Compressed Gas Association. [**1,** 2021]

3.3.20 Combustible. A substance that will burn.

Δ **3.3.21* Combustible Dust.** A finely divided combustible particulate solid that presents a flash-fire hazard or explosion hazard when suspended in air or the process-specific oxidizing medium over a range of concentrations. [**652,** 2024]

Δ **3.3.22 Combustible Liquid.** An ignitible liquid that is classified as a Class II or Class III liquid. *(See 4.9.2 and 4.9.3.)* [**30,** 2024]

3.3.23* Compressed Gas System. An assembly of equipment designed to contain, distribute, or transport compressed gases. [**318,** 2022]

3.3.24 Container. A containment device including, but not limited to, cylinders, tanks, intermediate bulk containers, pressure vessels, drums, carboys, cans, bottles, boxes, bags, bins, and portable tanks that vary in shape, size, and material of construction and are used for holding, storing, and transporting hazardous materials covered by this code.

3.3.24.1 ***Aboveground Tank [Ignitible (Flammable or Combustible) Liquid].*** A storage tank that is installed above grade, at grade, or below grade without backfill. [**30,** 2024]

3.3.24.1.1* ***Atmospheric Tank [Ignitible (Flammable or Combustible) Liquid].*** A storage tank that has been designed to operate at pressures from atmospheric through a gauge pressure of 1.0 psi (6.9 kPa) (i.e., 760 mm Hg through 812 mm Hg) measured at the top of the tank. [**30,** 2024]

3.3.24.1.2 ***Secondary Containment Tank [Ignitible (Flammable or Combustible) Liquid].*** A tank that has an inner and outer wall with an interstitial space (annulus) between the walls and that has a means for monitoring the interstitial space for a leak. [**30,** 2024]

3.3.24.2 ***ASME Container.*** A container constructed in accordance with the ASME *Boiler and Pressure Vessel Code.*

3.3.24.3 ***Closed Container [Ignitible (Flammable or Combustible) Liquid].*** A container as herein defined, so sealed by means of a lid or other device that neither liquid nor vapor will escape from it at ordinary temperatures. [**30,** 2024]

3.3.24.4 ***Combustible Containers.*** Containers that include paper bags, fiber drums, plastic containers, and wooden or fiber boxes or barrels, as well as noncombustible containers having removable combustible liners or packing, and noncombustible containers having combustible overpacks.

3.3.24.5 ***Compressed Gas Container [Gas].*** A pressure vessel designed to hold compressed gas at an absolute pressure greater than 1 atmosphere at 68°F (20°C) that includes cylinders, containers, and tanks. [**55,** 2023]

3.3.24.5.1* ***Tube Trailer [Gas].*** See 3.3.91.

3.3.24.6* ***Container [Ignitible (Flammable or Combustible) Liquid].*** A vessel of 119 gal (450 L) or less capacity used for transporting or storing liquids, excluding intermediate bulk containers. [**30,** 2024]

3.3.24.7 ***Cylinder [Gas].*** See 3.3.28.

3.3.24.7.1 ***Cylinder Pack [Gas].*** See 3.3.31.

3.3.24.8 ***Cylinder Containment Vessel [Gas].*** See 3.3.30

3.3.24.9* ***ISO Module.*** A single unit or unit assembly of containers, IBCs, portable tanks, or cylinders permanently mounted in a frame conforming to International Organization for Standardization (ISO) requirements.

3.3.24.10 ***Noncombustible Containers.*** Containers constructed of glass or metal that can be coated with a polymeric material no more than 1/32 in. (2 mils) in thickness.

3.3.24.11* ***Nonmetallic Container [Solid, Ignitible (Flammable or Combustible) Liquid].*** A container as defined in 3.3.24 constructed of glass, plastic, fiber, or a material other than metal. [**30,** 2024]

3.3.24.12 ***Overpack Container.*** A closed container intended to encapsulate and contain a leaking or damaged liquid or solid material container thereby preventing the release of liquids, solids, or vapors and is made of the same material or similarly protective material as the leaking or damaged container.

3.3.24.13* ***Portable Tank [Ignitible (Flammable or Combustible) Liquid].*** Any vessel having a liquid capacity over 60 gal (230 L) intended for storing liquids and not intended for fixed installation. [**30,** 2024]

3.3.24.13.1* ***Nonmetallic Portable Tank [Ignitible (Flammable or Combustible) Liquid].*** A portable tank, as herein defined, constructed of plastic, fiber, or a material other than metal. [**30,** 2024]

3.3.24.13.2* ***Portable Tank [Gas].*** Any packaging over 60 US gal (227.1 L) capacity designed primarily to be loaded into or on, or temporarily attached to, a transport vehicle or ship and equipped with skids, mountings, or accessories to facilitate handling of the tank by mechanical means. [**55,** 2023]

3.3.24.13.3* ***Pressure Vessel.*** A container, process vessel, or other component designed in accordance with the ASME *Boiler and Pressure Vessel Code*, DOT, or other approved standards.

3.3.24.14* ***Safety Can [Liquid].*** A listed container of not more than 5.3 gal (20 L) capacity having a flame mitigation device, such as a flame arrester in each fill and pour opening or expanded metal mesh in the container, and having a spring-closing lid and spout cover designed to safely relieve internal pressure when exposed to fire. [**30,** 2024]

3.3.24.15 ***Storage Tank [Ignitible (Flammable or Combustible) Liquid].*** Any vessel having a liquid capacity that exceeds 60 gal (230 L), is intended for fixed installation, and is not used for processing. [**30,** 2024]

3.3.24.15.1* ***Stationary Tank [Gas].*** A packaging designed primarily for stationary installations not intended for loading, unloading, or attachment to a transport vehicle as part of its normal operation in the process of use. [**55,** 2023]

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3.3.25 Continuous Gas Detection System [Gas]. A gas detection system in which the instrument is maintained in continuous operation and the interval between sampling of any point does not exceed 30 minutes. [**55,** 2023]

3.3.26 Court. An open, uncovered, unoccupied space, unobstructed to the sky, bounded on three or more sides by exterior building walls. [***101,*** 2021]

3.3.26.1 ***Enclosed Court.*** A court bounded on all sides by the exterior walls of a building or by the exterior walls and lot lines on which walls are permitted. [**5000,** 2021]

3.3.27 Cryogenic Fluid [Gas]. A fluid with a boiling point lower than −130°F (−90°C) at an absolute pressure of 14.7 psi (101.3 kPa). [**55,** 2023]

3.3.27.1 ***Flammable Cryogenic Fluid.*** A cryogenic fluid that forms flammable mixtures in air when in its vapor state. [**55,** 2023]

3.3.27.2 ***Inert Cryogenic Fluid.*** A cryogenic fluid that vaporizes to produce an inert gas when in its vapor state. [**55,** 2023]

3.3.27.3 ***Oxidizing Cryogenic Fluid.*** An oxidizing gas in the cryogenic state. [**55,** 2023]

3.3.28* Cylinder [Gas]. A pressure vessel designed for pressures higher than absolute pressure of 40 psi (276 kPa) and having a circular cross-section.

3.3.29 Cylinder Containment System [Gas]. A gastight recovery system comprising equipment or devices that can be placed over a leak in a compressed gas container, thereby stopping or controlling the escape of gas from the leaking container. [**55,** 2023]

3.3.30 Cylinder Containment Vessel [Gas]. A gastight recovery vessel designed so that a leaking compressed gas container can be placed within its confines, thereby encapsulating the leaking container. [**55,** 2023]

3.3.31* Cylinder Pack [Gas]. An arrangement of cylinders into a cluster where the cylinders are confined into a grouping or arrangement with a strapping or frame system and connections are made to a common manifold. The frame system is allowed to be on skids or wheels to permit movement. [**55,** 2023]

3.3.32 Deflagration. Propagation of a combustion zone at a velocity that is less than the speed of sound in the unreacted medium. [**68,** 2023]

3.3.33 Detonation. Propagation of a combustion zone at a velocity greater than the speed of sound in the unreacted medium. [**68,** 2023]

3.3.34 Distributor [Gas]. A business engaged in the sale or resale, or both, of compressed gases or cryogenic fluids, or both. [**55,** 2023]

3.3.35 Dosing Vessels. Metering vessels, mixing vessels, day storage tanks, and intermediate bulk containers (IBCs) used to serve for the transient storage and transfer or use of materials in the use area.

3.3.36 DOT. US Department of Transportation. [**52,** 2023]

3.3.37 Emergency Response. Emergency response or responding to emergencies means a response effort by employees from outside the immediate release area or by other designated responders including, but not limited to, private sector emergency responders, mutual aid groups, local fire departments, or other qualified parties to an occurrence that results, or is likely to result, in an uncontrolled release of a hazardous material.

3.3.38 Emergency Response Liaison. A person designated to act as a liaison for emergency response as defined by the emergency plan.

3.3.39 Emergency Shutoff Valve [Gas]. A designated valve designed to shut off the flow of gases or liquids. [**55,** 2023]

3.3.39.1 ***Automatic Emergency Shutoff Valve [Gas].*** A designated fail-safe automatic closing valve designed to shut off the flow of gases or liquids that is initiated by a control system where the control system is activated by either manual or automatic means. [**55,** 2023]

3.3.39.2 ***Manual Emergency Shutoff Valve [Gas].*** A designated valve designed to shut off the flow of gases or liquids that is manually operated. [**55,** 2023]

3.3.40 Excess Flow Control [Gas]. A fail-safe system or approved means designed to shut off flow due to a rupture in pressurized piping systems. [**55,** 2023]

3.3.41* Exhausted Enclosure [Gas]. An appliance or piece of equipment that consists of a top, a back, and two sides that provides a means of local exhaust for capturing gases, fumes, vapors, and mists. [**55,** 2023]

3.3.42* Explosion Control [Gas]. A means of either preventing an explosion through the use of explosion suppression, fuel reduction, or oxidant reduction systems or a means to prevent the structural collapse of a building in the event of an explosion through the use of deflagration venting, barricades, or related construction methods. [**55,** 2023]

3.3.43 Explosion Vent. An opening in an enclosure to relieve the developing pressure from a deflagration.

3.3.44* Explosive. Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion. [**495,** 2023]

3.3.45* Explosive Decomposition. Rapid chemical reaction resulting in a large, almost instantaneous, release of energy.

3.3.46* Explosive Reaction. A reaction, which includes both deflagration and detonation, producing a sudden rise in pressure with potentially destructive results.

3.3.47 Fire Prevention Code. The fire prevention code adopted by the jurisdiction.

Δ **3.3.48 Fire Protection System.** Any fire alarm device or system or fire-extinguishing device or system, or combination thereof, that is designed and installed for detecting, controlling, or extinguishing a fire or otherwise alerting occupants, or the fire department, or both, that a fire has occurred. [**1140,** 2022]

3.3.49 Flammable Liquid. An ignitible liquid that is classified as a Class I liquid. *(See 4.9.1.)* [**30,** 2024] Class I liquids shall be further subclassified in accordance with the following:

(1) *Class IA Liquid.* A liquid that has a flash point below 73°F (22.8°C) and a boiling point below 100°F (37.8°C).
(2) *Class IB Liquid.* A liquid that has a flash point below 73°F (22.8°C) and a boiling point at or above 100°F (37.8°C).

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(3) *Class IC Liquid.* A liquid that has a flash point at or above 73°F (22.8°C), but below 100°F (37.8°C).

3.3.50* Flammable Solid. A solid substance, other than a substance defined as a blasting agent or explosive, that is liable to cause fire resulting from friction or retained heat from manufacture, that has an ignition temperature below 212°F (100°C), or that burns so vigorously or persistently when ignited that it creates a serious hazard.

3.3.51 Flash Point (FP). The minimum temperature of a liquid at which sufficient vapor is given off to form an ignitible mixture with the air, near the surface of the liquid or within the vessel used, as determined by the appropriate test procedure and apparatus specified in 4.9.5. [**30,** 2024]

3.3.52 Gallon [Gas]. A standard US gallon. [**55,** 2023]

3.3.53 Gas.

Δ **3.3.53.1* *Compressed Gas [Gas].*** A material, or mixture of materials, that (1) is a gas at 68°F (20°C) or less at an absolute pressure of 14.7 psi (101.3 kPa) and (2) has a boiling point of 68°F (20°C) or less at an absolute pressure of 14.7 psi (101.3kPa) and that is liquefied, nonliquefied, or in solution, except those gases that have no other health or physical hazard properties are not considered to be compressed gases until the pressure in the packaging exceeds an absolute pressure of 40.6 psi (280 kPa) at 68°F (20°C). [**55,** 2023]

3.3.53.2 *Corrosive Gas [Gas].* A gas that causes visible destruction of or irreversible alterations in living tissue by chemical action at the site of contact. [**55,** 2023]

3.3.53.3* *Flammable Gas [Gas].* A material that is a gas at 68°F (20°C) or less at an absolute pressure of 14.7 psi (101.3 kPa). [**55,** 2023]

N **3.3.53.3.1* *Category 1A Flammable Gas.*** A flammable gas that is ignitible at an absolute pressure of 14.7 psi (101.3 kPa) when in a mixture of 13 percent or less by volume with air or that has a flammable range at an absolute pressure of 14.7 psi (101.3 kPa) with air of at least 12 percent regardless of the lower limit. [**55,** 2023]

N **3.3.53.3.2 *Category 1B Flammable Gas.*** A non-pyrophoric or non-chemically unstable Category 1A flammable gas that has either a lower flammability limit of more than 6 percent by volume of air or a fundamental burning velocity of less than 3.9 in./s (10 cm/s). [**55,** 2023]

3.3.53.4 *Flammable Liquefied Gas [Gas].* A liquefied compressed gas that, when under a charged pressure, is partially liquid at a temperature of 68°F (20°C) and is flammable. [**55,** 2023]

3.3.53.5 *Highly Toxic Gas [Gas].* A chemical that has a median lethal concentration (LC_{50}) in air of 200 ppm by volume or less of gas or vapor, or 2 mg/L or less of mist, fume, or dust, when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 0.44 lb and 0.66 lb (200 g and 300 g) each. [**55,** 2023]

3.3.53.6 *Inert Gas [Gas].* A nonreactive, nonflammable, noncorrosive gas such as argon, helium, krypton, neon, nitrogen, and xenon. [**55,** 2023]

3.3.53.7 *Nonflammable Gas [Gas].* A gas that does not meet the definition of a flammable gas. [**55,** 2023]

3.3.53.8* *Other Gas [Gas].* A gas that is not a corrosive gas, flammable gas, highly toxic gas, oxidizing gas, pyrophoric gas, toxic gas, or unstable reactive gas with a hazard rating of Class 2, Class 3, or Class 4 gas. [**55,** 2023]

3.3.53.9 *Oxidizing Gas [Gas].* A gas that can support and accelerate combustion of other materials more than air does. [**55,** 2023]

3.3.53.10 *Pyrophoric Gas [Gas].* A gas with an autoignition temperature in air at or below 130°F (54.4°C). [**55,** 2023]

Δ **3.3.53.11 *Toxic Gas [Gas].*** A gas with a median lethal concentration (LC_{50}) in air of more than 200 ppm but not more than 2000 ppm by volume of gas or vapor, or more than 2 mg/L but not more than 20 mg/L of mist, fume, or dust, when administered by continuous inhalation for 1 hour (or less if death occurs within 1 hour) to albino rats weighing between 0.44 lb and 0.66 lb (200 g and 300 g) each. [**55,** 2023]

3.3.53.12* *Unstable Reactive Gas [Gas].* A gas 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. [**55,** 2023]

3.3.53.12.1 *Class 2 Unstable Reactive Gas [Gas].* Materials that readily undergo violent chemical change at elevated temperatures and pressures. [**55,** 2023]

3.3.53.12.2 *Class 3 Unstable Reactive Gas [Gas].* Materials that in themselves are capable of detonation or explosive decomposition or explosive reaction, but that require a strong initiating source or that must be heated under confinement before initiation. [**55,** 2023]

3.3.53.12.3 *Class 4 Unstable Reactive Gas [Gas].* Materials that in themselves are readily capable of detonation or explosive decomposition or explosive reaction at normal temperatures and pressures. [**55,** 2023]

3.3.54* Gas Cabinet [Gas]. A fully enclosed, noncombustible enclosure used to provide an isolated environment for compressed gas cylinders in storage or use. [**55,** 2023]

3.3.55 Gas Manufacturer/Producer [Gas]. A business that produces compressed gases or cryogenic fluids, or both, or fills portable or stationary gas cylinders, containers, or tanks. [**55,** 2023]

3.3.56* Gas Room [Gas]. A separately ventilated, fully enclosed room in which only compressed gases, cryogenic fluids, associated equipment, and supplies are stored or used. [**55,** 2023]

3.3.57* Gaseous Hydrogen (GH_2) System. An assembly of equipment that consists of, but is not limited to, storage containers, pressure regulators, pressure relief devices, compressors, manifolds, and piping and that terminates at the source valve. [**55,** 2023]

3.3.58 Handling. The deliberate movement of material by any means to a point of storage or use. [**1,** 2021]

3.3.59 Hazardous Materials Storage Cabinet. A metal cabinet complying with the conditions set forth in 6.1.18.

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3.3.60 High-Hazard Level Contents.

3.3.60.1 ***High-Hazard Level 1 Contents.*** For definition and examples see 4.2.1.2.1.

3.3.60.2 ***High-Hazard Level 2 Contents.*** For definition and examples see 4.2.1.2.2.

3.3.60.3 ***High-Hazard Level 3 Contents.*** For definition and examples see 4.2.1.2.3.

3.3.60.4 ***High-Hazard Level 4 Contents.*** For definition and examples see 4.2.1.2.4.

3.3.61* Ignitible Liquid. Any liquid or liquid mixture that has a measurable closed-cup flash point. [**30,** 2024]

3.3.62* Immediately Dangerous to Life and Health (IDLH) [Gas]. A concentration of airborne contaminants, normally expressed in parts per million (ppm) or milligrams per cubic meter, that represents the maximum level from which one could escape within 30 minutes without any escape-impairing symptoms or irreversible health effects. [**55,** 2023]

3.3.63* ISO Module [Gas]. An assembly of tanks or tubular cylinders permanently mounted in a frame conforming to International Organization for Standardization (ISO) requirements. [**55,** 2023]

3.3.64 Limit.

3.3.64.1 ***Ceiling Limit.*** The maximum concentration of an airborne contaminant to which a person can be exposed.

3.3.64.2* ***Permissible Exposure Limit (PEL) [Gas].*** The maximum permitted 8-hour, time-weighted average concentration of an airborne contaminant. [**55,** 2023]

3.3.64.3* ***Short-Term Exposure Limit (STEL) [Gas].*** The concentration to which it is believed that workers can be exposed continuously for a short period of time without suffering from irritation, chronic or irreversible tissue damage, or narcosis of a degree sufficient to increase the likelihood of accidental injury, impairment of self-rescue, or the material reduction of work efficiency, without exceeding the daily permissible exposure limit (PEL). [**55,** 2023]

3.3.65 Liquefied Hydrogen (LH_2) System. An assembly of equipment that consists of, but is not limited to, storage containers, pressure regulators, pressure relief devices, compressors, manifolds, and piping and that terminates at the source valve. [**55,** 2023]

3.3.66 Manufacturing Plants. Those facilities where hazardous materials are produced by chemical means or where hazardous materials are pelletized, ground, dissolved, packaged, mixed, or blended.

3.3.67 Material.

3.3.67.1 ***Combustible Material.*** A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn; a material that does not meet the definition of noncombustible or limited-combustible. [**5000,** 2021]

3.3.67.2* ***Corrosive Material.*** A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact.

3.3.67.3 ***Hazard Material.***

3.3.67.3.1 ***Health Hazard Material.*** A chemical or substance classified as a toxic, highly toxic, or corrosive material in accordance with definitions set forth in this code.

3.3.67.3.2 ***Physical Hazard Material.*** A chemical or substance classified as an explosive, flammable cryogen, flammable gas, flammable solid, ignitible (flammable or combustible) liquid, organic peroxide, oxidizer, oxidizing cryogen, pyrophoric, unstable (reactive), or water-reactive material.

3.3.67.4* ***Hazardous Material.*** A chemical or substance that is classified as a physical hazard material or a health hazard material, whether the chemical or substance is in usable or waste condition. *(See also 3.3.67.3.1, Health Hazard Material, and 3.3.67.3.2, Physical Hazard Material.)*

3.3.67.5* ***Incompatible Material.*** Materials that, when in contact with each other, have the potential to react in a manner that generates heat, fumes, gases, or by-products that are hazardous to life or property.

3.3.67.6 ***Limited-Combustible (Material).*** See 4.8.2.

3.3.67.7* ***Noncombustible Material.*** See 4.8.1.

3.3.67.8 ***Pyrophoric Material.*** A chemical with an autoignition temperature in air at or below 130°F (54.4°C).

3.3.67.9* ***Toxic Material.*** A material that produces a lethal dose or a lethal concentration within any of the following categories: (1) a chemical or substance that has a median lethal dose (LD_{50}) of more than 50 mg/kg but not more than 500 mg/kg of body weight when administered orally to albino rats weighing between 200 g and 300 g each; (2) a chemical or substance that has a median lethal dose (LD_{50}) of more than 200 mg/kg but not more than 1000 mg/kg of body weight when administered by continuous contact for 24 hours, or less if death occurs within 24 hours, with the bare skin of albino rabbits weighing between 2 kg and 3 kg each; (3) a chemical or substance that has a median lethal concentration (LC_{50}) in air of more than 200 parts per million but not more than 2000 parts per million by volume of gas or vapor, or more than 2 mg/L but not more than 20 mg/L, of mist, fume, or dust when administered by continuous inhalation for 1 hour, or less if death occurs within 1 hour, to albino rats weighing between 200 g and 300 g each.

3.3.67.9.1* ***Highly Toxic Material.*** A material that produces a lethal dose or lethal concentration that falls within any of the following categories: (1) a chemical that has a median lethal dose (LD_{50}) of 50 mg/kg or less of body weight when administered orally to albino rats weighing between 200 g and 300 g each; (2) a chemical that has a median lethal dose (LD_{50}) of 200 mg/kg or less of body weight when administered by continuous contact for 24 hours, or less if death occurs within 24 hours, with the bare skin of albino rabbits weighing between 2 kg and 3 kg each or albino rats weighing 200 g and 300 g each; (3) a chemical that has a median lethal concentration (LC_{50}) in air of 200 parts per million by volume or less of gas or vapor, or 2 mg/L or less of mist, fume, or dust, when administered by continuous inhalation for 1 hour, or less if death occurs within 1 hour, to albino rats weighing between 200 g and 300 g each.

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3.3.67.10* ***Unstable (Reactive) Material.*** 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.

3.3.67.10.1* ***Class 1 Unstable (Reactive).*** Materials that in themselves are normally stable, but that can become unstable at elevated temperatures and pressures.

3.3.67.10.2* ***Class 2 Unstable (Reactive).*** Materials that readily undergo violent chemical change at elevated temperatures and pressures.

3.3.67.10.3* ***Class 3 Unstable (Reactive).*** Materials that in themselves are capable of detonation or explosive decomposition or explosive reaction, but that require a strong initiating source or that must be heated under confinement before initiation.

3.3.67.10.4* ***Class 4 Unstable (Reactive).*** Materials that in themselves are readily capable of detonation or explosive decomposition or explosive reaction at normal temperatures and pressures.

3.3.67.11* ***Water-Reactive Material.*** A material that explodes, violently reacts, produces flammable, toxic, or other hazardous gases; or evolves enough heat to cause self-ignition or ignition of nearby combustibles upon exposure to water or moisture.

3.3.68 Maximum Allowable Quantity Per Control Area (MAQ). A threshold quantity of hazardous material in a specific hazard class that once exceeded, requires the application of additional administrative procedures, construction features, or engineering controls. *(See A.5.1.)*

3.3.69 Mechanical Code [Gas]. The mechanical or mechanical construction code adopted by the jurisdiction. [**55,** 2023]

3.3.70* Mobile Supply Unit [Gas]. Any supply source that is equipped with wheels so it is able to be moved around. [**55,** 2023]

3.3.71* Nesting [Gas]. A method of securing cylinders upright in a tight mass using a contiguous three-point contact system whereby all cylinders in a group have a minimum of three contact points with other cylinders or a solid support structure (e.g., a wall or railing). [**55,** 2023]

3.3.72* Non-Bulk Flammable Gas System. A system consisting of cylinders or other storage systems, with each individual cylinder and each individual set of connected cylinders having less than 5000 scf (141.6 Nm^3). [**55,** 2023]

3.3.73* Normal Temperature and Pressure (NTP) [Gas]. A temperature of 70°F (21°C) at an absolute pressure of 14.7 psi (101.3 kPa). [**55,** 2023]

3.3.74 Occupancy. The purpose for which a building or other structure, or part thereof, is used or intended to be used. [**ASCE/SEI** 7:1.2]

3.3.74.1* ***Assembly Occupancy.*** An occupancy (1) used for a gathering of 50 or more persons for deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation, or similar uses; or (2) used as a special amusement building, regardless of occupant load. [***101,*** 2021]

3.3.74.2* ***Business Occupancy.*** An occupancy used for the transaction of business other than mercantile. [**5000,** 2021]

3.3.74.3* ***Day-Care Occupancy.*** An occupancy in which four or more clients receive care, maintenance, and supervision, by other than their relatives or legal guardians, for less than 24 hours per day. [**5000,** 2021]

3.3.74.4* ***Detention and Correctional Occupancy.*** An occupancy, other than one whose primary intended use is health care, ambulatory health care, or residential board and care, used to lawfully incarcerate or lawfully detain one or more persons under varied degrees of restraint or security where such occupants are mostly incapable of self-preservation because of security measures not under the occupants' control. [**5000,** 2021]

3.3.74.5* ***Educational Occupancy.*** An occupancy used for educational purposes through the twelfth grade by six or more persons for 4 or more hours per day or more than 12 hours per week. [**5000,** 2021]

3.3.74.6* ***Health Care Occupancy.*** An occupancy used to provide medical or other treatment or care simultaneously to four or more patients, on an inpatient basis, where such patients are mostly incapable of self-preservation due to age, physical or mental disability, or because of security measures not under the occupants' control. [**5000,** 2021]

3.3.74.6.1* ***Ambulatory Health Care Occupancy.*** An occupancy used to provide services or treatment simultaneously to four or more patients that provides, on an outpatient basis, one or more of the following: (1) treatment for patients that renders the patients incapable of taking action for self-preservation under emergency conditions without the assistance of others; (2) anesthesia that renders the patients incapable of taking action for self-preservation under emergency conditions without the assistance of others; (3) treatment for patients who, due to the nature of their injury or illness, are incapable of taking action for self-preservation under emergency conditions without the assistance of others. [***101,*** 2021]

3.3.74.7* ***Industrial Occupancy.*** An occupancy in which products are manufactured or in which processing, assembling, mixing, packaging, finishing, decorating, or repair operations are conducted. [**5000,** 2021]

3.3.74.8* ***Mercantile Occupancy.*** An occupancy used for the display and sale of merchandise. [**5000,** 2021]

3.3.74.9 ***Multiple Occupancy.*** A building or structure in which two or more classes of occupancy exist. [**5000,** 2021]

3.3.74.10* ***Residential Board and Care Occupancy.*** An occupancy used for lodging and boarding of four or more residents, not related by blood or marriage to the owners or operators, for the purpose of providing personal care services. [**5000,** 2021]

3.3.74.11* ***Residential Occupancy.*** An occupancy that provides sleeping accommodations for purposes other than health care or detention and correctional. [**5000,** 2021]

3.3.74.12* ***Storage Occupancy.*** An occupancy used primarily for the storage or sheltering of goods, merchandise, products, or vehicles. [**5000,** 2021]

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3.3.75 Organic Peroxide. Any organic compound having a double oxygen or peroxy (-O-O-) group in its chemical structure.

3.3.76 Organic Peroxide Formulation. A pure or technically pure organic peroxide or a mixture of organic peroxides with an active oxygen (aO) concentration greater than 1 percent alone or in combination with one or more materials. The transport type for organic peroxide formulations is determined by the UN *Manual of Tests and Criteria, Part II*. Terms such as *accelerator*, *catalyst*, *initiator*, and *curing agent* are sometimes used to describe organic peroxide formulations and are misleading because they can also refer to materials that are not or do not contain organic peroxides, some of which might present increased hazard when mixed with organic peroxides.

3.3.76.1 ***Class I Organic Peroxide.*** Describes organic peroxide formulations that are more severe than a Class II but do not detonate and that are characterized as "explosive in package" or by a very fast burning rate. Includes those characterized for transport as Type B, those characterized for transport as Type C and Type D with a large-scale burning rate equal to or greater than 300 kg/min, and those characterized for transport as Type C and Type D with a small-scale burning rate equal to or greater than 9.0 kg/min × m^2 unless the large-scale burning rate is less than 300 kg/min.

3.3.76.2 ***Class II Organic Peroxide.***

3.3.76.2.1 ***Class IIA Organic Peroxide.*** Describes organic peroxide formulations that burn very rapidly and that present a severe reactivity hazard, and those characterized for transport as Type C and Type D with a large-scale burning rate equal to or greater than 140 kg/min but less than 300 kg/min and those characterized for transport as Type E with a large-scale burning rate equal to or greater than 140 kg/min. Includes those characterized as Type C and Type D if the small-scale burning rate is equal to or greater than 2.2 kg/min × m^2, but less than 9.0 kg/min × m^2 and Type E if the small-scale burning rate is equal to or greater than 2.2 kg/min × m^2.

3.3.76.2.2 ***Class IIB Organic Peroxide.*** Describes organic peroxide formulations that burn very rapidly and that present a severe reactivity hazard, and those characterized for transport as Type C with a large-scale burning rate of less than 140 kg/min. Includes those characterized for transport as Type D and Type E with a large-scale burning rate equal to or greater than 60 kg/min but less than 140 kg/min, those characterized as Type C if the small-scale burning rate is less than 2.2 kg/min × m^2, and those characterized as Type D and Type E if the small-scale burning rate is equal to or greater than 0.9 kg/min × m^2 but less than 2.2 kg/min × m^2.

3.3.76.3 ***Class III Organic Peroxide.*** Describes organic peroxide formulations that burn rapidly and present a moderate reactivity hazard. Includes those characterized for transport as Type D with a large-scale burning rate less than 60 kg/min, those characterized for transport as Type E with a large-scale burning rate equal to or greater than 10 kg/min but less than 60 kg/min, those characterized for transport as Type F with a large-scale burning rate equal to or greater than 10 kg/min, and those characterized as Type D and Type E if the small-scale burning rate is less than 0.9 kg/min × m^2 and Type F irrespective of the small scale burning rate.

3.3.76.4 ***Class IV Organic Peroxide.*** Describes organic peroxide formulations that burn in the same manner as ordinary combustibles and present a minimal reactivity hazard. Includes those characterized for transport as Type E or Type F with a large-scale burning rate less than 10 kg/min.

3.3.76.5 ***Class V Organic Peroxide.*** Describes organic peroxide formulations that burn with less intensity than ordinary combustibles or those that do not sustain combustion and present no reactivity hazard, and those characterized for transport as Type G without additional subsidiary risks.

3.3.77 OSHA [Gas]. The Occupational Safety and Health Administration of the US Department of Labor. [**55,** 2023]

3.3.78* Oxidizer. Any solid or liquid material that readily yields oxygen or other oxidizing gas or that readily reacts to promote or initiate combustion of combustible materials and that can, under some circumstances, undergo a vigorous self-sustained decomposition due to contamination or heat exposure.

3.3.78.1 ***Class 1.*** An oxidizer that does not moderately increase the burning rate of combustible materials with which it comes into contact or a solid oxidizer classified as Class 1 when tested in accordance with the test protocol set forth in Section G.1.

3.3.78.2 ***Class 2.*** An oxidizer that causes a moderate increase in the burning rate of combustible materials with which it comes into contact or a solid oxidizer classified as Class 2 when tested in accordance with the test protocol set forth in Section G.1.

3.3.78.3 ***Class 3.*** An oxidizer that causes a severe increase in the burning rate of combustible materials with which it comes into contact or a solid oxidizer classified as Class 3 when tested in accordance with the test protocol set forth in Section G.1.

3.3.78.4 ***Class 4.*** An oxidizer that can undergo an explosive reaction due to contamination or exposure to thermal or physical shock and that causes a severe increase in the burning rate of combustible materials with which it comes into contact.

3.3.79* Pile. Material in a single contiguous storage area, including any material not properly separated by the appropriate distance.

3.3.80* Protection Level. A term used to describe a tier of building safety that exceeds the construction requirements for control areas to accommodate quantities of hazardous materials in excess of those permitted using the control area concept. *(See Section 5.3.)*

3.3.81 Remotely Located, Manually Activated Shutdown Control [Gas]. A control system that is designed to initiate shutdown of the flow of gas or liquid that is manually activated from a point located some distance from the delivery system. [**55,** 2023]

3.3.82* Safety Data Sheet (SDS). The document that describes composition of a material, hazardous properties and hazard mitigation, and disposal information.

3.3.83* Secondary Containment. That level of containment that is external to and separate from primary containment.

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3.3.84 Spill Control. A method for the control of a hazardous materials spill.

3.3.85 Standard Cubic Foot (scf) of Gas [Gas]. An amount of gas that occupies one cubic foot at an absolute pressure of 14.7 psi (101 kPa) and a temperature of 70°F (21°C). [**55,** 2023]

3.3.86* Storage (Hazardous Material). Hazardous material in the act of being stored as a supply reserved for future use or disposal including, but not limited to, any of the following: (1) hazardous material packaged in individual containers, without active connections, that can be handled, stacked, arranged, or transported on site; (2) unconnected mobile equipment or over-the-road transport vehicles containing hazardous materials awaiting transportation; (3) mobile equipment including over-the-road transport vehicles containing hazardous materials when connected and serving as a source of supply; (4) stationary tanks containing hazardous materials, including tanks connected and serving as a source of supply.

3.3.86.1 ***Bulk Solid Storage.*** The storage of more than 6000 lb (2722 kg) in a single container.

3.3.86.2 ***Detached Storage.*** Storage in a separate building or in an outside area located away from all structures. [**1,** 2021]

3.3.86.2.1 ***Detached Building (Hazardous Materials).*** A separate single-story building, without a basement or crawl space, used for the storage or use of hazardous materials and located an approved distance from all other structures.

3.3.86.2.2 ***Detached Storage (Oxidizers).*** Storage in either an open outside area or in a separate building containing no incompatible materials and located away from all other structures.

3.3.86.3 ***Protected Storage Room.*** A separated room in a building for storage of hazardous materials meeting the construction requirements of the applicable protection level (1 to 4) in accordance with Section 5.3.

3.3.86.4 ***Segregated Storage.*** Storage in the same room or inside area but physically separated by distance, noncombustible partitions, cabinets, or enclosures from incompatible materials.

3.3.86.5 ***Storage, Compressed Gases or Cryogenic Fluids [Gas].*** An inventory of compressed gases or cryogenic fluids in containers that are not in the process of being examined, serviced, refilled, loaded, or unloaded.

3.3.87 Storage Height. The height from the finished floor to the top of the highest container or a pile's peak.

3.3.88* Tank.

3.3.88.1 ***Container Tank.*** Any vessel of 119 gal (450 L), 1000 lb (454 kg) or less water capacity used for transporting or storing hazardous chemicals.

3.3.88.2* ***Portable Tank.*** A container designed primarily to be loaded into or on or temporarily attached to a transport vehicle or ship and equipped with skids, mountings, or accessories to facilitate handling of the tank by mechanical means and not intended for fixed installation.

3.3.88.3* ***Stationary Tank.*** A vessel used for storing hazardous materials designed for stationary installations not intended for loading, unloading, or attachment to a transport vehicle or ship as part of its normal operation in the process of use.

3.3.89 TC [Gas]. Transport Canada. [**55,** 2023]

3.3.90 Treatment System [Gas]. An assembly of equipment capable of processing a hazardous gas or vapor and reducing the gas concentration to a predetermined level at the point of discharge from the system to the atmosphere.

3.3.91* Tube Trailer [Gas]. A truck or semitrailer on which a number of very long compressed gas tubular cylinders have been mounted and manifolded into a common piping system. [**55,** 2023]

3.3.92* Use. To place a material, including solids, liquids, and gases, into action.

3.3.92.1* ***Closed System Use.*** Use of a solid or liquid hazardous material in a closed vessel or system that remains closed during normal operations where vapors emitted by the product are not liberated outside of the vessel or system and the product is not exposed to the atmosphere during normal operations and all uses of compressed gases.

3.3.92.2* ***Open System Use.*** Use of a solid or liquid hazardous material in a vessel or system that is continuously open to the atmosphere during normal operations and where vapors are liberated or the product is exposed to the atmosphere during normal operations.

3.3.93 Valve Outlet Cap or Plug [Gas]. A removable device that forms a gastight seal on the outlet to the control valve that is provided on a source containing a compressed gas or cryogenic fluid. [**55,** 2023]

3.3.94 Valve Protection Cap [Gas]. A rigid, removable cover provided for container valve protection during handling, transportation, and storage. [**55,** 2023]

3.3.95 Valve Protection Device [Gas]. A device attached to the neck ring or body of a cylinder for the purpose of protecting the cylinder valve from being struck or from being damaged by the impact resulting from a fall or an object striking the cylinder. [**1,** 2021]

3.3.96 Waste. Hazardous materials that have been determined by the user to be beyond their useful life and that are awaiting disposal or processing by either public or private means.

3.4 Special Performance-Based Definitions.

3.4.1 Analysis.

3.4.1.1 ***Sensitivity Analysis.*** An analysis performed to determine the degree to which a predicted output will vary given a specified change in an input parameter, usually in relation to models. [**5000,** 2021]

3.4.1.2 ***Uncertainty Analysis.*** An analysis performed to determine the degree to which a predicted value will vary. [**5000,** 2021]

3.4.2 Data Conversion. The process of developing the input data set for the assessment method of choice. [***101,*** 2021]

3.4.3 Design Fire Scenario. See 3.4.8.1.

3.4.4 Design Specification. See 3.4.18.1.

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3.4.5 Design Team. A group of stakeholders including, but not limited to, representatives of the architect, client, and any pertinent engineers and other designers. [***101***, 2021]

3.4.6* Exposure Fire. A fire that starts at a location that is remote from the area being protected and grows to expose that which is being protected. [***101***, 2021]

3.4.7* Fire Model. A structured approach to predicting one or more effects of a fire. [***101***, 2021]

3.4.8* Fire Scenario. A set of conditions that defines the development of fire, the spread of combustion products throughout a building or portion of a building, the reactions of people to fire, and the effects of combustion products. [***101***, 2021]

3.4.8.1 ***Design Fire Scenario.*** A fire scenario selected for evaluation of a proposed design. [***101***, 2021]

3.4.9* Fuel Load. The total quantity of combustible contents of a building, space, or fire area. [**5000,** 2021]

3.4.10 Input Data Specification. See 3.4.18.2.

3.4.11 Occupant Characteristics. The abilities or behaviors of people before and during a fire. [***101***, 2021]

3.4.12* Performance Criteria. Threshold values on measurement scales that are based on quantified performance objectives. [***101***, 2021]

3.4.13* Proposed Design. A design developed by a design team and submitted to the authority having jurisdiction for approval. [***101***, 2021]

3.4.14 Safe Location. A location remote or separated from the effects of a fire so that such effects no longer pose a threat. [***101***, 2021]

3.4.15 Safety Factor. A factor applied to a predicted value to ensure that a sufficient safety margin is maintained. [***101***, 2021]

3.4.16 Safety Margin. The difference between a predicted value and the actual value where a fault condition is expected. [***101***, 2021]

3.4.17 Sensitivity Analysis. See 3.4.1.1.

3.4.18 Specification.

3.4.18.1 ***Design Specification.*** A building characteristic and other conditions that are under the control of the design team. [**5000,** 2021]

3.4.18.2 ***Input Data Specification.*** Information required by the verification method. [***101***, 2021]

3.4.19 Stakeholder. An individual, or representative of same, having an interest in the successful completion of a project. [***101***, 2021]

3.4.20 Uncertainty Analysis. See 3.4.1.2.

3.4.21 Verification Method. A procedure or process used to demonstrate or confirm that the proposed design meets the specified criteria. [***101***, 2021]

Chapter 4 Classification of Materials, Wastes, and Hazard of Contents

4.1* Hazardous Material Classification. Materials shall be classified into one or more of the following categories of hazardous materials, based on the definitions found in Chapter 3:

(1) Corrosive solids, liquids, or gases
(2) Flammable solids
(3) Flammable gases
(4) Flammable cryogenic fluids
(5) Inert cryogenic fluids
(6) Inert gases
(7) Organic peroxide formulations
(8) Oxidizer solids or liquids
(9) Oxidizing gases
(10) Oxidizing cryogenic fluids
(11) Pyrophoric solids, liquids, or gases
(12) Toxic or highly toxic solids, liquids, or gases
(13) Unstable (reactive) solids, liquids, or gases
(14) Water-reactive solids or liquids

4.2 Classification of High-Hazard Contents.

4.2.1 General.

4.2.1.1 High-hazard contents shall include materials defined as hazardous material in Chapter 3, whether stored, used, or handled.

4.2.1.2 High-hazard contents shall include those materials defined as hazardous material solids, liquids, or gases limited to the hazard categories specified in 1.1.1 and classified in accordance with 4.2.1.2.1 through 4.2.1.2.4 whether stored, used, or handled.

4.2.1.2.1 High-Hazard Level 1 Contents. High-hazard Level 1 contents shall include materials that present a detonation hazard, including, but not limited to, the following hazard categories:

(1) Class 4 oxidizers
(2) Detonable pyrophoric solids or liquids
(3) Class 3 detonable and Class 4 unstable (reactive) solids, liquids, or gases
(4) Detonable organic peroxides

4.2.1.2.2 High-Hazard Level 2 Contents. High-hazard Level 2 contents shall include materials that present a deflagration hazard or a hazard from accelerated burning, including, but not limited to, the following hazard categories:

(1) Combustible dusts that are stored, used, or generated in a manner that creates a severe fire or explosion hazard
(2) Class I organic peroxides
(3) Class 3 solid or liquid oxidizers that are used or stored in normally open containers or systems or in closed containers or systems at gauge pressures of more than 15 psi (103.4 kPa)
(4) Flammable gases
(5) Flammable cryogenic fluids
(6) Nondetonable pyrophoric solids, liquids, or gases
(7) Class 3 nondetonable unstable (reactive) solids, liquids, or gases
(8) Class 3 water-reactive solids and liquids

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4.2.1.2.3 High-Hazard Level 3 Contents. High-hazard Level 3 contents shall include materials that readily support combustion or present a physical hazard, including, but not limited to, the following hazard categories:

(1) Flammable solids, other than dusts classified as high-hazard Level 2, that are stored, used, or generated in a manner that creates a high fire hazard
(2) Class IIA, Class IIB, and Class III organic peroxides
(3) Class 2 solid or liquid oxidizers
(4) Class 3 solid or liquid oxidizers that are used or stored in normally closed containers or systems at gauge pressures of less than 15 psi (103.4 kPa)
(5) Class 2 unstable (reactive) materials
(6) Class 2 water-reactive solids, liquids, or gases
(7) Oxidizing gases
(8) Oxidizing cryogenic fluids

4.2.1.2.4 High-Hazard Level 4 Contents. High-hazard Level 4 contents shall include materials that are acute health hazards, including, but not limited to the following hazard categories:

(1) Corrosive solids, liquids, or gases
(2) Highly toxic solids, liquids, or gases
(3) Toxic solids, liquids, or gases

4.2.2 Responsibility for Classification. Classification shall be performed by an approved organization, individual, or testing laboratory. [**55:**5.1.4]

4.3 Mixtures. Mixtures shall be classified in accordance with the hazards of the mixture as a whole by an approved, qualified organization, individual, or testing laboratory.

4.4* Multiple Hazards. Hazardous materials that have multiple hazards shall conform to the code requirements for each applicable hazard category.

4.5* Classification of Waste. Waste comprised of or containing hazardous materials shall be classified in accordance with Sections 4.1 through 4.4 as applicable.

4.5.1* Waste classified in accordance with Sections 4.1 through 4.4 shall comply with the requirements of Chapters 1 through 9 and the material-specific requirements of Chapters 11 through 21 as applicable.

Δ **4.6 Toxicity of Gas Mixtures.** The toxicity of gas mixtures shall be classified in accordance with this code or with the requirements of 29 CFR 1910.1200, 49 CFR 173.115, or ISO 10298, *Gas Cylinders — Gases and Gas Mixtures — Determination of Toxicity for the Selection of Cylinder Valve Outlets*. [**55:**5.1.4.1]

4.7 Flammability of Gas Mixtures. For gas mixtures other than those containing ammonia and nonflammable gases, flammability of gas mixtures shall be classified in accordance with CGA P-23, *Standard for Categorizing Gas Mixtures Containing Flammable and Nonflammable Components*; or by physical testing in accordance with the requirements of ASTM E681, *Standard Test Method for Concentration Limits of Flammability of Chemicals (Vapors and Gases)*; or ISO 10156, *Gas Cylinders — Gases and Gas Mixtures — Determination of Fire Potential and Oxidizing Ability for the Selection of Cylinder Valve Outlets*. [**55:**5.1.4.2]

4.8 Combustibility of Materials.

4.8.1* Noncombustible Material.

4.8.1.1 A material that complies with any one of the following shall be considered a noncombustible material:

(1)* The material, in the form in which it is used, and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat.
(2) The material is reported as passing ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*.
(3) The material is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-Shaped Airflow Stabilizer, at 750°C*.

[**5000:**7.1.4.1.1]

4.8.1.2 Where the term *limited-combustible* is used in this code, it shall also include the term *noncombustible*. [**5000:**7.1.4.1.2]

4.8.2* Limited-Combustible Material. A material shall be considered a limited-combustible material where one of the following is met:

(1) The conditions of 4.8.2.1 and 4.8.2.2, and the conditions of either 4.8.2.3 or 4.8.2.4, shall be met.
(2) The conditions of 4.8.2.6 shall be met.

[**5000:**7.4.1.2]

4.8.2.1 The material does not comply with the requirements for a noncombustible material in accordance with 4.8.1. [**5000**:7.1.4.2.1]

4.8.2.2 The material, in the form in which it is used, exhibits a potential heat value not exceeding 3500 Btu/lb (8141 kJ/kg) when tested in accordance with NFPA 259. [**5000**:7.1.4.2.2]

4.8.2.3 The material shall have a structural base of noncombustible material with a surfacing not exceeding a thickness of ⅛ in. (3.2 mm) where the surfacing exhibits a flame spread index not greater than 50 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials,* or UL 723, *Test for Surface Burning Characteristics of Building Materials*. [**5000**:7.1.4.2.3]

Δ **4.8.2.4** The material shall be composed of materials that in the form and thickness used neither exhibit a flame spread index greater than 25 nor exhibit evidence of continued progressive combustion when tested in accordance with ASTM E84 or UL 723 and are of such composition that all surfaces that would be exposed by cutting through the material on any plane would neither exhibit a flame spread index greater than 25 nor exhibit evidence of continued progressive combustion when tested in accordance with ASTM E84 or UL 723. [**5000:**7.1.4.2.4]

4.8.2.5 Materials shall be considered limited-combustible materials where tested in accordance with ASTM E2965, *Standard Test Method for Determination of Low Levels of Heat Release Rate for Materials and Products Using an Oxygen Consumption Calorimeter*, at an incident heat flux of 75 kW/m^2 for a 20-minute exposure, and both the following conditions are met:

(1) The peak heat release rate shall not exceed 150 kW/m^2 for longer than 10 seconds.
(2) The total heat released shall not exceed 8 MJ/m^2.

[**5000**:7.1.4.2.5]

4.8.2.6 Where the term *limited-combustible* is used in this code, it shall also include the term *noncombustible*. [**5000:**7.1.4.2.6]

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4.9 Classification of Ignitible (Flammable or Combustible) Liquids.

4.9.1 Class I Liquids.

4.9.1.1 A liquid with a closed-cup flash point below 100°F (37.8°C) shall be designated as a Class I liquid (i.e., flammable liquid), as determined by the test procedures and apparatus set forth in 4.9.5 and a Reid vapor pressure that does not exceed an absolute pressure of 40 psi (276 kPa) at 100°F (37.8°C), as determined by ASTM D323, *Standard Test Method for Vapor Pressure of Petroleum Products (Reid Method)*. [**30:**4.2.1.1]

4.9.1.2 Class I liquids shall be further subclassified in accordance with the following:

(1) *Class IA Liquid*. A liquid that has a flash point below 73°F (22.8°C) and a boiling point below 100°F (37.8°C).
(2) *Class IB Liquid*. A liquid that has a flash point below 73°F (22.8°C) and a boiling point at or above 100°F (37.8°C).
(3) *Class IC Liquid*. A liquid that has a flash point at or above 73°F (22.8°C), but below 100°F (37.8°C).

[**30:**4.2.1.2]

4.9.2 Class II Liquids. A liquid with a closed-cup flash point at or above 100°F (37.8°C) but below 140°F (60°C) shall be designated as a Class II liquid (i.e., combustible liquid), as determined by the test procedures and apparatus set forth in 4.9.5. [**30:**4.2.2]

4.9.3 Class III Liquids.

4.9.3.1 A liquid with a closed-cup flash point at or above 140°F (60°C) shall be designated as a Class III liquid (i.e., combustible liquid), as determined by the test procedures and apparatus set forth in 4.9.5. [**30:**4.2.3.1]

4.9.3.2 Class III liquids shall be further subclassified in accordance with the following:

(1) *Class IIIA Liquid*. A liquid that has a flash point at or above 140°F (60°C), but below 200°F (93°C).
(2) *Class IIIB Liquid*. A liquid that has a flash point at or above 200°F (93°C).

[**30:**4.2.3.2]

4.9.4 Determination of Boiling Point (BP).

4.9.4.1 For defining the boiling point, atmospheric pressure shall be considered to be an absolute pressure of 14.7 psi (101.4 kPa). [**30:**4.3.1]

4.9.4.2 For mixtures that do not have a constant boiling point, the 20 percent evaporated point of a distillation performed in accordance with ASTM D86, *Standard Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure*, shall be considered to be the boiling point. [**30:**4.3.2]

4.9.5 Determination of Flash Point (FP). The flash point of a liquid shall be determined according to the methods specified in 4.9.5.1 through 4.9.5.4. [**30:**4.4]

4.9.5.1 Except as specified in 4.9.5.1.1, the flash point of a liquid having a viscosity below 5.5 centiStokes at 104°F (40°C) or below 9.5 centiStokes at 77°F (25°C) shall be determined in accordance with ASTM D56, *Standard Test Method for Flash Point by Tag Closed Cup Tester*. [**30:**4.4.1]

4.9.5.1.1 Cut-back asphalts, liquids that tend to form a surface film, and liquids that contain suspended solids shall not be tested in accordance with ASTM D56, *Standard Test Method for Flash Point by Tag Closed Cup Tester*, even if they otherwise meet the viscosity criteria. [**30:**4.4.1.1]

4.9.5.1.2 Such liquids as stated in 4.9.5.1.1 shall be tested in accordance with 4.9.5.2. [**30:**4.4.1.2]

4.9.5.2 The flash point of a liquid having a viscosity of 5.5 centiStokes or more at 104°F (40°C) or 9.5 centiStokes or more at 77°F (25°C) or a flash point of 200°F (93.4°C) or higher shall be determined in accordance with ASTM D93, *Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester*. [**30:**4.4.2]

4.9.5.3 As an alternative, ASTM D3278, *Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus*, shall be permitted to be used for paints, enamels, lacquers, varnishes, and related products and their components that have flash points between 32°F (0°C) and 230°F (110°C) and viscosities below 150 Stokes at 77°F (25°C). [**30:**4.4.3]

4.9.5.4 As an alternative, ASTM D3828, *Standard Test Methods for Flash Point by Small Scale Closed Cup Tester*, shall be permitted to be used for materials other than those for which ASTM D3278 is specifically required. [**30:**4.4.4]

Chapter 5 Permissible Storage and Use Locations

5.1* General.

5.1.1 Control Areas or Special Protection Required. Hazardous materials shall be stored and used in any of the following:

(1) In control areas complying with Section 5.2
(2) In occupancies complying with requirements for Protection Level 1, Protection Level 2, Protection Level 3, or Protection Level 4 in accordance with Section 5.3
(3) In outdoor areas complying with Section 5.4

5.1.2 High-Hazard Contents. Occupancies in which high-hazard contents are stored, used, or handled shall also comply with Chapter 6.

5.2 Control Areas.

5.2.1 Hazardous materials shall be permitted to be stored and used in control areas in accordance with 5.2.1 and 5.2.2.

5.2.1.1 General.

5.2.1.1.1 All occupancies shall be permitted to have one or more control areas in accordance with Section 5.2.

5.2.1.1.2* The aggregate quantity of hazardous materials in storage and use shall not exceed the quantity for storage set forth in Table 5.2.1.1.3.

5.2.1.1.2.1 The quantity of hazardous materials in an individual control area in laboratories classified as business occupancies shall not exceed the MAQ set forth in Table 5.2.1.1.3.

5.2.1.1.3* The MAQ of hazardous materials per control area shall be as specified in Table 5.2.1.1.3 except as modified by 5.2.1.2 through 5.2.1.5. Ammonium nitrate shall also comply with Chapter 11.

5.2.1.2 Quantity Limits for Occupancies Other than Mercantile, Storage, or Industrial Occupancies.

5.2.1.2.1 The MAQ of hazardous materials per control area in occupancies other than mercantile, storage, or industrial occupancies shall be as specified in Table 5.2.1.2.1.

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Table 5.2.1.1.3 Maximum Allowable Quantities (MAQ) of Hazardous Materials per Control Area

Material	Class	High Hazard Protection Level	Storage			Use — Closed Systems			Use — Open Systems	
			Solid Pounds	Liquid Gallons (lb)	Gas (at NTP) ft³ (lb)	Solid Pounds	Liquid Gallons (lb)	Gas (at NTP) ft³ (lb)	Solid Pounds	Liquid Gallons (lb)
Physical Hazard Materials										
Combustible metals	See Note 1.	See Note 1.	See Note 1.	See Note 1.	See Note 1.	See Note 1.	See Note 1.	See Note 1.	See Note 1.	See Note 1.
Cryogenic fluid [**55:**Table 6.3.1.1]	Flammable	2	N/A	45[c,f]	N/A	N/A	45[c,f]	N/A	N/A	45[c,f]
	Oxidizing	3	N/A	45[a,b]	N/A	N/A	45[a,b]	N/A	N/A	45[a,b]
	Inert	N/A	N/A	NL	N/A	N/A	NL	N/A	N/A	NL
Explosives	See Note 1.	See Note 1.	See Note 1.	See Note 1.	See Note 1.	See Note 1.	See Note 1.	See Note 1.	See Note 1.	See Note 1.
Flammable gas[g] [**55:**Table 6.3.1.1]	Gaseous	2	N/A	N/A	1000[a,b]	N/A	N/A	1000[a,b]	N/A	N/A
	Liquefied	2	N/A	N/A	(150)[a,b]	N/A	N/A	(150)[a,b]	N/A	N/A
	Liquefied petroleum (LP)	2	N/A	N/A	(300)[h,i,j]	N/A	N/A	(300)[i]	N/A	N/A
Ignitible (flammable or combustible liquid)[c]	IA	3	N/A	30[a,b]	N/A	N/A	See Note 1.	N/A	N/A	See Note 1.
	IB and IC	3	N/A	120[a,b]	N/A	N/A	See Note 1.	N/A	N/A	See Note 1.
	Combination (IA, IB, IC)	3	N/A	120[a,b,k]	N/A	N/A	See Note 1.	N/A	N/A	See Note 1.
	II	3	N/A	120[a,b]	N/A	N/A	See Note 1.	N/A	N/A	See Note 1.
	IIIA	3	N/A	330[a,b]	N/A	N/A	See Note 1.	N/A	N/A	See Note 1.
	IIIB	N/A	N/A	13,200[a,d]	N/A	N/A	See Note 1.	N/A	N/A	See Note 1.
Flammable solid	N/A	3	125[a,b]	N/A	N/A	125[a,b]	N/A	N/A	25[a,b]	N/A
Inert gas	Gaseous	N/A	N/A	N/A	NL	N/A	N/A	NL	N/A	N/A
	Liquefied	N/A	N/A	N/A	NL	N/A	N/A	NL	N/A	N/A
Organic peroxide	I	2	16[a,b]	(16)[a,b]	N/A	8[a,b]	(8)[a,b]	N/A	8[b]	(8)[b]
	IIA	3	100[a,b]	(100)[a,b]	N/A	100[a,b]	(100)[a,b]	N/A	50[b]	(50)[b]
	IIB	3	400[a,b]	(400)[a,b]	N/A	400[a,b]	(400)[a,b]	N/A	200[b]	(200)[b]
	III	3	840[a,b]	(840)[a,b]	N/A	840[a,b]	(840)[a,b]	N/A	840[b]	(840)[b]
	IV	N/A	NL	NL	N/A	NL	NL	N/A	NL	NL
	V	N/A	NL	NL	N/A	NL	NL	N/A	NL	NL
Oxidizer	4	1	1[a,l]	(1)[a,l]	N/A	¼[l]	(¼)[l]	N/A	¼[l]	(¼)[l]
	3[m]	2 or 3	10[a,b]	(10)[a,b]	N/A	2[b]	(2)[b]	N/A	2[b]	(2)[b]
	2	3	250[a,b]	(250)[a,b]	N/A	250[b]	(250)[b]	N/A	50[b]	(50)[b]
	1	N/A	4000[a,n]	(4000)[a,n]	N/A	4000[n]	(4000)[n]	N/A	1000[n]	(1000)[n]
Oxidizing gas [**55:**Table 6.3.1.1]	Gaseous	3	N/A	N/A	1500[a,b]	N/A	N/A	1500[a,b]	N/A	N/A
	Liquefied	3	N/A	N/A	(150)[a,b]	N/A	N/A	(150)[a,b]	N/A	N/A
Pyrophoric	N/A	2	4[a,l]	(4)[a,l]	N/A	1[l]	(1)[l]	N/A	NP	NP
Pyrophoric gas [**55:**Table 6.3.1.1]	Gaseous	2	N/A	N/A	50[a,l]	N/A	N/A	50[a,l]	N/A	N/A
	Liquefied	2	N/A	N/A	(4)[a,l]	N/A	N/A	(4)[a,l]	N/A	N/A
Unstable (reactive)	4	1	1[a,l]	(1)[a,l]	N/A	¼[l]	(¼)[l]	N/A	¼[l]	(¼)[l]
	3	1 or 2	5[a,b]	(5)[a,b]	N/A	1[b]	(1)[b]	N/A	1[b]	(1)[b]
	2	2	50[a,b]	(50)[a,b]	N/A	50[b]	(50)[b]	N/A	10[b]	(10)[b]
	1	N/A	NL	NL	N/A	NL	NL	N/A	NL	NL
Unstable (reactive) gas [**55:**Table 6.3.1.1]	Gaseous	1	N/A	N/A	10[a,l]	N/A	N/A	10[a,l]	N/A	N/A
	4 or 3 detonable									
	3 non-detonable	2	N/A	N/A	50[a,b]	N/A	N/A	50[a,b]	N/A	N/A
	2	3	N/A	N/A	750[a,b]	N/A	N/A	750[a,b]	N/A	N/A
	1	N/A	N/A	N/A	NL	N/A	N/A	NL	N/A	N/A
Unstable (reactive) gas [**55:**Table 6.3.1.1]	Liquefied	1	N/A	N/A	(1)[a,l]	N/A	N/A	(1)[a,l]	N/A	N/A
	4 or 3 detonable									
	3 non-detonable	2	N/A	N/A	(2)[a,b]	N/A	N/A	(2)[a,b]	N/A	N/A
	2	3	N/A	N/A	(150)[a,b]	N/A	N/A	(150)[a,b]	N/A	N/A
	1	N/A	N/A	N/A	NL	N/A	N/A	NL	N/A	N/A
Water-reactive	3	2	5[a,b]	(5)[a,b]	N/A	5[b]	(5)[b]	N/A	1[b]	(1)[b]
	2	3	50[a,b]	(50)[a,b]	N/A	50[b]	(50)[b]	N/A	10[b]	(10)[b]
	1	N/A	NL	NL	N/A	NL	NL	N/A	NL	NL
Health Hazard Materials										
Corrosive	N/A	4	5000[a,b]	500[a,b]	N/A	5000[b]	500[b]	N/A	1000[b]	100[b]
Corrosive gas [**55:**Table 6.3.1.1]	Gaseous	4	N/A	N/A	810[a,b]	N/A	N/A	810[a,b]	N/A	N/A
	Liquefied	4	N/A	N/A	(150)[a,b]	N/A	N/A	(150)[a,b]	N/A	N/A
Highly toxic	N/A	4	10[a,b]	(10)[a,b]	N/A	10[b]	(10)[b]	N/A	3[b]	(3)[b]

(continues)

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

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Table 5.2.1.1.3 ***Continued***

Material	Class	High Hazard Protection Level	Storage			Use — Closed Systems			Use — Open Systems	
			Solid Pounds	Liquid Gallons (lb)	Gas (at NTP) ft^3 (lb)	Solid Pounds	Liquid Gallons (lb)	Gas (at NTP) ft^3 (lb)	Solid Pounds	Liquid Gallons (lb)
Highly toxic gas	Gaseous	4	N/A	N/A	20[b,o]	N/A	N/A	20[b,o]	N/A	N/A
[**55:**Table 6.3.1.1]	Liquefied	4	N/A	N/A	(4)[b,o]	N/A	N/A	(4)[b,o]	N/A	N/A
Toxic	N/A	4	500[a,b]	(500)[a,b]	N/A	500[b]	(500)[b]	N/A	125[b]	(125)[b]
Toxic gas	Gaseous	4	N/A	N/A	810[a,b]	N/A	N/A	810[a,b]	N/A	N/A
	Liquefied	4	N/A	N/A	(150)[a,b]	N/A	N/A	(150)[a,b]	N/A	N/A

For SI units, 1 lb = 0.454 kg; 1 gal = 3.785 L; 1 ft^3 = 0.0283 m^3. Where quantities are indicated in pounds and when the weight per gallon of the liquid is not provided to the AHJ, a conversion factor of 10 lb/gal (1.2 kg/L) shall be used.

NTP: Measured at normal temperature and pressure [70°F (21°C) and 14.7 psi (101.3kPa)].

N/A: Not applicable. NL: Not limited. NP: Not permitted.

Notes:

(1) See Chapter 2 for the reference code or standard governing these materials and establishing the MAQs. In accordance with 1.1.1.2, materials having multiple hazards that fall within the scope of NFPA 400 shall comply with NFPA 400.

(2) Table values in parentheses correspond to the unit name in parentheses at the top of the column.

(3) The use of explosive materials required by federal, state, or municipal agencies while engaged in normal or emergency performance of duties is not required to be limited. The storage of explosive materials is required to be in accordance with the requirements of NFPA 495.

(4) The storage and use of explosive materials in medicines and medicinal agents in the forms prescribed by the official United States Pharmacopeia or the National Formulary are not required to be limited.

(5) The storage and use of propellant-actuated devices or propellant-actuated industrial tools manufactured, imported, or distributed for their intended purposes are required to be limited to 50 lb (23 kg) net explosive weight.

[a]Quantities are permitted to be increased 100 percent where stored or used in approved cabinets, gas cabinets, exhausted enclosures, gas rooms explosives magazines, or safety cans, as appropriate for the material stored, in accordance with this code. Where footnote b also applies, the increase for both footnote a and footnote b is permitted to be applied accumulatively.

[b]Maximum quantities are permitted to be increased 100 percent in buildings equipped throughout with an automatic sprinkler system in accordance with NFPA 13. Where footnote a also applies, the increase for both footnote a and footnote b is permitted to be applied accumulatively.

[c]Beverages, medicines, foodstuffs, cosmetics, and other products that contain not more than 20 percent by volume of water-miscible ignitible (flammable or combustible) liquids, with the remainder of the product consisting of components that do not burn, are not limited. *(See 9.1.4 of NFPA 30.)*

[d]The permitted quantities are not limited in a building equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13 and designed in accordance with the protection criteria contained in Chapter 16 of NFPA 30.

[e]None allowed in unsprinklered buildings unless stored or used in gas rooms, approved gas cabinets, or exhausted enclosures, as specified in this code.

[f]With pressure-relief devices for stationary or portable containers vented directly outdoors or to an exhaust hood. [**55:**Table 6.3.1.1]

[g]Flammable gases in the fuel tanks of mobile equipment or vehicles are permitted to exceed the MAQ where the equipment is stored and operated in accordance with this code.

[h]Additional storage locations are required to be separated by a minimum of 300 ft (92 m).

[i]In mercantile occupancies, storage of LP-Gas is limited to a maximum of 200 lb (91 kg) in nominal 1 lb (0.45 kg) LP-Gas containers.

[j]See NFPA 58 for liquefied petroleum gas (LP-Gas) requirements. LP-Gas is not within the scope of NFPA 400.

[k]Containing not more than the MAQ of Class IA, Class IB, or Class IC flammable liquids, individually, per control area.

[l]Permitted only in buildings equipped throughout with an automatic sprinkler system in accordance with NFPA 13.

[m]A maximum quantity of 220 lb (99 kg) of solid or 22 gal (83 L) of liquid Class 3 oxidizer is permitted where such materials are necessary for maintenance purposes, operation, or sanitation of equipment. Storage containers and the manner of storage are required to be approved.

[n]The permitted quantities are not limited in a building equipped throughout with an automatic sprinkler system in accordance with NFPA 13.

[o]Allowed only where stored or used in gas rooms, approved gas cabinets, or exhausted enclosures, as specified in this code.

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Δ Table 5.2.1.2.1 Maximum Allowable Quantities (MAQ) of Hazardous Materials per Control Area in Occupancies Other Than Mercantile, Storage, or Industrial Occupancies

Material	Class	Solid Pounds	Liquid Gallons (lb)	Gas (at NTP) ft^3 (lb)
Ignitible (flammable or combustible) liquid[a,b,c]	I and II	N/A	10	N/A
	IIIA	N/A	60	N/A
	IIIB	N/A	120[d]	N/A
Cryogenic fluid	Flammable	N/A	10	N/A
	Oxidizing	N/A	10	N/A
Explosives[e,f,g,h]	See Note 1.	See Note 1.	See Note 1.	See Note 1.
Flammable gas[b]	Gaseous	N/A	N/A	NP[i]
	Liquefied	N/A	N/A	NP[i,j]
	Liquefied petroleum (LP)	N/A	N/A	(20)[k]
Flammable solid	N/A	5	N/A	N/A
Oxidizers	4	NP	NP	N/A
	3	10[l]	1[l]	N/A
	2	250	25	N/A
	1	4,000[m]	400[m]	N/A
Oxidizing gas	Gaseous	N/A	N/A	NP[i]
	Liquefied	N/A	N/A	NP[i]
Organic peroxides	I	NP	NP	N/A
	IIA	NP	NP	N/A
	IIB	NP	NP	N/A
	III	25	(25)	N/A
	IV	NL	NL	N/A
	V	NL	NL	N/A
Pyrophoric materials	N/A	1[n]	(1)[n]	NP
Unstable (reactive)	4	¼	(¼)	NP
	3	1	(1)	NP
	2	10	(10)	NP[i]
	1	NL	NL	NP
Water-reactive	3	1	(1)	N/A
	2	10	(10)	N/A
	1	NL	NL	N/A
Corrosives	N/A	1,000	100	NP
Highly toxic	N/A	3	(3)	NP[o]

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Δ **Table 5.2.1.2.1** ***Continued***

Material	Class	Solid Pounds	Liquid Gallons (lb)	Gas (at NTP) ft^3 (lb)
Toxic	N/A	125	(125)	NP[o]

For SI units, 1 lb = 0.454 kg; 1 gal = 3.785 L, 1 ft^3 = 0.0283 m^3. Where quantities are indicated in pounds and when the weight per gallon of the liquid is not provided to the AHJ, a conversion factor of 10 lb/gal (1.2 kg/L) shall be used.
NTP: Measured at normal temperature and pressure [70°F (21°C) and 14.7 psi (101 kPa)]. N/A: Not applicable. NP: Not permitted. NL: Not limited.
Notes:
(1) The hazardous material categories and MAQs that are shaded in this table are not regulated by NFPA 400 but are provided here for informational purposes. See Chapter 2 for the reference code or standard governing these materials and establishing the MAQs. In accordance with 1.1.1.2, materials having multiple hazards that fall within the scope of NFPA 400 shall comply with NFPA 400.
(2) Table values in parentheses correspond to the unit name in parentheses at the top of the column. The aggregate quantity in use and storage is not permitted to exceed the quantity listed for storage.
[a]Storage in excess of 10 gal (38 L) of Class I and Class II liquids combined or 60 gal (227 L) of Class IIIA liquids is permitted where stored in safety cabinets with an aggregate quantity not to exceed 180 gal (681 L).
[b]Fuel in the tank of operating mobile equipment is permitted to exceed the specified quantity where the equipment is operated in accordance with this code.
[c]Medicines, foodstuffs, cosmetics, and other consumer products that contain not more than 50 percent by volume of water-miscible ignitible (flammable or combustible) liquids, with the remainder of the product consisting of components that do not burn, are not limited where packaged in individual containers that do not exceed a 1.3 gal (5 L) capacity. *(See 9.1.4 of NFPA 30.)*
[d]Storage shall be permitted to be increased 100 percent in educational, day care, and health care occupancies if the building is protected throughout with an automatic sprinkler system installed in accordance with NFPA 13.
[e]The use of explosive materials required by federal, state, or municipal agencies while engaged in normal or emergency performance of duties is not required to be limited. The storage of explosive materials is required to be in accordance with the requirements of NFPA 495.
[f]The storage and use of explosive materials in medicines and medicinal agents in the forms prescribed by the official United States Pharmacopeia or the National Formulary are not required to be limited.
[g]The storage and use of propellant-actuated devices or propellant-actuated industrial tools manufactured, imported, or distributed for their intended purposes are required to be limited to 50 lb (23 kg) net explosive weight.
[h]The storage and use of small arms ammunition, and components thereof, are permitted where in accordance with NFPA 495.
[i]Containers, cylinders, or tanks not exceeding 250 ft^3 (7.1 m^3) content measured at NTP and used for maintenance purposes, patient care, or operation of equipment shall be permitted.
[j]In residential occupancies consisting of lodging and rooming houses, hotels, dormitories, apartments, and residential board and care facilities, storage containers are not permitted to exceed 0.325 ft^3 (0.0092 m^3).
[k]In educational occupancies, allowed in laboratories only; additional 20 lb (9 kg) units are permitted where minimum 20 ft (6.1 m) separation is provided.
[l]A maximum quantity of 220 lb (99 kg) of solid or 22 gal (83 L) of liquid Class 3 oxidizer is permitted where such materials are necessary for maintenance purposes, operation, or sanitation of equipment. Storage containers and the manner of storage are required to be approved.
[m]Quantities are not limited in educational, day care, and health care occupancies protected throughout by automatic sprinkler systems in accordance with NFPA 13.
[n]Not permitted in health care occupancies.
[o]Gas containers or cylinders not exceeding 20 ft^3 (0.57 m^3) content measured at NTP are permitted to be stored or used within gas cabinets or exhausted enclosures of educational occupancies.

5.2.1.2.2 The MAQ set forth in Table 5.2.1.2.1 shall be the maximum aggregate quantity allowed in storage and use.

5.2.1.3 Industrial Occupancies. The MAQ of hazardous materials per control area in industrial occupancies shall be as specified in Table 5.2.1.1.3, with increased quantities permitted where storage areas comply with 5.2.1.5.

5.2.1.4 Storage Occupancies. The MAQ of hazardous materials per control area in storage occupancies shall be as specified in Table 5.2.1.1.3, with increased quantities permitted where storage areas comply with 5.2.1.5.

5.2.1.5 Special Quantity Limits for Mercantile, Industrial, and Storage Occupancies.

5.2.1.5.1 General. Where storage in mercantile, industrial, and storage occupancies is in compliance with all of the special controls set forth in 5.2.1.5.2, the MAQ of selected hazardous materials shall be permitted to be increased in accordance with 5.2.1.5.3.

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5.2.1.5.2 Special Controls Required for Increased Quantities. Where quantities of hazardous materials are increased in accordance with 5.2.1.5.3, such materials shall be stored in accordance with the following limitations:

(1) Storage and display of solids shall not exceed 200 lb/ft^2 (976.4 kg/m^2) of floor area actually occupied by solid merchandise.
(2) Storage and display of liquids shall not exceed 20 gal/ft^2 (76 L/m^2) of floor area actually occupied by liquid merchandise.
(3) Storage and display height shall not exceed 6 ft (1.8 m) above the finished floor.
(4) Individual containers less than 5 gal (19 L) or less than 25 lb (11 kg) shall be stored or displayed on pallets, racks, or shelves.
(5) Racks and shelves used for storage or display shall be in accordance with 6.1.13.
(6) Containers shall be listed or approved for the intended use.
(7) Individual containers shall not exceed 100 lb (45.4 kg) capacity for solids or a 10 gal (38 L) capacity for liquids.
(8) Incompatible materials shall be separated in accordance with 6.1.12.
(9) Except for surfacing, floors shall be of noncombustible construction.
(10) Aisles 4 ft (1.2 m) in width shall be maintained on three sides of the storage or display area.
(11) Hazard identification signs shall be provided in accordance with 6.1.8.

5.2.1.5.3* Special Maximum Allowable Quantity Increases for Storage in Mercantile, Storage, and Industrial Occupancies. The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials permitted within a single control area of a mercantile, storage, or industrial occupancy shall be permitted to exceed the MAQ specified in Table 5.2.1.1.3, without complying with Protection Level 2, Protection Level 3, or Protection Level 4, provided that the quantities comply with Table 5.2.1.5.3(a) and Table 5.2.1.5.3(b) and that materials are displayed and stored in accordance with the special limitations in 5.2.1.5.2.

5.2.2 Construction Requirements for Control Areas.

5.2.2.1 Number of Control Areas. The maximum number of control areas within a building shall be in accordance with Table 5.2.2.1.

5.2.2.2 Where only one control area is present in a building, no special construction provisions shall be required.

5.2.2.3 Where more than one control area is present in a building, control areas shall be separated from each other by fire barriers in accordance with Table 5.2.2.1.

5.3 Protection Levels.

5.3.1 Where the quantity of hazardous materials in storage or use exceeds the MAQ for indoor control areas as set forth in Section 5.2, the occupancy shall comply with the requirements for Protection Level 1, Protection Level 2, Protection Level 3, or Protection Level 4, as required for the material in storage or use as defined in 6.2.2 through 6.2.5.

5.3.2 Protection Level 5 shall apply to semiconductor fabrication facilities where required by the building code.

Table 5.2.1.5.3(a) Maximum Allowable Quantity (MAQ) per Indoor and Outdoor Control Area for Selected Hazard Categories in Mercantile, Storage, and Industrial Occupancies

	Maximum Allowable Quantity[a,b]			
	Solids		Liquids	
Hazard Category	lb	kg	gal	L
Physical Hazard Materials: Nonflammable and Noncombustible Solids and Liquids				
Oxidizers				
Class 3	1,500	680	150	568
Class 2	2,250	1,021	225	852
Class 1	18,000[c]	8,165[c]	1,800[c]	6,814[c]

Note: Maximum quantities for hazard categories not shown are required to be in accordance with Table 5.2.1.1.3.
[a]Maximum quantities are permitted to be increased 100 percent in buildings that are sprinklered in accordance with NFPA 13. Where footnote b also applies, the increase for both footnotes is permitted to be applied.
[b]Maximum quantities are permitted to be increased 100 percent where stored in approved storage cabinets in accordance with NFPA 1. Where footnote a also applies, the increase for both footnotes is permitted to be applied.
[c]Quantities are not limited in buildings protected by an automatic sprinkler system complying with NFPA 13.

5.3.3 Protection Level 1.

5.3.3.1 Buildings containing quantities of hazardous materials exceeding the MAQ of high-hazard level 1 contents permitted in control areas shall comply with applicable regulations for Protection Level 1, as set forth in the applicable sections of Chapter 6, Chapters 11 through 21, and the building code.

5.3.3.2 High-hazard level 1 contents shall include materials that present a detonation hazard as defined in 4.2.1.2.1.

5.3.4 Protection Level 2.

5.3.4.1 Buildings, and portions thereof, containing quantities of hazardous materials exceeding the MAQ of high-hazard level 2 contents permitted in control areas shall comply with applicable regulations for Protection Level 2, as set forth in the applicable sections of Chapter 6, Chapters 11 through 21, and the building code.

5.3.4.2 High-hazard level 2 contents shall include materials that present a deflagration hazard or a hazard from accelerated burning as defined in 4.2.1.2.2.

5.3.5 Protection Level 3.

5.3.5.1 Buildings, and portions thereof, containing quantities of hazardous materials exceeding the MAQ of high-hazard level 3 contents permitted in control areas shall comply with applicable regulations for Protection Level 3, as set forth in the applicable sections of Chapter 6, Chapters 11 through 21, and the building code.

5.3.5.2 High-hazard level 3 contents shall include materials that readily support combustion or present a physical hazard as defined in 4.2.1.2.3.

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Table 5.2.1.5.3(b) Maximum Allowable Quantity (MAQ) per Indoor and Outdoor Control Area for Selected Hazard Categories in Mercantile and Storage Occupancies

	Maximum Allowable Quantity[a,b]			
	Solids		Liquids	
Hazard Category	lb	kg	gal	L
Physical Hazard Materials: Nonflammable and Noncombustible Solids and Liquids				
Unstable (reactive)				
Class 3	550	250	55	208
Class 2	1,150	522	115	435
Water-reactive				
Class 3	550	250	55	208
Class 2	1,150	522	115	435
Health Hazard Materials: Nonflammable and Noncombustible Solids and Liquids				
Corrosive	10,000	4,536	1,000	3785
Highly toxic[c]	20	9	2	8
Toxic[c]	1,000	454	100	378

Note: Maximum quantities for hazard categories not shown are required to be in accordance with Table 5.2.1.1.3.
[a]Maximum quantities are permitted to be increased 100 percent in buildings that are sprinklered in accordance with NFPA 13. This increase shall not apply to highly toxic solids and liquids. Where footnote b also applies, the increase for both footnotes is permitted to be applied.
[b]Maximum quantities are permitted to be increased 100 percent where stored in approved storage cabinets in accordance with NFPA 1. This increase shall not apply to highly toxic solids and liquids. Where footnote a also applies, the increase for both footnotes is permitted to be applied.
[c]Toxic or highly toxic solids or liquids displayed in original packaging in mercantile or storage occupancies and intended for maintenance, operation of equipment, or sanitation when contained in individual packaging not exceeding 100 lb (45.4 kg) shall be limited to an aggregate of 1200 lb (544.3 kg) or 120 gal (454.2 L).

5.3.6 Protection Level 4.

5.3.6.1 Buildings, and portions thereof, containing quantities of hazardous materials exceeding the MAQ of high-hazard level 4 contents permitted in control areas shall comply with applicable regulations for Protection Level 4, as set forth in the applicable sections of Chapter 6, Chapters 11 through 21, and the building code.

5.3.6.2 High-hazard level 4 contents shall include materials that are acute health hazards as defined in 4.2.1.2.4.

5.3.7 Detached Building Required for High-Hazard Level 2 and High-Hazard Level 3 Materials. Buildings required to comply with Protection Level 2 or Protection Level 3 and containing quantities of high-hazard contents exceeding the quantity limits set forth in Table 5.3.7 shall be in accordance with 6.2.3.4 or 6.2.4.4, as applicable.

5.4* Outdoor Areas.

5.4.1 Outdoor Control Areas.

5.4.1.1 General.

5.4.1.1.1 Hazardous materials shall be permitted to be stored or used in outdoor control areas in accordance with 5.4.1.2 and 5.4.1.3.

5.4.1.1.2 Where storage or use is in an outdoor control area, compliance with the outdoor storage and use requirements in Chapters 11 through 21 shall not be required.

5.4.1.2 Maximum Allowable Quantity per Outdoor Control Area. Maximum allowable quantities of hazardous materials in an outdoor control area shall be as specified in Table 5.2.1.5.3(a) and Table 5.2.1.5.3(b) or Table 5.4.1.2.

5.4.1.3 Number of Outdoor Control Areas.

5.4.1.3.1 A single outdoor control area shall be permitted on any property.

Table 5.2.2.1 Design and Number of Control Areas

Floor Level	Maximum Allowable Quantity per Control Area (%)*	Number of Control Areas per Floor	Fire Resistance Rating for Fire Barriers† (hr)
Above grade			
>9	5.0	1	2
7–9	5.0	2	2
4–6	12.5	2	2
3	50.0	2	1
2	75.0	3	1
1	100.0	4	1
Below grade			
1	75.0	3	1
2	50.0	2	1
Lower than 2	NP	NP	N/A

NP: Not permitted. N/A: Not applicable.
*Percentages represent the applicable MAQ per control area shown in Table 5.2.1.1.3 or Table 5.2.1.2.1 with all the increases permitted in the footnotes of that table.
†Fire barriers are required to include floors and walls, as necessary, to provide a complete separation from other control areas.

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Table 5.3.7 Detached Buildings Required Where Quantity of Material Exceeds Amount Shown

Material	Class	Quantity of Material: Solids and Liquids (tons)	Quantity of Material: Gases ft^3 (m^3)[a]
Individual bulk hydrogen compressed gas systems	N/A	N/A	15,000 (425)
Oxidizers	3	1,200	N/A
	2	2,000	N/A
Organic peroxides	I	1[b]	N/A
	IIA	25[b]	
	IIB	40[b]	
	III	50[b]	
Unstable (reactive) materials	3, nondetonable	1	2,000 (57)[c]
	2	25	10,000 (283)[c]
Water-reactive materials	3	1	N/A
	2, deflagrating	25	N/A
Pyrophoric gases		N/A	2,000 (57)

For SI units, 1 ton = 0.9 met ton.
N/A: Not applicable.
[a]See Table 21.2.5.
[b]Where two or more different classes of organic peroxide formulations are stored, see 14.3.2.5.
[c]Nondetonable.

5.4.1.3.2 Where a property exceeds 10,000 ft^2 (929 m^2), a group of two outdoor control areas shall be permitted where approved and where each control area is separated by a minimum distance of 50 ft (15 m).

5.4.1.3.3 Where a property exceeds 35,000 ft^2 (3252 m^2), additional groups of outdoor control areas shall be permitted where approved, provided that each group is separated by a minimum distance of 300 ft (91 m).

5.4.2 Outdoor Storage and Use Areas. Where the quantity of hazardous materials in outdoor storage or use exceeds the MAQ for outdoor control areas as set forth in Table 5.4.1.2, the outdoor area shall comply with the applicable outdoor requirements of Chapter 6 and Chapters 11 through 21.

5.4.3 Weather Protection Structures. Weather protection, when provided, shall comply with 6.2.7.2.

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Table 5.4.1.2 Maximum Allowable Quantities of Hazardous Materials per Outdoor Control Area

		Storage			Use — Closed Systems			Use — Open Systems	
Material	**Class**	**Solid Pounds**	**Liquid Gallons (lb)**	**Gas (at NTP) ft³ (lb)**	**Solid Pounds**	**Liquid Gallons (lb)**	**Gas (at NTP) ft³ (lb)**	**Solid Pounds**	**Liquid Gallons (lb)**
Physical Hazard Materials									
Flammable gas									
Gaseous		N/A	N/A	3000	N/A	N/A	1500	N/A	N/A
Liquefied		N/A	N/A	(300)	N/A	N/A	(150)	N/A	N/A
Flammable solid		500	N/A	N/A	250	N/A	N/A	50	N/A
Organic peroxide	Detonable	1	(1)	N/A	¼	(¼)	N/A	¼	(¼)
Organic peroxide	I	20	(20)	N/A	10	(10)	N/A	2	(2)
	IIA	100	(200)	N/A	100	(100)	N/A	100	(100)
	IIB	400	(400)	N/A	400	(400)	N/A	400	(400)
	III	NL	NL	N/A	NL	NL	N/A	NL	NL
	IV	NL	NL	N/A	NL	NL	N/A	NL	NL
	V	NL	NL	N/A	NL	NL	N/A	NL	NL
Oxidizer	4	2	(2)	N/A	1	(¼)	N/A	¼	(¼)
	3	40	(40)	N/A	20	(2)	N/A	2	(2)
	2	1000	(1000)	N/A	500	(250)	N/A	50	(50)
	1	NL	NL	N/A	NL	NL	N/A	NL	NL
Oxidizing gas									
Gaseous		N/A	N/A	6000	N/A	N/A	6000	N/A	N/A
Liquefied		N/A	N/A	(600)	N/A	N/A	(300)	N/A	N/A
Pyrophoric		8	(8)	100	4	(4)	10	0	0
Unstable (reactive)	4	2	(2)	20	1	(1)	2	¼	(¼)
	3	20	(20)	200	10	(10)	10	1	(1)
	2	200	(200)	1000	100	(100)	250	10	(10)
	1	NL	NL	1500	NL	NL	NL	NL	NL
Water-reactive	3	20	(20)	N/A	10	(10)	N/A	1	(1)
	2	200	(200)	N/A	100	(100)	N/A	10	(10)
	1	NL	NL	N/A	NL	NL	N/A	NL	NL
Health Hazard Materials									
Corrosive		20000	2000	N/A	10000	1000	N/A	1000	100
Corrosive gas									
Gaseous		N/A	N/A	1620	N/A	N/A	810	N/A	N/A
Liquefied		N/A	N/A	(300)	N/A	N/A	(150)	N/A	N/A
Highly toxic		20	(20)	N/A	10	(10)	N/A	3	(3)
Highly toxic gas									
Gaseous		N/A	N/A	40*	N/A	N/A	20*	N/A	N/A
Liquefied		N/A	N/A	(8)*	N/A	N/A	(4)*	N/A	N/A
Toxic		1000	(1000)	N/A	500	50	N/A	125	(125)
Toxic gas									
Gaseous		N/A	N/A	1620	N/A	N/A	810	N/A	N/A
Liquefied		N/A	N/A	(300)	N/A	N/A	(150)	N/A	N/A

For SI units, 1 lb = 0.454 kg; 1 gal = 3.785 L; 1 ft³ = 0.0283 m³.

N/A: Not applicable. NL: Not limited.

NTP: Measured at normal temperature and pressure [70°F (21°C) and 14.7 psi (101 kPa)].

Notes:

(1) Table values in parentheses correspond to the unit name in parentheses at the top of the column.

(2) For gallons of liquids, divide the amount in pounds by 10.

(3) The aggregate quantities in storage and use cannot exceed the quantity listed for storage.

(4) The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials allowed in outdoor storage per single property under the same ownership or control used for retail or wholesale sales is permitted to exceed the MAQ where such storage is in accordance with 5.2.1.5.

*Permitted only where stored or used in approved exhausted gas cabinets, exhausted enclosures, or fume hoods.

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Chapter 6 Fundamental Requirements

6.1 General Requirements.

6.1.1 Applicability. Storage, use, and handling of hazardous materials in any quantity shall comply with Section 6.1 and the applicable material-specific requirements in Chapters 11 through 21.

6.1.1.1* Storage of hazardous materials in quantities exceeding the MAQ set forth in Chapter 5 shall comply with Section 6.2 and the applicable material specific requirements in Chapters 11 through 21.

6.1.1.2* The use, dispensing, and handling of hazardous materials in quantities exceeding the MAQ set forth in Chapter 5 shall comply with Section 6.3 and the applicable material specific requirements in Chapters 11 through 21.

6.1.2* Safety Data Sheets (SDS). Safety data sheets (SDS) shall be available on the premises for hazardous materials regulated by this code. When approved, SDSs shall be permitted to be retrievable by electronic access.

6.1.3 Release of Hazardous Materials.

6.1.3.1 Prohibited Releases. Hazardous materials shall not be released into a sewer, storm drain, ditch, drainage canal, lake, river, or tidal waterway; upon the ground, a sidewalk, a street, or a highway; or into the atmosphere, unless such release is permitted by the following:

(1) Federal, state, or local governing regulations
(2) Permits of the jurisdictional air quality management board
(3) National Pollutant Discharge Elimination System permit
(4) Waste discharge requirements established by the jurisdictional water quality control board
(5) Sewer pretreatment requirements for publicly or privately owned treatment works

6.1.3.2 Control and Mitigation of Unauthorized Releases. Provisions shall be made for controlling and mitigating unauthorized releases.

6.1.3.3 Records of Unauthorized Releases. Accurate records of the unauthorized release of hazardous materials shall be kept by the permittee.

6.1.3.4* Notification of Unauthorized Releases. The fire department shall be notified immediately or in accordance with approved emergency procedures when an unauthorized release becomes reportable under state, federal, or local regulations.

6.1.3.5 Container Failure. When an unauthorized release due to primary container failure is discovered, the involved primary container shall be repaired or removed from service.

6.1.3.6 Overpack Containers. Overpack containers shall be permitted to be used as a means to provide protection for primary containers to be transported for repair or removal from service.

6.1.3.7 Responsibility for Cleanup of Unauthorized Releases.

6.1.3.7.1 The person, firm, or corporation responsible for an unauthorized release shall institute and complete all actions necessary to remedy the effects of such unauthorized release, whether sudden or gradual, at no cost to the AHJ.

6.1.3.7.2 When deemed necessary by the AHJ, cleanup of an unauthorized release shall be permitted to be initiated by the fire department or by an authorized individual or firm, and costs associated with such cleanup shall be borne by the owner, operator, or other person responsible for the unauthorized release.

6.1.4* Personnel Training. Persons in areas where hazardous materials are stored, dispensed, handled, or used shall be trained in the hazards of the materials employed and actions required by the emergency plan. The level of training to be conducted shall be consistent with the responsibilities of the persons to be trained in accordance with 6.1.4.1 through 6.1.4.5.

6.1.4.1 Awareness. The training provided for persons designated in 6.1.4 shall include awareness training in accordance with 6.1.4.1.1 through 6.1.4.1.3.

6.1.4.1.1 Completion. Initial training shall be completed prior to beginning work in the work area.

6.1.4.1.2 Hazard Communications. Training shall be provided prior to beginning work in the work area to enable personnel to recognize and identify hazardous materials stored, dispensed, handled, or used on site and where to find safety information pertaining to the hazards of the materials employed.

6.1.4.1.3 Emergency Plan. Training shall be provided prior to beginning work in the work area to enable personnel to implement the emergency plan.

6.1.4.2 Operations Personnel. Persons engaged in storing, using, or handling hazardous materials shall be designated as operations personnel and shall be trained in accordance with 6.1.4.1 and 6.1.4.2.1 through 6.1.4.2.6.

6.1.4.2.1 Physical and Health Hazard Properties. Operations personnel shall be trained in the chemical nature of the materials, including their physical hazards and the symptoms of acute or chronic exposure as provided by the safety data sheet (SDS) furnished by the manufacturer or other authoritative sources.

6.1.4.2.2 Dispensing, Using, and Processing. Operations personnel shall be trained in the use of specific safeguards applicable to the dispensing, processing, or use of the materials and equipment employed.

6.1.4.2.3 Storage. Operations personnel shall be trained in the application of storage arrangements and site-specific limitations on storage for the materials employed.

6.1.4.2.4 Transport (Handling). Operations personnel involved in materials handling shall be trained in the requirements for on-site transport of the materials employed.

6.1.4.2.5 Actions in an Emergency. Operations personnel shall be trained in the necessary actions to take in the event of an emergency, including the operation and activation of emergency controls prior to evacuation.

6.1.4.2.6 Changes. Training shall be provided whenever a new hazardous material is introduced into the work area that presents a new physical or health hazard, or when new information is obtained pertaining to physical or health hazards of an existing hazardous material that has not been included in

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previous training, and when there are changes in any of the following:

(1) Equipment
(2) Operations
(3) Hazardous materials

6.1.4.3 Emergency Response Liaison.

6.1.4.3.1 Responsible persons shall be designated and trained to be emergency response (ER) liaison personnel.

6.1.4.3.2 Emergency response liaison personnel shall do the following:

(1) Aid emergency responders in pre-planning responses to emergencies
(2) Identify locations where hazardous materials are located
(3) Have access to safety data sheets
(4) Be knowledgeable in the site emergency response procedures

6.1.4.4* Emergency Responders. Emergency responders shall be trained to be competent in the actions to be taken in an emergency event.

6.1.4.4.1* Emergency Response Team Leader. Persons acting as ER team leaders shall be trained under the Incident Command System concept or equivalent.

6.1.4.4.2* Response to Incipient Events. Responses to incidental releases of hazardous materials where the material can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area, or by maintenance personnel, shall not be considered emergency responses as defined within the scope of this code.

6.1.4.4.3* On-Site Emergency Response Team. When an on-site emergency response team is provided, emergency responders shall be trained in accordance with the requirements of the specific site emergency plan or as required by federal, state, or local governmental agencies.

6.1.4.5 Training Mandated by Other Agencies. Training required by federal, state, or local regulations that is required based on the quantity or type of hazardous materials stored, dispensed, handled, or used shall be conducted in accordance with the requirements of and under the jurisdiction of the governing agency.

6.1.4.6 Documentation. Training shall be documented and the documentation made available to the AHJ upon written request.

6.1.5 Ignition Source Controls.

6.1.5.1 Smoking. Smoking shall be prohibited in the following locations:

(1) Within 25 ft (7.6 m) of outdoor storage areas, dispensing areas, or open use areas
(2) In rooms or areas where hazardous materials are stored or dispensed or used in open systems in amounts requiring a permit in accordance with Section 1.8

6.1.5.2 Open Flames and High-Temperature Devices. Open flames and high-temperature devices shall not be used in a manner that creates a hazardous condition.

6.1.5.3 Energy-Consuming Equipment. Energy-consuming equipment with the potential to serve as a source of ignition shall be listed or approved for use with the hazardous materials stored or used.

6.1.5.3.1* Powered Industrial Trucks. Powered industrial trucks shall be operated and maintained in accordance with NFPA 505. [**1:**10.18]

6.1.6 Systems, Equipment, and Processes. Processes, methods, specifications, equipment testing and maintenance, design standards, performance, installation, equipment design and construction, and other pertinent criteria shall be in accordance with this section.

6.1.6.1 Design and Construction of Containers and Tanks. Containers, cylinders, and tanks shall be designed and constructed in accordance with approved standards. Containers, cylinders, tanks, and other means used for containment of hazardous materials shall be of an approved type.

6.1.6.2 Piping, Tubing, Valves, and Fittings. Piping, tubing, valves, fittings, and related components used for hazardous materials shall be in accordance with the following:

(1) Piping, tubing, valves, fittings, and related components shall be designed and fabricated from materials compatible with the material to be contained and shall be of a strength and durability to withstand the pressure, structural and seismic stress, and exposure to which they are subject.
(2) Piping and tubing shall be identified in accordance with ASME A13.1, *Scheme for the Identification of Piping Systems*, to indicate the material conveyed.
(3) Accessible manual valves, or fail-safe emergency shutoff valves operated by a remotely located manually or automatically activated shutdown control, shall be installed on supply piping and tubing at the following locations:
    (a) Point of use
    (b) Tank or bulk source
(4) Manual emergency shutoff valves and remotely located manually activated shutdown controls for emergency shutoff valves shall be identified, and the location shall be clearly visible, accessible, and indicated by means of a sign.
(5) Backflow prevention or check valves shall be provided when the backflow of hazardous materials could create a hazardous condition or cause the unauthorized discharge of hazardous materials.
(6) Liquids classified in accordance with NFPA 704 shall be carried in pressurized piping above a gauge pressure of 15 psi (103 kPa) having a hazard ranking as follows:
    (a) Health hazard Class 3 or Class 4
    (b) Flammability Class 4
    (c) Instability Class 3 or Class 4
(7) The pressurized piping specified in 6.1.6.2(6) shall be provided with an approved means of leak detection and emergency shutoff or excess flow control in accordance with the following:
    (a) Where the piping originates from within a hazardous material storage room or area, the excess flow control shall be located within the storage room or area.
    (b) Where the piping originates from a bulk source, the excess flow control shall be located at the bulk source.

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(c) Piping for inlet connections designed to prevent backflow shall not be required to be equipped with excess flow control.

6.1.6.3 Additional Regulations for Supply Piping for Health Hazard Materials. Supply piping and tubing for liquids or solids having a health hazard ranking of Class 3 or Class 4 in accordance with NFPA 704 shall be in accordance with ASME B31.3, *Process Piping*, and the following:

(1) Piping and tubing utilized for the transmission of highly toxic, toxic, or highly volatile corrosive liquids shall have welded, threaded, or flanged connections throughout, except for connections located within a ventilated enclosure, or an approved method of drainage or containment.
(2) Piping and tubing shall not be located within corridors, within any portion of a means of egress required to be enclosed in fire resistance–rated construction, or in concealed spaces in areas not classified as Protection Level 1 through Protection Level 4 occupancies.

6.1.6.4 Equipment, Machinery, and Alarms. Equipment, machinery, and required detection and alarm systems associated with the use, storage, or handling of hazardous materials shall be listed or approved.

6.1.7 Empty Containers and Tanks. Empty containers and tanks previously used for the storage of hazardous materials shall be free from residual material and vapor as defined by DOT, the *Resource Conservation and Recovery Act (RCRA)*, or other regulating authority or shall be maintained as specified for the storage of hazardous material.

6.1.8 Signs.

6.1.8.1 General.

6.1.8.1.1 Design and Construction. Signs shall be durable, and the size, color, and lettering of signs shall be in accordance with nationally recognized standards.

6.1.8.1.2 Language. Signs shall be in English as the primary language or in symbols permitted by this code.

6.1.8.1.3 Maintenance. Signs shall meet the following criteria:

(1) They shall not be obscured.
(2) They shall be maintained in a legible condition.
(3) They shall not be removed, unless for replacement.

6.1.8.2 Hazardous Materials Identification.

6.1.8.2.1 NFPA 704 Placard. Visible hazard identification signs in accordance with NFPA 704 shall be placed at the following locations, except where the AHJ has received a hazardous materials management plan and a hazardous materials inventory statement in accordance with Sections 1.11 and 1.12 and has determined that omission of such signs is consistent with safety:

(1) On stationary aboveground tanks
(2) On stationary aboveground containers
(3) At entrances to locations where hazardous materials are stored, dispensed, used, or handled in quantities requiring a permit
(4) At other entrances and locations designated by the AHJ

6.1.8.2.2 Identification of Containers, Cartons, and Packages. Individual containers, cartons, or packages shall be conspicuously marked or labeled in accordance with nationally recognized standards.

6.1.8.3 No Smoking Signs. Where "no smoking" is not applicable to an entire site or building, signs shall be provided as follows:

(1) In rooms or areas where hazardous materials are stored or dispensed or used in open systems in amounts requiring a permit in accordance with Section 1.8
(2) Within 25 ft (7.6 m) of outdoor storage, dispensing, or open-use areas

6.1.9 Protection from Vehicles.

6.1.9.1 Guard posts or other approved means shall be provided to protect the following where subject to vehicular damage:

(1) Storage tanks and connected piping, valves, and fittings
(2) Storage areas containing tanks or portable containers except where the exposing vehicles are powered industrial trucks used for transporting the hazardous materials
(3) Use areas

6.1.9.2 Where guard posts are installed, the posts shall meet the following criteria:

(1) They shall be constructed of steel not less than 4 in. (102 mm) in diameter and concrete filled.
(2) They shall be spaced not more than 4 ft (1.2 m) between posts on center.
(3) They shall be set not less than 3 ft (0.9 m) deep in a concrete footing of not less than a 15 in. (381 mm) diameter.
(4) They shall be set with the top of the posts not less than 3 ft (0.9 m) above ground.
(5) They shall be located not less than 3 ft (0.9 m) from the tank.

6.1.10 Electrical Wiring and Equipment.

6.1.10.1 General. Electrical wiring and equipment shall be installed in accordance with *NFPA 70*.

6.1.10.2 Static Accumulation. When processes or use conditions exist where flammable gases, dusts, or vapors can be ignited by static electricity, means shall be provided to prevent the accumulation of a static charge and to dissipate the static charge to ground.

6.1.11 Protection from Light. Materials that are sensitive to light shall be stored in containers designed to protect them from such exposure.

6.1.12 Separation of Incompatible Materials.

6.1.12.1 Incompatible materials in storage and storage of materials incompatible with materials in use shall be separated when the stored materials are in containers having a capacity of more than 5 lb (2.268 kg) or ½ gal (1.89 L).

6.1.12.2 Separation shall be accomplished by one of the following methods:

(1) Segregating incompatible materials storage by a distance of not less than 20 ft (6.1 m)

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(2) Isolating incompatible materials storage by a noncombustible partition extending not less than 18 in. (457 mm) above and to the sides of the stored material or by a noncombustible partition that interrupts the line of sight between the incompatible materials
(3) Storing liquid and solid materials in hazardous materials storage cabinets complying with 6.1.18
(4) Storing compressed gases in gas cabinets or exhausted enclosures complying with Chapter 21

6.1.12.3 Materials that are incompatible shall not be stored within the same cabinet or enclosure.

6.1.13 General Storage.

6.1.13.1 Storage. The storage arrangement of materials shall be in accordance with this chapter and the material specific requirements of Chapters 11 through 21 as applicable.

6.1.13.2 Shelf Storage. Shelving shall be constructed to carry the design loads and shall be braced and anchored in accordance with the seismic design requirements of the applicable building code.

6.1.13.2.1 Shelf Construction.

6.1.13.2.1.1 Shelving shall be treated, coated, or constructed of materials that are compatible with the hazardous materials stored.

6.1.13.2.1.2 Shelves shall be provided with a lip or guard where used for the storage of individual containers, except under either of the following conditions:

(1) Where storage is located in hazardous materials storage cabinets or laboratory furniture specifically designed for such use
(2) Where amounts of hazardous materials in storage do not exceed the quantity threshold for requiring a permit in accordance with Section 1.8

6.1.13.2.2 Shelf storage of hazardous materials shall be maintained in an orderly manner.

6.1.14* Seismic Protection. Machinery and equipment utilizing hazardous materials in areas subject to seismic activity shall be seismically anchored in accordance with the building code.

6.1.14.1 Shock Padding. Materials that are shock sensitive shall be padded, suspended, or otherwise protected against accidental dislodgement and dislodgement during seismic activity.

6.1.15 Outdoor Storage and Use Areas. Outdoor storage and use areas for hazardous materials shall comply with the following:

(1) Outdoor storage and use areas shall be kept free of weeds, debris, and common combustible materials not necessary to the storage or use of hazardous materials.
(2) The area surrounding an outdoor storage and use area shall be kept clear of weeds, debris, and common combustible materials not necessary to the storage or use of hazardous materials for a minimum distance of 15 ft (4.5 m).
(3) Outdoor storage and use areas for hazardous materials shall be located not closer than 20 ft (6.1 m) from a property line that can be built upon, a street, an alley, or a public way, except that a 2-hour fire barrier wall, without openings and extending not less than 30 in. (762 mm) above and to the sides of the storage area, shall be permitted in lieu of such distance.

6.1.16 Maintenance Required.

6.1.16.1* Equipment, machinery, and required detection and alarm systems associated with hazardous materials shall be maintained in an operable condition.

6.1.16.2 Stationary tanks not used for a period of 90 days shall be safeguarded or removed in an approved manner.

6.1.16.2.1 The tanks specified in 6.1.16.2 shall have the fill line, gauge opening, and pump connection secured against tampering.

6.1.16.2.2 Vent lines shall be maintained.

6.1.16.2.3* Tanks that are to be placed back in service shall be tested in an approved manner.

6.1.16.3 The following shall apply to defective containers, cylinders, and tanks:

(1) They shall be removed from service, repaired, or disposed of in an approved manner.
(2) Overpack containers shall be permitted to be used as a means to provide protection for primary containers that are transported for repair or removal from service.

6.1.16.4 Defective equipment or machinery shall be removed from service and repaired or replaced.

6.1.16.5 Required detection and alarm systems that are defective shall be replaced or repaired.

6.1.17 Testing.

6.1.17.1 The equipment, devices, and systems listed in 6.1.17.2.1 shall be tested at one of the intervals listed in 6.1.17.2.2. Written records of the tests conducted or maintenance performed shall be maintained.

6.1.17.2 Testing shall not be required under the following conditions:

(1) Where approved written documentation is provided that testing will damage the equipment, device, or system and the equipment, device, or system is maintained as specified by the manufacturer
(2) Where equipment, devices, and systems fail in a fail-safe manner
(3) Where equipment, devices, and systems self-diagnose and report trouble, with records of the self-diagnosis and trouble reporting made available to the AHJ
(4) Where system activation occurs during the required test cycle for the components activated during the test cycle
(5) Where approved maintenance in accordance with 6.1.16.1 is performed not less than annually or in accordance with an approved schedule, in which case the testing requirements set forth in 6.1.17.2.1 and 6.1.17.2.2 are permitted to apply.

6.1.17.2.1 Equipment, Devices, and Systems Requiring Testing. The following equipment, devices, and systems shall be tested in accordance with 6.1.17 and 6.1.17.2.2:

(1) Limit control systems for liquid level, temperature, and pressure required by 6.2.1.7 and 6.3.1.2
(2) Monitoring and supervisory systems required by 6.2.1.1 and 6.3.2.1.1

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6.1.17.2.2 Testing Frequency. The equipment, systems, and devices listed in 6.1.17.2.1 shall be tested at one of the following frequencies:

(1) Not less than annually
(2) In accordance with the approved manufacturer's requirements
(3) In accordance with approved recognized industry standards
(4) In accordance with an approved schedule

6.1.18 Hazardous Materials Storage Cabinets. When storage cabinets are used to increase MAQ per control area or to otherwise comply with a specific provision in Chapter 6, such cabinets shall be in accordance with the following:

(1) Cabinets shall be constructed of metal.
(2) The interior of cabinets shall be treated, coated, or constructed of materials that are nonreactive with the hazardous material stored, and such treatment, coating, or construction shall include the entire interior of the cabinet.
(3) Cabinets shall be either listed as suitable for the intended storage or constructed in accordance with the following:
    (a) Cabinets shall be of steel having a thickness of not less than 0.044 in. (1.12 mm) (18 gauge).
    (b) The cabinet, including the door, shall be double-walled with 1½ in. (38.1 mm) airspace between the walls.
    (c) Joints shall be riveted or welded and shall be tight-fitting.
    (d) Doors shall be well fitted, self-closing, and equipped with a self-latching device.
    (e) The bottoms of cabinets utilized for the storage of liquids shall be liquidtight to a minimum height of 2 in. (51 mm).
    (f) For requirements regarding electrical equipment and devices within cabinets used for the storage of hazardous liquids, compressed gases, or cryogenic fluids, see *NFPA 70*.
(4) Cabinets shall be marked in conspicuous lettering that reads as follows: HAZARDOUS — KEEP FIRE AWAY

6.1.19 Installation of Tanks. Installation of tanks shall be in accordance with 6.1.19.1 through 6.1.19.2.

6.1.19.1 Underground Tanks.

6.1.19.1.1 Underground tanks used for the storage of liquid hazardous materials shall be provided with secondary containment.

6.1.19.1.2 In lieu of providing secondary containment for an underground tank, an aboveground tank in an underground vault complying with NFPA 30 shall be permitted.

6.1.19.2 Aboveground Tanks. Aboveground stationary tanks installed outdoors and used for the storage of hazardous materials shall be located and protected in accordance with the requirements for outdoor storage of the particular material involved and in accordance with the requirements of Chapters 11 through 21.

6.1.19.2.1 Aboveground tanks that are installed in vaults complying with NFPA 30 shall not be required to comply with location and protection requirements for outdoor storage.

6.1.19.2.2 Aboveground tanks that are installed inside buildings and used for the storage of hazardous materials shall be located and protected in accordance with the requirements for indoor storage of the particular material involved.

6.1.19.2.3 Marking. Aboveground stationary tanks shall be marked as required by 6.1.8.2.1.

6.1.20 When required, fire alarm systems and smoke detection systems shall be installed in accordance with *NFPA 72*.

6.2 Requirements for Occupancies Storing Quantities of Hazardous Materials Exceeding the Maximum Allowable Quantities per Control Area for High-Hazard Contents.

6.2.1 Indoor Storage General Requirements. The requirements set forth in 6.2.1 shall apply to buildings, or portions thereof, that are required to comply with Protection Level 1 through Protection Level [4] where required by Section 5.3. [**5000:**34.3.2]

6.2.1.1 Fire Protection Systems. Buildings, or portions thereof, required to comply with Protection Level 1 through Protection Level [4] shall be protected by an approved automatic fire sprinkler system complying with Section 55.3 of *NFPA 5000*. [**5000:**34.3.2.1]

6.2.1.1.1 The design of the sprinkler system shall be not less than ordinary hazard group 2 in accordance with NFPA 13 except as follows:

(1) Where different requirements are specified in Chapters 11 through 21 of this code
(2) Where the materials or storage arrangement requires a higher level of sprinkler system protection in accordance with nationally recognized standards
(3) Where approved alternative automatic fire extinguishing systems are permitted

6.2.1.1.2 Electronic supervision of supervisory signals shall be provided in accordance with 55.3.2.1 of *NFPA 5000*. [**5000:**34.3.2.1.1]

6.2.1.1.3 Waterflow alarms shall be monitored in accordance with 55.3.2.2 of *NFPA 5000*. [**5000:**34.3.2.1.2]

6.2.1.1.4 Rooms or areas that are of noncombustible construction with wholly noncombustible contents shall not be required to comply with 6.2.1.1. [**5000:**34.3.2.1.3]

6.2.1.2 Building Height Exception. The height of a one-story building, or portion thereof, containing only tanks or industrial process equipment shall not be limited based on the type of construction. [**5000:**34.3.2.2]

6.2.1.3 Separation of Occupancies Having High Hazards. The separation of areas containing high-hazard contents from each other and from other use areas shall be as required by Table 6.2.1.3 and shall not be permitted to be reduced with the installation of fire protection systems as required by 6.2.1.1. [**5000:**34.3.2.3]

6.2.1.4 Egress. Egress from areas required to comply with Protection Level 1, Protection Level 2, Protection Level 3, or Protection Level 4 shall comply with 34.3.2.4 of *NFPA 5000* and with 6.2.1.4 of this code. [**5000:**34.3.2.4]

6.2.1.4.1 Travel Distance Limit. Travel distance to an exit from areas required to comply with Protection Level 1 through Protection Level [4] shall not exceed the distance given in Table 6.2.1.4.1, measured as required in 11.6.3 of *NFPA 5000*. [**5000:**34.3.2.4.1]

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Δ Table 6.2.1.3 Required Separation of Occupancies Containing High-Hazard Contents (hr)

Occupancy	Protection Level 1	Protection Level 2	Protection Level 3*	Protection Level 4	Protection Level 5
Apartment buildings	NP	4	3	4	4
Assembly ≤ 300	NP	4	3	2	4
Assembly > 300 and ≤ 1000	NP	4	3	2	4
Assembly > 1000	NP	4	3	2	4
Board and care, small	NP	4	3	4	4
Board and care, large	NP	4	3	4	4
Business	NP	2	1	1	1
Day-care > 12	NP	4	3	4	4
Day-care homes	NP	4	3	4	4
Detention and correctional	NP	4	3	4	4
Dwellings, one- and two-family	NP	4	3	4	4
Educational	NP	4	3	2	3
Health care, ambulatory	NP	4	4	4	4
Health care, nonambulatory	NP	4	4	4	4
Hotels and dormitories	NP	4	3	4	4
Industrial, general purpose	NP	2	1	1	1
Industrial, special purpose	NP	2	1	1	1
Lodging and rooming houses	NP	4	3	4	4
Mercantile, Class A	NP	2	1	1	1
Mercantile, Class B	NP	2	1	1	1
Mercantile, Class C	NP	2	1	1	1
Mercantile, covered mall	NP	2	1	1	1
Mercantile, bulk retail	NP	2	1	1	1
Protection Level 1	—	NP	NP	NP	NP
Protection Level 2	NP	—	1	2	2
Protection Level 3	NP	1	—	1	1
Protection Level 4	NP	2	1	—	1
Protection Level 5	NP	2	1	1	—
Storage, low and ordinary hazard	NP	2	1	1	1

NP: Not permitted.
*Rooms in excess of 150 ft^2 (14 m^2), storing flammable liquids, combustible liquids, or Class III oxidizers are required to be provided with not less than a 2-hour separation. [**5000:**Table 34.3.2.3]

Table 6.2.1.4.1 Travel Distance Limits

Protection Level	Distance	
	ft	m
1	75	23
2	100	30
3	150	46
4	175	53

[**5000:**Table 34.3.2.4.1]

6.2.1.4.2 Capacity of Means of Egress. Egress capacity for high-hazard contents areas shall be based on 0.7 in. (18 mm) per person for stairs or 0.4 in. (10 mm) per person for level components and ramps in accordance with 11.3.3.1 of *NFPA 5000*. [**5000:**34.3.2.4.2]

6.2.1.4.3 Number of Means of Egress. Not less than two means of egress shall be provided from each building, or portion thereof, required to comply with Section 6.2, unless rooms or spaces do not exceed 200 ft^2 (18.6 m^2), have an occupant load not exceeding three persons, and have a travel distance to the room door not exceeding 25 ft (7.6 m). [**5000:**34.3.2.4.3]

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6.2.1.4.4 Common Path of Travel Distance Limit. The common path of travel distance from areas required to comply with Protection Level 1 through Protection Level 5 shall not exceed the distance given in Table 6.2.1.4.4, measured as required in 11.6.3 of *NFPA 5000*.

6.2.1.4.5 Dead Ends. Means of egress, for other than rooms or spaces that do not exceed 200 ft^2 (18.6 m^2), have an occupant load not exceeding three persons, and have a travel distance to the room door not exceeding 25 ft (7.6 m), shall be arranged so that there are no dead ends in corridors. [**5000:**34.3.2.4.4]

6.2.1.4.6 Doors. Doors serving high-hazard contents areas with occupant loads in excess of five shall be permitted to be provided with a latch or lock only if the latch or lock is panic hardware or fire exit hardware complying with 11.2.1.7 of *NFPA 5000*. [**5000:**34.3.2.4.5]

6.2.1.5 Ventilation. Buildings, or portions thereof, in which explosive, flammable, combustible, corrosive, or highly toxic dusts, mists, fumes, vapors, or gases are, or might be, emitted shall be provided with mechanical exhaust ventilation or natural ventilation where natural ventilation can be shown to be acceptable for the materials as stored. [**5000:**34.3.2.5.1]

6.2.1.5.1 Solids and liquids stored in closed containers shall not be required to comply with 6.2.1.5.

6.2.1.5.2 Mechanical exhaust systems shall comply with the *Uniform Mechanical Code*, as referenced in Chapter 50 of *NFPA 5000*. [**5000:**34.3.2.5.2]

6.2.1.5.3 Mechanical ventilation shall be at a rate of not less than 1 $ft^3/min/ft^2$ (5.1 $L/s/m^2$) of floor area over areas required to comply with Protection Level 1 through Protection Level [4]. [**5000:**34.3.2.5.3]

6.2.1.5.4 Ventilation requirements shall be determined by calculations based on anticipated fugitive emissions or by sampling of the actual vapor concentration levels under normal operating conditions. [**5000:**34.3.2.5.5]

6.2.1.5.5 Make-up air shall be provided, and provision shall be made for locating make-up air openings to avoid short-circuiting the ventilation. [**5000:**34.3.2.5.6]

6.2.1.5.6 Ducts conveying explosives or flammable vapors, fumes, or dusts shall extend directly to the exterior of the building without entering other spaces. [**5000:**34.3.2.5.7]

6.2.1.5.6.1 Exhaust ducts shall not extend into or through ducts and plenums. [**5000:**34.3.2.5.7.1]

Table 6.2.1.4.4 Common Path of Travel Distance Limits

Hazard Level	Distance	
	ft	m
1	25	8
2	25	8
3	25	8
4	75	23
5	75	23

[**5000:**Table 34.3.2.4.6.1]

6.2.1.5.6.2 Ducts conveying vapor or fumes having flammable constituents less than 25 percent of their lower flammability limit shall be permitted to pass through other spaces. [**5000:**34.3.2.5.7.2]

6.2.1.5.7 Emissions generated by workstations shall be removed from the areas in which they are generated by means of local exhaust installed in accordance with the mechanical code.

6.2.1.5.8 The location of supply and exhaust openings shall be in accordance with the *Uniform Mechanical Code*, as referenced in Chapter 50 of *NFPA 5000*. [**5000:**34.3.2.5.9]

6.2.1.5.9 Systems shall operate continuously unless alternate designs are approved. [**5000:**34.3.2.5.11]

6.2.1.5.10 A manual shutoff control for ventilation equipment required by 6.2.1.5 shall be provided outside the room adjacent to the principal access door to the room. [**5000:**34.3.2.5.12]

6.2.1.5.11 The shutoff control described in 6.2.1.5.10 shall be of the break-glass type and shall be labeled as follows:

VENTILATION SYSTEM EMERGENCY SHUTOFF
[**5000:**34.3.2.5.13]

6.2.1.5.12 Exhaust ventilation shall be arranged to consider the density of the potential fumes or vapors released. [**5000:**34.3.2.5.14]

6.2.1.5.12.1 For fumes or vapors that are lighter than air, exhaust shall be taken from a point within 12 in. (305 mm) of the high point of the room or area in which they are generated.

6.2.1.5.12.2 For fumes or vapors that are heavier than air, exhaust shall be taken from a point within 12 in. (305 mm) of the floor. [**5000:**34.3.2.5.14.1]

6.2.1.5.12.3 The location of both the exhaust and inlet air openings shall be arranged to provide air movement across all portions of the floor or room to prevent the accumulation of vapors. [**5000:**34.3.2.5.14.2]

6.2.1.5.12.4 Exhaust ventilation shall not be recirculated within the room or building if the materials stored are capable of emitting hazardous vapors. [**5000:**34.3.2.5.14.3]

6.2.1.5.12.5 Recirculation shall be permitted where it is monitored continuously using a fail-safe system that is designed to automatically sound an alarm, stop recirculation, and provide full exhaust to the outside in the event that vapor–air mixtures in concentrations over one-fourth of the lower flammable limit are detected. [**5000:**34.3.2.5.14.4]

6.2.1.5.12.6 Air contaminated with explosive or flammable vapors, fumes, or dusts, or with radioactive materials, shall not be recirculated.

6.2.1.6* Explosion Control. Buildings, or portions thereof, required to comply with Protection Level 1 through Protection Level 3 and containing materials shown in Table 6.2.1.6 shall be provided with a means of explosion control. [**5000:**34.3.2.6]

6.2.1.7 Limit Controls. Limit controls shall be provided in accordance with 6.2.1.7.1 and 6.2.1.7.2.

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Table 6.2.1.6 Explosion Control Requirements

Hazard Category	Class	Protection Method
Combustible dust presenting an explosion hazard	NA	Explosion control[a]
Explosives	Detonating	Barricade[b]
	Deflagrating	Explosion control[a]
Flammable gas or cryogen	NA	Explosion control[a]
Flammable liquid[c]	Class IA, storage >1 gal	Explosion control[a]
	Class IA, use	Explosion control[a]
	Class IB, use-open[d]	Explosion control[a]
Organic peroxides[e]		
	Class I, Transport Type B	Barricade[b]
	Class I, Transport Type C	Explosion control[a]
	Class I, Transport Type D	Explosion control[a]
Oxidizer liquids and solids	Class 4	Barricade[b]
Pyrophoric gas[f]	NA	Barricade[b] Explosion control[a]
Unstable reactives	Class 4	Barricade[b]
	Class 3 detonating	Barricade[b]
	Class 3 deflagrating	Explosion control[a]
Water-reactive liquids and solids	Class 3	Explosion control[a]
	Class 2 deflagrating	Explosion control[a]

NA: Not applicable.
[a]Explosion control is required to be a deflagration prevention method, such as combustible concentration reduction, or oxidant concentration reduction, or a deflagration control method complying with NFPA 69, or an approved, engineered deflagration-venting method.
[b]Barricades are required to comply with NFPA 495.
[c]Deflagration venting is not required for rooms that are less than or equal to 500 ft^2 (46.5 m^2) in floor area and do not have any exterior walls as set forth in 34.3.4.2.2 of *NFPA 5000*.
[d]A protection method is required where an explosive environment can occur as a result of the dispensing or use process.
[e]See A.14.2.6 for additional guidance.
[f]Where gas–air mixtures are capable of detonation, barricade construction is required to be provided.

6.2.1.7.1 Temperature Control. Materials that must be kept at temperatures other than normal ambient temperatures to prevent a hazardous reaction shall be provided with an approved means to maintain the temperature within a safe range.

6.2.1.7.1.1 Redundant temperature control equipment that will operate on failure of the primary temperature control system shall be provided.

6.2.1.7.1.2 The use of alternative means that prevent a hazardous reaction shall be permitted subject to the approval of the AHJ.

6.2.1.7.2 Pressure Control.

6.2.1.7.2.1 Stationary tanks and equipment containing hazardous material liquids that can generate pressures exceeding design limits due to exposure fires or internal reaction shall have some form of construction or other approved means that will relieve excessive internal pressure.

6.2.1.7.2.2 The termination point for piped vent systems used for the purpose of operational or emergency venting shall be located to prevent impingement exposure on the system served and to minimize the effects of high-temperature thermal radiation or the effects of contact with the material being vented from the escaping plume on the supply system, personnel, adjacent structures, and ignition sources.

6.2.1.8 Standby and Emergency Power.

6.2.1.8.1 Where mechanical ventilation, treatment systems, temperature control, alarm, detection, or other electrically operated safety systems are required by this code, NFPA 1, or *NFPA 5000*, such systems shall be provided with standby power or emergency power as required by 6.2.1.8. [**5000:**34.3.2.7.1]

6.2.1.8.2 Standby power for mechanical ventilation, exhaust treatment, and temperature control systems shall not be required where such systems are engineered and approved as fail-safe. [**5000:**34.3.2.7.2]

6.2.1.8.3 The secondary source of power shall be an approved means of legally required standby power in accordance with *NFPA 70*.

6.2.1.9 Spill Control and Secondary Containment for Hazardous Materials Liquids and Solids.

6.2.1.9.1 General. Buildings, or portions thereof, required to comply with Protection Level 1 through Protection Level 4 shall be provided with spill control and secondary containment in accordance with 6.2.1.9.2 and 6.2.1.9.3, except for outdoor storage on containment pallets complying with 6.2.7.3.3.

6.2.1.9.2 Spill Control.

6.2.1.9.2.1 Buildings, or portions thereof, used for storage of hazardous materials liquids in individual containers having a capacity of more than 55 gal (208.2 L) shall be provided with spill control to prevent the flow of liquids to adjoining areas.

6.2.1.9.2.2 Where spill control is required, floors in indoor locations and similar surfaces in outdoor locations shall be constructed to contain a spill from the largest single vessel by one of the following methods:

(1) Liquidtight sloped or recessed floors in indoor locations or similar areas in outdoor locations
(2) Liquidtight floors in indoor locations or similar areas in outdoor locations provided with liquidtight raised or recessed sills or dikes
(3) Sumps and collection systems

[**5000:**34.3.2.8.2.2]

6.2.1.9.2.3 Except for surfacing, the floors, sills, dikes, sumps, and collection systems shall be constructed of noncombustible material, and the liquidtight seal shall be compatible with the material stored. [**5000:**34.3.2.8.2.3]

6.2.1.9.2.4 Where liquidtight sills or dikes are provided, they shall not be required at perimeter openings that are provided with an open-grate trench across the opening that connects to an approved collection system. [**5000:**34.3.2.8.2.4]

6.2.1.9.3 Secondary Containment.

6.2.1.9.3.1 Buildings, or portions thereof, used for any of the following shall be provided with secondary containment:

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(1) Storage of liquids where the capacity of an individual vessel exceeds 55 gal (208.2 L) or the aggregate capacity of multiple vessels exceeds 1000 gal (3785 L)
(2) Storage of solids where the capacity of an individual vessel exceeds 550 lb (248.8 kg) or the aggregate capacity of multiple vessels exceeds 10,000 lb (4524.8 kg)

6.2.1.9.3.2 Buildings, or portions thereof, containing only hazardous materials in listed secondary containment tanks or systems shall not be required to comply with 6.2.1.9.3.1.

6.2.1.9.3.3 Buildings, or portions thereof, containing only ammonium nitrate solids, organic peroxide solids, flammable solids, pyrophoric solids, or corrosive solids shall not be required to comply with 6.2.1.9.3.1.

6.2.1.9.3.4 The building, room, or area shall contain or drain the hazardous materials and fire protection water through the use of one of the following methods:

(1) Liquidtight sloped or recessed floors in indoor locations or similar areas in outdoor locations
(2) Liquidtight floors in indoor locations or similar areas in outdoor locations provided with liquidtight raised or recessed sills or dikes
(3) Sumps and collection systems
(4) Drainage systems leading to an approved location

6.2.1.9.3.5 Where incompatible materials are present in open containers or systems, such materials shall be separated from each other in the secondary containment system.

6.2.1.9.3.6 Secondary containment for indoor storage areas shall be designed to contain a spill from the largest vessel plus the design flow volume of fire protection water calculated to discharge from the fire-extinguishing system over the minimum required system design area, or area of the room or area in which the storage is located, whichever is smaller, for a period of 20 minutes.

6.2.1.9.3.7 A monitoring method shall be provided to detect hazardous materials in the secondary containment system.

6.2.1.9.3.8 The monitoring method specified in 6.2.1.9.3.7 shall be permitted to be visual inspection of the primary or secondary containment or other approved means.

6.2.1.9.3.9 Where secondary containment is subject to the intrusion of water, a monitoring method for detecting water shall be provided.

6.2.1.9.3.10 Where monitoring devices are provided, they shall be connected to distinct visual or audible alarms.

6.2.1.9.3.11 Where remote containment systems are provided, drainage systems shall be in accordance with the plumbing code, as referenced in Chapter 2, and the following provisions also shall be met:

(1) The slope of floors in indoor locations to drains or similar areas in outdoor locations shall be not less than 1 percent.
(2) Drains from indoor storage areas shall be sized to carry the volume of the fire protection water, as determined by the design density discharged from the automatic fire-extinguishing system over the minimum required system design area, or area of the room or area in which the storage is located, whichever is smaller.
(3) Materials of construction for drainage systems shall be compatible with the materials stored.
(4) Separate drainage systems shall be provided to avoid mixing incompatible materials where such materials are present in an open-use condition.
(5) Drains shall terminate in an approved location away from buildings, valves, means of egress, fire access roadways, adjoining property, and storm drains.

6.2.1.10 Floors in Storage Rooms. Floors in storage areas for ammonium nitrate, organic peroxides, oxidizers, pyrophoric materials, unstable (reactive) materials, water-reactive solids and liquids, corrosive materials, and toxic and highly toxic materials shall be of liquidtight, noncombustible construction.

6.2.1.11 Supervision of Alarm, Detection, and Automatic Fire-Extinguishing Systems. Alarm, detection, and automatic fire-extinguishing systems required by Chapter 6 or other chapters of this code regulating hazardous materials shall be supervised by an approved central, proprietary, or remote station service or shall initiate audible and visual signals at a constantly attended on-site location.

6.2.2 Protection Level 1.

6.2.2.1 General. Buildings, or portions thereof, required to comply with Protection Level 1 shall comply with 6.2.2 and the building code.

6.2.2.2 Detached Building Required.

6.2.2.2.1* Buildings required to comply with Protection Level 1 shall be used for no other purpose, shall not exceed one story in height, and shall be without basements, crawl spaces, or other under-floor spaces. [**5000:**34.3.3.2.1]

6.2.2.2.2 Roofs of buildings described in 6.2.2.2.1 shall be of lightweight construction with suitable thermal insulation to prevent sensitive material from reaching its decomposition temperature. [**5000:**34.3.3.2.2]

6.2.2.2.3 Buildings required to comply with both Protection Level 1 and Protection Level 4 shall comply with the most restrictive requirements for both protection levels. [**5000:**34.3.3.2.3]

6.2.2.3 Minimum Distance to Property Lines or Horizontal Separation. Buildings required to comply with Protection Level 1 shall be set back from property lines, or be provided with a horizontal separation in accordance with *NFPA 5000*, by a distance of not less than 75 ft (23 m) and of not less than that required by Table 6.2.2.3. [**5000:**34.3.3.3]

6.2.2.3.1 Explosives that are in accordance with NFPA 495 shall not be required to comply with 6.2.2.3. [**5000:**34.3.3.3.1]

6.2.2.3.2 Distances shall be measured from the perimeter wall to property lines, including those on a public way. [**5000:**34.3.3.3.2]

6.2.2.3.3 Quantities of explosives used in applying Table 6.2.2.3 shall be based on equivalent pounds (kilograms) of TNT. [**5000:**34.3.3.3.3]

6.2.2.4 Frangible Building. Frangible buildings complying with 7.4.1.4.5.3 of *NFPA 5000* shall not be required to be protected with an automatic sprinkler system. [**5000:**34.3.3.4]

6.2.3 Protection Level 2.

6.2.3.1 General. Buildings, or portions thereof, required to comply with Protection Level 2 shall comply with 6.2.1 and 6.2.3.2 through 6.2.3.5.2. [**5000:**34.3.4.1]

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Table 6.2.2.3 American Table of Distances

Quantity of Explosive Materials[1,2,3,4,5]		Distances in Feet							
		Inhabited Buildings[10]		Public Highways Traffic Volume of 3,000 Vehicles/Day or Less[12]		Passenger Railways — Public Highways with Traffic Volume of More Than 3,000 Vehicles/Day[11,12]		Separation of Magazines[6,13]	
Pounds Over	Pounds Not Over	Barricaded[7,8,9]	Un-barricaded	Barricaded[7,8,9]	Un-barricaded	Barricaded[7,8,9]	Un-barricaded	Barricaded[7,8,9]	Un-barricaded
0	5	70	140	30	60	51	102	6	12
5	10	90	180	35	70	64	128	8	16
10	20	110	220	45	90	81	162	10	20
20	30	125	250	50	100	93	186	11	22
30	40	140	280	55	110	103	206	12	24
40	50	150	300	60	120	110	220	14	28
50	75	170	340	70	140	127	254	15	30
75	100	190	380	75	150	139	278	16	32
100	125	200	400	80	160	150	300	18	36
125	150	215	430	85	170	159	318	19	38
150	200	235	470	95	190	175	350	21	42
200	250	255	510	105	210	189	378	23	46
250	300	270	540	110	220	201	402	24	48
300	400	295	590	120	240	221	442	27	54
400	500	320	640	130	260	238	476	29	58
500	600	340	680	135	270	253	506	31	62
600	700	355	710	145	290	266	532	32	64
700	800	375	750	150	300	278	556	33	66
800	900	390	780	155	310	289	578	35	70
900	1,000	400	800	160	320	300	600	36	72
1,000	1,200	425	850	165	330	318	636	39	78
1,200	1,400	450	900	170	340	336	672	41	82
1,400	1,600	470	940	175	350	351	702	43	86
1,600	1,800	490	980	180	360	366	732	44	88
1,800	2,000	505	1,010	185	370	378	756	45	90
2,000	2,500	545	1,090	190	380	408	816	49	98
2,500	3,000	580	1,160	195	390	432	864	52	104
3,000	4,000	635	1,270	210	420	474	948	58	116
4,000	5,000	685	1,370	225	450	513	1,026	61	122
5,000	6,000	730	1,460	235	470	546	1,092	65	130
6,000	7,000	770	1,540	245	490	573	1,146	68	136
7,000	8,000	800	1,600	250	500	600	1,200	72	144
8,000	9,000	835	1,670	255	510	624	1,248	75	150
9,000	10,000	865	1,730	260	520	645	1,290	78	156
10,000	12,000	875	1,750	270	540	687	1,374	82	164
12,000	14,000	885	1,770	275	550	723	1,446	87	174
14,000	16,000	900	1,800	280	560	756	1,512	90	180
16,000	18,000	940	1,880	285	570	786	1,572	94	188
18,000	20,000	975	1,950	290	580	813	1,626	98	196
20,000	25,000	1,055	2,000	315	630	876	1,752	105	210
25,000	30,000	1,130	2,000	340	680	933	1,866	112	224
30,000	35,000	1,205	2,000	360	720	981	1,962	119	238
35,000	40,000	1,275	2,000	380	760	1,026	2,000	124	248
40,000	45,000	1,340	2,000	400	800	1,068	2,000	129	258
45,000	50,000	1,400	2,000	420	840	1,104	2,000	135	270
50,000	55,000	1,460	2,000	440	880	1,140	2,000	140	280
55,000	60,000	1,515	2,000	455	910	1,173	2,000	145	290
60,000	65,000	1,565	2,000	470	940	1,206	2,000	150	300
65,000	70,000	1,610	2,000	485	970	1,236	2,000	155	310
70,000	75,000	1,655	2,000	500	1,000	1,263	2,000	160	320
75,000	80,000	1,695	2,000	510	1,020	1,293	2,000	165	330
80,000	85,000	1,730	2,000	520	1,040	1,317	2,000	170	340
85,000	90,000	1,760	2,000	530	1,060	1,344	2,000	175	350
90,000	95,000	1,790	2,000	540	1,080	1,368	2,000	180	360
95,000	100,000	1,815	2,000	545	1,090	1,392	2,000	185	370
100,000	110,000	1,835	2,000	550	1,100	1,437	2,000	195	390
110,000	120,000	1,855	2,000	555	1,110	1,479	2,000	205	410
120,000	130,000	1,875	2,000	560	1,120	1,521	2,000	215	430
130,000	140,000	1,890	2,000	565	1,130	1,557	2,000	225	450
140,000	150,000	1,900	2,000	570	1,140	1,593	2,000	235	470
150,000	160,000	1,935	2,000	580	1,160	1,629	2,000	245	490
160,000	170,000	1,965	2,000	590	1,180	1,662	2,000	255	510
170,000	180,000	1,990	2,000	600	1,200	1,695	2,000	265	530

(continues)

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Table 6.2.2.3 *Continued*

Quantity of Explosive Materials[1,2,3,4,5]		Distances in Feet							
		Inhabited Buildings[10]		Public Highways Traffic Volume of 3,000 Vehicles/Day or Less[12]		Passenger Railways — Public Highways with Traffic Volume of More Than 3,000 Vehicles/Day[11,12]		Separation of Magazines[6,13]	
Pounds Over	Pounds Not Over	Barricaded[7,8,9]	Un-barricaded	Barricaded[7,8,9]	Un-barricaded	Barricaded[7,8,9]	Un-barricaded	Barricaded[7,8,9]	Un-barricaded
180,000	190,000	2,010	2,010	605	1,210	1,725	2,000	275	550
190,000	200,000	2,030	2,030	610	1,220	1,755	2,000	285	570
200,000	210,000	2,055	2,055	620	1,240	1,782	2,000	295	590
210,000	230,000	2,100	2,100	635	1,270	1,836	2,000	315	630
230,000	250,000	2,155	2,155	650	1,300	1,890	2,000	335	670
250,000	275,000	2,215	2,215	670	1,340	1,950	2,000	360	720
275,000	300,000	2,275	2,275	690	1,380	2,000	2,000	385	770

Superscript numerals refer to explanatory footnotes.

Explanatory Notes Essential to the Application of the American Table of Distances.

[1]"Explosive materials" means explosives, blasting agents, and detonators.

[2]"Explosives" means any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion. A list of explosives determined to be within the coverage of 18 USC 40, "Importation, Manufacture, Distribution and Storage of Explosive Materials," is issued at least annually by the Director of the Bureau of Alcohol, Tobacco, and Firearms of the Department of the Treasury. For quantity and distance purposes, detonating cord of 50 grains per foot should be calculated as equivalent to 8 lb (3.7 kg) of high explosives per 1000 ft (305 m). Heavier or lighter core loads should be rated proportionately.

[3]"Blasting agents" means any material or mixture consisting of fuel and oxidizer, intended for blasting, and not otherwise defined as an explosive, provided that the finished product, as mixed for use or shipment, cannot be detonated by means of a No. 8 test blasting cap where unconfined.

[4]"Detonator" means any device containing any initiating or primary explosive that is used for initiating detonation. A detonator may not be permitted to contain more than 10 g of total explosives by weight, excluding ignition or delay charges. The term includes, but is not limited to, electric blasting caps of instantaneous and delay types, blasting caps for use with safety fuses, detonating cord delay connectors, and nonelectric instantaneous and delay blasting caps that use detonating cord, shock tube, or any other replacement for electric leg wires. All types of detonators in strengths through No. 8 cap should be rated at 1½ lb (0.7 kg) of explosives per 1000 caps.

[5]For strengths higher than No. 8 cap, the manufacturer should be consulted.

[6]"Magazine" means any building, structure, or container, other than an explosives manufacturing building, approved for the storage of explosive materials.

[7]"Natural barricade" means natural features of the ground, such as hills, or timber of sufficient density that the surrounding exposures that need protection cannot be seen from the magazine when the trees are bare of leaves.

[8]"Artificial barricade" means an artificial mound or revetted wall of earth of a minimum thickness of 3 ft (0.9 m).

[9]"Barricaded" means the effective screening of a building containing explosive materials from the magazine or another building, a railway, or a highway by a natural or an artificial barrier. A straight line from the top of any sidewall of the building containing explosive materials to the eave line of any magazine or other building or to a point 12 ft (3.7 m) above the center of a railway or highway shall pass through such barrier.

[10]"Inhabited building" means a building regularly occupied in whole or part as a habitation for human beings, or any church, schoolhouse, railroad station, store, or other structure where people are accustomed to assemble, but does not include any building or structure occupied in connection with the manufacture, transportation, storage, or use of explosive materials.

[11]"Railway" means any steam, electric, or other railroad or railway that carries passengers for hire.

[12]"Public highway" means any road, street, or way, whether on public or private property, open to public travel.

[13]Where two or more storage magazines are located on the same property, each magazine shall comply with the minimum distances specified from inhabited buildings, railways, and highways, and, in addition, they should be separated from each other by not less than the distances shown for "separation of magazines," except that the quantity of explosive materials contained in detonator magazines shall govern with regard to the spacing of said detonator magazines from magazines containing other explosive materials. If any two or more magazines are separated from each other by less than the specified "separation of magazines" distances, such magazines, as a group, shall be considered as one magazine, and the total quantity of explosive materials stored in such group shall be treated as if stored in a single magazine located on the site of any magazine of the group, and shall comply with the minimum specified distances from other magazines, inhabited buildings, railways, and highways.

[14]Storage in excess of 300,000 lb (136,200 kg) of explosive materials in one magazine generally is not necessary for commercial enterprises.

[15]This table applies only to the manufacture and permanent storage of commercial explosive materials. It is not applicable to the transportation of explosives or any handling or temporary storage necessary or incident thereto. It is not intended to apply to bombs, projectiles, or other heavily encased explosives.

[16]Where a manufacturing building on an explosive materials plant site is designed to contain explosive materials, the building shall be located at a distance from inhabited buildings, public highways, and passenger railways in accordance with the American Table of Distances based on the maximum quantity of explosive materials permitted to be in the building at one time.

Source: Reprinted from IME SLP 2, "American Table of Distances (ATD)," with permission of the Institute of Makers of Explosives, revised in June 1991.

[**495:**Table 9.4.1(b)]

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6.2.3.2 Exterior Wall Required.

6.2.3.2.1 Buildings, or portions thereof, required to comply with Protection Level 2 shall be located on property such that not less than 25 percent of the perimeter wall is an exterior wall. [**5000:**34.3.4.2.1]

6.2.3.2.2 Rooms utilized for the use, dispensing, mixing, and storage of ignitible (flammable and combustible) liquids having a floor area of not more than 500 ft^2 (46.5 m^2) shall not be required to be located on the outer perimeter of the building where such rooms comply with NFPA 30. [**5000:**34.3.4.2.2]

6.2.3.3 Minimum Distance to Property Lines or Horizontal Separation.

6.2.3.3.1 Buildings, or portions thereof, required to comply with Protection Level 2 shall be set back from property lines, or be provided with a horizontal separation in accordance with 7.3.4.2 of *NFPA 5000* at any of the following distances:

(1) Not less than 30 ft (9.1 m) where the area of the occupancy exceeds 1000 ft^2 (93 m^2) and a detached building is not required
(2) Not less than 50 ft (15 m) where a detached building is required by Table 5.3.7
(3) Not less than the distances required by Table 6.2.2.3 for buildings containing materials with explosive characteristics

[**5000:**34.3.4.3.1]

6.2.3.3.2 Distances shall be measured from the walls enclosing the Protection Level 2 area to property lines, including those on a public way, or in accordance with 7.3.4.2 of *NFPA 5000* for buildings on the same lot. [**5000:**34.3.4.3.2]

6.2.3.4 Detached Building Required.

6.2.3.4.1* Buildings required to comply with Protection Level 2, and containing quantities of high-hazard contents exceeding the quantity limits set forth in Table 5.3.7, shall be used for manufacturing, processing, dispensing, use, or storage of hazardous materials and no other purpose; shall not exceed one story in height; and shall be without basements, crawl spaces, or other under-floor spaces. [**5000:**34.3.4.4.1]

6.2.3.4.2 Buildings that contain high-hazard level 2 contents also shall be permitted to contain high-hazard level 3 or high-hazard level 4 contents, provided that incompatible materials are separated as otherwise required by the provisions of this code, NFPA 1, and *NFPA 5000*. [**5000:**34.3.4.4.2]

6.2.3.4.3 The roofs of buildings specified in 6.2.3.4.1 shall be of lightweight construction.

6.2.3.5 Water-Reactive Materials.

6.2.3.5.1 Rooms or areas containing Class 2 or Class 3 water-reactive materials shall be resistant to water penetration. [**5000:**34.3.4.5.1]

6.2.3.5.2 Piping for conveying water, other than fire protection piping, shall not route over or through areas containing Class 2 or Class 3 water-reactive materials, unless isolated by approved liquidtight construction. [**5000:**34.3.4.5.2]

6.2.4 Protection Level 3.

6.2.4.1 General. Buildings, or portions thereof, required to comply with Protection Level 3 shall comply with 6.2.1 and 6.2.4.2 through 6.2.4.7.2. [**5000:**34.3.5.1]

6.2.4.2 Exterior Wall Required.

6.2.4.2.1 Buildings, or portions thereof, required to comply with Protection Level 3 shall be located on property such that not less than 25 percent of the perimeter wall is an exterior wall. [**5000:**34.3.5.2.1]

6.2.4.2.2 Rooms utilized for the use, dispensing, mixing, and storage of ignitible (flammable and combustible) liquids having a floor area of not more than 500 ft^2 (46.5 m^2) shall not be required to be located on the outer perimeter of the building where such rooms are in accordance with NFPA 30. [**5000:**34.3.5.2.2]

6.2.4.3 Minimum Distance to Property Lines or Horizontal Separation.

6.2.4.3.1 Buildings, or portions thereof, required to comply with Protection Level 3 shall be set back from property lines, or be provided with a horizontal separation in accordance with 7.3.4.2 of *NFPA 5000*, at any of the following distances:

(1) Not less than 30 ft (9.1 m) where the area of the occupancy exceeds 1000 ft^2 (93 m^2) and a detached building is not required
(2) Not less than 50 ft (15 m) where a detached building is required by Table 5.3.7
(3) Not less than the distances required by Table 34.3.3.3 of *NFPA 5000* for buildings containing materials with explosive characteristics

[**5000:**34.3.5.3.1]

6.2.4.3.2 Distances shall be measured from the walls enclosing the Protection Level 3 area to property lines, including those on a public way, or in accordance with 7.3.4.2 of *NFPA 5000* for buildings on the same lot. [**5000:**34.3.5.3.2]

6.2.4.4 Detached Building Required.

6.2.4.4.1* Buildings required to comply with Protection Level 3, and containing quantities of high-hazard contents exceeding the quantity limits set forth in Table 5.3.7, shall be used for manufacturing, processing, dispensing, use, or storage of hazardous materials and no other purpose; shall not exceed one story in height; and shall be without basements, crawl spaces, or other under-floor spaces. [**5000:**34.3.5.4.1]

6.2.4.4.2 Buildings that contain high-hazard level 3 contents also shall be permitted to contain high-hazard level 2 or high-hazard level 4 contents, provided that incompatible materials are separated as otherwise required by the provisions of this code and NFPA 1. [**5000:**34.3.5.4.2]

6.2.4.5 Detached Unprotected Building. Where acceptable to the AHJ, based on a determination that a protected building is not practical and an assessment of acceptable risk, storage buildings required to comply with Protection Level 3 shall be permitted without fire protection systems, provided that all of the following provisions are met:

(1) The building, or portions thereof, shall comply with the following:
    (a) It shall have a horizontal separation of at least 200 ft (61 m) from exposed business, industrial, mercantile, and storage occupancies on the same lot and from any property line that is or can be built upon.
    (b) Where protection for exposures is provided in accordance with 6.2.4.5(6)(c), the horizontal separation shall be at least 100 ft (30 m).

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(2) The building, or portions thereof, shall comply with either of the following:

(a) It shall have a horizontal separation of at least 1000 ft (305 m) from exposed occupancies other than business, industrial, mercantile, and storage occupancies on the same lot and from any property line that is or can be built upon.
(b) Where protection for exposures is provided in accordance with 6.2.4.5(6)(c), the horizontal separation shall be at least 500 ft (150 m).

(3) The building shall not exceed one story in height.
(4) The building shall not have basements, crawl spaces, or other under-floor accessible spaces.
(5) Egress from the building shall not exceed 50 percent of the distances listed in Table 6.2.1.4.1, measured as required in 11.6.2 of *NFPA 5000*, and in compliance with 34.3.2.4.2 through 34.3.2.4.5 of *NFPA 5000*.
(6) The building shall comply with the requirements of all of the following:

(a) 34.3.2.2 of *NFPA 5000* for building height
(b) 6.2.1.5 for ventilation
(c) 6.2.1.6 for explosion control
(d) 6.2.1.8 for standby and emergency power
(e) 6.2.1.10 for floor construction
(f) 34.3.2.10 of *NFPA 5000* for unprotected vertical openings

(7) Spill control shall comply with 6.2.1.9.
(8) Secondary containment shall comply with 6.2.1.9.3, except that containment for fire protection water shall not be required if the building is not provided with a fire protection sprinkler system.
(9) Where credit is taken for protection for exposures in accordance with 34.3.5.5(1) and 34.3.5.5(2) of *NFPA 5000,* protection of exposures shall consist of fire protection for structures on property adjacent to the storage building that is provided by (1) a public fire department or (2) a private fire brigade maintained on the property adjacent to the storage building, either of which shall be capable of providing cooling water streams to protect the property adjacent to the storage building.

[**5000:**34.3.5.5]

6.2.4.6 Roofs. The roofs of buildings specified in 6.2.4.4.1 shall be of lightweight construction.

6.2.4.7 Water-Reactive Materials.

6.2.4.7.1 Rooms or areas containing Class 2 or Class 3 water-reactive materials shall be resistant to water penetration. [**5000:**34.3.5.7.1]

6.2.4.7.2 Piping for conveying water, other than fire protection piping, shall not route over or through areas containing Class 2 or Class 3 water-reactive materials, unless isolated by approved liquidtight construction. [**5000:**34.3.5.7.2]

6.2.5 Protection Level 4.

6.2.5.1 Buildings, or portions thereof, required to comply with Protection Level 4 shall comply with 6.2.1, 6.2.5.2, and 6.2.5.3. [**5000:**34.3.6]

6.2.5.2 Highly Toxic Solids and Liquids. Highly toxic solids and liquids not stored in approved hazardous materials storage cabinets shall be isolated from other hazardous materials storage by a 1-hour fire barrier. [**5000:**34.3.6.2]

6.2.5.3 Gas Rooms. Exhaust ventilation for gas rooms shall be designed to operate at a negative pressure in relation to the surrounding areas and shall direct the exhaust ventilation to an exhaust system. [**5000:**34.3.6.1]

6.2.6 Protection Level 5. Buildings, and portions thereof, required to comply with Protection Level 5 shall comply with *NFPA 5000*, NFPA 1, and NFPA 318.

6.2.7 Outdoor Storage. Outdoor storage areas shall be in accordance with the requirements of Chapters 11 through 21, as applicable.

6.2.7.1 Clearance from Combustibles. Clearance from combustibles shall comply with 6.1.15(2).

6.2.7.2 Weather Protection. Where weather protection is provided for sheltering outside hazardous material storage or use areas, such storage or use areas shall be considered outside storage or use areas, provided that all of the following conditions are met: [**5000:**34.2.6]

(1) The overhead structure shall be approved noncombustible construction with a maximum area of 1500 ft^2 (140 m^2) except that area increases based on location or fire protection systems under the requirements of the building code shall be allowed.
(2) Supports and walls shall not obstruct more than one side or more than 25 percent of the perimeter of the storage or use area. [**5000:**34.2.6(1)]
(3) The distance from the structure and the structural supports to buildings, lot lines, or public egress to a public way shall not be less than the distance required by Chapters 11 through 21 for an outside hazardous material storage area without weather protection.
(4) Weather-protection structures containing storage of explosive or detonable materials shall be considered indoor storage.

6.2.7.3 Secondary Containment.

6.2.7.3.1 General. Where secondary containment is required, it shall be in accordance with 6.2.1.9.3.

6.2.7.3.2 Where Required. Where required by Table 6.2.7.3.2, outdoor storage areas used for hazardous materials solids or liquids shall be provided with secondary containment in accordance with 6.2.1.9.3.

6.2.7.3.3 Containment Pallets. Where used as a substitute for spill control and secondary containment for outdoor storage in accordance with 6.2.1.9.1, containment pallets shall comply with the following:

(1) A liquidtight sump accessible for visual inspection shall be provided.
(2) The sump shall be designed to contain not less than 66 gal (249.8 L).
(3) Exposed surfaces shall be compatible with the material stored.
(4) Containment pallets shall be protected to prevent collection of rainwater within the sump.

6.3 Requirements for Use, Dispensing, and Handling of Hazardous Materials in Amounts Exceeding Maximum Allowable Quantities.

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Δ **Table 6.2.7.3.2 Required Secondary Containment — Hazardous Materials Solids and Liquids Storage**

Material	Class	Outdoor Storage	
		Solids	Liquids
Physical Hazard Materials			
Flammable solids		NR	NA
Organic peroxide liquids	I	NR	NR
	IIA	NR	NR
	IIB	NR	NR
	III	NR	NR
	IV	NR	NR
Oxidizer liquids	4	NR	NR
	3	NR	NR
	2	NR	NR
Pyrophoric liquids		NR	R
Unstable (reactive) liquids	4	R	R
	3	R	R
	2	R	R
	1	NR	NR
Water reactive liquids	3	R	R
	2	R	R
	1	NR	NR
Health Hazard Materials			
Corrosive liquids		NR	R
Highly toxic liquids		R	R
Toxic liquids		R	R

NR: Not required. NA: Not applicable. R: Required.

6.3.1* General. The following shall apply to aggregate quantities of hazardous materials used, dispensed, or handled:

(1) Where the aggregate quantity of hazardous materials used, dispensed, or handled exceeds the MAQ, the requirements set forth in Section 6.3 shall apply, except as specified in 6.3.1.1.
(2) Where the aggregate quantity of hazardous materials used, dispensed, or handled does not exceed the MAQ, Section 6.3 shall not apply.

6.3.1.1 Uses Not Required to Comply. The following use conditions shall not be required to comply with Section 6.3:

(1) Corrosives used in stationary lead–acid battery systems used for standby power, emergency power, or uninterrupted power supply complying with Chapter 52 of NFPA 1
(2) Application and release of pesticide products and materials intended for use in weed abatement, erosion control, soil amendment or similar applications, where applied in accordance with the manufacturer's instructions and label directions

6.3.1.2 Limit Controls.

6.3.1.2.1 General. Limit controls shall be provided in accordance with 6.3.1.2.1 through 6.3.1.2.4.2.

6.3.1.2.2 Temperature Control. Process tanks and equipment, which involve temperature control of the material to prevent a hazardous reaction, shall be provided with limit controls to maintain the temperature within a safe range.

6.3.1.2.3 Pressure Control.

6.3.1.2.3.1 Stationary tanks and equipment containing hazardous materials liquids that can generate pressures exceeding design limits due to exposure fires or internal reaction shall have a form of construction or other approved means that relieves excessive internal pressure.

6.3.1.2.3.2 The means of pressure relief shall vent to an approved location.

6.3.1.2.3.3 Where required by Chapter 21, the means of pressure relief shall vent to an exhaust scrubber or treatment system.

6.3.1.2.4 Liquid Level.

6.3.1.2.4.1 High Level. Open tanks in which hazardous materials are used shall be equipped with a liquid level limit control or other means to prevent overfilling of the tank.

6.3.1.2.4.2 Low Level. Open tanks and containers in which hazardous materials are heated shall be equipped with approved automatic shutoff controls, which will sense low liquid levels and shut off the source of heat.

6.3.1.3 Standby and Emergency Power. Where mechanical ventilation, treatment systems, temperature control, alarm, detection, or other electrically operated safety systems are required by this code, NFPA 1, or *NFPA 5000*, such systems shall be provided with standby power or emergency power as required by 6.3.1.3. [**5000:**34.3.2.7.1]

6.3.1.3.1 Standby power for mechanical ventilation, exhaust treatment, and temperature control systems shall not be required where such systems are engineered and approved as fail-safe. [**5000:**34.3.2.7.2]

6.3.1.3.2 The secondary source of power shall be an approved means of legally required standby power in accordance with *NFPA 70*, except for areas containing highly toxic or toxic gases, where a legally required emergency power system in accordance with Chapter 52 of *NFPA 5000* and NFPA 55 shall be provided to operate safety systems required by this code, NFPA 1, or *NFPA 5000*. [**5000:**34.3.2.7.3]

6.3.1.4 Spill Control and Secondary Containment for Hazardous Materials Liquids.

6.3.1.4.1 Spill Control. Where spill control is specifically required in 6.3.2 or 6.3.3, such systems shall be in accordance with 6.3.1.4.1.1 through 6.3.1.4.1.3.

6.3.1.4.1.1 General. Where spill control is required, floors in indoor locations and similar surfaces in outdoor locations shall be constructed to contain a spill from the largest single vessel by one of the following methods:

(1) Liquidtight sloped or recessed floors in indoor locations or similar areas in outdoor locations
(2) Liquidtight floors in indoor locations or similar areas in outdoor locations provided with liquidtight raised or recessed sills or dikes
(3) Sumps and collection systems [**5000:**34.3.2.8.2.2]

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6.3.1.4.1.2 Except for surfacing, the floors, sills, dikes, sumps, and collection systems shall be constructed of noncombustible material, and the liquidtight seal shall be compatible with the material stored. [**5000:**34.3.2.8.2.3]

6.3.1.4.1.3 Where liquidtight sills or dikes are provided, they shall not be required at perimeter openings that are provided with an open-grate trench across the opening that connects to an approved collection system. [**5000:**34.3.2.8.2.4]

6.3.1.4.2 Secondary Containment. Where secondary containment is specifically required in 6.3.2 or 6.3.3, such systems shall be in accordance with 6.3.1.4.2.1 through 6.3.1.4.2.10.

6.3.1.4.2.1 Buildings, or portions thereof, containing only hazardous materials in listed secondary containment tanks or systems shall not be required to comply with 6.3.1.4.2. [**5000:**34.3.2.8.3.2]

6.3.1.4.2.2 Secondary containment shall be achieved by means of drainage control where required by NFPA 30. [**5000:**34.3.2.8.3.4]

6.3.1.4.2.3 The building, room, or area shall contain or drain the hazardous materials and fire protection water through the use of one of the following methods:

(1) Liquidtight sloped or recessed floors in indoor locations or similar areas in outdoor locations
(2) Liquidtight floors in indoor locations or similar areas in outdoor locations provided with liquidtight raised or recessed sills or dikes
(3) Sumps and collection systems
(4) Drainage systems leading to an approved location [**5000:**34.3.2.8.3.5]

6.3.1.4.2.4 Where incompatible materials are present in open containers or systems, such materials shall be separated from each other in the secondary containment system. [**5000:**34.3.2.8.3.6]

6.3.1.4.2.5 Secondary containment for indoor storage areas shall be designed to contain a spill from the largest vessel plus the design flow volume of fire protection water calculated to discharge from the fire-extinguishing system over the minimum required system design area, or area of the room or area in which the storage is located, whichever is smaller, for a period of 20 minutes. [**5000:**34.3.2.8.3.7]

6.3.1.4.2.6 A monitoring method shall be provided to detect hazardous materials in the secondary containment system. [**5000:**34.3.2.8.3.8]

6.3.1.4.2.7 The monitoring method shall be permitted to be visual inspection of the primary or secondary containment, or other approved means. [**5000:**34.3.2.8.3.9]

6.3.1.4.2.8 Where secondary containment is subject to the intrusion of water, a monitoring method for detecting water shall be provided. [**5000:**34.3.2.8.3.10]

6.3.1.4.2.9 Where monitoring devices are provided, they shall be connected to distinct visual or audible alarms. [**5000:**34.3.2.8.3.11]

6.3.1.4.2.10 Where remote containment systems are provided, drainage systems shall be in accordance with the *Uniform Mechanical Code*, and the following provisions also shall be met:

(1) The slope of floors in indoor locations to drains or similar areas in outdoor locations shall be not less than 1 percent.
(2) Drains from indoor storage areas shall be sized to carry the volume of the fire protection water, as determined by the design density discharged from the automatic fire-extinguishing system over the minimum required system design area, or area of the room or area in which the storage is located, whichever is smaller.
(3) Materials of construction for drainage systems shall be compatible with the materials stored.
(4) Separate drainage systems shall be provided to avoid mixing incompatible materials where such materials are present in an open-use condition.
(5) Drains shall terminate in an approved location away from buildings, valves, means of egress, fire access roadways, adjoining property, and storm drains.

6.3.1.5 Lighting. Lighting by natural or artificial means shall be provided, and artificial lighting, where provided, shall be in accordance with nationally recognized standards.

6.3.1.6 System Design.

6.3.1.6.1 Systems shall be suitable for the use intended and shall be designed by persons competent in such design.

6.3.1.6.2 Where nationally recognized good practices or standards have been established for the processes employed, they shall be followed in the design.

6.3.1.6.3 Controls shall be designed to prevent materials from entering or leaving process or reaction systems at other than the intended time, rate, or path.

6.3.1.6.4 Where automatic controls are provided, they shall be designed to be fail-safe.

6.3.1.7 Liquid Transfer.

6.3.1.7.1 Approved containers shall be used where liquids are dispensed from containers.

6.3.1.7.2 Liquids having a hazard ranking of 3 when exceeding 5.3 gal (20 L), or liquids having a hazard ranking of 4 when exceeding 1.1 gal (4 L), shall be transferred by one of the following methods:

(1) From safety cans
(2) Through an approved closed-piping system
(3) From containers or tanks by an approved pump taking suction through an opening in the top of the container or tank
(4) For other than highly toxic liquids, from containers or tanks by gravity through an approved self-closing or automatic-closing valve where the container or tank and dispensing operations are provided with spill control and secondary containment complying with 6.3.1.4.1 through 6.3.1.4.2.10
(5) By the use of approved engineered liquid transfer systems

6.3.1.8 Supervision of Alarm, Detection, and Automatic Fire-Extinguishing Systems. Alarm, detection, and automatic fire-extinguishing systems required by Section 6.3 shall be supervised by an approved central, proprietary, or remote station service or shall initiate an audible and visual signal at a constantly attended on-site location.

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6.3.2 Indoor Dispensing and Use.

6.3.2.1 General Indoor Requirements.

6.3.2.1.1 Fire Protection Systems.

6.3.2.1.1.1 General. Indoor dispensing and use areas shall be provided with approved fire protection systems in accordance with 6.2.1.1.

6.3.2.1.1.2 Fire-Extinguishing System for Laboratory Fume Hoods and Spray Booths. In addition to the requirements of 6.2.1.1, laboratory fume hoods and spray booths where flammable materials are dispensed or used shall be protected by an automatic fire-extinguishing system.

6.3.2.1.2 Protection Level 1 through Protection Level 4. Buildings and structures required to comply with Protection Level 1, Protection Level 2, Protection Level 3, or Protection Level 4 controls shall be constructed in accordance with the specific protection level controls of Section 6.2 and the requirements of *NFPA 5000*.

6.3.2.1.2.1 Building Height Exception. The height of a one-story building, or portion thereof, containing only tanks or industrial process equipment shall not be limited based on the type of construction. [**5000:**34.3.2.2]

6.3.2.1.2.2 Separation of Occupancies Having High Hazards. The separation of areas containing high-hazard contents from each other and from other use areas shall be as required by Table 6.2.1.3 and shall not be permitted to be reduced with the installation of fire protection systems as required by 6.3.2.1.1. [**5000:**34.3.2.3]

6.3.2.1.2.3 Egress. Egress from areas required to comply with Protection Level 1, Protection Level 2, Protection Level 3, or Protection Level 4 shall comply with 6.2.1.4 and Chapter 14 of NFPA 1.

6.3.2.1.3 Ventilation.

Δ **6.3.2.1.3.1 General.** Indoor dispensing and use areas shall be provided with exhaust ventilation in accordance with 6.2.1.5.

6.3.2.1.3.2 Exceptions to Ventilation Requirement. Exhaust ventilation required by 6.3.2.1.3.1 shall not be required for dispensing and use of flammable solids other than those with finely divided particles.

6.3.2.1.3.3 Standby and Emergency Power. Standby or emergency power shall be provided in accordance with 6.2.1.8.

6.3.2.1.4 Explosion Control.

6.3.2.1.4.1 General. Explosion control shall be provided in accordance with 6.2.1.6 where an explosive environment can occur because of the characteristics or nature of the hazardous materials dispensed or used, or as a result of the dispensing or use process, unless process vessels comply with 6.3.2.1.4.2.

6.3.2.1.4.2 Process Vessels. Additional explosion control shall not be required for materials and processes that are located in process vessels designed to fully contain or vent the worst-case explosion anticipated within the vessel under process conditions considering the most likely failure. When deflagration venting from process vessels is provided, the discharge from venting systems shall be in accordance with NFPA 68 and arranged so that overpressures produced will not endanger personnel or damage the building, structure, or surrounding buildings or structures in which the process is located.

6.3.2.2 Indoor — Open Systems.

6.3.2.2.1 General. Dispensing and use of hazardous materials in open containers or systems in amounts exceeding the MAQ specified in Section 5.2 shall be in accordance with 6.3.2.2.2 through 6.3.2.2.4.2.

6.3.2.2.2 Ventilation. In addition to the requirements of 6.3.2.1.3, where liquids or solids having a health, instability, or flammability hazard ranking of Class 3 or Class 4 in accordance with NFPA 704 are dispensed or used, mechanical exhaust ventilation shall be provided to capture fumes, mists, or vapors at the point of generation, unless such liquids or solids can be demonstrated as not creating harmful fumes, mists, or vapors.

6.3.2.2.3 Floor Construction. Except for surfacing, floors of areas where liquid or solid hazardous materials are dispensed or used in open systems shall be of noncombustible, liquidtight construction.

6.3.2.2.4 Spill Control and Secondary Containment for Hazardous Materials Liquids.

6.3.2.2.4.1 Spill Control. Buildings, or portions thereof, used for any of the following shall be provided with spill control in accordance with 6.3.1.4.1 to prevent the flow of liquids to adjoining areas:

(1) Dispensing of hazardous materials liquids into vessels exceeding a 1.1 gal (4 L) capacity
(2) Open use of hazardous materials liquids in vessels or systems exceeding a 5.3 gal (20 L) capacity

6.3.2.2.4.2 Secondary Containment.

(A) Where required by Table 6.3.2.2.4.2(A), buildings, or portions thereof, used for either of the following shall be provided with secondary containment in accordance with 6.3.1.4.2.1 through 6.3.1.4.2.10:

(1) Open use of liquids where the capacity of an individual vessel or system exceeds 1.1 gal (4 L)
(2) Open use of liquids where the capacity of multiple vessels or systems exceeds 5.3 gal (20 L)

(B) Buildings, or portions thereof, containing only hazardous materials in listed secondary containment tanks or systems shall not be required to comply with 6.3.2.2.4.2(A).

6.3.2.3 Indoor — Closed Systems.

6.3.2.3.1 General. Dispensing and use of hazardous materials in closed containers or systems in amounts exceeding the MAQ specified in Chapter 5 shall be in accordance with 6.3.2.3.1 through 6.3.2.3.3.2.

6.3.2.3.2 Ventilation. If closed systems are designed to be opened as part of normal operations, ventilation shall be provided in accordance with 6.3.2.1.3.1.

6.3.2.3.3 Spill Control and Secondary Containment for Hazardous Materials Liquids.

6.3.2.3.3.1 Spill Control. Buildings, or portions thereof, where hazardous materials liquids are used in individual closed vessels exceeding a 55 gal (208.2 L) capacity shall be provided with spill control in accordance with 6.3.1.4.1 through 6.3.1.4.1.3 to prevent the flow of liquids to adjoining areas.

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Table 6.3.2.2.4.2(A) Required Secondary Containment — Hazardous Materials Liquids Use

Material	Class	Indoor Use	Outdoor Use
Physical Hazard Materials			
Organic peroxide liquids	I	R	R
	IIA	R	R
	IIB	R	R
	III	R	R
	IV	R	R
Oxidizer liquids	4	R	R
	3	R	R
	2	R	R
Pyrophoric liquids		R	R
Unstable (reactive) liquids	4	R	R
	3	R	R
	2	R	R
	1	NR	R
Water-reactive liquids	3	R	R
	2	R	R
	1	NR	R
Health Hazard Materials			
Corrosive liquids		R	R
Highly toxic liquids		R	R
Toxic liquids		R	R

R: required. NR: Not required.

6.3.2.3.3.2 Secondary Containment. Where required by Table 6.3.2.2.4.2(A), buildings, or portions thereof, used for either of the following shall be provided with secondary containment in accordance with 6.3.1.4.2.1 through 6.3.1.4.2.10:

(1) Closed-use capacity of an individual vessel or system exceeds 55 gal (208 L)
(2) Closed-use aggregate capacity of multiple vessels or systems exceeds 1000 gal (3785 L)

6.3.3 Outdoor Dispensing and Use.

6.3.3.1 General.

6.3.3.1.1 Location. Outdoor dispensing and use areas shall be located as required for outdoor storage of hazardous materials in quantities exceeding the MAQ.

6.3.3.1.2 Clearance from Combustibles. Clearance from combustibles shall be in accordance with 6.1.15(2).

6.3.3.1.3 Weather Protection. Weather protection, when provided, shall comply with 6.2.7.2.

6.3.3.2 Outdoor — Open Systems.

6.3.3.2.1 General. In addition to the requirements set forth in 6.3.3.1 through 6.3.3.1.3, dispensing and use of hazardous materials in open containers or systems in amounts exceeding the MAQ specified in Chapter 5 shall be in accordance with 6.3.3.2.1 through 6.3.3.2.2.2.

6.3.3.2.2 Spill Control and Secondary Containment for Hazardous Materials Liquids.

6.3.3.2.2.1 Spill Control. Outdoor areas used for either of the following shall be provided with spill control in accordance with 6.3.1.4.1 through 6.3.1.4.1.3 to prevent the flow of liquids to adjoining areas:

(1) Dispensing of hazardous materials liquids into vessels exceeding a 1.1 gal (4 L) capacity
(2) Open use of hazardous materials liquids in vessels or systems exceeding a 5.3 gal (20 L) capacity

6.3.3.2.2.2 Secondary Containment.

(A) Where Required. Where required by Table 6.3.2.2.4.2(A), outdoor areas used for either of the following shall be provided with secondary containment in accordance with 6.3.1.4.2.1 through 6.3.1.4.2.10:

(1) Open use of liquids where the capacity of an individual vessel or system exceeds 1.1 gal (4 L)
(2) Open use of liquids where the capacity of multiple vessels or systems exceeds 5.3 gal (20 L)

(B) Incompatible Materials. Incompatible materials used in open systems shall be separated from each other in the secondary containment system.

6.3.3.3 Outdoor — Closed Systems.

6.3.3.3.1 General. In addition to the requirements set forth in 6.3.3.1 through 6.3.3.1.3, dispensing and use of hazardous materials in closed containers or systems in amounts exceeding the MAQ specified in Chapter 5 shall be in accordance with 6.3.3.3.1 through 6.3.3.3.2.2.

6.3.3.3.2 Spill Control and Secondary Containment for Hazardous Materials Liquids.

6.3.3.3.2.1 Spill Control. Outdoor areas where hazardous materials liquids are used in individual closed vessels exceeding a 55 gal (208 L) capacity shall be provided with spill control in accordance with 6.3.1.4.1 through 6.3.1.4.1.3 to prevent the flow of liquids to adjoining areas.

6.3.3.3.2.2 Secondary Containment. Where required by Table 6.3.2.2.4.2(A), outdoor areas used for either of the following shall be provided with secondary containment in accordance with 6.3.1.4.2.1 through 6.3.1.4.2.10:

(1) Closed-use capacity of an individual vessel or system exceeds 55 gal (208 L)
(2) Closed-use aggregate capacity of multiple vessels or systems exceeds 1000 gal (3785 L)

6.3.4 Handling.

6.3.4.1 General. The handling and transportation of hazardous materials in exit access corridors or exit enclosures shall be in accordance with 6.3.4.2 through 6.3.4.4.2.

6.3.4.2 Carts and Trucks Required. Liquids in containers exceeding 5 gal (19 L) in an exit access corridor or exit enclosure shall be transported on a cart or truck.

6.3.4.2.1 Containers of hazardous materials having a hazard ranking of 3 or 4 in accordance with NFPA 704 and transported within corridors or exit enclosures shall be on a cart or truck.

6.3.4.2.2 Where carts and trucks are required for transporting hazardous materials, they shall be in accordance with 6.3.4.3, except for the following:

(1) Two hazardous material liquid containers that are hand carried in safety carriers

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