

NFPA 430

Code for the Storage of Liquid and Solid Oxidizers

2004 Edition



NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
An International Codes and Standards Organization

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NFPA 430
Code for the
Storage of Liquid and Solid Oxidizers
2004 Edition

This edition of NFPA 430, *Code for the Storage of Liquid and Solid Oxidizers*, was prepared by the Technical Committee on Hazardous Chemicals and acted on by NFPA at its May Association Technical Meeting held May 23–26, 2004, in Salt Lake City, UT. It was issued by the Standards Council on July 16, 2004, with an effective date of August 5, 2004, and supersedes all previous editions.

This edition of NFPA 430 was approved as an American National Standard on August 5, 2004.

Origin and Development of NFPA 430

At the 1969 NFPA Annual Meeting, the Sectional Committee on Storage, Handling and Transportation of Hazardous Chemicals obtained tentative adoption of a Code for the Storage and Transportation of Oxidizing Materials and Organic Peroxides, No. 499-T. Subsequently, the Sectional Committee decided to replace No. 499-T with two codes, one for the storage of liquid and solid oxidizers and the other for organic peroxides.

The text printed here contains those requirements that the Sectional Committee believes to be essential for the safe storage of liquid and solid oxidizers. It was processed in accordance with the NFPA Regulations Governing Committee Projects. A draft was adopted as a Tentative Code in 1971. In 1972, an amended version of the 1971 edition was adopted as a Tentative Code. The 1972 edition, with further revisions, was officially adopted by the Association in 1973. Amendments were adopted in 1974, 1975, and 1980.

For the 1990 edition of NFPA 43A, the Committee initiated a complete revision of the document that incorporated revised limits for the quantities of oxidizers stored in buildings, whether they are sprinklered or nonsprinklered. The limits were revised in consideration of the burning characteristics and loss experience this class of chemicals had demonstrated over the previous few years. In that edition, the Committee provided enhanced requirements for the storage of oxidizers in retail establishments. The Committee also included an enhanced list of typical oxidizers covered by this code in the appendix as a guide to users of the document.

The 1995 edition of NFPA 430 was a renumbering and revision of the former code NFPA 43A. It represented a complete revision of the document to update the requirements for the safe handling, fire prevention, and storage provisions for liquid and solid oxidizers. The edition incorporated new material into the document to reflect changes in protection technology, particularly in the requirements for sprinkler protection of oxidizers stored in rack storage configurations. The Committee completely revised the document to make it compatible with industry practices and to incorporate enhanced provisions for the safe handling and storage of liquid and solid oxidizers.

The 2000 edition of NFPA 430 contained new requirements for the storage and display of oxidizing materials in retail occupancies. These requirements, located in Chapter 7 of the document, addressed quantities of materials stored, location and arrangement of materials, and fire protection.

The 2004 edition of NFPA 430 contains new requirements for mercantile and industrial storage of oxidizers and new requirements for sprinkler control of storage in buildings that are required to have sprinkler protection. The 2004 edition also includes new annex material that provides more information on the behavior of oxidizers and emergency response and incident procedures.

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

Committee Scope: This Committee shall have primary responsibility for documents on, and maintain current codes for, classes of hazardous chemicals and codes for specific chemicals where these are warranted by virtue of widespread distribution or special hazards.

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NFPA 430

Code for the

Storage of Liquid and Solid Oxidizers

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

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

Chapter 1 Administration

1.1 Scope.

1.1.1 This code shall apply to the storage and handling of oxidizers that are liquid or solid at ambient conditions.

1.1.1.1 This code shall not apply to the storage of solid and liquid oxidizers for normal use on the premises of one- and two-family dwellings.

1.1.1.2 Separate chapters shall specify requirements for storage of oxidizers by class where the quantities stored are greater than the stated minimums.

1.1.1.3* For quantities of a class of oxidizer that are less than the minimum covered by the separate chapter for that class, those parts of that chapter pertaining to fire prevention and compatibility as well as all of Chapter 4 of this code shall be used as requirements.

1.1.2 This code shall not apply to explosives or blasting agents, which are covered by NFPA 495, *Explosive Materials Code*; to ammonium nitrate, which is covered in NFPA 490, *Code for the Storage of Ammonium Nitrate*, or to organic peroxides, which are covered in NFPA 432, *Code for the Storage of Organic Peroxide Formulations*.

1.1.3 The quantity and arrangement limits in this code shall not apply to the storage of oxidizers in process areas at plants where oxidizers are manufactured.

1.1.3.1 This code shall not apply to the storage of solid and liquid oxidizers in existing buildings used for the storage of oxidizers at manufacturing plants.

1.1.4 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.

1.2* Purpose. The purpose of this code shall be to provide requirements for the safe storage of commercially available strengths of liquid and solid oxidizers.

1.3 Application. The requirements of NFPA 1, *Uniform Fire Code*, NFPA 13, *Standard for the Installation of Sprinkler Systems*, NFPA 30, *Flammable and Combustible Liquids Code*, and NFPA 5000, *Building*

Construction and Safety Code, shall apply where applicable and where they are more restrictive than this code.

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 determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this code deemed appropriate.

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

1.5 Equivalency.

1.5.1 Nothing in this code is intended to prevent the use of systems, methods, or devices equivalent to those prescribed by this code, provided that technical documentation is submitted to the authority having jurisdiction that demonstrates equivalency, and provided that the system, method, or device is approved for the intended purpose.

1.5.2 The arrangement and quantity of oxidizers in storage shall be permitted to deviate from the requirements of succeeding chapters where specially engineered fire prevention or fire protection systems that are equivalent to or exceed the requirements of this code are used and are acceptable to the authority having jurisdiction.

1.6 Enforcement. This code shall be administered and enforced by the authority having jurisdiction designated by the governing authority. (See Annex E for sample wording for enabling legislation.)

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, *Uniform Fire Code*™, 2003 edition.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2002 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2002 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems*, 2003 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 2002 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 2002 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 2003 edition.

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, 2003 edition.

NFPA 70, *National Electrical Code*®, 2005 edition.

NFPA 91, *Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids*, 2004 edition.

NFPA 432, *Code for the Storage of Organic Peroxide Formulations*, 2002 edition.

NFPA 472, *Standard for Professional Competence of Responders to Hazardous Materials Incidents*, 2002 edition.

NFPA 490, *Code for the Storage of Ammonium Nitrate*, 2002 edition.

NFPA 495, *Explosive Materials Code*, 2001 edition.

NFPA 5000®, *Building Construction and Safety Code*®, 2003 edition.

2.3 Other Publications.

2.3.1 Canadian Government Publication. Transport Canada, 330 Sparks Street, Ottawa, K1A 0N5, Canada.

Canadian Ministry of Transport Regulations.

2.3.2 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402.

Title 29, Code of Federal Regulations, Part 1910.120, "Hazardous Waste Operations and Emergency Response," Occupational Safety and Health Administration.

Title 29, Code of Federal Regulations, Part 1910.1200, "Hazardous Communication," Occupational Safety and Health Organization.

Title 49, Code of Federal Regulations, Parts 100 to end.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this code. Where terms are not included, common usage of the terms shall apply.

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 Combustible. A substance that will burn.

3.3.2 Containers.

3.3.2.1 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 in combustible overpacks.

3.3.2.2 Noncombustible Containers. Containers constructed of glass or metal that can be coated with a polymeric material no more than 2 mils (50.8 µm) in thickness.

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

3.3.4 Handling. The deliberate movement of material by any means to a point of storage or use.

3.3.5 Material.

3.3.5.1 Compatible Material. A material that, when in contact with an oxidizer, will not react with the oxidizer or promote or initiate its decomposition.

3.3.5.2 Incompatible Material. A material that, when in contact with an oxidizer, can cause hazardous reactions or can promote or initiate decomposition of the oxidizer.

3.3.5.3* Noncombustible Material. A material that, 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.

3.3.6 Mercantile Occupancy. An occupancy used for the display and sale of merchandise.

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

3.3.7.1 Class 1. An oxidizer that does not moderately increase the burning rate of combustible materials with which it comes into contact.

3.3.7.2 Class 2. An oxidizer that causes a moderate increase in the burning rate of combustible materials with which it comes into contact.

3.3.7.3 Class 3. An oxidizer that causes a severe increase in the burning rate of combustible materials with which it comes into contact.

3.3.7.4 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.

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

3.3.9 Plants.

3.3.9.1 Manufacturing Plants. Those facilities where oxidizers are produced by chemical means or where oxidizers are pelletized, ground, dissolved, packaged, mixed, or blended.

3.3.10 Storage.

3.3.10.1 Bulk Liquid Storage. The storage of more than 2271 L (600 gal) in a single container.

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

3.3.10.3 Cutoff Storage. Storage in the same building or inside area but physically separated from incompatible materials by partitions or walls, or storage in a fixed tank.

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

3.3.10.5* Segregated Storage. Storage in the same room or inside area but physically separated by distance from incompatible materials.

3.3.11 Storage Height. The height from the finished floor to the top of the highest container.

Chapter 4 Basic Requirements

4.1 Hazard Management.

4.1.1 The design of a new or modified facility or a facility that has had a change of use or occupancy to handle or store oxidizers shall be submitted to the authority having jurisdiction. *(For existing structures, see Section 1.4.)*

4.1.1.1 All new or existing facilities handling or storing oxidizers greater than 1814 kg (4000 lb) for Class 1 oxidizers, 454 kg (1000 lb) for Class 2 oxidizers, 91 kg (200 lb) for Class 3 oxidizers, and 4.5 kg (10 lb) for Class 4 oxidizers shall provide written notification to the authority having jurisdiction.

4.1.2 No new or existing facility shall store materials in any occupancy covered by this code over 16,329 kg (36,000 lb) for Class 1 oxidizers, 2041 kg (4500 lb) for Class 2 oxidizers, 1043 kg (2300 lb) for Class 3 oxidizers, and 4.5 kg (10 lb) for Class 4 oxidizers until a Hazardous Materials Management Plan (HMMP) has been completed and submitted to the authority having jurisdiction.

4.1.2.1 The HMMP shall be reviewed and updated annually and when the facility is modified.

4.1.2.2 The HMMP shall comply with the requirements NFPA 1, *Uniform Fire Code*.

4.1.2.3 Training exercises according to the HMMP shall be conducted at least every 3 years in cooperation with local emergency organizations.

4.1.2.4 The authority having jurisdiction shall be notified immediately of any of the following:

- (1) Release of oxidizers in excess of 45.4 kg (100 lb)
- (2) Release of oxidizers that might pose a threat to people, property, or the environment
- (3) Signs of reacting oxidizer, contaminated oxidizer, or package deterioration of more than 45.4 kg (100 lb) of oxidizer.

4.1.2.4.1 Manufacturing plants shall not be required to notify the authority having jurisdiction of an accidental release unless it poses a threat to people, property, or the environment or when required by local, state, or federal law.

4.1.2.5 The facility responsible for an accidental release shall activate the HMMP immediately.

4.1.3 No facility shall close or abandon any oxidizer storage facility without notifying the authority having jurisdiction at least 30 days prior to the scheduled closing.

4.2 Identification of Materials in Storage.

4.2.1* All storage areas containing oxidizers shall be conspicuously identified as to the hazard class by the words "Class [*appropriate classification number*] Oxidizers," as defined in 3.3.7.

4.2.2 Oxidizers in mercantile display areas shall not be required to be identified in accordance with 4.2.1.

4.2.3 Where oxidizers having different classifications are stored in the same area, the area shall be marked for the most severe hazard class present.

4.2.4 All packages shall be approved and individually marked with the chemical name of the oxidizer.

4.3 Storage Containers, Tanks, and Bins.

4.3.1 Shipping Containers. Where a storage container for solid and liquid oxidizers also functions as the shipping container, the container shall meet the requirements of the U.S. Department of Transportation, 49 CFR 100 to end, or the *Canadian Ministry of Transport Regulations* (Transport Canada).

4.3.2 Tanks and Bins. Tanks for the storage of bulk liquid oxidizers and bins for the storage of bulk solid oxidizers shall meet the following requirements:

- (1) Materials of construction shall be compatible with the oxidizer being stored.
- (2) Tanks and bins shall be designed and constructed in accordance with federal, state, and local regulations or, as a minimum, in accordance with nationally recognized engineering practices [e.g., American Society of Mechanical Engineers (ASME), American Petroleum Institute (API)].
- (3) Tanks and bins shall be equipped with a vent or other relief device to prevent overpressurization due to decomposition or fire exposure.

4.3.3 Outside Storage.

4.3.3.1 The size of outside storage tanks for Class 1, Class 2, and Class 3 oxidizers shall not be limited by this code.

4.3.3.2 The size of outside storage tanks for Class 4 oxidizers shall be limited in accordance with this code.

4.4 Storage Arrangements.

4.4.1 At least one side of each pile of oxidizer shall be on an aisle.

4.4.2* The arrangement and quantity of oxidizers in storage shall depend upon their classification, type of container, type of storage (segregated, cutoff, or detached), and fire protection as specified in this code and in the manufacturer's or processor's instructions.

4.4.2.1 Mercantile occupancies shall comply with Chapter 9.

4.4.2.2 Storage occupancies shall store and protect oxidizers in accordance with Chapter 5 through Chapter 8.

4.4.3* Oxidizers shall be stored to avoid contact with incompatible materials such as ordinary combustibles, combustible or flammable liquids, greases, other oxidizers, and those materials that have the potential to react with the oxidizer or promote or initiate its decomposition.

4.4.3.1 These incompatible materials shall not include approved packaging materials, pallets, or other dunnage.

4.4.3.2 Hydrogen peroxide (Classes 2 through 4) stored in drums shall not be stored on wooden pallets.

4.4.3.3 Where oxidizers are in segregated storage with flammable and combustible liquids, the oxidizer containers and flammable and combustible liquid containers shall be separated by at least 7.6 m (25 ft).

4.4.3.4 The separation shall be maintained by dikes, drains, or floor slopes to prevent flammable liquid leakage from encroaching on the separation.

4.4.3.5 Solid oxidizers shall not be stored directly beneath liquids.

4.4.4 Where Class 2, Class 3, or Class 4 liquid oxidizers are stored, means shall be provided to prevent the liquid oxidizer from flowing out of a cutoff area into an area containing incompatible materials.

4.4.5* Oxidizers shall be stored to prevent contact with water, which can affect either container integrity or product stability.

4.4.6 Oxidizers shall be stored so that the storage temperature cannot be within 14°C (25°F) of their decomposition temperature or to 52°C (125°F), whichever is lower and in accordance with the manufacturer's recommendations.

4.5 Mixed Storage. Each class shall be considered independent of the others, and a facility shall be permitted to carry up to the maximum quantity for each class of material.

4.6 Other Considerations.

4.6.1 Where required by *NFPA 5000, Building Construction and Safety Code*, spill control and secondary containment shall be provided in accordance with the requirements of *NFPA 5000*.

4.6.2 Storage arrangement shall take into consideration the potential evolution of large quantities of smoke and toxic fumes, especially as storage affects manual fire-fighting operations, building egress, and evacuation of adjacent occupancies or communities.

4.7 Training.

4.7.1 General.

4.7.1.1 Facilities storing oxidizers shall have a training program.

4.7.1.2 The training shall be based on current material safety data sheets (MSDS) and other information supplied by manufacturers.

4.7.2 Personnel Training Requirements.

4.7.2.1 Persons responsible for the operation and maintenance of areas in which oxidizers are stored shall be trained in the chemical and physical hazards of the stored materials and compatibility of stored materials.

4.7.2.2 The training shall include coverage of other topical areas as required by 29 CFR 1910.1200, "Hazard Communication," or other applicable hazard communication regulations.

4.7.3 Persons responsible for the operation and maintenance, sequence of mitigation, and protection against oxidizer incidents and/or releases in areas in which oxidizers are stored in excess of 16,329 kg (36,000 lb) for Class 1 oxidizers, 2041 kg (4500 lb) for Class 2 oxidizers, 1043 kg (2300 lb) for Class 3 oxidizers, and 4.5 kg (10 lb) for Class 4 oxidizers shall be trained to meet all requirements of 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response," and the technician level as described in NFPA 472, *Standard for Professional Competence of Responders to Hazardous Materials Incidents*.

4.8 Heating and Electrical Installations.

4.8.1 Heating shall be arranged so that stored materials cannot be placed in direct contact with heating units, piping, or ducts.

4.8.2 Oxidizers shall be separated from sources of heat such as heating units, piping, or ducts so that they cannot be heated to within 14°C (25°F) of their decomposition temperature or to 52°C (125°F), whichever is lower and in accordance with the manufacturer's recommendations.

4.8.3 Electrical installations shall be in conformance with NFPA 70, *National Electrical Code*.

4.9 Smoking.

4.9.1 Smoking shall be prohibited in all storage areas containing oxidizers.

4.9.2 "No Smoking" signs shall be placed conspicuously within storage areas and at all entrances to storage areas.

4.10 Maintenance and Repairs.

4.10.1 The performance of maintenance work in an oxidizer storage area shall be subject to prior review and approval by supervisory personnel.

4.10.2 Cutting and welding procedures shall be in conformance with NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*.

4.11 Fire Protection.

4.11.1* Fire Hydrants.

4.11.1.1 Fire hydrants and water supplies shall be provided as required by the authority having jurisdiction.

4.11.1.2 Hydrants shall be installed in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*.

4.11.2 Automatic Sprinkler Protection.

4.11.2.1 Automatic sprinklers shall be provided in accordance with the requirements of Chapters 5 through 9.

4.11.2.2 Where automatic sprinkler systems are required, the sprinkler system shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems* and the system density shall meet the required densities contained in this code for the class of oxidizer, the storage arrangements, and the stored quantities.

4.11.2.2.1 Buildings with automatic sprinkler systems that do not meet the installation requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems* or the required densities contained in this code shall be considered as nonsprinklered and shall follow the storage arrangements and quantities for a nonsprinklered building.