

NFPA 432

Code for the

Storage of

Organic

Peroxide

Formulations

2002 Edition



NFPA, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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NFPA 432
Code for the
Storage of Organic Peroxide Formulations
2002 Edition

This edition of NFPA 432, *Code for the Storage of Organic Peroxide Formulations*, was prepared by the Technical Committee on Hazardous Chemicals and acted on by NFPA at its May Association Technical Meeting held May 19–23, 2002, in Minneapolis, MN. It was issued by the Standards Council on July 19, 2002, with an effective date of August 8, 2002, and supersedes all previous editions.

This edition of NFPA 432 was approved as an American National Standard on July 19, 2002.

Origin and Development of NFPA 432

The development of NFPA 432 (formerly NFPA 43B in previous editions) began in 1969 with the tentative adoption by the Association of NFPA 499-T, *Code for the Storage and Transportation of Oxidizing Materials and Organic Peroxides*. As a result of suggestions by reviewers of this Tentative Code, the Technical Committee on Storage, Handling and Transportation of Hazardous Chemicals decided to replace NFPA 499-T with two codes, one for the storage of liquid and solid oxidizing materials and the other for organic peroxides.

The Technical Committee experienced great difficulty in developing NFPA 43B, primarily because initial attempts to classify burning behavior of the various organic peroxides considered only the peroxide itself. By 1975, it had become apparent to the Committee that any classification system would have to take into account the composition of each formulation (i.e., concentration of peroxide, active oxygen, and diluent) and the strength and size of the shipping container, if an accurate assessment of fire and explosion hazard were to be made. By analyzing the characteristics of most of the commercially available organic peroxide formulations and by conducting a limited number of full-scale fire tests, the Committee developed a valid classification scheme and storage requirements.

The first edition of NFPA 43B was adopted at the 1985 NFPA Fall Meeting.

The 1993 edition of NFPA 43B contained enhanced fire protection and storage requirements for all classes of organic peroxide formulations. The Committee on Hazardous Chemicals clarified the storage limitations for both sprinklered and nonsprinklered storage of all classes of organic peroxide formulations. The Committee also clarified the separation distance from the storage of incompatible materials. In addition, Appendix B contained expanded and updated tables of typical organic peroxide formulations that included more listed formulations and information on temperature control recommendations as well as hazard identification ratings.

For the 1997 edition, NFPA 43B was redesignated as NFPA 432. Provisions were added to address the classification of electrical equipment on the interior of any nonventilated, nonrefrigerated storage cabinet used for the storage of Class I, II, or III organic peroxide formulations. In addition, a table alphabetizing all the organic peroxide formulations was added to Appendix B.

Revisions to the tables of Typical Class Formulations included the following:

- (1) Class I Formulations — The Health Hazard Identification Rating was revised for five organic peroxide formulations.
- (2) Class II Formulations — The Health Hazard Identification Rating was revised for eight organic peroxide formulations.
- (3) Class III Formulations — The Health Hazard Identification Rating was revised for 17 organic peroxide formulations, and the Flammability Hazard Identification Rating for cumyl hydroperoxide was also revised.
- (4) Class IV Formulations — The Health Hazard Identification Rating was revised for nine organic peroxide formulations.
- (5) Class V Formulations — The Health Hazard Identification Rating was revised for five organic peroxide formulations.
- (6) The classification for 2,4-Pentanedione peroxide was revised.

Other changes were editorial in nature to bring the document into conformance with the *NFPA Manual of Style*.

For the 2002 edition, there were changes made to conform to NFPA's *Manual of Style*. These changes included reordering chapters and restructuring the definition section. The tables found in Annex B listing different classes of organic peroxides have been clarified to increase ease of use. Names of several compounds were corrected and clarifying footnotes were added.

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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.

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

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

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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.

Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet between the paragraphs that remain.

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

Chapter 1 Administration**1.1 Scope.**

1.1.1 This code shall apply only to commercially available organic peroxide formulations in U.S. Department of Transportation- or Canadian Ministry of Transport-approved packages.

1.1.2 This code shall not apply to the storage of such formulations in process areas where they are manufactured or used.

1.1.3 This code does not apply to organic peroxide formulations that are capable of detonation in their normal shipping containers under conditions of fire exposure. Such formulations shall be handled and stored as Explosives 1.1 (formerly known as Class A explosives) in accordance with NFPA 495, *Explosive Materials Code*.

1.2 Purpose. The purpose of this code is to provide reasonable requirements for the safe storage of commercially available formulations containing organic peroxides.

1.3 Application. The requirements of NFPA 30, *Flammable and Combustible Liquids Code*, and NFPA 230, *Standard for the Fire Protection of Storage*, shall apply where applicable and where they are more restrictive than this code.

1.4 Equivalency. Nothing in this standard is intended to prevent the use of systems, methods, or devices that provide equivalent protection from fire and explosion, provided that suitable data is available to demonstrate equivalency.

1.5 Enforcement. This code shall be administered and enforced by the authority having jurisdiction designated by the governing authority. (See Annex C 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, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 10, *Standard for Portable Fire Extinguishers*, 1998 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 1999 edition.

NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems*, 2000 edition.

NFPA 15, *Standard for Water Spray Fixed Systems for Fire Protection*, 2001 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 1995 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 2000 edition.

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, 1999 edition.

NFPA 70, *National Electrical Code*®, 2002 edition.

NFPA 80, *Standard for Fire Doors and Fire Windows*, 1999 edition.

NFPA 230, *Standard for the Fire Protection of Storage*, 1999 edition.

NFPA 251, *Standard Methods of Fire Endurance of Building Construction and Materials*, 1999 edition.

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

2.3 Other Publications. (Reserved)**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). The organization, office, or individual responsible 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 Deflagration. Propagation of a reaction zone at a velocity that is less than the speed of sound in the unreacted medium.

3.3.2 Detonation. Propagation of a reaction zone at a velocity that is at or above the speed of sound in the unreacted medium.

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

3.3.4* Incompatible Materials. Materials that can initiate, catalyze, or accelerate the decomposition of organic peroxide formulations or that can cause hazardous reactions when in contact with such formulations.

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

3.3.6* Organic Peroxide Formulation. A pure organic peroxide or a mixture of one or more organic peroxides with one or more other materials in various combinations and concentrations.

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

Chapter 4 Basic Requirements

4.1 Identification. All storage areas containing organic peroxide formulations shall be conspicuously identified by the words "Organic Peroxides" and by the class, as defined in Section 4.12.

4.1.1* When organic peroxide formulations having different classifications as defined by Section 4.12 are stored in the same area, the area shall be marked for the most severe class present.

4.1.2 Packages containing organic peroxide formulations shall be individually marked with the chemical name of the organic peroxide or with other pertinent information to allow proper area classification as required by this section.

4.1.3 Packages containing organic peroxide formulations that require temperature control shall be marked with the recommended storage temperature range.

4.2 Employee Instruction. Personnel involved in operations in organic peroxide storage areas shall be instructed in proper and safe handling of such materials, proper use of personal protective equipment, fire suppression equipment, proper and safe disposal of spilled material, and proper emergency procedures. Records shall be maintained of such training. Manufacturers' instructions shall be consulted for each specific formulation.

4.3 Building Construction. Any construction materials that can be contacted by organic peroxide formulations shall be compatible with the materials stored.

4.4 Heating and Cooling.

4.4.1 Storage areas shall be maintained within the recommended storage temperature range for the materials stored. (See Annex B for compounds needing refrigeration systems.)

4.4.2* Where the required storage temperature range extends beyond normal ambient temperatures, high or low temperature limit switches, as applicable, shall be provided in addition to the normal temperature controls. These limit switches shall actuate an alarm arranged to ensure prompt response.

4.4.3 Heating systems shall use hot water, low pressure [less than 15 psig (103 kPa gauge)] steam, or indirectly heated warm air. Cooling systems shall not utilize direct expansion of a flammable gas.

4.4.4 Heating coils, radiators, air diffusers, cooling coils, piping, and ducts shall be installed so as to prevent direct contact with containers and to prevent overheating or overcooling of the materials stored.

4.5 Electrical Installations.

4.5.1 Electrical installations shall meet all applicable requirements of NFPA 70, *National Electrical Code*®.

4.5.2 The interior of any refrigerator or freezer cabinet used for the storage of Class I, II, or III organic peroxide formulations shall be considered a Class I, Group D, Division 1 location as defined in Article 500 of NFPA 70, *National Electrical Code*. Any electrical equipment installed in the interior of such cabinets shall be approved for such use and shall be installed according to the requirements of Article 501 of NFPA 70, *National Electrical Code*.

4.5.3 The interior of any nonventilated, nonrefrigerated storage cabinet used for the storage of Class I, II, or III organic peroxide formulations shall be considered a Class I, Division 1 location as defined in Article 500 of NFPA 70, *National Electrical Code*.

4.5.4 Where the storage cabinet is ventilated, the electrical equipment shall be considered a Class I, Division 2 location as defined in Article 500 of NFPA 70, *National Electrical Code*. Mechanical ventilation systems shall provide at least 1 ft³ per min per ft² of floor area (0.09 m² per min per 0.03 m³).

4.6 Smoking. Smoking shall be prohibited in all organic peroxide storage areas. "No Smoking" signs shall be placed conspicuously at all entrances to and within storage areas.

4.7 Maintenance Operations.

4.7.1 Maintenance operations in organic peroxide storage areas shall be subject to prior review by and approval of supervisory personnel.

4.7.2 Cutting and welding operations in organic peroxide storage areas shall not be conducted until all organic peroxide formulations have been removed. Cutting and welding operations shall be conducted according to the requirements of NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*.

4.8 Fire Protection.

4.8.1* Manual fire-fighting equipment shall be provided according to manufacturers' recommendations and maintained according to the requirements of NFPA 10, *Standard for Portable Fire Extinguishers*, and NFPA 14, *Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems*.

4.8.2* Where required by other provisions of this code, automatic sprinklers and water spray systems shall be designed and installed according to the requirements of NFPA 13, *Standard for the Installation of Sprinkler Systems*, and NFPA 15, *Standard for*