

NFPA®

40

Standard for the
Storage and Handling
of Cellulose Nitrate Film

2022



NFPA® 40

Standard for the Storage and Handling of Cellulose Nitrate Film

2022 Edition



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



Documents
Document Sharing Hub

IMPORTANT NOTICES AND DISCLAIMERS CONCERNING NFPA® STANDARDS

NFPA® codes, standards, recommended practices, and guides (“NFPA Standards”), of which the document contained herein is one, are developed through a consensus standards development process approved by the American National Standards Institute. This process brings together volunteers representing varied viewpoints and interests to achieve consensus on fire and other safety issues. While the NFPA administers the process and establishes rules to promote fairness in the development of consensus, it does not independently test, evaluate, or verify the accuracy of any information or the soundness of any judgments contained in NFPA Standards.

The NFPA disclaims liability for any personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance on NFPA Standards. The NFPA also makes no guaranty or warranty as to the accuracy or completeness of any information published herein.

In issuing and making NFPA Standards available, the NFPA is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is the NFPA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

The NFPA has no power, nor does it undertake, to police or enforce compliance with the contents of NFPA Standards. Nor does the NFPA list, certify, test, or inspect products, designs, or installations for compliance with this document. Any certification or other statement of compliance with the requirements of this document shall not be attributable to the NFPA and is solely the responsibility of the certifier or maker of the statement.

REVISION SYMBOLS IDENTIFYING CHANGES FROM THE PREVIOUS EDITION

Text revisions are shaded. A **Δ** before a section number indicates that words within that section were deleted and a **Δ** to the left of a table or figure number indicates a revision to an existing table or figure. When a chapter was heavily revised, the entire chapter is marked throughout with the **Δ** symbol. Where one or more sections were deleted, a **•** is placed between the remaining sections. Chapters, annexes, sections, figures, and tables that are new are indicated with an **N**.

Note that these indicators are a guide. Rearrangement of sections may not be captured in the markup, but users can view complete revision details in the First and Second Draft Reports located in the archived revision information section of each code at www.nfpa.org/docinfo. Any subsequent changes from the NFPA Technical Meeting, Tentative Interim Amendments, and Errata are also located there.

REMINDER: UPDATING OF NFPA STANDARDS

Users of NFPA codes, standards, recommended practices, and guides (“NFPA Standards”) should be aware that these documents may be superseded at any time by the issuance of a new edition, may be amended with the issuance of Tentative Interim Amendments (TIAs), or be corrected by Errata. It is intended that through regular revisions and amendments, participants in the NFPA standards development process consider the then-current and available information on incidents, materials, technologies, innovations, and methods as these develop over time and that NFPA Standards reflect this consideration. Therefore, any previous edition of this document no longer represents the current NFPA Standard on the subject matter addressed. NFPA encourages the use of the most current edition of any NFPA Standard [as it may be amended by TIA(s) or Errata] to take advantage of current experience and understanding. An official NFPA Standard at any point in time consists of the current edition of the document, including any issued TIAs and Errata then in effect.

To determine whether an NFPA Standard has been amended through the issuance of TIAs or corrected by Errata, visit the “Codes & Standards” section at www.nfpa.org.

ADDITIONAL IMPORTANT NOTICES AND DISCLAIMERS CONCERNING NFPA® STANDARDS

Updating of NFPA Standards

Users of NFPA codes, standards, recommended practices, and guides (“NFPA Standards”) should be aware that these documents may be superseded at any time by the issuance of a new edition, may be amended with the issuance of Tentative Interim Amendments (TIAs), or be corrected by Errata. It is intended that through regular revisions and amendments, participants in the NFPA standards development process consider the then-current and available information on incidents, materials, technologies, innovations, and methods as these develop over time and that NFPA Standards reflect this consideration. Therefore, any previous edition of this document no longer represents the current NFPA Standard on the subject matter addressed. NFPA encourages the use of the most current edition of any NFPA Standard [as it may be amended by TIA(s) or Errata] to take advantage of current experience and understanding. An official NFPA Standard at any point in time consists of the current edition of the document, including any issued TIAs and Errata then in effect.

To determine whether an NFPA Standard has been amended through the issuance of TIAs or corrected by Errata, visit the “Codes & Standards” section at www.nfpa.org.

Interpretations of NFPA Standards

A statement, written or oral, that is not processed in accordance with Section 6 of the Regulations Governing the Development of NFPA Standards shall not be considered the official position of NFPA or any of its Committees and shall not be considered to be, nor be relied upon as, a Formal Interpretation.

Patents

The NFPA does not take any position with respect to the validity of any patent rights referenced in, related to, or asserted in connection with an NFPA Standard. The users of NFPA Standards bear the sole responsibility for determining the validity of any such patent rights, as well as the risk of infringement of such rights, and the NFPA disclaims liability for the infringement of any patent resulting from the use of or reliance on NFPA Standards.

NFPA adheres to the policy of the American National Standards Institute (ANSI) regarding the inclusion of patents in American National Standards (“the ANSI Patent Policy”), and hereby gives the following notice pursuant to that policy:

NOTICE: The user’s attention is called to the possibility that compliance with an NFPA Standard may require use of an invention covered by patent rights. NFPA takes no position as to the validity of any such patent rights or as to whether such patent rights constitute or include essential patent claims under the ANSI Patent Policy. If, in connection with the ANSI Patent Policy, a patent holder has filed a statement of willingness to grant licenses under these rights on reasonable and nondiscriminatory terms and conditions to applicants desiring to obtain such a license, copies of such filed statements can be obtained, on request, from NFPA. For further information, contact the NFPA at the address listed below.

Law and Regulations

Users of NFPA Standards should consult applicable federal, state, and local laws and regulations. NFPA does not, by the publication of its codes, standards, recommended practices, and guides, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

NFPA Standards are copyrighted. They are made available for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of safe practices and methods. By making these documents available for use and adoption by public authorities and private users, the NFPA does not waive any rights in copyright to these documents.

Use of NFPA Standards for regulatory purposes should be accomplished through adoption by reference. The term “adoption by reference” means the citing of title, edition, and publishing information only. Any deletions, additions, and changes desired by the adopting authority should be noted separately in the adopting instrument. In order to assist NFPA in following the uses made of its documents, adopting authorities are requested to notify the NFPA (Attention: Secretary, Standards Council) in writing of such use. For technical assistance and questions concerning adoption of NFPA Standards, contact NFPA at the address below.

For Further Information

All questions or other communications relating to NFPA Standards and all requests for information on NFPA procedures governing its codes and standards development process, including information on the procedures for requesting Formal Interpretations, for proposing Tentative Interim Amendments, and for proposing revisions to NFPA standards during regular revision cycles, should be sent to NFPA headquarters, addressed to the attention of the Secretary, Standards Council, NFPA, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101; email: stds_admin@nfpa.org.

For more information about NFPA, visit the NFPA website at www.nfpa.org. All NFPA codes and standards can be viewed at no cost at www.nfpa.org/docinfo.

Copyright © 2021 National Fire Protection Association®. All Rights Reserved.

NFPA® 40

Standard for the

Storage and Handling of Cellulose Nitrate Film

2022 Edition

This edition of NFPA 40, *Standard for the Storage and Handling of Cellulose Nitrate Film*, was prepared by the Technical Committee on Hazardous Chemicals. It was issued by the Standards Council on March 18, 2021, with an effective date of April 8, 2021, and supersedes all previous editions.

This edition of NFPA 40 was approved as an American National Standard on April 8, 2021.

Origin and Development of NFPA 40

NFPA 40, *Standard for the Storage and Handling of Cellulose Nitrate Film*, was developed by the National Board of Fire Underwriters Committee of Consulting Engineers and was first adopted by NFPA in 1910, under the title *Standard for the Storage and Handling of Cellulose Nitrate Motion Picture Film*. Amendments were adopted in 1915, 1919, 1922, and 1926. A complete revision was adopted in 1931, with further amendments in 1936, 1939, 1946, and 1947. Extensive revisions were also made in 1953. The technical requirements of the early editions of NFPA 40 were based on extensive fire tests conducted by motion picture film manufacturers. With the reorganization of the committee in 1960, the Technical Committee on Explosives was given responsibility for NFPA 40. However, in 1970, responsibility was transferred to the Technical Committee on Storage, Handling, and Transportation of Hazardous Chemicals. The 1953 edition of NFPA 40 was reconfirmed in 1962. Amendments were adopted in 1967, and the 1967 edition was reconfirmed in 1974.

In 1979, the Technical Committee on Storage, Handling, and Transportation of Hazardous Chemicals debated whether to withdraw the document because cellulose nitrate motion picture film had not been manufactured for more than 20 years. However, due to the large quantities of cellulose nitrate motion picture film in various archives, the committee decided to revise NFPA 40 and to maintain it as an active NFPA standard as long as archive collections are being maintained. (The Library of Congress, the Smithsonian Institution, the U.S. military services, and others have great quantities of such film, which is slowly being reprinted onto safety film.) An updated edition was adopted in 1982 and reconfirmed in 1988.

The 1994 edition of NFPA 40 reflected a partial revision of the standard to improve its usability, adoptability, and enforceability, and to update old terminology. In addition, the Technical Committee on Hazardous Chemicals clarified the requirements relating to protection of film cabinets and vaults with automatic sprinkler protection, as well as clarifying the requirements for decomposition vents.

For the 1997 edition, the terminology and provisions relating to long-term storage of cellulose nitrate motion picture film were updated to be consistent with the terminology used in the film storage industry. This was done in response to new storage facilities for cellulose nitrate films that were being built, and clarification was needed for consistency between the standard's provisions for vault construction and various building code requirements. Those changes were reflected throughout the standard. Provisions for handling cellulose nitrate motion picture films also were updated within the safety limits previously established by the Technical Committee on Hazardous Chemicals. However, the committee reduced the number of rolls of cellulose nitrate motion picture film allowed to be present in a shipping room to reduce the potential hazard to persons working in the area. Other changes were editorial in nature to bring the document into conformance with the 1986 edition of the *Manual of Style for NFPA Technical Committee Documents*.

The 2001 edition expanded the scope of the document to include flat film, making NFPA 40 the single document that addressed cellulose nitrate film storage. Before that revision, NFPA 42, *Code for the Storage of Pyroxylin Plastic*, had covered flat film storage, but the requirements did not address it adequately. Several changes were made to the storage chapter of NFPA 40 to reflect the safety

concerns with flat film. Restructuring changes also were made to make the document conform to the 2000 edition of the *Manual of Style for NFPA Technical Committee Documents*, including eliminating several exceptions, changing the chapter order, and moving nonmandatory material to the annexes. In addition, the title of the standard was changed to *Standard for the Storage and Handling of Cellulose Nitrate Film*.

The 2007 edition was essentially a reconfirmation of the 2001 edition of the document.

The 2011 edition included amendments to the requirements for applying the standard to new and existing facilities so that the equivalency provision applied correctly. Research by FM Global that was concluded in 2000 was incorporated in revisions to film vault fire protection. The committee provided an annex item that provided information on converting sheets of flat film to roll film equivalencies because storage requirements in the standard are based on roll film quantities. The committee also revised the standard to comply with the 2004 edition of the *Manual of Style for NFPA Technical Committee Documents*.

The 2016 edition clarified how the storage requirements in NFPA 40 apply to both motion picture film and flat film. Explanatory material expanded on the flat-film to roll-film equivalencies developed in the 2011 edition to include mass, volume, and number of rolls or sheets of film. The committee also revised recommendations for the inspection, reformatting, and disposal of unstable nitrate film to accurately reflect the variable nature of nitrate decay.

In the 2019 edition, the terms *standard roll* and *single- and double-roll containers* were replaced by terminology used by modern archivists. A new definition for *decomposition* was added, along with a new requirement for inspection and maintenance of portable fire extinguishers to comply with NFPA 10. Changes were made to the extended term storage vault requirements to allow for flexible storage configurations. Requirements for openings in, and exhaust capacities of, projection booths were revised to reflect modern practices and equipment, and a new requirement for temperature and humidity control was added.

For the 2022 edition, the term *extended term storage* has been changed to *permanent storage* to reflect current terminology. The requirement for buildings to be of Type I construction has been modified to apply to permanent storage and not for areas under a certain quantity threshold of film. Other revisions include an allowance to store film in freezers or refrigerators depending on the quantity; a reference to an applicable test method to determine fire resistance ratings of partitions and fire doors; and new annex material to provide examples of DOT-authorized containers for storing film.

Technical Committee on Hazardous Chemicals

Robert J. James, Chair
UL LLC, IL [RT]
Rep. UL LLC

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

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

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

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

Mark J. Dossett, San Diego Fire-Rescue Department, CA [E]
Rep. California Fire Chiefs Association

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, Lawrence Berkeley National Laboratory, CA [U]

R. Kenneth Lee, Axial 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

Eugene Y. Ngai, Chemically Speaking LLC, NJ [SE]

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

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

Michael Reilly, Fairfax County Fire & Rescue Department, VA [L]
Rep. International Association of Fire Fighters

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

Milton R. Shefter, Miljoy Ent. Incorporated, CA [U]
(VL to Document: NFPA 40)

Jonathan Thomas Shriner, US Architect of the Capitol, DC [U]
(VL to Document: NFPA 40)

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

James C. Belke, US Environmental Protection Agency, DC [E]
(Voting Alt.)

Joseph Carl Chew, Haines Fire and Risk Consulting, Corp., NJ [SE]
(Alt. to Anthony M. Ordile)

James Carver, El Segundo Fire Department, CA [E]
(Alt. to Mark J. Dossett)

Peter Dluzeski, 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)

Richard H. Ferguson, Axial LLC, PA [M]
(Alt. to R. Kenneth Lee)

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

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

Lynne M. Kilpatrick, LMK Associates LLC, WA [SE]
(Alt. to Eugene Y. Ngai)

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

Kathleen Nehmer, Pond & Company, MA [SE]
(Voting Alt.)

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)

Clark D. Shepard, ExxonMobil Corporation, TX [M]
(Alt. to Joyce Miles)

Robert Suarez, Des Moines Fire Department, IA [L]
(Alt. to Michael Reilly)

Amy Theis, Dekra Process Safety, NJ [RT]
(Alt. to Michael Carolan)

Thomas M. Wideman, Biolab, GA [M]
(Alt. to Kirk Mitchell)

Nonvoting

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

Laura Moreno, NFPA Staff Liaison

Patrick A. McLaughlin, McLaughlin & Associates, ID [U]
Rep. TC on Industrial, Storage, & Miscellaneous Occupancies

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.

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.

Contents

Chapter 1 Administration	40- 6	5.3 Portable Fire Extinguishers.	40- 9
1.1 Scope.	40- 6	Chapter 6 Storage of Nitrate Film	40- 9
1.2 Purpose.	40- 6	6.1 General.	40- 9
1.3 Application.	40- 6	6.2 Film Cabinets.	40- 9
1.4 Retroactivity.	40- 6	6.3 Vaults Other Than Permanent Storage Vaults.	40- 10
1.5 Equivalency.	40- 6	6.4 Permanent Storage Cabinets and Freezers.	40- 11
1.6 Approval of Plans.	40- 6	6.5 Permanent Storage Vaults.	40- 12
Chapter 2 Referenced Publications	40- 6	Chapter 7 Handling of Nitrate Film	40- 13
2.1 General.	40- 6	7.1 General Conditions.	40- 13
2.2 NFPA Publications.	40- 6	7.2 Containers Required.	40- 13
2.3 Other Publications.	40- 7	7.3 Shielding.	40- 13
2.4 References for Extracts in Mandatory Sections. (Reserved)	40- 7	7.4 Scrap and Discarded Film.	40- 13
Chapter 3 Definitions	40- 7	7.5 Transportation.	40- 13
3.1 General.	40- 7	Chapter 8 Motion Picture Projection and Special Processes	40- 13
3.2 NFPA Official Definitions.	40- 7	8.1 Enclosures for Motion Picture Projectors.	40- 13
3.3 General Definitions.	40- 7	Chapter 9 Special Occupancies	40- 14
Chapter 4 Construction Requirements and Arrangements of Buildings	40- 8	9.1 Motion Picture Film Exchanges.	40- 14
4.1 Construction.	40- 8	9.2 Motion Picture Film Laboratories.	40- 14
4.2 Exits.	40- 8	Annex A Explanatory Material	40- 14
4.3 Explosion Venting.	40- 8	Annex B Additional Information on Cellulose Nitrate Film	40- 18
4.4 Space for Workers.	40- 8	Annex C History of Cellulose Nitrate Film Use and Storage	40- 19
4.5 Tables and Racks.	40- 8	Annex D Informational References	40- 20
4.6 Electrical Equipment.	40- 8	Index	40- 22
4.7 Heating, Cooling, and Refrigeration Equipment.	40- 8		
4.8 Duct Systems.	40- 9		
Chapter 5 Fire Protection	40- 9		
5.1 Automatic Sprinklers.	40- 9		
5.2 Water Supplies.	40- 9		