

NFPA®

45

**Standard on
Fire Protection for
Laboratories
Using Chemicals**

2019



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NFPA® 45

Standard on

Fire Protection for Laboratories Using Chemicals

2019 Edition

This edition of NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*, was prepared by the Technical Committee on Laboratories Using Chemicals. It was issued by the Standards Council on November 5, 2018, with an effective date of November 25, 2018, and supersedes all previous editions.

This edition of NFPA 45 was approved as an American National Standard on November 25, 2018.

Origin and Development of NFPA 45

The first edition of NFPA 45 was developed by the Technical Committee on Chemistry Laboratories. It was tentatively adopted at the 1974 NFPA Annual Meeting and was officially adopted at the 1975 NFPA Fall Meeting. The committee wishes to acknowledge that NFPA 45 is due in large part to the leadership and efforts of the late Russell H. Scott, who served as chairman of the committee during the planning and drafting stages of the first edition of NFPA 45. After the document had been in use for two years, the technical committee began an exhaustive review of the text; amendments were adopted for the 1982, 1986, and 1991 editions.

The 1996 edition of NFPA 45 included clarification on the scope and application of the standard as it applied to various types of educational, industrial, and medical laboratory facilities. Clarification of objectives was made to ensure a fire is contained to the room of origin. The requirements for maximum quantities of flammable and combustible liquids, construction, and fire protection in laboratory units were separated into two tables, one for sprinklered laboratory units and the other for nonsprinklered laboratory units. In addition, the committee revised the fire hazard classifications to recognize that clinical laboratories were using this standard as directed by NFPA 99, *Standard for Health Care Facilities*, and to identify that NFPA 101®, *Life Safety Code*®, no longer addresses laboratory occupancies.

The 2000 edition of NFPA 45 included modified laboratory separation requirements, and nonsprinklered laboratories of Class A or B and Class C [over 929 m² (10,000 ft²)] were prohibited. Expanded requirements and advisory information for compressed and liquefied gases were added. Additional changes included modified laboratory ventilating systems and hood requirements. Average face velocity is used to determine the safe operating levels for hood exhaust systems. Changes were made to address the current industry trend in the utilization of variable air volume (VAV) laboratory ventilation systems, which provide clear requirements for the containment of contaminants within the hood. The language was clarified regarding multiple or manifold exhaust ducts within buildings.

The 2004 edition of NFPA 45 included a new requirement that all new laboratories must be protected with automatic extinguishing systems. Pressurized liquid dispensing containers not previously recognized but indirectly prohibited because of quantity restrictions were defined, addressed, and regulated. Clarification of the scope was provided for labs containing the minimum quantity of either flammable and combustible liquids or gas that would qualify the lab for coverage under NFPA 45. Clarification was also made that the minimum quantity of gas does not include low-pressure utility gas in accordance with NFPA 54, *National Fuel Gas Code*.

The 2004 edition included expanded advisory material on biological safety cabinets and recognition of listed Class II, Type B2 biological safety cabinets in lieu of chemical fume hoods under certain circumstances. All flammable and combustible liquids requirements were consolidated into one chapter. Requirements were incorporated to limit hazchem storage spill scenarios to less than 20 L (5 gal). Expanded requirements and advisory information were created for compressed and liquefied gases. Maximum quantity requirements were clarified for outside cylinder storage.

The 2011 edition of NFPA 45 included major modifications to Chapters 4, 5, 9, 10, and 11 to modify the design, construction, and operational requirements for laboratories located in buildings over 1 story in height. Height restrictions were added for Class A and B laboratory units. The fire resistance rating of laboratory units, height restrictions, and quantities of hazardous materials were modified for laboratory units depending upon the height of the building containing the laboratories. Laboratories located in health care facilities previously covered by NFPA 99 were added to NFPA 45. Hazardous materials in storage or use in a laboratory work area that could present an explosion hazard were quantified. Requirements for the management of time-sensitive chemicals were clarified.

The 2015 edition of NFPA 45 included a new chapter on educational and instructional laboratories. The standard applies to all educational and instructional laboratories, independent of the quantity of chemicals present. Requirements for Class A, B, C, and D laboratory units permitted below grade were clarified in Chapter 5, and requirements for fire-retardant clothing, inert atmosphere glove boxes, handling pyrophoric reagents and water reactive materials, and open flame operations were added in Chapters 6, 7, and 11. Supplementary information on laboratory units was expanded to provide additional guidance. Because explosion hazard protection is no longer within the scope of NFPA 45, the chapter by that title was removed and the information was relocated to Annex C.

The 2019 edition of NFPA 45 adds definitions for *use*, *closed system use*, and *open system use* as the terms are found throughout the standard. The 2019 edition also incorporates requirements for laboratory units in health care facilities, particularly flammable and combustible liquid quantity limitations; lab unit classifications; fire separation; and specific provisions for distillation and solvent recycling equipment and tissue processors. Area limitations for lab units have been removed, because the quantity of flammable liquids is limited by the volume and density limits. Language has been revised to clarify that curbing of laboratory floors can be used to prevent liquids from migrating to lower floor levels, and new annex text has been added to list other preventative means. Requirements for exit doors have been revised to clarify that the methods need to also comply with NFPA 101 egress requirements. The section on emergency lighting has been revised to require emergency lighting in all laboratory work areas, not only those that require a second means of access to an exit. Requirements for Class I wet standpipe systems have been clarified, and requirements for manual fire alarm systems have been revised to include all buildings with laboratory units. Terminology related to flame-resistant clothing has been revised to align with NFPA 2112. Requirements for laboratory exhaust systems have been expanded to prohibit sound attenuation devices within them. Laboratory exhaust ducts, dampers, and exhaust ducting through fire barriers has been addressed to clarify the installation of exhaust ducts through fire-rated barriers and to align with the current editions of NFPA 90A and 91. Inspection, testing, and maintenance of fire-extinguishing systems in ductwork or chemical fume hoods has been revised from a specified time interval to a schedule appropriate for the type of system. A new retroactivity clause has been added to clarify that the chapter on chemical storage, handling, and waste disposal contains operational requirements that need to be applied to existing laboratories, not only new construction. Hazardous chemical containers stored and handled in laboratory work areas are now limited to 20 L (5 gal), where previous language about limiting spill scenarios was ambiguous. A minimum inspection frequency of 1 year has been added for chemical storage. Annex material has been added to reinforce the need to evaluate the effects of any mixing of wastes, to clarify the process of dispensing Class I liquids in a ventilated area, to explain why pyrophoric reagents and water-reactive materials in glove boxes need to be sealed in airtight containers when not in use, to describe flame-jetting hazards, and to explain the need for hazard evaluations and risk assessments before new or changed experiments. Language has been added to reference NFPA 30 for quantities of flammable and combustible liquids within inside liquid storage areas, and requirements for gas cylinders have been aligned with NFPA 55. Requirements for emergency gas shutoffs and overpressure protection have been clarified, and new language has been added to address the potential explosion hazards associated with mixing flammable and oxidizing materials. The sections on heating operations and heating equipment have been combined into one section for consistency, and new requirements to perform hazard analysis and risk assessment before use of pressure containing equipment have been added.

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Committee Scope: This Committee shall have primary responsibility for documents for the prevention of loss of life and damage to property from fire and explosion in chemical laboratories.

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