

NFPA®

115

**Standard for
Laser Fire Protection**

2020



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NFPA® 115

Standard for

Laser Fire Protection

2020 Edition

This edition of NFPA 115, *Standard for Laser Fire Protection*, was prepared by the Technical Committee on Laser Fire Protection. It was issued by the Standards Council on April 10, 2019, with an effective date of April 30, 2019, and supersedes all previous editions.

This edition of NFPA 115 was approved as an American National Standard on April 30, 2019.

Origin and Development of NFPA 115

In September 1988, a request was received by the NFPA Standards Council to establish a project on laser fire protection. At that time, NFPA documents did not address the fire hazards of lasers. Existing non-NFPA standards addressed other laser hazards (primarily health hazards) but did not adequately address the fire hazards involved. In October 1988, the council published a request for comments on the need for such a project. After reviewing comments submitted, the council approved the establishment of a laser fire protection project in July 1989. The resultant document (designated NFPA 115) was intended to supplement existing NFPA documents and other standards involving lasers. Where a particular hazard, such as a flammable liquid, was appropriately addressed by another NFPA document, that document was referenced.

Lasers can be a significant fire hazard. Class 4 and some Class 3b lasers (classification is from ANSI Z136.1, *Safe Use of Lasers*) are powerful enough that the beam is an ignition hazard. During use, particularly in the medical field, the laser beam is directly adjacent to combustible materials and, in certain clinical procedures, flammable gastrointestinal gases and prepping agents. Fire incidents have occurred when the laser beam has impinged on a material other than the intended target.

Additionally, some lasers use flammable liquids as an integral part of their operation. The flammable liquids are pumped and flow through tubing, which can be quartz or plastic. Both types of tubing are prone to damage, either by breaking or melting, when exposed to a fire. When this occurs, a flammable liquid pool of fire is created.

Materials used to fabricate laser systems are often inappropriate with respect to fire safety. Manufacturers do not always choose component materials with regard to their ignition and heat-release properties. Lasers can involve the use of high-energy power supplies. Motors for use with flammable liquids need to be intrinsically safe or of approved electrical classification.

As part of an ongoing effort to document the fire hazards of lasers, there is a database of fires involving lasers. Documented incidents have occurred in hospitals, research laboratories, and industrial applications. According to the data, most incidents involve the laser beam as the ignition source. Materials ignited include adjacent combustibles as well as components of the laser itself. Other incidents have involved components of the laser overheating or igniting due to a failure of the laser system.

In the 1999 edition of this document, changes were made to conform to the NFPA *Manual of Style*. In addition, many of the references to “flammable” liquids were changed to “ignitable” liquids because the word “flammable” was too restrictive.

In the 2003 edition, the document changed from a recommended practice to a standard. Therefore, the language within the body of the document was changed to enforceable language, and recommendations or advisory information was moved to the annexes.

The 2008 edition was revised to stay current with other NFPA documents. The definitions were updated, and the language was changed where appropriate to add clarity. A new requirement was added, which called for fire training for health care facilitators wherever a patient might come in contact with lasers.

The 2012 edition was updated and definitions were changed in accordance with the NFPA *Glossary of Terms*. The language was clarified for pre-fire planning for staff members to be trained and knowledgeable in emergency procedures.

The 2016 edition was updated with current references and definitions in accordance with the NFPA *Glossary of Terms*. In addition to language revisions to clarify requirements, the list of degraded components that could lead to a fire in the Performance Monitoring section was updated.

The 2020 edition has not been significantly revised. Reference standards were updated to the most current editions. Requirements for fire suppression were revised to clarify the decisions concerning selection and placement in NFPA 10 and, while not required, the laser safety officer has the authority to determine whether other suppression systems or methods are appropriate for the particular laser installation.

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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 fire protection for laser equipment, including their safe installation, use, and maintenance.

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Standard for

Laser Fire Protection

2020 Edition

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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.

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

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

Chapter 1 Administration

1.1 Scope.

1.1.1 This document shall provide minimum fire protection requirements for the design, manufacture, installation, and use of lasers and associated equipment.

1.1.2 Criteria for training for and responding to fire emergencies involving lasers shall be included.

1.2 Purpose. This document shall provide requirements intended to prevent or mitigate the effects of fire involving lasers.

1.3 Application. This document shall apply to lasers capable of producing a beam ignition hazard, lasers utilizing materials or components presenting a fire hazard, and the areas where such lasers are used.

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

1.4.1 Unless otherwise specified, the provisions of this standard 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 standard. Where specified, the provisions of this standard 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 standard deemed appropriate.

1.4.3 The retroactive requirements of this standard 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. Nothing in this standard 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 standard.

1.5.1 Technical documentation shall be submitted to the authority having jurisdiction to demonstrate equivalency.

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

1.6 Interface with Existing Codes and Standards.

1.6.1 When interface with existing NFPA or other consensus codes and standards occurs, reference shall be made in the text to the appropriate source.

1.6.2 Due to the unique fire hazards associated with lasers and their operations, this standard shall provide additional fire safety requirements beyond that of other documents.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard 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 10, *Standard for Portable Fire Extinguishers*, 2018 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2019 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 2018 edition.

NFPA 55, *Compressed Gases and Cryogenic Fluids Code*, 2020 edition.

NFPA 70®, *National Electrical Code*®, 2020 edition.

NFPA 99, *Health Care Facilities Code*, 2018 edition.

NFPA 101®, *Life Safety Code*®, 2018 edition.

NFPA 600, *Standard on Facility Fire Brigades*, 2020 edition.

NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*, 2017 edition.

2.3 Other Publications.

2.3.1 ANSI Publications. Laser Institute of America, Secretariat of ANSI Z136, 13501 Ingenuity Drive, Suite 128, Orlando, FL 32826 (www.lia.org).

ANSI Z136.1, *Safe Use of Lasers*, 2014.



ANSI Z136.3, *Safe Use of Lasers in Health Care Facilities*, 2011.

ANSI Z136.5, *Safe Use of Lasers in Educational Institutions*, 2009.

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

ASTM D5, *Standard Test Method for Penetration of Bituminous Materials*, June 1, 2013.

ASTM D4359, *Standard Test for Determining Whether a Material Is a Liquid or a Solid*, 2012.

2.3.3 CGA Publications. Compressed Gas Association, 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923.

CGA V-1, *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections*, 2013.

2.3.4 IEC Publications. Available from American National Standards Institute, 25 West 43rd Street, 4th floor, New York, NY 10036, U.S. National Committee for the IEC (www.ansi.org).

IEC 60825-1, *Safety of laser products — Part 1: Equipment classification and requirements*, 2014.

2.3.5 U.S. Government Publications. U.S. Government Publishing Office, Superintendent of Documents, Washington, DC 20402.

OSHA Instruction Pub 8-1.7, *Guidelines for Laser Safety and Hazard Assessment*, August 5, 1991.

Title 21, Code of Federal Regulations, Part 1040, Chapter 1, “Performance Standards for Light Emitting Products,” April 1, 2014.

Title 21, Code of Federal Regulations, Parts 1040.10 and 1040.11, April 1, 2013.

Title 29, Code of Federal Regulations, Part 1910.38(b)(4)(i).

Title 40, Code of Federal Regulations.

Title 49, Code of Federal Regulations.

2.3.6 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 30, *Flammable and Combustible Liquids Code*, 2018 edition.

NFPA 53, *Recommended Practice on Materials, Equipment, and Systems Used in Oxygen-Enriched Atmospheres*, 2016 edition.

NFPA 59A, *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)*, 2019 edition.

NFPA 99, *Health Care Facilities Code*, 2018 edition.

NFPA 306, *Standard for the Control of Gas Hazards on Vessels*, 2019 edition.

NFPA 600, *Standard on Facility Fire Brigades*, 2015 edition.

NFPA 921, *Guide for Fire and Explosion Investigations*, 2017 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. 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. *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 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.

3.2.4* 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.

3.2.5 Shall. Indicates a mandatory requirement.

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

3.2.7 Standard. An NFPA Standard, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase “standards development process” or “standards development activities,” the term “standards” includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

3.3 General Definitions.

3.3.1* Accessible Emission Limit (AEL). The maximum accessible emission level permitted within a particular class.

3.3.2* Beam. A collection of rays that can be parallel, divergent, or convergent.

3.3.3 Beam Intensity Profile (Irradiance Distribution). A description of the variations that can be present in the cross-section of a laser beam or in a focused laser spot.