American National Standard

ANSI Z136.1 – 2014

American National Standard for Safe Use of Lasers

Laser Institute of America
Laser Applications and Safety

Approved American National Standard
ANSI

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American National Standard for Safe Use of Lasers

Secretariat
Laser Institute of America

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American National Standard

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Foreword

(This introduction is not a normative part of ANSI Z136.1-2014, *American National Standard for Safe Use of Lasers.*)

In 1968, the American National Standards Institute (ANSI) approved the initiation of the Safe Use of Lasers Standards Project under the sponsorship of the Telephone Group.

Prior to 1985, Z136 standards were developed by ANSI Committee Z136 and submitted for approval and issuance as ANSI Z136 standards. Since 1985, Z136 standards have been developed by the ANSI Accredited Standards Committee (ASC) Z136 for Safe Use of Lasers. A copy of the procedures for development of these standards can be obtained from the secretariat, Laser Institute of America, 13501 Ingenuity Drive, Suite 128, Orlando, FL 32826, or viewed at www.z136.org.

The present scope of ASC Z136 is to protect against hazards associated with the use of lasers and optically radiating diodes.

ASC Z136 is responsible for the development and maintenance of this standard. In addition to the consensus body, ASC Z136 is composed of standards subcommittees (SSC) and technical subcommittees (TSC) involved in Z136 standards development and an editorial working group (EWG). At the time of this printing, the following standards and technical subcommittees were active:

SSC-1	Safe Use of Lasers (parent document)
SSC-2	Safe Use of Lasers and LEDs in Telecommunications Applications
SSC-3	Safe Use of Lasers in Health Care
SSC-4	Measurements and Instrumentation
SSC-5	Safe Use of Lasers in Educational Institutions
SSC-6	Safe Use of Lasers Outdoors
SSC-7	Eyewear and Protective Barriers
SSC-8	Safe Use of Lasers in Research, Development, and Testing
SSC-9	Safe Use of Lasers in Manufacturing Environments
SSC-10	Safe Use of Lasers in Entertainment, Displays, and Exhibitions
TSC-1	Biological Effects and Medical Surveillance
TSC-2	Hazard Evaluation and Classification
TSC-4	Control Measures and Training
TSC-5	Non-Beam Hazards
TSC-7	Analysis and Applications
EWG	Editorial Working Group

The nine standards currently issued are:

ANSI Z136.1-2014, *American National Standard for Safe Use of Lasers* (replaces ANSI Z136.1-2007)

ANSI Z136.2-2012, *American National Standard for Safe Use of Optical Fiber Communication Systems Utilizing Laser Diode and LED Sources* (replaces ANSI Z136.2-1997 *American National Standard for Safe Use of Optical Fiber Communications Systems Utilizing Laser Diode and LED Sources*)

ANSI Z136.3-2011, *American National Standard for Safe Use of Lasers in Health Care* (replaces ANSI Z136.3-2005 *American National Standard for Safe Use of Lasers in Health Care Facilities*)

ANSI Z136.4-2010, *American National Standard Recommended Practice for Laser Safety Measurements for Hazard Evaluation* (replaces ANSI Z136.4-2005)

ANSI Z136.5-2009, *American National Standard for Safe Use of Lasers in Educational Institutions* (replaces ANSI Z136.5-2000)

ANSI Z136.6-2005, *American National Standard for Safe Use of Lasers Outdoors* (replaces ANSI Z136.6-2000)

ANSI Z136.7-2008, *American National Standard for Testing and Labeling of Laser Protective Equipment* (first edition)

ANSI Z136.8-2012, *American National Standard for Safe Use of Lasers in Research, Development, or Testing* (first edition)

ANSI Z136.9-2013, *American National Standard for Safe Use of Lasers in Manufacturing Environments* (first edition)

This American National Standard provides guidance for the safe use of lasers and laser systems by defining control measures for each of seven laser hazard classifications. Once a laser or laser system is properly classified, there should be no need to carry out tedious measurements or calculations to meet the provisions of this standard. However, technical information on measurements, calculations and biological effects is also provided within the standard and its appendixes.

It is expected that this standard will be periodically revised as new information and experience in the use of lasers are gained. Future revisions may have modified content and the use of the most current document is highly recommended.

While there is considerable compatibility among existing laser safety standards, some requirements differ among state, federal, and international

standards. These differences may have an effect on the particulars of the applicable control measures.

Occasionally questions may arise regarding the meaning or intent of portions of this standard as it relates to specific applications. When the need for an interpretation is brought to the attention of the secretariat, the secretariat will initiate action to prepare an appropriate response. Since ANSI Z136 standards represent a consensus of concerned interests, it is important to ensure that any interpretation has also received the concurrence of a balance of interests. For this reason, the secretariat is not able to provide an instant response to interpretation requests except in those cases where the matter has previously received formal consideration. Requests for interpretations and suggestions for improvements of the standard are welcome. They should be sent to ASC Z136 Secretariat, Laser Institute of America, 13501 Ingenuity Drive, Suite 128, Orlando, FL 32826.

This standard was processed and approved for submittal to ANSI by ASC Z136. Committee approval of the standard does not necessarily imply that all members voted for its approval.

Robert Thomas, Committee Chair
Sheldon Zimmerman, Committee Vice-Chair
Ben Edwards, Committee Secretary

Notice

(This notice is not a normative part of ANSI Z136.1-2014, *American National Standard for Safe Use of Lasers.*)

Z136 standards and recommended practices are developed through a consensus standards development process approved by the American National Standards Institute. The process brings together volunteers representing varied viewpoints and interests to achieve consensus on laser safety related issues. As secretariat to ASC Z136, the Laser Institute of America (LIA) administers the process and provides financial and clerical support to the committee.

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American National Standard for Safe Use of Lasers

1. General

1.1 Scope.

This standard provides recommendations for the safe use of lasers and laser systems that operate at wavelengths between 180 nm and 1000 μm.

1.2 Application.

The objective of this standard is to provide reasonable and adequate guidance for the safe use of lasers and laser systems. A practical means for accomplishing this is to (1) classify lasers and laser systems according to their relative hazards and to (2) specify appropriate controls for each classification.

Other special application standards within the Z136 series may deviate from the requirements of this standard. Each deviation is valid only for applications within the scope of the standard in which it appears. Guidance in specialized standards (e.g., Z136.3 and Z136.4)[1] that appears to conflict with the requirements of this standard shall have precedence within the scope of that standard. The laser safety officer (LSO) shall determine which, if any, of the specialized Z136 laser safety standards are applicable. The complete record of current Z136 standards is listed in the Foreword and Section 10 of this document.

The basis of the hazard classification scheme in Section 3 of this standard is the ability of the laser beam to cause biological damage to the eye or skin during use. For example:

a) **Class 1 Laser System:**
Considered to be incapable of producing damaging radiation levels during operation, and exempt from any control measures.

NOTE 1—For the purposes of this standard, products that have been classified previously as Class IIa under the Federal Laser Product Performance Standard (FLPPS) should be treated the same as those in Class 1 (see Appendix J).[2]

NOTE 2—A common example of a Class 1 laser system is one that includes an embedded higher class laser, but during normal operation presents no laser radiation hazard to the user.

b) **Class 1M Laser System:**
Considered to be incapable of producing hazardous exposure conditions during normal operation unless the beam is viewed with collecting optics (e.g., telescope) and is exempt from any control measures other than to prevent potentially hazardous optically aided viewing.

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[1] When reference to a standard, regulation or order is followed by a date (e.g., Z136.1-2007), the reference is to that specific document. When the reference to a standard, regulation or order is not followed by a date (e.g., Z136.2, FAA order JO 7400.2), it means the latest revision of that document.

[2] Notes in text, and figures of this standard are given for information only and do not contain requirements needed to implement the standard.