American National Standard

*ANSI Z136.2 – 2012*

# *American National Standard for Safe Use of Optical Fiber Communication Systems Utilizing Laser Diode and LED Sources*

Laser Institute of America
*Laser Applications and Safety*

Approved American National Standard
ANSI

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# American National Standard for Safe Use of Optical Fiber Communication Systems Utilizing Laser Diode and LED Sources

**Secretariat**
**Laser Institute of America**

**Approved: December 19, 2012**
**American National Standards Institute, Inc.**

**American National Standard**

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## Foreword

(This introduction is not a normative part of ANSI Z136.2-2012, *American National Standard for Optical Fiber Communication Systems Utilizing Laser Diode and LED Sources*.)

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 are 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 eight standards currently issued are:

ANSI Z136.1-2007, *American National Standard for Safe Use of Lasers* (replaces ANSI Z136.1-2000)

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

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)

This American National Standard provides guidance for the safe use, maintenance, service, and installation of optical communications systems utilizing laser diodes or light emitting diodes operating at wavelengths between 0.6 μm and 1 mm. Optical communication systems include end-to-end optical fiber based links, fixed terrestrial point-to-point free-space links, or a combination of both. This standard is intended to be used by those who assemble the end-to-end system and by service, maintenance, and other personnel who may come in contact with such systems where access is in uncontrolled, controlled and restricted locations. It provides detailed safety information for systems where optical energy may be accessible and where source parameters are uncertain or not under the control of the user. Control measures commensurate with the specific hazard level (optical fiber links) and access level (free-space links) are provided. Most evaluations can be carried out analytically and a number of representative examples of hazard evaluation are provided in the 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 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 and regulations. 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 Z136.2-2012, *American National Standard for Optical Fiber Communication Systems Utilizing Laser Diode and LED Sources*.)

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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Appendix A

# American National Standard for Safe Use of Optical Communications Systems Utilizing Laser Diodes and LED Sources

## 1. General

### 1.1 Scope

This standard addresses hazards and provides guidance for the safe use, maintenance, service, and installation (manufacturer) of optical communications systems (OCS) utilizing laser diodes or light emitting diodes (LED) operating at wavelengths between 0.6 μm and 1 mm and not intended for visual communications.[1] For purposes of this standard, OCS includes end-to-end optical fiber based links (optical fiber communications systems – OFCS), fixed terrestrial point-to-point free-space links (free space optical communications systems – FSOCS) or a combination of both.

Sections 3.4 and 4.3 of this standard apply only to systems or parts of systems where the radiant energy is confined within an optical fiber during intended use (OFCS); Sections 3.5 and 4.4 of this standard apply only to those open beam systems where the radiant energy is always available during intended use (FSOCS). As defined in this standard, FSOCS applies only to fixed, point-to-point terrestrial systems used for telecommunications purposes. For other free-space optical systems and applications, refer to ANSI Z136.6.

NOTE—LEDs are included in the scope of this standard for the following reasons: 1) The optical energy emitted by an LED (usually an edge-emitter) launched into an optical fiber results in a worst-case viewing condition approximately the same as if the source were a laser. 2) Although the spectral bandwidth of an LED is much larger than that of a laser, the spectral emission is still relatively narrow and the tables for the maximum permissible exposure (MPE) values and accessible emission limits (AEL) can still be used satisfactorily to provide conservative results.

### 1.2 Purpose

The purpose of this standard is to provide specific requirements for the safe use, service, operation, maintenance and installation of OCS, including OFCS and FSOCS. As such, it is intended to be used by those who assemble the end-to-end system (installation) and by service, maintenance, and other personnel who may come in contact with such systems where access is in uncontrolled, controlled and restricted locations. It provides detailed safety information for systems where optical energy may be accessible and where source parameters are uncertain or not under the control of the user.

NOTE—It is recognized that the user of this standard may fall into one or more of the following categories: manufacturer, installer, or service/installation and/or operating organization. Although the installer of the end-to-end system comprised of certified products, e.g., products certified in

[1] For consistency and because the unit micrometer (μm) is the preferred unit used throughout the optical communications field, μm will be used throughout this document.