

American National Standard

*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



ANSI®
Z136.2 – 2012
First Printing

**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

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American National Standard does not in any respect preclude anyone, whether or not he or she has approved the standard, from manufacturing, marketing, purchasing, or using products, processes or procedures not conforming to the standard. American National Standards are subject to periodic review and users are encouraged to obtain the latest editions.

CAUTION NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this standard no later than five years from the date of publication. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Published by

**Laser Institute of America
13501 Ingenuity Drive, Suite 128
Orlando, FL 32826**

ISBN: 978-0-912035-68-0

Copyright © 2012 by Laser Institute of America.
All rights reserved.

No part of this publication may be copied or reproduced in any form, including an electronic retrieval system or be made available on the Internet, a public network, by satellite, or otherwise, without the prior written permission of the publisher.

Printed in the United States of America.

This is a preview. [Click here to purchase the full publication.](#)

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.

The LIA and its directors, officers, employees, members, affiliates, and sponsors, expressly disclaim 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 this document or these standards. The LIA's service as secretariat does not constitute, and LIA does not make any endorsement, warranty, or referral of any particular standards, practices, goods, or services that may be referenced in this document. The LIA also makes no guarantee or warranty as to the accuracy or completeness of any information published herein. The LIA has no power, nor does it undertake to police or enforce compliance with the contents of this document.

In issuing and making this document available, the LIA is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is the LIA 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.

Participants At the time it approved this standard, ASC Z136 had the following members:

<i>Organization Represented</i>	<i>Name of Representative</i>
Academy of Laser Dentistry	Scott Benjamin
Altos Photonics, Inc.	Lucian Hand
American Academy of Dermatology	Mark Nestor
American College of Obstetricians & Gynecologists	Ira Horowitz
American Dental Association	Joel White
American Glaucoma Society	Michael Berlin
American Industrial Hygiene Association	R. Timothy Hitchcock
American Society for Laser Medicine & Surgery	David Sliney
American Society of Safety Engineers	Brian Biesman (Alt)
	Thomas V. Fleming
	Walter Nickens (Alt)
American Veterinary Medical Association	Kenneth Bartels
American Welding Society	Mark McLearn
Association of periOperative Registered Nurses (AORN)	Evangeline Dennis
Association of Surgical Technologists	Kevin Frey
Buffalo Filter	Daniel Palmerton
Camden County College	Fred Seeber
Daniel Laser Safety	Paul Daniel Jr.
Health Physics Society	Thomas Johnson
	David Sliney (Alt)
High-Rez Diagnostics	Richard Hughes
Institute of Electrical and Electronics Engineers Standards Association (SCC-39)	Ron Petersen
International Imaging Industry Association (I3A)	Joseph Greco
Kentek Corporation	William Arthur
L*A*I International	Thomas Lieb
Laser Institute of America	Gus Anibarro
Laser Safety Consulting, LLC.	Darrell Seeley
Lawrence Berkeley National Laboratory	Ken Barat
Lawrence Livermore National Laboratory	Robert Ehrlich
Lightwave International	Roberta McHatton
Los Alamos National Laboratory	Connon Odom
National Aeronautics and Space Administration	Guy Camomilli
National Institute of Standards and Technology (NIST)	Randall Scott (Alt)
North American Association for Laser Therapy (NAALT)	Joshua Hadler
Power Technology, Inc.	Raymond Lanzafame
	William Burgess

Rockwell Laser Industries
 Solta Medical Inc.
 TASC, Inc.
 Underwriters Laboratories, Inc.
 University of Texas,
 Southwestern Medical Center
 US Department of Health and Human
 Services, Center for Devices and
 Radiological Health
 US Department of Labor, Occupational
 Safety & Health Administration
 US Department of the Air Force,
 Air Force Research Laboratory
 US Department of the Air Force,
 Surgeon General's Office
 US Department of the Army, Medical
 Research & Materiel Command
 US Department of the Army,
 US Army CHPPM
 US Department of the Navy,
 Naval Air Systems Command
 US Department of the Navy,
 Naval Sea Systems Command

William Ertle
 George Frangineas
 Edward Early
 Peter Boden
 John Hoopman

 Richard Felten
 Robert James (Alt)

 Jeffrey Lodwick

 Benjamin Rockwell
 Robert Thomas (Alt)
 Edward Kelly

 Bruce Stuck

 Jeffrey Pfoutz
 Penelope Galoff (Alt)
 James Sheehy

 Sheldon Zimmerman
 Mary Zimmerman (Alt)

Individual Members

Robert Aldrich
 Prem Batra
 Hong Chen
 Richard Crowson
 Jerome Dennis
 David Dewey
 Ben Edwards
 Mark Festenstein
 Donald Haes
 Robert Handren, Jr.
 Ami Kestenbaum
 David J. Lund
 Martin Mainster
 Wesley Marshall
 J. Stuart Nelson
 Patti Owens
 Jay Parkinson
 Randolph Paura
 William P. Roach
 Penny J. Smalley
 Nikolay Stoev
 Paul Testagrossa