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Guide to levels of competence required in laser safety

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Guide to levels of competence required in laser safety

Recommandations pour les niveaux de compétence requis pour la sécurité des lasers

Leitfaden für die erforderlichen Ausbildungslevel auf dem Gebiet Lasersicherheit

This Technical Report was approved by CENELEC on 2005-01-08.

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CENELEC

European Committee for Electrotechnical Standardization
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Europäisches Komitee für Elektrotechnische Normung

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Foreword

This Technical Report was prepared by the Technical Committee CENELEC TC 76, Optical radiation safety and laser equipment.

The text of the draft was submitted to the vote and was approved by CENELEC as CLC/TR 50448 on 2005-01-08.

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1 Scope and object

1.1 Scope

This Guide has been prepared in order to provide information and guidance to employers and employees in organisations in which lasers are used. It is supplementary to the safety requirements specified in the EN 60825 series of standards on laser safety. The Guide outlines procedures for the management of laser hazards and defines levels of competence for those who work with laser equipment or who have responsibility for laser safety.

1.2 Object

The object of this Guide is to assist organisations in which lasers are used to adopt appropriate organisational arrangements covering the implementation and maintenance of effective control procedures as required by EN 60825-1 and by other standards in the EN 60825 series, and to ensure that persons using, controlling, or working with laser equipment, and those having responsibility for laser safety, have the necessary knowledge, understanding and ability to carry out their work without placing themselves or others at any undue health risk.

The Guide defines the employer's responsibility for laser safety, establishes a system of safety management to meet the practical needs of organisations using lasers, and sets out minimum standards of competence in order to help employers to determine the safety training needs of their employees.

2 References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 60825-1 *Safety of laser products – Part 1: Equipment classification, requirements and user's guide*

EN 60825-2 *Safety of laser products – Part 2: Safety of optical fibre communication systems*

EN 60825-4 *Safety of laser products – Part 4: Laser guards*

IEC 60825-8 *Safety of laser products – Part 8: Guidelines for the safe use of medical laser equipment*

IEC 60825-10 *Safety of laser products – Part 10: Laser safety application guidelines and explanatory notes*

EN 60825-12 *Safety of laser products – Part 12: Safety of free space optical communication systems used for transmission of information*

IEC 60825-14 *Safety of laser products – Part 14: A user's guide*

EN 60601-2-22 *Medical electrical equipment – Part 2: Particular requirements for the safety of diagnostic and therapeutic laser equipment*

3 Employer responsibilities

3.1 General

In any organisation in which lasers are in use, it is the employer's responsibility to take all reasonable steps to ensure that adequate safety controls are implemented and maintained, and that relevant safety information and training is provided to their employees.

General information with regard to the potential hazards arising from the use of laser equipment should be obtained in the first instance from the equipment supplier.

Suppliers of laser products have a duty to provide information to their customers on the safety of the products supplied, and should also ensure that their customers are aware of the existence of relevant safety standards and national regulations affecting the use of the products concerned.

Employees at all levels within organisations in which lasers are in use share responsibility for the safety of themselves and of others, but the employer must ensure that effective organisational and administrative safety arrangements are in place. Day-to-day implementation of these arrangements may be delegated to others through the line management structure, but the employer retains overall responsibility for ensuring that these arrangements remain adequate and that they are continuously in operation.

3.2 Safety arrangements

The arrangements for safety shall cover the following:

– the identification of laser and related hazards and the assessment of health risks that may arise from the laser equipment under all conditions of use, including

  - installation and set-up,
  - normal operation,
  - maintenance,
  - servicing and adjustment work,
  - fault situations,
  - foreseeable misuse,
  - removal and disposal;

– the implementation, monitoring and review of appropriate control procedures to eliminate these hazards or, where this is not practicable, to reduce the risk of harm to an acceptably low level;

– the provision of sufficient information, guidance, supervision and training to employees to ensure that the laser equipment is used in accordance with the procedures established, and only used by those who have an adequate knowledge and understanding of the hazards involved and of the need for the control procedures which have been established.

The policies adopted to implement these arrangements for the management and control of laser hazards should be documented and be made available to all employees who have any involvement with laser equipment.

3.3 Safety controls

The use of engineering controls for the elimination of laser hazards and the protection of employees should always be considered first. Where it is not feasible or reasonably practicable for such measures to provide adequate protection, then safe systems of work must be developed and implemented. If necessary, but only as a last resort where adequate protection cannot be provided by other means, suitable personal protective equipment (PPE) shall be provided by the employer. Such PPE may include, but is not limited to, laser protective eyewear. It is the employer's responsibility to

assess the suitability of PPE, to provide it to all employees and visitors who may be at risk, to maintain it in good order, and to replace it whenever necessary. Adequate information, instruction and training covering the proper use of PPE, its limitations, and the reporting of defects, damage or loss, shall be given by the employer, who should take all reasonable steps to ensure the proper use of PPE.

4 Levels of competence

4.1 Laser Safety Officer

Every organisation within which laser equipment of Class 3B or Class 4 is in use should appoint an internal Laser Safety Officer to take administrative responsibility on behalf of the employer for overseeing laser safety. Certain Class 1 laser products that contain embedded Class 3B or Class 4 lasers may produce accessible emission under some conditions of use, e. g. during servicing, and could therefore also necessitate the appointment of a Laser Safety Officer. The appointment of a Laser Safety Officer is also recommended where Class 1M or Class 2M laser products generating well-collimated beams are in use, and which could present a hazard if viewed through binoculars or telescopes at a considerable distance from the laser.

The Laser Safety Officer should ensure that adequate controls for minimising health risks arising from the use of laser equipment are in place, that regular monitoring of laser hazards and of the effectiveness of control measures is carried out, and that records of such monitoring are maintained.

Overall responsibility for laser safety remains with the employer, who should ensure that the person appointed as the Laser Safety Officer has the capability, knowledge and understanding, as well the resources needed, to undertake these tasks effectively. Within the limits of the mandate from the employer he bears the responsibility for the safety control actions both engineering and administrative.

Within large organisations having extensive laser use it can often be helpful to appoint area or departmental laser safety representatives to assist the Laser Safety Officer and to provide more local support to laser users.

The standard of competence necessary for a Laser Safety Officer is that he or she should

– know that optical radiation encompasses visible light and invisible infrared and ultraviolet radiation, that it is designated in terms of wavelength, and that it differs from ionising radiation,

– know the basic characteristics (spatial, spectral and temporal) of laser emission,

– understand the appropriate quantities and units in which laser emission is specified,

– know of the existence of relevant laser safety standards and national regulations affecting laser use,

– understand the concept of laser hazard classes 1, 1M, 2, 2M, 3R, 3B and 4, and the meaning of laser warning labels,

– know the type(s) of laser equipment in use within the organisation concerned and understand its intended purpose,

– know the waveband(s) and wavelength(s) of emission of the laser equipment in use,

– know the tissue(s) at risk from laser beam exposure, and in the case of laser emission within the retinal hazard region (wavelengths between 400 nm and 1 400 nm) understand the focusing effects of the eye,

– appreciate the severity of harm that may occur from laser beam exposure,

– know the approximate area around the laser(s) within which hazardous exposure levels may arise under different circumstances of use,

– understand the nature and extent of other hazards that may arise from the use of the laser equipment, including the following:
  - mechanical hazards;
  - electrical hazards;
  - noise and vibration hazards;
  - thermal hazards;
  - fire and explosion hazards;
  - chemical hazards;
  - biological hazards;
  - radiation hazards, in addition to those due to laser emission,

– understand the control procedures that are necessary to eliminate the risk of harm occurring or to reduce this risk to an acceptable level, including the proper use of warning signs and controlled areas,

– understand the essential requirements of occupational health & safety and the general principles of good safety management,

– understand the need to establish, document and implement safe working procedures (covering normal operation, adjustment work, and the occurrence of unplanned events, including accidents),

– have sufficient technical understanding and management ability to be able to take administrative responsibility, on behalf of the employer, for overseeing, regular monitoring, and the continuous control of laser hazards within the organisation, having due regard to the type(s) of laser(s) in use, the specific nature of the laser application(s), the people involved in the work, and the kind(s) of working environment(s) concerned,

– know how to respond to laser-related accidents and to other incidents where safety could be compromised,

– know how to seek, and be able to act on, the specialist advice of a Laser Protection Adviser whenever necessary.

4.2 Laser user

Those who use, work with, or who are placed in control of laser equipment of Class 1M, 2M, 3R, 3B or 4 should be sufficiently competent in the operation and use of the equipment, and in addition should

– understand the general nature of laser radiation,

– know the health hazards that can arise from the use of the laser equipment, the tissues of the body which are at risk, and the severity of harm which can result,

– understand the meaning of the warning labels appropriate to the class(es) of laser being used,

– understand the proper use of hazard control procedures including, where appropriate, the need for personal protection,

– be aware of the need for any additional precautions that may be necessary when undertaking non-routine activities, such as adjustment work,

– be familiar with the organisation’s procedures and policy governing laser use, including emergency action and accident reporting procedures.

4.3 Awareness for other persons

Persons who are not themselves involved in using or working with laser equipment, but who nevertheless have some responsibility for laser equipment of Class 1M, 2M, 3R, 3B or 4, for those who use it, or for general health and safety matters within the organisation, should have some understanding of the general issues of laser safety. Such persons could include, for example, supervisors, managers, safety officers, occupational health & safety staff, and employee representatives. They should appreciate in general terms the extent and function of laser equipment within the organisation, and in addition should

– understand the general nature of laser radiation and laser radiation hazards,

– have a knowledge of the classification scheme for lasers and the meaning of laser warning signs,

– appreciate the extent of laser use within the organisation, and its intended purpose,

– be familiar with the organisation's policies regarding laser safety,

– know the particular hazards arising from the use of laser equipment within the organisation, and be aware of the control measures that are in place.

4.4 Laser Protection Adviser

Where an employer is not competent to undertake without assistance the necessary duties with regard to laser safety which are defined in Clause 3, a competent person, having sufficient skill, knowledge and experience, should be appointed to advise the employer in these matters and to provide assistance in the establishment of the organisation's laser safety policy and in the implementation of the required arrangements. Such a person, called a Laser Protection Adviser, may be an employee of the organisation concerned or an external adviser.

The employer should ensure that all relevant information relating to the use or intended use of the laser equipment is made available to the Laser Protection Adviser, and that the Laser Protection Adviser is given sufficient time and resources to enable him or her to undertake the necessary tasks effectively, having regard to the size of the organisation, the risks to which employees may be exposed, and the distribution of those risks throughout the organisation.

Many larger organisations undertaking extensive and varied laser work may find it convenient to retain professional laser safety skills in-house and to combine the role of the Laser Safety Officer with that of the Laser Protection Adviser in one employee.

In other circumstances, however, the Laser Safety Officer need not be the Laser Protection Adviser, since it is neither necessary nor appropriate for a high-level of expertise in laser safety to be retained in-house where such expertise cannot be utilised on a regular basis. In such cases the employer, or on his or her behalf the Laser Safety Officer, should seek the guidance of an external Laser Protection Adviser whenever necessary.

Any person acting as a Laser Protection Adviser should have sufficient knowledge, understanding, competence and experience in relevant matters of laser safety, particularly with regard to the following:

– the provisions and applicability of relevant safety standards and national regulations;

– the type of laser equipment in use;

– the particular application or working environment concerned;

– the hazards that may be present;

– hazard evaluation and risk assessment procedures;

– safety management;