HEALTH AND SAFETY AUTHORITY

Guidance for Employers
on the Control of

Artificial Optical Radiation

at Work Regulations 2010

Our vision:

A national culture where all commit to safe and healthy workplaces and the safe and sustainable management of chemicals

Contents

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Introduction

Artificial optical radiation exists in most workplaces. Many present little or no risk of causing injury or ill health and some allow work activities to be carried out safely.

All workers are exposed to artificial optical radiation. One of the challenges is to ensure that sources that may present a risk of exposing workers to levels in excess of the exposure limit values are adequately assessed without the burden of having to assess the majority of sources that do not present a risk under reasonably foreseeable circumstances – the so-called 'safe light' sources.

The Health and Safety Authority has produced this Guide to help businesses satisfy themselves that they are protecting their workers from harm associated with very intense light.

This Guide aims to give employers guidance on the Control of Artificial Optical Radiation at Work Regulations 2010 (S.I. No. 176 of 2010) available at www.deti.ie

The Regulations lay down the minimum safety requirements for the exposure of workers to risks arising from artificial optical radiation.

This Guide is primarily intended to assist employers, and in particular small and medium-sized enterprises.

It applies to all undertakings where workers may be exposed to artificial optical radiation. It aims to lead users through a logical path for assessing the risk from exposure of workers to artificial optical radiation.

The objective of the Guide is to give practical assistance for the prevention of occupational accidents or ill health associated with sources of artificial optical radiation. *It is not intended as a legal interpretation of the legislation.*

This Guide should be read in conjunction with the Control of Artificial Optical Radiation at Work Regulations 2010. If you require a more in-depth understanding, you are advised to consult the guide produced by the EU entitled *A Non-Binding Guide to the Artificial Optical Radiation Directive 2006/25/EC* available at www.hse.gov.uk

The Regulations transpose Directive 2006/25/EC of the European Parliament and Council of 5 April 2006 on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation).

The Regulations do not provide a definition of artificial optical radiation. Natural sources such as volcanic eruptions, the sun and reflected

solar radiation from, for example, the moon, are clearly excluded.

Optical radiation is a form of non-ionising radiation and should not be confused with ionising radiation, which is potentially much more harmful than non-ionising radiation.

The Regulations do not specifically exclude any artificial optical radiation source. However, many sources, such as indicator lights on electrical equipment, are trivial sources of optical radiation. This Guide provides a list of 'safe light' sources that can be generically assessed as not likely to exceed the exposure limit values contained within Schedule 11 of the Regulations.

There will be some worker exposure scenarios which are very intricate and therefore beyond the scope of this Guide. You should seek further advice on assessing intricate exposure scenarios.

The Regulations cover all artificial sources of optical radiation from a humble light bulb to a Class 4 laser. Since the Regulations are so all-embracing there is a need to identify applications of artificial optical radiation that are so insignificant with regard to health, that no further assessment is required. This Guide is intended to give an indication of such 'safe light' sources; to provide guidance for a number of other specific applications; to present an assessment methodology; and also, in some cases, to suggest that further assistance should be sought.

There are a number of applications of artificial optical radiation which require direct exposure of employees at levels that may exceed the exposure limit values. These include some entertainment and medical applications. Such applications will need thorough risk assessments to ensure that the exposure limit values are not exceeded.

The Regulations came into effect on 29 April 2010.

This guidance includes:

- a list of light sources that are considered 'safe light' sources that will not cause harm during their normal use (see Annex (A)) and
- examples of work activities which generate hazardous levels of intense light and suggested appropriate control measures (see Annex (B)).

General background information

What is artificial optical radiation?

Optical radiation is another term for light, covering ultraviolet (UV) radiation, visible light and infrared radiation.

Any man-made source of light, whether visible or invisible, is considered to be artificial optical radiation. Office lighting, computer displays, blowtorches, welding arcs and stage lighting are all examples of typical artificial optical radiation sources. The majority of light sources in most workplaces are considered trivial and do not present any significant optical risk to workers.

Health effects of exposure to optical radiation

Optical radiation is absorbed in the outer layers of the body and, therefore, its biological effects are mostly confined to the skin and eyes.

The risk posed by optical radiation depends on the type of radiation, its intensity and the part of the body that is exposed to it. The symptoms of excessive exposure are well defined and the areas of the body most at risk are the skin and the eyes.

Exposure of the eyes to optical radiation can damage the cornea and lens, and produce pain and symptoms similar to that of sand in the eye. The effects on the skin range from redness, burning and blistering and accelerated ageing through to various types of skin cancer. These adverse effects are rare as artificial sources of optical radiation are well controlled.

The misuse of powerful lasers can cause serious damage to the eye, including blindness, as well as producing skin burns.

Purpose of the Regulations

Why are the Regulations needed?

A small number of intense sources of light at work can damage your eyes and skin, and need to be managed properly. Adherence to these Regulations will ensure that all workers at risk of exposure to artificial optical radiation are protected.

What work activities are likely to be affected by the Regulations?

It is difficult to think of an occupation that does not involve, at some point, exposure to artificially generated optical radiation. Everyone who works in an indoor environment is likely to be exposed to optical emissions from lighting and computer screens. Outdoor workers may require some form of task lighting when natural illumination is insufficient.

Apart from ever-present sources, such as lighting and computer screens, artificial optical radiation may be produced either deliberately, as a necessary part of some process, or else as an unwanted by-product. For example, in order to induce fluorescence in a penetrant dye, it is necessary to produce UV radiation and expose the dye to it. On the other hand, the production of copious UV during welding is an unavoidable by-product although it is in no way essential to the process.

Whether optical radiation is produced deliberately for use or as an unintended by-product of a process, it is still necessary to control it.

Artificially generated optical radiation is present in most workplaces, but certain workplaces contain more hazardous sources than others.

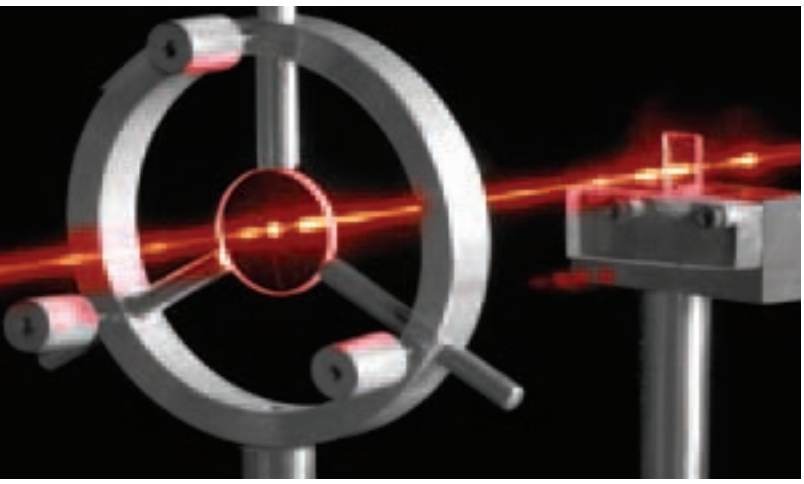
Examples of hazardous sources of very intense light that pose a risk of harm to the eyes and skin of workers which require control measures include:

- metal working involving welding (both arc and oxy-fuel) and plasma cutting,
- pharmaceuticals and research , where UV fluorescence and sterilisation may be in use,
- hot industries, such as glass and metal working, where furnaces emit infrared radiation,
- print industries, where inks and paints are often set by the process of photo-induced polymerisation,
- motor vehicle repairs, where paints can be UV cured,
- medical treatment, where practitioners and patients may be exposed to operating-theatre spotlighting and to therapeutic use of optical radiation,

Purpose of the Regulations

- cosmetic treatment, which makes use of lasers and flash lamps, as well as UV and infrared sources,
- research and education, where Class 3B and Class 4 lasers may be in use and UV induced fluorescence may be a useful tool,
- plastics manufacturing involving laser bonding,
- sewage treatment, where UV sterilisation may be in use,
- shop floor and warehousing industries, where large open buildings are illuminated by powerful area lights,
- non-destructive testing, which may involve the use of UV radiation to reveal fluorescent dyes,
- art and entertainment, where performers and models may be directly illuminated by spotlights, effect lighting, modelling lights and flash lamps and
- entertainment, where workers in the audience area may be illuminated by general and effect lighting.

Less common hazardous sources can be associated with specialist activities –for example workers for companies manufacturing or repairing equipment containing lasers may be at a higher risk of exposure to the light source than the end-user.



(Regulation 179) Determination of exposure and assessment of risks:

The main emphasis of the Regulations is on the duty of employers to ensure that workers are not exposed to levels of artificial optical radiation in excess of the exposure limit values. Employers may be able to demonstrate that they have fulfilled this duty through providing manufacturers safety guidance notes, through generic assessments carried out by themselves or others, by undertaking theoretical assessments or by doing measurements.

Where employees are exposed to artificial sources of optical radiation, an employer must carry out a suitable and appropriate assessment of the risk arising from such exposure:

- if all of the sources in the workplace are included in the list of 'safe light' sources, Annex (A), no further action, other than making a record to show that the employer has reviewed the sources and come to this conclusion, is required and
- if sources not listed in Annex (A) are present, risk assessment will be more complex and the employer will have to decide whether to carry out self-assessment or to seek external assistance (Sections 3–9 of *A Non-Binding Guide to the Artificial Optical Radiation Directive 2006/25/EC* produced by the European Commission should help inform this decision).

Scenarios which require a more complex risk assessment should be assessed by following the hierarchical approach given in Annex (C).

This more complex risk assessment should be carried out by a competent person. The Health and Safety Authority defines a competent person for this scenario as a suitably qualified scientific expert with sufficient training, experience and knowledge appropriate to the nature of artificial optical radiation.

If the employer chooses to go down the self-assessment route, data from product manufacturers may help in compiling the risk assessment. In particular, some types of artificial optical radiation source should be classified to provide the user with an indication of the accessible optical radiation hazard. It is suggested that the employer should request appropriate information from the suppliers of sources of artificial optical radiation. Many products will be subject to the essential safety requirements as specified in the applicable European Community Directives, for example for CE marking.

Requirements of the Control of Artificial Optical Radiation at Work Regulations 2010

It is recommended that the artificial optical radiation risk assessment should be carried out using the following methodology:

1. record all likely sources of exposure to artificial optical radiation and consider who may be exposed,
2. decide which sources are 'safe light' sources (a record of this decision should be made and no further action would need to be taken),
3. decide which exposure scenarios need further assessment,
4. follow the hierarchical approach for more complex risk assessments given in Annex (C),
5. make a judgement on the risks identified,
6. prioritise control measures for sources likely to expose workers to levels of artificial optical radiation above the exposure limit values,
7. record all the significant findings and
8. review regularly.

The employer should reduce exposure to artificial optical radiation to values as low as reasonably practicable, rather than working up to the exposure limit value.

It is necessary to review the risk assessment if artificial optical radiation sources change, or work practices are modified. This review is also important to determine if the risk assessment has been effective and the preventive measures undertaken adequate.

Workers may not necessarily know that they are photosensitive, or they may develop photosensitivity after the risk assessment has been completed. All claims should be recorded and, where appropriate, health surveillance used. It may be necessary to change the source(s) of artificial optical radiation or otherwise adjust work practices. The following procedure should be used:

- decide on an appropriate routine review interval – perhaps a year,
- ensure that reviews are carried out if the situation changes: for example, new sources are introduced, work practices change, or adverse incidents occur and
- record the reviews and the conclusions.

The key requirement is to ensure that a worker's eyes and skin are properly protected.

Businesses with only safe sources need take no special measures.

Businesses with hazardous sources will need to

assure themselves that workers are protected.

Other sources of information which could be used includes sector specific guides, manufacturer's data and the guide produced by the European Commission entitled *A Non-Binding Guide to the Artificial Optical Radiation Directive 2006/25/EC.*

Annex (F) covers less common issues that may be relevant to your risk assessment.

(Regulation 180) Provisions aimed at avoiding or reducing exposure:

It is important to recognise that, unlike many other hazards, reducing the level of artificial optical radiation below a certain level may actually increase the risk of injury. An obvious example of this is area lighting also indicator lamps and signals need to emit an appropriate level of optical radiation to be fit for purpose.

A judgement on the risk from the exposure to the artificial optical radiation will determine whether the work may proceed with caution until the preventive measures are in place, or whether the work should stop until they are in place. Implement the following procedure:

- decide whether work can continue,
- implement preventive action and
- inform workers of the basis for the preventive action.

Where there is a potential for an exposure above the exposure limit values, the hazard should be managed through the application of a combination of appropriate control measures, but applying them in the following hierarchy of importance:

1. eliminate the hazard (is the source of hazardous optical radiation really necessary?),
2. substitute the hazard with a less hazardous process or less hazardous equipment (is the hazardous level of optical radiation essential?, do you really need it so bright?),
3. introduce engineering controls, protective housings, enclosures, interlocks, delayed operation switches, warning lights, audio signals, remote controls, alignment aids, viewing and filtered windows and elimination of reflections and
4. introduce administrative controls limiting the duration of exposure to artificial optical radiation and personal protective equipment (PPE).

You, the employer, should then have in place sensible control measures which follow the principles below:

- use an alternative, safer light source which can achieve the same result,
- prevent access of the light source to the skin and eyes of workers by engineering controls (e.g. screening, interlocks, clamping (rather than holding) working pieces),
- organise work to reduce exposure of workers and others (e.g. restrict access to hazardous areas by non-essential staff by using a dedicated room, screening/barriers, display safety/warning signs, etc),
- increase distance between staff and source (e.g. remote control, time delays) and finally (if the above have not reduced the risk sufficiently)
- issue appropriate PPE (e.g. goggles and face shields).

The information in Annex (B) summarises the key risk reduction measures to be taken by an employer, when you are involved in certain hazardous activities, to ensure that the eyes and skin of your workers is properly protected.

The information in Annex (D) covers the key safety signs to be considered and Annex (E) contains information on PPE.

(Regulation 181) Employee information and training:

Regulation 181 requires information and training for workers who are exposed to risks from artificial optical radiation. It is suggested that the level of training should be in proportion to the risk from exposure to optical radiation. Where all of the sources are considered 'safelight' sources then it should be adequate to inform workers of this. However, workers should be made aware that they could belong to particularly sensitive risk groups and of the process for managing that situation.

If accessible artificial optical radiation that is likely to exceed the exposure limit value is present in the workplace then consideration should be given to formal training and perhaps the appointment of workers to specific roles.

When determining the level of training required, the employer should consider the following:

- the expertise of staff and current awareness of the risks from artificial optical radiation,
- the existing risk assessments and their conclusions,
- whether the workers are required to assist with risk assessments or with their review,
- whether the workplace is static and the risks

have been formally assessed as acceptable or whether the environment changes frequently and

- whether you have access to external expertise to assist with the management of risks and training of workers new to the workplace or to work with artificial optical radiation.

It is important that the risks are put into perspective. For example, requiring formal training courses for the use of a Class 2 laser pointer is not justified. Training for workers using Class 3B and Class 4 lasers will almost always be required. However, it is not possible to define the specific length of a training programme or indeed how it ought to be delivered. This is why the risk assessment is important.

Ideally, the question of the requirement for training and, if required, the method of its delivery, should be identified before the source of artificial optical radiation is brought into use.

(Regulation 182) Health surveillance:

Health surveillance, the results of which are taken into account in the application of preventive measures at a particular place of work, is intended to prevent or diagnose rapidly any long-term health risks and any risk of chronic disease resulting from exposure to artificial optical radiation.

Health surveillance consists of having procedures to detect work-related ill health at an early stage and acting on the results. The main aims are to safeguard the health of employees, including particularly the identification and protection of people at increased risk, and to check the long-term effectiveness of control measures.

These Regulations require that the employer must ensure appropriate health surveillance is made available to those employees of whom a risk assessment reveals a risk to health exists, including those employees exposed to artificial optical radiation in excess of an exposure limit value. Appropriate health surveillance, under this Regulation, should involve:

- establishing arrangements to ensure that individual records are made and kept up to date (the records should contain a summary of the results of the health surveillance carried out and should be in a form enabling their consultation at a later date, taking into account issues of confidentiality),

- allowing individual workers access to their own records on request,
- making a medical examination carried out by a registered medical practitioner available to a worker if it is suspected or known that they have been exposed to artificial optical radiation in excess of the exposure limit value and
- making a medical examination carried out by a registered medical practitioner available to a worker if the worker is found to have an identifiable disease or adverse health effects, which are considered, in the opinion of a registered medical practitioner, to be a result of exposure to artificial optical radiation.

A challenge to the implementation of this requirement is that many adverse health effects may be the result of exposure to natural optical radiation. Therefore, it is important that the registered medical practitioner carrying out the medical examination is familiar with the potential adverse health effects from the specific sources of workplace exposure to artificial optical radiation.

If the exposure limits are thought to have been exceeded in a particular case or if the adverse health effect or identifiable disease is considered to have been caused by artificial optical radiation in the workplace, then the following actions are necessary:

- the worker should be informed of the results,
- the worker should receive information and advice regarding follow-up health surveillance,
- the employer should be informed of any issues of medical confidentiality,
- the employer should review the existing risk assessment,
- the employer should review the existing control measures, which may involve seeking specialist advice and
- the employer should arrange any necessary continued health surveillance.

The requirements of this Regulation need to be considered in the context of over one hundred years of worker exposure to artificial optical radiation; the number of reported adverse health effects is small, and restricted to a small number of industries.

A worker exposed to artificial optical radiation at work is not entitled to receive pre-employment, routine and post-employment eye examinations, just because they carry out or carried out such work. Similarly, skin

examinations may be of benefit to workers, but are not usually justified purely on the basis of routine exposure to artificial optical radiation.

Having followed this Guide, you, the employer, should be able to demonstrate to both staff and Inspectors that you are protecting the eyes and skin of your workers from harm associated with very intense light.

Annexes:

Annex (A): List of safe light sources

This includes the vast majority of light sources used in the workplace such as:

- all forms of ceiling-mounted lighting used in offices etc with diffusers over the bulb (this includes compact fluorescent floodlighting, ceiling-mounted tungsten halogen spotlights and ceiling-mounted tungsten lamps),
- compact fluorescent lamps and tungsten halogen lamps when situated at distances more than 60cm from the user,
- all forms of task lighting (this includes desk lamps including tungsten task lighting),
- photocopiers, computer or similar display equipment (including personal electronic devices and photographic flash lamps),
- gas-fired overhead heaters,
- vehicle indicator, brake, reversing and fog lamps,
- indicator LEDs and
- street lighting.

More intense sources could be a problem if they are stared at for long periods or if they are in very close proximity to workers. It is our natural instinct to look away from these before harm can occur and in addition, they are often used at a safe distance from workers. These measures continue to be acceptable and no special conditions are required. Examples include:

- ceiling-mounted fluorescent lighting without diffusers over the bulb,
- high-pressure mercury floodlighting,
- desktop projectors,
- interactive whiteboard presentation equipment,
- vehicle headlights,
- non-laser medical applications such as theatre and task lighting, diagnostic lighting such as foetal transilluminators and X-ray viewing boxes,
- UV insect traps,
- art and entertainment applications such as illumination by spotlights, effect lights and flash lamps and
- any Class 1, 1M, 2, 2M and 3R laser devices which are not used in combination with magnifying aids (e.g. laser printers, CD/DVD recorders, materials processing lasers, disconnected fibre-optic systems, bar code scanners, level and alignment devices in civil engineering and surveying and laser pointers).

Annex (B)

ANNEX (B): Work activities which generate hazardous levels of intense light and the appropriate control measure for them

What industries use hazardous sources of intense light?	What are the hazardous activities?	How might workers be harmed by the intense light?	What key risk reduction measures do you need to consider?
Metal working.	Welding (arc and oxy-fuel). Plasma cutting.	Damage to the eyes: photokeratitis and photoconjuctivitis ('arc eye', 'snow blindness'); cataracts; photoretinal damage ('blue light hazard'), retinal burn; corneal burn. Damage to skin: UV burning.	Provide face shields, coveralls and gloves. Protect others using screens/curtains/ restricted access. Provide information and training. Provide information and training, display appropriate warning signs, monitor and enforce use of control measures and if any staff over-exposed, provide medical examination and consider whether health surveillance is appropriate.

Annex (B)

Pharmaceuticals and research.	UV sterilisation and induced fluorescence.	Damage to skin.	Provide face shield and ensure other areas of skin not exposed (e.g. lab coats and gloves). Protect others using screens/curtains/ restricted access. Provide information and training, display appropriate warning signs, monitor and enforce use of control measures and if any staff over-exposed, provide medical examination and consider whether health surveillance is appropriate.
Hot industries.	Proximity to furnaces, burners and hot metals/ glass.	Damage to eyes and skin. Thermal discomfort.	Engineering measures: remote controls, screening, interlocks, clamps to hold material. Provide face shield, coveralls and gloves – full body PPE may be required. Enforced maximum working periods, routine change of activity. Protect others using screens/curtains/ restricted access. Provide information and training, display appropriate warning signs, monitor and enforce use of control measures and if any staff over-exposed, provide medical examination and consider whether health surveillance is appropriate.

Annex (B)

Printing and paint (motor vehicle repairs).	UV curing of inks and paints.	Damage to skin.	Engineering measures: remote controls, screening, interlocks, clamps to hold material. Provide face shield and ensure other areas of skin not exposed by providing coveralls and gloves. Protect others using screens/curtains/ restricted areas. Provide information and training, display appropriate warning signs, monitor and enforce use of control measures and if any staff over-exposed, provide medical examination and consider whether health surveillance is appropriate.

Annex (B)

Medical and cosmetic treatments.	Laser surgery (Class 3B and 4 lasers). UV and blue light therapy.	Potential permanent damage to eyes from lasers, including blindness. Laser burns to skin. Other damage to eyes and skin.	Specialist input likely to be required for laser work. Provide face shields/goggles and coveralls. Provide gloves where appropriate (it is recognised that thin nitrile gloves are likely to be needed for dexterity and that these will offer limited protection against laser burns). Establish designated treatment rooms with restricted access. Protect others using screens/curtains/ restricted areas. Keep staff distant while patient exposed. Include laser sources as part of fire assessment. Provide information and training, display appropriate warning signs, monitor and enforce use of control measures, if any staff over-exposed, provide medical examination and consider whether health surveillance is appropriate.

Annex (B)

Industry, research and education.	Class 3B and 4 lasers.	Potential permanent damage to eyes, including blindness. Laser burns to skin. Potential ignition source.	Specialist input likely to be required. Engineering measures: enclosed, controlled area, interlocks, remote controls, screening, clamps to hold material. Designate laboratories with restricted access. Provide face shield/goggles and coveralls. Provide gloves where appropriate (it is recognised that thin nitrile gloves are likely to be needed for dexterity and that these will offer limited protection against laser burns). Include laser sources as part of fire assessment. Provide information and training, display appropriate warning signs, monitor and enforce use of control measures, if any staff over-exposed, provide medical examination and consider whether health surveillance is appropriate.

Annex (C)

Annex (C): Hierarchical approach for more complex risk assessments

Items to be considered	Comments
(a) the level, wavelength range and duration of exposure to artificial sources of optical radiation;	This is the fundamental information about the scenario. If the exposure level is significantly below the exposure limit that would apply for exposure for a complete working day then no further assessment is required unless exposure to multiple sources are a concern. See (h).
(b) the exposure limit values referred to in Schedule 11 of the Regulations;	From the information in (a) it should be possible to identify the applicable exposure limit values.
(c) any effects concerning the health and safety of workers belonging to particularly sensitive risk groups;	It is suggested that the approach should be reactive rather than proactive. There may be some workers who know that they are particularly sensitive to flickering light, for example. The employer should then consider whether modifications to the work activity can be introduced.
(d) any possible effects on workers' health and safety resulting from workplace interactions between optical radiation and photosensitising chemical substances;	It is suggested that employers should specifically consider the possibility of photosensitisation from chemical substances used in the work-place. However, as with (c), the employer may need to react to issues raised by the workers where the photosensitivity is caused by chemical substances used outside of the workplace.

Annex (C)

(e) any indirect effects such as temporary blinding, explosion or fire;	Eye exposure to bright lights may be an issue for some work practices. The normal aversion response should provide a level of protection at exposure levels below the exposure limit value. However, the employer should consider sources of artificial optical radiation that may cause distraction, dazzle, glare and afterimages, where such exposures could compromise the safety of the worker or others. The optical radiation from some artificial optical radiation sources may be capable of causing an explosion or fire. This is particularly relevant for Class 4 lasers, but should also be considered for other sources, especially in environments where flammable or explosive agents may be present.
(f) the existence of replacement equipment designed to reduce the levels of exposure to artificial optical radiation;	It is suggested that this should be considered where the exposure of workers to artificial optical radiation above the exposure limit values is possible.
(g) appropriate information obtained from health surveillance, including published information, as far as possible;	This information may come from within the employer's organisation, from industry representative groups or from international organisations such as the World Health Organisation and the International Commission on Non-Ionising Radiation Protection.

Annex (C)

(h) multiple sources of exposure to artificial optical radiation;	From the information obtained in (a) and (b), it may be possible to determine the proportion of the exposure limit that will be provided by each artificial optical radiation source. A simplified approach will be to consider this for the number of sources that may expose workers and add the proportions. If the sum is less than one, then the exposure limit values are unlikely to be exceeded. If the sum exceeds one then a more detailed assessment will be required.
(i) a classification applied to a laser as defined in accordance with the relevant European Committee for Electrotechnical Standardization (CENELEC) standard and, in relation to any artificial source likely to cause damage similar to that of a laser of Class 3B or 4, or any similar classification;	Class 3B and Class 4 laser products emit accessible laser radiation that could lead to the exposure limit values being exceeded. However, under some circumstances, lower hazard class lasers may also need assessment. EN 62471 assigns non-laser artificial optical radiation sources to a different classification scheme. Risk Group 3 devices should be assessed, but consideration should also be given to the likely exposure scenarios for lower Risk Groups.
(j) information provided by the manufacturers of optical radiation sources and associated work equipment in accordance with the relevant Community Directives.	Employers should request adequate information from manufacturers and suppliers of artificial optical radiation sources and products to ensure that they can undertake the assessments required by the Regulations. It is suggested that the availability of such information could form the basis for procurement policy.

Annex (D): List of key safety signs

Key safety signs to consider for all activities with hazardous sources of artificial optical radiation as listed in the Safety Signs at Places of Work Regulations 2007 and further explained in the Guide to the Safety Signs at Places of Work Regulations 2007 (amended May 2010).

Prohibition signboards:

No access for unauthorised persons

Warning signboards:

Laser beam

Non-ionising radiation

Mandatory signboards:

Safety overalls must be worn

Face protection must be worn

Safety gloves must be worn

Eye protection must be worn

Text below the signboards is for explanatory purposes and should not be used unless incorporated in a supplementary signboard.

Text may be included on a supplementary signboard providing that it does not adversely affect the effectiveness of the safety signboard.

The following is an example of a signboard and associated supplementary signboard.

Annex (E): Personal protective equipment (PPE)

Reduction of unintended exposure to optical radiation should be included in the design specifications of the equipment. Exposure to optical radiation should be reduced, as far as reasonably practicable, by means of physical safeguards, such as engineering controls. PPE should only be used when engineering and administrative controls are impracticable or incomplete.

The purpose of PPE is to reduce optical radiation to the level which does not cause adverse health

Annex (E)

effects in the exposed individual. The optical radiation injuries may not be apparent at the time of the exposure. It should be noted that exposure limit values are wavelength dependent: therefore the degree of protection offered by PPE may also be wavelength dependent.

Although an acute skin injury resulting from exposure to optical radiation is less likely to affect the individual's quality of life, it should be recognised that the probability of skin injury may be high, especially for hands and face.

It is important to remember that:

- PPE should be appropriate for the risks involved, without itself leading to any increased risk,
- PPE should be appropriate for the conditions at the workplace and
- PPE should take account of the ergonomic requirements and the worker's state of health.

Types of PPE and their function

PPE	Function
Protective eyewear: safety spectacles, goggles, face shields, visors. Protective clothing and gloves.	Eyewear should allow the worker to see everything in the work area but restrict the optical radiation to acceptable levels. Selection of appropriate eyewear depends upon many factors including: wavelength, power/energy, optical density, need for prescription lenses, comfort, etc.
	Sources of optical radiation may present a fire hazard and protective clothing may be necessary. Equipment that produces UV radiation may present a skin hazard and skin should be covered using suitable protective clothing and gloves. Protective clothing or gloves may be required by application specifications, for example thermal clothing when working in hot industries.

Annex (F)

Annex (F): List of less common issues that may be relevant to your business

Do you have employees whose health is at particular risk (e.g. those with pre-existing medical conditions made worse by light)?

Do you use any chemicals (e.g. skin creams) which could react with light to make the symptoms worse?

Do you have employees who are exposed to multiple sources of bright light at the same time?

Does exposure to bright light pose unrelated risks (e.g. temporary blindness which could lead to mistakes in a hazardous task)?

Annex (G): Sources of further information

The Control of Artificial Optical Radiation at Work Regulations 2010 (S.I. No. 176 of 2010) are available at www.deti.ie

A non-binding Guide to the Artificial Optical Radiation Directive has been produced by the European Commission and is available at www.hse.gov.uk

Guidance on the use of lasers, intense light source systems and LEDs in medical, surgical, dental and aesthetic practices are available at www.mhra.gov.uk then put the following reference DB2008(03) into the site search facility to locate the document Guidance on the safe use of lasers, IPL systems and LEDs.

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