

# Health & Safety Issues Related to Electricity Industry's Activities

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A EURELECTRIC report

December 2014

***EURELECTRIC is the voice of the electricity industry in Europe.***

*We speak for more than 3,500 companies in power generation, distribution, and supply.*

***We Stand For:***

***Carbon-neutral electricity by 2050***

We have committed to making Europe's electricity cleaner. To deliver, we need to make use of **all low-carbon technologies**: more renewables, but also clean coal and gas, and nuclear. Efficient electric technologies in **transport and buildings**, combined with the development of smart grids and a major push in **energy efficiency** play a key role in reducing fossil fuel consumption and making our electricity more sustainable.

***Competitive electricity for our customers***

We support well-functioning, distortion-free **energy and carbon markets as** the best way to produce electricity and reduce emissions cost-efficiently. Integrated EU-wide electricity and gas markets are also crucial to offer our customers the **full benefits of liberalisation**: they ensure the best use of generation resources, improve **security of supply**, allow full EU-wide competition, and increase **customer choice**.

***Continent-wide electricity through a coherent European approach***

Europe's energy and climate challenges can only be solved by **European – or even global – policies**, not incoherent national measures. Such policies should complement, not contradict each other: coherent and integrated approaches reduce costs. This will encourage **effective investment to** ensure a sustainable and reliable electricity supply for Europe's businesses and consumers.

***EURELECTRIC. Electricity for Europe.***

# Health & Safety Issues Related to Electricity Industry's Activities

WG Health Safety & Environment

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# Table of Contents

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Introduction.....	5
Asbestos .....	6
Asthma .....	7
Biocides .....	8
Drugs and Alcohol.....	9
Electrical Accidents .....	10
Electric and Magnetic Fields .....	11
Fuel Poverty and Health Consequences .....	13
Idiopathic Environmental Hypersensitivity (IEI) .....	14
Ionising Radiations.....	15
Medical Ethics.....	18
Musculoskeletal Disorders (MSD) .....	20
Noise.....	22
Pandemic Preparedness.....	23
Particulate Matter .....	24
Stress and Well Being at Work.....	27
Vibration.....	28
Welding .....	29

# Introduction

## Health and safety topics in the European power sector

### Foreword

Representing over 3500 companies in over 30 countries active in power generation and markets as well as distribution networks with over 800.000 employees, EURELECTRIC members embody an unparalleled expertise in health and safety questions relating to our sector. With our first executive briefing in 2007, EURELECTRIC's expert group on health and safety issues created a tool for sharing this knowledge with each other. This has helped to raise awareness and share best practices among managers in charge of health and safety for employees and customers of the power industry.

With the feedback and additional input from the experts of the EURELECTRIC network, an updated report has now been finalised. The new edition has been expanded to include additional chapters on *Biocides, Fuel Poverty and Health Consequences, Idiopathic Environmental Hypersensitivity (IEI), Ionising Radiations, Medical Ethics, Musculoskeletal Disorders (MSD) and Pandemic Preparedness*. Each chapter is presented in a short general description followed by a risk assessment and the relevant control/prevention measures. The report remains a concise and fact-based briefing, but provides many links for further information and background understanding.

Our sector's commitment to the highest standards in health and safety practises remains unchanged as we continue to recognise the responsibility towards our workforce and the society in which we operate.



**Jesse Scott**

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## Asbestos

Asbestos has been widely used as a technically excellent fire-protecting, insulating and reinforcing material. In industrialised countries, asbestos use and exposure was at its peak in the period from the 1950s to the 1970s. The health consequences of exposure to asbestos fibres have been found to be detrimental and, since the 1990s, new installation of asbestos has been banned in most countries and the management of existing asbestos material is heavily regulated.

In the electricity industry, since the 1920s, asbestos has been used in boiler walls and pipelines. From the 1950s, its use extended to turbine insulation, jointing, packaging and fire protection. Other uses have been in high voltage devices and cable channels.

Medical facts and risks:

- Long latency. The period from first exposure to disease is more than 20 years.
- Asbestosis (one of the lung diseases caused by asbestos exposure) is becoming rare as it is caused by cumulative exposure to asbestos which this has been reduced by preventative measures.
- The occurrence of mesothelioma caused by past asbestos exposure has not yet begun to decline because of the very long latent period.
- Lung cancer risks are multiplied by smoking. For this disease along with mesothelioma, effective methods of early detection exist.

Awareness of the asbestos risk is the key to prevention

Companies should have formal asbestos management policies in place which ensure compliance with legislation. Pro-active asbestos management is the best way to avoid anxiety, complex safety measures, risk of health damage and rising costs in the future. Companies are obliged to keep records of workplace measurements and medical records of staff (currently at work or retired), who have been significantly exposed to asbestos fibres. These records should be kept for 40 years.

The issue of legal compensation needs to be considered in cases of asbestos related occupational disease, whilst use of specific substitute materials (eg, ceramic fibres) should be monitored and recorded very carefully so that if previously unrecognised health effects are identified in future, preventive measures can be taken.

For more information: Health and safety executive. Asbestos related disease. Available from: [www.hse.gov.uk/statistics/causdis/asbestos.htm](http://www.hse.gov.uk/statistics/causdis/asbestos.htm) [accessed 2014 October 17th].

## Asthma

Asthma resulting from workplace exposure is called occupational asthma, which can be caused by single or multiple exposures to non-specific irritants in high concentrations or more commonly by an allergic reaction. Here initial exposures cause no problems but once sensitization of the airways has taken place, any subsequent exposures cause attacks of asthma. Across industry the most frequent causes of occupational asthma are exposures to animal protein, flour, wood dust, enzyme or chemical sensitizing allergens in the workplace.

Depending on the particular material being burnt, dust from biomass (including wood pellets or wood chips) can be a recognized or potential cause of allergic occupational asthma.

Prevention of occupational asthma by general protection measures at workplaces with exposure to irritant and sensitizing agents and health surveillance of workers at these workplaces is an important task for companies. Provided that allergic occupational asthma is diagnosed early, with subsequent removal from exposure, no further attacks will occur. However, if the diagnosis is missed, the asthma can persist even if exposure no longer takes place.

In many cases, redeployment away from exposure is necessary. The most important engineering control methods and organizational measures to reduce occupational asthma are:

- elimination or substitution of known respiratory sensitizers;
- enclosure of the process;
- local exhaust ventilation;
- personal protection;
- environmental monitoring.

Managers should be aware of the possibility of occupational asthma occurring in exposed employees and provide appropriate information, instruction and training.

Cases of occupational asthma must be reported to the appropriate national health authorities.

For more information:

Oasys and occupational asthma. Available from: [www.occupationalasthma.com](http://www.occupationalasthma.com) [accessed 2014 October 17th].

## Biocides

A biocide is a substance which controls harmful or unwanted organisms through chemical or biological means. Common examples of products containing biocidal substances are disinfectants, insect repellents and wood preservatives (used on wood poles) such as creosote. Biocides are used to control organisms such as viruses, bacteria, fungi, insects and animals. Regulation (EU) No 528/2012 of the European Parliament concerning the making available on the market and use of biocidal products was adopted on 22 May 2012. It repeals and replaces Directive 98/8/EC, and it is applicable since of 1 September 2013. It is important that there are safeguards to ensure that products containing biocides can be used without causing harm to people (workers, consumers or bystanders), the environment or animals. The new Regulation maintains the two-step process of approval; (i) evaluation of the active substance at the Union level, and (ii) product authorisation at Member State level. Some biocidal products will be authorised at the Union level giving them direct access to the entire Union market.

Only biocides that have been authorised for sale should be used. Before any new biocidal substance is used, an assessment of its impact should be made, based on the way in which the product with the biocidal substance is to be used. Health surveillance may also be necessary. Information supplied with the product should be used to train staff on how to control its use, storage and disposal. Appropriate PPE should be worn. All such information should be available in the MSDS (Material Safety Data Sheet) and this document is used interchangeably with the Safety Data Sheet (SDS).

Biocides are not a significant cause of ill health in our industry and health risks from biocides are very low if their use is in accordance with the GHS (Globally Harmonised System of Classification and Labelling of Chemicals).

To read more: [*accessed 2014 November 12<sup>th</sup>*]

Regarding regulation:

[http://ec.europa.eu/environment/chemicals/biocides/regulation/regulation\\_en.htm](http://ec.europa.eu/environment/chemicals/biocides/regulation/regulation_en.htm)

Regarding health effects:

- <http://www.senseaboutscience.org/pages/-environmental-impact-of-conventional-and-organic-farming-on-the-land-used-480.html>
- <http://www.ehjournal.net/content/pdf/1476-069X-9-7.pdf>



## Drugs and Alcohol

Consumption, use and abuse of alcohol and drugs vary according to country, occupational group, social and working environments. The actual prevalence remains uncertain but controversial reports have suggested that 50% of all workers consume alcohol during working hours. However, it is generally accepted that 10% of male and 5% of female workers develop pervasive and persistent alcohol related problems. Reports show that 80% of accidents are related to alcohol consumption. Data on the prevalence of drug abuse in the working population are less robust but, in some countries, it is estimated that 40% of working people under the age of 40 have experimented with drug abuse. Workers with certain risk factors are more vulnerable to addiction: social pressures to use drugs or alcohol, easy access to alcohol, isolation from social settings, stress (whether from home, workplace or both), work overload, family difficulties, isolation from families (such as that experienced by expat workers) and loneliness.

Preventive measures include: information provided to workers on the dangers of alcohol and drug abuse, non-punitive policies aimed at assisting employees with alcohol and drug abuse to seek help in order to overcome their problem, Employee Assistance Programmes (EAP), confronting the situation rather than colluding with the employee, banning alcoholic beverages in the workplace, supply of non-alcoholic drinks, co-operation of colleagues and group therapy. Rehabilitation should also include partnering with other organisations outside the workplace such as AA, etc. Moreover, companies need to have a clear policy which spells out unequivocally the consequences of drugs use or excessive alcohol consumption if they have an impact on the organisation. These can include dismissal.

The most commonly abused substances are: alcohol, tranquilisers, cocaine, marijuana, ecstasy and various “designer drugs”.

Workplace testing for alcohol is controversial. Arguments can be made for testing on a “*for cause*” or “*post incident*” basis in any job and for unannounced testing in safety critical work because there is evidence that it can act as a deterrent. However, evidence for any substantial business benefit from testing is lacking and companies considering introducing testing must take account of many legal and ethical requirements. Managers should always be alert to deterioration in work behaviour or attendance patterns and have a discussion with the employee when his/her documented record of work performance or sickness absence is unsatisfactory. Where a health problem (including substance abuse) could be the root cause of the workplace problem, it would be appropriate to refer the individual to the company’s occupational health staff.

For more information:

Health and safety executive. Don’t mix it. A guide for employers on alcohol at work. Available from: <http://www.hse.gov.uk/pubns/indg240.pdf> [accessed 2014 October 17th].

Health and safety executive. Druge misuse at work. A guide for employers. Available from: <http://www.hse.gov.uk/pubns/indg91.pdf> (drugs) [accessed 2014 October 17th].

## Electrical Accidents<sup>1</sup>

Electrical burns are by far the most frequent consequence of electrically induced accidents.

Their frequency can be significantly decreased through policies of prevention and education but they remain among the most serious workplace accidents in the electricity sector.

The severity of electrical burns is related to all the physical parameters of the accident: voltage, current intensity and duration of the current flow. It should be emphasised that accidents due to high-voltage currents are especially serious because, in addition to the burns at the contact point, the current can cause deep burns along the entire length of its path in muscle mass, tendons and neuro-vascular bundles. The size of the surface burn is a major indicator of the likelihood of a deep burn.

The consequences of these types of burns can be particularly severe and range from the need for amputation of a limb to neurological sequelae and post-traumatic stress disorder.

Electric shock is another serious and potentially fatal consequence with the heart ceasing to pump effectively because of ventricular fibrillation. Here, an electric shock becomes hazardous because it occurred during a certain phase of the heart's electrical activity and delivered a charge greater than approximately 1mC.

The first and most important step to prevent electrical accidents is to put in place measures that reduce the likelihood of a person coming in contact with live parts. Key to this is their insulation, taking into account the wear and ageing of installations. Additional protective measures include use of a high-sensitivity residual current protective device (ie, earth leakage circuit breaker).

First aid and immediate measures are also of major importance including immediate cardiac massage followed as soon as possible by use of an automated external defibrillator (AED). The latter does not require medical training since the new devices are simple to use with very brief instruction. Ventricular fibrillation may be restored to normal rhythm in up to 60% of cases if it is treated promptly with an AED. It is important to note that first aiders should only intervene if they have the appropriate protective equipment.

Read more: Electrical Safety First. Best Practice Guides. Available from:

<http://www.esc.org.uk/industry/industry-guidance/best-practice-guides> [accessed 2014 October 17th].

Current Biological Effect	1 mA	Threshold for feeling
	10 – 20 mA	Voluntary let-go of circuit impossible
	25 mA	Onset of muscular contractions
	50 mA	Arrhythmia
	100 mA	Ventricular fibrillation (cardiac arrest)

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<sup>1</sup> "It has been improved very much in this field but there is still much to be done" J P Reilly

## Electric and Magnetic Fields

In modern societies, exposure to power frequency Electric and Magnetic Fields (ELV-EMFs) occurs almost everywhere – at home, in the workplace, in association with public transportation and in city streets. EMFs are present whenever electricity is generated or transmitted and in the vicinity of any electrical appliance.

The higher Radio Frequency Fields (RF-EMFs) of wireless communication technologies are also ubiquitous and, besides antennae and mobile phones, smart metering devices have also triggered questions about possible health effects. EMFs are largest in close proximity to their source and fall off significantly with distance from that source.

In 2002, the World Health Organisation's International Agency for Research on Cancer (IARC) categorised the magnetic fields from overhead electric power lines as a Group 2B, ie "possible", human carcinogen. In 2011, IARC gave the same classification to the radio frequency fields from mobile phones and other devices that emit similar RF-EMFs.

Extensive worldwide biomedical research has been undertaken since 1970s and various independent expert committees, convened by national and international bodies, have regularly reviewed the findings. Authorities, such as the IARC (2002), the SCENHIR (2011) and the EPHRAN program (2012) have also concluded that there is no causal association with childhood and adult cancers in general or with reproductive disorders.

In relation to RF-EMFs, the possible statistical association from epidemiological studies is with brain tumours. However, these findings could be affected, at least in part, by selection bias and misclassification and laboratory studies have failed to show either any deleterious effect in bioassays or a plausible biological mechanism, so the occurrence of a real sanitary risk is hypothetical.

Consequently, both the WHO and the International Committee on Non-Ionising Radiation Protection (ICNIRP) base their exposure recommendations only on established acute effects of EMFs. For ELV-EMFs, these are stimulation of the nervous tissue in high fields and, for RF-EMFs, the heating of tissues. Possible long-term effects are not a basis for action.

In 2013, the recent European Directive on workers' exposure to EMFs took the same approach, the exposure limit values it sets addresses only scientifically well-established links between short-term direct biophysical effects and exposure to electromagnetic fields. As a result, neither this Directive nor the previous European Union Recommendation on public exposure (1999/519/EC) addresses any putative long-term effects.

Under the new directive, the recommended exposure limit values are less stringent than previously. In the Electricity Industry, there are very few situations where exposures even close to these limits could arise. The vast majority of practical work tasks in power generation, transmission and distribution (which already make use of good engineering practices), will be able to continue.

The Electricity Industry remains committed to active and responsible conduct in relation of EMFs. The industry continues to be an active partner with all stakeholders, employees, customers, researchers and authorities in supporting research, sharing information and preparing recommendations for the control of exposure.

All EMF communications should be sensitive to society's demands and attentive to and respectful of the feelings, motives and values of the individuals concerned.

To read more:

- <http://www.emf-portal.de/> The **EMF-Portal** is an internet information platform on biological and health-related effects of non-ionizing electromagnetic fields based on scientific literature
- <http://clefdeschamps.info/> : French
- [http://www.nationalgridus.com/non\\_html/shared\\_env\\_emfs.pdf](http://www.nationalgridus.com/non_html/shared_env_emfs.pdf) [accessed 2014 November 12th]

## Fuel Poverty and Health Consequences

The concept of “Energy/fuel poverty” does not exist in all EU Member States and where it exists, it is understood quite differently from one Member State to the other. In the UK for instance, it largely refers to consumers living in poor quality housing stock. The UK government defines fuel poor as those who spend more than 10% of household income to achieve adequate levels of warmth in the home and meet their other energy needs. Adequate warmth is defined as 21oC/23oC in the main living areas and 18oC in other areas. In other parts of Europe it may relate to consumers struggling to pay their energy bills in general.

Fact is that an increasing number of consumers across Europe report that they struggle to pay their energy bills. To a significant extent, this is due to the impact of the economic crisis on households’ purchasing power combined with a continued rise of electricity and gas retail prices since 2008. The average rise at EU level, for domestic electricity consumers, stands at 4% per annum. Energy wholesale prices have steadily declined over the last five years, by as much as 45%. It is the share of taxes and levies on consumer’s bills which has witnessed the largest increase. The energy component – set by market forces – today accounts for only 43% of the total retail electricity bill on average across Europe.

As companies act as collectors of governments’ money (including VAT, funding of generation technologies, energy efficiency schemes, etc.), the increasing weight of fiscal and policy-related fees magnifies the costs and financial liabilities that electricity companies – and ultimately customers – bear in case of bills’ non-payment.

The consequences in terms of physical and psychological health are important. The annual burden of cardiovascular and pulmonary mortality and morbidity which is attributable to the effects of exposure to indoor low temperature, is significant. The use of inappropriate heating, especially when ventilation is inadequate, puts people at risk of intoxication by carbon monoxide.

Access to clean and affordable energy should be a priority in Europe. The power sector recommends several actions to address the issue, including better assessment of the impact of new policy initiatives at EU level. Any new energy policy initiative at EU level should be subject to an impact assessment complemented by a cost-analysis to make sure that consumers will not bear disproportionate risks and unintended consequences. Further, using social policy to ensure that essential services are met, promoting energy efficiency (e.g. through financing schemes), and increasing the transparency of bills are important measures.

To read more: <http://fuelpoverty.eu/> [accessed 2014 November 12th]

## Idiopathic Environmental Hypersensitivity (IEI)

According to the WHO<sup>2</sup>, IEI includes symptoms as variable as redness, tingling, a burning sensation in the face, fatigue, tiredness, lack of concentration, dizziness, nausea, heart palpitations, headache and digestive complaints. However, it is important to emphasise that a physical examination will not detect any objective signs and, similarly, laboratory tests do not show any abnormalities which could be linked to the symptoms.

IEI can be particularly related to EMF exposure, since people will report symptoms that they believe are triggered by exposure to EMF (HV lines, transformers, relay antennas, cell phones, microwave ovens, etc), but others associate their symptoms with exposure to chemicals (at concentrations that are well below toxic thresholds) or to indoor air (in the context of sick building syndrome).

The great majority of the double blinded studies that have been conducted on this topic have provided a clear cut response to the following question, “Do people with IEI-EMF display physiological effects when exposed to EMF?” At present, the answer is that there is no reliable evidence to support the hypothesis<sup>34</sup>.

Importantly, in such studies, the actual distances to mobile phone base stations and to power lines did not predict non-specific physical symptoms<sup>5</sup>. However, psychological factors (such as imagined perception of environmental sensitivity, lack of control, avoidant coping style) and demographic and home aspects were significantly associated with non-specific symptoms.

It is, nevertheless, a fact that, as a minimum, these symptoms reflect psychological suffering and this should be taken carefully into account and receive proper attention.

To read more: <http://www.who.int/peh-emf/publications/facts/fs296/en/> [accessed 2014 November 12th]

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<sup>2</sup> WHO fact sheet no 296 and [http://emfandhealth.com/WHO\\_EMSensitivity.pdf](http://emfandhealth.com/WHO_EMSensitivity.pdf)

<sup>3</sup> Rubin GJ – Bioelectromagnetics 2011

<sup>4</sup> SCENHIR Health effects of exposure to electromagnetic fields (EMF). 2013

<sup>5</sup> Baliatsas C et al: <http://www.biomedcentral/1471-2458/11/412>

## Ionising Radiations

The most obvious use of ionising radiation in the electricity industry is generation utilising nuclear power where there is the potential for exposure through the commissioning and refuelling of the nuclear reactor, operation and maintenance and exposure to waste products. There are, however, other potential exposures to employees, for example, from industrial radiography. Concerns have also been raised about potential health effects on residents living close to nuclear power plants.

Ionising radiation can be in the form of alpha particles, beta particles, gamma rays (including x-rays) or neutron radiation. Exposure is extensively controlled through legislation with a strict hierarchy of dose limits in place and radiation doses to individuals are frequently assessed. There is a hierarchy of legislation in place based on the Basic Safety Standards Directive 96/29 with legal requirements for classification of workers who may be exposed to higher levels of radiation and who will require appropriate health surveillance.

Radiation workers may be *directly exposed* to radiation (gamma/neutron) or *contaminated* internally/externally with radioactive particles. The principal protective techniques are based on time, distance and shielding.

The exposure route for the public residing near nuclear power stations is through radioactive discharges, which are very tightly regulated.

The main effect of ionising radiation is to damage DNA in cell nuclei which can lead to mutation or cell death. Mutation may lead to cancer or genetic effects and there is, in theory, no threshold (termed stochastic effects) for this, whereas cell death is can in extreme cases cause damage to organs. Organ damage, therefore, has a threshold and such effects are classed as deterministic. They require a relatively high radiation dose.

Routine work with ionising radiation generally involves exposure to very low doses with an equally small risk of long term cancer and this forms the basis of occupational dose limits, the risks equating to those found in other (non-radiation exposed) occupations. Risks are calculated by international bodies such as ICRP, BEIR and NRCP from analysis of epidemiological data largely from the A-bomb survivors but also encompassing studies on occupational groups. Radiation dose is measured in Gray (Gy), which is converted to Sieverts or more usually in millisieverts (mSv) for dose exposure and this is then used to calculate cancer risk. The two are identical for beta and gamma radiation.

- For radiation workers:  
Legal dose limits are 20 mSv per year although different levels apply to younger workers, pregnant women and for body exposures. The average annual dose for those working on nuclear reactor sites is normally less than 5 mSv.
- The public dose limit:  
The public dose limit is 1 mSv per year and discharge authorisations ensure that public exposure is well below this. The general population receives the highest dose from natural radiation, mostly from radon. Frequent air travellers receive a dose from cosmic rays that can average 3mSv per year.

High dose deterministic effects would normally occur at levels over 500 mGy which would only be seen in the event of an accident. This predominantly affects radiosensitive tissues, usually those dividing rapidly such as the haemopoietic (blood forming) system, skin and cells of the small

intestine. However, long term low dose exposure can result in formation of cataracts in the posterior pole of the eye.

Stable iodine prophylaxis is useful in preventing the uptake of radioactive iodine into the thyroid gland and remains one of the key countermeasures that would be implemented in the event of a nuclear accident. It is predominantly of benefit in preventing thyroid cancer in children and young people. Arrangements are normally in place for stable iodine to be issued automatically to workers and residents living close to nuclear power stations in the event of any accidental release.

To read more:

- <https://www.osha.gov/SLTC/radiationionizing/index.html>
- [http://www.arpansa.gov.au/pubs/factsheets/017is\\_ionisingRadiationHealth.pdf](http://www.arpansa.gov.au/pubs/factsheets/017is_ionisingRadiationHealth.pdf) [accessed 2014 November 12th]



## Legionellosis

Legionellosis is a potentially fatal infectious disease caused by bacteria belonging to the genus *Legionella*, mainly *Legionella pneumophila*, a ubiquitous aquatic organism that thrives in temperatures between 25 and 45°C (77 to 113°F).

Legionnaires' disease is acquired by inhalation of aerosols of water containing *Legionella*. Ingestion of water and person-to-person contact do not cause an infection. The bacterium is widely distributed in water and soil and almost all natural water sources contain *Legionella* so their presence should not be taken as an indication of a problem. However, it can grow in water services in buildings such as air conditioning systems, showers, whirlpool baths and indoor ornamental fountains.

The essence of preventing *Legionella* is good facility design, control of water flow and temperature and cleanliness. Cold water storage tanks should be covered, insulated against heat and kept clean. The temperature in warm water systems should be kept above 55°C and draw off temperatures less than 50°C. Disinfection can be achieved by superheating the water system regularly to temperatures higher than 70°C or through hyper-chlorination of the water. Cooling towers need regular cleaning and treatment with biocides and regular monitoring.

There has been no reported case of legionnaires' disease occurring from a power station natural up draught cooling tower. Nevertheless, such towers should be maintained according to the Country regulations and treatment with a biocide (which not only inhibits growth of legionella but also limits fouling with operational benefits) should be regularly monitored. During cooling system cleaning, respiratory protection should be used.

Read more:

World Health Organization. *Legionella and the prevention of legionellosis*. Available from: [http://www.who.int/water\\_sanitation\\_health/emerging/legionella.pdf](http://www.who.int/water_sanitation_health/emerging/legionella.pdf) [accessed 2014 October 17th].

<http://www.cdc.gov/legionella/top10htm>

Centers for Disease Control and Prevention. *Legionella (Legionnaires' Disease and Pontiac Fever)*. Available from: <http://www.cdc.gov/legionella/index.html> [accessed 2014 October 17th].

[http://www.hpa.org.uk/webc/HPAwebFile/HPAweb\\_C/1274093149925](http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1274093149925)

European Guidelines for Control and Prevention of Travel Associated Legionnaires' Disease.

The European Working Group for *Legionella* Infections. *EWGLI Technical Guidelines for the Investigation, Control and Prevention of Travel Associated Legionnaires' Disease*. Available from: <http://ecdc.europa.eu/en/activities/surveillance/ELDSNet/Documents/EWGLI-Technical-Guidelines.pdf> [accessed 2014 October 17th].

## Medical Ethics

Views on ethical conduct in occupational health practice can vary from country to country and even between occupational health practitioners. This article attempts to find common ground by considering different sets of guidance from a number of national or European organisations of occupational health (OH) professionals.

Within occupational health (OH) practice, there are many ethical challenges; unlike most medical specialities where the practitioner's duty is to the patient and sometimes to society as a whole. Occupational health introduces an additional duty to the employer and, therefore, there is a greater potential for conflicts of interest to arise. As a consequence, ethical codes and their practical implementation become very important.

This chapter only focuses on ethical issues which arise at the interface between management and OH professionals. Ethical principles, which determine internal OH policies and procedures, are not discussed.

### Health

It is essential that the occupational health practitioner has credibility and the trust of the employees. The responsibility to employees is a professional duty of care which must always take priority; this does not mean OH professionals will always side with the employee but that clinical issues are given primacy. In practice, what is best for the employee is usually best for the employer although this might not be self-evident in every case. The OH professional must act impartially, not just because this is an ethical requirement but because it is the only way of acquiring the trust and co-operation of management and employees.

Formal fitness for work health assessments are performed on employees in specific occupations (or who undertake certain tasks). The OH professional will provide a statement of the employee's fitness (including, if need be, recommendations for workplace adjustments) but not disclose the details of any medical condition.

Where pre-employment health assessments are performed, these should be limited to the chosen candidate and not used to exclude potential employees during the selection process. Health questionnaires should only be read by OH clinical staff when assessing fitness. OH professionals will take account of any disability legislation which aims to prevent discrimination on health grounds.

When an employee is referred to the OH department for a report on his/her fitness for work (including to return to work if off sick), this must be done with consent of the employee. As a minimum, the manager must ensure the employee understands both the manager's "problems" with the employee and the questions he/she wishes answered. In some countries, it is a requirement for these to be clearly set out in writing and sometimes for the paperwork to be signed by both manager and employee, the purpose being to ensure there is clarity and openness over the referral process. The employee will be made aware by the health professional of the contents of the medical report and, depending on local practice, may be provided with a copy.

### Occupational Health staff – duty of confidentiality

Any information provided by the employee to an OH professional in a clinical encounter is confidential and will not be divulged by the health professional to the employer. Where OH teams include non-clinical staff (for example, in an administrative or management role), they should receive training in medical confidentiality and sign a confidentiality agreement as a condition of employment. It is recommended that, through appropriate publicity, all employees are made aware of the confidentiality of clinical consultations and the information contained in their Occupational Medical Record.

### The medical record

Medical records are confidential to the OH department and to the employee who is the subject of the record. Others, including managers, employee representatives, and HR or company lawyers may not see any part of the record. Whilst in some countries legal practices may allow them to access the information if they obtain written consent from the employee, it would be normal for the employee to refuse to provide such consent and he/she must not suffer any adverse consequences as a result of doing so.

Managers should be aware that correspondence about an employee between themselves and OH professionals will be placed in the individual's medical record and, therefore, could be accessed by the employee.

OH services frequently make use of information technology (IT), for example, for scheduling appointments, recording information on individuals' health and illness and creating and storing medical reports. In some cases, entire occupational medical records are computerised. The setting up and maintenance of such electronic systems allows IT specialists to have access to confidential medical information. For this reason, the number of such specialists should be kept to a minimum and each should be briefed about confidentiality and required to complete a confidentiality agreement.

### Obligations towards the Company

OH practitioners must, to the best of their ability, treat company information as confidential and abide by company rules that apply to all employees.

### Alcohol and Drugs

Workplace alcohol and drug testing is becoming more common in Europe but it brings with it many ethical issues. Whenever testing is introduced it is key that workforce representatives are involved in the planning and preparation and then all affected employees must be made aware of the circumstances when they could be tested. There may need to be revisions to employment contracts or a letter sent in order to inform every employee. The results of testing constitute sensitive personal data and, therefore, must be kept confidential and shared with as few people as possible. Decisions to test "for cause" and "post incident" must be made objectively and in an even-handed manner. The same applies to any sanctions which follow a positive test; in similar circumstances, to dismiss one employee but offer another a rehabilitation programme would be unfair and potentially unethical.

To read more:

[http://www.icohweb.org/site\\_new/multimedia/core\\_documents/pdf/code\\_ethics\\_eng\\_2012.pdf](http://www.icohweb.org/site_new/multimedia/core_documents/pdf/code_ethics_eng_2012.pdf)  
[accessed 2014 November 12th]

## Musculoskeletal Disorders (MSD)

Musculoskeletal disorders are very common in the general population and, although they may impinge on an employee's ability to perform their job, attributing the cause to work is often problematic. This is partly because many factors are usually involved in their aetiology but also because hard scientific evidence linking specific conditions to work is often lacking. Most studies attempting to establish the part played by occupation or activities fail to quantify "exposure" with sufficient accuracy and often lack strict criteria for defining the medical condition. As a result, a broad range of conditions is often included in any scientific review.

MSD is a wide ranging term but, in the context of work, it usually encompasses:

- Low back pain – generally with no specific pathology and termed "mechanical". Less commonly, it is due to a prolapsed disc with pressure on emerging nerve roots and, more rarely, can be due to serious disease such as cancer.
- Chronic neck pain – a vague term and only sometimes associated with findings on clinical examination (such as tenderness).
- Upper limb pain (somewhere between shoulder and the fingers).
- Knee osteoarthritis.
- Foot disorders.

Note: Low back pain from whole body vibration is covered in a separate chapter.

### Upper limb pain

Upper limb pain can be divided into two broad groups. First, there are specific conditions, each with characteristic symptoms and physical signs on examination. Examples are carpal tunnel syndrome (CTS), tenosynovitis and epicondylitis of the elbow ("golfers' or tennis elbow" depending on the side affected). There is scientific evidence linking both carpal tunnel syndrome and epicondylitis (whether outer or inner) with repetitive use of the hands especially if the forces involved are high. Contrary to popular belief, use of display screen equipment has not been linked with CTS in scientific studies but there is an association between this condition and hand transmitted vibration, as occurs when using vibrating tools. Second are non-specific upper limb disorders where the individual complains of persistent pain and restricted movement sometimes with a sensation of swelling and/or numbness and tingling but no formal diagnosis of well recognised condition can be made. In such cases, it is not disputed that the person has symptoms which can impact on their ability to do their job but they will often attribute their symptoms to their particular work.

Despite the limited evidence linking activities or occupations with upper limb MSDs, it is generally recommended that good ergonomic practice should be followed in order to prevent and, where necessary, help alleviate MSDs in the workplace. Ergonomic theory advocates:

- Minimising work effort by adopting good postures which allow strong muscles to contribute to the work
- Avoiding prolonged static loading
- Minimising the magnitude of forces that have to be applied
- Ensuring the tool fits the worker
- Ensuring the tool is fit for purpose and correctly maintained
- Avoiding repetition of the same movements as much as possible
- Allowing adequate rest breaks
- At the wrist, avoiding forceful twisting, rotation or side to side movements
- Avoiding highly flexed (bent) fingers and wrists

- Minimising workplace environmental hazards such as poor lighting, temperature control and layout
- Reducing workplace psychosocial risk factors, e.g., by ensuring a good standard of supervision, providing individuals with more control over their work and avoiding tight deadlines.

Work caused upper limb MSDs are believed to be relatively uncommon in the electricity sector because repetitive work involving large amounts of force and high frequency of movement is unusual. This is in contrast to a production line job, for example, in the manufacturing sector.

#### Low back pain

The relationship between low back pain and work is complex. There is strong evidence linking certain physical demands (manual handling, lifting, bending and twisting) with the acute onset of low back pain or back “injury”. There is also strong evidence of an association between these demands and symptoms of low back pain and the exacerbation of existing pain. However, this does not mean the association is causal. In both situations, non-occupational factors (such as psychosocial pressures, poor posture) are more important.

Whilst the scientific evidence for a benefit from workplace interventions is weak, it is good practice to control the following risk factors:

- Minimising the weight of loads and the frequency of lifting.
- Minimising the distance from the hands (on the load) and the low back.
- Reducing the vertical distance the load must move.
- Minimising the degree of rotation and sideways bending of the back.
- Maximising the space around the individual performing manual handling.
- Ensuring a good grip on the load to be lifted.
- Reducing workplace psychological factors.

#### Knee Osteoarthritis

There is reasonably good evidence linking this condition with climbing, kneeling, squatting and lifting.

#### Foot Problems

Plantar fasciitis (a major cause of heel pain) is associated with regular prolonged walking especially case of overweight.

#### Prevention and Early Identification

MSDs should be managed by a preventive approach using risk assessments which consider the factors listed above.

Formal scoring tools are available for this purpose. Where the risk is judged to be unacceptable, possible interventions include modified job design, job rotation, employee training and regular breaks where the work is repetitive.

Employees should also be informed of the need to report relevant symptoms early so that the risk assessment can be reviewed, treatment arranged promptly and workplace adjustments made to allow a recovery to take place. These are likely to include a reduction in the frequency of repetitive movement, the force applied and total duration of the work.

To read more: [https://www.osha.europa.eu/en/topics/msds/index\\_html](https://www.osha.europa.eu/en/topics/msds/index_html) [accessed 2014 November 12th]

## Noise

Noise induced hearing damage is of slow, insidious onset and often unnoticed by the worker until serious hearing loss has been sustained, which is permanent and irreversible. It is a most disturbing condition disproportionately damaging the consonant range first, allowing only some of the components of speech to be heard resulting in the loss of the ability to communicate.

Major sources of noise in the electricity industry are the following:

- Proximity to turbines
- Pumps
- Fans
- Workshop
- Hand held machines (e.g. compressor tools, chain saws and drills)

The exposure of workers to noise is subject to the national provisions implementing Directive 2003/10/EC on the exposure of workers to the risks arising from noise. This Directive sets exposure limit values (L EX 8 hours = 87 dB(A) and peak = 200 PA) and exposure action values in respect of the daily noise exposure levels and peak sound pressure levels exposure. The Machinery Directive does not set noise emission limits, but requires manufacturers to reduce risks due to noise emission to the lowest level, taking account of technical progress and the available means of reducing noise.

Companies should not require employees to work in an environment in which they are exposed to a noise level exceeding 87 dB(A) daily without appropriate protective measures. Where the noise level cannot practically be reduced below 85 dB(A), companies should indicate noisy zone areas through signs and prohibit any person from entering without protective equipment. Hearing protection devices must be provided free of charge to exposed employees and their correct use must be enforced and controlled. The reduction of risks arising from noise exposure must be based on the general principles of prevention set out in the Framework Directive and the more specific provisions in the 2003 Noise Directive.

Audiometric tests should be conducted in a pre-employment situation and at regular intervals for all employees who enter areas where noise exposure limits are exceeded.

Noise-source control is the only universally successful hearing conservation measure and should receive top priority from managers. Personal protection should not be seen as an easy alternative to implementing noise-source control.

To read more: [http://www.who.int/occupational\\_health/publications/occupnoise/en/](http://www.who.int/occupational_health/publications/occupnoise/en/) [accessed 2014 November 12th]

## Pandemic Preparedness

The spread of avian flu from Asia to Europe in 2005 and 2006 as well as the worldwide pandemic of swine flu in 2009 have shown very clearly that pathogenic agents are able to spread worldwide very fast due to increased geographical mobility of people. Medical science finds itself in a race against time to protect the general public through measures to limit the spread of infection along with vaccination and drug treatment (when available and effective).

Due to the rapid spread of infection, it is essential that companies responsible for services to the public, which energy companies belong to first and foremost, take measures to protect their employees and to ensure the continuation of electrical power supplies.

Preparation for these goals is based on three principles:

### **1. Implementation of internal measures as set out in an emergency plan, prepared in advance**

An emergency plan must be co-ordinated and agreed by all the responsible departments (Occupational Health, Occupational Safety, Human Resources, Facilities, the Legal Department and Corporate Communications). This plan has to pay special attention to all critical infrastructures necessary to ensure the electrical power supply continues. The plan should ensure, where possible, that employees avoid gatherings, meetings and working closely together and that arrangements are made for the rapid transfer home of anyone becoming ill at work.

### **2. Provision of personal protective equipment**

Adequate personal protective equipment must be provided for those employees whose role brings them into contact with infectious people. Examples include Occupational Health staff, First Aiders and those who visit members of the public in their homes. Depending on the infectivity of the particular influenza virus, it may be necessary to consider how to protect other employees. Furthermore, disinfection strategies must be implemented.

### **3. Provision of medications prophylactically and for treatment**

Depending on national regulations and Government advice, the supply of medication, if required, should be provided by the national health care system. In some specific circumstances, internal company distribution would be needed, including the provision of medication for both prophylactic and therapeutic use.

To read more: [https://www.osha.gov/Publications/OSHA\\_pandemic\\_health.pdf](https://www.osha.gov/Publications/OSHA_pandemic_health.pdf) [accessed 2014 November 12th]

## Particulate Matter<sup>6</sup>

Over the last twenty years, in Europe, air pollution has been reduced considerably following the implementation of policies which aimed to reduce industrial emissions including particulate matter, sulphur dioxide and nitrogen oxides. In spite of this, the recorded levels of air pollution have still been associated with adverse health effects ( mainly respiratory and cardio – vascular effects). Even if the actual predominant source of outdoor air pollution is transportation, stationary power generation, industrial and agricultural emissions, and residential heating and cooking are also of importance.

Particulate air pollution is a complex mixture of solid, liquid or solid and liquid particles suspended in the air.

“Primary” particles are directly emitted by natural sources (volcanoes, sea spray and aerosols, wind erosion, forest fires, etc) or anthropogenic sources (combustion, etc).

“Secondary” particles are formed in air by complex, homogeneous and heterogeneous chemical processes, in particular from gaseous precursors such as SO<sub>x</sub> and NO<sub>x</sub> (sulphur and nitrogen oxides), (NH<sub>3</sub>) ammonia and organic compounds present in air.

The size of the particles is one of their important characteristics because it determines their residence time in the air as well as how far they penetrate into the respiratory tract and whether they remain there.

There are typically three classes of particles:

- The “ultrafine particles” (UFP) with a median aerodynamic diameter of less than 0.1µm, result from the nucleation process (formation of solid particles or liquid droplets from gaseous precursors)<sup>7</sup>. Their duration is short because they increase in size through coagulation with other particles. These UFP which penetrate deeply into the respiratory tract, reach the alveoli and can cross the respiratory barrier. They can also cross other biological barriers, such as the placenta and blood-brain barrier and, as a result, can be distributed across the whole body.
- The “fine particles” with a median aerodynamic diameter of less than 2.5 µm (PM<sub>2.5</sub>), are generally formed by coagulation phenomena due to collisions between smaller particles formed by nucleation, and also gas condensation on the particles. In the respiratory tract, they are deposited in the tracheobronchial region but also reach the alveoli.
- The metal content, and presence of polycyclic aromatic hydrocarbons (PAHs), other organic components and endotoxins, have been found to be major contributors to the toxicity of small particles

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<sup>6</sup> The nanoparticles are the subject of a specific sheet

<sup>7</sup> Homogeneous nucleation and heterogeneous nucleation involve the conversion of vapour phase materials to a particulate form. In both cases, the vapour-containing gas streams must cool to the temperature at which nucleation can occur, (the dew point). Each vapour phase element and compound has a different dew point. Therefore, some materials nucleate in relatively hot gas zones while others remain as vapour until the gas stream is cold.

Homogeneous nucleation is the formation of new particles composed almost entirely of the vapour phase material. The formation of particles by homogeneous nucleation involves only one compound.



- The “coarse particles” with a median aerodynamic diameter between 10 µm and 2.5 µm are most often formed by mechanical processes (road dust produced by traffic, erosion, etc) and their composition is generally that of the original material. They can only penetrate the respiratory tract as far as the bronchi. They have also been associated with health effects.

*Note:* the term PM10 refers to all particles with a median aerodynamic diameter of less than 10 microns. They come from agriculture/forestry, manufacturing, residential and road transport sources.

Note also: the abbreviation TSP (total suspended particulate matter) refers to the total mass of suspended particles and usually includes the particles up to a diameter of about 40 microns.

The short-term effects of exposure to particles relate to overall mortality and, in particular, deaths from cardiac and pulmonary disease and to morbidity – aggravation of chronic bronchitis, asthma or cardiac diseases.

Asthma has been considered a sensitive marker of pollution effects. Whilst it can be aggravated by air pollution levels (and not necessarily particulate pollution), its incidence has not been observed to increase as a function of pollution. It is, therefore, likely that pollutants play a limited role in influencing respiratory function, relative to other factors, not all of which are now known.

Studies show that long-term exposure to particles (especially PM 2.5) has negative impacts on cardiac and respiratory health. A number of assumptions have to be made when estimating the size of the association, but there is little doubt that a reduction in particulate air pollution would have health benefits through increased life expectancy and reduced mortality.

It is not clear whether it is the size of the particles per se or their chemical composition which is more responsible for the health effects. There may also be an effect from potentially toxic pollutants adsorbed onto the particles, examples being, elemental carbon such as carbon black, heavy metals, organic compounds such as PAHs and endotoxins. Not all components of particulate matter are equally harmful. For example, neither toxicological nor epidemiological studies have provided any conclusive evidence that nitrate particles contribute to the adverse health effects of particulate matter at the concentrations experienced in Europe.

Since gaseous pollutants are commonly correlated with particles, but the toxicity of particles by itself has been demonstrated by epidemiological and toxicological studies, our knowledge about health effects (for both short-term and long-term exposures) of ultrafine particles (UFP) is still limited but research suggests they are no more toxic than other fractions.

Across the EU, due to stringent regulations (for example, use of Best Available Techniques for pollution control under the IED Directive since 2011), fossil-fuelled power plants emit very small quantities of PM2.5 (as primary particles) directly to the atmosphere (less than 3% of all primary PM2.5 emissions). However, although emissions have declined substantially, power stations are still significant contributors to emissions of SO2 and NOx that can form secondary particles in the atmosphere. Secondary fine particles in power station plumes are likely to consist predominately of soluble ammonium sulphate and nitrate.

To read more: <http://www.greenfacts.org/en/particulate-matter-pm/index.htm> [accessed 2014 November 12th]

## Shift Work

Shift work (involving night work) is unavoidable in many industries and particularly in the electricity industry, due the fact that electricity should be provided uninterruptedly throughout the year (healthcare, industrial manufacturing and transports are also largely concerned).

Some consider that 15-20% of the working population in Europe and in the USA is engaged in shift work. On the other hand, shift work (and mainly night work that is the most disruptive for the circadian rhythm) is physically and psychologically demanding and can have negative impacts on the health of a shift worker.

### **Work time may be organised into various basic types of shift systems.**

In general, a distinction may be drawn between permanent shift systems and alternating shift systems. Many human functions fluctuate around a rhythm of about 24 hours, called the circadian rhythm. Shift work can impair employees health either directly, through the disruption of the circadian rhythm i.e. through the suppression of melatonin secretion (due to exposure to light at night), or indirectly, through a change in other habits or psychological factors. The most important problems are: sleep disturbances manifesting as primarily fatigue, bad dietetic habits, substance abuse and psychosocial issues. An increased female breast cancer incidence among the employees has consistently been showed in epidemiological studies. As a consequence, the International Agency for Research on Cancer (IARC 2007) has classified shift work a probable cause of breast cancer (class 2A): There is limited evidence in humans for the carcinogenicity of shift work which involves night work. There is sufficient evidence in experimental animals for the carcinogenicity of light during the daily dark period (biological night). Shift work which involves circadian disruption is probably carcinogenic to humans (Group 2A).

The effects of night work can also impact safety at work.

### **A great number of countries have implemented guidelines for or national legal requirements for shift work to reduce health and safety problems for employees.**

The number of night shifts worked in succession should be as low as possible, with at least a 48h break provided after a sequence of night's shifts before there is a return to day work.

- It should be necessary "to record precisely in a systematic fashion shift work schedules and the time actually spent in such regimes".
- "Occupational physician should be informed about the IARC classification and should consult with shift work researchers about what shift work regime is the most favourable with regard to reducing or eliminating chronodisruption and as how to persuade shift workers of the necessity of such regimes."<sup>8</sup>
- Employees who are working on alternating shifts or regular night shifts should be under occupational health supervision. They should be given adequate information about possible problems arising from shift work and the appropriate action needed to overcome them.

Read more:

IARC. Painting, Firefighting, and Shiftwork. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Volume 98. 2010. Available from:

<http://monographs.iarc.fr/ENG/Monographs/vol98/mono98-8E.pdf> [accessed 2014 October 17th].

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<sup>8</sup> Scand J Work Environ Health 2009 ;35:74-79

## Stress and Well Being at Work

Stress per se is not an illness but it can be manifested in a number of ways including behaviour change and mental or physical ill health. No definition is perfect but perhaps it can best be described as how we feel when there is an imbalance between the perceived pressures upon us and our perceived ability to cope. Whether a particular pressure leads to stress will vary from one person to another and depends on two key factors: individual personality and acquired coping skills. Fortunately, few employees become seriously ill with mental or physical ill health as a result of work-related stress, however, beneath this small group are many more who take multiple short spells of absence and an even greater number who are not performing optimally.

It is estimated that productivity in an individual experiencing stress declines by between 30 and 50%. Companies also face the risk of legal action from staff which have developed mental ill health as a manifestation of occupational stress and then decide to sue for breach of duty of care. A personal injury claim in this area could harm a company's image. There is also the cost of ill health retirement if the illness is thought to be long term and no suitable alternative work can be found non-work related stress could also have an important impact although it is important to recognise that most stress results from the combination of work and non-work pressures (termed stressors).

### Potential stress factors:

demands of the job, e.g. workload, time deadlines; lack of control; role issues, e.g. lack of role clarity, excessive responsibility; perceived injustice, e.g. feeling of being treated unfairly, lack of autonomy, poor communications; relationships, e.g. with superior, staff or customers; harassment; change, e.g. uncertainty, rapid and repeated change; career issues, e.g. lack of appropriate training, fear of redundancy; the home - work balance, e.g. difficulty in striking a balance.

Company managers should deal with stress by controlling the stress hazards, improving communication with employees; improving participation in decision making; providing more autonomy; and reducing uncertainty about the future of job and working organisation

Read more:

Blaug R, Kenyon A, Lekhi R. Stress at work. A report prepared for The Work Foundation's Principal Partners. The Work Foundation, 2007. Available from:

[http://www.theworkfoundation.com/DownloadPublication/Report/69\\_69\\_stress\\_at\\_work.pdf](http://www.theworkfoundation.com/DownloadPublication/Report/69_69_stress_at_work.pdf)  
[accessed 2014 October 17th].

## Vibration

Vibration has different effects depending on the frequency, the intensity of vibration, the part of body exposed and individual and climate factors.

Exposure transmitted via the upper limbs such as from hand held electric drills, grinders, nut runners, chain-saws, can cause Hand-Arm Vibration Syndrome, affecting the upper limbs, blood vessels and nerves of the arms. The prevalence increases as the vibration intensity and exposure time increase. Also low temperature and smoking affect the development of problems. Principal symptoms are: temporary sensation loss with or without tingling which persist after cessation of tool use, blanching of the finger tips on exposure to cold and damp and sometimes pain in upper limb muscles and joints. Cumulative exposure can prolong the sensory loss, which in extreme cases can become permanent.

The solution to address this problem is risk assessment as required by the Physical Agents Vibration Directive (2002/44/CE). Measurements of vibration intensity from specific tools are required along with the recording of “trigger time” by employees. The need to implement control measures will depend on whether the Exposure Action Value (EAV) or Exposure Limit Value (ELV) are exceeded. Steps include: elimination or damping of vibration at source together with regular tool maintenance; choosing proper tools with low vibration; reducing exposure time e.g. through operator rotation;; use of special gloves, appropriate clothing against moist and cold; training of workers and supervisors on the nature of the risk and its control.

Whole Body Vibration (WBV) is also covered by the Directive. In the electricity sector it can result from some driving activities such as operating coal moving scrapers, tractors and all-terrain vehicles. WBV can play a part in the causation of low back pain although it is difficult to quantify its contribution because of the multifactorial nature of this condition, including poor posture. It can also aggravate existing low back pain. Risk assessment may necessitate measurements of WBV; and the need for subsequent control measures will depend on whether the EAV or the ELV are exceeded. Interventions include the selection of suitable seats, proper maintenance, avoidance of driving on unsuitable surfaces and driver training.

Read more:

Nelson CM, Brereton PF. The European Vibration Directive. *Industrial Health* 2005; 43: 472-479. Available from: [www.jniosh.go.jp/en/industrial\\_health/pdf/43-3-11.pdf](http://www.jniosh.go.jp/en/industrial_health/pdf/43-3-11.pdf) [accessed 2014 October 17th].

Griffin MG. Minimum health and safety requirements for workers exposed to hand transmitted and whole body vibration in the European Union - a review. *Occupational and Environmental Medicine* 2004; 61: 387-397. Available from: <http://oem.bmj.com/content/61/5/387.full.pdf+html> [accessed 2014 October 17th].

## Welding

Welding, and similar processes such as cutting and jointing, can be associated with exposures to fumes, dust, gas and steam with irritant properties, sensitizing agents leading to asthma, substances leading to intoxications, carcinogenic agents and ultraviolet rays. Exposure to these agents can lead to acute or chronic and irreversible diseases of the upper and lower respiratory tract, intoxications and skin disease. A slight increase in risk of cancer of the respiratory tract has been observed with welding procedures involving exposure to nickel and hexavalent chrome compounds especially in stainless steel workers.

Diseases linked to emissions from welding, cutting and jointing:

- Acute exposure : upper airways; chronic bronchitis; metal fume fever; toxic pneumonitis; pulmonary oedema a type of pneumonia especially but not solely in aged workers who smoke, and occasionally this disease can be fatal; skin disease due to contact with chrome compounds.
- Asthma; stainless steel fume has chromium oxide (CrO<sub>3</sub>) and Nickel Oxide in it. Both these chemicals can cause asthma. For this reason, stainless steel welding fume is considered more harmful than mild steel fume.
- Cumulative exposure can lead to Chronic Obstructive Pulmonary Disease (COPD) and may eventually lead to severe respiratory failure
- Fixed or mobile exhaust ventilation systems should ensure that the occupational hygiene limits are respected. If the technical ventilation is unsatisfactory, or if the installation of such ventilation systems is otherwise impractical, suitable breathing apparatus should be used. A welding visor is also necessary to protect from ultraviolet and infrared radiation. Welding fume is internationally classified as possibly carcinogenic to humans (IARC classification group 2B). Primarily associated with stainless steel welding, this classification is not limited to stainless steel fume, it covers all welding fume.
- Noise and vibration and manual handling even non-specific to the welders have also to be taken into consideration for periodic examination.

The pre-employment examination for welders should include case history, clinical examination and spirometric testing of lung function. If a person shows respiratory diseases such as asthma or chronic obstructive bronchitis, the company's health expert should advise on whether employment as a welder should proceed.

The frequency of any periodic examinations depends principally on the welding procedures used, the exposure levels and local regulations. Given the increased risk of pneumococcal pneumonia, considerations should be given to the routine vaccination of all who perform any welding as part of their role. Occupational health experts will advise on this issue. Managers should provide workers with appropriate information, instruction, training and Personal Protective Equipment (PPE).

Read more:

Appl Occup Environ Hyg. 2000 Dec;15(12):936-45. Occupational health concerns in the welding industry. Korczynski RE. Workplace Safety & Health Branch, Manitoba : accessed 2014 November 12th

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