**PUBLIC CONSULTATION ON ELECTROMAGNETIC FIELDS AT WORK**

Draft MCA Guidance on the Merchant Shipping and Fishing Vessels (Health and Safety) (Electro-magnetic fields) Regulations 2016

**What does this guidance contain?**

Information to help you as a shipowner:

* decide what you may need to do to protect seafarers from the risk arising from exposure to electromagnetic fields (EMFs),
* understand what you need to do to comply with the Merchant Shipping and Fishing Vessels (Health and Safety at Work) (Control of Electromagnetic Fields at Work) Regulations 2016,
* identify if EMFs in your workplace could be hazardous and if so, if there could be any risk of harm, and
* assess and control any risks from EMFs in the workplace.

It will also be useful to safety officers and safety representatives and others with responsibility for health and safety.

**Note:**

**Whilst shipowners will now have to assess seafarers’ exposure to EMFs, the majority will not need to take any additional action to reduce the risk from EMF**. This is because either the levels of EMF are below Action Levels stated in the Regulations, and detailed later in this guidance, and where seafarers may be exposed to higher levels of EMFs, shipowners or employers should already assess and manage the associated risks.

**1. What is an electromagnetic field (EMF)?**

An EMF is produced whenever a piece of electrical or electronic equipment (i.e. TV, food mixer, computer mobile phone etc.) is used.

EMFs are static electric, static magnetic and time varying electric, magnetic and electromagnetic (radio wave) fields with frequencies up to 300 GHz.

EMFs are present in virtually all workplaces and if they are high enough, you may need to take action to ensure your workers are protected from any adverse effects.

**2. Effects of EMFs in various frequency ranges and related industries/uses:**



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|  | **Why could EMF be an issue?**  Exposure to high levels of EMFs can give rise to short term effects that may be irritating, unpleasant or harmful.  The effects that occur depend on the frequency range and intensity of the EMFs to which a seafarer is exposed.  **What are the effects?**  EMFs at different frequencies affect the human body in different ways causing sensory and health effects, indirect effects can also occur; these are caused by the presence of an object in an EMF which may become the cause of a health and safety hazard. See table 1 below.  **Table 1:**   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | | **Field & frequency range** | **Effects** | **Examples of activities & equipment** | | --- | --- | --- | | **Static Electric**  **& Static Magnetic Fields**  0 – 1 Hz | **Indirect effects**: Uncontrolled attraction of ferromagnetic metals i.e. the risk of injury from objects in a large static magnetic field being attracted to magnets in the workplace and flying towards them.  **Sensory** **effects:**  Nausea, vertigo, metallic taste in the mouth, flickering sensations (magnetophosphenes) in peripheral vision.  **Health effects**: Micro shocks. | MRI scanners (Main magnet)  Electrochemical processes e.g. Industrial electrolysis, aluminium extraction.  Nuclear magnetic resonance  Spectrometers  Electro–magnetic lifting cranes  Electric vehicles (cars, underground trains) | | **Low frequency magnetic & electric fields**  1 Hz – 10 MHZ | **Indirect effects:**  Interference with active or passive implanted or body worn medical devices (more information is provided later in this guidance), electric shocks  **Sensory**  **effects:**  Nausea, vertigo, metallic taste in the mouth  **Health effects**:  Nerve stimulation, effects on the central & peripheral nervous system of the body. Tingling, muscle contraction, heart arrhythmia.  Contact currents caused by a person touching a conductive object in an EMF where one of them is grounded and the other is not which can result in shocks or burns. | High voltage power lines; Production and distribution of electricity;  Welding (arc & spot)  Electrical arc furnaces  Industrial induction heating (e.g. large coils used around the site of a weld)  AM & FM radio  Electric hand-held tools  Electric vehicles (cars, trains, trams, metros)  MRI (switched gradient fields)  Radio transmitters and antennae (eg GMDSS MF/HF) | | **High frequency fields**:  100 kHz - 300 GHz | **Indirect effects:**  Interference with active or passive implanted or body worn medical devices (more information is provided later in this guidance), electric shocks, causing electro-explosive devices to initiate, i.e. when used in close proximity to explosives that have an electrical means of initiation.  Sparks caused by induced fields triggering fires or explosions where flammable fuels, vapours or gasses are present.  **Sensory**  **effects:**  Auditory effects such as perception of clicks or buzzing caused by pulsed radar systems.  **Health effects:**  Thermal stress; heating effects leading to a rise in core body temperature or localised limb heating (e.g. knees or ankles).  Contact with charged conducting bodies can lead to RF shock or deep tissue burns. | MRI (RF coils)  Broadcasting & TV antennas  Radar(eg primary and secondary navigation radar)  Radio transmitters and antennae (eg GMDSS VHF, UHF for on-board communications, satellite communications)  Diathermy  Dielectric heating (e.g. vulcanising, plastics welding or microwave drying)  Anti-theft systems | | **Intermediate frequency fields**  100kHz – 10 MHz | Effects of both high & low frequencies can be experienced as detailed above. | Surgical diathermy  Broadcasting systems & devices (AM radio)  Anti-theft devices  Military & research radiofrequency systems | | |

**3. EMFs in the workplace**

Examples of equipment where EMFs are present can be found in tables A - D at Annex A of this guidance.

The information contained in these tables is non-exhaustive and should be used as a reference point; the individual circumstances should be considered and judgements made accordingly.

**4. Workplaces where it is unlikely that EMFs will be a risk**

Many sources of EMF in the workplace produce such low levels of EMF that it is likely - other than assessing exposure to EMF - the measures you already have in place to manage risks, will be sufficient to ensure seafarers are protected and meet the requirement of the Regulations.

Table A in Annex A contains a non-exhaustive list of equipment where EMFs are unlikely to pose a risk.

**5. Workplaces where EMFs may be a risk**

Table B in Annex A contains a non-exhaustive list of equipment where EMFs may pose a risk

Tables C and D in Annex A provide non-exhaustive lists of equipment where EMFs may pose a risk to workers at particular risk. (See section 12).

**6. What the law says**

The Regulations require employers and shipowners to:

* Ensure that exposure is below a set of exposure limit values (ELVs) – detailed later in this guidance;
* Assess the levels of EMFs to which seafarers may be exposed;
* Assess the risks of the seafarers’ exposure and eliminate or minimise those risks. You must ensure you take seafarers at particular risk, such as pregnant workers and anyone with active or passive implanted or body worn medical devices, into account. (More information is provided later in this guidance);
* Provide information and training on the particular risks (if any) posed to seafarers by EMFs in the workplace and details of any action you are taking to remove or control them. This information should also be made available to their safety representatives as appropriate; and
* Take appropriate action when employees are exposed to EMFs in excess of the ELVs.
* Provide health surveillance as appropriate

The Regulations also:

* Allow for the sensory effects ELVs to be exceeded when seafarers are adequately protected; and
* Allow MCA to exempt specific work activities from the ELVs where certain conditions are met. (More information is provided in section 13 of this guidance).

**7. Action Levels (ALs) and Exposure Limit Values (ELVs)**

The requirements in the Regulations are based on two sets of values related to EMFs: action levels (ALs) and exposure limit values (ELVs).

Shipowners need to ensure that the exposure of seafarers to EMFs is below the ELVs. ELVs relate to the levels of EMFs in the body; this is often difficult and expensive to measure directly. For this reason, a separate set of exposure values (ALs) have been produced, which can be measured more easily. ALs have two main purposes:

* Specific ALs may be used to demonstrate that electromagnetic field levels are below particular ELVs

If the AL is exceeded, it is still possible, and it is often the case, that the corresponding ELV will not be exceeded; further consideration and assessment is required to determine whether the corresponding ELV may be exceeded.

If the AL is exceeded and compliance with the ELVs has not been demonstrated, you must take action to ensure that, as far as is reasonably practicable, the risk from exposures is eliminated or minimised. Simple measures to reduce exposure may be the easiest way to achieve compliance e.g. by moving the person further away from the EMF source, or by installing screening.

* Other ALs are not tied to a particular ELV; instead they detail the EMF levels above which particular indirect effects may take place.

Exposure Limit Values (ELVs) are limits specified to protect workers from the health and sensory effects of EMFs. Health effect ELVs are used to prevent possible harm from the heating of tissue and electrical stimulation of nerve and tissue caused by exposure to EMFs.

Sensory effect ELVs are used to prevent effects such as a feeling of nausea, vertigo or a metallic taste caused by EMFs.

If exposure to EMFs is below the ALs, the risks of exposure are likely to be very low, though shipowners must still consider any other risk of indirect effects and the impact of exposure on seafarers at particular risk, more information on which is provided later in this guidance.

Exposure to EMFs above the ALs but below the ELVs will often be safe, but in some circumstances it can present additional risks, which must be considered in the shipowner’s risk assessment.

The tables at Annex A provide:

* A list of equipment where it is unlikely that seafarers will be exposed to EMFs in excess of any AL or ELV; and
* Lists of equipment which may exceed particular ALs or ELVs, and may need a more detailed assessment of exposure.

**8. Exceeding the ELVs**In certain circumstances the ELVs can be exceeded. In particular:

* Employees may be exposed to EMFs in excess of the sensory effects ELVs while they are undertaking ‘lower risk work activities’ (see below);
* HSE may exempt specific work activities from the exposure limits stated in the Regulations; you should refer to the list of activities exempted by HSE (at Annex B) to determine if your work activity is included. Any exemption is subject to the employer meeting safety conditions.

More information on exemptions is provided later in section 13.

**9. Lower risk work activities**In these Regulations, lower risk work activities are those activities during which seafarers are not exposed to EMFs exceeding:

* + any AL or ELV at all; or
  + any AL or ELV other than those set out in Schedule 2, provided any applicable safety conditions are met.

You will not need to produce an exposure action plan for lower risk work activities and, as mentioned above, seafarers may be exposed to EMFs in excess of the ELVs if they are only exceeded during lower risk work activities.

Please note that ‘lower risk’ does not mean risk free – you will still need to undertake a suitable and sufficient risk assessment.

**10. Assessing the exposure and risk**

You should manage all hazards in the workplace, including those from EMFs, through:

* risk assessment,
* adoption of proportionate control measures and
* ensuring risks are eliminated or reduced to as low a level as is reasonably practicable.

You will need to consider the safety of others who are not seafarers but who are working on the ship, e.g. riding crew or surveyors; the responsibilities for external staff will depend on who, if anyone, is employing them.

The Merchant Shipping and Fishing Vessels ( Health and Safety at Work) Regulations 1997 place a duty on the Company to coordinate arrangements for the health and safety of all those working on board. To be able to manage the risks, you will need to determine the potential level of EMFs to which seafarers may be exposed. You must then carry out a suitable and sufficient assessment of the risks arising from that exposure.

The risk assessment must include consideration of :

* indirect effects (see Table 1); and
* seafarers at particular risk (See section 12 of this guidance).

Where relevant, the risk assessment must also include consideration of:

* the ALs and ELVs;
* the frequency, level, duration and type of exposure, including the distribution over the seafarer’s body and the variations between areas in the workplace;
* direct effects;
* the existence of replacement equipment designed to reduce the level of exposure to electromagnetic fields;
* appropriate information obtained from the health surveillance;
* information provided by the manufacturer of relevant equipment;
* other health and safety related information;
* multiple sources of exposure; and
* simultaneous exposure to multiple frequency fields.

You can do this in a number of different ways by accessing information already available, for example by referring to

• emission information and other safety related data provided by the manufacturer or distributor of equipment;

• sector or industry standards and guidelines, if available,

• the EU (non-binding) EMF Practical Guide to Good Practice,

• exposure databases, if available and

• information provided by Trade Associations and other industry bodies

In most cases, you should be able to find relevant information from these sources. If you cannot find enough information to determine the exposure levels, you may need to undertake measurements or calculations to determine exposure but this will only be as a last resort. You will not need to measure or calculate in respect of any work activity which is exempted from the exposure limits.

**11. Controlling the risks**

You will need to carry out a suitable and sufficient assessment of the risks to seafarers posed by their exposure to EMFs on your ship. If exposure is below the ALs, the risks will likely be very low, but you will always need to consider the risks from indirect effects or to seafarers at particular risk; you are not expected to anticipate unforeseeable risks. The tables at Annex A provide information to help you in your assessment.

For any work activity which is not classed as a lower risk work activity, or where the exposure assessment demonstrates that the exposure of seafarers to electromagnetic fields does not exceed any ELV, you must devise and implement an action plan to ensure seafarers are not exposed to EMFs in excess of the ELVs. You will also need to consult safety representatives or other seafarer representatives when deciding risk control measures.

Your action plan must include consideration of:

* other working methods that entail less exposure to electromagnetic fields;
* the choice of equipment emitting less intense electromagnetic fields, taking account of the work to be done;
* technical and/or organisational measures that limit the duration and/or intensity of emission of electromagnetic fields, including, where necessary, the use of interlocks, screening or similar health protection mechanisms.   
  E.g. in many situations ELVs may only be exceeded where the seafarer is close to the EMF source; this can be easily remedied by moving the person further away from the EMF source, or by installing screening;
* consider the use of signage, access controls and floor markings;  
  If areas are already suitably restricted for other reasons, cannot be entered accidentally, and if seafarers in the areas are informed of the risks arising from EMF exposure, signs may not be required;
* in the case of exposure to electric fields, measures and procedures to manage spark discharges and contact currents through technical means and through the training of seafarers;
* ensure appropriate maintenance of equipment and design of workplaces and when replacing or hiring equipment, consider selecting equipment which emits lower levels of EMFs.
* consider providing personal protective equipment e.g. insulating shoes, gloves and other protective clothing, where appropriate

The risk assessment should record the significant findings and details of any groups of seafarers identified by it as being especially at risk. Your risk assessment should be reviewed at suitable intervals e.g. if working practices change, you are replacing equipment, there have been any other significant changes such as appointment of new workers who may be at particular risk, or if any adverse effects are reported. You can find general information on how to undertake a risk assessment in Chapter 1 of the Code of Safe Working Practices for Merchant Seafarers.

**12. Workers at particular risk**

You must give special consideration to the safety of seafarers at particular risk, such as pregnant workers or those with active implanted medical devices (AIMDs), passive implanted medical devices (PIMD) and body worn medical devices (BWMD) etc. (Examples of devices and implants are provided later in this guidance). You must do this even if you are in compliance with the exposure limits.

Refer to the information provided in this guidance on controlling the risks, record details of any significant findings from your risk assessment and the controls you have put in place to minimise the risks as appropriate.

Table C in Annex A contains a non-exhaustive list of examples of workplaces and equipment to consider. You will need to consider these in addition to the information contained in Table B.

Pregnant Workers

As working with certain levels of EMFs could result in a greater risk to a pregnant worker, you should encourage seafarers to advise you in writing if they become pregnant. You may wish to take a practical approach and limit the exposure of

pregnant workers to the public exposure limits. These are stated in Council Recommendation 1999/519/EC

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:199:0059:0070:EN:PDF>

Table C in Annex A contains a non-exhaustive list of examples of workplaces and equipment to consider. You will need to consider these in addition to the information contained in Table B.

If risks to a seafarer are identified during pregnancy, you must take appropriate action to eliminate, reduce or control the risks. They must be included and managed as part of the general workplace risk assessment.

You can find more information on *‘*risks to new and expectant mothers’ at: <https://www.gov.uk/government/publications/mgn-522-mf-merchant-shipping-and-fishing-vessels-regs-1997-and-merchant-shipping-mlc-medical-certification-regs-2010-new-and-expectant-mothers>

Active implanted medical devices (AIMDs), passive implanted medical devices (PIMD) and body worn medical devices (BWMD)

Exposure to EMFs can interfere with the normal operation of active implanted medical devices (AIMDs), passive implanted medical devices (PIMD) and body worn medical devices (BWMD), because some levels of EMFscould cause devices to malfunction or workers to receive injuries.

Tables C and D in Annex A contain non-exhaustive lists of examples of workplaces and equipment to consider. You will need to consider this information in addition to the information contained in Table B.

You should encourage seafarers to consider the information in Table 2 and advise you if they may be affected. If they have implants or devices fitted, ask them to obtain information/instructions from the manufacturer of the medical device.

If the device is implanted, they should also obtain advice from the medical professional who completed the implant procedure.

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|  | **Table 2**:  Non- exhaustive list of examples of devices, implants and other items for consideration include: |
|  | |  |  |  |  | | --- | --- | --- | --- | | **Active implanted medical devices** | **Passive implanted medical devices** | **Body worn medical devices** | **Items that that may contain**  **ferromagnetic materials**: | | cardiac pacemakers | orthopaedic implants or joints | insulin pumps | metallic fragments in or near eyes or blood vessels from industrial (common in people who do welding or metalwork for a living) or military injuries | | implantable cardiac defibrillators | pins, plates, screws, | hormone infusion pumps | Semi-permanent make up | | cochlea implants | surgical staples & clips i.e. tubal ligation clips – used in female sterilisation & aneurism clips, | hearing aids | jewellery or piercings | | brainstem implants | stents, | Continuous glucose monitoring systems | body art/tattoos - some tattoo ink contains traces of metal | | inner ear prostheses | heart valve prostheses, | metalized drug delivery patches (over the counter or prescription) |  | | Neurostimulators | annuloplasty rings, |  |  | | retinal encoders | intrauterine contraceptive device (IUD) or other metallic contraceptive implants |  |  | | implanted drug infusion pumps | penile implants –used to treat erectile dysfunction (impotence) |  |  | |  | dental fillings and bridges |  |  | |

**13. Exemption**

MCA may exempt work activities from the exposure limits stated in the Regulations.An exemption would only be required where ELVs are, or are likely to be, exceeded.

If your work activity is exempt you will not have to comply with the exposure limits in respect of that activity, but you will have to meet the exemption conditions. These include:

* ensuring that you are reducing exposure to the lowest level reasonably practicable; and
* ensuring that seafarers are protected against the health effects and safety risks posed by that exposure.

An exemption does not affect your other responsibilities under the Regulations, such as undertaking a risk assessment and providing suitable information and training. However, you will not be required to use measurements or calculations in your exposure assessment, this is because such measurements etc. are only required where it is necessary to demonstrate compliance with the exposure limits.

To decide if you can use an exemption, you will need to refer the exemption flow chart found in Annex B.

**14. Use of magnetic resonance imaging (MRI) for medical purposes**

The exposure limit requirements do not apply to the installation, maintenance of, or research related to, MRI equipment where it is used for patients in the health sector where:

* it is reasonable in the circumstances that the equipment be used;
* the exposure of workers is reduced to the lowest level reasonably practicable; and
* workers are protected against the health effects and safety risks arising from their exposure to electromagnetic fields

Other requirements of the Regulations continue to apply.

Further information can also be found in the EU (non-binding) Practical Guide on EMF, Appendix F.

**15. Use of MRI on ships**

If MRI is used in any circumstances NOT related to the use of MRI equipment for patients in the health sector, where the ELVs are exceeded, this will be considered case by case, to see if it is appropriate to issue an exemption. See section 13 and Annex B.

**16. Information and training**

If, through your assessment process, you identify that there are risks that need to be managed*,* you must provide relevant information and training for seafarers who are likely to be subject to those risks (and/or their safety representatives).

This information should include:

* an explanation of ALs and ELVs,
* details of possible undesired health, sensory or indirect effects and what to do if these are experienced,
* details of the safe working practices you will adopt to eliminate and reduce risks arising from exposure,
* an explanation of any safety signage used,
* details of appropriate personal protective equipment,
* information for seafarers at particular risk such as pregnant workers and those with active implanted medical devices (AIMDs), passive implanted medical devices (PIMD) or body worn medical devices (BWMD) and
* the circumstances in which they may be entitled to a medical examination and/or health surveillance

**17. Health Surveillance**

You may already consider health surveillance for other hazards in your workplace; this provides an early indication of ill health and helps ensure corrective action is taken.

You will only need to carry out health surveillance for EMF exposure if a seafarer is exposed to EMFs above the ELV and reports experiencing an undesired or unexplained health effect which is suspected of being associated with EMF exposure; you must then ensure health surveillance and medical examinations are provided as appropriate. You should note that as the Regulations do not address suggested long-term effects of exposure to EMFs, any health surveillance required should not be burdensome

You should refer to existing HSE guidance on investigating accidents and health surveillance and take action as required.

You can find more information on health surveillance at Chapter 7 of the Code of Safe Working Practices for Merchant Seafarers.

**18. Further reading**

You can find more information about:

EMFs and links to other useful documents at: [www.hse.gov.uk/**radiation**/nonionising/](http://www.hse.gov.uk/radiation/nonionising/)

Safety signs & signals: <https://www.gov.uk/government/publications/msn-1763-safety-signs-and-signals>

**19. Useful links: *[4]***

* Directive (2013/35/EU) on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields)

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:179:0001:0021:EN:PDF>

* Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997 http://www.legislation.gov.uk/uksi/1997/2962/contents/made

Link to the EU (non-binding) EMF Practical Guide to Good Practice to be included when available

* Council Recommendation 1999/519/EC

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:199:0059:0070:EN:PDF>

* The International Commission on Non-Ionizing Radiation Protection (ICNIRP); as an independent organization ICNIRP provides scientific advice and guidance on the health and environmental effects of non-ionizing radiation (NIR). <http://www.icnirp.org/en/home/index.html>
* Research Report 1018 – Electromagnetic Fields (EMF) in the welding environment - Prepared by TWI Ltd for the Health and Safety Executive. <http://www.hse.gov.uk/research/rrhtm/rr1018.htm>

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|  | **Annex A**  *Note to consultees : The sub-headings in these tables are based on HSEs guidance. Suggestions for further “marinising” the lists would be welcome.* |
|  | **Table A –** **Non-exhaustive list of examples of workplaces and equipment where it is unlikely that EMF would be a risk for most workers.**  **N.B. Tables C and D provide information relating workers at particular risk.** |
|  | **Wireless communications** |
|  | Being in the vicinity of phones,(landlines, mobile phones, cordless, Digital Enhanced Cordless Telephone (DECT) base stations) and fax machines in workplaces |
|  | **Office/Mess/Accommodation** |
|  | Audio visual equipment; TVs, DVDs etc. |
|  | Communication equipment and wired networks |
|  | Computer & IT equipment |
|  | Electric fans, fan heaters & room heaters |
|  | Office equipment i.e. photocopiers, printers, shredders etc. |
|  | Household & professional appliances as long as Wireless Local Area Network (WLAN) and Bluetooth are not involved |
|  | Lighting including desk lamps |
|  | **General on board** |
|  | Workplaces accessible to the general public which meet the exposure limits for the general public specified in Council Recommendation 1999/519/EC |
|  | Alarm systems |
|  | Base and fixed radio station antennas outside operator’s designated exclusion zone |
|  | Workplaces containing electric handheld and transportable tools |
|  | Coating & painting equipment |
|  | Control equipment not containing radio transmitter |
|  | Measuring equipment & instrumentation not containing radio transmitters |
|  | Workplaces containing glue guns  Workplaces containing portable heat guns  Hydraulic ramps |
|  | **Miscellaneous** |
|  | Equipment, around which, the exposure limits for the general public specified in Council Recommendation 1999/519/EC are not exceeded.  Battery chargers, non-inductive-coupling designed for household use  Battery powered portable equipment that do not contain radio frequency transmitters |

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|  | **Table B -** Non-exhaustive list of equipment where EMFs may pose a riskto ALL workers |
|  | **Electrical supply** |
|  | Electrical circuits where the conductors are close together and have a net current of more than 100 A. (Exposure to magnetic fields) |
|  | Electrical circuits within an installation with a phase current rating of more than 100 A for the individual circuit (Exposure to magnetic fields) |
|  | Electrical installations with a phase current rating of more than 100 A  These include wiring, switchgear & transformers. (Exposure to magnetic fields) |
|  | Overhead bare conductor over 100 kV or overhead line over 150 kV above the workplace (Exposure to electric fields) |
|  | **Light industry** |
|  | Dielectric heating and welding |
|  | Welding; spot and seam welding |
|  | Induction heating |
|  | Induction soldering |
|  | Magnetic particle (crack) detection |
|  | Industrial magnetiser and demagnetisers, e.g. tape erasers |
|  | Microwave heating and drying |
|  | RF Plasma devices including vacuum deposition and spluttering |
|  | **Heavy industry** |
|  | Industrial electrolysis |
|  | Furnaces, arc and induction melting |
|  | **Medical** |
|  | MRI equipment |
|  | Medical diagnostic and treatment equipment using EMFs e.g. diathermy and trans cranial magnetic stimulation |
|  | **Navigation equipment on board** |
|  | Radar |
|  | Maintenance of radar or high powered communications systems. eg GMDSS MF/HF/VHF installations |
|  | Radio broadcasting systems and devices |
|  | **Navigation equipment** |
|  | Base and fixed radio station antennas, inside operator’s designated exclusion zone |
|  | Radio frequency or microwave energised lighting equipment |

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|  | **Table C -** Non-exhaustive lists of equipment, in addition to those in table B, where EMFs may pose a risk to workers at particular risk, i.e. **pregnant workers or workers with passive implanted medical devices** |
|  | **Electrical supply** |
|  | Work on wind turbines, generators |
|  | **Light industry** |
|  | Electrostatic painting equipment |
|  | Automated induction heating systems, fault-finding and repair involving close proximity to the EMF source. |
|  | Automated welding systems, fault-finding, repair and teaching involving close proximity to the EMF source. |
|  | **Medical** |
|  | MRI equipment |

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|  | **Table D -** Non-exhaustive lists of equipment, in addition to those in tables B and C, where EMFs may pose a risk to workers at particular risk, **i.e. workers with active implanted and active body worn medical devices.** |
|  | **Wireless communications** |
|  | Use of Wi-Fi or Bluetooth including access points for WLAN |
|  | Use of cordless phones, DECT base stations & fax machines |
|  | Use of mobile phones |
|  | **Office** |
|  | Audio visual equipment containing radiofrequency transmitters |
|  | **Infrastructure (buildings and grounds)** |
|  | Use of electric garden appliances |
|  | **Security** |
|  | Article surveillance equipment and RFID |
|  | Tape or hard drive erasers |
|  | Metal detectors |
|  | **Electrical supply** |
|  | Work on generators (including wind turbines) or main or emergency generators |
|  | Inverters, including photovoltaic systems |
|  | **Light industry** |
|  | Arc welding processes including MIG, MAG & TIG |
|  | Industrial and large professional battery chargers |
|  | Corona discharge surface treating equipment |
|  | Electrostatic painting equipment |
|  | Use of heat guns |
|  | Use of glue guns |
|  | Use of hand held and portable tools e.g. drills, sanders, circular saws and angle grinders. |
|  | Furnaces resistively heated |
|  | Welding systems – working close to the EMF source; fault finding and teaching |
|  | Automated induction heating systems, fault-finding and repair involving close proximity to the EMF source. |
|  | Automated welding systems, fault-finding, repair and teaching involving close proximity to the EMF source. |
|  | Induction sealing equipment |
|  | Machine tools e.g. pedestal drills, grinders, lathes, milling machines, saws. |
|  | **Medical** |
|  | MRI equipment |
|  | **Construction** |
|  | Construction equipment e.g. working close to concrete mixers, cranes etc. |
|  | **Transport** |
|  | Motor vehicles and plant - working close to starter, alternator and ignition systems in motor vehicles and work places |
|  | Large motors |
|  | **Miscellaneous** |
|  | Battery chargers inductive or proximity-coupling |
|  | Equipment generating static magnetic fields greater than 0.5 millitesla e.g. by magnetic chucks, tables and conveyors, lifting magnets, magnetic brackets, nameplates, badges |
|  | Headphones producing strong magnetic fields |
|  | Professional inductive cooking equipment |
|  | Two way radios e.g. walkie-talkies, vehicle radios |
|  | Battery powered transmitters |
|  | **Military activities and on board** |
|  | Maintenance of radar or high powered communications systems, eg GMDSS MF/HF/VHF |

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