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Safety, Health and Environment Standard 10

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EMFs – Occupational Exposure Limits

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PUBLISHING AND COPYRIGHT INFORMATION

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Amendments since publication

Issue	Date	Amendment
Issue 2	September 2023	Editorial amendments Reformatted into new template Definitions added Details of all other technical, general and editorial amendments are included in the associated Document Amendment Summary for this Issue (available on request from the Safety Health and Environment Directorate of ENA).

Contents

Foreword

This Safety, Health and Environment (SHE) Standard is published by the Energy Networks Association (ENA) and comes into effect from September 2023. It has been prepared under the authority of the ENA Safety Health and Environment Manager and has been approved for publication by the ENA Safety Leaders Group (SLG). The approved abbreviated title of this document is “ENA SHES 10”.

ENA Electricity Member Companies are committed to sharing best practice and working with the Regulators to successfully manage the risks to health and safety within our Industry. Where all ENA Electricity Member Companies agree to follow a similar approach to manage a specific risk the intention will be to formalise a common standard. This will be communicated to HSE for their information and will provide operational inspectors with an understanding of the minimum standards they should expect when visiting an ENA Electricity Member Company

Introduction

Electric and Magnetic Fields (EMFs) are produced wherever there are currents or voltages present. A larger current or voltage results in larger EMFs, and the closer a body is to the source similarly results in larger exposures EMFs. ENA Member Companies own and operate the electricity networks, and their employees may therefore be subject to higher than average EMF exposures.

At high-enough levels EMFs can interfere with the action of nerves, which is undesirable. Electric fields can also have indirect effects, making the hairs on the arm vibrate, or producing small spark discharges on contact with a metal object, which can be uncomfortable, even painful, but are not considered harmful.

Protection against these effects is primarily by means of compliance with exposure limits. In the UK the relevant occupational exposure limits are based on the 2010 ICNIRP limits via the 2013 EU Directive. This is set out in the Control of Electromagnetic Fields at Work Regulations 2016. ENA member Companies ensure that employee exposures are compliant with these limits and provide relevant information to contractors to aid their own risk assessments.

Compliance with the exposure limits is intended to prevent all known direct health risks from EMFs. Therefore, when exposures are below the limits, there is no risk, and no basis for reducing exposures further via the application of an “as low as reasonably practicable” or equivalent principle. The exposure limits incorporate a considerable safety margin. Exceeding the exposure limits is not expected to produce any harm unless the limits are exceeded several-fold. The exposure limits relate to instantaneous effects and do not include any time factors or restrictions. There is no basis for restrictions on repeated or long-term exposures provided the exposure limits are not exceeded.

1 Scope

This Policy applies to all UK staff of ENA Electricity Member Companies.

Contractors are required to have comparable systems in place that ensure the safety of their staff and compliance with the relevant Regulations. In the interests of consistency, contractors are encouraged to comply with the ENA Risk Assessment and the ENA Worker Information Sheet which are both freely available.

This Standard applies to all employees, but, in practical terms, employees only working in offices will always be compliant with the relevant limits (as evidenced in the Risk Assessment referred to below). The provisions of this Standard only have effect in operational areas.

2 Aim

This Standard sets out how ENA Member Companies comply with the occupational exposure limits that are in force in the UK.

The key principles are:

- The exposures received by employees should not exceed the relevant exposure limits;
- Compliance with limits is ensured for reasonably foreseeable conditions and events. Compliance is not required for conditions or events that are unlikely to be regarded as reasonably foreseeable, or for rare events where the limits are exceeded by modest amounts and the introduction of controls to achieve compliance exposure would be grossly disproportionate to any benefit obtained;
- In assessing compliance, mainstream, state-of-the-art scientific evidence will be used;
- Compliance will be assessed, and any necessary changes to plant specifications or to working practices should be developed by competent EMF specialists. The practical implementation of compliance should be made as light-touch as possible but should be understood by employees who should have a basic level of EMF awareness.;
- The necessary arrangements for achieving compliance will be transparent and will be discussed with employees and their representatives through HESACs, Staff Forums, etc. The evidence necessary to assess compliance shall be freely available to employees and the public.

3 Normative references

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

Standards publications

- Control of Electromagnetic Fields at Work Regulations 2016
- Directive 2013/35/EU of the European Parliament and of the Council of 26 June 2013
- Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz to 100 KHz), International Commission on Non-Ionizing Radiation Protection, Health Physics 99(6):818-836; 2010

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1

EMF
Electromagnetic Fields – invisible areas of energy associated with the use of electrical power and various forms of natural and man made lighting. Spatial distribution of the resultant (modulus) of the r.m.s. electric field strength (E) and the magnetic flux density (B). The spatial distribution is derived from a measurement or calculation grid.

4.2

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4.3

Hz
Hertz - coherent SI unit of frequency, defined by the unit equation Hz = s−1, where s is the second.

4.4

kV
kiloVolt - a unit of potential equal to a thousand volts.

4.5

T
Tesla – unit of magnetic flux density in the International System of Units (SI).

5 Common Operating Framework

For occupational exposure, the requirements are set by:

- Control of Electromagnetic Fields at Work Regulations 2016 (referred to in this Standard as “the Regulations”).

Note that, by virtue of being Regulations, these are legally binding.

The Regulations draw on:

- Directive 2013/35/EU of the European Parliament and of the Council of 26 June 2013 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) (20th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC) and repealing Directive 2004/40/EC.

This Directive in turn draws its quantitative values and scientific underpinning from:

- Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz to 100 KHz), International Commission on Non-Ionizing Radiation Protection, Health Physics 99(6):818-836; 2010.

The limits on 50 Hz fields created in these documents that ENA Member Companies will normally comply with are the “High Action levels” from the Regulations (Tables AL1 and AL2 in the Schedule):

- Magnetic field: 6 mT (18 mT for exposure only to limbs).
- Electric field: 20 kV/m.

This ensures that the Health Effects Exposure Limit Values are not exceeded. The other provisions of this Standard ensure that the conditions set in the Regulations for exceeding the Low Action Levels and the Sensory Effects Exposure Limit Values are met.

Where the field is not uniform or is not oriented in the direction where the coupling of the field to the body is a maximum, other values may apply and will be derived on a case-by-case basis as necessary. These limits apply to the unperturbed field, that is the field at a point that would exist in the absence of persons or movable objects.

The Regulations allow for exposure up to a higher value, the “Exposure Limit Value” (Table ELV2). In designing and installing new equipment, ENA Member Companies will not normally make use of this provision and will normally comply with the High Action Levels as set out above. However, when compliance with the High Action Levels is not reasonably practicable, or when assessing compliance for existing equipment or work practices, then compliance with the Exposure Limit Values is acceptable. This shall be set out and justified in the Risk Assessment.

6 Common Operating Framework Steps

6.1 Risk Assessment

ENA will maintain a formal Risk Assessment. This single document will encompass the separate requirements in the Regulations for an Exposure Assessment, a Risk Assessment, and an Action Plan.

The Risk Assessment will be freely available to all employees and the public.

The Risk Assessment will cover all equipment or activities where there is a potential for EMFs to be an issue. It should:

- Cover both direct and indirect effects of EMFs;
- Assess the exposure drawing on all available information. Any or all measurements or calculations obtained by industry employees or supplied by manufacturers, and information in Standards and guidance documents may be used as appropriate;
- Assess risk in terms of compliance with the relevant exposure limits. Compliance with the exposure limits shall be deemed to have sufficiently eliminated any risk from EMFs, except for staff at particular risk covered in more detail below.

The Risk Assessment should detail any actions necessary to ensure compliance.

- For new equipment, the primary method of ensuring compliance should be to specify that the equipment is designed so as not to produce exposures in excess of the exposure limits. Operational restrictions or restrictions on working practices should be used only in exceptional circumstances;
- For existing equipment that has the potential to exceed the exposure limits, compliance should normally be ensured by operational restrictions or restrictions on working practices. Alterations to existing equipment should be required only in exceptional circumstances;
- In both cases, fences or other barriers should be avoided if other reasonably practicable methods of ensuring compliance are available and, if used, shall be clearly distinguishable from other fences or barriers that are used to indicate or protect against other hazards such as high voltages.

Any operational restrictions, delimited areas, warning signs, fences, barriers etc. imposed solely for EMF reasons shall not apply during an emergency where the safety of staff is at risk for other reasons. For example, it shall be acceptable to pass through EMFs that exceed the relevant limits in order to escape from a fire.

Where the Risk Assessment identifies the need for constraints on the design of equipment, these constraints should be included in the relevant Technical Specifications and/or tender documents, referencing the Risk Assessment. Manufacturers and suppliers are expected, where relevant, to produce suitable evidence of compliance. Where such evidence is required manufacturers and suppliers shall be required to assess compliance against the numerical values of the various exposure limits as set out and interpreted in this Standard and the Risk Assessment.

The Risk Assessment shall be periodically reviewed and updated as necessary, particularly when there is there is evidence that it is no longer valid or when there has been a significant change in the matters to which it relates.

6.2 Training and Information

ENA will provide an industry-wide information sheet on occupational exposure to EMFs that includes as a minimum all the information specified in the Regulations. The information sheet will be as simple and short as possible but include the key requirements of the Regulations whilst more detailed information will be made publicly available on a website.

This information sheet:

- Will be brought to the attention of all new employees taking up an operational role in an electricity business through induction procedures;
- Will be brought to the attention of all employees and will be publicly accessible online;
- Will be included as part of site induction in all relevant operational electricity sites.

6.3 Pregnant employees

Pregnant employees are considered “staff at particular risk” in the terms of the Regulations.

Any employee notifying an ENA Member Company that they are pregnant will be offered the choice of complying with the public exposure limits instead of the occupational exposure limits for the duration of their pregnancy. Where an employee chooses to exercise this option then reasonable adjustments to their work should be made, as for any other pregnancy-related provision.

The public limits are lower than the occupational limits by a factor of, broadly speaking, five. The Risk Assessment will identify plant items or work practices where exposures may occur that are high enough to trigger action under this provision. Note that this will occur only on operational sites. All office sites are already compliant with the public limits.

Note that there is no evidence that the mother or the unborn baby is any more sensitive to EMFs. This provision is made as a precautionary measure and to provide reassurance. There is no need to introduce warning signs or restrictions for access related to pregnancy and these should not be used. The choice made by a pregnant employee should be recorded by their line manager.

6.4 Employees with Implanted Medical Devices

“Active implanted medical devices” (AIMDs) includes pacemakers, implanted cardiac defibrillators, cochlear implants, implanted insulin pumps, neurostimulators, etc. “Body worn medical device” includes hearing aids, body-worn insulin pumps, etc. Passive devices, such as joints, plates, pins, screws, etc., can be assumed not to give rise to any interference effects with EMFs. Any “active” medical device (i.e. one that has a power supply, electronic circuitry, and/or sensing electrodes), whether implanted or body-worn, should be assumed to be covered by the following provisions. In case of doubt then advice should be sought from relevant specialists.

Employees with active medical devices are considered “staff at particular risk” in the terms of the Regulations.

Some active medical devices can, in some circumstances, experience interference from power-frequency EMFs at levels below the occupational exposure limits. Except under exceptional circumstances, it is only exposures above the Reference Levels from the public exposure limits that can produce interference, and the public exposure limits should be used to identify such a possibility. (The Reference Levels are 100 μT and 5 kV/m, which are lower than the actual public limits.) The Risk Assessment will identify plant items or work practices where the Reference Levels could be exceeded and therefore where interference is a possibility. Particular active medical devices as fitted to particular individuals may have a higher immunity to interference, which should be assessed on a case-by-case basis.

Employees with active medical devices will be identified through:

- Pre-employment medical screening;
- Return-to-work interviews; and
- Voluntary information from the individual with the device where there is an existing case.

The manager conducting the return-to-work interview should ask whether an active medical device has been fitted in every case where absence from work could have involved fitting an active medical device, and should not rely on the employee volunteering this information.

Where an employee has an AIMD, the relevant specialists will make an assessment of that person’s work environment. An assessment of the implications for their role will then be made by Occupational Health or other responsible individual with suitable experience to make such an assessment, taking appropriate account of the employee’s own attitude to the risk presented to them. It will often be helpful to seek further details of the device and its sensitivity levels from the physician concerned and/or the manufacturer, and employees will be expected to co-operate in seeking this information.

Reasonable adjustment should be made to work practices in order to reduce any risks arising from interference to an acceptable level.

All inductions for employees, contractors, and visitors for sites where there is a possibility of exposure to EMFs high enough to cause interference with active medical devices, should include a warning of the possibility of interference.

Warning signs should be used only where:

- Exposures to EMFs higher than the general-public reference levels could realistically occur, and;
- The presence of such EMFs would not be expected from the general characteristics of the site.

In practice, this means that warning signs should not be used on electrical operational sites, such as substations, HVDC convertor stations, overhead line towers, or cable tunnels, where the nature of the site creates an expectation of possible interference with active medical devices, unless there is unusual equipment present with significantly greater than normal capability of producing interference. Warning signs may be used e.g. in relation to electrical equipment on a gas operational site, where the predominantly non-electrical nature of the equipment would mean that high EMFs were not necessarily expected.

Where warning signs are used, they should be a “yellow triangle” hazard warning sign; red prohibition signs should not be used. Fences or other barriers should not be used.

6.5 Reporting symptoms and raising concerns

Employees who have concerns about exposure to EMFs, or who think they may have experienced over-exposure or have suffered symptoms of exposure, should raise those concerns in the first instance with their company’s designated EMF point of contact (or ask their line manager to raise those concerns on their behalf). Each company should agree with Occupational Health or equivalent function a protocol for when such concerns should be passed to Occupational Health, at which point the line manager should also be informed if not already involved.

The symptoms that would first be expected to be produced by exposure to high EMFs are a flickering sensation in the periphery of the vision called “magnetophosphenes” or “electrophosphenes.” Other symptoms, at even higher exposures, could include headaches and nausea. Such symptoms do not necessarily indicate that the exposure limits have been exceeded, because there is provision within the Regulations for exceeding certain limits which are related “sensory effects” (defined as involving a transient disturbance in sensory perception or a minor and temporary change in brain function) provided the limits related to “health effects” are not exceeded. Any instances should, however, be investigated.

6.6 Health surveillance and medical examinations

There is no requirement or justification for routine health surveillance for employees exposed to EMFs.

Where there is reason to believe that a significant over-exposure may have occurred, or where symptoms are reported that appear to be more severe than the sensory effects permitted under the Regulations and which may be attributable to EMFs, then one or more medical examinations should be arranged at the discretion of Occupational Health or equivalent function. Any such medical examination should be arranged within the employee’s normal working hours and the results made available to them. Records of such examinations shall be kept in line with other health surveillance records.