Workshop on
CURRENT TRENDS IN HEALTH AND SAFETY
RISK ASSESSMENT OF WORK-RELATED EXPOSURE TO EMFs

Hotel Michelangelo, Milan
February 14-16, 2007

Occupational Exposure to EMFs:

An ILO Perspective

Shengli Niu

Programme on Safety and Health at Work (SafeWork)

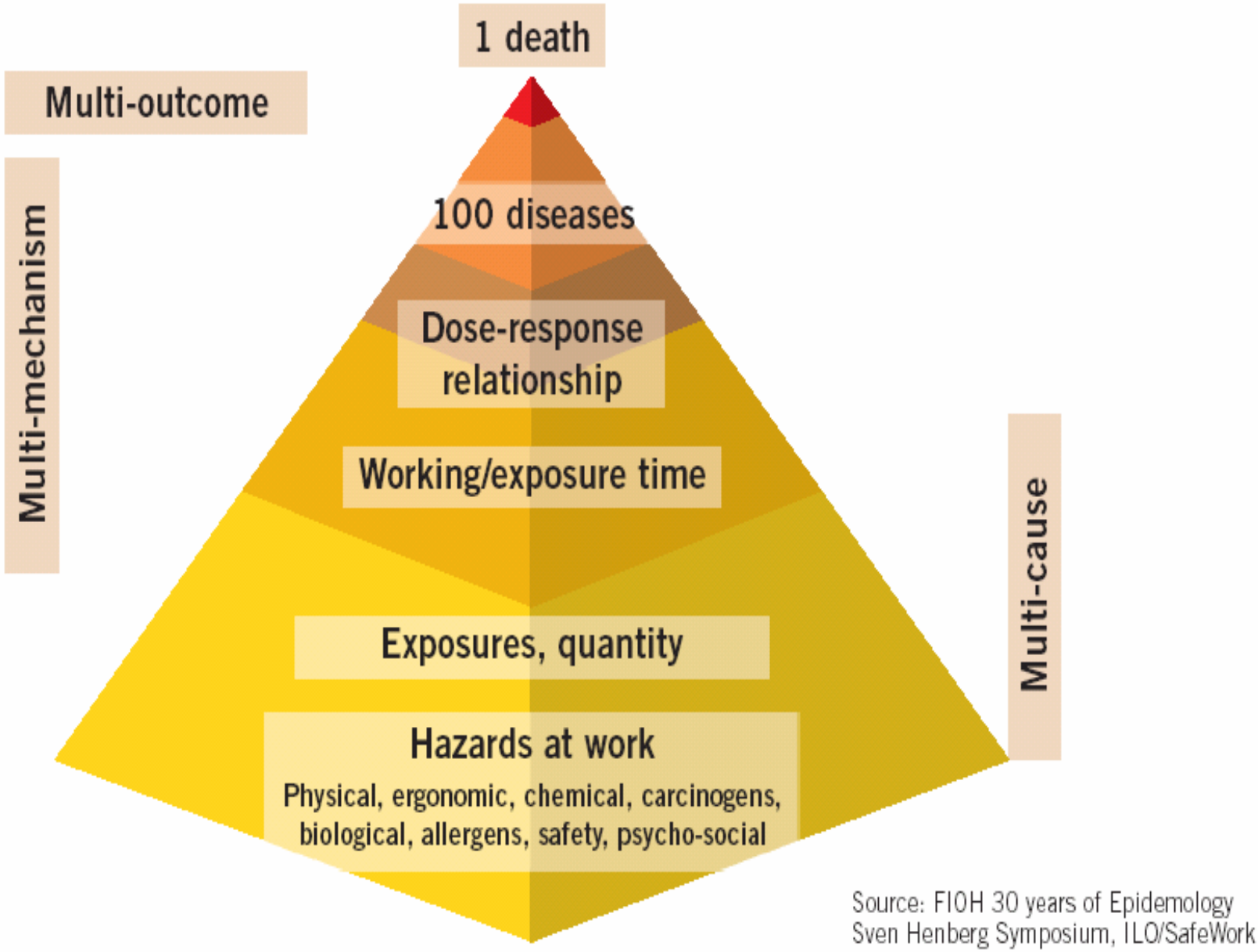
International Labour Office

niu@ilo.org

Occupational Risk Factors

- **Chemical risk factors: 100,000**
- **Physical factors: 50**
- **Biological agents: 200**
- **Adverse ergonomic conditions: 20**
- **Allergens: 3000**

Links between hazards, exposures and work-related negative outcomes/diseases



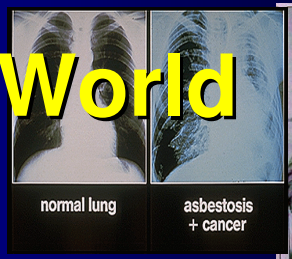
Source: FIOH 30 years of Epidemology
Sven Henberg Symposium, ILO/SafeWork

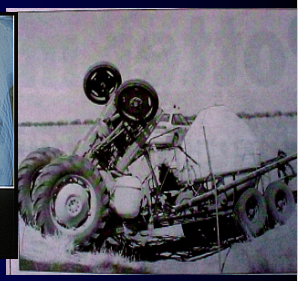
Work-related effects of radiation

- Cancer of pancreas, attributable fractions: men 0.8%, women 1.9%
- Lung cancer caused by radon and combined effects: men 4.5 %, women 1.2%
- Bone cancer : 0.6/0.6 %
- Skin melanoma, airline pilots 0.1/0.1%
- Female breast cancer, 1.7%
- **Skin non-melanoma, ultraviolet radiation, men13.1%, women 3.8%**
- **Leukaemia, low-frequency magnetic fields, men 17.8%, women 2.3%**

Scand J Work Environ Heath 2001;27(3):157-160

Work-related Annual Deaths - World





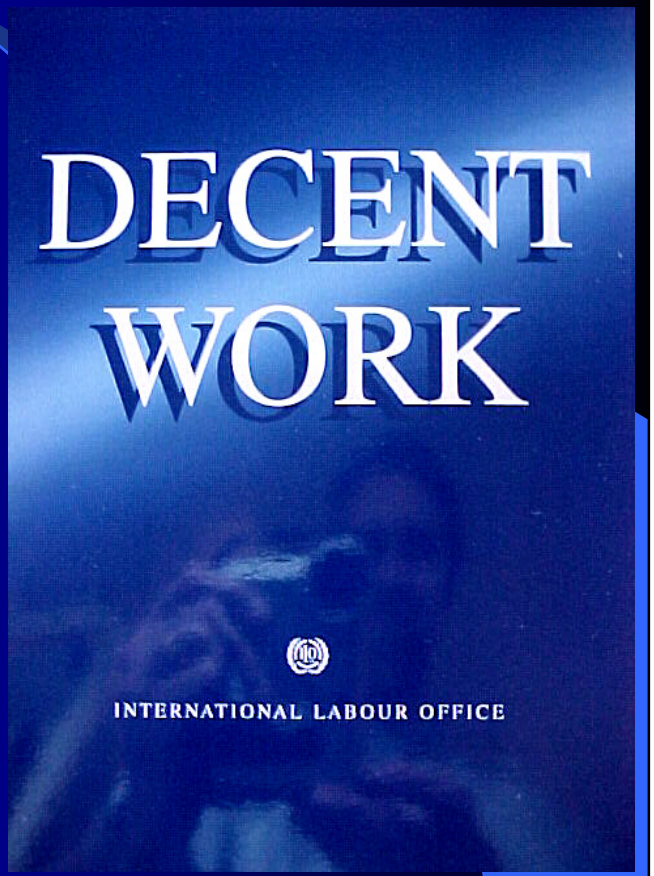
• Economically active population:	2.7 billion
• ***Deaths attributed to occupation***	***1.9 - 2.3 Million***
• **Work-related diseases:(lower limit)**	**1.6 Million**
- communicable diseases, w/r	320 000
- cancer, w/r	610 000
- circulatory diseases, w/r	449 000
- chronic respiratory diseases (silicosis 36 000), w/r	145 000
- nervous system disorders, w/r	20 000
- digestive system diseases, w/r	21 000
- genito-urinary disorders, w/r	9 000
• **Deaths caused by work accidents**	**355 000**
• Commuting injuries (not included in overall deaths above)	**158 000**

Decent Work must be Safe Work

ILO Response

The International Labour Organization was founded to ensure everyone the right to earn a living in freedom, dignity and security, in short, the right to decent work. We have never accepted the belief that injury and disease "go with the job"

SafeWork Programme



International Labour Organization

- The ILO is a tripartite organization with worker and employer representatives taking part in its work on equal status with those of governments.
- The number of the ILO member countries now stands at 180.
- In 1969 the ILO was awarded the Nobel Peace Prize

International Labour Organization

- **Standard-setting** is one of the ILO's major means of action to improve conditions of life and work worldwide.
- ILO standards are **Conventions** and **Recommendations** adopted by the International Labour Conference.

International Labour Conference

- **Between 1919 and 2006, 187 Conventions and 198 Recommendations were adopted.**
- **Many of these instruments relate to occupational safety and health.**

ILO Policy on the Improvement of Working Conditions and Environment

- Work should take place in a safe and healthy working environment;
- Conditions of work should be consistent with workers' well-being and human dignity;
- Work should offer real possibilities for personal achievement, self-fulfilment and service to society.

Basic Principles in Occupational Safety and Health

- **Responsibilities of the employer** towards the health and safety of the workers in his/her employment;

- **Role of the competent authority:** national policy, regulation, inspection, enforcement;

Basic Principles in Occupational Safety and Health

- **Basic workers' rights**: right to know, to participate, to stop work in case of imminent danger, etc.

Basic Principles in Occupational Safety and Health

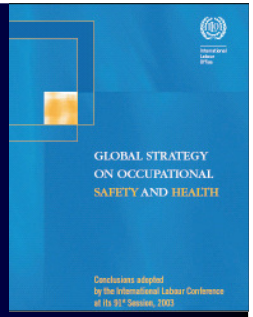
Hierarchy of preventive measures(C.148,1977):

- technical measures,
- organizational measures,
- personal protective equipment;

And more recently (C. 176, 1995 Article 6):

- elimination of risks,
- control measures, minimization of risks,
- personal protection equipment;

Fundamentals for Global OSH Strategy



- Building and maintenace of Safety Culture
- Integrated approach to OSH
- Concept of OSH Management Systems
- Active participation of
  - *Government*
  - *Employers*
  - *Workers*

LABOUR INSPECTION

Basic Occupational Health Services

Global Strategy and Action Plan

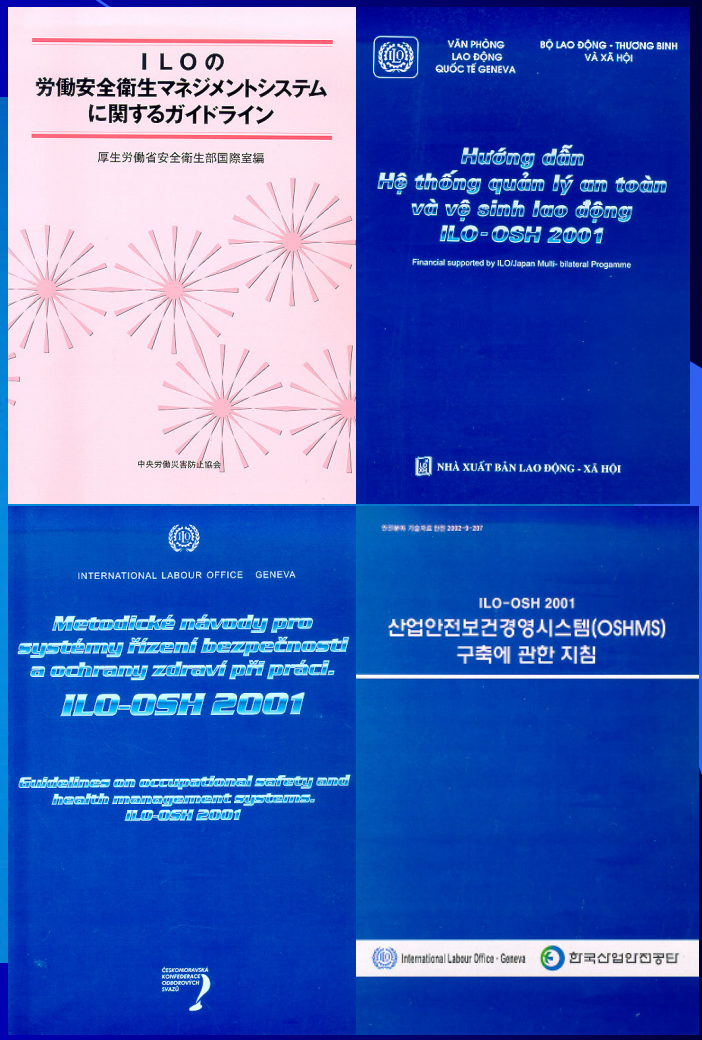
- **Building and maintenance of a preventative safety and health culture**
- right to safe and healthy work environment
- principle of prevention
- a systems approach

- **Toolbox**

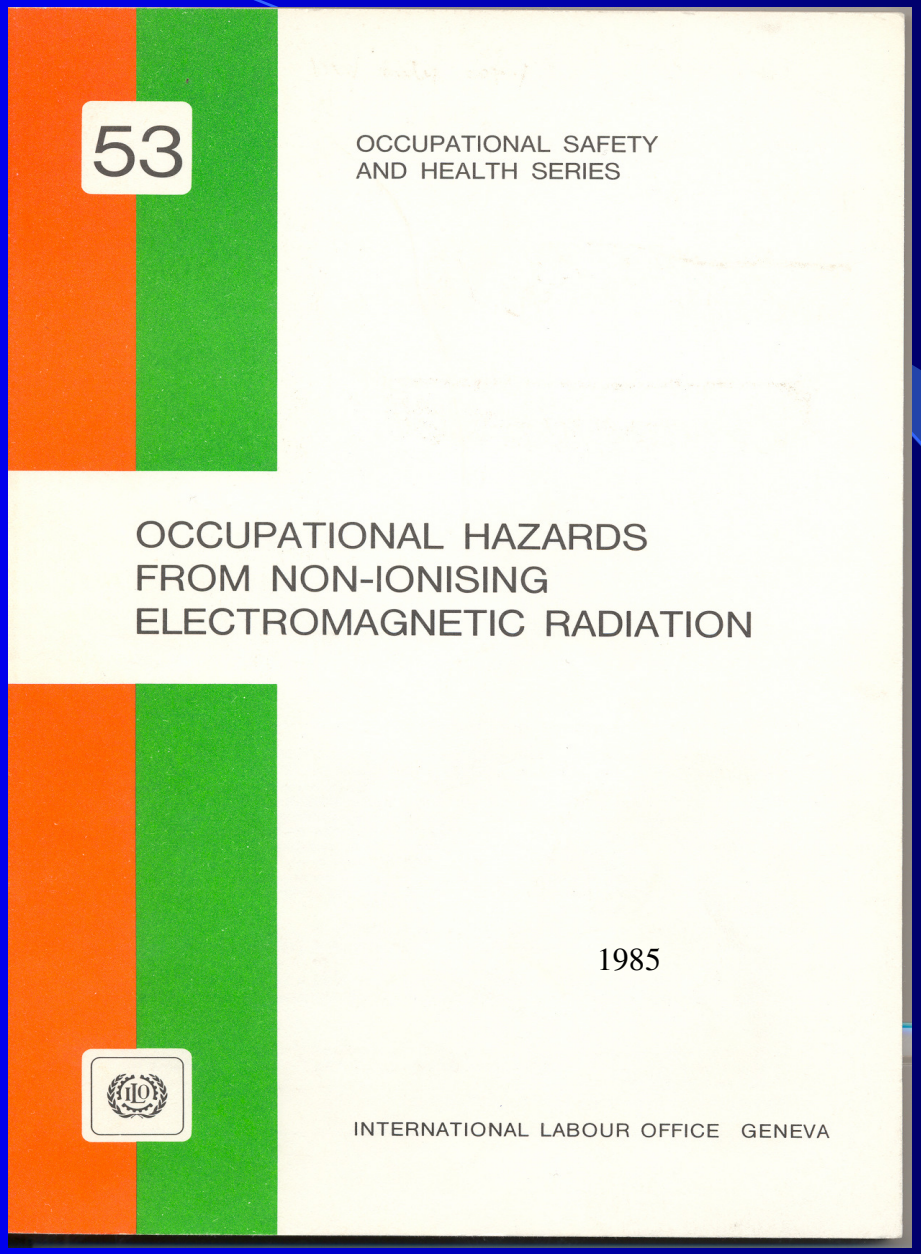
1. Promotion, awareness raising and advocacy
2. ILO instruments: standards, codes, guides
3. Technical assistance and cooperation
4. Knowledge development, management and dissemination
5. International Collaboration

ILO OSH2001

- ISO International Workshop 1996
- ILO tripartite experts meeting April 2001
- ILO-OSH 2001
- Compatible with other OSH-MS standards
- Action on 2 levels:
  - National level
  - Organisation level



ILO instruments: standards, codes, **guides**



OCCUPATIONAL SAFETY
AND HEALTH SERIES
No. 53

OCCUPATIONAL HAZARDS FROM NON-IONISING ELECTROMAGNETIC RADIATION

Prepared for the International Labour Organisation by the International Radiation Protection Association (International Non-Ionising Radiation Committee)

INTERNATIONAL LABOUR OFFICE GENEVA

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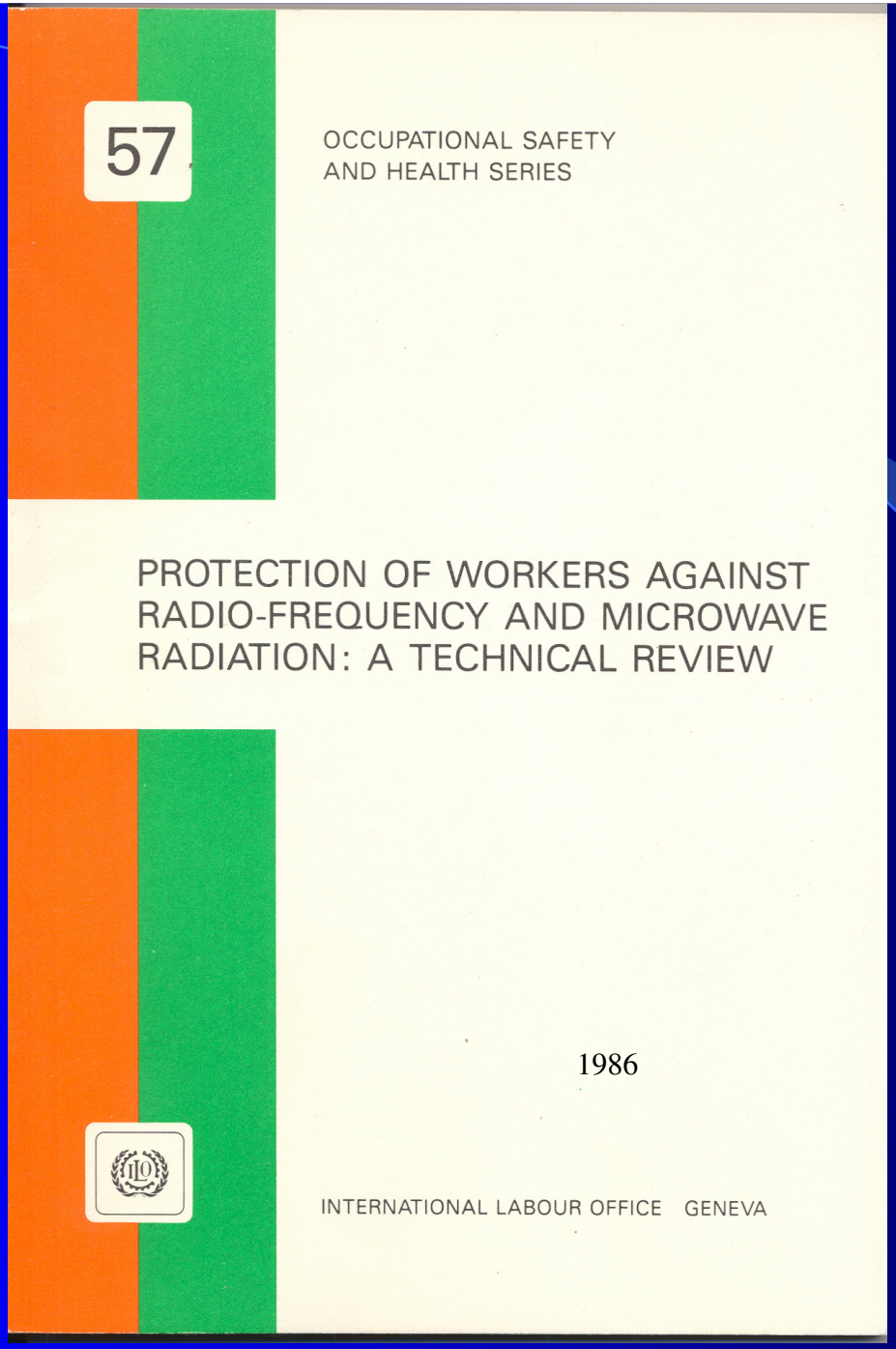
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OCCUPATIONAL SAFETY
AND HEALTH SERIES
PROTECTION OF WORKERS AGAINST
RADIO-FREQUENCY AND MICROWAVE
RADIATION: A TECHNICAL REVIEW
1986
INTERNATIONAL LABOUR OFFICE GENEVA

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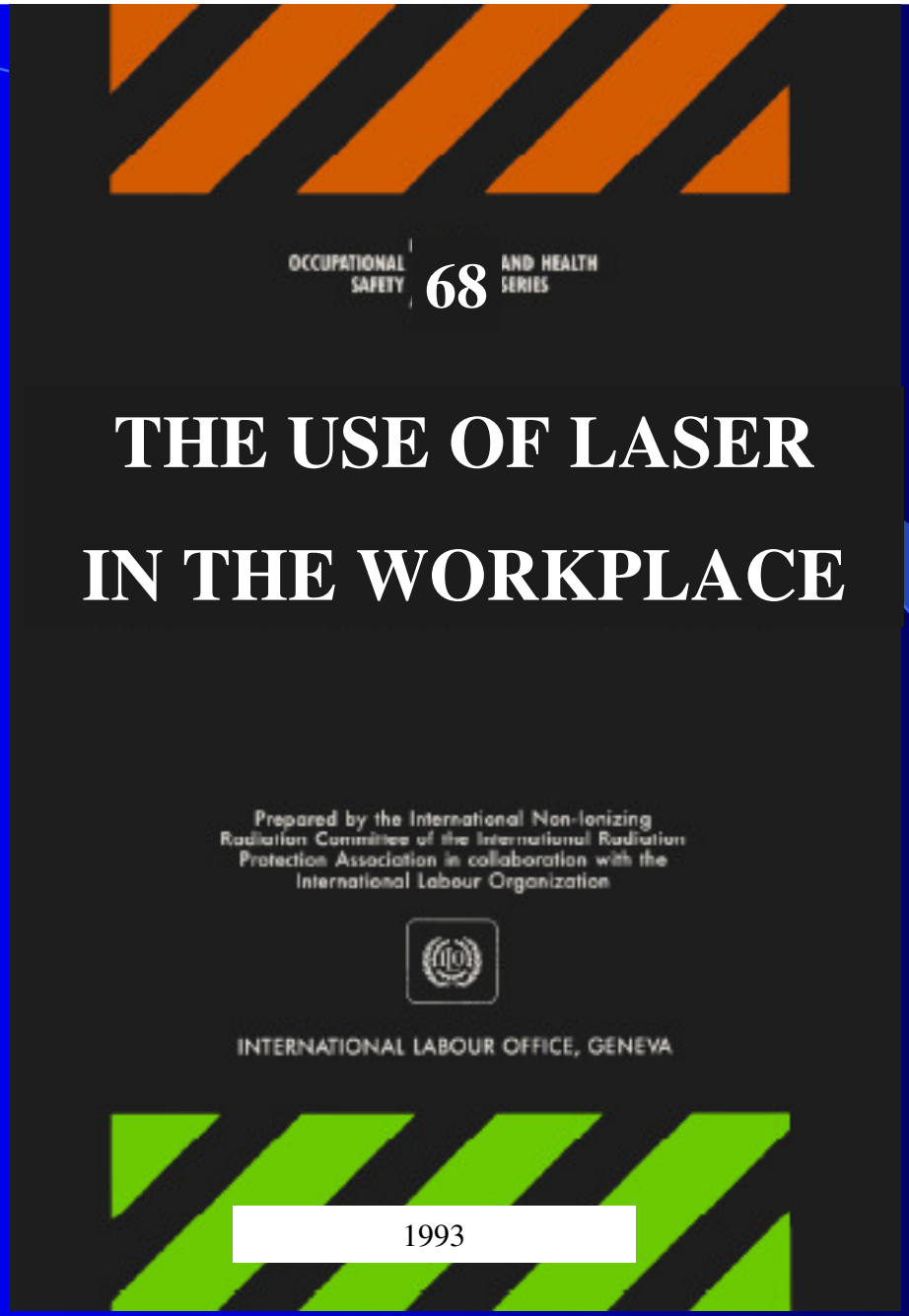
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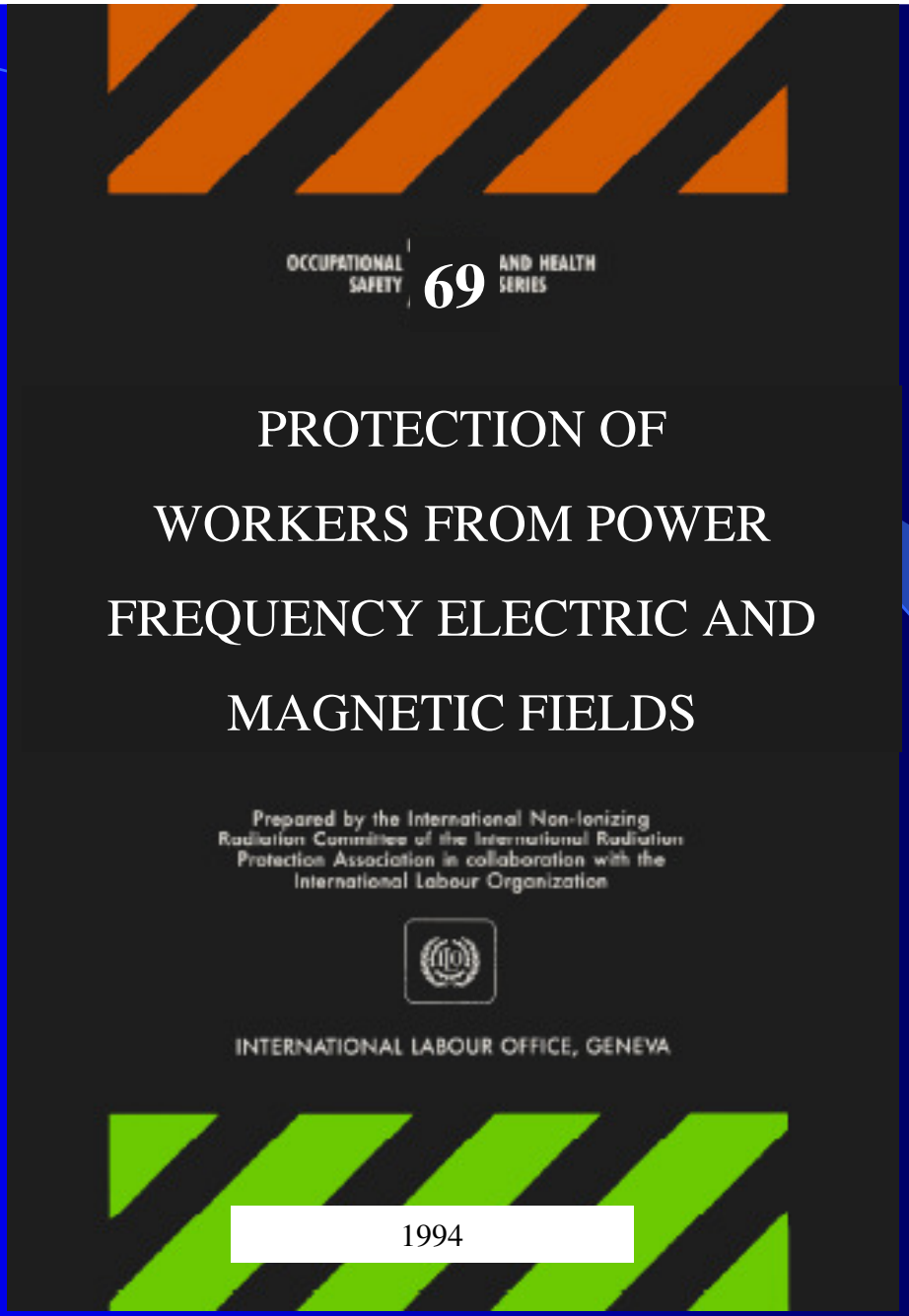
AND HEALTH SERIES
THE USE OF LASER IN THE WORKPLACE
Prepared by the International Non-Ionizing Radiation Committee of the International Radiation Protection Association in collaboration with the International Labour Organization
INTERNATIONAL LABOUR OFFICE, GENEVA
1993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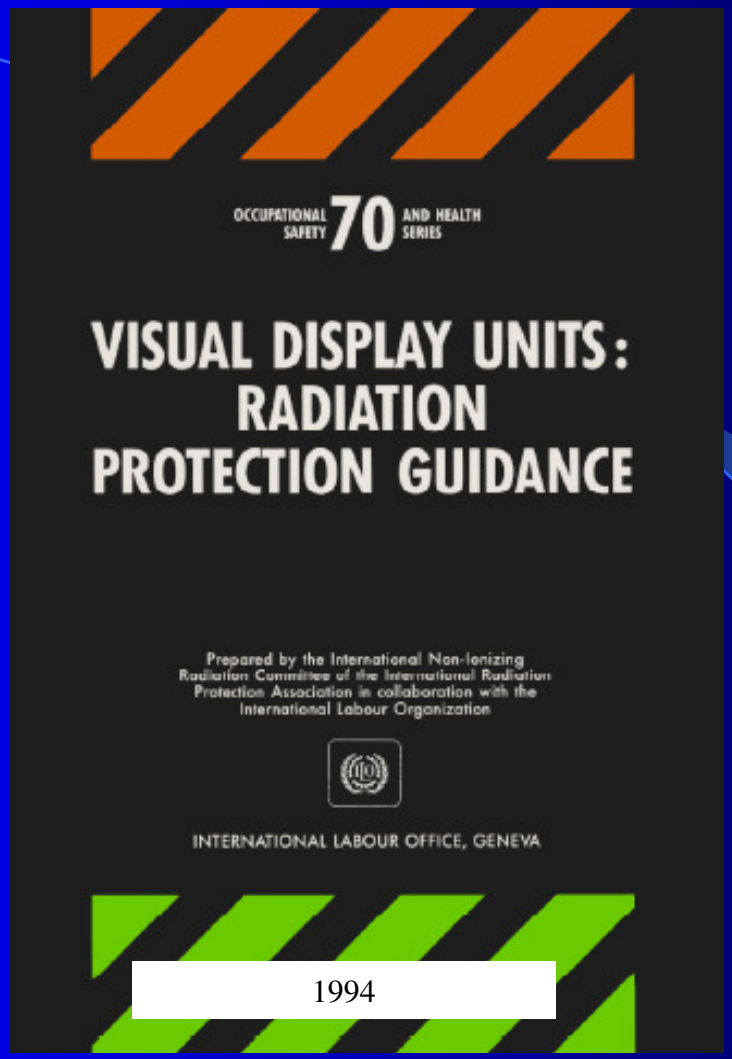
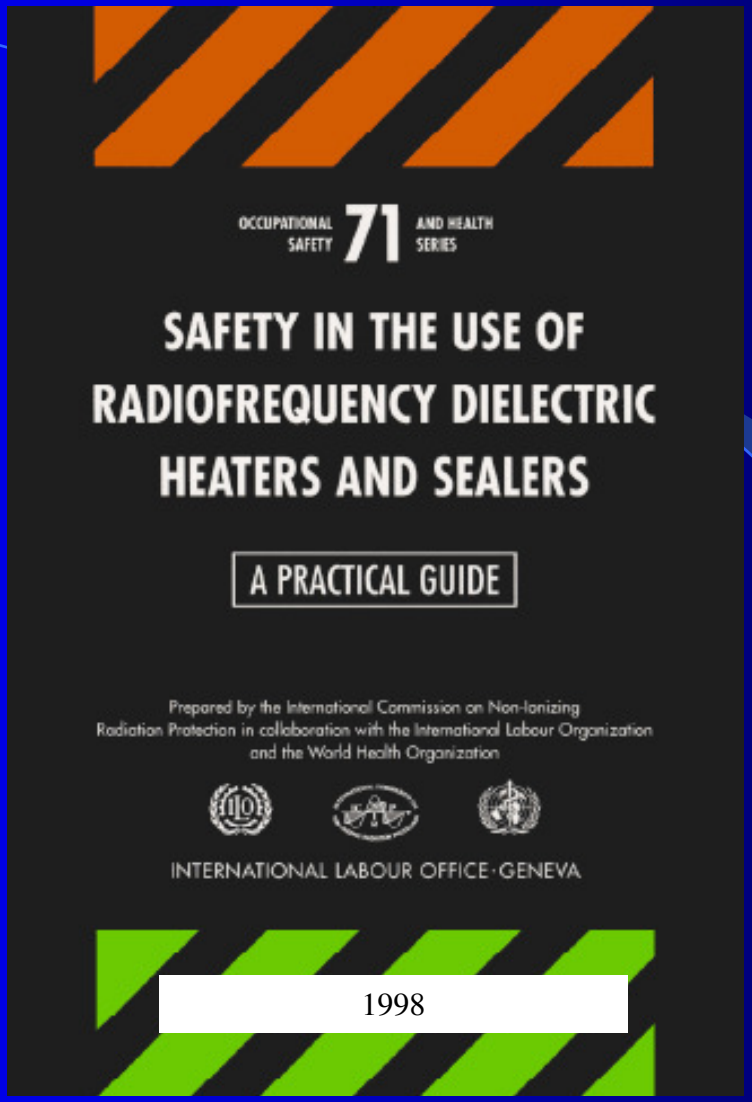
AND HEALTH SERIES
PROTECTION OF WORKERS FROM POWER FREQUENCY ELECTRIC AND MAGNETIC FIELDS
Prepared by the International Non-Ionizing Radiation Committee of the International Radiation Protection Association in collaboration with the International Labour Organization
INTERNATIONAL LABOUR OFFICE, GENEVA
1994



http://www.ilo.org/public/english/protection/safework/cops/english/download/e000015.pdf

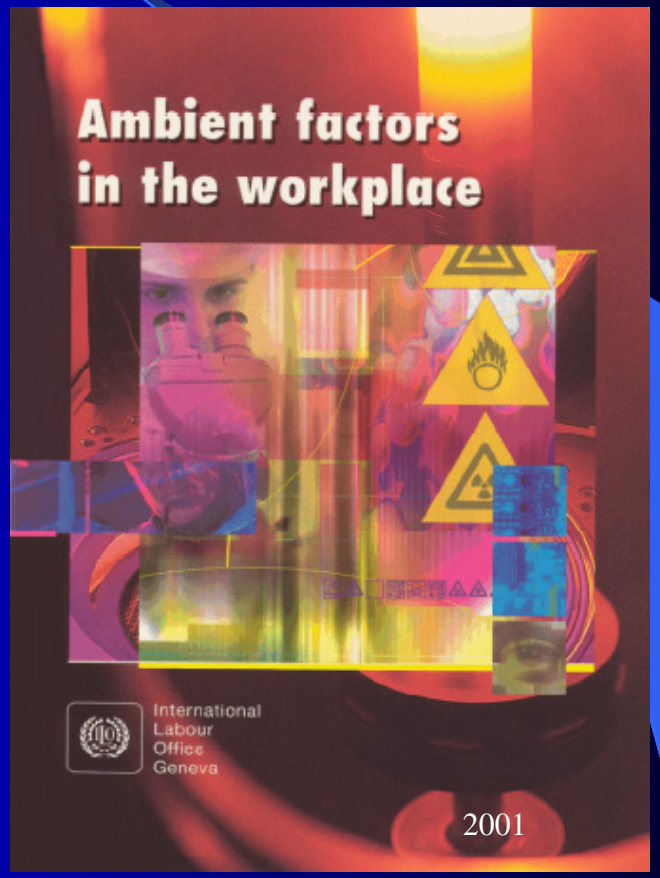


http://www.ilo.org/public/english/protection/safework/cops/english/download/e000014.pdf

ILO instruments: standards, **codes**, guides

Codes of Practice & Guidelines

ILO also provides practical guidance in the form of codes of practice or guidelines. They are used as reference work by anyone in charge of formulating detailed regulations or framing occupational safety and health programmes.



http://www.ilo.org/public/english/protection/safework/cops/english/download/e000009.pdf

6. Electric and magnetic fields

6.1. Scope

6.1.1. This chapter gives specific information to help employers, workers and competent authorities apply the general principles in Chapters 2 and 3. It applies to activities where workers are exposed to electric and magnetic fields, including static fields (0 Hz), extremely low frequency (ELF) fields (up to 300 Hz) — which include electric and magnetic fields at frequencies between 50 and 60 Hz (also called power frequencies) — and radiofrequency (RF) fields (from 300 Hz to 300 Ghz).

6.1.2. In the application of the provisions of this code, the detailed guidance given in the following practical guides published in the ILO Occupational Safety and Health Series should be taken into consideration: No. 69 on *Protection of workers from power frequency electric and magnetic fields* (Geneva, 1994); No. 70 on *Visual display units: Radiation protection guidance* (Geneva, 1994); and No. 71 on *Safety in the use of radiofrequency dielectric heaters and sealers* (Geneva, 1998).

6.2. Assessment

6.2.1. For the prevention of adverse effects of electric and magnetic fields on workers, employers should:

(a) identify the sources of electric and magnetic fields and the equipment and activities which could give rise to exposure at or near prescribed national or internationally recognized standards;

(b) obtain information on the exposure of workers:

(i) where they are likely to be exposed to significant electric or magnetic fields, including in the case of workers who may move from site to site;

(ii) by comparison with other similar workplaces and equipment;

(iii) from the occupational health service or the competent authority;

(c) seek advice from suppliers about the fields produced and the recommended precautions, and make this information a factor to be considered in the purchase of new equipment;

(d) if this advice is incomplete or otherwise of doubtful value, arrange for measurements by a technically competent person, to be carried out in accordance with current national and international knowledge.

6.2.2. Employers should assess the hazard or risk by:

(a) reference to national exposure limits and to internationally recognized standards (see section 6 of the annex) in the absence of national standards;

(b) comparing actual exposure levels with exposure limits following measurements by a technically competent person, carried out in accordance with current national and international knowledge.

6.2.3. Employers should conduct assessments:

(a) before routine operations begin, for all new installations capable of producing electric or magnetic fields exceeding the recommended exposure limits;

(b) when any malfunction is suspected that may significantly affect field strengths;

(c) following any repairs or changes in working conditions, protective shielding and barriers that may affect the exposure levels;

(d) at appropriate intervals of installations capable of exposing personnel in excess of the recommended exposure limits.

6.2.4. Employers should keep records of all formal field strength survey measurements and their evaluation; such records should include a review of all known incidents and their attributed causes.

6.2.5. In assessing the hazard and risk, the employer should take account of the need to prevent cardiac accidents which may result from exposure of workers with pacemakers or similar medical implants to electric and magnetic fields, as well as the special needs of workers for protection in relation to their health condition, for example in the case of pregnant women.

6.3. Prevention and control

6.3.1. Employers should ensure protection from electric and magnetic field exposure by:

(a) preventing dangerous exposure;

(b) the practice of caution and prudent avoidance;

(c) using appropriate techniques to minimize undue exposure to high-intensity fields.

In adopting appropriate techniques, employers should seek the advice of a technically competent person or service.

6.3.2. In the case of excessive, avoidable or unintentional radiation or leakage, employers should give priority to the minimization of unwanted emission of electric and magnetic fields from the source itself by shielding and absorbing with appropriate materials and design.

6.3.3. Employers should ensure that high radiofrequency (RF) aerials are designed and installed to direct the radiation away from any personnel and take due care to prevent the wave front from being reflected by material or other structures.

6.3.4. When workers are exposed to deliberate radiation sources such as antennas for broadcasting and telecommunication and the radiation cannot be suppressed, they should wear appropriate personal protection suits to reduce the coupling with the electromagnetic field, and the absorption of energy by organs or tissues of the body.

6.3.5. If shielding is not a practicable method of reducing the intensity of the fields, employers should limit:

(a) access of personnel to areas where an exposure limit is or may be exceeded;

(b) the exposure of workers present in these areas;

(c) access of personnel fitted with cardiac pacemakers and similar medical implants, where there is significant exposure to electric or magnetic fields;

and ensure that:

(d) sources are enclosed to prevent the spread of an electric field, controlled access is established, and the duration of exposure is reduced;

(e) electric and magnetic field sources are positioned as far as practicable from areas to which workers normally have access;

(f) the immediate vicinity of unmanned high-field sources is fenced off and warning signs and labels are posted;

(g) exposure in uncontrolled areas does not exceed the general public limits;

(h) satisfactory interlock systems are provided to prevent entry while the field is "live" and high-risk fields are present;

(i) workers are protected against electric shock;

(j) magnetic fields that may be strong enough to affect cardiac pacemakers or similar medical implants are clearly marked.

6.4. Health surveillance

6.4.1. Health surveillance of workers exposed to electric and magnetic fields should be carried out in accordance with the requirements given in the practical guides mentioned in paragraph 6.1.2 above, and might include:

(a) assessment of the health status of the worker before starting work with electric and magnetic field exposure (pre-employment or pre-assignment), during the exposure period and at the end of occupational exposure (at no financial cost to workers), with a view to detecting contraindications and ensuring protection of the worker and the safe use of electric and magnetic fields;

(b) detection and early prevention and treatment of any adverse effects caused by exposure;

(c) collection of precise individual data on exposure to electric and magnetic field and adequate health records that can be used in future epidemiological studies.

6.5. Training and information

6.5.1. Employers should ensure that workers exposed to significant electric or magnetic fields are provided with training, instructions and information on:

(a) normal safe operating practices and the procedures to be followed in the event of malfunction of the devices, or in an emergency;

(b) the hazards associated with operating the specific devices assigned to them and, in particular, the importance of any interlock system and dangers associated with defeating such systems;

(c) the effect of magnetic fields on cardiac pacemakers and similar medical implants;

(d) the use of personal protective equipment;

(e) effects that may occur after exposure to electric or magnetic fields has ceased.

ILO instruments: **standards**, codes, guides

Occupational Safety and Health Convention No. 155 and Recommendation No. 164, 1981.

Occupational Health Services Convention No 161 and Recommendation No 171, 1985.

Occupational Cancer Convention No. 139 and Recommendation No. 147, 1974.

Working Environment (air pollution, noise and vibration) Convention No. 148 and Recommendation No. 156, 1977.

Employment Injury Benefit Convention No. 121, 1964.

The List of Occupational Diseases Recommendation No. 194, 2002.

Current Activities

MEULOD/2006/1

INTERNATIONAL LABOUR ORGANIZATION

Report on the replies to the questionnaire on the updating of the "list of occupational diseases" annexed to the List of Occupational Diseases Recommendation, 2002 (No. 194) and on the amendments to the list of occupational diseases submitted to the Committee on Occupational Accidents and Diseases of the 90th Session of the International Labour Conference in 2002

Working document for the Meeting of Experts on updating the List of Occupational Diseases
(Geneva, 13-20 December 2006)

InFocus Programme on Safety and Health at Work and the Environment (SafeWork)
Geneva, October 2005

INTERNATIONAL LABOUR OFFICE GENEVA

Qu. 4:

Do you agree to add "Acute diseases caused by electromagnetic fields – EMF"?

Total number of replies: 118 (71)

Affirmative: 77 (45)

Argentina, Argentina (CGT), Argentina (UIA), Azerbaijan, Bahamas, Belarus, Belarus (FPB), Belarus (UHW), Belize, Bosnia and Herzegovina (Society of Occupational Medicine), Brazil, Cameroon, Cameroon (USLC), Cameroon (GICAM), Canada (CSN), Colombia, Congo, Cyprus, Czech Republic (SPCR), Egypt, Egypt (FEI), Estonia, Ethiopia, Gabon, Ghana, Germany (IGM), Greece, Guatemala, Honduras, Hungary, India, India (AITUC), Islamic Republic of Iran, Islamic Republic of Iran (ICEA), Italy, Italy (CGIL), Japan (JTUC), Kenya, Latvia, Lithuania, The former Yugoslav Republic of Macedonia, Mauritius, Morocco, Netherlands (FNV), Nicaragua, Nicaragua (UPANIC), Panama, Peru, Philippines, Philippines (Social Security System), Philippines (Occupational Safety and Health Centre), Poland, Portugal (CCP), Portugal (CPT), Portugal (UGT), Qatar (QCA), Russian Federation, Rwanda, San Marino, Saudi Arabia, Sierra Leone, Slovenia (ZPIZ), Slovenia (ZDODS), Slovenia (CIOTSM), Sri Lanka (LJEWU), Switzerland, Trinidad and Tobago (ECA), Tunisia, Turkey, Turkey (TSF), Turkey (TKS), Uganda, Ukraine (FPU), United Arab Emirates, Bolivarian Republic of Venezuela, Zambia.

WHO.

Negative: 41 (26)

Algeria, Bahrain, Benin (National Fund of Social Safety), Bulgaria, Canada, Canada (CLC), Chile, China, Croatia, Cuba, Czech Republic, Dominican Republic, Finland, Germany, Germany (BDA), Germany (DGB), Israel, Japan, Netherlands, New Zealand, Oman, Portugal, Portugal (CIP), Qatar, San Marino (ANIS), Serbia and Montenegro, Serbia and Montenegro (Institute of Occupational Health), Sri Lanka, Slovenia, Slovenia (Institute of Occupational Safety), Slovenia (ZDS), Spain, Spain (UGT), Sweden, Switzerland (UPS), Trinidad and Tobago, Turkey (MESS), Turkey (INTES), United Kingdom, United Kingdom (CBI).

International Maritime Health Association.

Comments

1.2.5. "Diseases due to radiofrequency radiations" as a new item

Radiofrequency (RF) fields are part of the electromagnetic spectrum. The RF part of the electromagnetic spectrum is generally defined as the part of the spectrum where electromagnetic waves have frequencies within the range of approximately 3 kilohertz to 300 gigahertz.

Common sources of RF fields include: FM radio (30-300 MHz), mobile telephones, television broadcast, microwave ovens, medical diathermy (0.3-3 GHz), radar, satellite links, microwave communications (3-30 GHz) and the sun (3-300 GHz). RF fields are non-ionizing radiations (NIR). RF fields may produce different effects on human beings. These effects depend on the frequency and intensity of the RF field. Most adverse health effects that could occur from exposure to RF fields between 1 MHz and 10 GHz are consistent with responses to induced heating, resulting in rises in tissue or body temperatures higher than 1°C. Tissue damage in humans could occur during exposure to high RF levels because of the body's inability to cope with or dissipate the excessive heat that could be generated. Induced heating in body tissues may provoke various physiological and thermoregulatory responses, including a decreased ability to perform mental or physical tasks as body temperature increases. Induced heating may affect foetal development. Birth defects could occur when the temperature of the foetus is raised by 2-3°C for a number of hours. Induced heating can also affect male fertility and lead to the induction of eye opacities (cataracts). Current scientific evidence indicates that exposure to RF fields is unlikely to induce or promote cancers. Relatively high levels of exposure to RF fields can affect workers in the broadcasting, transport and communications industries when working in close proximity to RF transmitting antennas and radar systems.

NIOSH/WHO/ILO Occupational EMF Document

Evaluation and Managing Occupational Exposure to EMF

A Joint Publication of the
US Centre for Disease Control and Prevention,
National Institute of Occupational Safety and Health,
the World Health Organization
And the
International Labour Organization

Contents

Preface

Chapter 1 Introduction

Chapter 2 Interaction Mechanisms (biological & health effects?)

Chapter 3 Exposure Measurements

Chapter 4 Occupational Exposure Guidelines on EMFs (ICNIRP, ACGIH & IEEE)

EU 2004/40/EC & NRPB?

Chapter 5 Typical Exposure Situations

Static fields, office appliances, electricity production and distribution, induction heaters and furnaces, welding devices, electric trains, NMR & MRI, diathermy equipment, hyperthermia equipment, RFID/EAS/MD, radio/TV transmitters, RF dielectric heaters, MV dryers, mobile phones, base stations, air and naval radars

Chapter 6 Basic Concepts -ELF & RF control

Chapter 7 EMF exposure management plans

Responsibilities (CA, E , W, P & M?), exposure assessment, exposure controls (normal and over exposure?), medical surveillance, training (& information?), plan reviews.

Annexes? Glossary, model regulations ???

Other Current Activities

- ICNIRP/WHO/ILO Practical guide on worker protection against exposure to UV
- WHO EHC monograph on ELF

SafeWork

Thank you!