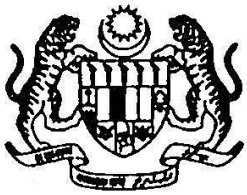

GUIDELINES ON REPRODUCTIVE HEALTH POLICY & PROGRAMMES AT THE WORKPLACE

DEPARTMENT OF OCCUPATIONAL SAFETY AND HEALTH
MINISTRY OF HUMAN RESOURCES
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PREFACE

These guidelines may be cited as the **Guidelines on Reproductive Health Policy & Programmes in the Workplace**

Growing scientific evidence suggests exposures of certain occupational hazards can cause a wide range of reproductive health disorders ranging from infertility to adverse pregnancy outcomes.

The "Guidelines on Reproductive Health Policy and Programmes in the Workplace" will provide employers, employees, occupational medicine physicians and other occupational safety and health professionals with guidelines for managing potential occupational reproductive health hazards.

Implementation of these guidelines will ensure a safe, healthy and reproductive health of the working population. Reproductive outcomes need to be monitored, documented, reported and distributed to relevant agencies for early corrective action.

These activities will need close cooperation and collaboration among the various disciplines and agencies both government and non-government. We are committed to ensure Vision 2020 gives birth to an advanced industrial nation without forsaking the health of the next generation and our future is not stolen.

These guidelines will reviewed from time to time and feedback to the Department of Occupational Safety and Health will be appreciated.

Director General
Department of Occupational Safety and Health
Malaysia

December 2002

FOREWORD

This guidelines are one of the outcomes of the Reproductive Health Hazards And Its Management In The Manufacturing Sector Project (06 02-05-7011) funded by the Ministry of Science, Technology and Environment under the Intensification of Research in Priority Areas (IRPA) programme. This project was conducted by the Occupational Safety and Health Research Group (*Gabungan Penyelidik Keselamatan dan Kesihatan Pekerjaan)* with researchers from Universiti Kebangsaan Malaysia, Universiti Sains Malaysia, Universiti Putra Malaysia, Ministry of Health and the National Institute of Occupational Safety and Health,Malaysia (NIOSH). The Centre Coordinators (Co-Investigators) were Prof. Madya Dr. Khadlijah Shamsuddin (UKM), Prof. Madya Dr. Razlan Musa (USM), Prof. Madya Dr. Chee Heng Leng (UPM), Hajjah Maimunah Khalid (NIOSH), Malaysia and Dr Hj. Mohd. Yusof Adun (MOH). This project was carried out under the Healthy Life Style Programme with leadership from Dato Prof. Dr Mustafa Embong and Prof Mafauzy from Universiti Sains Malaysia.

Various professionals from government and non-government agencies concerned with the welfare of reproductive health of working populations contributed to the preparation of this guidelines during round table meetings conducted at UKM. Their assistance towards the development of this guidelines is very much appreciated.

Prof. Dr. Krishna Gopal Rampal
Principal Investigator
Reproductive Health Hazards and Its Management in the Manufacturing Sector
IRPA 06 02-05-7011

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	NAME	INSTITUTION
1.	Ir. Dr. Johari Basri	Director General DOSH
2.	Ir. Zainuddin Abdullah	Deputy Director General DOSH
3.	Prof. Krishna Gopal Rampal	Universiti Kebangsaan Malaysia
4.	Prof, Madya Dr. Noor Hashim Ismail	Universiti Kebangsaan Malaysia
5.	Prof, Madya Dr. Khadijah Shamsudin	Universiti Kebangsaan Malaysia
6.	Dr. Ummi Khaltum Shamsudin	Universiti Kebangsaan Malaysia
7.	Dr. Hanizah Mohd Yusof	Universiti Kebangsaan Malaysia
8.	Dr. Fikri Ujang	Universiti Kebangsaan Malaysia
9.	Dr. Jamilah Jamaludin	Universiti Kebangsaan Malaysia
10.	Dr. Pinta Pudiyanti Siregar	Universiti Kebangsaan Malaysia
11.	En Kang Fang Thye	Universiti Kebangsaan Malaysia
12.	Pn. Nor Anita Megat Nordin	Universiti Kebangsaan Malaysia
13.	Cik Rachel Mok Poi Ling	Universiti Kebangsaan Malaysia
14.	En. Shahrizan Yunus	Universiti Kebangsaan Malaysia
15.	Prof, Madya Dr. Chee Heng Leng	Universiti Putra Malaysia
16.	En. Rosnan Hamzah	Universiti Putra Malaysia
17.	Prof, Madya Datin Dr. Rashidah Shuib	Universiti Sains Malaysia
18.	Prof, Madya Dr. Razlan Musa	Universiti Sains Malaysia
19.	Dr. Zainul Abidin Md. Hussain	Department of Occupational Safety and Health
20.	Pn. Zaiton Sharif	Department of Occupational Safety and Health
21.	Dr. Agus Salim	NIOSH Malaysia
22.	Pn. Hajjah Maimunah Khalid	NIOSH Malaysia
23.	En. Ng Wei Khiang	NIOSH Malaysia
24.	En. Mazlan	Federation of Malaysia Manufacturer
25.	En. Hj. Hashim Hj. Zulkifli	CUEPACS
26.	En. Abd.Rahim Mohd	CUEPACS
27.	En. K. Nadasapillay	MTUC
28.	Miss Anne Khoo	Nurses Union
29.	Dr. Mohd Ismail Mohd Tambi	LPPKN
30.	En. Azizuddin Mohd Yusof	LPPKN
31.	Dr. Ang Eng Suan	Federation of Family Planning Associations, Malaysia
32.	Dr. Mary Cardosa	All Women's Action Society
33.	Dr. Sharkawi Jaya	PETRONAS
34.	Mr. Allan Yeo	Exxon Mobil
35.	Dr. Edwin Leo	Subang Jaya Medical Centre

36.	En. Paguman Singh	PERKESO
37.	Pn. Rashidah Abdullah	Asian-Pasific Resource & Research Centre for Women
38.	Prof. Datin Dr. Nafisah Adeed	Malaysian Medical Association
39.	En. Ahmad Humaizi Mat Noor	Malaysian Employers Federation
40.	Dr.Ravindra J	Obstetric & Gynaecology Doctor
41.	Dr.B. Jagdev Singh	Tokoh Keselamatan & Kesihatan Pekerjaan

For further information please contact:

Department of Occupational Safety and Health
Level 2,3 and 4 Block D3, Parcel D
Pusat Pentadbiran Kerajaaan Persekutuan
62506 Putrajaya
Tel: 03-88865200; Fax: 03-88892339
e-mail : jkkp@dosh.gov.my

1.0 DEFINITIONS:

1.1 "Reproductive health" is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in all matters relating to the reproductive system and to its functions and processes;

1.2 "Reproductive health hazards" means any substance, situation or activity that affect the reproductive health of women and men or the ability of couples to have healthy reproductive outcomes in relation to sexuality, fertility, pregnancy, breastfeeding, reproductive cancers and menopause and other areas;

1.3 "Mutagenic" means substances or preparations which if inhaled, ingested or penetrated into the skin may induce genetic changes in spermatozoa or ovum cells, or increase its incidence;

1.4 "Teratogenic" means substances or preparations which if inhaled, ingested or penetrated into the skin of a pregnant woman, may induce deformation in the foetus or increase its incidence;

1.5 "Carcinogenic" means substances or preparations which if inhaled, ingested or penetrated into the skin, may induce cancer in humans or increase its incidence;

1.6 "Chemical Safety Data Sheet" means a document which contains relevant information on a chemical and is furnished in pursuance of the Occupational Safety and Health (Classification, Packaging, and Labeling of Hazardous Chemicals) Regulations 1997;

1.7 "Ergonomic" means the study of the behaviour and activities of people working with mechanical and electronic machines and tools;

1.8 "Personal Protective Equipment" (PPE) means any equipment which is intended to be worn or held by a person at work and which protects him against one or more risks to his health or safety and any additional accessory designed to meet that objective;

1.9 "Health surveillance" means any examination and investigations which may be necessary to detect exposure levels and early biological effects and responses, and includes biological monitoring, biological effect monitoring, medical surveillance, enquiries about symptoms of occupational poisoning or occupational disease and review of records and occupational history;

1.10 "Risk assessment" means the process of evaluating the risks to safety and health arising from hazards at work;

1.11 "Assessor" means an employee or any other person appointed by the employer and registered with the Director General to carry out assessments of risk to health;

1.12 "Hygiene technician" means an employee or any other person appointed by the employer and registered with the Director General to carry out any inspection, examination or test on engineering control equipment installed in a place of work or to carry out chemical exposure monitoring;

1.13 "Director General" means the Director General of Department of Occupational Safety and Health appointed by the Minister of Human Resources for the purpose of exercising the powers, performing the functions and discharging the duties assigned to him under the Occupational Safety and Health Act 1994.

1.14 "Occupational Safety and Health Officer" means the occupational safety and health officer appointed by the Minister of Human Resources from public officers and includes the Director General, Deputy Directors General, Directors, Deputy Directors and Assistant Directors of Department of Occupational Safety and Health for the purposes of the Occupational Safety and Health Act 1994;

1.15 "Employee" means a person who is employed for wages under a contract of service on or in connection with the work of an industry to which the Occupational Safety and Health Act 1994 applies and –

a) who is directly employed by the principal employer on any work of, or incidental or preliminary to or connected with the work of, the industry, whether such work is done by the employee at the place of work or elsewhere; or

b) who is employed by or through an immediate employer at the place of work of the industry or under the supervision of the principal employer or his agent on work which is ordinarily part of the work of the industry or which is preliminary to the work carried on in or incidental to the purpose of the industry; or

c) whose services are temporarily lent or let on hire to the principal employer by the person with whom the person whose services are so lent or let on hire has entered into a contract of service;

1.16 "Employer" means the immediate employer or the principal employer or both;

1.17 "Immediate employer" in relation to employees employed by or through him, means a person who has undertaken the execution at the place of work where the principal employer is carrying on his trade, business, profession, vocation, occupation or calling, or under the supervision of the principal employer or his agent, of the whole or any part of any work

carried on in, or incidental to the purpose of, any such trade, business, profession, vocation, occupation or calling, and includes a person by whom the services of an employee who has entered into a contract of service with him are temporarily lent or let on hire to the principal employer;

1.18 "Pregnant employee" is an employee who is medically certified to be pregnant and who informs her employer of her condition;

1.19 "Employee who has recently given birth" means an employee who has given birth not more than fourteen weeks preceding an expected date of delivery and who informs her employer of her condition;

1.20 "Employee who is breastfeeding" means an employee who, having given birth not more than twenty four weeks previously, is breastfeeding and who informs her employer of her condition;

1.21 "Female employee of child bearing capacity" means all women who have reached puberty but have not yet attained menopausal age, no matter what their age, marital status or personal child-bearing intentions.

2.0 INTRODUCTION:

Disorders and problems of reproduction and occupational hazards to reproductive health have become prominent public health issues. In the late 70's, it was discovered that men occupationally exposed to dibromochloropropane (DBCP) were subject to varying degrees of testicular toxicity, potentially culminating in infertility. Lead exposure has been found to cause increased incidence of asthenospermia, hypospermia and tetraspermia in male worker (Thomas & Ballantyne, 1990) meanwhile methyl mercury found in fishes in Minamata Bay, Japan, has resulted in the birth of congenitally deformed babies among the fishing community (National Seminar: Reproductive Health & Safety in the Workplace, 2000).

Occupational exposures can produce a wide range of effects on reproduction depending on the nature, degree and duration of hazard exposure and biological variation of an individual. The effects of exposure before conception include reduced fertility, unsuccessful fertilization or implantation, an abnormal foetus, reduced libido, or menstrual dysfunction. Maternal exposure after conception may result in perinatal death, low birth weight, birth defects, developmental behavioral disability, and cancer (OSHA, USA).

Many of these problems – infertility, miscarriage, low birth weight etc., are fairly common occurrences and affect working and non-working women and thus make identification or determination of occupational hazards to reproductive health all the more necessary. In addition to that, there are very limited epidemiological data due to several reasons (e.g. the frequency of some

adverse reproductive effects is rare and large sample sizes are necessary for a study to have sufficient power, existence of many confounding factors, etc.), and uncertainty concerning the extrapolation of animal toxicological studies to human due to differences in species sensitivity.

The issue of reproductive hazards in the workplace can be easily overlooked because it is usually felt to be largely non-essential to the survival of an individual. Nevertheless, it is crucial for the survival and well-being of the human race, a fact many of us tend to forget. We have seriously looked into this issue and developed the "Guidelines on Reproductive Health Policy and Programmes in the Workplace". It is hoped that the guidelines will be able to help to facilitate the protection of employee's reproductive health while not reinforcing gender inequalities or different treatment to certain group of employees, e.g., pregnant employees and employees who have recently given birth or are breastfeeding in the workplace.

3.0 OBJECTIVES:

The objectives of the "Guidelines on Reproductive Health Policy and Programmes in the Workplace" are:

- to provide employers and employees guidelines for identifying and managing potential occupational reproductive health hazards; and

- to promote a safe, healthy and productive work environment and to specifically reduce teratogenic, mutagenic, carcinogenic and maternal risks while not infringing on individual rights or other social values.

The "Guidelines on Reproductive Health Policy and Programmes in the Workplace" are developed based upon the following principles:

- Reproductive health represents one of the major aspects of human life.

- The magnitude of occupational and environmental risks on reproductive and developmental health in modern society is not well characterized and need to be addressed.

- Scientific epidemiological and toxicological data concerning the reproductive and developmental health risks of many physical, chemical and biological agents are limited and, in some instances non-existent.

- Industrial exposure limits for most chemical agents which have been promulgated by the Occupational Safety and Health Act 1994, i.e., permissible exposure limits (PELs), have been established without

considering protection from adverse reproductive or developmental health effects. Consequently, compliance with the Occupational Safety and Health Act 1994 (OSHA) exposure limits for many compounds does not assure protection of reproductive health.

- Employees have a fundamental right to work in an environment that is free of reproductive health risks.

- Employees have a fundamental right to know about potential reproductive health risks encountered in the workplace.

- Reproductive policies must avoid gender discrimination and consider potential adverse effects on males, females, and offspring. Previously, concern over potential harm to fetal health and the potential consequences of tort liability suits have led some corporations to restrict the work of fertile or pregnant women or to exclude women entirely from some area of production.

4.0 LEGAL PROVISIONS

4.1 The Factories and Machinery Act 1967 and Its Regulations

The earliest provisions with some direct bearing on reproductive health at work were contained in the Factories and Machinery (Lead) Regulations 1984. The provision for special biological monitoring is made by Regulation 34 (e) of these regulations, which states that:

"The employer shall make available biological monitoring in the form of blood sampling and analysis for lead level to each employee who may be exposed to lead above the action level at least monthly for a female employee of child-bearing capacity"

Provisions for medical removal protection are made by Regulation 41(c) and Regulation 43.

Regulation 41 (c) stipulates that:

"The employer shall remove an employee from work having any exposure to lead at or above the action level on each occasion that a periodic and follow-up sampling test of a female employee of child-bearing capacity indicate that the employee's blood level is at or above 40 µg/100 g of whole blood"

Regulation 43 stipulates that:

"The employer shall after being notified of the fact remove a pregnant employee and a breastfeeding employee from work which may expose the said employee to lead"

4.2 The Occupational Safety and Health Act 1994 and Its Regulations

There is no specific provision relating to reproductive health under the Occupational Safety and Health Act 1994 and Its Regulations. Section 15 of the Act elaborates the general duties of employers and self-employed persons to their employees, provides sufficient legislative berth for the provision of reproductive health at work. Subsection 15(1) states that:

'It shall be the duty of every employer and every self-employed person to ensure, so far as practicable, the safety, health and welfare of all his employees"

Taken in the context of reproductive health, this would mean that the employer (including the self-employed) is responsible for protecting all his employees from all risk to their safety, health and welfare, including the risks to reproductive health. Thus in principle "all his employees" cover pregnant employees, employees who have recently given birth or are breastfeeding.

Subsection 15(2) of the same Act, read specifically in the context of reproductive health, would extend the duty stated in Subsection 15(1) to:

(a) the provision and maintenance of plant and systems of work that are, so far as practicable, safe and without risks to health;

(b) the making of arrangements for ensuring, so far as practicable, safety and absence of risks to health in connection with the use or operation, handling, storage and transport of plant and substances;

(c) the provision of such information, instruction, training and supervision as is necessary to ensure, so far as practicable, the safety and health at work of his employees;

(d) so far as is practicable, as regards any place of work under the control of the employer or self-employed person, the maintenance of it in a condition that is safe and without risks to health and the provision and maintenance of the means of

access to and egress from it that are safe and without such risks; and

(e) the provision and maintenance of a working environment his employees that is, so far as practicable, safe, without risks to health, and adequate as regards facilities for their welfare at work.

4.3 The Occupational Safety and Health (Classification, Packaging and Labelling of Hazardous Chemicals) Regulations 1997

The purpose of the Regulations is to provide a legal frame work for a large group of chemicals, commonly known as "industrial chemicals" which are largely not regulated by any legal instrument with respect to classification, packaging and labelling requirements.

The Regulations clearly stipulate the responsibility of the suppliers of chemicals (including manufacturers, formulators etc.) to classify chemicals according to their hazardous properties, pack them in appropriate containers, label the container with prescribed information, and accompany the chemicals with an information sheet known as the Chemical Safety Data Sheet (CSDS).

Therefore, a supplier should ensure that chemical hazards which are risky to reproductive health, i.e. teratogen, carcinogen and mutagen, are labelled well in accordance with the requirements in the Regulations to avoid any untoward incident related to the use and handling of chemical, and to reduce occupationally related reproductive health disorders.

4.4 The Occupational Safety and Health (Use and Standards of Exposure of Chemicals Hazardous to Health) Regulations 2000

The Use and Standards of Exposure of Chemicals Hazardous to Health Regulations 2000 provide to certain employers within the jurisdiction of the Occupational Safety and Health Act, management of chemicals used in the workplace to protect the health of employees. The Regulations outline the duty of an employer or self-employed person which include:

a) Identification of chemicals hazardous to health used in the place of work;
b) Assurance that his employees are not exposed at any time to any chemical hazardous to health listed in Schedule I exceeding the ceiling limit specified for that chemical;
c) Risk assessment of chemicals hazardous to health;
d) Exposure controls;

e) Assurance that chemical hazards are labelled in accordance with the requirements of the Occupational Safety and Health (Classification, Packaging and Labelling of Hazardous Chemicals) Regulations 1997; in the case of a pesticide, in accordance with the requirements of the Pesticides Act 1974; or in the case of a schedule waste, in accordance with the requirements of the Environmental Quality (Schedule Wastes) Regulations 1989;
f) Provision to his employees the information, instruction and training programmes on chemicals hazardous to health, its risks and precautions which should be taken;
g) Exposure monitoring at the workplace;
h) Employees' health surveillance programme;
i) Medical removal programme where an employee is detected by medical practitioner or by an occupational health doctor that he/she has a medical condition which places him/her at increased risk of material impairment to health from exposure to chemicals hazardous to health, the employer shall grant medical removal protection to the said employee.

Subsection 28(2) has put pregnant employees or employees who are breastfeeding into the medical removal programme to protect their reproductive health. It states:

"The employer, after being notified by an occupational safety and health officer who is also a medical practitioner or an occupational health doctor of the fact, shall not permit a pregnant employee or breastfeeding employee to be engaged in, and shall remove the employee from work which may expose or is likely to expose the employee to chemicals hazardous to health".

j) Signage on chemicals hazardous to health by putting warning sign at areas identified as hazardous; and
k) Record keeping, i.e., retention of risk assessment, exposure monitoring, engineering control equipment, health surveillance; and education and training records given to his employees.

4.5 The Atomic Energy Licensing Act 1984 Radiation Protection (Basic Safety Standards) Regulations 1988

The Radiation Protection (Basic Safety Standards) Regulations 1988 prohibits employment of pregnant employees and employees who have recently given birth or are breastfeeding in the workplace that is highly exposed to radiation.

Subsection 7(3) states that:

"No person shall allow a female worker to work in a controlled area if she is or is suspected to be pregnant".

Subsection 7(4) states that:

"No person shall employ a nursing mother in any work involving a high risk of radioactive contamination unless she is placed under special surveillance to detect any possible radioactive contamination".

5.0 COMPONENTS OF THE GUIDELINES

- Development of a reproductive health policy and programmes in the workplace
- Identification of reproductive health hazards and risk assessment
- Reproductive health hazards management

5.1 Development of a Reproductive Health Policy and Programmes in the Workplace

The Occupational Safety and Health Act 1994 (Act 514) requires all employers with more than five employees, to formulate a written Safety and Health Policy of their workplaces. The policy should also include or take into concern the reproductive health of the employees. Here, a guideline is provided to help organisations formulate a Reproductive Health Policy and Programmes in the Workplace.

Who are the employers that should develop a Reproductive Health Policy and Programmes in the Workplace?

Employers who have:

a) male employees exposed to any of the reproductive health hazards listed in Table 1; and
b) female employees at child bearing capacity exposed to any of the reproductive health hazards listed in Table 2,

should develop Reproductive Health Policy and Programmes in the Workplace.

Purpose of policy:

The Reproductive Health Policy and Programmes in the Workplace demonstrate the company's concern and commitment to ensure reproductive health of the employees. It acts as a basis for developing and implementing programmes for securing the reproductive health at the workplace. Finally, it should affect all work activities and decision making process of the organisation.

Contents of written statement:

There are three main parts of the written policy, namely:

5.1.1 General Policy Statement
5.1.2 Organisation
5.1.3 Arrangements

5.1.1 General policy statement (or statement of intent)

The first part can be a simple and brief statement of the overall intent of the employer to look after the reproductive health and health of the workforce. Among others it should:

a) outline the goals of the policy;
b) indicate that the management accepts responsibility for reproductive health of the employees and others who may be affected by the work activities;
c) outline that when implementing programmes to safeguard employees' reproductive health, no restrictions on certain types of work, opportunity or inequalities of treatment for female of child-bearing capacity;
d) bear a reference to other parts of the policy document which go into more details; and
e) be dated and signed by the Chairman or Managing Director, or the top management.

5.1.2 Organisation

The second part of the policy document should explain the organisation for reproductive health responsibilities. This will be mainly about "who is to do what". Essentially it should spell out:

a) the list of reproductive health responsibilities of all levels of management i.e. from top management down to supervisors, and safety and health personnel (if any);
b) the role of employees in the implementation of the policy. Each employee has a duty not to endanger himself/herself or others by his/her actions or omissions, and to co-operate in all measures provided for his/her reproductive health;
c) the structure and functions of safety and health committees and other in-house safety and health organisation (if any).

5.1.3 Arrangements

The third part of written policy documents deals with practical systems and procedures. It concerns mainly with potential reproductive hazards and methods of dealing with them. Among others, essentially it should specify detailed arrangements for ensuring that the General Policy is being implemented including:

a) the arrangements for training and instruction;
b) information about reproductive hazards that may be in certain processes, the control measures and the ways in which employees should co-operate for their own reproductive health;
c) specify the company safe system of work, including safe work procedures and rules;
d) scheme for the issuance, use and maintenance of personal protective equipment (PPE); and
e) the procedure for reporting and investigation of accidents.

After the development of reproductive health policy, employers should:

- Inform all employees of their written reproductive health policy.
- Review and revise the policy, as appropriate, from time to time.
- Inform employees of any revision to the policy.

It is important that contents of the policy and programmes be made known to all employees during induction and job training. The general policy statement should also be displayed at strategic locations in the workplace.

5.2 Reproductive health risk assessment

The assessment of occupational reproductive and developmental risks, like any risk from an occupational hazard, involves several distinct steps including hazard identification, exposure assessment, dose-response evaluation and risk characterisation. Accurate hazard identification, exposure assessment and risk characterisation or classification are key to health promotion and disease prevention.

5.2.1 Hazards identification

5.2.1.1 An employer should identify the reproductive health hazards in the place of work. The hazard identification includes all activities carried out in order to determine whether a substance, situation or activity has the potential to cause harm. The hazards identification should also involve participation from the employees as well.

5.2.1.2 The inventory of hazards encompasses those that are present during normal and unusual work activity, involving breakdowns and maintenance. It can be developed from a list of the chemicals purchased and used, through an understanding of the process in order to determine the intermediate and final products, by conducting a walk-through survey and by 'brainstorming' of those who work in specific areas. This hazard

identification exercise can take place by studying each individual hazard, work process or work unit.

5.2.1.3 Professional judgement from occupational safety and health officers may be required in hazard identification since information concerning the reproductive health hazards of many agents is limited and may be non-existent.

5.2.1.4 Other source of reproductive toxicity information may be found in:

- Material Safety Data Sheets (MSDS); however, detailed information concerning the reproductive toxicity potential of many agents may not be included in an MSDS. Absence of reproductive information on a MSDS does not exonerate an agent.
- text books, peer-reviewed medical and toxicological journals
- computer data bases:
  - MEDLINE, National Library of Medicine, Bethesda MD (1-800-638-8480)
  - REPROTOX, Reproductive Toxicology Center, Washington DC (202-293-5946)
  - TERIS, Teratogen Information System, Seattle WA
  - MICROMEDIX
    - Toxicology Information Programme, National Library of Medicine, Bethesda MD (301-496-1131) maintains the following data bases:
      - ETICBACK Environmental Teratology Information Backfile
      - DART Developmental and Reproductive Toxicology
      - HSDB Hazardous Substance Data Bank
      - RTECS Registry of Toxic Effects of Chemical Substances
      - TOXLINE Toxicology Information System
      - IRIS Integrated Risk Information System
  - Governmental agencies:
    - Environmental Protection Agency, Washington DC
    - National Institute of Occupational Safety and Health, USA
    - Occupational Safety and Health Administration, USA
  - Agency for Toxic Substances and Disease Registry
    - Organisation: March of Dimes Foundation

5.2.1.5 Table 1 and 2 both provide a list of reproductive health hazards to male employee and pregnant employees,

employees who have recently given birth or are breastfeeding. Exposure level considered harmful for certain hazards and examples of preventive measures to female employees are also specified in table 2.

5.2.1.6 It should be the duty of employers to assess any risk to the reproductive health of employees, and any possible effect on the pregnant employees, employees who have recently given birth or are breastfeeding, resulting from any activity at that employees' place of work likely involved a risk of exposure to reproductive hazards listed in Table 1 and 2. There is a need to bear in mind that there could be different risks depending on whether employees are pregnant, have recently given birth or are breastfeeding.

5.2.1.7 The assessment carried out should be reviewed if:

a) there has been a significant change in the work to which the assessment relates; and
b) notification of pregnancy by female employees.
c) directed by the Director General, Deputy Director General or the Director of Occupational Safety and Health.

5.2.1.8 An employer may need an assessor to carry out the risk assessment. Risk assessor should complete the assessment within one month and furnish the employer with a report of the assessment.

5.2.1.9 The employer should ensure that the report of the reproductive health risk assessment conducted is maintained in good order and condition for a period of not less than thirty years.

5.2.1.10 The employer should make available the assessment report for examination upon request by the Director General or by any employee exposed or likely to be exposed to reproductive health hazards.

5.2.1.11 If the risk assessment does reveal a risk, the employer should inform all employees concerned of the potential risks immediately and take appropriate action to eliminate or control the risks.

5.2.2 Exposure assessment

Exposure assessment can be qualitative or quantitative in nature. Qualitative assessment can be used to enumerate exposures associated with the tasks of a particular job and to estimate on a

relative scale (e.g., none, negligible, low, medium, high) the magnitude of potential exposure for each listed agent and relevant route. This ranking can be based upon the volume of material present or used, the physical form of the material, volatility, frequency of contact, whether or not the material is contained within a closed system and any engineering controls that might be in place. Quantitative ambient air monitoring can then be directed toward those tasks which have the greatest potential for exposure. In some situations, analyses of surface samples and dust, soil and water samples may be indicated to evaluate other potential exposure pathways. The assessment of potential reproductive and developmental risks associated with a particular job can be directed to those agents where there is a likelihood of a significant exposure.

5.2.3 Risk characterisation

Risk characterisation is the process of determining the potential health risks of exposure based upon the site-specific exposure potential and the toxicity potential of the agent. The risk characterisation process is based upon information obtained during hazard identification and exposure assessment to arrive to an estimate of risk and its acceptability.

5.3 Reproductive health hazards management

Ensuring safety in the work place is not merely the responsibility of occupational safety and health professionals, but the responsibility and co-operation of employers and employees to work together to reduce reproductive health hazards in the workplace.

5.3.1 Measures to encourage reproductive health of employees include:

- Identification of reproductive health hazards and risk assessment
- Reproductive health hazards elimination
- Reproductive health hazards exposure control
- Education and training to employees

5.3.1.1 Identification of reproductive health hazards and risk assessment

Reproductive health hazards identification and risk assessment has been discussed in part 5.2

5.3.1.2 Reproductive health hazards elimination

Ideally, if a significant workplace reproductive health hazard is identified, the best option for elimination of the agent is through product substitution.

Substitution should be carefully evaluated to assure that risk is eliminated and reduced rather than increased by procedural changes or by the toxic properties of the proposed substitute.

In the event that the elimination of the agent is not feasible due to technological constraints, economic infeasibility or scientific uncertainty concerning the magnitude of the risk, other primary preventions for instance, use of engineering control and personal protective equipment and education to employees should be implemented to reduce risks to reproductive health.

5.3.1.3 Exposure control

Principle: To ensure employees are not exposed to reproductive and developmental hazards that exceed acceptable levels of exposure. Methods of exposure control include:

- Engineering control
- Exposure control monitoring
- Reproductive health surveillance
- Administrative control
- Medical removal protection
- Personal protective equipment

Engineering control

a) An employer, with advice from the occupational safety and health professionals should select effective engineering control techniques based on the physicochemical properties of the hazard, conditions of use and the exposure limit that must be observed, etc., to control exposure and thereby reduce the risk of disorders of reproduction of employee.

b) Any engineering control equipment provided should be:
   - inspected at an appropriate intervals by the employer, each interval being no longer than one month; and
   - examined and tested for its effectiveness by a hygiene technician at appropriate intervals, each interval being no longer than twelve months.

c) Every engineering control equipment should be maintained and operated at all times while any machinery or plant is in operation to ensure exposure level of employees to reproductive health hazards are reduced to the lowest practicable level, or for those chemicals to which have been assigned with permissible exposure limits, to below the limits.

Exposure control monitoring

a) Where an assessment of risk to reproductive health indicates that monitoring of exposure is required or it is requisite for ensuring the maintenance of adequate control on the exposure of employees to reproductive health hazards, the employers should ensure that the exposure of employees to reproductive health hazards are monitored in accordance with an approved method of monitoring and analysis.

b) Exposure assessment should be conducted by hygiene technician and repeated at intervals of not more than six months or at such shorter intervals as determined by the assessor. The monitoring should continue at this frequency until such time the assessor is satisfied that further monitoring of exposure is no longer required.

c) Exposure control monitoring can be accomplished by environmental monitoring which includes the measurement of hazards in the air and other environmental media such as work surfaces, soil and water, or by biological monitoring which involves measurement of a hazard or its metabolites in blood, urine, etc.

d) Biological monitoring is usually preferred to environmental monitoring because it provides more accurate measurement of employees' exposure.

e) Biological monitoring provides:

- an index of exposure to a reproductive health hazard and takes into account all routes of absorption (e.g. inhalation, percutaneous absorption, inadvertent ingestion);
- an objective data concerning whether reproductive health hazards exposure control methods are effective.

f) Biological monitoring should only be implemented after consideration of the many variables that can affect test results

including pharmacokinetic data, dose response relationships, and laboratory quality control procedures. When these are well known and adequately controlled, biological monitoring provides the best estimate of the dose absorbed.

g) The employer should ensure that the record of any monitoring carried out or a summary thereof is maintained in good order and condition and kept for a period of thirty years from the date of the last entry made in it.

Reproductive health surveillance

a) Where an assessment indicates that health surveillance is necessary for the protection of the reproductive health of employees exposed or likely to be exposed to reproductive health hazards, the employer shall carry out a reproductive health surveillance programme. Reproductive health surveillance procedures include:

i) Symptom reviews

- This procedure requires the clinician (other trained competent health professional) to enquire about relevant symptoms of exposure to specific reproductive health hazards. A clinical assessment is then made to decide whether these symptoms are likely to be due to workplace factors.

- A different approach to symptom review is to provide a list of relevant symptoms to exposed individuals, and instruct them to report the experience of these symptoms for further clinical evaluation.

ii) Periodical clinical assessment

- This includes limited examination by a trained health care professional, e.g. nurse, medical assistant or occupational safety and health professional, or self examination. Clinical assessment should be done continuously and periodically after an interval of time.

iii) Medical examination

- This refers to examination by a physician. For the purpose of occupational reproductive health surveillance, full head to toe medical examination

may be needed because a healthy reproductive system involves the endocrine and central nervous system.

b) The employer should ensure that the reproductive health surveillance record or a copy thereof is maintained in good order and condition and kept for a period of thirty years from the date of the last entry made in it.

c) The employer should, after a reasonable notice being given, allow any of his employees access to the reproductive health surveillance record which relates to the employee.

d) Reproductive history questionnaires can also be included as a part of reproductive health surveillance programme.

Questionnaires can be administered to a population at risk for the purpose of determining whether there are any unusual patterns or clusters of reproductive health problems. Ideally, information from a control non-exposed population should be collected to serve as a comparison group. End points that can be considered include live births, fetal loss and birth defects. If potential problems are identified that could be related to occupational exposure, a reassessment of exposure potential and reproductive toxicity data may be required for a work site or a specific industrial process. Questionnaires also provide a database that could be used to facilitate a retrospective assessment of the effects of a workplace on reproductive function.

Administrative control

a) An employee who is pregnant or has recently given birth, or is breastfeeding should notify the employer. The purpose of employee notification is to provide an opportunity for counseling of the employee regarding issues concerning potential reproductive risk in the workplace.

b) The employer should grant temporary reassignment to an employee from a job position where there is potential exposure to a reproductive or developmental hazard which cannot be adequately controlled through engineering or work practice controls alone. Temporary reassignment should be considered in two specific circumstances:
   - when an employee notify that she is pregnant or has recently given birth, or is breastfeeding,

- when a couple has intention to have children, has sought medical consultation for infertility but no cause has been discovered.

Medical removal protection

a) Voluntary removal from reproductive health risk at the employee's request, will be allowed with the intention to protect the reproductive health. This will be sufficiently in advance of conception to allow the reproductive health hazard(s) of concern to be eliminated from the body.

b) Removal at any stage of pregnancy will be allowed if a medical practitioner certifies that continuing work will be harmful to the foetus, either if terms of physical stress or hazardous exposure.

c) In all cases of medical removal, employees should be given economic protection, either in the form of full wages or sickness benefit. There should be no prejudice to salary or career development.

d) During this period of medical removal, where possible, alternative work can be offered to the employee in an environment free from reproductive hazards.

e) Return to the previous job will be permitted when a medical practitioner certifies that possibility of harm to the foetus is minimal.

f) Return to the previous job could wait until either the completion of the pregnancy or the completion of lactation, depending on an assessment as to whether the substance poses hazards to the breastfed child.

g) It has to be reminded that substitution of female employees would not eliminate the risk to male's reproductive health.

Personal protective equipment (PPE)

a) The use of PPE should not be regarded as an alternative to engineering or other suitable control measures but should be provided and maintained where such control measures cannot ensure protection.

b) Examples of PPE are respiratory protective equipment and protective clothing.

c) All PPE that is necessary for safety in the use or handling of physical, chemical, biological agents or other hazards should be provided and maintained by the employer without cost to the employee. The equipment should not be brought home to avoid contamination at home.

d) Employees required to wear PPE should be fully instructed in its use.

e) Employers should provide supervision to ensure that the PPE is properly used.

f) PPE should afford adequate protection against the risk from those hazardous chemicals to which the wearer is exposed, throughout the period during which such equipment is necessary, having regard to the type of work.

g) The PPE provided should be suitable for its purpose and there should be a sufficient supply readily available in the workplace for employees who require it.

h) The PPE worn should fit the employees comfortably. For example, a pregnant employee may not feel comfortable wearing the protective clothing she used to wear due to increase in body size.

i) The PPE should not adversely affect the health or medical condition of the employees.

5.3.1.4 Education and training of employees

Employers and occupational safety and health professional should work towards providing employees with detailed information and health and safety training about the chemicals, physical or biological agents, or any other potentially hazardous substances or work situations with which they must work. This will increase compliance with protective equipments and care with safety in the workplace. It will also help them in the decision making process when faced with possible side effects in pregnancy.

Implementation:

a) The employers and occupational safety and health professional should develop a risk communication programme aimed to educate the employees about substances, situations and activities that may represent potential risks to the reproductive health as well as to the developing foetus.

b) Risk communication programmes should be clearly written and in simple language that can be easily understood by employees.

c) All employees have the right to know that certain workplace exposures can have negative effects on their sexual or reproductive health.

d) Information about the nature of a chemical and its risks to health should be easily accessible to the employees.

e) Information available should be updated as new toxicological and epidemiological information becomes available.

f) As part of the education programme, areas in the workplace where reproductive hazards may exist will be defined and have warning signs reading "Reproductive Hazard Area".

g) Employees have the right to review Chemical Safety Data Sheet (CSDS), which provides information on the identity and health effects of substances used in the workplace.

h) Training intended to protect employees' reproductive health should also be included as part of the occupational safety and health training programme. Employees should be advised on the possible safety measures to reduce exposure to reproductive hazards.

i) Employees should be trained in the correct and effective use of the control measures, in particular the engineering control measures and measures for PPE provided, and should be made aware of their significance.

j) Employees should be advised to keep a record of their work conditions, as well as the names of any chemicals, biological or physical agents, and potentially hazardous situations to which they may be exposed. They should note any irregularities or abnormalities that occur in their sexual functioning, in their menstrual cycle, in their (or their partner's) ability to become pregnant, or in their children's development.

k) Employees in similar jobs should be encouraged to meet and discuss any work situations that could be dangerous to their

health. Any health problems amongst employees should be reported and acted on as soon as possible.

l) The employer should review and conduct the training programme:
- at least once in two years;
- if there is a change in the reproductive health hazards information, safe work practice or control measures; or
- each time employees are assigned to new tasks or new work areas where they are exposed or likely to be exposed to reproductive health hazards.

m) All training programmes should be documented and kept for inspection by any occupational safety and health officer.

6.0 REFERENCES

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TABLE 1: LIST OF OCCUPATIONAL REPRODUCTIVE HEALTH HAZARDS TO MALE EMPLOYEES

A. PHYSICAL AGENTS	
Reproductive hazards	**Risk to reproductive health**
i) Ionizing radiation, e.g. electromagnetic and particulate radiation.	Lowered number of sperm, abnormal sperm shape, altered sperm transfer and altered hormones/sexual performance. Chromosomal damage is observed in germ cells that survive radiation.
ii) Non-ionizing radiation, e.g. microwave radiation from radar equipment	A survey showed that radar equipment male operators in US military services had higher fertility problems and their sperm concentration was also lower than the control group. However, their endocrine and accessory sex gland functions were not affected. It was suggested that microwave radiation had detrimental effect on spermatogenesis.
iii) Extremes of heat, e.g. welding and ceramic industry	Lowered number of sperm and altered sperm transfer. In welding industry, exposure of male employees to high environmental temperature (31.1 to 44°C)/skin temperature in the groin region increased by an average of 1.4°C, for an average of five hours a day significantly decreases the proportion of sperms with normal morphology especially after six weeks of exposure to radiant heat.
iv) Vibration, e.g. professional driving	Two studies done previously have shown that prolonged urban automobile driving is associated to abnormal sperm morphology, low sperm concentration and low semen volume. The researchers attributed this poor semen quality to the constant vibrations that men in these profession were exposed to.

B. BIOLOGICAL AGENTS	
Reproductive hazards	**Risk to reproductive health**
Any biological agent in groups 2,3 and 4, e.g. HIV and *Treponema Pallidum*	Aids (caused by HIV) and syphilis (caused by *T. Pallidum*) are sexually transmitted disease. A male employee who works in health care centers, may be accidentally infected and then transmit the agent to his wife (through sexual intercourse) and his newborn child (if his wife is pregnant at that time) without his realization.
C. CHEMICAL AGENTS	
Reproductive hazards	**Risk to reproductive health**
Substances labelled R40, R45, R46, R47, R49, R61 and R63. (Ref: Occupational Safety and Health (Classification, Packaging and Labelling of Hazardous Chemicals) Regulations 1997)	The risk of a substance can be identified from the label of a chemical package. R40: possible risk of irreversible effects; R45: may cause cancer; R46: may cause heritable genetic damage; R47: may cause birth defects R49: may cause cancer by inhalation; R61: may cause harm to the unborn child; R63: possible risk of harm to the unborn child; Exposure of male employee to **lead** (in battery industry is associated with lowered number of sperm, abnormal sperm shape, altered sperm transfer and altered hormones/sexual performance. Another study has related the exposure of lead to "disorders of sexual dynamics" and loss of libido amongst employees in a storage battery plant as opposed to those working in offices and annex workrooms. **Dibromochloropropane (DBCP)** is a chemical pesticide, previously used widely on various types of crops throughout the world. Later it was found that DBCP caused increases in rates of oligospermia, lower number of sperm, impaired testicular function, with concomitantly elevated FSH levels, amongst exposed workers. Male farmers who used **ethylene dibromide** to grow papayas had a statistically significant decrease in sperm

	count, the percentage of viable, motile and morphologically normal sperm in one study. The reproductive toxicity of ethylene dibromide is observed even when the farmers are exposed to levels far lower than current standard of the Occupational Safety and Health Administration, USA. **2-bromopropane** is the main constituent in the cleaning solution used in the electronic industry. This compound is shown to have gonadal toxicity as evidenced by azospermia, oligospermia and in some cases poor sperm motility. It is likely that 2-bromopropane has detrimental effect on the testis most likely the Sertoli cells. **Perchloroethylene (PCE**) is commonly used in the dry cleaning industry. The concentration of amount of PCE in the expired air of dry cleaners was correlated with the semen quality. The number of sperms with round head; possibly without acrosome were detected in dry cleaners and not in other laundry men and the number of such sperms directly correlated with the amount of PCE in the expired air. Painters are constantly exposed to **ethylene glycol** vapours which is toxic. In a survey of painters in shipping industry it was found that these painters did have a higher incidence of azoospermia and oligospermia and also a higher odds ratio towards poor sperm counts. **Anabolic steroids** have been used by athletes to improve strength and performance for many years. Among other side effects, anabolic steroids induce hypogonadotrophic hypogonadism with associated azoospermia or oligospermia, abnormal sperm morphology, motility and testicular atrophy. **Adrenolytic drugs** such as **guanethidine** or **methoxamine** lead to stasis of sperm in the epididymis. Occupational exposure to **sex steroids** such as **estrogens**, can exert negative biofeedback on FSH secretion and result in decreased sperm production, sexual dysfunction, gynecomastia and hypogonadotropic hypogonadism, and potentially to cryptorchidism and testicular cancer. Several compounds are known to have antiandrogenic activity (**9,10-Dihydrophenanthrene, Linuron, Vincozolin, DDT/DDE and Flutamide**). Other common compounds which have been identified as occupational reproductive hazards are listed below: • Carbaryl (Sevin) • Toluenediamine and dinitrotoluene • Ethylene dibromide • Plastic production (styrene and acetone) • Ethylene glycol monoethyl ether • Perchloroethylene

	• Mercury vapour • Kepone • Bromine vapour • Carbon disulfide • 2,4-Dichlorophenoxy acetic acid (2,4-D) Others chemical compounds which are not listed above should not be regarded to be free from reproductive health hazards.
D. OTHER WORKING CONDITIONS	
Reproductive hazards	**Risk to reproductive health**
i) Cigarette smoking	Cigarette smoking is associated with modest reduction in sperm concentration (13-17%), motility and morphology. Smoking may alter hormone levels in males. Despite these findings, there is no data to confirm a statistically significant reduction in male fertility in smokers. Interestingly, in-vitro studies suggested that nicotine may not be responsible for the harmful effect of cigarette smoke on the sperm kinetic parameters. Limited studies suggested smoking to be mutagenic to human spermatozoa and lead to cancer, birth defect and genetic diseases in offspring.

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5. Environmental and Occupational Hazards and Male Infertility
(http://www.uhmc.sunysb.edu/urology/male_i…/Environmental_and_Occupational_Hazards.htm)

TABLE 2: LIST OF OCCUPATIONAL REPRODUCTIVE HEALTH HAZARDS TO FEMALE EMPLOYEES

A. PHYSICAL AGENTS means any agents causing foetal lesions and/or likely to disrupt placental detachment.			
Reproductive hazards	**Risk to reproductive health**	**Exposure level considered harmful**	**Examples of preventive measures**
i) Shock, vibration or movement	Regular exposure to shocks, i.e. sudden severe blow to the body or low frequency vibration, for example driving or riding in off-road vehicles, or excessive movement, may increase the risk of a miscarriage. Long-term exposure to whole body vibration may increase the risk of premature birth or low birth weight. Breastfeeding employees are at no greater risk than other employees.		Work should be organised in such a way that pregnant employees and those who have given birth are not exposed to work entailing risk arising from unpleasant vibration of the entire body, particularly at low frequencies, microtraumas, shaking, shocks or where jolts or blows are delivered to the lower body.
ii) Noise	Prolonged exposure to loud noise may lead to increased blood pressure and tiredness. Experimental evidence suggests that prolonged exposure of the unborn child to loud noise during pregnancy may have an effect on later hearing and that low frequencies have a greater potential for causing harm. Several studies have also shown that exposure of a pregnant woman to loud noise is associated to	Not more that 90dB/8h, 95dB/4h, 100dB/2h, no exposure of continuous noise above 115dB or impulse noise above 140dB. (Ref: FMA Noise 1989)	Pregnant employees should not be exposed to noise levels exceeding the limit considered harmful. It should be noted that the use of personal protective equipment by the mother will not protect the unborn child from the physical hazard. This is because noise can pass through the maternal abdomen and affect the foetus, although noise energy may be attenuated by the abdomen.

	premature birth, low birth weight and congenital anomalies (American Academy of Paediatrics). There are no particular problems for women who have recently given birth or are breastfeeding.		Administrative control should be taken.
iii) Ionising radiation, e.g. electromagnetic and particulate radiation.	onising radiation are mutagenic, carcinogenic and teratogenic. It can also cause impaired fertility in women. If a nursing mother works with radioactive liquids or dusts, the child may be exposed, particularly through contamination of the mother's skin. Also, there may be a risk from radioactive contamination breathed in or ingested by the mother and transferred to the milk or via the placenta to the unborn child. Exposure to foetus will cause mental retardation and abortion.	The annual dose limit for the whole body exposure of an employee should be 50 mSv. For a female employee of child bearing capacity, the annual dose should be the same as the limit specified for any employee except that any exposure should be as uniformly distributed with time as is practicable. For a pregnant employee, the dose to the foetus accumulated over the period of time between confirmation of pregnancy and the date of delivery should not exceed 10 mSv. (Ref: Atomic Energy Licensing Act 1984 Radiation Protection (Basic Safety Standards) Regulations 1988)	The employer must inform female employees exposed to ionising radiation of the need to declare the pregnancy as soon as possible, having regard to the risks of exposure for the unborn child and of contamination of the breastfed child in the event of bodily radioactive contamination. Work procedures should be designed to prevent pregnant employees from being exposed to ionising radiation. Special attention should be paid to the possibility of nursing mothers receiving radioactive contamination and they should not be employed in work where there is risk of such contamination.

iv) Non-ionising electro-magnetic radiation, e.g. ultraviolet, infrared, microwave and radio frequency (MW/F), lasers and video display terminal (VDT).	An association of non-ionising electromagnetic radiation and low birth weight, spontaneous abortion and birth defects have been reported. There has been considerable public concern about reports of higher levels of miscarriage and birth defects among some groups of VDT employees, in particular due to electromagnetic radiation. Many scientific studies have been carried out, but taken as a whole their results do not show any link between miscarriages or birth defects and working with VDT. Research and reviews of the scientific evidence will continue to be undertaken. There may also be ergonomic risks from work with VDT.	A pregnant employee should not work continuously with VDTs (e.g. computer) for more than 4 hours during any one work shift (8 hours). (Ref: Makowiec-Dabrowska et al. 1998) Work-Rest-Cycle should be adopted.	It is advised to minimize exposure by means of health and safety measures. The levels of electromagnetic radiation which are likely to be generated by display screen equipment are well below those set out in international recommendations for limiting risk to human health created by such emissions, and the Radiological Protection Board does not consider such levels to pose a significant risk to health. No special protective measures are therefore needed to protect the health of people from this radiation. NIOSH (USA) recommends a 15 minutes break for every 2 hours of VDT work or 15 minutes every hour if the workload or visual demands are high. In the light of the scientific evidence, pregnant employee does not need to stop working with VDTs. However, to avoid problems caused by stress and anxiety, women who are pregnant and are worried about working with VDT should be given the opportunity to discuss their concerns with someone adequately informed of current authoritative scientific information. Employees should also be given the opportunity to request transfer to other work which is risk-free.

v) Extremes of cold or heat	Pregnant employee tolerates heat less well and may more readily faint or be more liable to heat stress. The risk is likely to be reduced after birth but it is not certain how quickly an improvement comes about. Exposure to heat may lead to adverse pregnancy outcomes. Breastfeeding may be impaired by heat dehydration. Working in extreme cold may be a hazard for pregnant employees and their unborn child. The risks are increased particularly in the event of sudden changes in temperature.	Working in a hot or cold microclimate or working under conditions of temperature variation of more than 15 degree Celsius. (Ref: Makowiec-Dabrowska et al. 1998)	Pregnant and breastfeeding employees should not be exposed to prolonged excessive heat or cold at work. The proper clothing should also be provided.
vi) Work in hyperbaric atmosphere, e.g. pressurized enclosures and underwater diving.	People working under high pressure, for instance compressed air, are at risk of developing the bends. This is due to free bubbles of gas in the circulation. It is not clear whether pregnant women are more at risk of the bends but the unborn child could potentially be seriously harmed by such gas bubbles. For those who have recently given birth there is a small increase in the risk of the bends. There is no physiological reason why a breast feeding mother should not work under high pressure (although there would be obvious practical difficulties)		Pregnant employees should not work in a high-pressure atmosphere.

	Diving may cause exposure to a hyperbaric environment on the unborn child. There is no evidence to suggest that breastfeeding and diving are incompatible.		Pregnant employees should not dive. Employees should be aware that pregnancy can constitute a medical reason not to dive and she should inform her employer as soon as possible so that her employer can take appropriate action.

B. BIOLOGICAL AGENTS, for examples hepatitis B and C virus, Human Immunodeficiency virus, Rubella virus, cytomegalovirus, *Toxoplasma*, *Mycobacterium tuberculosis*, *Treponema pallidum*.

1. "Group 1 biological agent" means one that is unlikely to cause human disease;
2. "Group 2 biological agent" means one that can cause human disease and might be a hazard to workers; it is unlikely to spread to the community; there is usually effective prophylaxis or treatment available;
3. "Group 3 biological agent" means one that can cause severe human disease and present a serious hazards to workers; it may present a risk of spreading to community, but there is usually effective prophylaxis or treatment available;
4. "Group 4 biological agent" means one that cause severe human disease and is a serious hazard to workers; it may present a high risk of spreading to the community; there is usually no effective prophylaxis or treatment available.

Reproductive hazards	Risk to reproductive health	Exposure level considered harmful	Examples of preventive measures
Any biological agent in groups 2,3 and 4	Many biological agents within the three risk groups can affect the unborn child if the mother is infected during pregnancy Transmission occurs through the placenta while the child is in the womb, or during or after birth, e.g. through breastfeeding or through close physical contact between mother and child. The newborn child may suffer from hepatitis B or C, AIDS, herpes, TB, syphilis, chickenpox and	Any exposure at all	Depends on the risk assessment, which will take account firstly of the nature of the biological agent, how infection is spread, how likely contact is, what control measures there are. These include physical containment and the usual hygiene measures. The use of available vaccines is to be recommended, with due regard for any contra-indications for administering them to women in the early stages of pregnancy. If there is a

	typhoid. Rubella (German measles) and toxoplasmosis can cause abortion of the unborn child, or physical and neurological damage.		known high risk of exposure to a highly infectious agent, then it will be appropriate for the pregnant employee to avoid exposure altogether. The employer must ensure immunity testing (chickenpox, toxoplasmosis, parvovirus) for occupations at risk, and job transfer or temporary leave during epidemics, if the employee is seronegative. Exposure to these, biological agents should be avoided, except if pregnant women is protected by her state of immunity. Hygienic work habits recommended.
. CHEMICAL AGENTS means chemical elements, or compounds or mixtures thereof, whether natural or synthetic, but does not include micro-organisms.			
Reproductive hazards	**Risk to reproductive health**	**Exposure level considered harmful**	**Examples of preventive measures**
Substances labelled R40, R45, R46, R47, R49, R61, R63 and R64. (Ref: Occupational Safety and Health (Classification, Packaging and Labelling of Hazardous Chemicals) Regulations 1997)	The risk of a substance can be identified from the label of a chemical package. R40: possible risk of irreversible effects; R45: may cause cancer; R46: may cause heritable genetic damage; R47: may cause birth defects R49: may cause cancer by inhalation; R61: may cause harm to the unborn	Anaesthetic gases i) halothane – 1 ppm/8h, 3ppm/15min ii) nitrous oxide – 100 ppm/8h iii) isoflurane, enflurane – 10 ppm/8h Inorganic lead (Plumbum) - 40µg/100g of whole blood sample (Ref: The Factories and Machinery (Lead) Regulations, 1984)	For work with hazardous substances, which include chemicals which may cause heritable genetic damage, employers are required to assess the health risks to employees from such work, and where appropriate prevent or control the risks. In carrying out assessment, employers should have regard for pregnant employees, employees who have recently given birth or are breastfeeding.

	child; R63: possible risk of harm to the unborn child; R64: may cause harm to breastfed babies. Among 100,000 chemicals used in commerce today, only 0.2% has been recognized as hazards to reproductive health of adults and the developmental health of the unborn child. Therefore the actual risk to health of these substances can only be determined following a risk assessment at the workplace. All chemicals should be deemed to be hazardous to reproductive health. Exposure of pregnant women to lead is associated with abortions and miscarriages, but there is no indication that this is still relevant at current accepted standards of exposure. There are strong indication that that exposure to lead, both intra-uterine and post-partum, leads to developmental problems, especially of the nervous system and the blood-forming organs. Women, new born and young children are more sensitive to lead than male adults. Organic mercury compounds could have adverse effects on the unborn child. Animal studies and human observations have demonstrated that exposure to these forms of	Mercury – 50 nmol/L in urine sample Cytotoxic drugs – Preparation of the drug solution for therapeutic administration is harmful. Carbon monoxide – 14 ppm/8h Carcinogens, mutagens, teratogens – Any exposure at all. Organic solvents – 10% of permissible exposure limits stated in the Schedule 1 of USECHH Regulations 2000.	Prevention of exposure must be the first priority. It is important to note that chemicals can be transferred through inhalation, consumption and percutaneous absorption (i.e. that may be absorbed through the skin), causing harmful effects. Where it is appropriate to prevent the risk, control of exposure may be made by a combination of technical measures, along with good work planning and housekeeping, and the use of Personal Protective Equipment (PPE). PPE should only be used for control purposes if all other methods have failed. It may also be used as secondary protection in combination with other methods. If all the methods above fail to safeguard the reproductive health of a pregnant employee, she should be granted medical removal protection. Substitution of harmful agents should be made, if possible.

	mercury during pregnancy can slow the growth of the unborn baby, disrupt the nervous system, and cause the mother to be poisoned. Lead and organic mercury are secreted in breast milk. That may pose a risk to breast feed infant if a woman is highly exposed before and during pregnancy. Long term exposure to cytotoxic drugs cause damage to genetic information in sperm and eggs. Some can cause cancer. Absorption is by inhalation or through the skin. Pregnant women may have heightened susceptibility to the effects of exposure to carbon monoxide (CO). CO can readily crosses the placenta and results in the unborn child being starved of oxygen. Data on the effects of exposure to CO are limited, but there is evidence of adverse effects on the unborn child. Both the level and duration of maternal exposure are important factors in the effect on the unborn child. There is no indication that breast-fed babies suffer adverse effects from their mother's exposure to CO, nor that the mother is significantly more sensitive to CO after giving birth.		

D. PSYCHOSOCIAL OR ORGANIZATIONAL HAZARDS			
Reproductive hazards	**Risk to reproductive health**	**Exposure level considered harmful**	**Examples of preventive measures**
i) Mental and physical fatigue, and working hours.	Long working hours, shift work and night work can have a significant effect on the health of new and expectant mothers, and on breastfeeding. Not all women are affected in the same way undertaken, working conditions and the individual concerned. This applies especially to health care. Generally, however, both mental and physical fatigue increases during pregnancy and in the postnatal period due to the various physiological and other changes taking place. Because they suffer from increasing tiredness, some pregnant and breastfeeding worker may not be able to work irregular hours or late shifts or night work, or overtime. Working time arrangements (including provisions for rest breaks, and their frequency and timing) may affect the health of the pregnant woman and her unborn child, her recovery after childbirth, or her ability to breast-feed, and may increase the risks of stress and stress related ill health. Because of changes in blood pressure which may occur during and after		It may be necessary to adjust working hours temporarily, as well as other working conditions, including the timing and frequency of rest breaks, and to change shift patterns and duration to avoid risks. With regard to night work, alternative day work should be organised for pregnant women.

	pregnancy and childbirth, normal patterns of breaks from work may not be adequate for new or expectant mothers.		
ii) Occupational stress	Expectant and breastfeeding mothers can be particularly affected by occupational stresses, for various reasons: - hormonal, physiological and psychological changes occur and sometimes change rapidly during and after pregnancy, sometimes affecting susceptibility to stress, or to anxiety or depression in individuals and post-natal depression; - financial, emotional and job insecurity may be affected by the changes in economic circumstances brought about by pregnancy, especially if this is reflected in workplace culture; - it may be difficult to combine work and private life, especially with long, unpredictable or unsociable working hours or where other family responsibilities are involved; - possible exposure to situations involving violence at the workplace. If a woman is exposed to the risk of violence at work during pregnancy, when she has recently given birth or		In laying down measures, employers will need to take account of known stress factors (such as shift patterns, job insecurity, workloads, etc) and the particular medical and psychosocial factors affecting the individual woman. Protective measures may include adjustments to working conditions or working hours, and ensuring that the necessary understanding, support, counselling and recognition is there when the woman returns to work, whilst her privacy is also respected.

	while she is breastfeeding, this may be harmful. It can lead to detachment of the placenta, miscarriage, premature delivery, underweight birth and it may affect the ability to breast-feed. This risk particularly affects employees in direct contact with customers and clients. Additional work-related stress may occur if a woman's anxiety about her pregnancy, or about its outcome (e.g. where there is a past history of miscarriage, stillbirth or other abnormality) is heightened as a result of peer group or other pressure in the workplace. Stress is associated in some studies with increased incidence of miscarriage and pregnancy loss, and also with impaired ability to breast-feed. Women who have recently suffered loss through stillbirth, miscarriage, adoption at birth or neonatal death, will be especially vulnerable to stress, as will women who have experienced serious illness or trauma (including Caesarean section) associated with pregnancy or childbirth. However, in certain circumstances, returning to work after such events may help or alleviate stress, assuming a		

	sympathetic and supportive work environment.		
E. ERGONOMIC PROFILE			
Reproductive hazards	**Risk to reproductive health**	**Exposure level considered harmful**	**Examples of preventive measures**
i) Manual handling of loads.	Manual handling of heavy loads is considered to pose a risk to pregnancy, such as risk of foetal injury and premature birth. The risk depends on strain, i.e. the weight of the load, how you lift and how often it occurs during work time. As the pregnancy progresses, a pregnant employee is at greater risk from manual handling injury. This is due to hormonal relaxation of the ligaments and the postural problems of advancing pregnancy. There can also be risks for those who have recently given birth, for example after a Caesarean section there is likely to be a temporary limitation on lifting and handling capability. Breastfeeding mothers may experience discomfort due to increased breast size and sensitivity.	The weight of the load to be lifted or carried by a pregnant employee may not exceed ¼ of the admissible value (kg) for non-pregnant employee. (Ref: Makowiec-Dabrowska et al. 1998)	The changes an employer should make will depend on the risks identified in the assessment and the circumstances of the business. For example, it may be possible to alter the nature of the task so that risks from manual handling are reduced for all employees, including new or expectant mothers. Or it may be necessary to address the specific needs of the employee and reduce the amount of physical work, or provide aids for her in future to reduce the risks she faces. Where there is a risk particularly of back injury to employees, the employers should: - take steps to reduce these risks to the lowest level; - avoid the need for hazardous manual handling; and - assess the risks from those operations that cannot be avoided

ii) Postural problems connected with the activity of new or expectant mothers.	Fatigue from standing and other physical work has long been associated with miscarriage, premature birth and low birth weight. It is hazardous working in tightly fitting workspaces or with workstations which do not adjust sufficiently to take account of increased abdominal size, particularly during the later stages of pregnancy. This may lead to strain or sprain injuries. Dexterity, agility, co-ordination, speed of movements, reach and balance may also be impaired, and an increased risk of accidents may need to be considered.		Ensure that the hours, volume and pacing of work are not excessive and that, where possible, the employees themselves have some control over how work is organised. Ensure that seating is available where appropriate. Sufficient space should be provided to pregnant employees. Fatigue can be avoided or reduced by making it possible to take longer and more frequent breaks during the work session. Adjusting workstations or work procedures may help remove postural problems and the risk of accidents.
iii) Sitting activities	Pregnancy-specific changes in the coagulation factors and mechanical compression of the pelvic veins by the uterus pose a relatively high risk of thrombosis or embolism for pregnant women. When sitting still during pregnancy, venous filling in the legs increase significantly and may cause aching and oedema in the legs. The increase in lumbar lordosis caused by the increase in abdominal circumference can lead to muscular pain in the lumbar region of the spine, which may be		Ensure that seating is available where appropriate. Constant sitting or constant standing is both inadvisable. It is better to alternate between the two. If this is not possible, provision should be made for breaks. Employers should provide adjustable chair with good backrest to employees and encourage them to do some exercise or moving around after prolonged sitting.

	intensified by remaining in a specific position for an excessively long period of time.		
iv) Standing activities	Physiological changes during pregnancy (increased blood and systolic volume, general dilatation of blood vessels and possible compression of abdominal or pelvic veins) promote peripheral congestion while standing. Venous compression may reduce the venous return from the pelvis which leads to compensatory increases in the maternal heart rate and to contractions of the uterus. If the compensation is insufficient, this may lead to dizziness and faintness. Continuous standing (and/or walking) for long periods during the working day also contributes to an increased risk of premature childbirth.	A pregnant worker should not stand more than 3 hours continuously per shift. (Ref: Makowiec-Dabrowska et al. 1998)	Ensure seating is available where appropriate. Employees, especially those that are pregnant should be allowed to change work activities and take breaks.

v) Working alone	Pregnant women are more exposed to risk than others when working alone, particularly if they fall or if urgent medical attention is required.		Depending on their medical condition, access to communications with others and levels of (remote) supervision involved, may need to be reviewed and revised to ensure that help and support is available when required, and that emergency procedures (if needed) take into account the needs of new and expectant mothers. Arrangement to work alone should be organised.
vi) Movements and postures	The nature and extent of any risks of injury or ill health resulting from movements or posture during and after pregnancy will depend on a number of factors, including: - the nature, duration and frequency of tasks/movements; - the pace, intensity and variety of work; - patterns of working time and rest breaks; - ergonomic factors and the general working environment; - the suitability and adaptability of any work equipment involved. Hormonal changes in women who are pregnant or have recently given birth can affect the ligaments,		The employer must ensure that employees who are pregnant, have recently given birth or are breastfeeding are not exposed to: - manual handling involving risk of injury; - awkward movements and postures, especially in confined spaces; - work at heights; - where appropriate, work equipment and lifting gear should be introduced or adapted, storage arrangements altered, or workstations or job content redesigned; - long period spent handling loads, or standing or sitting without regular exercise or movement to maintain healthy circulation should be avoided.

	increasing susceptibility to injury. Resulting injury may not be apparent until some time after the birth. Particular attention should also be given to women who may handle loads during the three months following a return to work after childbirth. Postural problems can arise at different stages of pregnancy, and on returning to work, depending on the individual and her working conditions. These problems may increase as the pregnancy progresses, especially if the work involves awkward movements or long periods of standing or sitting in one position where the body is exposed to risks of prolonged static load or impaired circulation. These may contribute to the development of varicose veins and haemorrhoids as well as backache. Backache in pregnancy may be associated with prolonged work and poor working posture, as well as excessive movements. A pregnant woman may need more workspace, or may need to adapt the way she works (or the way she interacts with the work of others or with her work equipment) as pregnancy changes both her size and the ways in which she can move, stand or sit still for a long time in comfort and safety.		

	There may also be additional risks if a woman is returning to work after a childbirth with medical complications such as a Caesarean birth or deep vein thrombosis.		
F. OTHER WORKING CONDITIONS			
Reproductive hazards	**Risk to reproductive health**	**Exposure level considered harmful**	**Examples of preventive measures**
i) Work at heights	It is hazardous for pregnant employees working at heights, for example ladders and platforms.		The employer must ensure that pregnant employees are not exposed to work at heights.
ii) Lack of rest and other welfare facilities	Rest is important for new and expectant mothers. Tiredness increases during and after pregnancy and may be exacerbated by work-related factors. The need for rest is both physical and mental.		The need for physical rest may require suitable facilities for the woman concerned to have access to somewhere where she can sit or lie down comfortably in privacy, and without disturbance, at appropriate intervals.

iii) Cigarette smoking	Cigarette smoke is mutagenic and carcinogenic and is a known risk to pregnancy where the mother smokes. The effects of passive smoking are less clear but are known to affect the heart and lungs, and to pose a risk to infant health. Cigarette smoke is also a respiratory sensitizer, and is known to be associated with asthma, the onset of which is associated in some cases with pregnancy.		Expectant mothers must be warned of the dangers of smoking, including passive smoking. Where there is no official ban on smoking in communal areas such as rest rooms and canteens, the employer must take account of the potential danger to pregnant women of exposure to cigarette smoking: adopting, if necessary, preventive and protection measures. A smoke free workplace should be created.
iv) Risk of infection or kidney disease as a result of inadequate hygiene facilities	Without easy access to toilets (and associated hygiene facilities) at work, due to distance, work process or system, etc., there may be increased risks to health and safety, including significant risks of infection and kidney disease. Because of pressure on the bladder and other changes associated with pregnancy, pregnant women often have to go to the toilet more frequently and more urgently than others. Breastfeeding women may also need to do so because of increased fluid intake to promote breast milk production.		Protective measures include adaptation of rules governing working practice, for example in continuous processing and team working situations, and appropriate measures to enable expectant and nursing mothers to leave their workstation/activity at short notice more frequently than normal, or other wise (if this is not possible) making temporary adjustments to working conditions as specified in the Guidelines.

			Hygienic toilet should be accessible. The toilet must not be slippery, lest the pregnant employee may fall down. Pregnant employees should be allowed to visit the toilet more frequently without fear of penalty.
v) Hazards as a result of inappropriate Nutrition	Adequate and appropriate nutrition and liquid refreshment (especially clean drinking water) at regular intervals is essential to the health of the new or expectant mothers and breastfeeding children. Appetite and digestion are affected by the timing, frequency and duration of meal breaks and other opportunities for intake of food and drink, and this also affects the health of the unborn child. This is affected during and after pregnancy by hormonal and physiological changes, including those resulting in or affecting morning sickness (usually in early pregnancy), the position of the unborn child in the womb, the nutritional needs of the individual mother and her unborn or breastfeeding child, etc. Pregnant women may need more frequent meal breaks and more		New and expectant mothers' particular needs concerning rest, meal and refreshment breaks may be established in consultation with the individuals concerned. These needs may change as the pregnancy progresses. Protective measures must be taken to deal with these constraints, particularly with regard to the need for rest, meal and refreshment breaks, and to maintain appropriate hygiene standards. Establishment of canteen/cafe at the workplace should adhere to Food Act & Regulations 1983.

	frequent access to drinking water or other light refreshments, and may also only be able to tolerate food "little and often" rather than in larger quantities at "normal' mealtimes. Their eating patterns and preferences may change, especially in early stages of pregnancy, not only in response to morning sickness but also due to discomfort or other problems in the later stages of pregnancy.		
vi) Hazard due to unsuitable or absent facilities	Access to appropriate facilities for expressing and safely storing breast milk for breastfeeding mothers, or to enable infants to be breast-fed at or near the workplace, may facilitate breastfeeding by working women, and may significantly protect the health of both mother and infant. Evidence shows that breastfeeding can help to protect the mother against cancer and helps protect the child from certain diseases in infancy. Obstacles to breastfeeding in the workplace may significantly affect the health of both mother and child.		Protective measures include: - access to a private room in which to breast-feed or express breast milk; - use of secure, clean refrigerators for storing expressed breast milk whilst at work, and facilities for washing, sterilizing and storing receptacles; - time off without loss of pay or benefits, and without fear of penalty to express milk or breast-feed.
vii) Travelling either inside or outside the establishment	Travelling in the course of work, and to and from the workplace, can be problematic for pregnant women, involving risks including fatigue,		Appropriate arrangement for travelling should be established to minimise the health effects to the female

	vibration, stress, static posture, discomfort and accidents. These risks can have a significant effect on the health of new and expectant mothers.		employees. Pregnant employee should be given the option not to travel taking into account her pregnancy status.
viii) Work equipment and personal protective equipment (including clothing)	Work equipment and personal protective equipment is not generally designed for use by pregnant women. Pregnancy and breastfeeding involve physiological changes which may make some existing work and protective equipment not only uncomfortable but also unsafe for use in some cases – for example, where equipment does not fit properly or comfortably, or where the operational mobility, dexterity or co-ordination of the woman concerned is temporarily impeded by her pregnancy or recent childbirth.		The employer must carry out a risk assessment which takes account of changes in risks as pregnancy progresses. Wherever possible, the risk should be avoided by adaptations or substitution e.g. of suitable alternative equipment to allow the work to be conducted safely and without risk to health. PPE should be the last resort in control measures.

Reference: EU Commission's Guidelines on the Assessment of the Chemical, Physical and Biological Agents and Industrial Processes Considered Hazardous for the Safety or Health of Pregnant Workers and Workers Who Have Recently Given Birth or Are Breastfeeding (Council Directive 92/85/EEC)