

# Doctors' Guide

to

**Medical Examinations for  
Workers engaged in Hazardous Occupations  
in Industrial Undertakings**

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This guide is prepared by  
the Occupational Safety and Health Branch,  
Labour Department

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# PREFACE

In Hong Kong, apart from radiation workers, workers engaged in four occupations in industrial undertakings are required by law to undergo pre-employment and periodic medical examinations. These are occupations where workers are exposed to asbestos or controlled carcinogenic substances, or have to perform compressed air work, or mines, quarries and tunnelling work.

Besides statutory requirements, pre-employment and periodic medical examinations are also recommended as a good occupational health practice for workers exposed to certain hazards in industrial undertakings.

This Guide is developed with a view to facilitating medical practitioners to perform medical examinations for workers engaged in hazardous occupations in industrial undertakings. It provides background information on the prevention of occupational diseases and employees' compensation issues, as well as practical guidance on the medical examination of workers exposed to 17 occupational hazards in industrial undertakings, including the four covered by statutory medical examinations.

Occupational Health Service  
Occupational Safety & Health Branch  
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# Chapter 1

## PRINCIPLES OF PREVENTION OF OCCUPATIONAL DISEASES

The prevention of occupational diseases calls for a multi-disciplinary approach. While health hazards should be controlled at source by engineering control measures such as enclosure and isolation, the doctor is often consulted on other complementary measures like health education, personal protective equipment and health surveillance programme.

### ENGINEERING CONTROL MEASURES

Many potential risks of disease and injury can be avoided by planning the layout and design of a new plant. The basic engineering control measures include substitution, isolation and ventilation. For example, benzene may be substituted with toluene in many chemical processes; noisy processes could be enclosed to reduce noise exposure; and heat disorders may be prevented by improving the general ventilation in the workplace.

### ENVIRONMENTAL MONITORING

Environmental monitoring provides a valuable index of the risk when compared against Occupational Exposure Limits. Details of environmental monitoring are discussed in Chapter 2.

### HEALTH SURVEILLANCE

Health surveillance is basically a system of monitoring the health status of persons to determine departures from normal health, so as to identify potential problem areas and the effectiveness of existing preventive strategies. Medical examination is a common means of conducting such surveillance. For most chemicals, medical examinations must be conducted for workers whose exposure levels, i.e. concentrations of the chemical in air, are liable to exceed *half* of the Occupational Exposure Limit of that chemical. Examples are cadmium, lead, manganese. In the case of certain other chemicals that are associated with significant cancer risks (such as arsenic, asbestos, benzene, tar and pitch), or are associated with allergic disorders (such as isocyanates), workers should have medical examinations irrespective of the level of exposure.

Health surveillance is done through pre-employment and periodic medical examinations:

### **(a) Pre-employment medical examinations**

For health surveillance to be effective, it is useful to start from the time a worker begins his exposure to a particular risk. This pre-employment examination would then be used as a base-line against which subsequent changes can be evaluated. For example, a fall in the red blood cell/plasma cholinesterase level can be an indicator of organophosphate poisoning. The pre-employment examination also ensures that the worker selected is fit to undertake the job without risk to himself. For example, workers with significant anaemia should not be engaged in work involving lead and benzene exposure. To make these examinations more meaningful, the doctor should know the type of job the worker is going to do and its possible health hazards.

### **(b) Periodic medical examinations**

These are often used to detect:

- signs of the disease (e.g. chest x-ray, liver function test, audiogram)
- levels of a chemical or metabolite (e.g. blood lead, urinary t,t-muconic acid)

These examinations are useful in detecting “susceptible” groups for whom corrective action may be taken even before they develop clinical signs of the disease. For example, workers with high lead levels may be suspended from further lead exposures and be given chelation therapy if necessary to prevent the development of overt lead poisoning. Workers with abnormalities that are non-occupational in origin may also be removed from exposure and treated before returning to the job. Thus lead workers with significant iron deficiency anaemia, for example, should be removed from further lead work until they have been treated. The nature of the examinations and the frequency of such examinations depend on the type of disease and the degree of hazard in a particular work situation. Good record keeping is vital and may be useful in the detection of “new” occupational diseases through the collection and analysis of data.

It is important to stress here that a test result should not be seen in isolation. Although the significance of a test result (e.g. blood lead level) is often assessed by comparing it to a recommended “standard”, it is often prudent to repeat a test if the result is abnormal. It is also obvious (although sometimes “overlooked”) that a doctor should

look at test results with reference to the clinical picture presented by the patient or worker, and not at the results by themselves. Thus, all workers with abnormal test results should be examined by the doctor.

It is also important to compare test results with previous ones. Such serial comparison of results may indicate that further investigations are necessary.

Some of the biological standards are more important on a group basis rather than on an individual basis. Thus, it would be useful to also compare group results in addition to looking at results of individual workers. Group results, especially when compared serially, may reflect the environmental air levels to which the workers have been exposed.

## **PERSONAL PROTECTION**

The doctor may occasionally be required to advise on the types of protective equipment to use. The choice depends on the hazard and the part of the body involved, the acceptability by the user and the degree of protection provided by the personal protective equipment. For example, the choice of hearing protectors will depend on the intensity of the noise in the environment, the fit of and the attenuation provided by the protectors. Proper maintenance of these equipment should also be stressed if they are to remain effective.

## **HEALTH EDUCATION AND ADVICE**

Workers should be informed of the hazards they are exposed to and the ways of protecting themselves. For example, workers exposed to tar, pitch, bitumen and creosote should be taught to conduct “self checks” on their skin and to report any suspicious lesions on their bodies; asbestos workers should be advised to stop smoking. The importance of good personal hygiene and the proper use of personal protective equipment, such as hearing protectors and respirators, should be emphasized. Workers should also be advised on the importance of “self-preparation” for certain types of health surveillance programmes, for example, they should refrain from taking sea-food, including fish, for at least 3 days prior to the urine collection for arsenic analysis.

## USEFUL REFERENCES

- 1 H.A Waldron, C. Edling: Occupational Health Practice. Fourth Edition, Butterworths and Co (Publisher) Ltd, 1997.
- 2 International Labour Office: Encyclopaedia of Occupational Health and Safety, Geneva, Fourth Edition, 1998.
- 3 Levy BS and Wegman DH: Occupational Health. Recognising and Preventing Work-Related Disease. Third Edition, 1995.

# Chapter 2

## ENVIRONMENTAL MONITORING

### OBJECTIVES

Environmental monitoring is carried out for a number of reasons including:

- (a) determination of the exposure levels to airborne contaminants
- (b) assessment of the adequacy and effectiveness of engineering control measures
- (c) establishment of a basis for correlating health effects with exposure to specific contaminants

### AIR SAMPLING METHODS

The method of sampling will depend on the chemical being monitored. The common air sampling methods are:

**(a) Sample Bag –**

collecting gases and vapours by using air sample bags

**(b) Sorbent Tube –**

sampling gases and hydrocarbon vapours by using tubes containing a bed of adsorbent such as charcoal or silica gel

**(c) Impinger –**

collecting certain inorganic chemicals and some organic chemicals by using impingers: glass bubble tubes containing a liquid medium

**(d) Badge –**

sampling gases and hydrocarbon vapours by using gas monitoring badges that are available with a variety of collection media including solid adsorbents and reagent-filled tubes

**(e) Filter –**

collecting particulate matters such as dusts, fumes and mists by using filters

### DIRECT READING INSTRUMENTS

There are many types of direct reading instruments available for measuring gases, vapours and aerosols (particulates in air) using different detection principles. Some of the instruments are specific for a particular contaminant, others are non-specific.

Most direct reading instruments allow for a continuous monitoring of the contaminant level, some have data logging features and alarm settings to warn users of hazardous conditions. Examples are detector tubes for detecting toxic gases and vapours; electrochemical sensors and solid state gas detectors for measuring toxic gases; and direct reading instruments for measuring the mass concentration of aerosols or airborne particulates.

Selection of instruments and equipment best capable of providing the data required in a given survey or study, is ultimately a matter of judgement on the part of the industrial hygiene professionals.

## **SAMPLING STRATEGIES**

Air sampling strategies in terms of the location, duration and frequency of sampling as well as the number of samples must fulfil the requirements that samples represent worker exposures or environmental conditions and that measurements are efficient, accurate and economical. For example, if the objective of monitoring is to determine a worker's exposure level, it is necessary to conduct personal monitoring by attaching the monitoring device as close as possible to the worker's breathing zone.

## **OCCUPATIONAL EXPOSURE LIMITS (OELs)**

When assessing the risks of exposure to contaminants in working environments, the results of air sampling or concentration measurements are compared with their OELs. There are three types of OELs:

- (a) Occupational Exposure Limit – Time-weighted Average (OEL-TWA) is the time-weighted average (TWA) concentration of a toxic substance over an 8-hour workday and a 40-hour workweek, to which nearly all persons can be exposed day after day without adverse health effects.
- (b) Occupational Exposure Limit – Short-term Exposure Limit (OEL-STEL) is the TWA concentration to which persons may be exposed not longer than 15 minutes and not more than four times (with at least 60 minutes between successive exposures) in the workday.
- (c) Occupational Exposure Limit – Ceiling (OEL-C) is the concentration that should not be exceeded during any part of the working exposure.

Examples of OELs for some toxic chemicals are found in Annex I. Note that these OELs may change when new scientific data are available that justify such needs.

For chemicals that do not have sufficient toxicological information to establish OEL-STEL or OEL-C, it is recommended that excursions should not exceed three times the OEL-TWA for more than a total of 30 minutes during a workday and under no circumstances should they exceed five times the OEL-TWA, provided the OEL-TWA is not exceeded.

Please refer to the Code of Practice on Control of Air Impurities (Chemical Substances) in the Workplace, published by the Labour Department, for further information.

# Chapter 3

## BIOLOGICAL MONITORING

### **BASIS**

Biological monitoring of occupational exposure to chemicals refers to the assessment of the “internal dose’ of the worker through the assay of:

- (a) concentrations of the chemicals or their metabolites in biological samples (measuring the exposure or body burden) and/or
- (b) biological indicators of effect (e.g. early and reversible physiological changes)

### **OBJECTIVE**

The primary objective of biological monitoring is to ensure that the current or past exposure of the worker is not harmful to his health by detecting potential excessive exposure before overt adverse health effects occur.

### **VALUE & LIMITATIONS**

On an individual basis, the results of biological monitoring may be used to estimate the amount of absorption of the chemical during a specific time interval. On a group basis, the results provide an indication of the overall industrial hygiene condition at the workplace. Thus biological monitoring is complementary to environmental monitoring. It may, in fact, give a better indication of the health risk because it reflects the overall uptake (by all routes of entry) and takes into account other factors (e.g. individual variation in respiratory uptake, work habits, personal hygiene, physical exertion and pre-exposure burden). It is also useful in evaluating the efficacy of personal protective equipment used.

However, biological monitoring is not possible for all chemical exposures. Thus, acute-acting substances (such as skin irritants) and substances which have predominantly sensitizing properties (e.g. glycidyl ethers) are not suitable for biological monitoring.

### **PRACTICAL CONSIDERATIONS**

Biological effect indicators are largely based on biochemical tests, the use and interpretation of which are relatively straightforward. In contrast, the determination of concentrations of chemicals and metabolites in biological samples requires

meticulous attention to detail both in sampling and laboratory analysis because accuracy is crucial when trace levels are involved.

### **Time of Sampling**

For certain chemicals, the substance itself and/or its metabolite(s) may be rapidly eliminated from the body following exposure. In such cases, the time of sampling is critical. Depending on the rate of elimination, the biological sample may be collected during exposure, at the end of the work shift, just before the next work shift (i.e. 16 hours after the end of exposure) or before resuming work after the weekend (i.e. 60 to 64 hours after the last exposure).

### **Collection of Specimen**

#### **(a) Container**

For urine samples, disposable wide-mouthed plastic bottles that have been cleaned with nitric acid and then rinsed with deionized water (with screwed caps) should be used.

For whole blood samples, metal-free disposable syringes and plastic tubes (with screwed caps) should be used. The tube should be shaken well.

#### **(b) Cleanliness**

Blood or urine specimens should be collected in a clean environment after the worker has washed his hands and preferably changed into clean clothing. This is to prevent any undesirable external contamination of the biological samples.

#### **(c) Amount of specimen to be collected**

For whole blood analysis, take at least 3 ml venous blood. For urine analysis, collect at least 35 ml of urine.

#### **(d) Storage**

Urine should generally be stored refrigerated or frozen until the analysis is carried out, rather than with added chemical preservatives.

Whole blood is collected as an unclotted sample and should be stored refrigerated until analysis.

During transportation, blood samples should, as far as possible, be kept in a suitable insulated container with ice packs. The actual transportation time should preferably not exceed 2 hours. All biological fluids should be analyzed as soon as possible to avoid any loss due to prolonged storage.

### (e) Labelling

All specimen containers should be properly labelled. This should include the name, ID No. of the worker and the date and time of specimen collection.

### Correction for Variation in Urinary Dilution

As routine collection of 24-hour urine samples from workers is not practical, early morning specimens are generally preferred unless otherwise indicated (see Time of Sampling). When the sample is not a 24-hour urine specimen, the results should be corrected for variations in urinary dilution. This can be done either by using the specific gravity (SG) (see formula below) or creatinine concentration of the same sample.

There is no significant superiority of creatinine adjustment over specific gravity correction, although creatinine correction may be better for very concentrated and very dilute samples.

#### Formula for SG Correction:

$$\text{Corrected Value (to SG of 1.016)} = \text{Uncorrected Value} \times \frac{16}{\text{Last 2 digits of observed SG}}$$

Example: If observed SG = 1.023

$$\text{Corrected Value} = \frac{\text{Uncorrected Value}}{\text{Value}} \times \frac{16}{23}$$

## INTERPRETATION OF RESULTS

### Biological Action Limits (BALs)

BALs represent the maximum concentrations of toxic substances or metabolites in the biological media that are regarded as acceptable under working conditions and would not be associated with significant risk to the worker's health. These limits generally represent the approximate biological equivalent of various established occupational exposure limits for air contaminants. One should be aware that these index values may change when new toxicological information suggests that there is such a need.

At present, there are several national lists of BALs, e.g. the Biological Exposure Index (BEI) of the American Conference of Governmental Industrial Hygienists (ACGIH) and the Biologische Arbeitsstofftoleranzwerte (BAT) of the Deutsche Forschungsgemeinschaft. Nevertheless, there are very few BALs available that are accepted universally. This can be explained by a number of reasons. For instance, it is difficult to establish norms even among non-exposed populations, not to say setting norms among workers whose variations in individual characteristics and occupational exposure profiles are often marked. Comparison of large groups of workers and non-exposed persons over a relatively long period of time may be required. Moreover, the development of a biological method is usually more difficult technically than the development of air sampling and analytical methods.

Examples of BALs for some toxic chemicals are found in Annex II. Note that these BALs may change when new scientific data are available that justify such needs.

### FOLLOW UP ACTION

All results exceeding the BALs must be verified by a repeat test as soon as possible (preferably within 3 days). Possible sources of error should be excluded (e.g. contamination, errors arising from the sampling or analytical procedures and causes unrelated to job exposure). If verified, removal of the affected worker(s) from further exposure to the hazard should be considered until subsequent follow-up results fall below the BALs and there are no other abnormalities found in the medical examination.

All cases of excessive absorption or poisoning should be notified to the Labour Department. The occupational hygiene conditions of the workplace will be assessed, and the relevant safety and health laws will be enforced, where appropriate, so as to protect the safety and health of workers at work. Proprietors concerned will be required to take appropriate corrective actions to improve the working environment.

### **USEFUL REFERENCES**

1. Lauwerys R.R. : Industrial Chemical Exposure : Guidelines for Biological Monitoring. Biomedical Publication Davis, California, 2001.
2. Linch A.L. : Biological Monitoring for Industrial Chemical Exposure Control. CRC Press, Inc, Boca Raton, Florida, 1974.
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4. M.H. Ho and H.K. Dillon : Biological Monitoring of Exposure to Chemicals : Organic Compounds, ed. 1987, J. Wiley & Sons Inc., Canada, 1987.
5. Threshold Limit Values (for Chemical Substances and Physical Agents) and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, Ohio, USA, 2002.

# Chapter 4

## RESPIRATORY PROTECTION

The most important route by which toxic chemicals enter our bodies is through inhalation. The best way to protect workers from inhaling such chemicals is to reduce or prevent contamination of the air they breathe through the use of engineering control measures such as enclosures, local exhaust ventilation systems and substitution of toxic chemicals. Where such measures are not feasible or cannot be implemented immediately or are inadequate to control the hazard, then respiratory protection has to be used. Respiratory protection may also have to be used in maintenance operations or during emergencies.

### INDICATIONS FOR RESPIRATOR USAGE

There are two main indications:

- (a) When exposed to hazardous air contaminants in concentrations which exceed the Occupational Exposure Limits (OELs).
- (b) When in an oxygen deficient environment (< 19%), e.g. in a confined space such as a storage tank or manhole.

### EFFECTIVE RESPIRATORY PROTECTION

If respirators are used, they should be used properly so as to ensure effective protection. Otherwise they can give a false sense of security and in fact be a danger to the user.

For respirators to be effective, they must:

- (a) be of the correct type for the situation or hazard
- (b) fit the persons using them
- (c) be worn all the time in the hazardous environment
- (d) be properly maintained in good working condition

### Correct type of respirator

There is no all-purpose respirator. It is very important to select the correct type of respirator for the particular hazard or situation. Basically, there are two main types of respirators: air-supplied and air-purifying.

Air-supplied respirators provide a separate supply of air, e.g. air-line respirators and self-contained breathing apparatus (SCBA). These respirators must be used when in an oxygen deficient environment or when the levels of the contaminants are at very high concentrations beyond the protective limits of most air-purifying respirators. Examples of such situations are maintenance operations or emergencies, e.g. fire-fighting, rescue and accidental leakage.

Air-purifying respirators work by filtering or absorbing air contaminants as they pass through the respirator filter or cartridge. There are filters for particulates, e.g. dust, mist and fume and cartridges for vapours and gases. Some of the cartridges are specific for certain types of gases or vapours. Sometimes, a combination of a toxic dust filter and an organic solvent cartridge is required, e.g. a worker exposed to both pesticide dust and solvent vapour. The respirators also come in various types of face-pieces, e.g. full-face mask or half mask. Full-face respirators have the advantage of eye protection and a higher protection level but are heavier and bulkier. There are also disposable respirators which have the advantage of being lighter and being maintenance free. However, these may not be available in different sizes.

### **Proper fit**

There must be a good seal between the edges of the respirator and your face. Otherwise, the air contaminants would leak in through the edges of the respirator. The factors that may lead to poor fit include wrong size of respirator, wrong method of wearing respirator, wrong positioning of face-piece or straps, over-loose straps, interposition by beard, facial deformities and defective respirator.

To ensure proper fit:

- (a) Select the correct size/type of respirator
- (b) Put on the respirator according to the manufacturer's instruction, adjusting the straps and face-piece to obtain the best fit
- (c) Carry out a fit test at time of issue of respirator. (Fit test: This is based on the ability to taste an aerosol of a substance like saccharine with the respirator worn. With a proper fit, you should not be able to taste it) and
- (d) Carry out seal checks each time the respirator is used. (Seal checks: With the respirator worn, cover the filter or cartridge with the palm of your hands. Breathe in and hold your breath. The face-piece should collapse slightly and remain so, if there is no obvious leak).

## **Consistent usage**

The protection factor is reduced each time the respirator is removed in the presence of contaminated air. They should be worn all the time while in a contaminated environment.

## **Proper maintenance**

The cartridges or filters of non-disposable respirators must be regularly changed to ensure continued protection. Particulate filters should be changed once they are clogged up resulting in increased breathing resistance. Gas and vapour cartridges must be changed once they are saturated and can no longer absorb any more of the contaminant. This would be indicated by a “breakthrough” of the chemical into the respirator, e.g. smell or irritation by the chemical. The higher the concentration, the more frequent the change. Once there is a breakthrough of the contaminant, the worker must leave the area and change the cartridge immediately. There must be good warning properties of the contaminant in order that a breakthrough can be detected. Otherwise air-supplied respirators are indicated.

## **MEDICAL FITNESS**

Most workers should have no problems breathing through the respirators when at work. A few workers with poor lung or heart function may have difficulties breathing through the respirators. Workers with poor effort or tolerance, or with history of unstable angina, may have difficulty doing strenuous exercise and carrying the heavy air-supplied respirators. Where indicated, lung function tests and stress ECG can be carried out.

## **RESPIRATORY PROTECTION PROGRAMME**

A self-regulatory and comprehensive respiratory protection programme should include the following:

- (a) regular environmental monitoring of the hazard
- (b) engineering control to reduce the hazard where practicable
- (c) selection and provision of suitable respirators
- (d) supervision to ensure proper fit and consistent usage
- (e) proper maintenance
- (f) training in use and care of respirators
- (g) medical examinations for fitness

# Chapter 5

## HEARING PROTECTION

When engineering and administrative control measures are not practicable or are ineffective in reducing worker's noise exposure to below the recommended levels, workers should be provided with, and wear, personal hearing protectors.

### **INDICATIONS FOR HEARING PROTECTOR USAGE**

When the daily personal noise exposure reaches or exceeds 90 dB(A), hearing protectors should always be used. If the daily personal noise exposure is between 85 and 89 dB(A), use of hearing protectors should also be considered (please refer to the First and Second Action Levels as specified in the Factories and Industrial Undertakings (Noise at Work) Regulation).

### **EFFECTIVE HEARING PROTECTION**

For hearing protectors to be effective, they must:

- (a) be of the correct type for the exposure situation
- (b) fit the persons wearing them
- (c) be worn all the time in the noisy environment
- (d) be properly maintained

### **Correct type of hearing protectors**

Selection of hearing protectors should be based on the following:

- (a) Degree of protection required in the worker's environment.

Where the degree of noise attenuation of the hearing protector is available, it can be used as one of the factors in selecting personal hearing protection. It is subtracted from the C-weighted sound pressure level in the environment. The result would indicate the potential noise reduction afforded by the hearing protector in question. For example, if a worker is exposed to a noise level of 100 dB and the attenuation of a particular ear plug is 20 dB, then wearing the ear plug would effectively cut down his exposure to a noise level of 80 dB.

In general, for exposure to noise levels below 100 dB(A), ear plugs provide sufficient protection. For exposures between 100 and 110 dB(A), ear muffs should be provided and at exposures over 110 dB(A), both ear plugs and ear muffs should be worn.

(b) Suitability for use in the type of working environment and job involved.

For example, ear plugs are difficult to use hygienically in work that requires them to be inserted with dirty hands. For such jobs, ear muffs may be better. Conversely, ear muffs tend to be uncomfortable in hot environments or may make it difficult for the wearer to enter a confined environment or to wear other personal protective equipment, such as helmets or respirators.

### **Proper fit**

There are basically two types of hearing protectors:

#### **(a) Ear muffs**

Ear muffs consist of a pair of cushioned cups connected and held in place by an elastic head band. The muffs are designed to cover the entire ear, preventing the entry of noise. These are usually of “free” size and one size will fit many workers.

#### **(b) Ear plugs**

Ear plugs are insert devices designed to fit into the ear canal, sealing it against noise entry. There are two types of ear plugs :

- Disposable ear plugs are used a few time and discarded. They are made of expandable polyurethane foam or glass wool and are of “free” size.
- Non-disposable or reusable ear plugs are made of silicone, rubber or plastic and come in various shapes and sizes. The size of the ear canal varies from person to person. Ear plugs that are too big cause discomfort whereas those which are too small are ineffective.

All hearing protectors will have to be properly fitted to ensure adequate protection. Worker’s ear canals can be “sized” with an earscope.

### **Consistent usage**

Hearing protectors should be used all the time in a noisy environment. The protection factor is reduced each time a hearing protector is removed when there is still noise exposure. For example, the effective noise reduction achieved will be as much as half the NRR (Noise Reduction Rating) if a worker removes his hearing protectors even for 20 min in 8 hours of usage.

## **Proper maintenance**

All hearing protectors should be inspected regularly and replaced where necessary. Disposable ear plugs should be discarded once they do not expand after compression or when dirty. Reusable ear plugs have to be washed regularly with mild soap and warm water. Ear muffs should be inspected for tightness of fit and condition of the ear cups.

## **HEARING CONSERVATION PROGRAMME**

A self-regulatory Hearing Conservation Programme (HCP) for controlling the noise hazard and preventing noise induced deafness amongst workers should include:

- (a) Noise surveys to identify and target noisy areas for corrective action
- (b) Implementation of noise control measures where feasible
- (c) Putting up signs on hearing protector usage in designated noisy areas
- (d) Medical examinations for all workers exposed to excessive noise
- (e) Provision of suitable personal hearing protectors to all exposed workers
- (f) Education and training of all workers on the importance of hearing protector usage, their selection and maintenance

# Chapter 6

## COMPENSABLE OCCUPATIONAL DISEASES

An employee who is incapacitated by any of the 46 diseases prescribed in the Second Schedule of the Employees' Compensation Ordinance (ECO) Cap. 282 is entitled to receive compensation if he/she fulfils the other requirements set out in the Schedule with respect to that particular disease. Silicosis and asbestos-related diseases are covered by the Pneumoconiosis (Compensation) Ordinance (PCO) Cap. 360, while noise-induced deafness by reason of employment is covered by the Occupational Deafness (Compensation) Ordinance (ODCO) Cap. 469. Please refer to the list on page 23-24 for details.

### **PRESCRIBED OCCUPATIONAL DISEASES UNDER ECO**

#### **Compensation for Temporary Incapacity**

An employee who suffers temporary incapacity (i.e. requiring sick leave) arising from a prescribed occupational disease is entitled to receive periodical payments at the rate of four-fifths of his/her normal earnings, if the disease is one due to the nature of any occupation in which he/she was employed at any time within the prescribed period immediately preceding the incapacity caused.

The employer is also liable to pay medical expenses incurred by the employee for receiving medical treatment. The amount payable is subject to a daily maximum listed in the ECO.

#### **Compensation for Permanent Incapacity**

If an employee suffers permanent incapacity arising from the prescribed occupational disease, he is entitled to receive a compensation for permanent incapacity. The amount of compensation payable depends on his monthly earnings, age and percentage of loss of earning capacity as determined by an Employees' Compensation Assessment Board.

#### **Notification**

If an employee suffers incapacity arising from a prescribed occupational disease, the examining doctor can notify the employer on behalf of the employee of his

incapacity due to the occupational disease using Form 1A (Annex III). The employer must then submit in duplicate a Notice of Occupational Disease, i.e. Form 2A (Annex IV), to the Commissioner for Labour within 14 days of the employee's incapacity, or in the case of death, within 7 days of the death of the employee.

If the employee wishes to claim compensation, he should submit the sick leave certificates to the employer as soon as possible and keep a photocopy for reference. He should also attend sick leave clearance interview at the Occupational Medicine Unit as directed by the notification issued by the Employees' Compensation Division of the Labour Department. When the disease has been cured or the medical condition has become static, the employee will be assessed by an Employees' Compensation Assessment Board for any permanent incapacity.

## **SILICOSIS AND ASBESTOS-RELATED DISEASES**

If an employee suffers from silicosis or asbestos-related diseases and wants to claim compensation, he should call the Pneumoconiosis Compensation Office of the Labour Department (Tel: 28524822) to arrange for a medical assessment by the Pneumoconiosis Medical Board. Details of compensation scheme can be found in the information leaflet published by the Pneumoconiosis Compensation Fund Board.

## **OCCUPATIONAL DEAFNESS**

If an employee is diagnosed to be suffering from occupational noise-induced hearing loss and wishes to claim compensation, he should contact the Occupational Deafness Compensation Board (Tel: 27231288) to apply.

In general, an employee is entitled to compensation if he:

- has been employed in designated noisy occupations for a minimum of 5 or 10 years as specified in the Occupational Deafness (Compensation) Ordinance
- has been under continuous employment in a designated noisy occupation in the 12 months preceding the application for compensation
- has a hearing loss of at least 40 dB in both ears averaged over 1, 2 and 3 kHz, and such loss is due in the case of at least one ear to noise

## List of Compensable Occupational Diseases

### (I) Prescribed Occupational Diseases (under ECO)

#### Group A – Diseases Caused by Physical Agents

- A1. Radiation illness
- A2. Heat cataract
- A3. Compressed air illness
- A4. Cramp of hand or forearm
- A5. Beat hand
- A6. Beat knee
- A7. Beat elbow
- A8. Tenosynovitis of hand or forearm
- A9. Carpal tunnel syndrome

#### Group B – Diseases Caused by Biological Agents

- B1. Anthrax
- B2. Glanders
- B3. Leptospirosis
- B4. Extrinsic allergic alveolitis
- B5. Brucellosis
- B6. Tuberculosis
- B7. Parenterally contracted viral hepatitis
- B8. Infection by *streptococcus suis*
- B9. Avian chlamydiosis
- B10. Legionnaires' disease

#### Group C – Diseases Caused by Chemical Agents

- C1. Lead poisoning
- C2. Manganese poisoning
- C3. Phosphorus poisoning
- C4. Arsenic poisoning
- C5. Mercury poisoning
- C6. Carbon bisulphide poisoning
- C7. Benzene poisoning
- C8. Poisoning by benzene derivatives
- C9. Dinitrophenol poisoning

- C10. Poisoning by halogen derivatives of aliphatic hydrocarbons
- C11. Diethylene dioxide poisoning
- C12. Chlorinated naphthalene poisoning
- C13. Poisoning by oxides of nitrogen
- C14. Beryllium poisoning
- C15. Cadmium poisoning
- C16. Dystrophy of the cornea
- C17. Skin cancer
- C18. Chrome ulceration
- C19. Urinary tract cancer
- C20. Peripheral polyneuropathy
- C21. Localised papillomatous or keratotic new skin growth
- C22. Occupational vitiligo

#### **Group D – Diseases Caused by Miscellaneous Agents**

- D1. Skin inflammation or ulceration
- D2. Inflammation or ulceration of upper respiratory passage or mouth
- D3. Nasal cancer
- D4. Byssinosis
- D5. Occupational asthma

#### **(II) Pneumoconiosis Group (under PCO)**

Silicosis

Asbestos-related diseases

#### **(III) Occupational Deafness (under ODCO)**

# Chapter 7

## STATUTORY AND RECOMMENDED MEDICAL EXAMINATIONS

### STATUTORY MEDICAL EXAMINATIONS

In industrial undertakings, apart from radiation workers whose medical examinations are governed by the subsidiary regulations of the Radiation Ordinance (Cap. 303), the following workers are required under four subsidiary regulations of the Factories and Industrial Undertakings Ordinance (Cap. 59) respectively to undergo pre-employment and periodic medical examinations:

- (a) Workers engaged in mines, quarries and tunnelling work (under the Factories and Industrial Undertakings Regulations)
- (b) Workers exposed to asbestos (under the Factories and Industrial Undertakings (Asbestos) Regulation)
- (c) Workers exposed to controlled carcinogenic substances, i.e. alpha-naphthylamine and its salts [*other than alpha-naphthylamine containing, as a by-product of a chemical reaction, more than one per cent of beta-naphthylamine*], ortho-tolidine and its salts, dianisidine and its salts, dichlorobenzidine and its salts, auramine and magenta (under the Factories and Industrial Undertakings (Carcinogenic Substances) Regulations)
- (d) Workers engaged in compressed air work (under the Factories and Industrial Undertakings (Work in Compressed Air) Regulations)

### RECOMMENDED MEDICAL EXAMINATIONS

Besides statutory requirements, medical examinations are recommended as a good occupational health practice for workers exposed to certain hazards in industrial undertakings. The following are some examples of these hazards:

- (a) Silica
- (b) Arsenic
- (c) Cadmium
- (d) Manganese
- (e) Lead
- (f) Mercury
- (g) Organophosphates
- (h) Tar, pitch, bitumen and creosote
- (i) Raw cotton dust

- (j) Benzene
- (k) Methylenediphenyl diisocyanate (MDI) and Toluene diisocyanate (TDI)
- (l) Lasers (Class 3B & 4)
- (m) Excessive noise (daily personal noise exposure of 85 dB(A) and above)

## **PRE-EMPLOYMENT EXAMINATIONS**

Pre-employment medical examinations should be conducted within a certain period before or after commencing such employment. The timing and types of medical examinations to be performed depend on the nature of the occupational hazards. Please refer to the section on specific agents for details. For statutory medical examinations, the requirements are also specified in the relevant regulations.

## **PERIODIC EXAMINATIONS**

The frequency of periodic examinations and the types of examinations/tests required vary with the nature of the occupational hazards. Please refer to the section on specific agents for details. For statutory medical examinations, the requirements are also specified in the relevant regulations.

## **LABORATORY TESTS**

The examining doctor should liaise with those laboratories that provide the audiometric, radiological, blood or urine examinations required and make suitable arrangement with the laboratories to perform the tests. As for the less common biochemical tests such as heavy metal assay, the examining doctor may consider approaching the Chemical Pathology Department of the Faculty of Medicine of the two Universities for arrangements.

## **ABNORMAL RESULTS**

All abnormal results should be repeated immediately to ensure that the results are consistent.

## **REPORT OF MEDICAL EXAMINATION**

For workers engaged in mines, quarries and tunnelling work, the examining doctor should forward a copy of examination report to the Senior Occupational Health Officer of the Labour Department for certification of fitness to work. In other cases,

the examining doctor should certify the medical fitness of workers for employment in their specific occupations and report to the employer concerned.

In medical examinations for compressed air workers and workers engaged in mines, quarries and tunnelling work, the report forms are prescribed in the relevant regulations. In other cases, the report can be prepared in the form as suggested at Annex V of this guide. A copy of the report should also be sent to the examined worker. The report may be accompanied by recommendations as to limitations on, or suspension from, employment of the examined worker in his particular occupation, as follows:-

- i) He should continue to be employed in his particular occupation subject to such conditions and limitations as specified

Example

*A worker with a mild degree of noise-induced hearing loss may continue his employment in a noisy occupation provided that he must wear suitable hearing protectors with adequate noise damping to prevent further deterioration*

- ii) He should be suspended from employment in his particular occupation for such period as specified

Example

*A compressed air worker with type II decompression illness and presenting with gross neurological deficits should be suspended from compressed air work for at least 28 days after successful recompression therapy*

- iii) He should be suspended from employment in his particular occupation until he is certified fit to work in that occupation

Example

*A worker with occupational exposure to mercury and presenting with signs and symptoms of mercury poisoning should be suspended from the particular work until all necessary treatments have been completed, re-examination shows no residual toxic effects, and urine mercury level falls below 35 mcg/g creatinine*

- iv) He should be permanently suspended from employment in his particular occupation

Example

*A worker with occupational exposure to benzene should be permanently suspended from the particular work if he has aplastic anaemia*

Moreover, in the case of abnormal medical examination results, which indicate failure of exposure control measures in place, employers concerned should be advised to review those measures and take steps to rectify any irregularities immediately.

## **SUSPENSION**

Suspension of a worker from a specific job may be necessary to prevent a disease from developing or to prevent aggravation of a disease. It may be on a temporary or permanent basis. However, suspension of a worker is not always necessary, particularly in conditions where the first sign of disease is irreversible, the physical condition of the worker is still satisfactory for work and any necessary preventive or remedial actions will be followed strictly. Examples include noise-induced deafness, silicosis and asbestosis. Nevertheless, should these cases develop clinical symptoms and disability, suspension may be considered on an individual basis.

## **SICK LEAVE**

If a worker is suspended from his particular occupation because of over-exposure to certain hazards involved, but his physical condition, e.g. asymptomatic and physically well, does not preclude him from doing other work, re-deployment to another job should always be considered for him. If it proves to be not reasonably practicable to re-deploy the worker, the examining doctor should consider granting sick leave to him until he is fit to resume his particular job.

## **NOTIFICATION OF OCCUPATIONAL DISEASES**

Section 15 of the Occupational Safety and Health Ordinance Cap. 509 requires every medical practitioner to notify the Commissioner for Labour (notification form at Annex VI) if he suspects or diagnoses a worker to be suffering from any of the Notifiable Occupational Diseases listed in Schedule 2 of the Ordinance.

The list of notifiable occupational diseases in Schedule 2 covers poisoning and other medical conditions arising from hazardous exposures and doctors engaged in medical examination of workers should make sure that the notification requirement is observed. For the purpose of notification, poisoning shall include asymptomatic cases with evidence of excessive absorption of chemicals.

Upon notification, officers of the Labour Department would

- (a) initiate workplace investigations to evaluate workplace hazards and screen other potentially affected workers for early management, and require employers to take necessary actions to improve occupational hygiene at the workplace
- (b) based on the workplace investigation findings, confirm the diagnosis of occupational disease
- (c) advise and assist the employee on compensation-related matters

## **MEDICAL EXAMINATION REQUIREMENTS**

The medical examination requirements for the statutory and the recommended medical examinations for workers engaged in hazardous occupations in industrial undertakings are detailed in the following section. For the easy reference of examining doctors, information on the health effects of, and the main industries and occupations at risk for, individual occupational hazards are also given.

## 7.1 EMPLOYMENT IN MINES, QUARRIES AND TUNNELLING OPERATIONS

### HEALTH EFFECTS

#### Acute Silicosis

- (a) Rare
- (b) Due to inhalation of high concentrations of very fine free silica dust particles
- (c) May develop within a few months with severe dyspnoea, cough, mucoid sputum, fever, weight loss and cyanosis
- (d) Can be fatal within a year

#### Chronic Silicosis

- (a) Most of the cases are asymptomatic
- (b) Some may have dyspnoea, cough and wheezing

Note:

- Silica is silicon dioxide (SiO<sub>2</sub>), also called “crystalline” silica. Includes quartz, tridymite and cristobalite
- Silicotics may develop progressive massive fibrosis
- Silicotics are more prone to developing pulmonary tuberculosis
- They may also have a higher risk of lung cancer
- There is also an association with scleroderma and chronic renal disease

### MEDICAL EXAMINATIONS

#### (a) Frequency of examination

- Pre-employment (within 1 month before commencing employment) and once every 12 months

#### (b) Types of test required

- Clinical examination with particular emphasis on the chest
- Full-sized chest x-ray examination

## **SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT**

**(a) It is usually not necessary to suspend workers with suspected or definite silicosis.**

- Asymptomatic cases of suspected (category 1/0) or definite (category 1/1 and above in 2 consecutive CXR films, as compared with the set of standard films of ILO Classification of Radiographic Appearances of Pneumoconiosis) silicosis can continue their work and be monitored by annual medical examinations to exclude complications (e.g. pulmonary tuberculosis, chronic bronchitis and cardiac failure)
- Cases with mild symptoms can also continue their work and have their condition closely monitored by annual or more frequent medical examinations

**(b) If it is necessary to suspend silicotic workers, it is usually on a permanent basis. Permanent suspension should be considered for silicotic workers with the following conditions:**

- Aged below 35 and symptomatic
- Older age and have significant symptoms that affect work
- Complications such as pulmonary tuberculosis and other cardio-pulmonary diseases

**All suspected or definite cases of silicosis must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department, and referred to the Pneumoconiosis Clinic of the Department of Health for compensation assessment.**

### **TREATMENT AND FOLLOW UP**

- (a) There is no cure for silicosis. Symptomatic cases can be referred to the Pneumoconiosis Clinic of the Department of Health for symptomatic treatment and follow up.
- (b) Cases with complications such as pulmonary tuberculosis can also be referred to government chest clinics for treatment.

## 7.2 EMPLOYMENT INVOLVING EXPOSURE TO ASBESTOS

### HEALTH EFFECTS

- (a) Asbestosis - chronic fibrotic lung disease
- (b) Pleural plaques/calcification
- (c) Benign pleural effusion
- (d) Chronic bronchitis
- (e) Bronchogenic cancer (cigarette smoking is an important synergistic factor and the risk may be increased by more than 50 times when compared to a non-smoker and unexposed worker)
- (f) Mesothelioma (pleural or mediastinal)
- (g) Gastro-intestinal cancers (some evidence particularly the oesophagus, stomach, colon)
- (h) Possible cancer of the larynx and ovary
- (i) Skin corns

### MAIN INDUSTRIES AND OCCUPATIONS AT RISK

- (a) Asbestos milling and processing
- (b) Manufacture and use of asbestos-cement products, e.g. roofing sheets, wall boards, rubbish chutes in high rise buildings
- (c) Manufacture of gaskets
- (d) Ship building and repairing, e.g. in lagging and delagging of boilers and pipes
- (e) Construction industry, e.g. sawing and grinding of asbestos boards used in roofing and fire-proof doors/partitions
- (f) Renovation/demolition work, e.g. old buildings, power stations where asbestos material may have been used
- (g) Manufacture and repair of brake linings, e.g. car and bus mechanics
- (h) Insulation work, e.g. removal or replacement of asbestos insulation of furnaces, ovens etc.

### MEDICAL EXAMINATIONS

#### (a) Frequency of examination

- Pre-employment (within 4 months before commencing employment) and once every 12 months

**(b) Types of test required**

- Clinical examination with particular emphasis on the lungs and abdomen. Ask for any history of exertional dyspnoea.
- Full-sized chest x-ray examination

Note:

- All workers should be advised not to smoke

**SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT****(a) It is not always necessary to suspend suspected or definite cases of asbestosis**

- Asymptomatic cases of suspected (category 1/0) or definite (category 1/1 and above in 2 consecutive CXR films, as compared with the set of standard films of ILO Classification of Radiographic Appearances of Pneumoconiosis) asbestosis can continue their work and be monitored by annual medical examinations to exclude deterioration and other conditions such as lung cancer and pleural diseases
- Cases with mild symptoms can also continue their work and have their condition closely monitored by annual or more frequent medical examinations

**(b) If it is necessary to suspend workers for asbestos-related disease, it is usually on a permanent basis. Permanent suspension should be considered for workers with the following conditions:**

- Symptomatic asbestosis
- Less than 35 years old with progressive asbestosis as evidenced by CXR findings
- Asbestos-related malignancies, e.g. bronchogenic carcinoma and mesothelioma

**All definite or suspected cases of asbestos-related disease must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department, and referred to the Pneumoconiosis Clinic of the Department of Health for assessment for compensation.**

## **TREATMENT AND FOLLOW UP**

- (a) There is no cure for asbestosis. Symptomatic cases can be referred to the Pneumoconiosis Clinic for symptomatic treatment and follow up.
- (b) Cases with complications such as bronchogenic carcinoma or mesothelioma can be referred to a government chest clinic or hospital for further treatment and follow up.

## 7.3 EMPLOYMENT INVOLVING EXPOSURE TO CARCINOGENIC SUBSTANCES (CONTROLLED SUBSTANCES)

**“Controlled substances” under the Factories and Industrial Undertakings (Carcinogenic Substances) Regulations mean any of the following chemicals:**

1. Alpha-naphthylamine and its salts (other than alpha-naphthylamine containing, as a by-product of a chemical reaction, more than one per cent of beta-naphthylamine)
2. Ortho-tolidine and its salts
3. Dianisidine and its salts
4. Dichlorobenzidine and its salts
5. Auramine
6. Magenta

### ALPHA-NAPHTHYLAMINE

#### HEALTH EFFECTS

##### Acute effects

- (a) Inhalation – cyanosis, possibly delayed
- (b) Skin contact – absorbed through skin and causes cyanosis
- (c) Eye contact – irritates the eyes
- (d) Ingestion – may produce methaemoglobinaemia (animal studies)

##### Chronic effects

- (a) Inhalation – latent bladder cancer with symptoms of bladder irritation, haematuria, dysuria, frequency of urination, and haemorrhagic cystitis
- (b) Skin contact – absorbed through skin and causes effects as in (a)
- (c) Eye contact – conjunctivitis

### ORTHO-TOLIDINE

#### HEALTH EFFECTS

##### Acute effects

- (a) Inhalation – irritation of the nasal mucosa

- (b) Skin contact – erythaema; absorbed through skin causing systemic toxicity
- (c) Eye contact – irritates the eyes

### **Chronic effects**

- (a) Inhalation – bladder cancer
- (b) Skin contact – absorbed through skin and causes effects as in (a)
- (c) Eye contact – conjunctivitis
- (d) Ingestion – kidney damage and renal failure

## **DIANISIDINE**

### **HEALTH EFFECTS**

#### **Acute effects**

- (a) Inhalation – methaemoglobinaemia, cyanosis, possibly delayed; jaundice; dysuria; anaemia
- (b) Skin contact – absorbed through skin and causes effects as in (a); irritation and allergic dermatitis
- (c) Ingestion – effects as in (a); injury to bladder wall, spleen, liver and kidneys

#### **Chronic effects**

- (a) Inhalation – nervous system, liver, kidneys and bone marrow may be affected
- (b) Skin contact – absorbed through skin and causes effects as in (a); dermatitis
- (c) Ingestion – cancer risk to human

## **DICHLOROBENZIDINE**

### **HEALTH EFFECTS**

#### **Acute effects**

- (a) Inhalation – irritation and pulmonary congestion
- (b) Skin contact – irritation and allergic dermatitis
- (c) Ingestion – digestive disorders, GI congestion and haemorrhage

#### **Chronic effects**

- (a) Inhalation – frequency of micturition; dysuria; haematuria
- (b) Skin contact – dermatitis
- (c) Ingestion – injury to liver and bladder; cancer risk to human

## AURAMINE

### HEALTH EFFECTS

#### Acute effects

- (a) Inhalation – methaemoglobinaemia; cyanosis; asthma
- (b) Skin contact – Absorbed through skin causing nausea, vomiting, fever, headache, yellow vision and cyanosis; skin burn, irritation and allergic dermatitis
- (c) Eye contact – conjunctival oedema, hyperaemia, purulent discharge opacification, corneal stroma necrosis
- (d) Ingestion – methaemoglobinaemia

#### Chronic effects

- (a) Inhalation – bladder cancer
- (b) Skin contact – bladder cancer
- (c) Ingestion – risk of liver cancer

## MAGENTA

### HEALTH EFFECTS

#### Acute effects

- (a) Inhalation – cough and irritation of the mucous membranes
- (b) Skin contact – irritation
- (c) Eye contact – irritates the eyes, redness
- (d) Ingestion – nausea, vomiting, diarrhoea, general malaise, numbness and tingling sensation, urinary frequency, chills, fever, arthralgia, hypocalcaemia, lead overload

#### Chronic effects

- (a) Skin contact – dermatitis
- (b) Eye contact – conjunctivitis
- (c) Ingestion – kidney damage and renal failure

### MAIN INDUSTRIES AND OCCUPATIONS AT RISK

- (a) Pigment manufacture and use, e.g. for plastics, textile, paper, rubber industries; in inks, enamels and glazes
- (b) Dye manufacture and use

- (c) Paint manufacture and use
- (d) Electric cable manufacture
- (e) Tanning leather

## **MEDICAL EXAMINATIONS**

### **Frequency of examination and types of test required**

Pre-employment (within 1 month after commencing employment) and once every 6 months

- (a) Clinical examination with particular emphasis on the skin, eye, GI, renal and respiratory system
- (b) Urine – exfoliative cytology

## **SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT**

Suspension is not immediately necessary for an abnormal urinary cytology result. A second urinary cytology test should be done as soon as possible. If the second test result is normal, a worker can continue his work but should have a third test one month later.

### **Temporary suspension**

- If the second or third urinary cytology result is abnormal, the worker should be suspended until further investigations confirm that there are no contraindicating medical conditions for employment in the job.
- Workers with evidence of poisoning from these chemicals should be suspended from further exposure until necessary treatment has been completed and re-examination shows no residual toxic effects.

### **Permanent suspension**

Permanent suspension should be considered for workers with definite evidence of permanent renal damage or cancer.

**All suspected or definite cases of poisoning or cancer related to these substances must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department.**

### **TREATMENT AND FOLLOW UP**

- (a) Cases of definite poisoning and cancer can be referred to hospitals for further treatment.
- (b) On completion of treatment, the examining doctor should re-examine the worker to certify medical fitness for work with carcinogenic substances (controlled substances).

## 7.4 EMPLOYMENT IN COMPRESSED AIR WORK

### HEALTH EFFECTS

#### Decompression Sickness

- (a) Acute
  - Type I: mild form, onset at any time from final stages of decompression to 12 or even 36 hours after decompression; “bends” (limb pains), skin mottling
  - Type II: severe form; onset usually early (within 45 minutes of decompression) – neurological, respiratory, cardiac or gastrointestinal involvement
- (b) Chronic
  - dysbaric osteonecrosis; usually involving shoulder, hip or knee; may be asymptomatic. Lesions may be in the head, neck or shaft of femur. Disability with persistent joint pain and stiffness is likely only if the articular surfaces are affected

#### Barotrauma

- (a) Pulmonary (pneumothorax, air embolism, surgical emphysema, pulmonary tissue damage)
- (b) Sinus
- (c) Aural (Sensorineural hearing loss in inner ear barotrauma, conductive loss in perforated tympani or ossicular disruption)

### MAIN INDUSTRIES AND OCCUPATIONS AT RISK

- (a) Tunnelling or shaft sinking operations in water bearing strata
- (b) Caisson work on river and sea beds

### MEDICAL EXAMINATIONS

#### Frequency of examination and types of test required

Pre-employment examination must be carried out within 3 days before commencing employment.

## Medical Examination

1. A clinical examination for fitness for compressed air work (with particular emphasis on the ENT, respiratory, cardiovascular, neurological and gastrointestinal systems)
2. Test in lock and full-sized chest X-ray
3. Radiographic examination of shoulder, hip and knee joints (for working pressures exceeding 1 bar)

## Frequency of Examination

1. Pre-employment
  2. Thereafter:
    - a) Not less than once in every 3 months for working pressures not exceeding 1 bar
    - b) Not less than once in every 4 weeks for working pressures exceeding 1 bar
    - c) After suffering from a cold, chest infection, sore throat, earache or other illness or injury necessitating absence from work for more than 3 consecutive days
- 
- Pre-employment
  1. Within 4 weeks after employment
  2. Thereafter – once every 12 months

## SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT

### Temporary suspension

- (a) Cases of decompression sickness or barotrauma should be suspended for a certain period after completion of treatment
  - Type I decompression sickness: at least 24 hours for those with uncomplicated recovery; 7 days for those with recurrence or relapse that requires further treatment
  - Type II decompression sickness: at least 7 days for those presented with altered sensations in limbs; 28 days for those with other neurological or pulmonary presentations
  - Pulmonary barotrauma: at least 28 days for cases with or without mediastinal/subcutaneous emphysema

- (b) Cases with certain physical or medical condition have to be suspended until the condition has resolved or has been well controlled or treated:
- Unfit physical condition: pregnancy, gross obesity
  - Underlying medical problems: hypertension, diabetes, chest infection, cold

### **Permanent suspension**

Permanent suspension should be considered for workers with the following conditions:

- (a) Decompression sickness with significant residual health effects after treatments, e.g. gross neurological deficit
- (b) Juxta-articular dysbaric osteonecrosis
- (c) Persistent or uncontrolled contraindicating medical conditions
  - Absolute contraindications:
    - i. negative valsalva manoeuvre
    - ii. chronic suppurative otitis media
    - iii. chronic upper respiratory tract infection, particularly recurrent sinus infection
    - iv. chronic lung disease (past or present), bronchial asthma, bronchiectasis
    - v. hernia
    - vi. heart disease, atrial or ventricular septal defects, patent ductus arteriosus
    - vii. epilepsy or other disease of the central nervous system
    - viii. bone disease
    - ix. alcoholism or drug abuse
    - x. acute or chronic psychiatric disorders
  - Relative contraindications (to be assessed on an individual basis):
    - i. age over 50
    - ii. gross obesity
    - iii. history of spontaneous pneumothorax
    - iv. history of childhood asthma
    - v. history of pulmonary tuberculosis
    - vi. history of thoracotomy
    - vii. allergic rhinitis, hay fever
    - viii. hypertension
    - ix. diabetes
    - x. on steroid treatment

**All suspected or definite cases of decompression sickness (Type I and Type II) or barotrauma must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department.**

### **TREATMENT AND FOLLOW UP OF COMPRESSED AIR ILLNESS**

- (a) All cases of decompression sickness should undergo therapeutic recompression.
- (b) Doubtful cases should be subjected to a trial of recompression. If clinical improvement is shown, the cases should undergo full therapeutic recompression.
- (c) Look out for recurrence after apparently successful recompression treatment.
- (d) Cases of barotrauma to ears or sinuses may require further treatment by ENT doctors.
- (e) On completion of treatment, the examining doctor should re-examine the worker to certify medical fitness for compressed air work.
- (f) Workers with history of decompression sickness who subsequently have bone or joint pain should be assessed by skeletal x-ray for any evidence of dysbaric osteonecrosis.

## 7.5 EMPLOYMENT INVOLVING EXPOSURE TO SILICA

### HEALTH EFFECTS

#### Acute Silicosis

- (a) Rare
- (b) Due to inhalation of high concentrations of very fine free silica dust particles (e.g. manufacture of abrasive soaps, and sandblasting)
- (c) May develop within a few months with severe dyspnoea, cough, mucoid sputum, fever, weight loss and cyanosis
- (d) Can be fatal within a year

#### Chronic Silicosis

- (a) Most of the cases are asymptomatic
- (b) Some may have dyspnoea, cough and wheezing

Note:

- Silica is silicon dioxide ( $\text{SiO}_2$ ), also called “crystalline” silica. Includes quartz, tridymite and cristobalite
- Silicotics may develop progressive massive fibrosis
- Silicotics are more prone to developing pulmonary tuberculosis
- They may also have a higher risk of lung cancer
- There is also an association with scleroderma and chronic renal disease

### MAIN INDUSTRIES AND OCCUPATIONS AT RISK

- (a) Rubber milling (using calcium carbonate containing silica)
- (b) Foundries (mouldbreaking and fettling)
- (c) Abrasive blasting using siliceous grains (e.g. sandstone, sand, quartzite and flint)
- (d) Manufacture of ceramics (chinaware, porcelain, earthenware) and refractories
- (e) Maintenance and repair of refractories (furnance linings)
- (f) Stone cutting, dressing, polishing, cleaning and monumental masonry (including tombstone engraving) using granite and sandstone
- (g) Enamelling using quartz, feldspar, metal oxides and carbonates
- (h) Manufacture of abrasive soaps

## MEDICAL EXAMINATIONS

### Frequency of examination and types of test required

Pre-employment (within 1 month before commencing employment) and once every 12 months:

- Clinical examination with particular emphasis on the chest
- Full-sized chest x-ray examination

## SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT

**It is not usually necessary to suspend workers with suspected or definite silicosis:**

- Asymptomatic cases of suspected (category 1/0) or definite (category 1/1 and above in 2 consecutive CXR films, as compared with the set of standard films of ILO Classification of Radiographic Appearances of Pneumoconiosis) silicosis can continue their work and be monitored by annual medical examinations to exclude complications (e.g. pulmonary tuberculosis, chronic bronchitis and cardiac failure)
- Cases with mild symptoms can also continue their work and have their condition closely monitored by annual or more frequent medical examinations.

**If it is necessary to suspend silicotic workers, it is usually on a permanent basis. Permanent suspension should be considered for silicotic workers with the following conditions:**

- Aged below 35 and symptomatic
- Older age and have significant symptoms that affect work
- Complications such as pulmonary tuberculosis and other cardio-pulmonary diseases

**All suspected or definite cases of silicosis must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department, and referred to the Pneumoconiosis Clinic of the Department of Health for assessment for compensation.**

## **TREATMENT AND FOLLOW UP**

- (a) There is no cure for silicosis. Symptomatic cases can be referred to the Pneumoconiosis Clinic of the Department of Health for symptomatic treatment and follow up.
- (b) Cases with complications such as pulmonary tuberculosis can also be referred to government chest clinics for treatment.

## 7.6 EMPLOYMENT INVOLVING EXPOSURE TO ARSENIC

### HEALTH EFFECTS

#### Inorganic arsenic

##### (a) Acute poisoning

- Rare, usually accidental
- If ingested, symptoms of throat constriction, dysphagia, epigastric pain, vomiting and watery diarrhoea develop within 1/2 to 4 hours. Fatal dose of ingested elemental arsenic is 70-180 mg. If not fatal, exfoliative dermatitis and peripheral neuritis may develop
- If inhaled, respiratory symptoms – rhinitis, cough, chest pain, dyspnea, pharyngitis, laryngitis – may occur

##### (b) Chronic poisoning

Skin	Increased pigmentation, desquamation, herpetic lesions around the mouth, hyperkeratoses (especially of palms and soles)
Respiratory tract	Perforation of nasal septum, chronic bronchitis, basilar fibrosis of lung
Liver	Liver cirrhosis, chronic hepatitis
Peripheral nervous system	Peripheral neuritis, initially sensory, later motor
Haematopoietic system	Normochromic anaemia, neutropenia, thrombocytopenia, aplastic anaemia
Eyes	Corneal dystrophy

##### (c) Other conditions

- Cancer of skin, lungs and ethmoids reported. Skin cancer presents with pigmentation, keratosis and single or multiple malignant growths. Basal or squamous cell type
- Angiosarcoma of the liver, lymphoma and leukaemia
- Genotoxic: chromosomal aberrations in human lymphocytes

Note:

- Some inorganic arsenic compounds (e.g. arsenic acid, arsenic trichloride) can be absorbed through intact skin.
- Inorganic arsenicals are generally more toxic than organic arsenicals; trivalent arsenic being more toxic than pentavalent arsenic.

### **Organic arsenic**

- Skin and mucous membrane irritation

**Arsine** (evolved when nascent hydrogen is generated in the presence of arsenic)

- Causes massive intravascular haemolysis
- Symptoms develop within hours of exposure
- Triad of haemoglobinuria (port-wine urine), jaundice (coppery-bronze hue) and abdominal pain
- Associated shivering, severe thirst and ECG changes
- Death due to acute renal failure
- Mainstay of treatment is exchange transfusion or dialysis

## **MAIN INDUSTRIES AND OCCUPATIONS AT RISK**

### **Inorganic and organic arsenic**

- (a) Manufacture and use of pesticides (weed killers, fungicides, wood preservatives)
  - in tanning and wood preservation
- (b) Manufacture of semiconductors
  - gallium arsenide substrate production and wafer processing
  - cleaning and maintenance of ion implant machines
  - handling of ion source
- (c) Manufacture of alloy (with copper or lead)
- (d) Smelting of arsenical (especially non-ferrous) ores
  - dust generated during grinding, screening, transfer and maintenance work on furnaces, flues and filters
- (e) Manufacture and use of organic arsenical compounds  
e.g. arsphenamine, neoarsphenamine, sulpharsphenamine and tryparsamide
- (f) Pigment manufacture and use
- (g) Manufacture and use of anti-fouling paints

## **Arsine**

- (a) Accidental exposures during tin refining, cleaning of tanks containing acid sludge, smelting and chemical industries
- (b) Accidental leakage, explosion or equipment malfunction during its use as a dopant gas in semiconductor manufacturing

## **MEDICAL EXAMINATIONS**

### **(a) Frequency of examination**

- Pre-employment (within 4 months before commencing employment) and once every 12 months

### **(b) Types of test required**

- Clinical examination with particular emphasis on the nervous, haematological and renal (for arsine exposure) systems, liver, skin, nasal septum and lymph nodes
- Estimation of inorganic arsenic in an early morning urine specimen (urine dipstick test for protein and blood can also be done for arsine exposure). Ensure that the worker has avoided seafood for three days prior to urine collection
- Full-sized chest x-ray examination

### **(c) Repeat test**

- If the urine arsenic level exceeds 35 mcg/litre, the urine test should be repeated immediately

## **SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT**

### **(a) Temporary suspension**

- Temporary suspension from exposure should be considered for all asymptomatic cases with urine arsenic level exceeding 35 mcg/litre in 2 successive examinations. The urinary arsenic level should be rechecked periodically (e.g. at 3-monthly intervals) until it falls below 35 mcg/litre.
- All cases with signs and symptoms in addition to laboratory evidence of arsenic or arsine poisoning should be suspended until all necessary treatments have been completed, re-examination shows no residual toxic effects and the urine arsenic level falls below 35 mcg/litre.
- All pregnant females should be suspended.

**(b) Permanent suspension**

- All cases with cancer associated with arsenic exposure

**All suspected or definite cases of arsenic/arsine poisoning or excessive absorption must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department.**

**TREATMENT AND FOLLOW UP**

- (a) Cases of definite arsenic poisoning can be referred to hospital for further treatment. BAL is the antidote for inorganic arsenic poisoning.
- (b) On completion of treatment, the examining doctor should re-examine the worker to certify medical fitness for arsenic work.

## 7.7 EMPLOYMENT INVOLVING EXPOSURE TO CADMIUM

### HEALTH EFFECTS

- (a) Acute poisoning
  - Chemical pneumonitis following fume inhalation; onset within 8 to 24 hours; mortality 15%
  - Gastrointestinal tract irritation following accidental ingestion
- (b) Chronic poisoning
  - Renal dysfunction (tubular and/or glomerular damage with low molecular weight proteinuria, glucosuria, amino aciduria, albuminuria and reduced creatinine clearance)
  - Emphysema
  - Bone pain; osteomalacia and fractures
  - Anosmia
  - Lung cancer

#### Note:

- Cigarette smoking adds to cadmium burden. Each cigarette contains about 1-2 ug cadmium (Cd) of which approximately 25-50% is retained in the lungs.
- The average normal gastrointestinal absorption in man ranges from 3-7% of ingested cadmium. This increases to as high as 20% with nutritional deficiencies of calcium, iron or protein.

### MAIN INDUSTRIES AND OCCUPATIONS AT RISK

- (a) Nickel-cadmium battery manufacturing (tableting and assembly of Cd electrodes)
- (b) Silver brazing, welding and soldering operations using cadmium-containing fillers
- (c) Plastics industry, especially compounding of polyvinyl chloride (PVC); used as thermal stabilizer
- (d) Electroplating
- (e) Pigment manufacture and use, e.g. for plastics, textile, paper, rubber industries; in inks, enamels and glazes
- (f) Alloy manufacture, e.g. low melting-point brazing alloys, Ag-Cd and Cu-Cd
- (g) Fungicides manufacture and use

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- EMPLOYMENT INVOLVING EXPOSURE TO CADMIUM
- (h) Manufacture of refrigerators, air-conditioners, television picture tubes, semiconductors, photo-cells and fluorescent lamps, and as neutron absorber in nuclear reactors
  - (i) Jewellery manufacture
  - (j) Automobile and aircraft industries
  - (k) Smelting and refining of Zn, Pb or Cu ores and scrap processing

## **MEDICAL EXAMINATIONS**

### **(a) Frequency of examination**

- Pre-employment (within 4 months before commencing employment) and once every 12 months

### **(b) Types of test required**

- Clinical examination with particular emphasis on the olfactory sense, renal, respiratory and skeletal system.
- Blood cadmium estimation (venous blood in heparinised container).
- Urine Beta-2-microglobulin estimation. DO NOT USE EARLY MORNING SPECIMEN. Collect morning specimen 2 hours after drinking 15 ml Mist Potassium Citrate. Discard specimen if urine pH lower than 5.6. Keep specimen refrigerated after collection and in ice during transportation. Specimens should reach the laboratory within 2 hours after collection.

### **(c) Repeat test**

- If the blood cadmium level exceeds 5 mcg/litre, the blood test should be repeated immediately
- If the urine Beta-2-microglobulin level exceeds 290 mcg/gm creatinine, the urine test should be repeated one month later

## **SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT**

### **(a) Temporary suspension**

- Temporary suspension from exposure should be considered for all asymptomatic cases with blood cadmium level exceeding 5 mcg/litre and/or urine Beta-2-microglobulin level exceeding 290 mcg/gm creatinine in 2 successive examinations. Blood cadmium and urine Beta-2-microglobulin

levels should be rechecked periodically (e.g. at 3-monthly intervals) until they fall below 5 mcg/litre and 290 mcg/gm creatinine respectively.

- All cases with signs and symptoms in addition to laboratory evidence of cadmium poisoning should be suspended until all necessary treatments have been completed, re-examination shows no residual toxic effects, and blood cadmium and urine Beta-2-microglobulin levels fall below 5 mcg/litre and 290 mcg/gm creatinine respectively.

**(b) Permanent suspension**

- All cases with cancer associated with cadmium exposure
- All cases of cadmium poisoning with evidence of permanent renal dysfunction or lung damage or cancer

**All suspected or definite cases of cadmium poisoning or excessive absorption must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department.**

**TREATMENT AND FOLLOW UP**

- (a) Cases of definite cadmium poisoning can be referred to hospital for further treatment.
- (b) On completion of treatment, the examining doctor should re-examine the worker to certify medical fitness for cadmium work.

## 7.8 EMPLOYMENT INVOLVING EXPOSURE TO MANGANESE

### HEALTH EFFECTS

#### Acute poisoning

- (a) Manganese dust and fumes cause minor irritation to the eyes and mucous membranes of the respiratory tract. Fume inhalation may result in metal fume fever. Manganese dust is not believed to be a causative factor in pneumonia. If at all, it is only an aggravating factor to a pre-existing condition.
- (b) Manganese salts (higher valency) – caustic effects

#### Chronic poisoning

- (a) Manganese (bivalent) compounds cause damage to the central nervous system and lungs.
  - Central nervous system: 3 phases
    - Subclinical stage with vague symptoms
    - Early clinical stage with acute psychomotor disturbances, speech and gait disturbances, tremors
    - Fully developed stage with manic depressive psychosis and parkinsonism
  - Lungs:
    - Increased incidence of pneumonia, acute and chronic bronchitis
- (b) Other reported effects:
  - Fall in blood pressure
  - Reduced urinary 17-ketosteroids
  - Changes in haemoglobin level and blood counts
  - Increased serum calcium, enzymes (e.g. adenosine deaminase) and albumin/globulin ratio

### MAIN INDUSTRIES AND OCCUPATIONS AT RISK

- (a) Milling of manganese ore
- (b) Manufacture of dry-cell batteries (manganese dioxide)
- (c) Iron and steel industry as a reagent to reduce sulphur and oxygen
- (d) Manganese electroplating
- (e) Manufacture of paints, varnishes, inks and dyes, fertilisers, feed additives, disinfectants and bleaching agents, glass and ceramics (decoloriser and coloring agent)

- (f) Manufacture of matches and fireworks
- (g) Manufacture of potassium permanganate
- (h) Welding operations with manganese-coated rods

## **MEDICAL EXAMINATIONS**

### **(a) Frequency of examination**

- Pre-employment (within 4 months before commencing employment) and once every 12 months

### **(b) Types of test required**

- Clinical examination with particular attention to behavioural and neurological changes (speech and emotional disturbances, hypertonia, tremor, equilibrium, gait, handwriting and adiadochokinesis)
- Urine manganese estimation (early morning specimen corrected to SG of 1.016)

### **(c) Repeat test**

- If the urine manganese level exceeds 50 mcg/litre, the urine test should be repeated immediately

## **SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT**

### **(a) Temporary suspension**

- Temporary suspension from exposure may be considered for all asymptomatic cases with urine manganese level exceeding 50 mcg/litre in 2 successive examinations. Urine manganese level should be rechecked periodically (e.g. at 3-monthly intervals) until it falls below 50 mcg/litre.
- All cases with signs and symptoms in addition to laboratory evidence of manganese poisoning should be suspended until all necessary treatments have been completed, re-examination shows no residual toxic effects, and urine manganese level falls below 50 mcg/litre.

### **(b) Permanent suspension**

- All cases of manganese poisoning with evidence of permanent neuro-behavioural changes

**All suspected or definite cases of manganese poisoning or excessive absorption must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department.**

### **TREATMENT AND FOLLOW UP**

- (a) Cases of definite manganese poisoning can be referred to hospital for further treatment.
- (b) On completion of treatment, the examining doctor should re-examine the worker to certify medical fitness for manganese work.

## 7.9 EMPLOYMENT INVOLVING EXPOSURE TO LEAD

### Lead and Inorganic Lead Compounds

#### HEALTH EFFECTS

##### (a) Haematological

- Anaemia, or a falling haemoglobin level; pallor and fatigability may be present

##### (b) Gastrointestinal

- Mild – anorexia, epigastric discomfort, constipation or diarrhoea
- Severe – abdominal colic  
(Burton's line, a bluish-black pigmentation at margins of gums, is an indication of lead exposure, not of lead poisoning)

##### (c) Peripheral nervous system

- Paresis (rarely paralysis), often affecting extensors of the hand or foot, with no sensory changes

##### (d) Central nervous system

- Encephalopathy may occur with severe poisoning (drowsiness, convulsions, coma)
- Slow mental changes may occur (learning difficulty, behavioural changes etc have been described in children with lead exposure)

##### (e) Renal

- Chronic nephritis and tubular degeneration may occur

##### (f) Reproductive

- Lead can cross the placenta and may cause neurological damage to the foetus

#### MAIN INDUSTRIES AND OCCUPATIONS AT RISK

- Manufacture of lead-acid storage batteries (accumulators)
- Manufacture and use of stabilizers in PVC compounding
- Burning/welding/cutting of lead-coated structures, e.g. shipbreakers and welders
- Manufacture of ammunition
- Manufacture and use of lead-based paints
- Manufacture of solder

- (g) Manufacture and use of glazes for porcelain, enamels, tiles
- (h) Manufacture of alloys

## **MEDICAL EXAMINATIONS**

### **(a) Frequency of examination**

- Pre-employment (within 4 months before commencing employment) and once every 6 months

### **(b) Types of test required**

- Clinical examination with particular emphasis on the haematological and nervous systems
- Estimation of
  - i) blood lead level (venous blood in heparinised container)
  - ii) haemoglobin level (g/dL)

### **(c) Repeat test**

- Blood test for lead should be repeated immediately if the blood lead level exceeds 30 mcg/100 ml
- Haemoglobin assessment should be repeated immediately if the test result shows anaemia

## **SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT**

### **(a) Temporary suspension**

- Temporary suspension from exposure may be considered for all asymptomatic cases with blood lead level exceeding 30 mcg/100ml in 2 successive examinations. Blood lead level should be rechecked periodically (e.g. at monthly intervals) until it falls below 25 mcg/100ml.
- Cases with signs and symptoms in addition to laboratory evidence of lead poisoning should be suspended until all necessary treatments have been completed, re-examination shows no residual toxic effects, and blood lead level falls below 25 mcg/100ml.
- Females with haemoglobin levels of 10 g/dL or less and males with haemoglobin levels of 11.0 g/dL or less should have their work suspended and be treated as appropriate. The cause of anaemia should be investigated, and the haemoglobin level should be reassessed in 3 months.

Note:

- Immediate suspension from work is not required for cases of mild anaemia. Instead, the cause should be investigated and the worker treated if possible. The haemoglobin level should be reassessed in 3 months.
- Each laboratory has its own “normal range” for haemoglobin level. Haemoglobin levels below the lower limit of this range may be taken as anaemia.
  - All females who are pregnant or breast-feeding should be suspended.

### **(b) Permanent suspension**

- All cases of lead poisoning with evidence of permanent toxic effects.

**All suspected or definite cases of lead poisoning or excessive absorption must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department.**

### **Treatment**

- (a) Cases of definite lead poisoning and cases of anaemia can be referred to hospital for further management.
- (b) On completion of treatment, the examining doctor should re-examine the worker to certify medical fitness for lead work.

## **Organic Lead (TEL, TML)**

### **HEALTH EFFECTS**

Mainly on the central nervous system (usually acute)

- Mild: headache, tremor, nervousness, agitation, insomnia, troubled dreams
- Severe: hallucinations, mental confusion, coma, death

Note:

- In addition to the inhalation route, organic lead may be absorbed through the skin

### **MAIN INDUSTRIES AND OCCUPATIONS AT RISK**

- (a) Cleaning of tanks containing leaded gasoline or aviation fuel
- (b) Production of anti-knock agents (organic lead compounds)
- (c) Blending anti-knock fluid and raw gasoline at refineries of anti-knock agents

## MEDICAL EXAMINATIONS

### (a) Frequency of examination

- Pre-employment (within 4 months before commencing employment) and once every 6 months

### (b) Types of test required

- Clinical examination with particular attention to the central nervous system
- Estimation of urinary lead level (early morning specimen at the end of a work week)

### (c) Repeat test

- If the urine lead level exceeds 150 mcg/litre, the urine test should be repeated immediately

## SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT

### (a) Temporary suspension

- Temporary suspension from exposure may be considered for all asymptomatic cases with urine lead level exceeding 150 mcg/litre in 2 successive examinations. Urine lead level should be rechecked (e.g. at monthly intervals) until it falls below 150 mcg/litre.
- All cases with signs and symptoms of lead poisoning should be suspended until all necessary treatments have been completed, re-examination shows no residual toxic effects and the urine lead level falls below 150 mcg/litre.

### (b) Permanent suspension

- All cases of lead poisoning with evidence of permanent toxic effects

**All suspected or definite cases of lead poisoning or excessive absorption must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department.**

## TREATMENT AND FOLLOW UP

- (a) Cases of definite lead poisoning can be referred to hospital for further treatment.
- (b) On completion of treatment, the examining doctor should re-examine the worker to certify medical fitness for lead work.

## 7.10 EMPLOYMENT INVOLVING EXPOSURE TO MERCURY

### HEALTH EFFECTS

#### Inorganic and Elemental Mercury

- (a) Acute poisoning
  - Chemical pneumonitis
  - Gastrointestinal tract irritation
  - Circulatory collapse
  - Acute renal failure
- (b) Chronic poisoning
  - Weight loss
  - Insomnia
  - Erethism
  - Tremor
  - Dysarthria
  - Mercurialentis
  - Gingivitis
  - Stomatitis
  - Excessive salivation
  - Metallic taste

**Organic Mercury** (alkyl compounds, e.g. methyl mercury, and aryl compounds, e.g. phenylmercury acetate)

- (a) Acute Irritative Effects
  - Irritation of the mucous membranes
  - Chemical pneumonitis
- (b) Poisoning (may be acute or chronic)
  - Neurological symptoms e.g. paresthaesia, concentric constrictions of the visual fields, impairment of hearing, rigidity, tremor, ataxia, chronic seizures
  - Fatigue, dyspnoea, chest and abdominal pain, vomiting
  - Symptoms of inorganic mercury poisoning may be present including renal damage
- (c) Dermatitis
- (d) Prenatal intoxication may occur resulting in foetal brain damage

Note:

- Elemental Mercury volatilises at room temperature
- Mercury and some of its compounds can be absorbed through intact skin

## **MAIN INDUSTRIES AND OCCUPATIONS AT RISK**

### **Inorganic Mercury**

- (a) Electrolytic production of sodium hydroxide, chlorine and acetic acid (as a fluid cathode)
- (b) Manufacture of artificial silk
- (c) Manufacture of scientific instruments (e.g. barometers, thermometers), electrical equipment (e.g. batteries, meters, switches, rectifiers), mercury vapour and incandescent lamps, X-ray tubes and radio valves.
- (d) Manufacture of amalgams (with copper, tin, silver or gold) and solders (with lead and tin)
- (e) Plating of gold, silver, bronze and tin (jewellers)
- (f) Paint and pigment manufacture
- (g) Tanning and dyeing, feltmaking
- (h) Used as a catalyst in the chemical industry e.g. production of acetic acid and acetaldehyde from acetylene

### **Organic Mercury**

- (a) Manufacture of certain pharmaceutical products (e.g. antiseptics, germicides, diuretics and contraceptives)
- (b) Manufacture and use of pesticides (e.g. algicides, fungicides, herbicides)
- (c) Manufacture and use of paints and waxes (e.g. antifouling paints, preservatives in paints, latex paints, fungus proofing of fabrics, paper, wood)
- (d) Used as catalysts and alkylating agents in the chemical industry

## **MEDICAL EXAMINATIONS**

### **(a) Frequency of examination**

- Pre-employment (within 4 months before commencing employment) and once every 12 months

### **(b) Types of test required**

- Clinical examination with particular attention to the central nervous system (and skin in case of organic mercury)

- Estimation of mercury (inorganic mercury) level in early morning specimen for workers exposed to inorganic mercury. Ensure that the worker has avoided seafood for 3 days before urine collection.
- Blood mercury (total mercury) level for workers exposed to alkyl mercury compounds. Ensure that the worker has avoided seafood for 3 days before blood collection.

**(c) Repeat test**

- If the urine mercury (inorganic mercury) level exceeds 35 mcg/g creatinine, the urine test should be repeated immediately.
- If the blood mercury (total mercury) level exceeds 5 mcg/100ml, the blood test should be repeated immediately.

## **SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT**

**(a) Temporary suspension**

- Temporary suspension from exposure may be considered for all asymptomatic cases with urine mercury level exceeding 35 mcg/g creatinine (exposed to metallic or inorganic mercury) or blood mercury level exceeding 5 mcg/100ml (exposed to organic mercury) in 2 successive examinations. The level of mercury in urine or blood should be rechecked at monthly intervals until it falls below 35 mcg/g creatinine or 5 mcg/100ml respectively.
- All cases with signs and symptoms in addition to laboratory evidence of mercury poisoning should be suspended until all necessary treatments have been completed, re-examination shows no residual toxic effects and the urine mercury level falls below 35 mcg/g creatinine or the blood mercury level falls below 5 mcg/100 ml.
- All pregnant females should be suspended (especially from alkyl mercury exposure).

**(b) Permanent suspension**

- All cases of mercury poisoning with evidence of permanent toxic effects

**All suspected or definite cases of mercury poisoning or excessive absorption must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department.**

## **TREATMENT AND FOLLOW UP**

- (a) Cases of definite mercury poisoning can be referred to hospital for further treatment.
- (b) On completion of treatment, the examining doctor should re-examine the worker to certify medical fitness for mercury work.

## 7.11 EMPLOYMENT INVOLVING EXPOSURE TO ORGANOPHOSPHATES

### HEALTH EFFECTS

**Acute poisoning** (onset is prompt but may be delayed up to 12 hours)

- (a) Central Nervous System: anxiety, dizziness, headache, sleeplessness, confusion, coma, convulsions
- (b) Respiratory: dyspnoea, chest tightness, bronchospasm, bronchial hypersecretion, pulmonary oedema
- (c) Gastrointestinal: salivation, nausea, vomiting, abdominal colic, diarrhoea, pancreatitis
- (d) Ocular: lacrimation, miosis, blurring of vision
- (e) Muscular: fasciculations, cramps

### Chronic poisoning

- (a) Non-specific: headache, quick onset of fatigue, disturbed sleep, anorexia
- (b) Central and autonomic nervous system: nystagmus, tremors, failing memory, disorientation
- (c) Peripheral nervous system: paresis, neuritis, paralysis

Special Note: Organophosphates (OP) can be readily absorbed through the skin

### MAIN INDUSTRIES AND OCCUPATIONS AT RISK

- (a) Formulation and manufacture of organophosphates e.g. insecticide sprays
- (b) Packing and redistribution of organophosphates

### MEDICAL EXAMINATIONS

#### (a) Frequency of examination

- Pre-employment (within 4 months before commencing employment) and once every 6 months

#### (b) Types of test required

- Clinical examination with particular attention to the central and autonomic nervous systems

- Plasma or red blood cell cholinesterase estimation (venous blood in heparinised container and should be sent immediately to the laboratory in an ice box)

Note:

- Plasma cholinesterase estimation is indicated following accidental skin contact or acute high exposures or in suspected acute poisoning cases.

### **(c) Repeat test**

- If the plasma or red blood cell cholinesterase level is between 50 and 70% of the pre-employment or the lower limit of the laboratory's normal range, a repeat test should be done one month later.

## **SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT**

### **(a) Temporary suspension**

- All cases with plasma or red blood cell cholinesterase level less than 50% of the pre-employment or the lower limit of the laboratory's normal range, and those with plasma or red blood cell cholinesterase level between 50 and 70% of the pre-employment or the lower limit of the laboratory's normal range but showing a fall of 10% or more in the repeat test, should be suspended until the cholinesterase level has returned to more than 70% of the pre-employment or the lower limit of the laboratory's normal range. Plasma or red blood cell cholinesterase level should be rechecked at monthly intervals during the suspension.
- All cases with signs and symptoms in addition to laboratory evidence of organophosphate poisoning should be suspended until all necessary treatments have been completed, re-examination shows no residual toxic effects, and the cholinesterase level is not less than 70% of the pre-employment or the lower limit of the laboratory's normal range.

### **(b) Permanent suspension**

- All cases of organophosphate poisoning with evidence of permanent toxic effects

Note:

- Suspension includes suspension from work with carbamates

**All suspected or definite cases of organophosphate poisoning or excessive absorption must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department.**

### **TREATMENT AND FOLLOW UP**

- (a) Cases of definite organophosphate poisoning can be referred to hospital for further management.
- (b) On completion of treatment, the examining doctor should re-examine the worker to certify medical fitness for work with organophosphates/carbamates.

## 7.12 EMPLOYMENT INVOLVING EXPOSURE TO TAR, PITCH, BITUMEN AND CREOSOTE

### HEALTH EFFECTS

#### Acute effects

- (a) Skin burns
- (b) Eyes - blepharconjunctivitis, keratitis

#### Chronic effects

- (a) Skin and mucous membranes
  - Irritation - erythema, burning, itching, followed by desquamation (aggravated by sunlight)
  - Pigmentation changes - usually hyperpigmentation (primarily forearms, wrists, hands, scrotum)
  - Follicular dermatitis (comedones, acne, sebaceous cysts)
  - Benign neoplasms - coarsening and hardening (shagreen appearance), kerato-acanthoma, tar warts or papillomata (tar warts may be premalignant)
  - Malignant neoplasms - epithelioma (usually after 20 years of exposure. Common sites are head, neck, scrotum and upper limbs)
- (b) Eyes
  - Dystrophy or ulceration of the cornea - irritation, pain, redness and swelling of the cornea, with or without visual impairment
- (c) Respiratory tract
  - Irritation - congestion, pneumonitis
- (d) Gastrointestinal tract
  - Burning pain
  - Diarrhoea

### MAIN INDUSTRIES AND OCCUPATIONS AT RISK

These substances look alike and can be used for similar purposes.

- (a) Manufacture of tar, pitch, bitumen and creosote
- (b) Water proofing of wood, making of roofing and insulating materials
- (c) Lining irrigation canals and reservoirs
- (d) Road surfacing

- (e) Manufacture of dyestuff
- (f) Manufacture of paints
- (g) Chemical feedstock for the production of benzene, toluene, xylene, phenol
- (h) Sealing agents e.g. in battery manufacture
- (i) Lubricant for die moulds

## **MEDICAL EXAMINATIONS**

### **(a) Frequency of examination**

- Pre-employment (within 4 months before commencing employment) and once every 12 months

### **(b) Types of test required**

- Clinical examination with particular attention to the skin, eyes and lungs

## **SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT**

### **(a) Temporary suspension**

- All cases presenting with non-malignant health effects of tar, pitch, bitumen and creosote should be suspended until all necessary treatments have been completed and re-examination shows no residual health effects.

### **(b) Permanent suspension**

- All cases with evidence of premalignant lesion or malignant neoplasm of the skin

**All suspected or definite cases of benign/malignant neoplasms or other health effects related to tar, pitch, bitumen and creosote must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department.**

## **TREATMENT AND FOLLOW UP**

- (a) Cases with definite health effects of tar, pitch, bitumen and creosote can be referred to hospital for further treatment.
- (b) On completion of treatment, the examining doctor should re-examine the worker to certify medical fitness for work with these substances.

## 7.13 EMPLOYMENT INVOLVING EXPOSURE TO RAW COTTON DUST

### HEALTH EFFECTS

- (a) Byssinosis
  - Initially chest tightness and/or breathlessness on the first day of the workweek, then progressing to other days of the week
  - Features of chronic bronchitis and emphysema at late stage
- (b) Chronic bronchitis
- (c) Mill fever
  - Acute, transitory resembling metal fume fever

### MAIN INDUSTRIES AND OCCUPATIONS AT RISK

#### Cotton processing (raw cotton textile industry)

- Ginning (removing fibre from seed)
- Opening, cleaning and picking of bale cotton using beaters and/or saw cleaners (fibre preparation)
- Carding (separating fibres and forming them into bundles or roughly parallel fibres)
- Spinning (reducing size by roving and imparting twist)
- Drawing and roving (straightening fibres, reducing strand or sliver size and imparting a slight twist)
- Twisting (twisting strands of yarn together to form ply yarns)

### MEDICAL EXAMINATIONS

#### (a) Frequency of examination

- Pre-employment (within 4 months before commencing employment) and once every 12 months

#### (b) Types of test required

- Clinical examination with particular emphasis on the chest
- Lung function tests – forced expiratory volume in one second (FEV1) and forced vital capacity (FVC)

Note:

- Annual tests must be pre- and post-shift tests on the first day of the working week, the latter to be done after at least 6 hours of exposure on the same day.

### **(c) Repeat test**

- All cases with suspicious findings should have a repeat clinical examination as well as lung function tests (FEV1 and FVC) after three months (or earlier if necessary)

## **SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT**

- (a) All workers with definite byssinosis, even if mild, should be removed from further exposure to raw cotton dust whenever possible.
- (b) Permanent suspension should be considered for byssinotic workers with the following conditions:
  - Significant chest tightness and/or breathlessness on the first day of the working week and other days
  - Chronic bronchitis and emphysema
  - Marked fall in ventilatory capacity:
    - 10% or more drop in FEV1 over the shift on the first day; or
    - FEV1 of < 80% predicted value and FEV1/FVC ratio of <75%, tested after at least 2 days off work

**All suspected or definite cases of byssinosis must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department.**

## **TREATMENT AND FOLLOW UP**

Cases of byssinosis with / without symptoms of bronchitis or emphysema can be referred to a government chest clinic for further treatment and follow up.

## 7.14 EMPLOYMENT INVOLVING EXPOSURE TO BENZENE

### HEALTH EFFECTS

#### Acute poisoning

- (a) Narcosis
- (b) Skin and mucous membrane irritation

#### Chronic poisoning

- (a) Non-specific manifestations eg anorexia, headache, dizziness, tiredness
- (b) Bone marrow depression
  - Leucopenia, thrombocytopenia, anaemia, pancytopenia
  - Aplastic anaemia
- (c) Skin irritation (repeated skin contact)
  - Dry, scaly dermatitis
  - Erythema and/or blistering

#### Others

- (a) Leukaemia (most common being acute myeloid leukaemia)
- (b) Lymphoma
- (c) Multiple myeloma

### MAIN INDUSTRIES AND OCCUPATIONS AT RISK

- (a) Petrochemical industries e.g. manufacture of benzene, production of carbon black
- (b) Petroleum refineries
- (c) Manufacture of plastics, synthetic fibres, detergents, synthetic resins, glue, dyes, paints
- (d) Work involving use of commercial solvents such as toluene, styrene and xylene (benzene may be present as a contaminant)

### MEDICAL EXAMINATIONS

#### (a) Frequency of examination

- Pre-employment (within 4 months before commencing employment) and once every 12 months

**(b) Types of test required**

- Clinical examination with particular attention to the haematological and central nervous systems
- Haemoglobin and full blood count (total white blood cells, red blood cells and platelets)
- Peripheral blood film (to look for blast cells)
- Urinary t,t-muconic acid estimation in an end-of-shift urine sample

**(c) Repeat test**

- If the urine t,t-muconic acid level exceeds 500 mcg/g creatinine, the urine test should be repeated immediately
- If the full blood count and peripheral blood film are abnormal, the tests should be repeated immediately

**SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT****(a) Temporary suspension**

- Temporary suspension from exposure should be considered for all asymptomatic cases with urine t,t-muconic acid level exceeding 500 mcg/g creatinine in 2 successive examinations. Urine t,t-muconic acid level should be rechecked periodically (e.g. at monthly intervals) until it falls below 500 mcg/g creatinine.
- All cases with mild anaemia or other non-malignant health effects of benzene should be suspended until all necessary treatments have been completed, re-examination shows no residual toxic effects and the urine t,t-muconic acid level falls below 500 mcg/g creatinine.
- All females who are pregnant or breast-feeding should not be exposed to benzene.

**(b) Permanent suspension**

- All cases of aplastic anaemia
- All cases of leukaemia, lymphoma or multiple myeloma

**All suspected or definite cases of benzene poisoning or excessive absorption must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department.**

## **TREATMENT AND FOLLOW UP**

- (a) Cases of definite benzene poisoning can be referred to hospital for further treatment.
- (b) On completion of treatment, the examining doctor should re-examine the worker to certify medical fitness for work with benzene exposure.

## 7.15 EMPLOYMENT INVOLVING EXPOSURE TO TOLUENE-DI-ISOCYANATE (TDI) AND METHYLENE-DIPHENYL-DI-ISOCYANATE (MDI)

### HEALTH EFFECTS

TDI and MDI share similar health effects. TDI, being more volatile, is inheritedly more hazardous.

#### Acute effects

- (a) Inhalation – nasal and throat irritation with choking sensation, nasal congestion and increased secretion; bronchitis, constriction of chest and bronchospasm; pneumonitis, headache, nausea and vomiting, abdominal pain; pulmonary edema and lung damage. Numbness, insomnia, intermittent shaking, drunkenness, personality changes, irritability and depression. Rarely, liver, kidney, blood and GI effects.
- (b) Skin contact – severe irritation with redness, pain, swelling, blistering and burns. May be absorbed through the skin to cause systemic effects as in (a).
- (c) Eye contact – severe irritation with redness, pain, lacrimation, conjunctivitis, swelling of the eyelids, blurred vision, and burn; keratitis, iridocyclitis, secondary glaucoma, blepharospasm and photophobia; corneal epithelium damage and solid particles formation in eye fluid hours after exposure.
- (d) Ingestion – corrosive action causing severe irritation, sore throat, abdominal pain, and diarrhea.

#### Chronic effects

- (a) Inhalation – respiratory distress, dry painful cough, chest pain, scant blood streaked sputum, fever, cyanosis, sleepiness, fatigue, thrombocytopenic purpura, chronic lung disease, and immunotoxicologic reaction. Respiratory sensitization/asthma with symptoms of cough, wheezing, tightness or congestion in the chest, shortness of breath and reduced pulmonary function. Changes in the sense of smell and chronic necrotic rhinitis, pneumonitis, tracheitis and bronchitis may result.
- (b) Skin – absorbed through skin and causes systemic effects as in (a). Allergic dermatitis.
- (c) Eye – conjunctivitis, etc, effects as with acute exposure.

## MAIN INDUSTRIES AND OCCUPATIONS AT RISK

- (a) Manufacture of polyurethane: flexible form (TDI) and rigid types (MDI)
- (b) Construction of insulation wall
- (c) Mould formation in toy design and manufacture
- (d) Mixing isocyanates in making of foam packing materials

## MEDICAL EXAMINATIONS

### (a) Frequency of examination

- Pre-employment (within 4 months before commencing employment) and once every 12 months

### (b) Types of test required

- Clinical examination with particular attention to the skin, eye, gastrointestinal and respiratory systems
- Lung function tests - forced expiratory volume in one second (FEV1) and forced vital capacity (FVC)

### (c) Repeat test

- All cases with suspicious findings should have a repeat clinical examination as well as lung function tests (FEV1 and FVC) after three months (or earlier if necessary)

## SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT

### (a) Temporary suspension

- All cases with non-sensitization health effects of TDI/MDI should be suspended until all necessary treatments have been completed and re-examination shows no residual health effects.

### (b) Permanent suspension

- All confirmed cases of TDI/MDI induced asthma and dermatitis should be removed from further exposure to the chemicals whenever possible
- Permanent suspension should be considered for cases of TDI/MDI induced asthma with significant reduction in lung function:
  - 10% or more drop in FEV1 over the shift on the first day; or
  - FEV1 of < 80% predicted value and FEV1/FVC ratio of <75%, tested after at least 2 days off work

**All suspected or definite cases of TDI/MDI induced asthma and/or dermatitis must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department.**

### **TREATMENT AND FOLLOW UP**

- (a) Cases presenting with TDI/MDI induced asthma can be referred to a government chest clinic for further investigation and treatment. Acute, severe asthmatic attacks may require emergency hospital treatment.
- (b) On completion of treatment, the examining doctor should re-examine the worker to certify medical fitness for work with TDI/MDI exposure.

## 7.16 EMPLOYMENT INVOLVING EXPOSURE TO LASERS (CLASS 3B AND 4)

The word 'Laser' is an acronym for 'Light Amplification by Stimulated Emission of Radiation'. Laser radiation is an electromagnetic radiation in the optical range (UV, Visible, or Infrared) with the distinctive characteristic of being coherent in both space and time (i.e. the waves are all in phase, and have the same frequency). As a result of the coherence of the radiation, the spatial characteristics of laser beams are very little divergence and the potential to have large energy densities per unit area. This almost constant power density at both ends of the beam is a significant factor in the hazard potential of laser.

On the basis of their potential for causing health hazards, lasers have been classified into 5 groups. (1, 2, 3A, 3B, 4). This classification applies both to lasers and laser systems.

### Class 1 = Exempt Lasers and Laser Systems

Lasers or laser systems that cannot emit radiation in excess of maximum permissible exposure levels, and are considered to be non-hazardous.

### Class 2 = Low Risk Visible Lasers or Laser Systems

Visible light emitting lasers which do not have enough power to injure a person accidentally, but which may produce retinal injury when viewed directly for more than 0.25 seconds.

### Class 3A = Moderate Risk Lasers and Laser Systems

Visible light emitting lasers which cannot induce injury when viewed directly with the unaided eye but may cause retinal damage if the energy is focused into the eye. (For example, with binoculars)

### Class 3B = Moderate Risk Lasers and Laser Systems

These include lasers which can produce accidental injury if viewed directly. Intrabeam viewing of either direct or mirror like (specular) reflection of the beam is hazardous.

### Class 4 = High Risk Lasers and Laser Systems

These include lasers and laser systems which not only produce a hazardous direct beam or specular reflection but also a hazardous diffuse reflection and a significant skin hazard.

In most practical situations, the lasers of concern are those of class 3B and 4.

## HEALTH EFFECTS

### Acute

Exposure to laser radiation can produce eye (cornea, lens, retina) and skin damages. The extent of the damage depends on the intensity and wavelength of the radiation, and on the duration of the exposure. The principal modes of interaction of laser radiation and biological system is by transfer of optical energy leading to temperature elevation of the tissue. At certain wavelength, laser energy can also initiate photochemical reactions. High power, pulsed lasers can produce strong shock-waves which can damage underlying tissues.

#### (a) Eye

- Photokeratitis
- Photochemical cataract
- Photochemical and thermal retinal injury
- Retinal burn
- Aqueous flare
- Corneal burn

#### (b) Skin

- Erythema
- Accelerated skin aging
- Increased pigmentation
- Pigment darkening
- Photosensitive reactions
- Burn

### Chronic

Chronic low level exposure to laser radiation generally does not lead to injury. Exposure to laser radiation has not been found to be associated with increased incidence of cancer. However, excessive exposure to ultraviolet radiation, whether in laser form or not, can lead to skin cancer. Tissue sensitization may also occur with repeated exposure.

## **MAIN INDUSTRIES AND OCCUPATIONS AT RISK**

- (a) Car repairing – alignment
- (b) Path alignment in construction
- (c) Electronics – engraving, marking
- (d) Metal work – engraving, marking, cutting, drilling

## **MEDICAL EXAMINATIONS**

### **(a) Frequency of examination**

- Pre-employment (within four months before commencing employment) and once every 12 months

### **(b) Types of test required**

- Clinical examination with particular emphasis on the eye and skin
- Ophthalmoscopic examination
- Visual acuity for far and near vision

## **SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT**

### **(a) Temporary suspension**

- Cases with laser-induced eye and/or skin injuries may be suspended for a period for treatment and recovery

### **(b) Permanent suspension**

- Permanent suspension may be considered for workers with the following conditions:
  - Mono-ocular vision
  - Tissue sensitization by lasers
  - Skin cancer (only for lasers with UV component)

**All suspected or definite cases of laser-induced injury / illness must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department.**

## **TREATMENT AND FOLLOW UP**

- (a) Cases presenting with laser-induced injury/illness can be referred to hospital for further treatment.
- (b) On completion of treatment, the examining doctor should re-examine the worker to certify medical fitness for laser work.

## 7.17 EMPLOYMENT INVOLVING EXPOSURE TO EXCESSIVE NOISE

### HEALTH EFFECTS

#### Acute

Rupture of the tympanum

- Subjective sensation of pain in both ears at the time of noise exposure
- Usually caused by sudden explosive noise
- Conductive hearing loss affecting all frequencies

Note:

- There may also be evidence of sensorineural loss, depending on whether the cochlea is affected.

#### Chronic

- (a) Noise-induced deafness (NID)
  - Irreversible sensorineural hearing loss developing after prolonged exposure to excessive noise (> 85 dB(A) over an 8-hr period per day or its equivalent)
  - Patient is initially unaware of his hearing defect
  - He may present with tinnitus
  - Audiogram: bilateral high frequency sensorineural loss of > 30 dB at 4 KHz and/or 6 KHz
- (b) Others
  - Temporary threshold shift results following short exposures to excessive noise. This condition is reversible.
  - Some physiological responses have been reported e.g. hypertension, variation in heart and respiration rate.

### MAIN INDUSTRIES AND OCCUPATIONS AT RISK

- (a) Shipbuilding and ship repairing – fitters, mechanics, etc
- (b) Granite quarries – crushers, drillers, etc
- (c) Engineering works – grinding, sawing involving high velocity equipment
- (d) Iron and steel mills, other heavy metal industries
- (e) Metal working industries e.g. making of ball and roller bearings, nuts, bolts and screws
- (f) Woodworking industry

- (g) Textile industry
- (h) Paper industry
- (i) Industries with bottling processes and operations involving cans and metal boxes

## MEDICAL EXAMINATIONS

### (a) Indication

Workers whose daily personal noise exposure is 85 dB(A) or above. The duration of exposure could be obtained by adding up the total duration of exposure per work day, whether there is one continuous exposure or a number of separate exposures.

### (b) Frequency of examination

- Pre-employment (within 4 months before commencing employment), once every 24 months for daily personal noise exposure between 85 and 89 dB(A) and once every 12 months for daily personal noise exposure of 90 dB(A) and above

### (c) Types of test required

- Clinical examination, including an auroscopic examination
- Audiometric test (bone conduction should be done if the air conduction result is abnormal)
  - Test should be done after the worker has been away from noise exposure for at least 16 hours
  - Test should be performed in an audiometric test booth

## **MAXIMUM ALLOWABLE OCTAVE-BAND SOUND PRESSURE LEVELS FOR AUDIOMETRIC TEST BOOTHS**

The background noise levels in audiometric test booths should comply with the following values:

Octave-Band Center Frequency (Hz)	Sound Pressure Level (dB)
250	40
500	40
1000	40
2000	47
4000	57
6000	62
8000	67

## **SUSPENSION FROM EXPOSURE AND NOTIFICATION TO THE LABOUR DEPARTMENT**

### **In general, it is not necessary to suspend NID cases:**

- NID cases usually can continue their work (unless safety at work is compromised by hearing impairment) but more frequent periodic medical examinations may be required if:
  - the average hearing threshold over 1, 2 and 3 KHz for air conduction is equal to or more than 40 dB
  - there is mild to moderate hearing loss in a worker less than 35 years old who is exposed to excessive noise for less than 5 years
  - there is rapid deterioration of hearing, e.g. loss of 20 dB or more at any frequency compared to the audiogram one year ago

### **If suspension is indicated, it is usually on a permanent basis**

- Suspension should be considered on a case by case basis, e.g. workers whose serial audiograms show rapid deterioration of hearing

**All suspected or definite cases of noise-induced deafness must be notified to the Occupational Health Service, Occupational Safety and Health Branch, Labour Department, and referred to the Occupational Deafness Compensation Board for assessment for compensation.**

## **TREATMENT AND FOLLOW UP**

- (a) There is no cure for noise-induced deafness. Cases can be referred to an ENT clinic for assessment on the need for hearing aid.
- (b) Cases associated with distressing tinnitus can also be referred to ENT clinics for further management.

## A Occupational Exposure Limits (OEL)<sup>1</sup> for Chemical Substances

	<b>Substance</b>	<b>OEL (TWA) (mg/m<sup>3</sup>)</b>	<b>OEL (STEL) (mg/m<sup>3</sup>)</b>
1	Arsenic, elemental and inorganic compounds, except Arsine, as As	0.01	–
2	Arsine	0.16 (0.05 ppm)	–
3	Benzene	1.6 (0.5 ppm)	8 (2.5 ppm)
4	Cadmium, elemental and compounds, as Cd (Total dust)	0.01	–
5	Coal tar pitch volatiles, as benzene soluble aerosol	0.2	–
6	Cotton dust, raw	2.5	–
7	Lead, inorganic dusts and fumes, as Pb	0.05	–
	Tetramethyl lead, as Pb	0.15	–
	Tetraethyl lead, as Pb	0.1	–
8	Manganese, elemental and inorganic compounds, as Mn	0.2	–
9	Mercury, as Hg		
	Alkyl compounds	0.01	0.03
	Aryl compounds	0.1	–
	Inorganic forms	0.025	–
10	Methylene-diphenyl-diisocyanate (Methylene bisphenyl isocyanate) (MDI)	0.051 (0.005ppm)	–
11	Organophosphate compounds		
	Diazinon	0.1	–
	Malathion	10	–
	Methyl parathion	0.2	–
12	Silica-crystalline		
	Cristobalite, respirable dust	0.05	–
	Quartz, respirable dust	0.1	–
	Tridymite, respirable dust	0.05	–
	Tripoli, respirable dust	0.1	–
13	Toluene-2,4-diisocyanate (TDI)	0.036 (0.005ppm)	0.14 (0.02ppm)

## B Control Limits for asbestos fibres<sup>2</sup>

- (a) Chrysotile
- 0.5 fibres per millilitre of air averaged over any continuous period of 4 hours
  - 1.5 fibres per millilitre of air averaged over any continuous period of 10 minutes
- (b) Any other forms, either alone or in mixtures, including mixtures of chrysotile with any other forms
- 0.2 fibres per millilitre of air averaged over any continuous period of 4 hours
  - 1.6 fibres per millilitre of air averaged over any continuous period of 10 minutes

## C Threshold Limit Values for Noise<sup>3</sup>

Sound Pressure Level dB (A)	Maximum duration per day (hr)
85	8
88	4
91	2
94	1
97	1/2
100	1/4
103	1/8
106	1/16
109	1/32
112	1/64
115 or more*	1/128

\* No exposure to noise in excess of 140 dB is allowed.

### Note:

1. Please refer to the Code of Practice on Control of Air Impurities (Chemical Substances) in the Workplace, Occupational Safety and Health Branch, Labour Department.
2. Please refer to the Factories and Industrial Undertakings (Asbestos) Regulation.
3. Please refer to TLVs and BEIs, American Conference of Governmental Industrial Hygienists, 2002.

<b><u>TEST</u></b>	<b><u>MINIMUM VOL. (ML)</u></b>	<b><u>BAL</u></b>	<b><u>REFERENCE</u></b>	<b><u>SAMPLING DETAILS</u></b>
<b><u>BLOOD (WHOLE)</u></b>				
Cadmium	3	5 mcg/L	ACGIH-BEI <sup>1</sup>	Venous blood in heparinised containers
Lead (metal & inorganic)	3	30 mcg/100ml	ACGIH-BEI <sup>1</sup>	Venous blood in heparinised containers
Mercury (for alkyl mercury exposure)	3	5 mcg/100ml	Guidelines for DFD <sup>2</sup>	Venous blood in heparinised containers Abstain from seafood for 3 days before test
<b><u>URINE</u></b>				
Arsenic	35	35 mcg/L	ACGIH-BEI <sup>1</sup>	End-of-workweek EMU <sup>3</sup> corrected to SG = 1.016 Abstain from seafood for 3 days before test
Lead (organic)	35	150 mcg/L	Guidelines for DFD <sup>2</sup>	End-of workweek EMU <sup>3</sup> corrected to SG = 1.016
Manganese	35	50 mcg/L	Guidelines for DFD <sup>2</sup>	EMU <sup>3</sup> corrected to SG = 1.016
Mercury (metal & inorganic)	35	35 mcg/g creatinine	ACGIH-BEI <sup>1</sup>	EMU <sup>3</sup> corrected to per gm creatinine Abstain from seafood for 3 days before test
t,t-Muconic acid (for benzene exposure)	35	500 mcg/g creatinine	ACGIH-BEI <sup>1</sup>	ESU <sup>4</sup> corrected to per gm creatinine

Note :

- 1) ACGIH-BEI = American Conference of Governmental Industrial Hygienists - *Biological Exposure Indices (2002)*
- 2) Guidelines for DFD = *Guidelines for Designated Factory Doctors, 3<sup>rd</sup> edition, Department of Community, Occupational and Family Medicine, National University of Singapore*
- 3) EMU = *Early Morning Urine Specimen*
- 4) ESU = *End of Shift Urine Specimen*

**EMPLOYEES' COMPENSATION ORDINANCE**

**(Chapter 282)**

**NOTICE BY OR ON BEHALF OF EMPLOYEE OF INCAPACITY  
OR DEATH DUE TO OCCUPATIONAL DISEASE**

To: <sup>(1)</sup> .....  
.....  
.....

Notice is hereby given that <sup>(2)</sup> .....  
.....  
on the <sup>(3)</sup> ..... day of ..... 19 ..... was found to be suffering  
from the following occupational disease .....  
..... believed to be due to his employment by you  
upon the following work  
<sup>(4)</sup> .....  
resulting in the death/partial/total incapacity of a permanent/temporary nature <sup>(5)</sup> of  
the employee.

And notice is hereby further given that in consequence thereof compensation is  
claimed from you.

Dated this ..... day of ..... 19 .....  
<sup>(6)</sup> .....

- 
- (1) Name and address of the employer or principal contractor.
  - (2) Full name and address of the employee.
  - (3) Date upon which disease is said to have been discovered.
  - (4) State nature of the work which is said to have caused the occupational disease.
  - (5) Delete whichever is inapplicable.
  - (6) Signature, name and address of person giving the notice.

**FORM 2A**

**EMPLOYEES' COMPENSATION ORDINANCE  
(CAP. 282)**

**SECTION 15**

**NOTICE BY EMPLOYER OF THE DEATH OR INCAPACITY OF  
AN EMPLOYEE DUE TO OCCUPATIONAL DISEASE**

**Important Notes**

- (1) To be completed and returned in **DUPLICATE** to the Commissioner for Labour -
  - (a) **WITHIN 7 DAYS** of the death of the employee; or
  - (b) **WITHIN 14 DAYS** of the employee's incapacity; or
  - (c) **WITHIN** such period of time as required by the Commissioner for Labour.
- (2) An employer who fails to give notice as required or who gives any false or misleading information to the Commissioner for Labour may be prosecuted.
- (3) Please '✓' in the appropriate box.
- (4) Please read the instructions carefully before completing this Form.

**FORM 2A**  
**EMPLOYEES' COMPENSATION ORDINANCE**  
**(CAP. 282)**

**SECTION 15**

**NOTICE BY EMPLOYER OF THE DEATH OR INCAPACITY OF  
AN EMPLOYEE DUE TO OCCUPATIONAL DISEASE**

To the Commissioner for Labour

I declare that the information given in this form is, to the best of my knowledge, true and accurate.	
Signature : _____ (for and on behalf of the employer)	
Name (in block letters) : _____	
Position :	<input type="checkbox"/> Sole proprietor <input type="checkbox"/> Partner <input type="checkbox"/> Manager <input type="checkbox"/> Officer
Date : _____	Chop of Company <b>(Note 1)</b>

**A. Particulars of the employee**

Name of employee (Surname first)		Identity Card/Passport No.
Telephone No.	Fax No.	Address
Date of Birth _____/_____/_____ Day/Month/Year	Sex <input type="checkbox"/> Male <input type="checkbox"/> Female	Occupation
An apprentice <input type="checkbox"/> Yes <input type="checkbox"/> No	Duration of employment From _____ to _____	

**B. Particulars of employer**

Name of employing company/person		Business Registration Certificate No. <b>(Note 2)</b>
Telephone No.	Address	Trade
Fax No.		

**C. Particulars of principal contractor/holding company (Note 3)**

Name of principal contractor/holding company		Business Registration Certificate No.
Telephone No.	Address	Trade
Fax No.		

**D. Particulars of the occupational disease**

Name of hospital or clinic where the employee received treatment		
Date of commencement of the occupational disease _____/_____/_____ Day/Month/Year	Disease suffering from	
Type of work attributed to the occupational disease	The disease resulted in <input type="checkbox"/> temporary incapacity <input type="checkbox"/> permanent incapacity <input type="checkbox"/> death on ____/____/_____ Day/Month/Year	



## Explanatory Notes

- Note 1:* The signature and company chop which appear in both copies of Form 2A submitted to the Commissioner for Labour should be in the original.
- Note 2:* If the Business Registration Certificate No. is not available, the Identity Card No. of the employing person should be entered.
- Note 3:* Section C on particulars of principal contractor/holding company should be completed only when the employer is either :
- (a) a subcontractor; or
  - (b) a subsidiary of a holding company within the meaning of the Companies Ordinance (Cap. 32) and which is covered by and specified in the insurance policy taken out by the group of companies to which it belongs.
- Note 4:* The name and address of the insurer as appeared on the insurance policy, instead of those of the broker or agent, should be entered here.
- Note 5:* Earnings include :
- (a) cash wages;
  - (b) the value of any privilege or benefit which can be estimated in cash, e.g. food, fuel or quarters supplied to the employee if, as a result of the accident, he is deprived of any of them;
  - (c) overtime or other special remuneration for work done, whether in the form of bonus, allowance or otherwise, if it is of a constant nature; and
  - (d) customary tips.
- But remuneration for intermittent overtime, casual payments of a non-recurrent nature, the value of travelling allowances or concession and the employer's contributions to provident funds are not included.

## Report Form for Recommended Medical Examinations

*Note: The original of this report should be forwarded to the employer and a copy should be provided to the examined employee.*

Name of employee: \_\_\_\_\_ Sex: \_\_\_\_\_ Age: \_\_\_\_\_

I.D. No. \_\_\_\_\_ ( ) Date of birth: \_\_\_\_\_

Job title: \_\_\_\_\_

Name and address of employing company:

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Type of hazardous exposures in respect of which medical examination is performed:

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### Certification:

I examined the above named person on \_\_\_\_\_ and certify that *he/she*\*:

- is fit to *start/continue*\* employment in the job as specified above, subject to the following conditions (if any):
- \_\_\_\_\_
- \_\_\_\_\_
- is unfit to *start/continue*\* employment in the job as specified above for a period of \_\_\_\_\_ months
- is unfit to *start/continue*\* employment in the job as specified above until medical fitness is certified after re-examination
- is permanently unfit to *start/continue*\* employment in the job as specified above

\* Please delete as appropriate

Recommendations for employer (if any):

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---

(Signature of the examining doctor)

---

(Date)

---

(Name of the examining doctor)

---

(Contact telephone no.)

---

---

(Address)

## OCCUPATIONAL SAFETY AND HEALTH ORDINANCE NOTIFICATION OF OCCUPATIONAL DISEASES

To : Commissioner for Labour

## PARTICULARS OF PATIENT

Name: \_\_\_\_\_ HKID/Passport no.: \_\_\_\_\_

Male/Female\*      Date of birth: \_\_\_ / \_\_\_ / \_\_\_      Occupation: \_\_\_\_\_

Home address: \_\_\_\_\_

Telephone no. (Home) \_\_\_\_\_ (Office) \_\_\_\_\_ (Pager/Mobile) \_\_\_\_\_

Name and address of employer: \_\_\_\_\_

Telephone no. of employer: \_\_\_\_\_

For Internal  
use:

Code: \_\_\_\_\_

Code: \_\_\_\_\_

Code: \_\_\_\_\_

Code: \_\_\_\_\_

NOTIFIABLE OCCUPATIONAL DISEASES (*Please put a tick in* )

1	Radiation Illness	18	Lead Poisoning	35	Chrome Ulceration
2	Heat Cataract	19	Manganese Poisoning	36	Urinary Tract Cancer
3	Compressed Air Illness	20	Phosphorus Poisoning	37	Peripheral Polyneuropathy
4	Cramp of Hand or Forearm	21	Arsenic Poisoning	38	Localised Papillomatous or Keratotic New Skin Growth
5	Beat Hand	22	Mercury Poisoning	39	Occupational Vitiligo
6	Beat Knee	23	Carbon Bisulphide Poisoning	40	Occupational Dermatitis
7	Beat Elbow	24	Benzene Poisoning	41	Chemical Induced Upper Respiratory Tract Inflammation
8	Tenosynovitis of Hand or Forearm	25	Poisoning by Nitro-, Amino-, or Chloro- Derivatives of Benzene	42	Nasal or Paranasal Sinus Cancer
9	Anthrax	26	Dinitrophenol Poisoning	43	Byssinosis
10	Glanders	27	Poisoning by Halogen Derivatives of Hydrocarbons	44	Occupational Asthma
11	Leptospirosis	28	Diethylene Dioxide Poisoning	45	Silicosis
12	Extrinsic Allergic Alveolitis	29	Chlorinated Naphthalene Poisoning	46	Asbestos-Related Diseases
13	Brucellosis	30	Poisoning by Oxides of Nitrogen	47	Occupational Deafness
14	Tuberculosis in health care workers	31	Beryllium Poisoning	48	Carpal Tunnel Syndrome
15	Parenterally Contracted Viral Hepatitis in health care workers	32	Cadmium Poisoning	49	Legionnaires' Disease
16	Streptococcus suis Infection	33	Dystrophy of the Cornea		
17	Avian Chlamydiosis	34	Skin Cancer		

Diagnosis: Confirm/Suspect\*      Date of onset of illness: \_\_\_ / \_\_\_ / \_\_\_

Follow-up of patient: Treated/Referred to hospital/Others(specify)\*: \_\_\_\_\_

Other relevant information: \_\_\_\_\_

Name of notifying medical practitioner: \_\_\_\_\_

Address of notifying medical practitioner: \_\_\_\_\_

Telephone no. of notifying medical practitioner: \_\_\_\_\_

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

\*Delete whichever is inapplicable

Please return this form by **fax (no. 25812049)** or by **mail** to Occupational Health Service, Labour Department, 15/F Harbour Building, 38 Pier Road, Central, Hong Kong.

For details of Notifiable Occupational Diseases and their related occupations, please refer to Schedule 2 of the Occupational Safety &amp; Health Ordinance and to the Labour Department publication "Guidance Notes on the Diagnosis of Notifiable Occupational Diseases". Enquiry telephone no. : 2852 4041.

Please  
affix  
stamp

**Occupational Health Service**  
Labour Department  
15/F, Harbour Building  
38, Pier Road  
Central  
Hong Kong