

**The Royal Australasian College of Physicians**

**Australasian Faculty of Occupational and Environmental  
Medicine**

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**Occupational Hygiene Principles**

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# Overview

## Occupational Hygiene Principles

## Respiratory Protection

## Hand protection - gloves

# Overview

## Occupational Hygiene Principles

- **What is the goal of Occupational Hygiene ?**
- **What is hazard and risk ?**
- **How does an Occupational Hygienist assess the risk to the worker's health?**
- **What are the controls to manage risk ?**

# Occupational Hygiene

What is the goal of Occupational Hygiene?

**To protect the worker's health by the identification, assessment and control of workplace hazards.**

# Occupational Hygiene

What is hazard and risk?

**A hazard is something that can harm your health.**

**Risk is the chance of harm occurring under specific circumstances.**

# Occupational Hygiene

**What is the hazard here?**

**Is the risk of chemical exposure high or low?**



# Occupational Hygiene

What workplace hazards can cause employee illness/disease ?

**Chemical**

**Physical, eg: noise, heat stress...**

**Ergonomics, eg: manual handling**

**Biological, eg: legionella...**

**Radiation**

**Other**

## Occupational Hygiene

What workplace hazards can cause employee illness/disease at your site ?

### Solvent based paint factory

**Over exposure to chemicals may cause:**

**Male and female reproductive issues, eg: toluene solvent**

**Lung damage/cancer: inhalation of hazardous powders**

**Dermatitis/irritation: skin contact with solvent**

**Dizziness/headaches/nausea: inhalation of solvent vapour**

**Eye damage: chemical splash to eye**

**Asthma symptoms: inhalation isocyanate paint spray**



# Occupational Hygiene

What workplace hazards can cause employee illness/disease ?

**Health issues may occur when the hazard comes in contact with the body.**

**How can chemicals enter the body?**

**Inhalation**

**Skin contact**

**Ingestion**

## Occupational Hygiene

How does an Occupational Hygienist assess the risk to workers health?

### How can workplace hazards be identified ?

**Observation of tasks**

**Employee concerns**

**Management of Change process**

**Audits to check compliance with regulations**

**Risk assessments**

## Occupational Hygiene

How does an Occupational Hygienist assess the risk to workers health?

**The higher the level of exposure (dose) the higher the risk to the worker's health.**

**The level of exposure (dose) is measured and compared to Occupational Exposure limits (OEL).**

## Occupational Hygiene

How does an Occupational Hygienist assess the risk to workers health?

**Occupational Exposure Limits (OEL) are international airborne chemical concentration levels that would result in no adverse health effect to most people.**

**Each chemical has it's own Occupational Exposure Limit (OEL).**

**Other hazards also have OEL, eg: Noise.....**

## Occupational Hygiene

How does an Occupational Hygienist assess the risk to workers health?

How is the airborne concentration of solvent vapour measured?



## Occupational Hygiene

How does an Occupational Hygienist assess the risk to workers health?

### **Measurement of Hazard – Degree of exposure**

**What sampling details need to be recorded?**

**Name of person wearing the monitor.**

**Flow rate of pump (mL/minute)**

**Time pump ran for(minutes)**

**PPE worn**

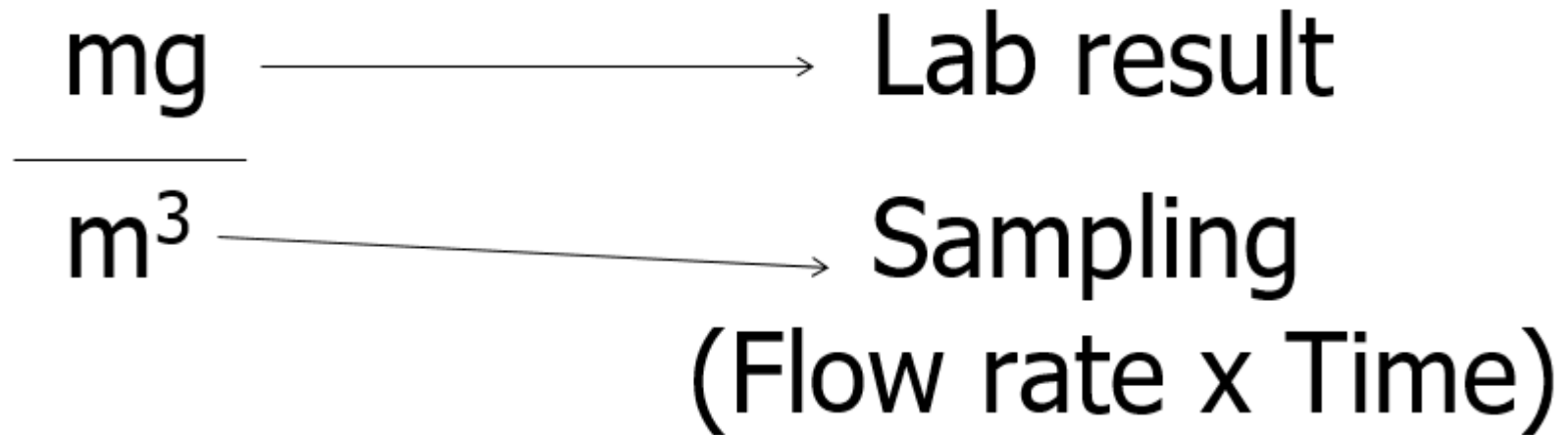
**Task done**

**Engineering controls used**

## Occupational Hygiene

How does an Occupational Hygienist assess the risk to workers health?

### Measurement of Hazard – Degree of exposure



The two together give the concentration of exposure

## Occupational Hygiene

How does an Occupational Hygienist assess the risk to workers health?

### Measurement of Hazard – Degree of exposure

**The measured concentration of solvent in the air is compared to the Occupational Exposure Limit (OEL) for that particular solvent.**



## Occupational Hygiene

How does an Occupational Hygienist assess the risk to workers health?

### Measurement of Hazard – Degree of exposure

**To be confident that the concentration of solvent vapour in the air is not at a level that may harm health, the sampling result should be below 50% of the OEL.**

## Occupational Hygiene

How does an Occupational Hygienist assess the risk to workers health?

### Measurement of Hazard – Degree of exposure

Some chemicals like solvents can have 2 OELs.

Why?

**STEL Short term exposure limit, 15-30 minute task.(mg/m<sup>3</sup>)**

**TWA Time weighted average – exposure averaged over 8 hours.  
(mg/m<sup>3</sup>)**

## Occupational Hygiene

How does an Occupational Hygienist assess the risk to workers health?

### Measurement of Hazard – Degree of exposure (Dose)

**The risk of the worker's health being affected by inhalation of the vapours is dependent on the amount inhaled or degree of exposure (dose).**

**The higher the dose the higher the risk of the worker's health being affected.**

## Occupational Hygiene

How are dusts measured ?

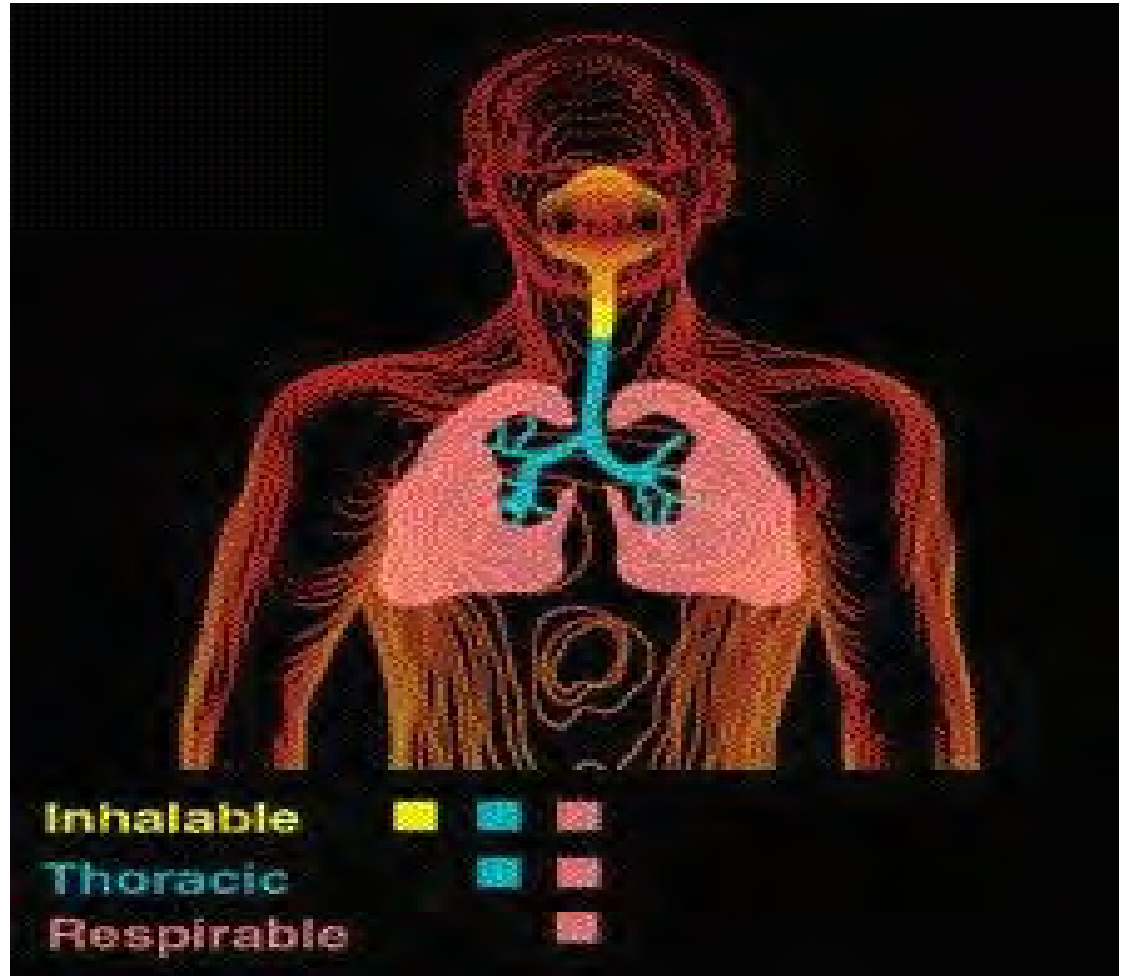
Particle size is important

## **What is the significance of “small” versus “large” particles?**

- Differ in toxicity
- Deposition location in the respiratory system
- Occupational Exposure limits (OEL) set based where it's deposited
- Require different sampling methods

# Particle size consideration

- Particle size determines the deposition site within the respiratory tract and the subsequent health effects.



## Occupational Hygiene

How does an Occupational Hygienist assess the risk to workers health?

### How are dusts measured?

**Inhalable dust** <100 microns is able to enter the nose / mouth and upper respiratory tract.



## Occupational Hygiene

How does an Occupational Hygienist assess the risk to workers health?

### How are dusts measured?

**Respirable dust** <10 microns is able to enter the lower regions of the lungs.

Eg: Crystalline silica can deposit in the lungs and cause the lung disease silicosis



# Occupational Hygiene

What are the controls to manage risk ?

## Hierarchy of control

**Eliminate the hazard (most effective)**

**Substitute the hazard with something less hazardous**

**Engineering controls, eg: ventilation**

**Administrative controls, eg: warning signs, job rotation**

**Personal Protective Equipment (least effective)**



# Respiratory Protection

## Inhalation Hazards

### **Dusts**

- pigments, sanding and grinding.

### **Vapors**

- evaporate easily at room temperature, solvents.

### **Aerosols**

- vapors condensed into tiny airborne particles or droplets.

### **Mists and Sprays**

- small droplets of liquid material suspended in the air; spray operations.

### **Gases**

- can be invisible and becomes airborne at room temperature.

### **Fumes**

- metal, plastic, or polymer under high heat
- welding and soldering.

# Respiratory Protection

## Use of a respirator

### Key points when selecting a Respirator.

- **Consult an Occupational hygienist / respirator specialist.**
- **Is the environment Immediately Dangerous to Life and Health.**
- **What is the inhalation hazard and the concentration in the air.**
- **Is other PPE to be worn with the respirator?. Are there other hazards eg: chemical splash, is a full face protection required or is hearing protection also needed ?**
- **What task is being performed while wearing the respirator, degree of exertion required ( breathing rate). Limited work space ?**
- **Does the type of respirator suit the worker, eg: does the worker have facial hair that may reduce the effectiveness of the respirator.**

# Respiratory Protection

## Use of a respirator

### Key points when selecting a Respirator.

- **Is the environment Immediately Dangerous to Life and Health.**

**Definition: US National Institute for Occupational Safety and Health (NIOSH).**

**“Is it likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment”.**

## Respiratory Protection

Use of a respirator

**What is a Respirator Protection Factor (PF) ?**

**The reduction in exposure that a particular respirator can provide.**

**PF = Ratio : ambient airborne concentration / concentration inhaled inside the respirator.**

**Required minimum protection factor is the ratio of : ambient airborne concentration / acceptable exposure level .**

**Eg: Ambient airborne concentration of chemical A is 100mg/m<sup>3</sup> and the Occupational Exposure Limit for chemical A is 10mg/3 a respirator with a Protection Factor of > 10 would be required.**

# Respiratory Protection

## Use of a respirator

### Key points when selecting a Respirator.

- **Is the environment Immediately Dangerous to Life and Health.**

**Example: entering a tank where there may be a lack of oxygen.**

Self contained breathing apparatus (SCBA). Face piece seals to face and is fed with breathing air from the cylinder worn on the back. Protection Factor = 100+



# Respiratory Protection

## Use of a respirator

**How do I know if the respirator will protect the worker from the chemical concentration in the air ?**

**Occupational Hygienist can measure the chemical concentration in the air. Result reported as : mg/m<sup>3</sup>**

**Occupational Hygienist can compare the measured result to the Occupational Exposure Limit (OEL) for that chemical.**

# Respiratory Protection

## Use of a respirator

Powered  
air purifying  
full face  
respirator.  
Protection  
Factor up  
to 100



Air purifying half  
face respirator.  
Protection Factor  
up to 10.



Air supplied hood  
connects to a  
hose supplying  
breathing air.  
Protection Factor  
up to 100



## Hand protection

### Dermal hazards

#### **Chemical**

- Solvent, corrosives.....

#### **Temperature**

- Heat , cold

#### **Sharps**

- Cut resistance.

#### **Mechanical**

- Handling rough surfaces eg: prevent splinter handling wooden pallets.

#### **Biological**

- Medical use.



# Hand protection

## Use of gloves

### Key points when selecting a glove.

- **Consult an Occupational hygienist / glove specialist.  
(eg: Glove companies have chemical breakthrough charts)**
- **What is the hazard?**
- **What is the time period exposed to the hazard?**
- **What is the task being performed. Level of exertion. Does the gloved hand need a high level of dexterity to perform the task?**
- **Do I want the glove to be disposable or re-useable ?**
- **What length of glove, do I need wrist and forearm protection?**

# Hand protection - Chemical Splash Resistant Gloves

## **Nitrile disposable glove**

Chemical resistance: good

Thickness: Thin

Finger Dexterity: Good

Exertion: light work , eg: laboratory



## **Nitrile re-useable glove**

Chemical resistance: good

Thickness: Medium

Finger Dexterity: Fair

Exertion: light to moderate work , eg: laboratory and factory

## **Neoprene re-useable glove**

Chemical resistance: good

Thickness: Thick

Finger Dexterity: Poor

Exertion: moderate to heavy work , eg: factory manual handling



# Summary

**The goal of Occupational Hygiene is to:**

**Protect the worker's health by the :**

**Identification**

**Assessment**

**and Control of workplace hazards.**