Jayoti Vidyapeeth Women's University

Hand Book on Occupational Optometry

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JAYOTI VIDYAPEETH WOMEN'S UNIVERSITY, JAIPUR

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Faculty of Physiotherapy & Diagnostics

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INTODUCTION

By – Pratishtha Rajvanshi

Description

The term "**optometry**" comes from the Greek words opsis; "view" and metron; "something used to measure", "measure", "rule"). The word entered the language when the instrument for measuring vision was called an optometer, (before the terms phoropter or refractor were used). The root word opto is a shortened form derived from the Greek word ophthalmos meaning, "eye."

Optometry is a health care profession that involves examining the eyes and applicable visual systems for defects or abnormalities as well as prescribing and selling of the correction of refractive error with glasses or contact lenses and management and treatment of some eye diseases.

Occupational optometry service is the new discipline of optometry in India. It was initiated as a subject in the undergraduate optometry programme for the first time in India in 1987 by Dr P.P. Santanam, an eminent occupational health professional at Elite School of Optometry. It got into exclusive clinical optometry practice in the year 2012 when the first occupational optometry services were initiated by Elite School of Optometry/SankaraNethralaya, a unit of Medical research foundation.

Readership

Researchers, post-graduates, graduates include all medical and para-medicos and an educated audience interested in Occupational optometry.

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Chapter 1- OCCUPATIONAL OPTOMETRY

WHAT IS OCCUPATIONAL OPTOMETRY?

Occupational optometry is the branch of optometric practice that is concerned with the efficient and safe visual functioning of an individual at work.

ROLE OF OCCUPATIONAL OPTOMETRIST

The role of optometrists in occupational optometry services includes primary eye care, eye safety consultation and vision consultation.

In our conventional service, anyone who is working in an industry will go for eye examination to either an optometry or ophthalmology clinic. The limitation in this system is that most of the time the understanding of the visual demand and work environment of the person at work is not taken into consideration in counseling or when optical prescriptions are given.

In Dr Santanam's Text book of Occupational Optometry, the role of the occupational optometrist is described as follows:

a) Diagnosis of visual deficiency and correct where necessary and possible.
b) Identify occupational causes of vision and eye problems. In indicated cases referral to the eye hospital. c) To help establish the visual requirements or standards for jobs.
d) Be able to advice on eye protection.
e) Visual Impairment assessment.

Vision Screening for the employees – preferably using various occupational vision screeners available in the market.

For example, Titmus vision screener, Keystone Vision Screener, EssilorErgomax.

The role played by optometrist in occupational environment encompasses.

- Vision examination (screening and general) which includes pre-employment tests and periodic recheck ups.
- Diagnosis of visual deficiency and correction where necessary and possible.
- Visual evaluation where visual requirements of the job are adequately matched with the visual abilities of the person at work.
- Possibly identify occupational causes of vision and eye problems.
- Advice on eye protection.
- To establish minimum visual requirements and standards for various jobs.
- The major factors affecting job performance include.
  - Qualifying visual factors.
  - Individual characteristics
  - Factors affecting visibility of task

Qualifying Visual Factors consist of :

Visual Acuity: Maximum visual acuity is desirable for every job but not always essential. The relative value of demands on acuity must be weighed in each job. Dynamic visual acuity is more reliable measure of a person's ability to perform tasks as driving or inspection tasks on a conveyer belt near, intermediate and distant.

Accommodation: Though it cannot be compromised in some occupations like few sports, in most of the occupations it can be managed with the appropriate type of occupational prescription.

Ocular Motility: Some jobs require wide fixational movements machinist, textile mechanism, sports and this may need to be done without moving the head. This indicates need for large frames and lenses, and vision training to combine movements of head and eyes.

Depth Perception: The visual system can effectively judge distance of objects using monocular and binocular cues. At low levels of illumination depth perception is of very low order which may be a problem for some occupations like photographs who have to cut photographic papers and chemical solutions in dark room . For drivers and pilots is very essential.

Peripheral Vision: Drivers, pilots, and sports field is required large lenses should be used with frames and lenses being close to face and angled in conformance to facial features.

Colour Discrimination: Under photopic conditions the human visual system has a highly developed colour sense. In certain work like transport drivers, interior decorations, painting and pilots, colour discrimination is important.

Individual Characteristics: Perfect occupational prescription even with proper type of multifocal segment for job needs can be a failure of the segment does not fit the individual characteristics. These include the subjects age, height, head posture, eye posture, head turning and eye movements. For example, taller the individual higher is the center of his lens with respect to a fixed work level.

Occupational Vision Services
The ideal workstation design
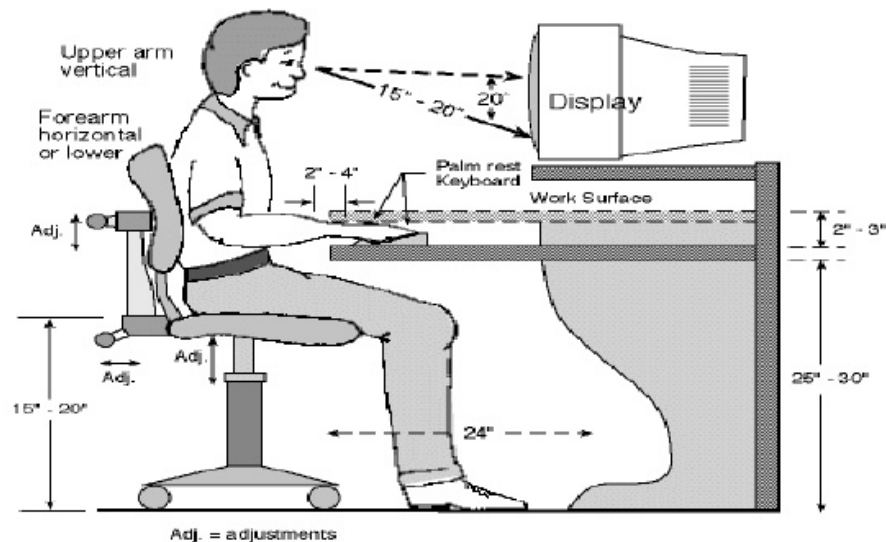
• Vision consultation: To provide consulting services concerning the general area of visual efficiency.

ROLE OF OPTOMETRIST IN OCCUPATIONAL OPTOMETRY

Factors influencing visibility of a task included:

- size of task
- distance of task
- illumination

- contrast

- colour

- time available to view task

- movement of the task

- glare

- atmospheric conditions

The simplest of the factors is to adjust the level of illumination. Problems can arise due to insufficient as well as excess lighting at the work place. "Good lighting" is that which is adequate and sufficient for a given performance.

Contrast is differences in luminance between visual task area, background and environment and should not exceed certain maximum values. A relationship of 10:3:1 for normal task and 10:5:1 for precision tasks is recommended.

The concept of colour and colour contrast has been used in the industry to ascertain the moving parts and also to provide relief from fatigue.

Optometrists help in providing vision care services to a worker to make him visually efficient and visually alert. A perception for safety glasses should also fulfils employees visual requirements on the job. Vision care service in industrially advanced countries are being rendered in planned phases, its carried out in four steps.

Chapter 2- OCCUPATIONALSAFETY AND HEALTH (OSH)

Occupational Safety and Health (OSH)

- A planned system of working to prevent illness and injury where you work by recognizing and identifying hazards and risks.

- Health and safety procedure is the responsibility of all persons in the computer and technology industries.

- You must identify the hazards where you are working and decide how dangerous they are. Eliminate the hazard or modify the risk that it presents.

Occupational Health and Safety standards:

1. Identify the hazard

2. Clear the area close to the hazard

3. Partition the hazard off or clearly identify the area to protect other people from harm

4. If the hazard is easily and safely cleared, then do so Occupational Health and Safety
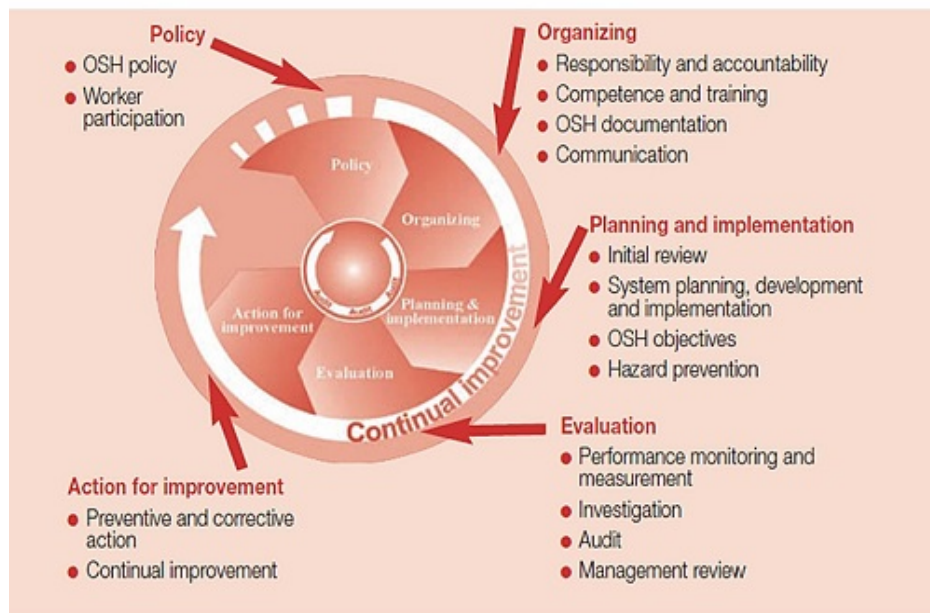
standards

If not…

5. Report the hazard to the appropriate person (such as teacher in charge, principal etc.) to obtain assistance

6. Following clearing of the hazard fill out the correct documentation to assist in identifying improved practice to reduce further incidence of hazards.

<u>Seven-step approach</u>

<u>An occupational optometry service includes the following seven steps:</u>

1. **Visual Task analysis of different jobs in work area :**

    It aims at acquiring the information on visual demand each job creates on the individual; assess the need for the visual function required for the job. This process of visual task analysis needs visit of the occupational optometrist to the work or job site/station to understand the process, therefore enhance the understanding of visual demand at work site for the individual. For example, to arrive at the visual acuity demand for a job, it is essential to measure the working distance between the individual at work and the task, and the minimum size of the task itself. If the job involves more of near working distance, the need for the understanding the efficiency of the accommodation and convergence is critical for the job. If the job demands colour vision, for example in the dyeing industry, then knowledge of the colours or the hues that are used in the work environment, will decide on the colour vision demands of the individual at work.

2. **Determination of the visual capability and defects of an individual :**

    Based on the visual task analysis, the battery of the visual functional tests that need to be done can be decided. These tests will help the optometrist in addition to routine eye examination to know the visual capability of the individuals at work and therefore know about whether they are visually competent; matching with the visual demand arrived from the visual task analysis. This step will help the optometrist to plan the intervention required to achieve the goal of matching the visual demand and the visual capability of the individual – a step in fulfilling the ILO/WHO aim of occupational health.

3. **Management and referral :**

    Effort will be taken to decide on the appropriate intervention in the form optical and/or protective eyewear in this step based on the outcome of the first two steps. The instructions of usage and maintenance of the protective eyewear should be given in this step. If the individuals are found to have any ocular pathology, they should be referred to the respective specialized ophthalmologists.

4. **Indoctrination and education of employees:**

    Awareness on how to safeguard one's eye sight in the work environment, advising on appropriate eye protection wear, the maintenance of the protective eyewear, appropriate reasons for which the protective eyewear need to be replaced or repaired, on the common eye diseases and the need for regular eye check-up are the essential components in this step.

5. **Report to the employer :**

    A report about the visual demand in various work- stations and the visual capability of the individuals in those work stations should be submitted to the employer. This report should also carry information about the relevant recommendations which might enhance the visual performance of the individuals and therefore consequent improved productivity. For example, the ideal protective eye wear, appropriate lighting in the work environment will be provided in the report.

6. **Follow-up:**

Usually the follow-up services need to be provided to see the impact of the service provided. This involves the visit to the work areas, interaction with the supervisors, employees and the employer.

7. **Pre-placement evaluation :**

In addition to the above steps, optometrists can contribute to the pre-placement and periodic medical examination of employees and give input in case of compensation evaluation.

Occupational health

- Occupational health should aim at the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations;

- the prevention among workers of departures from health caused by their working conditions;

- the protection of workers in their employment from risks resulting from factors adverse to health;

- the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological equipment, and,

- to summarize, the adaptation of work to man and of each man to his job.

The Joint ILO/WHO Committee on Occupational Health,1950

Occupational Health Strategies

Objectives :

• The maintenance and promotion of workers' health and working capacity

• The improvement of working environment and work to become conducive to safety and health

• Development of work organizations and working cultures in a direction which supports health and safety at work and in doing so also promotes a positive social climate and smooth operation and may enhance productivity of the undertakings.

—Joint ILO/WHO Committee on Occupational Health
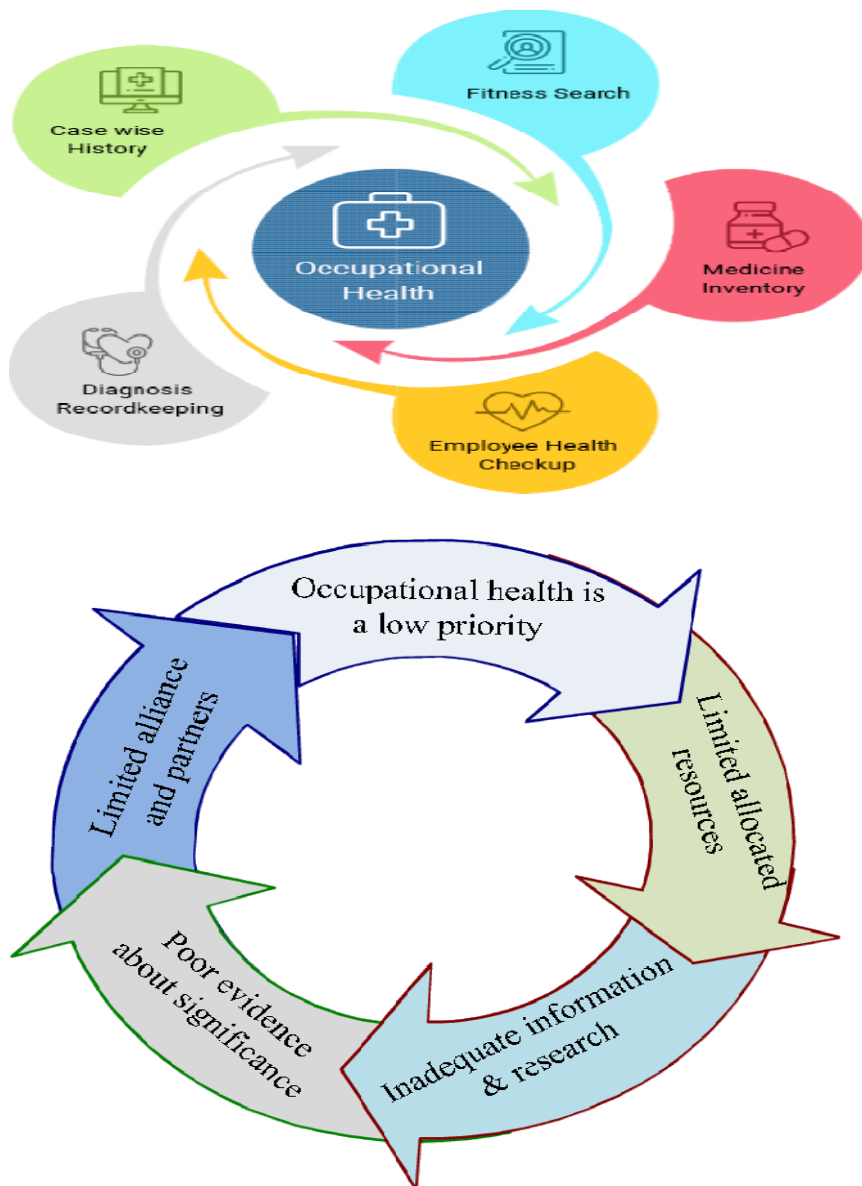
Chapter 3- OCCUPATIONAL HYGIENE

What is Occupational Hygiene?
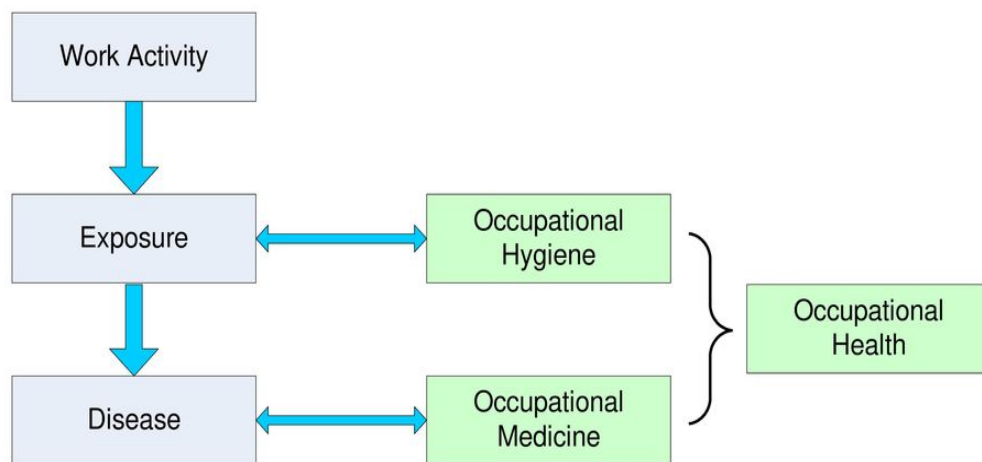
Occupational hygiene is the anticipation, recognition, evaluation, control, and confirmation of protection from hazards at work that may result in injury, illness, or affect the well-being of workers. Means by which to control aspects of work production that involve any degree of risk or danger that may cause injury or harm.

The social role of Occupational hygiene :

Occupational hygienists have been involved historically with changing the perception of society about the nature and extent of hazards and preventing exposures in the workplace and communities. Many occupational hygienists work day-to-day with industrial situations that require control or improvement to the workplace situation. However larger social issues affecting whole industries have occurred in the past e.g. since 1900, asbestos exposures that have affected the lives of tens of thousands of people. Occupational hygienists have become more engaged in understanding and managing exposure risks to consumers from products with regulations such as REACh

(Registration, Evaluation, Authorizations and Restriction of Chemicals) enacted in 2006

What is hazard?

A hazard is anything with potential to cause injury, illness or damage.

The occupational hygienist may be involved with the assessment and control of physical, chemical, biological or environmental hazards in the workplace or community that could cause injury or disease. Physical hazards may include noise, temperature extremes, illumination extremes, ionizing or non-ionizing radiation, and ergonomics. Chemical hazards related to dangerous goods or hazardous substances are frequently investigated by occupational hygienists. Other related areas including indoor air quality (IAQ) and safety may also receive the attention of the occupational hygienist. Biological hazards may stem from the potential for legionella exposure at work or the investigation of biological injury or effects at work, such as dermatitis may be investigated.
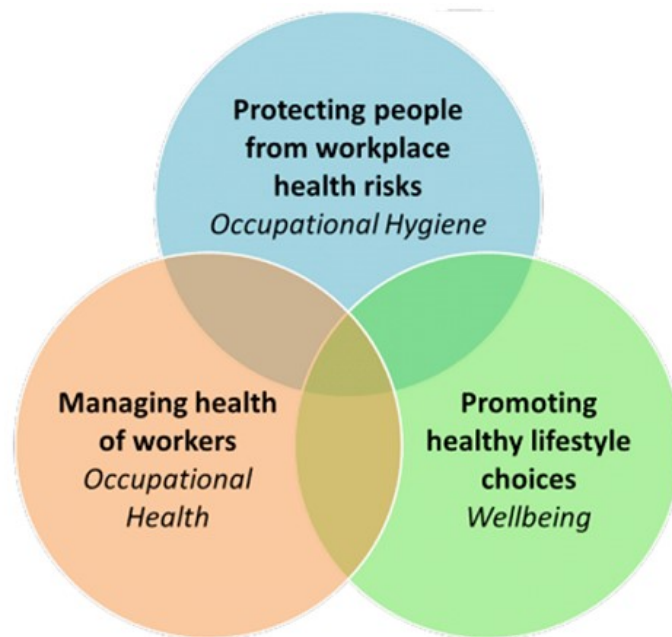
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Chapter 3- HAZARDS

• Anything or condition with the potential to cause harm

• The potential of a substance, person, activity or process to cause harm (injury or illness)

• Anything (material/substance, machine, methods or matters) in the workplace that has the potential to cause harm

CATEGORIES OF HAZARD :

• **Safety** – anything or condition that can cause physical injury

• **Health** – any infective agent, substance situation or condition that directly attacks the body tissues causing occupational illness

• **Environment** – any pollution, waste including noise in any form or quantity that impairs the quality of the working environment, such as dust, smoke, gases, radioactivity and odors

Types of Hazards :

PHYSICAL HAZARDS: Brought by unhealthy working conditions, poor lighting, poor

ventilation, insufficient facilities, inefficient or faulty equipment or machine, and improper work practices such as wrong use of knives.

BIOLOGICAL HAZARDS: Brought by workers infected with diseases or illnesses, unhygienic personal practices that can transmit bacteria, parasites, fungi to other workers and food, & equipment being handled.

ERGONOMIC HAZARDS Brought by poor posture when working long periods of

standing, bending, pushing, lifting, carrying that can cause body stress, muscle pains and soreness, back injury, numbness of hands, feet & other parts of body.

PSYCHOLOGICAL HAZARDS: Brought by too much stress from work may cause mental & emotional strains, anxieties, depression – losing focus on one's work and others.

CHEMICAL HAZARDS : Brought by use of chemicals such as disinfectants for cleaning equipment and floorings, fumes, and smokes from cooking.

CHEMICAL HAZARDS

Preventing Hazards (Best Cure): The 4 Step System

"S A F E"

Σποτ τηε Ηαζαρδ

Ασσεσσ τηε Ρισκ

Φιξ τηε Προβλεμ

Εϖαλυατε Ρεσυλτσ

STRATEGIES IN IDENTIFYING HAZARDS AND RISKS

OBSERVATION – Observe your workplace.

RECORDS – Look into past records of work-related injuries and find the causes. ; Gather

   information about the workplace from other people.

INTERVIEWS – Interview coworkers of any complaints

CONTROLLING HAZARDS AND RISKS IN THE WORKPLACE

Also known as risk control.

Aim to remove a hazard completely. If this is not possible a 'hierarchy of control' exist.

1. Eliminate completely the cause of the hazard.

2. Substitute with a less hazardous one.

3. Improving an equipment to increase its efficiency minimize wastage (engineering control)

4. Administration control

5. Wear personal protective equipment

Evaluating Results

How effective are changes made to fix the problem.

 Talk to workers & their response.

> Are changes making a difference?

> Workers opinion on change.

> Do solutions reduce risk?

> Do solutions create new hazards or increase risk of existing ones?

Details to be Written in Reporting Hazards or Risks

 For other incidents & near misses, a written record must be made. The Written Report must include: **What**: Description of Event / Injury / Damage.

When: Time & Date of incident.

Where: Location & Street Address.

Who: Person, Witness, Workplace & Reporter.

Why: Incident cause, Future action to prevent it again.

EXAMPLE: SAFETY PRACTICES IN THE KITCHEN

<u>To keep oneself clean :</u>

a) Wash hands thoroughly.

 b) Keep fingernails short and clean.

 c) Always wear PPE while at work.

d) Wear mask especially when a co-worker has colds.

e) Remove all accessories before working.

<u>To keep tools and equipment clean :</u>

Follow the correct procedures in washing, drying, and storing kitchen tools and equipment

<u>To keep the food clean :</u>

 a. Never handle food when you have wounds, cuts, and infections.

b. It is best to work with clean and sanitized gloves at all times to minimize hand contact with food.

 c. Refrigerate food, especially perishable ones.

d. Keep food in clean containers with cover.

e. Wash fruits and vegetables thoroughly before use.

f. Check food and containers for any possible contamination.

g. Clean the containers of ingredients regularly.

h. Follow the policy of first in, first out. Those stored earlier should be used first before those stored later.

i. Label packages of food to determine information.

<u>To keep the workplace clean :</u>

a. Do not do personal hygiene activities in the workplace.

b. Do not eat, smoke or spit in the workplace.

c. Do not sit on equipment and worktables.

d. Keep the surroundings areas free from dirt and disorganization.

e. Follow the Japanese philosophy of good housekeeping – sort/seiri, set-in-order/seiton,

sweep/seiso, standardize/seiketsu, and sustain/shitsuke.

MANAGEMENT OF HAZARDS :

All aspects of the workplace should be covered by a general risk assessment process that will

reveal the significant hazards present and the control measures in place. Risk is: "The

likelihood of a substance, person, activity or process to cause harm (injury or illness)"

Risk can be reduced, hazards are controlled by good management.

HAZARD REDUCTION STEPS:

1. IDENTIFICATION: Look for the hazard

2. ASSESSMENT and EVALUATION: Decide who might be harmed, how and to what extent

3. CONTROLS: Decide whether the existing precautions are adequate or more should be done

4. MONITORING and REVIEWING: Periodic checking for continuous improvement

ASSESS AND EVALUATE THE HAZARDS: "consider its severity(consequences) probability and exposure"

Once identified, determine how harmful the hazard can be;

• The likelihood to cause harm

• Under what conditions it can occur?

• What type of harm can occur?

• Who or how many workers can be harmed?

• What may be the extent of the harm or injury?

• Is there a history of problem, accidents or dangerous occurrence from the hazard?

• What monitoring is needed to evaluate the risk?

ENGINEERING CONTROLS: "Removing the hazard prom the worker"

Designing the workplace and process, also ensure professional installation of machine and equipment. (Isolation, lockouts, design, monitoring and warning equipment, process and procedural changes)

 • Knowledge

 • Maintenance

• Plant and equipment

ADMINISTRATIVE CONTROLS: "Removing the worker from the hazard"

• Accident/Incident reporting procedures

• Effective safety policy

• Develop rules, standards and safe systems of work

• Performance measurement

• Training and education

• Good communication

• Use of job safety analysis

• Housekeeping and maintenance

• Monitor performance and follow-up short comings

• Quality assurance and safety

• Purchasing

Personal Protective Equipment: "Protecting the worker from the hazard"

• Insulate the worker.

• Use only when all options are exhausted, and the hazard cannot be corrected through

substitution or design.

 Selection: 1. Where there is no immediate way to control the hazard by more effective

means.

2. When employed as a temporary measure, while more effective solutions

are being installed.

Its short comings: It cannot eliminate or reduce the hazard

If it fails the worker is exposed to the full destructive effects of the hazard

 It may be too cumbersome and can interfere with the worker's ability to perform the task,

thus compound the problem.

PRINCIPLES OF PREVENTION: "HIERACHY OF CONTROLS"

1. AVOIDANCE

2. EVALUATING THE RESIDUAL HAZARDS

3.COMBATING AT THE SOURCE

4.ADAPTING THE WORK TO THE INDIVIDUAL

5.ADAPTING TO TECHNNICAL PROGRESS

6.SUBTITUTION

7. DEVELOP A COHERENT INVOLVING ALL ASPECTS AT WORK

8. COLLECTIVE PROTECTION OVERIDES INDIVIDUAL PROTECTION

9. APPROPRIATE INSTRUCTIONS TO ALL EMPLOYEES

Hierarchy of Controls

Most effective — Elimination — Physically remove the hazard

Substitution — Replace the hazard

Engineering Controls — Isolate people from the hazard

Administrative Controls — Change the way people work

PPE — Protect the worker with Personal Protective Equipment

Least effective

Source: NIOSH
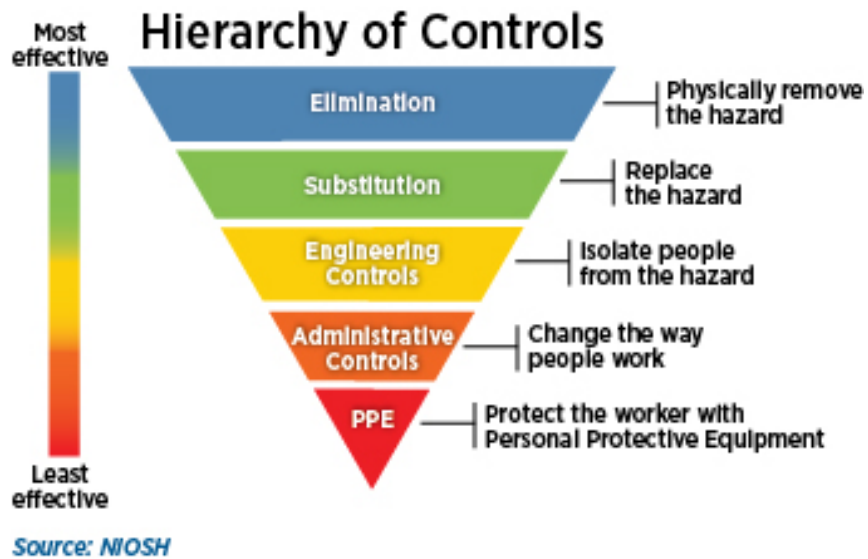
MONITORING AND REVIEWING : Controls must be reviewed periodically

Monitor and review when condition changes;

 New machinery

Change in process

New hazards

New information

Change in legislation

Change in workforce

New employees

Post accident risk assessment

EFFECTIVENESSS OF CONTROLS:

• Where hazards cannot be eliminated, control measures must be implemented to reduce it to

an acceptable level.

• Hazards should be controlled by applying contemporary, comprehensive and proactive

management systems than reactive responses.
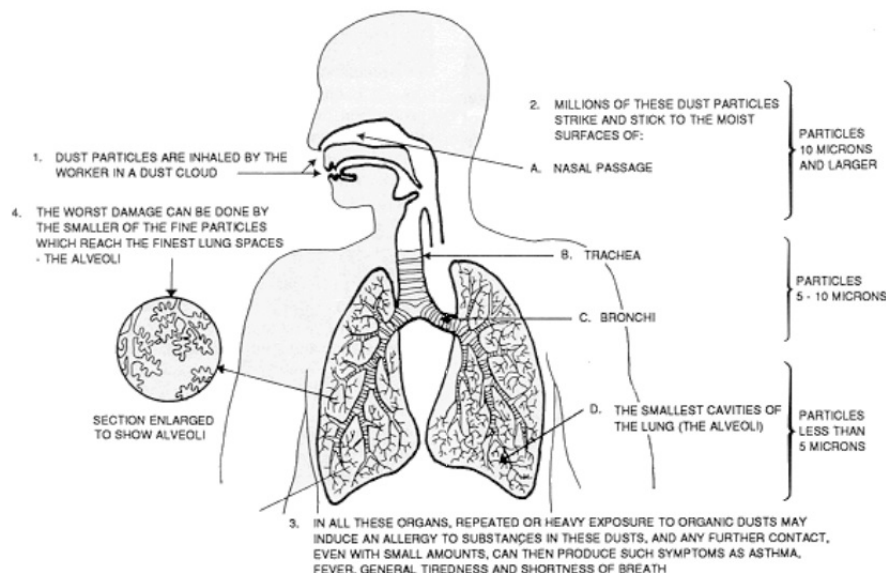
Effectiveness must meet these standards;

1. It must be sufficient to prevent the hazard from causing harm

2. It must protect everyone who can be harmed from the hazard

3. It must not create new hazards, or production and quality control problems

4. It must not create a hazard to the environment or the community of the workplace situation

ROUTES OF ENTRY:

Chemical and biological hazards can be transported into the human body by various agents, pathogens and other forms, through the four main routes of entry;

1. Inhalation – taken into the body through the lungs

2. Absorption - taken into the body through the skin

3. Ingestion - taken into the body orally 4. Injection (direct entry) - taken into the body through broken skin

Dust in the Respiratory System

1. DUST PARTICLES ARE INHALED BY THE WORKER IN A DUST CLOUD

2. MILLIONS OF THESE DUST PARTICLES STRIKE AND STICK TO THE MOIST SURFACES OF:
A. NASAL PASSAGE — PARTICLES 10 MICRONS AND LARGER

4. THE WORST DAMAGE CAN BE DONE BY THE SMALLER OF THE FINE PARTICLES WHICH REACH THE FINEST LUNG SPACES - THE ALVEOLI

B. TRACHEA — PARTICLES 5 - 10 MICRONS

C. BRONCHI

SECTION ENLARGED TO SHOW ALVEOLI

D. THE SMALLEST CAVITIES OF THE LUNG (THE ALVEOLI) — PARTICLES LESS THAN 5 MICRONS

3. IN ALL THESE ORGANS, REPEATED OR HEAVY EXPOSURE TO ORGANIC DUSTS MAY INDUCE AN ALLERGY TO SUBSTANCES IN THESE DUSTS, AND ANY FURTHER CONTACT, EVEN WITH SMALL AMOUNTS, CAN THEN PRODUCE SUCH SYMPTOMS AS ASTHMA, FEVER, GENERAL TIREDNESS AND SHORTNESS OF BREATH

Source: Ontario Ministry of Agriculture, Food and Rural Affairs, http://www.omafra.gov.on.ca/english/livestock/swine/facts/93-003f1.gif

The most common route of entry is inhalation since all organisms must breathe in oxygen to live. Hazards that cause immediate harm such as an injury from an accident are termed "acute", while "chronic" hazards where the harm is not experienced immediately due to prolong exposure to the health hazards.
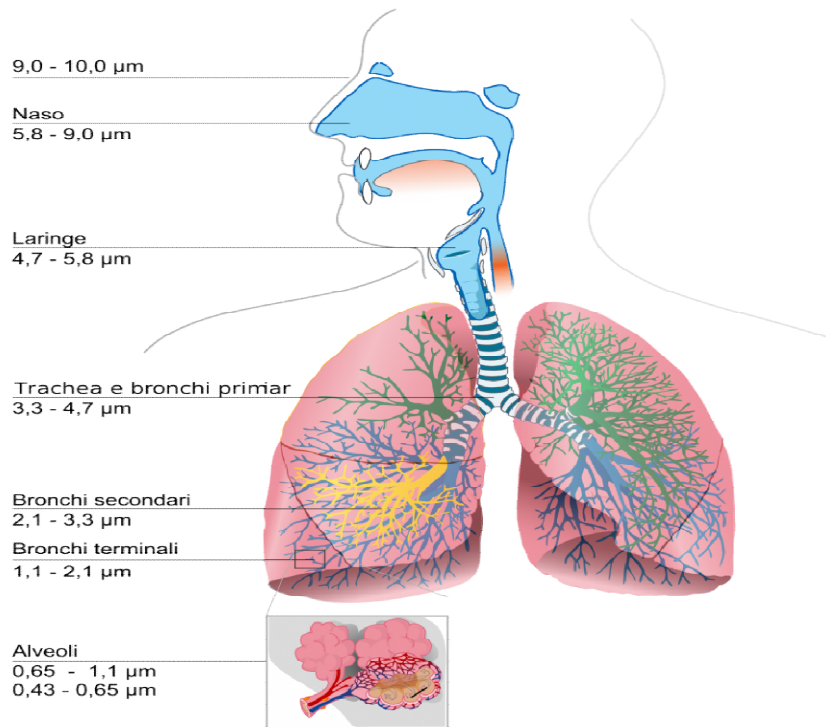
Responsibility and Support: Prevention is the first and safest and also the most effective measure of control for safety, health and environment hazards. Safety professionals must become familiar with health and safety issues in the workplace because its their responsibility to manage the safety and health matters, or solicit the services of specialist of specific safety situations for successful safety management.

Chapter 2- TASK ANALYSIS

Task analysis is the studies perform existing envisions will perform non-existing of the way people tasks with systems. Techniques for task analysis:

• decomposition of tasks into subtasks

• taxonomic classification of task knowledge

• listing things used and actions performed

Sources of information:

• Existing documentation

• Observation

• Interviews

• User profiles

Using task analysis to design:

• Manuals, documentation and New systems

Roles are only a tiny part of the picture when it comes to the needs and behaviors of users. They tell us, approximately, what kind of activities a user may undertake, but they say nothing about how and when tasks are performed.

So, for example, we may identify an accounting or bookkeeping role, but we would need to do user research to discover that some tasks are performed many times a day while others are relatively rare. The implications of these differences are significant for interactive systems design.
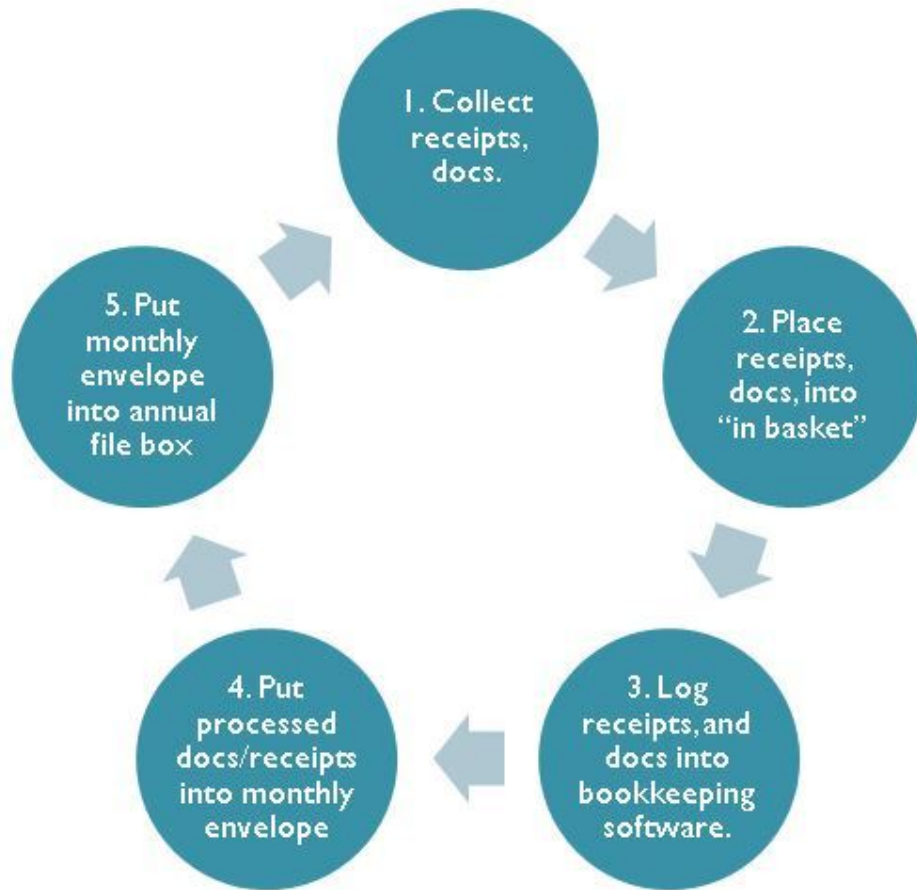
• Distance visual acuity must be within Normal range i.e. 20/20

They have to see distance vehicles and note down the vehicle numbers in cases of necessity

Also they have to look for pedestrians walking and crossing roads

• Near visual acuity must be within Normal range i.e. N6

They have to look for number directories, time in watch, check licenses, bluebooks and

other   important documents related to vehicles

• Normal Color vision

Color vision is one of the important visual functions for both Traffic officers and drivers to

ensure safe and accident free drive

Traffic lights should be well read during drive and monitoring Traffics

• Binocularity and Stereopsis

Depth perception will be another important visual function necessary for traffics and drivers

It is important for driving in heavy traffic and for traffics to figure out mistakes in cases of

accidents

• Good ocular health

Healthy eyes free of diseases like conjunctivitis, cataract, glaucoma etc. will add efficiency

in the works of traffic

Dry eyes, complaints of redness, watering and others may hinder the efficacy of traffic

duties

Why is Bookkeeping Important?

Gives companies a reliable measure of their performance

Provides information on general strategic decisions and a benchmark for its revenue and income goals

It is crucial for businesses to keep good records of every penny spent

Give external users (investors, financial institutions, or the government) access to reliable information to make better investment or lending decisions.

corporatefinanceinstitute.com

CFI

<u>Use of Task Models</u>

• Better understanding of the application (and in particular its use)

• Record discussions (multidisciplinary)

• Help design

• Help usability evaluation

• Help performance evaluation

• Help user in performing the tasks (contextual help)

• Documentation (content + structure)

Approaches to task analysis:

• Task decomposition

• splitting task into (ordered) subtasks

• Knowledge based techniques

• what the user knows about the task

• and how it is organized

• Entity/object based analysis

• relationships between objects, actions and the people who perform them

• Lots of different notations/techniques

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