WORKPLACE HEALTH AND SAFETY TRAINING MANUAL FOR PRACTITIONERS IN MICRO AND SMALL SCALE ENTERPRISE

University of Gondar

Department of Environmental and Occupational Health and Safety

In collaboration with World Vision-Ethiopia

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Acronyms

Abbreviations	Descriptions
BoLSA	Bureau of Labor and Social Affairs
DW	Decent Work
EOHS	Environmental and Occupational Health and Safety
E4Y	Engaged, Educated and Empowered Ethiopian Youth
FDRE	Federal Democratic Republic of Ethiopia
ILO	International Labor Organization
MSSEs	Micro and Small Scale Enterprises
MoLSA	Ministry of Labor and Social Affairs
MSDS	Material Safety Data Sheet
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
PwDs	People with Disabilities
SNNP	Southern Nations Nationalities of Peoples
ToT	Training of Trainers
TVET	Technical and Vocational Education and Training
UoG	University of Gondar
USDOL	United States Department of Labour
WFCL	Worst Form of Child Labor
WHO	World Health Organization
WV	World Vision
YwDs	Youth with Disabilities

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Background Information

The Ethiopian government has initiated a new push towards creating framework to ensure economic and social development with a long term vision of being a middle income country in the period of 2020-2023. In its commitment to the socio-economic development of the country, the Ethiopian Government has given greater focus for the development of the Micro and Small Scale Enterprises **(**MSSEs). MSSEs Development Strategy was designed to ensure the sustainability of the development achieved in all economic sectors of the country. The main focus of the government is creating Job opportunities through MSSEs development, to reduce unemployment and alleviate poverty and enhancing MSSEs as a base for industrial development.

The sectors is crucially important to the economic and social development of the country in the sense that it generates broader job opportunities and assist to alleviate poverty and facilitates rural and urban economic linkage and boost the economy as ground for the emerging Medium and Large scale industries. The program more focuses on poor people: unemployed youth and women, TVET school graduates, school dropouts, existing MSSEs such as weavers and street vendors, people who live on the street etc.

The National TVET Strategy is an important element of actions towards development and poverty reduction playing key role in building the required motivated and competent workforce through training and education. There is parts in the TVET training called “Occupational competency” for each profession, hence this training guide need to be delivered by either a professional from health and safety field or should be supported by short term training on basics of workplace health and safety. It is believed that the TVETs will be the supplier of skilled manpower/workforce for MSSEs but not limited and are also providing huge number of workers for the medium and large scale industries.

Despite the MSSEs are largely believed to provide means of livelihood to quite a large proportion of the Ethiopian population, the working conditions of MSEs are remain unregulated and exposure to occupational hazards while the need is quite substantial. MSSEs Workers lack the necessary awareness, technical means and resources to implement workplace health and safety measures. Exposure to occupational hazards, with the resultant injuries, disability, diseases and death, has profound effects both on

work productivity, well-being of workers, their families and dependents as well as on the socioeconomic development of the nation.

Based on the research conducted by University of Gondar research team in collaboration with World Vision, there is poor and inconsistent understanding and practice level of ensuring decent work opportunity among different stakeholders including the provision of OSH service at enterprise level. This finding is also supported by different literatures that one of the reasons for poor success in ensuring decent work opportunity is due to poor awareness among stakeholders for decent work creation. Hence, there is a great demand to work on awareness creation and capacity building on decent work agendas at each level of the actors.

Significant numbers of youth are winning their daily bread being engaged in MSSEs where workplace health and safety hazards are significantly common while the sector is inadequately/totally does not supervised and lacks occupational health services.A research conducted by World Vision project intervention districts of the Amhara and SNNP regions indicate that many youth in the districts are engaged in economic activities mainly either in unpaid family work/business or in employers business of micro and small scale enterprises where many of them don't have access to basic health and safety services to protect them from workplace hazards.

Work processes where youth engaged present the risk of physical injuries such as cuts, burns, hearing impairment resulting from loud noises, eye injuries due to excessive UV radiation and respiratory dysfunctions due to the noxious metal fumes inhaled. There is also a risk of psychosocial hazards i.e. stress at work and exhaustion, and ergonomic hazards that mainly involve musculoskeletal injuries.

Therefore, aggregated of the aforementioned points imply protection of the health and safety of workers in the MSSEs is a big challenge, which should be managed with an integrated approach to health promotion, social protection and employment creation. Innovative means to prevent exposure to occupational hazards, occupational accidents, and occupational diseases need to be developed through cost effective and sustainable measures at the worksite level in order to allow for capacity building within the MSSEs itself.

It is evident that high productivity and quality employment can only be reached when the requirements for preventing exposure to occupational hazards, accidents and diseases and workers' health and welfare are integrated in the management of the production process.

Hence, to improve the health and safety of workers and to increase productivity of MSSEs and to alleviate poverty at the country level at large, it is necessary to develop innovative means to prevent workers' exposure to occupational hazards, occupational accidents, and occupational diseases at the worksite level through capacity building within the MSSEs itself by providing training on occupational hazards prevention and controlling mechanisms.

Thus, acknowledging the critical role of health and safety service for the development of this sector and contribute for the national vision to contribute the economic growth through creation of motivated, healthy and productive workforce that has a vision to transform to middle and large scale industries in the future. Hence, University of Gondar collaborate with World Vision Ethiopia to develop a health and safety training manual that can be used by workers, managers and employers for promotion of workplace health and safety in growth oriented sectors of the micro and small scale enterprises by tailoring its context to fit into their own. In addition, this training manual is being prepared for practitioners, students and staffs of the Technical and Vocational Education and Training Colleges. The manual is being developed in collaboration with the federal ministry of Labor and social affairs and National technique and Vocational Education and training (TVET) agency and through the support of World Vision-Ethiopia.

This material is prepared to support the national action towards socioeconomic development sector through provision of basic OSH information primarily to workers and employers at MSSEs and also for TVET teachers and students on hazard identification in the production process, to estimate health and safety risk of the task and to take prevention and control measure for the identified hazards.

Target Sectors:

This training module is designed for any interested organization but with special emphasis for practitioners at growth oriented sectors of the micro and small scale enterprises and practitioners, students and teachers of Technical and Vocational Education and Training Colleges. In the study conducted by University of Gondar supported by World vision, from the nine categories of industries the first three most important sectors where >90% of the working youth were engaged were 299 (31.4%) of working youth engaged in wholesale and retail trade, restaurants and hotels, 261 (27.4%) in agriculture, hunting, forestry and fishing and 299 (31.4%) in community, social and personal services. Hence, this training module will give special for work places under these youth preferred sectors for engagement. This will help to reach majority of working youth in the target.

Classification of working sectors

- Agriculture, hunting, forestry and fishing
- Mining and quarrying
- Manufacturing
- Electricity, gas and water
- Construction
- Whole sale, retail trade, restaurants and hotel
- Transport, storage and communication
- Financing, insurance, real estate and banking
- Community, social and personal services

Beneficiaries:

This training manual can be used by any interested individual or organization but specially prepared to address the need of health and safety information for:

- Workers/employees
- Employers/business owners
- Labor inspectors at federal, regional, zonal and district level
- Safety officers and managers
- Micro and Small Scale Enterprise offices
- TVET and training institutions

Purpose of this training Module

This module is prepared with the core purpose to bring major changes in Occupational health and safety (OHS) practice of work forces in the micro and small scale enterprises to increase the sector competitiveness through building their capacity and skill to protect themselves from workplace health and safety hazards.

This training material is designed to achieve a minimum OHS competency on workers through the provision of basic OHS knowledge. Therefore, the overall aim of this training manual is focused to increase workers capacity on hazard identification, estimate the health and safety risks of the hazards and the application of individual and collective level control strategies. This will help to reduce injuries and illnesses resulting from exposures to workplace hazards and associated health and safety risks which will intern support organizational move for national and international competitiveness.

Objectives of the training module:

At the end of the training the trainees are expected to:

1. Explain what decent work is and recognize its importance
2. Associate labor rights, regulations and work place health and safety issues
3. Identify the probable and available workplace hazards in specific sector
4. Estimate the health and safety risks of hazards in their workplaces
5. Apply individual and collective level hazard control strategies
6. Participate actively in the creation of safety culture in their organization

Outline of the Training module

This training module has three four relevant to deliver basic knowledge about workplace health and safety and lessons are supported by practical exercises and workplace exposure for applications of the knowledge acquired.

- **Part I:** Over view of Occupational Health and Safety
- **Part II:** Legal frameworks in Occupational Health and Safety (OHS)
- **Part III:** Workplace Health and Safety hazards, associated risks and control methods
- **Part IV:** Better OSH management at Organizational Level

The training approaches:

This module is prepared with simple approaches to deliver basic health and safety information supported by practical/workplace exposure to give an insight of the theoretical knowledge. The training uses /will have;

- Interactive presentation
- Participant centered discussion with group/individual exercises
- Real life experience /stories
- Case studies
- Plays/games

Expectation and Evaluation

This manual has both pre-test and post-test examination with 20 questions to ensure the participant achieved the minimum competency which will be conducted before and after the training. Moreover, each session will have course evaluation form to be filled by participants.

This training module is designed for practitioners in the micro and small scale enterprises and, students and teachers of Technical and Vocational Education and Training Colleges. The manual is designed for training of the trainers which will be delivered in Seven days. However, the participants are expected to deliver this training in a short version (minimum 3 days) for ground level practitioners in their own specific sector by tailoring it to fit for their own context.

Materials Required to Conduct the Training

The following materials are needed to conduct the training;

- Presentation slides and LCD projector
- Hand-outs
- Pre-test and post-test questions
- Flip chart and Marker
- Stickers and plasters
- White board with marker or Blackboard and chalk
- Exercise sheets/printed guides
- Box or bags with different load, Balls, String/rope
- Sample Personal protective equipment (PPE)
- More others based on the planned exercises for specific session

Part I: Overview of Occupational Health and Safety

Learning objectives: at the end of this session participants are expected to:

- Understand the magnitude of workplace accidents and illnesses
- Classify workplace hazards by type
- Characterize potential health risks associated with different types of hazards
- Be aware of the hierarchical hazard control strategies at workplace.
- Describe the direct and indirect costs of occupational accidents/injuries/illnesses.

Training approaches/methods:

- Interactive presentation
- Brain storming
- Small-group discussions
- Group exercise
- Gallery walk
- Case studies

Introduction to work place health and safety

Time: 2 hours

1.1. Overview of OSH

What is occupational health?

- Start the session with brainstorming question to initiate participants thought about Occupational health and its components;
- Encourage participants to share ideas openly;
- Summarize the discussion with interactive presentation;

The field of Occupational Health covers a wide area. Industry is increasing in our country, and knowledge about occupational health is necessary to reduce health problems related to this increased activity. When you work with “Occupational health”, your task is to avoid and reduce the effect of factors in the work places which may cause any adverse health effects among the workers. To have a work place and earn salary is of course a very important issue, but nevertheless, factors at work can sometimes have unwanted side effects. In occupational health we try to reduce these side effects. We all aim to obtain good health among the workers.

Figure 1: Work setup of a saw mill

Here the workers cut timber to get materials ready for building purposes. However, there are dangerous tools such as saws present in this working environment. The workers cut the timber, but can also cut other things, for example, the hands of the worker. However, we can do several things to avoid such injuries from happening. That is what occupational health is about.

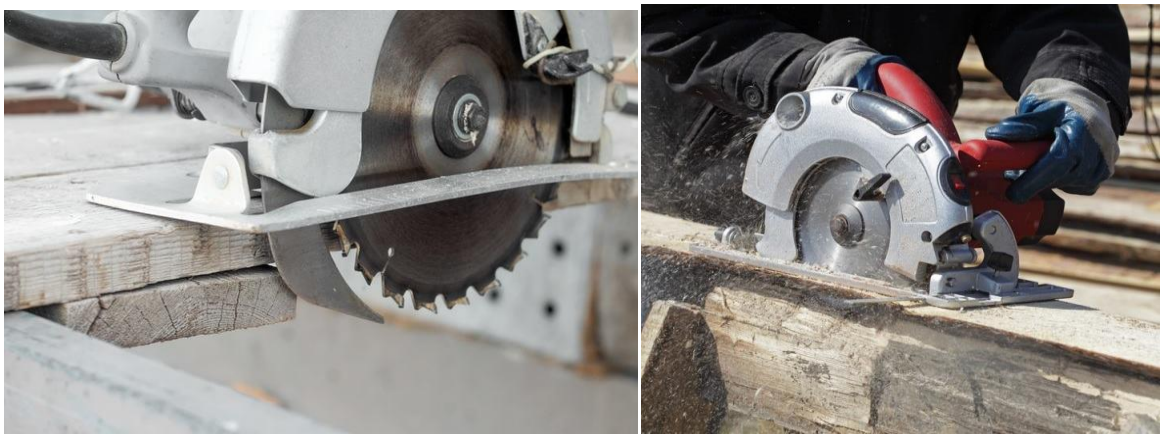


Figure 2: Moving part of the saw enclosed

- On the photos you can see that we can enclose the moving part of the saw so the worker does not come in contact with the saw blade easily.
- We can also have security systems, so the saw blade is not turning if the saw is not well enclosed,
- The saw can be in a special place or special room where no one other than the saw technician is located.

- We can also protect the worker by giving them strong, protective gloves, but for this particular case, strong gloves are not at all as good as the technical installations and enclosure I described.

Example 2: Flower farm with a large numbers of green houses

Figure 3: Flower farm with a large numbers of green houses

Case 1: *One leader at the flower farm asked two women working there, to cut more roses from the green house, to fill in this space. The women protested, because the green houses where the roses were growing had just been sprayed with pesticides, and no one should enter.*

If you were on their foot, what will you do?

Figure 4: Cutting roses in a green house

Normal practice is that the pesticide sprayers close up greenhouses some hours after spraying, to avoid human exposure to these toxic substances. In this case, the female workers were not listened to, but told to be quick, to go into the green house and cut more roses. They did so. Immediately afterwards, they felt very sick, with nausea, headache and vomiting. One of the women died the same day; she had serious pesticide intoxication and her kidneys stopped working.

This is a tragic example of an avoidable situation. The workers should not have entered the green house just after spraying. There are strict rules about waiting a certain amount of time after spraying before re-entering the area, to avoid workers running the risk of inhaling these substances. Or if the workers need to enter, they should be equipped with personal respiratory protective equipment so they do not inhale or get in contact with the toxic pesticides.

1.2. Definition of occupational health and safety related terms

There are several definitions of occupational health, but the one that most commonly used is this one, from WHO and the International Labour Organization (ILO):

"**Occupational Health is the promotion and maintenance of the highest degree of physical**
mental and social well-being of workers in all occupations."

Activity #1 Bingo Safety Awareness game

Discussion points:

- Match to define basic health and safety terms according to the instruction

Format

Small group activity and discussion

Time: 15 minutes

Material needed – Sheets of Bingo safety awareness game guide, definition and answer for matching.

Instructions:

- Divide participants into small groups of approximately four-six people each.
- Distribute the sheets and give instruction about the game
- Conclude the session using the definition key to enhance their awareness through discussion

- Give summary for the session brief presentation and checking answers for the exercise from the exercise answer Key.

Hazard is anything that has the potential to cause harm. Harm includes ill health and injury, damage to property, plant, products or the environment, production losses or increased liabilities to the detriment of the health or safety of a person.

Work place health and safety hazard includes;

- Physical hazards (Extreme T^{o}, noise, vibration, radiation etc.)
- Chemical hazards (gases, vapor, solvents etc.)
- Biological hazards (virus, bacteria, molds, animal bites etc.)
- Ergonomic hazards (repetitive movement, frequent lifting,
    - improperly adjusted workstations etc.)
- Psychosocial hazards (mental stress, bullying and
    - Work place harassment etc.)
- Specific safety hazards (slips, trips, working from height etc.)

1.3. Occupational Hazards control measures

- Encourage discussion among participants to mention what they know about workplace hazard control strategies.

There are many ways of reducing the risk of negative health effects at the workplace. The best way to achieve control is by addressing the source of the hazard/contamination. Substitution of currently-used materials with less hazardous materials is one of the most effective ways for eliminating or reducing exposure.

If control by source cannot be achieved or does not resolve the problem then an attempt should be made to control the risk by interrupting the path of exposure between the hazardous material and the worker/receiver. Personal protective equipment is considered to be the least effective measure.

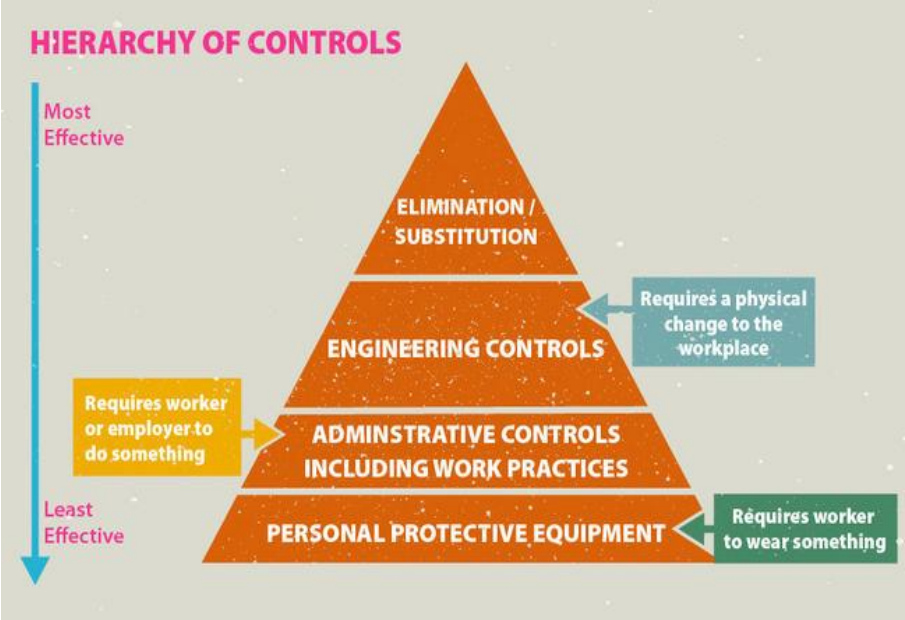


Figure 5: Hierarchy of control measures

1.4. Why OSH?

Accident Causation and it's costs

- Brief presentation to encourage participants thinking about the value of OSH service;

Workers represent half the world's population in the age group 16-67 years, and are the major contributors to economic and social development. However, around the world, millions of men and women are paid to work under poor and hazardous conditions. Despite the availability of effective interventions to prevent many occupational hazards and to protect and promote health at the workplace, large gaps exist between and within countries concerning health status of workers and their exposure to occupational risks. According to the ILO;

- More than 2 million people die from work-related diseases every year
- 321 million accidents occur due to workplace hazards annually
- Every 15 seconds, a worker dies from a work-related accident or disease,
- **Accident:** defined as unforeseen, uncontrolled, undesirable and sudden mishap which may result in minor or major injuries or death of the person involved, loss of property, interruptions in activities or functions in industry.

Root Cause Vs Risk Factors

Pose brain storming question about risk factor and root cause and let participants to reflect, and then give a brief description about.

Whenever accident occurs there is always a cause; but this may be obvious or difficult to trace. Generally causes of accident can be categorized as follows;

- **Technical/contextual/conditional Causes**
  - Unsafe conditions
  - Mechanical Factors
  - Environmental Factors
- **Human Causes**
  - Unsafe Act
  - Unsafe Personal factors; behavioural, structural

Group Activity

Task Evaluation to identify the root cause and risk factors;

- Assign participants in group of manageable size
- Determine Cases or activities to be evaluated
- Instruct to conduct task evaluation
  - Consider all the available risk factors and root causes in that specific task
- **Assessment and Discussion Points:**
  - What are the root causes?
  - What risk factors are presented?
  - What are the effects that could happen?
  - What are the prevention/control strategies for the identified risk factors and root causes?
- Present your finding using the task analysis sheet

➢ Conclude the session with brief and interactive presentation.

Root cause creates undesired outcome by leading individuals to practice wrongly. Root cause is the main source of the problem that may present risky condition. Risk factor is the immediate cause / condition that lead to the problem. There may be more than one root cause resulting in exposures to risk factors. In order to reduce the chance of an

injury/accident; the best strategy is to eliminate the root causes so that it will be possible to avoid risky conditions.

- Poor Environmental conditions are the aggravating factors that may increase workers' chance of developing effects from the risky condition.
  - Extreme heat, cold, noise, and poor lighting

Table 1: Task Evaluation Sheet

Description of process used to do task: _____

Check Points for Problem Identification	Description of Root Causes	Description of Risk Factors
Effort/strength required		
Location of parts, equipment or tools		
Position of parts, equipment or tools		
Design of parts, equipment or tools		
Speed of task		
Frequency or repetition of task		
Duration of task		
Productivity levels		
Environment		
Training		
PPE		

Key Note:

- ***Location****: where the part is placed; on the workbench, on the floor, suspended from a hoist, etc.*
- ***Position****: how the part is oriented relative to the worker; lying flat, placed upright on a side, tilted to one side, etc.*
- ***Speed****: how fast a task is done or cycle time.*
- ***Frequency****: how often a task is done; the number of times during the day, number of days per week, or number of weeks per month or year.*
- ***Duration****: how long the same task is done during the work shift.*

Cost of Accident

Initiate the session with the basic arguments for OSH services i.e. Economic argument, Humanitarian argument and Legal argument.

Public health efforts can increase labour productivity which lead to rapid economic growth. Major economic loss can happen as a result of poor working conditions. Work-

related injuries and diseases are very costly, and have direct and/indirect in-direct effects on the lives of workers, their families, employers and the nation.

Group Discussion

Divide participants in to manageable group and assign them to discuss about the direct and indirect costs of occupational accidents/injuries/illnesses.

- For the employer
- For the worker
- For the society/public

Summarize the session with interactive presentation using the following points.

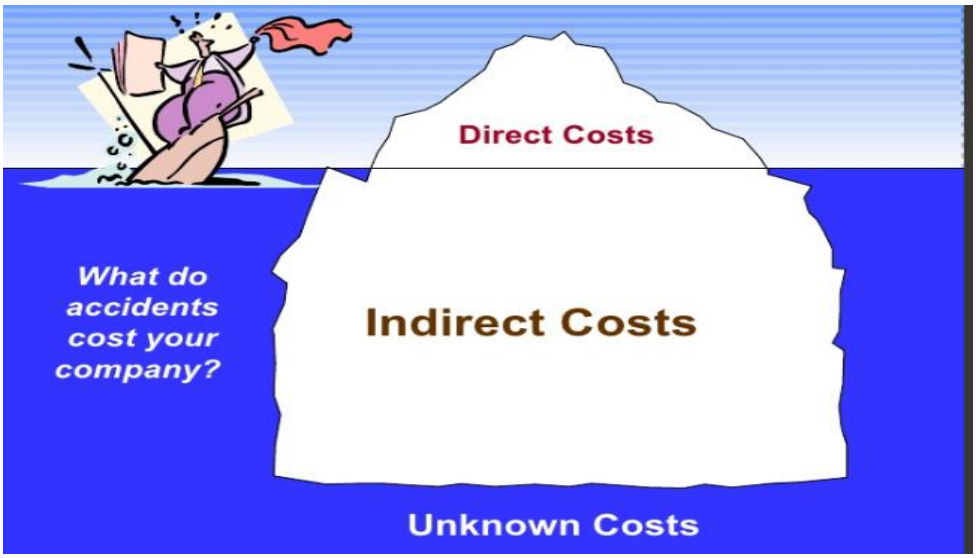


Figure 6: Ice Berg of Costs of Accident

Costs of Occupational Injuries/Diseases

Direct costs to workers:

- Pain and suffering from the injury or illness
- Loss of income
- Loss of a job
- Health-care costs for medication
- The potential to have permanent effect

Indirect costs to workers

- Difficult to measure
- One of the most obvious indirect costs is the human suffering caused to workers' families, which cannot be compensated with money.
- Accidents also affect the moral of employee.
- After the accident, the worker is psychologically hesitant to work at the same place and even reluctant to exert himself for the job; post-accident trauma

Direct and indirect costs of Occ. Accidents for Organizations

Direct costs for employers;

- Payment for work not performed;
- Medical and compensation payments;
- Repair/replacement of damaged machinery & equipment;
- Reduction or a temporary halt in production;
- Increased training expenses and administration costs;
- Negative effect on morale in other workers.
- Reduction in the quality of work;

Indirect costs for Organizations;

- Injured/ill worker has to be replaced;
- New worker has to be trained and given time to adjust;
- It takes time before the new worker is producing at the rate of the original worker;
- Time devoted to obligatory investigations, to the writing of reports and filling out of forms;
- Accidents often arouse the concern of fellow workers and influence labor relations in a negative way;
- Poor health and safety conditions in the workplace can result in poor public relations.

Effect on the Society/National Level Impacts

- Even through a victim receives compensation, he may require additional help from the society
- Obviously, for those who do not come under compensation act, the need for help from society is much greater.
- Loss of production hours causes fewer products in market.
- Employers necessarily include the cost of accident to the selling prices of their products.
- Therefore, the society has to pay more prices for the products.
- If the worker had been involved in social activities; then his replacement is difficult to achieve.
- Burden on public health care and rehabilitation
- Negative implication on investment, employment

Benefits of effective OSH Service

- Reduction in the number of accidents
- Reduction of morbidity and work-related injuries
- Reduced insurance costs for different crisis
- Reduced costs from material damage due to accident
- Better management of risks
- Demonstration of legal and regulatory compliance
- Demonstration of commitment to stakeholders
- Increased access to new customers and business
- Demonstration of innovative, forward thinking approach
- Reduction of absenteeism
- Increase job satisfaction
- Increased work performance

Conclude the session by presenting some live cases of occupational accidents/disasters both from international and national experiences with costs of accidents clearly calculated and demonstrated.

Part II: Legal Frameworks in Occupational Health and Safety (OHS)

Session Plan

Time Frame: 4 hour

Learning Objectives

At the end of this session, participants are expected to:

- Associate national context of OHS and decent work agendas to own context
- Be aware of relevant national laws; rules, regulations, policies, and guidelines in relation to health and safety at work
- Support and take part in the Ethiopian labour system function

Content

- Introduction to historical background of labour law
- National Constitution
- National labour law and other related legal provisions
- National occupational health and safety Policy, directives and guide lines

Learning/Teaching Methods

- Brainstorming
- Group work
- Plenary discussion

Tools

- Copies of the constitution and other legal documents
- Markers
- Flip charts

Session Implementation

Facilitator Activity:

- Explain the importance of this session to the overall legal frameworks related to occupational health and safety and the objectives of the session clearly.

Method: Brainstorming

- Ask participants to list down existing legal frameworks, which is, related the occupational health and safety.
- Historical background of Ethiopian labor law
- Issues listed in national constitutions related to occupational health and safety
- The scope(coverage) of labor law

Facilitators Activity: Group participants write and display their ideas on flipchart and present for the audience.

Duration: 20 minute for discussion

20 minute for presentation

Method: Group discussion

Summarize using facilitator note

Summary of Facilitators Note

Introductory Presentation

In the United Nations system, two specialized agencies are directly concerned with occupational health taken as a whole: the ILO and WHO. The ILO was set up in 1919 to bring governments, employers, and trade unions together for unified action to promote social justice and better working and living conditions everywhere. Ethiopia becomes member of the organization by the year 1923 after 4 years.

The objective of ILO was to promote the social justice & internationally recognized human & labor right. The declaration of Philadelphia – 1944 substitutes Labor is not

commodity, freedom of expression and of association are essential to sustained progress and poverty anywhere constitutes a danger to prosperity everywhere. ILO prepares more than 189 conventions to be ratified by the member states, and 204 recommendations among that most of them on workplace safety and health. Ethiopia Ratified 22 ILO (Including 1 denounced) conventions and make law of the land. The parent legislative frame work of the land is the constitution of the Federal Democratic Republic of Ethiopian Constitution Proclamation No. 1/1995 (21st August, 1995). Article 9/4 states about the supremacy of the constitution in the hierarchy of the laws of the land and all international agreements ratified by Ethiopia are an integral part of the law of the land which includes all the ILO'S Convention ratified by Ethiopia.

Labor relations in Ethiopia have been very low and slow in development. The cultural, religious and legal settings have had their respective shares for such an outcome. Culturally, the Ethiopian society's attitude towards labor and laborers has been very discouraging. The traditional Ethiopian society despised both trade and manual work. All the remaining occupations excluding priesthood were relegated to members of the population who were thought of as a lower class. Metal work, for instance was left to one group of the population with such a low reputation that nobody dared to mingle with segment of the population. It was by realizing this cultural attitude and its negative impact to labor development that the then emperor (King Menelik) issued a proclamation in 1908 with the following content:

> *"Let those who insult the worker on account of his labor cease to do so. You, by your insults and insinuations, are about to leave my country without artisans who can even make the plough. Hereafter anyone of you who insults these people is insulting me personally."*

A more comprehensive legislation on occupational Safety and Health management replaced this in 1964 i.e. Proclamation 232/1964 in order to address the change occurred.

The service goes to Ministry of Community development and Social affairs. This legislation was framed itself on the basic principles underlined by the two notable ILO conventions on Labor Inspection (Convention No. 81 and 129) which is not ratified till know.

The same trend continued up to the 1974 change of government i.e. the military-ruled socialist era. The government proclaimed pro- worker command economic influenced Labor Law, which provided legal provisions concerning terms and conditions of work i.e. Proclamation No. 64/76.

The proclamation No. 64/76 left the issue of OSH to be governed by the labor standard proclamation No. 232/1964.Post socialist Reform in 1991, dynamic change has brought about the overall transformation of economic development principles and trade liberalization. The labor proclamation no_42/93 was promulgated in 1993 and used up to 2003. Then due to some globalization issues and industrial lead agricultural economic development strategy, it was changed to labor proclamation no-377/2003 which used until know with 2 amendment proclamations (466/2005, 494/2006). Labor law is the specialized law in protecting of workers health and safety at work place in Ethiopia.

Summary of Ethiopian Legal Provisions on Occupational Health and Safety

- The Federal Democratic Republic of Ethiopian Constitution(Proclamation No. 3/1995)
- FDRE Proclamation No 377/2003
- FDRE Labor (amendment) Proclamation No. 466/2005
- FDRE Labor (amendment) Proclamation No. 494/2006
- Working Conditions of young workers and women guideline
- The Occupational Safety and Health Directive 2008
- National Occupational Health and Safety Policy 2014
- Occupational Health and Safety Committee Guide line 2006
- Private Organization Employees' Pension Proclamation No. 715/2011

- Right to Employment of Persons with Disability Proclamation No. 568/2008
- Employment relations established by religious and Charitable organizations regulation No. 342/15

The Constitution of Federal Democratic Republic of Ethiopia (Proclamation No.3/1995)

The FDRE constitution is the parent legislative framework of the land. This grand legislation has several articles pertaining to matters of Decent Work in general and of Safety, Health and Working Environment in particular.

- **Article 9**: states all international agreements ratified by Ethiopia are an integral part of the law of the land, which includes all the ILO'S Convention ratified by Ethiopia(e.g. C155-OHS)
- **Article 18**: Every citizen protected from inhuman Treatment in particular including no one shall be required to perform forced or compulsory labor.
- **Article 35**: Women shall have equal right with men in employment, promotion, pay and the transfer of pension entitlement.
- **Article 36 (1e)**: Children are entitled to be protected from social or economic exploitation and shall not be employed in or required to perform work that is likely to be hazardous or to interfere with their education or to be harmful l to their health or physical, Mental, spiritual, moral or social development.
- **Article 42(1)**: Factory and service workers, farmers, farm laborers, other rural workers and government employ whose work compatibility allows for it and who are below a certain level of responsibility; have the right to form associations to improve their conditions of employment and economic well -being.
- The right to form trade unions and other associations to bargain collectively with employers or other organizations that affect their interests and the right to express grievances including the right to strike.
- **Article 42 (2)**: Workers have the right to reasonable limitation of working hours, to rest, leisure, to periodic leaves with pay, to remuneration for public holidays as well as healthy and safe work environment.

- **Article 89 (8)**: in relation to economic objectives, it states that, government shall endeavor to protect and promote the health, welfare and living standards of the working population of the country.

National Labor Law: Proclamation No 377/2003

According to labor proclamation No. 377/2003, the Ministry of Labor and Social Affairs of Ethiopia is the organ charged with the responsibility to inspect labor administration, labor conditions, occupational health and safety.

- Present-day labor law, as a specialized law designed to protect employees' welfare, only came into existence because of the modern industrial development and with the rise of the status of the employee as wage earner.
- Employment relation is established through a contract of employment and it shall be deemed formed where a person (the employee) {agrees}, directly or indirectly, {to perform work} {for and under the authority of another (the employer)} for a {definite or indefinite period} or piecework in return for {wages}.
- The proclamation is applicable to 'Employment relations based on a contract of employment that exist between a worker and an employer.

- Contracts for the purpose of upbringing, treatment, care or rehabilitation, Apprenticeship, contracts of personal service for non-profit making purposes.
- Managerial employee
- Contracts related to persons like members of Armed Force, Police Force, employees of state administration, judges of courts of law, prosecutors and others whose employment relationship is governed by special laws
- Contracts relating to a person who performs an act, for consideration, at his own

Facilitator Activity:

Divide participants in to two groups and ask them to list down the responsibility of employer and employee regarding to occupational health and safety at work place on flipchart

Participant Activity:

Group one… list and discuss the responsibility ofemployer

Group two….List and discuss the responsibility of employee

Duration: 15 minute for discussion

20 minute for presentation

Method: Group discussion

Summarize using facilitator note

Duties of Employers Includes:

An employer shall take the necessary measure to safeguard adequately the health and safety of the workers in particular:

- Comply with occupational health and safety requirements provided under the act
- Take appropriate steps to ensure that workers are properly instructed and notified concerning the hazards of their respective occupations and the precautions necessary to avoid accident and injury to health;
- Ensure that directives are given and also assign safety officer; establish an occupational, safety and health committee of which the committee's establishment,
- Provide workers with protective equipment, clothing and other materials and instruct them of its use;
- Register employment accident and occupational diseases and notify to the labor inspection

- Arrange, according to the nature of the work, at his own expenses for the medical examination of newly employed workers and for those workers engaged in hazardous work, as may be necessary.
- ensure that the work place and premises do not cause danger to the health and safety of the workers;
- Take appropriate pre-executions to insure that all the processes of work shall not be a source or cause of physical, chemical, biological, ergonomically and psychological hazards to the health and safety of the workers;
- Implement the directives issued by the appropriate authority in accordance with this proclamation.
- To provide work to the worker in accordance with the contract of employment and unless otherwise stipulated in the contract of employment, to provide him with instruments and materials necessary for the performance of the work;
- To pay the worker wages and other emoluments in accordance with this proclamation or the collective agreement;
- To respect the worker's human dignity;
- To take all the necessary occupational safety and health measures and to abide by the standards and directives to be given by the appropriate authorities in respect of these measures;
- To defray (pay) the cost of medical examination, of the worker whenever such medical examination is required by law or the appropriate authority.

Duties of employee includes:

- Co-operate in the formulation of work rules to safeguard the workers' health and safety, and implement the rules.
- Inform forthwith to the employer any defect related to the appliances used and injury to health and safety of the workers that he discovers in the undertaking.
- Report to the employer any situation, which he may have reason to believe could present a hazard and which he cannot avoid on his own any accident or injury to health, which arises in the course of or in connection with work.

- Make proper use of all safeguards, safety devices and other appliance furnished for the protection of his health or safety and for the protection of the health and safety of others.
- Obey all health and safety instructions issued by the employer or by the competent authority.
- To perform in person the work specified in the contract of employment;
- To follow instructions given by the employer based on the terms of the contract and work rules;
- To handle with due care all instruments and tools entrusted to him for work;
- To report for work always in fit mental and physical conditions;
- To give all proper aid when an accident occurs or an imminent danger threatens life or property in his place of work without endangering his safety and health;
- To inform immediately the employer any act which endangers himself or his fellow workers or which prejudice the interests of the undertakings;
- To observe the provisions of this proclamation, collective agreement, work rules and directives issued in accordance with the law.

Provision of Minimum Labour Conditions

Group Activity:
Ask participants to discuss on the issue some of minimum labor conditions:

- Minimum labour wage
- Working hour
- Overtime
- Annual and maternity leave
- Trade union and collective bargaining:
  - Number of employees to establish trade union,
  - The contents of collective agreement and
  - The responsibility of trade union member, employer and government (Labor office) in the establishment of trade union.

Method: Group discussion

Summarize using facilitator note

Summary of Facilitators Note

- **Wage:** Wages means the regular payment to which the worker is entitled in return for the performance of the work that he performs under a contract of employment.

Under Ethiopian labor proclamation, the following payments shall not be considered as wages:

- Over-time pay
- Amount received by way of per-diems, hardship allowances, transport allowance, transfer expenses, and similar allowance payable to the worker on the occasion of travel or change of his residence
- Bonus
- Commission
- Other incentives paid for additional work results
- Service charge received from customers.

Ethiopian labour law does not prescribe minimum wages through law. Usually wages are fixed by the employer or by collective agreements or by the employee's contract of Employment.

- **Working Hour:** Normal working hours are 8 hours a day or 48 hours a week. They should be distributed evenly, but may be even calculated over a longer period of time.
- **Overtime:** Any work exceeding the normal working time of 48 hours a week is overtime. Overtime is only permissible for up to 2 hours a day, or 20 hours a month, or 100 hours a year, in the following cases.
- **Annual Leave:** Annual leave is uninterrupted leave with pay shall be a minimum of 14 working days, plus one working day for every additional year of service. Additional leave is granted for employees engaged in particularly hazardous or unhealthy work. It is forbidden to pay wages in lieu of the annual leave.

- **Maternity Leave**
  - An employer shall grant leave to a pregnant woman worker without deducting her wages, for medical examination connected with her pregnancy, provided, however, that she is obliged to present a medical certificate of her examination.
  - A pregnant woman worker shall, upon the recommendation of a medical doctor, be entitled to a leave with pay.
  - A woman worker shall be granted a period of 30 consecutive days of leave with pay preceding the presumed date of her confinement and a period of 60 consecutive days of leave after her confinement.
  - Where a pregnant woman worker does not deliver within the 30 days of her prenatal leave she is entitled to an additional leave until her confinement.
- **Trade Unions:** Workers and employers shall have the right to establish and form trade unions or employers' associations, respectively and actively participate in.
  - A trade union established in an undertaking where the ***number of workers is ten or more***
  - workers who work in undertakings which have less than ten workers may form a general trade union
  - Trade unions may jointly form federation and federations may jointly form confederations.
  - Employers' associations may jointly form employers federation and employers federations may jointly form employers' confederation.
  - No trade union or employers association may form a confederation without forming federations.
  - Any federation or confederation of trade unions or employers associations may join international organizations of trade unions or employers.
- **Collective agreement:** means an agreement concluded in writing between one or more representative of trade unions and one or more employers or agents or representatives of employers organizations.

- **Collective Bargaining**:- means a negotiation made between employers and worker organizations or their representatives concerning conditions of work or collective agreement or the renewal and modifications of the collective agreement.
  - Trade union shall have the right to bargain a collective agreement with one or more employers or their organization in matters provided for in
  - Employer or employer's associations shall have the right to bargain a collective agreement with their workers organized in a trade union.
- **Contents of the Collective Agreement**
  - The conditions for protection of occupational safety and health and the manner of improving socialservices;
  - Workers' participation, particularly, in mattersregarding promotion, wages, transfer, reductionand discipline;
  - Conditions of work, the procedure for making workrules and grievance procedures;
  - Arrangement of working hours and interval breaktimes;
  - Parties covered by the collective agreement and itsduration of validity.

2.3. Labor Inspection Service

Facilitators Activity:

Divide participants in to manageable groups and display the flowing idea on overhead projector in the front of room.

- What are the functions and powers of labor inspectors?
- What are the challenges of current Ethiopian labor inspection services?

Participants Activity: Group participants write and display their ideas on flipchart and present for the audience.

Duration: 30 minutes

Method: Group discussion

Summarize using facilitator note

Summary of Facilitators Note

History of Labour Inspection service

The earliest national legislation for improving working conditions dates from 1802 when the British parliament passed an “Act to preserve the morals of apprentices”. “Morals” were defined in terms of safety, health and welfare, and the “apprentices” were child workers in, for example, mining and chimney sweeping. Application of the Act was supervised by voluntary committees but the Act was not effectively enforced, so in 1833 the government appointed the first four “inspectors”. These were described as “persons of high standing” and they paid particular attention to long working hours for adults and children.

In France, a labour inspection service was established in 1874, comprising 15 divisional inspectors, and in 1892 a body of civil servants dedicated to labour inspection was created. Initially the service was charged with the surveillance of the implementation of legislation from 1841 prohibiting child workers of less than eight years old.

By the end of the nineteenth century, many European countries had introduced legislation aimed to some extent at improving conditions at work. Specialist inspectors were also appointed. For example, in Britain the first medical inspector was appointed in 1898 and the first specialist engineering adviser one year later. In 1901 the first female inspector of factories was appointed, in Germany.

In Ethiopia Labour Inspection service started in Ministry of Industry by the board of Workers safety and health. Member of the board, Minister,1 Engineers and 1 Medical service head proclamation 58/1944.

Then in 1952 - 11 labour inspectors employed in AA, Diredawa, Masawa and Asmara. The size and complexity of labour inspectorates continued in the twentieth century, initially in industrialised countries and latterly in developing countries, which often modelled their inspectorates’ organization on those of the former colonial powers. The remit of inspectorates has also broadened considerably over recent decades to cover a wider range of economic sectors and also of technical and employment issues, keeping abreast of changes in the world of work and changing public expectations. Modern-day

inspectorates may spend much more time than in the past on topics such as work-related stress, violence at work, illegal employment or forced labour, and less time on traditional topics such as boiler or crane safety, or industrial disputes.

Some of the Current Ethiopian Labor Inspection Service Includes:

- Ensure the implementation of the provisions of this Proclamation, regulations and directives issued in accordance with the Proclamation, other laws relating to labor relations, registered collective agreement, and the decisions and orders given by the authorities responsible to determine labor disputes;
- Supervise, executive, educate, study, make research and prepare a standard of work to ensure the implementation of the provisions issued in accordance with this Proclamation and other laws regarding working conditions, occupational safety, health and working environment;
- Prepare the list of occupational diseases and schedules of degrees of disablement;
- Classify dangerous trades or undertakings;
- Conduct studies, and compile statistical data relating to working conditions;
- Prepare training programs concerning the prevention of employment injuries;
- Supervise and ensure that where undertakings are constructed, expanded, renovated or their appliances installed, they are not dangerous to the safety and health of workers;
- Take administrative measures in order to implement this Proclamation and regulations and directives issued in accordance with this Proclamation;
- To seek in the courts or in the authorities responsible for determining labor disputes appropriate measures for the enforcement of the provisions of this Proclamation and of such sanctions as may be required by its decision rendered in the course of its lawful activities

Powers and Duties of Labor Inspectors

- Labor Inspectors assigned by Minister and authorized to carry out the responsibilities of follow-up and supervision of the inspection service.

- The Labor Inspectors shall have an identity card issued by the Minister bearing the official seal.
- The Labor Inspectors shall have the power to enter, during any working hours without prior notice, any work place which they may think necessary to inspect in order to examine, test or enquire to ascertain observation of the provisions. In particular;
    - To question any person alone or in the presence of witnesses;
    - To check, copy or extract any paper, file or other documents;
    - To ensure that the relevant notices are affixed at the appropriate place of work.
    - To take any sample of any matter in a work place and to test it to ensure that it does not cause injury to workers;
    - To take photograph of any worker, and measure draw or test buildings, rooms, factories, car tools, goods and copy and registered document in order to ensure the safety and health of workers;
- Where a sample is taken, the employer shall be informed in advance, the manager or his representative and shall have the right to be present.
- Challenges of labor inspection system: lack of sufficient human resource, lack of equipment based inspection, guarantee of inspector, low commitment of government, resistant of employer, etc.

2.4. Working Conditions of Women and Young Workers

Facilitators Activity:
Divide participants in to two groups, female participants in one group and male participants in one group and ask them to react on the following idea.

- Who is a young worker?
- What are the activities prohibited for woman workers and young workers?
- Why this activities prohibited by legislation?

Participants Activity: Group participants write and display their ideas on flipchart and present for the audience**.**
Duration: 10 minute for discussion
20 minute for presentation
Method: Group discussion
Summarize using facilitator note

Summary of Facilitators Note

Under the Ethiopian labour law, it has been clearly stipulated young worker is “a person who has attained the age of 14 but is not over the age of 18 years and it is clearly spelt out prohibited activities to employ persons below 14 years.

- It is prohibited to employ young workers which on account of its nature or due to the condition in which it is carried out, endangers the life or health of the young workers performing it.
- The prohibited activities to young worker which shall include in particular:

- Underground task such as mining, quarries etc.
- Construction task that involve work on scaffolding
- Road construction
- Activities linked to electricity installation
- Engage in illicit activities: selling drugs, sexual activities
- In sewers and digging tunnels
- Tasks in transport service that involve heavy weight lifting
- Metal melting
- Workplaces where there is extreme temperature (Hot and Cold)
- With toxic chemicals and pesticides
- Fishing task
- Manual handling materials >7kg for repetitive task
- Manual handling materials >11kg for one time task
- Manual handling materials with one wheel cart on smooth floor >20 kg
- Manual handling materials with one wheel cart on rough floor >16 kg
- Manual handling materials with on elevated working surface >5 kg for repetitive task
- Manual handling materials with on elevated working surface >9 kg for one time task
- Night and Overtime Work
- It is prohibited to employ young workers on:

- Night work between 10 p.m. and 6 a.m.
- Overtime work
- Weekly rest days
- Public holidays

- Women shall not be discriminated against as regards employment and payment based on their sex.
- It is prohibited to employ women on the hazardous or harmful to their health.
- No pregnant woman shall be assigned to night work between 10 p.m. and 6 a.m. or be employed on overtime work.
- No pregnant woman shall be given an assignment outside her permanent place of work, provided, however, she shall be transferred to another place of work if her job is dangerous to her health or pregnancy as ascertained by a medical doctor.
- An employer shall not terminate the contract of employment of a women during her pregnancy and until four months of her confinement.

2.5. National OSH Policy, Directives and Committee Guide line

Facilitators Activity:
Divide participants in to manageable groups and display the following questions .The first group reflect on the first question, second group on the second question and the last group on the third question.

i. Why it is important to establish OHS committee at enterprise level? The minimum number of committees needed to form.
ii. What are the strengths and gaps discussed in the OHS Directives 2008?
iii. What are the opportunity and threats behind of a national occupational health and safety policy 2014 for the promotion of occupational health and safety?

Participants Activity: write and display their ideas on flipchart and present it.

Duration: 30 minute for discussion
Method: Group discussion
Summarize using facilitator note

Summary of Facilitators Note

a. Occupational Health and Safety Committee Guideline-2005

Any company should establish Joint occupational health and safety committee after 6month of Establishment and when the no. of workers become 10. Number of member of the committee should be equal among employers and workers. The member of the committee should be equal selected from the part of employer and employee.

Table 2: Description of representatives to form OSH Committee

Sr. No	Number of workers	Number of committee members	
		From Employers	From workers
1	10 -30 workers	1	1
2	30 -100 workers	2	2
3	100 -500 workers	3	3
4	500 – 1000 workers	5	5
5	Above 1000 workers	7	7

b. The Occupational Safety and Health Directive 2008

The OSH Directive, issued by the MOLSA Minister, establishes under:

- Part I the duties of employers, rights and duties of workers, responsibilities of the labor inspectorate, and mandatory conditions on overcrowding, sanitation, fire safety, and preparedness.
- Part II provides guidance on mandatory employer responsibilities;
- Part III details provisions for ambient working conditions and certain hazards; and
- Part IV describes specific and general hazards by work practices or types of manufacturing processes, machinery operation or job performance procedures. Part
- Part V covers OSH in construction and
- Part VII covers the agricultural sector and the duties of authorities.

c. National Occupational Health and Safety Policy 2014

There is a current national OSH policy which deals with how occupational safety and health is handled at a national level and undertaking level as per the principle stated by the Occupation Safety and Health and Working Environment Convention No. 155/1981 for which Ethiopia is a signatory. This national policy focuses on the promotion of occupational health and safety through social dialogue, preventing of occupational disease and accidents, protecting venerable groups like children, person with disability, persons with positive HIV/AIDS, establishing OHS institutions and consultancy, etc.

Facilitators Activity:

Let the participant divided into manageable group and let they discuss and present the following work place cases discussion points;

1. Abebe always go to work by the car, which is assigned by the company. One day he was injured while he travels to work by car accident. Is it occupational accident? How?
2. Bekele employed in X company. The company pays him 50 birr/day for transportation. One day he got injured while he was travelling to work by taxi. Is it occupational accident? How?

Participants Activity: Group participants write and display their ideas on flipchart and present for the audience.

Duration: 30 minute for discussion and presentation

Method: Group discussion

Summarize using facilitator note

Summary of Facilitators Note

Occupational Accident

Under Ethiopian Labor Proclamation, "Occupational accident" means any organic injury or functional disorder sustained by a worker as a result of any cause extraneous to the injured worker or any effort he makes during or in connection with the performance of his work and includes:

- Any injury sustained by a worker while carrying out the employer's order, even away from the work place or outside his normal hours of work;
- Any injury sustained by a worker before or after his work or during any interruption of work if he is present in the work place or the premises of the undertaking by reason of his duties in connection with his work;
- Any injury sustained by a worker while he is preceding to or from place of work in a transport service vehicle provided by the undertaking which is available for the common use of its workers or in a vehicle hired and expressly destined by the undertaking for the same purpose;
- Any injury sustained by a worker as a result of an action of the employer or a third party during the performance of his work.

Occupational Disease

- For the purpose of this Proclamation an "occupational disease" means any pathological condition whether caused by physical, chemical or biological agents which arises as consequence of:
    - the type of work performed by the worker; or
    - the surroundings in which the worker is obliged to work during a certain period prior to the date in which the disease become evident.
- Occupational disease shall not include endemic or epidemic disease which is prevalent contracted in the area where the work is done, except in the case of workers exclusively engaged in combating such diseases by reason of their occupation.

Part III: Workplace Health and Safety Hazards, Associated Risks and Control Methods

3.1. Physical Hazards

3.1.1. Thermal Environment

Time: 4 hours

Learning objectives: the objective of this topic is to enable the trainees to manage workers' exposure to thermal stress to acceptable level.

Upon completion of this topic, the trainees are expected to:

- Define thermal stress: heat stress and cold stress
- Apply appropriate techniques to evaluate human working thermal environment
- Characterize health effects associated with exposure to thermal stressors
- Apply appropriate controlling methods of thermal stressors at work

Training approaches/methods:

- Interactive Presentation
- Brain storming
- Group discussion
- Pyramiding
- Spider diagram
- Case study
- Gallery method

Materials required:

- Presentation slides
- Printed materials/Handout
- Flip chart and marker
- Real life videos and/or Photos

Introduction

Humans are warm-blooded, that is, we have the physiological ability to regulate our body's internal temperature, which is kept at 37°C ± 2°C. If the body's core temperature either rises or falls beyond this, then *serious illness or even death* may result.

Temperature regulation centers in our brain are sensitive to small changes of blood temperature and also get feedback from sensory nerves at the skin. Our brains then use this information to adjust our bodies' responses to heat.

Human Response to the Thermal Environment

Activity # 1
Discussion points:

- How do you react (behavioral, physiological & psychological) to extreme hot temperature?
- How do you react (behavioral, physiological & psychological) to extreme cold temperature?

Method

Use Gallery Method

Time: 25 minutes

Material needed – Flip chart, markers, pens and pencils

Instructions:

- Step 1: Discuss in pair on the discussion points
- Step 2: Let the pairs come together to make a group of 4 people
- Step 3: Choose one person to be the group's scribe. Discuss and write down on the flip charts
- Step 4: After 15 minutes, everyone come to the big group and let each group attach their flip chart on the wall
- Step 5: Ask everyone to walkthrough and see each group flip chart for 5 minutes
- Step 6: Let the participants come back and raise their questions and concern to respective group

Summary Notes;

Mechanisms of human thermoregulation

Mechanisms of human thermoregulation include;

- **Behavioral response**: the most powerful form of thermoregulation. Put on or take off clothes, change posture, move, take shelter,
- **Vasodilatation:** the blood flows near to the skin to increase heat loss from the skin to the environment
- **Vasoconstriction:** blood flows in the deep (core) body parts to preserve heat.
- **Piloerection:** hairs standing on end to reduce heat loss by maintaining by making a layer of air on the surface of skin
- **Shivering:** is a simultaneous contraction of the muscle fibers which increase metabolic heat production with no net external muscular work
    - For a standing person at rest shivering can increase metabolic heat production from 70Wm-2 to 200Wm-2 or more
- **Sweating:** when body temperature rises sweat is secreted by the sweat gland over the body to allow cooling by evaporation
- **Acclimatization**: is a repeated exposures to heat stress over a number of days to maximize sweat production

Heat Transfer from the Body

Heat can be transferred from the body by conduction, radiation, convection and evaporation.An understanding of the mechanisms and factors involved in the heat balance mechanisms is useful to understand the evaluation of thermal stress issues. There are six fundamental factors which define human thermal environment

- **Climatic factors;**
    - Air temperature
    - Radiation
    - Humidity
    - Air movement
- **Personal factors;**
    - Metabolic heat production
    - Clothing

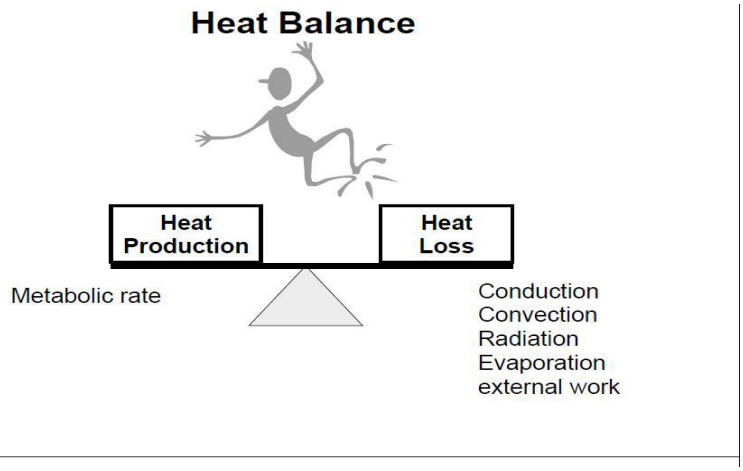


Figure 7: Heat balance of the body

Measurement of Body Temperature

- **Skin temperature**

Shell temperature is varies with external environmental condition. Measuring devices for skin temperature are placing sensors on skin (thermocouples, thermistors etc).

- **Internal body temperature**

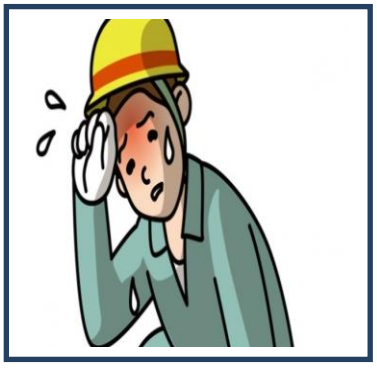
There are numerous methods for measuring internal body temperature through accessible places (oriphae). Devices used for internal body temperature;

- Mercury in glass thermometer
- Thermistors and thermocouples
- Radio pills, Heat flow meters and Infrared thermometer

3.1.1.1. Hot work Environment

Some workplaces have special challenges related to high temperatures. Such workplaces are for instance outdoors such as

- Agricultural work,
- Road paving,
- Outdoor construction,
- Forestry,



- Power line maintenance,
- Traffic regulation, fire fighting and mining.

Also, indoor work may be related to very high temperatures, such as work in smelters.

Table 3: Occupational exposure limits of Thermal (Values are given in ^{o}C)

Work Rest Regimen	Work Load		
	Light	Moderate	Heavy
Continuous work	30	26.7	25.5
75 % work + 25% rest; each hour	30.6	28	25.9
50 % work +50% rest; each hour	31.4	29.4	27.9
25 % work +75% rest; each hour	32.2	31.1	30

Heat Related Health Problems

Very hot work conditions may cause serious health problems. Including,

- **Heat stress:** Heat stress is the overall heat load on the body. Heat strain is the term used to describe the effects that occur in the body as a result of heat stress. The physical effects of heat strain can vary from less serious disorders such as skin rashes and fainting, to serious life-threatening situations where sweating stops and heat stroke develops.

  Symptoms: Nausea, vomiting**,** Fatigue, weakness**,** Headache, dizziness**,** Muscle cramps and aches
- **Heat Exhaustions**
- **Heat Stroke**

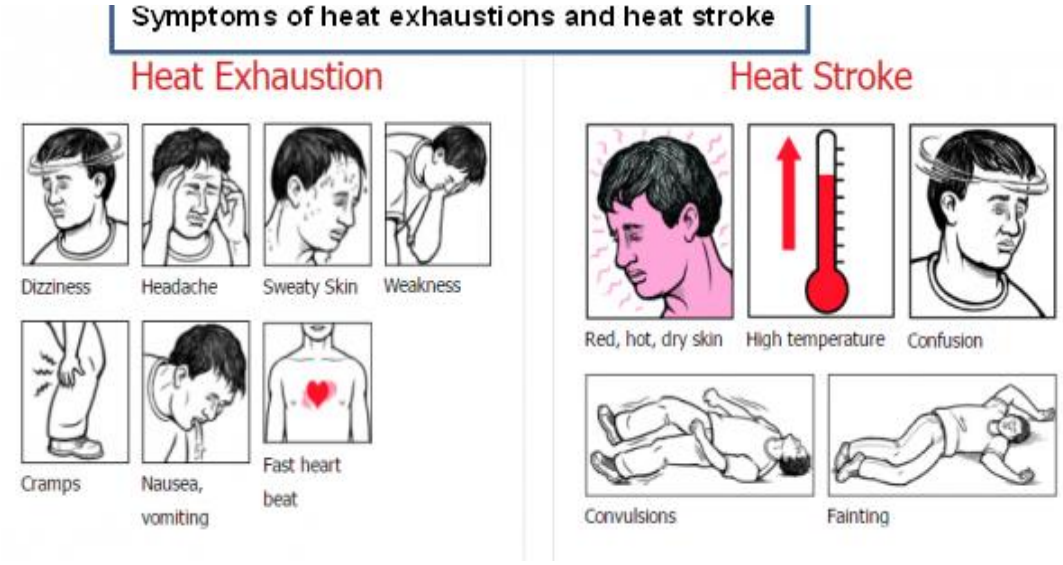


Figure 8: Symptoms of heat exhaustions and heat stroke

Assessment of hot environments and people working in them

Activity # 2

Discussion points:

- How do we assess how heat at work is affecting, or may affect, a person?
- Prevention and control strategies/methods of heat at work place?

Method

Use Cross-over methods

Time: 30 minutes

Material needed – Flip chart, markers, pens and pencils

Instructions:

- Step 1: Discuss in pair on the discussion points
- Step 2: Let the pairs come together to make a group of 4 people
- Step 3: Choose one person to be the group's scribe. Discuss and write down on the flip charts
- Step 4: After 15 minutes, everyone come to the big group and let each group attach their flip chart on the wall
- Step 5: Ask everyone to walkthrough and see each group flip chart for 5 minutes
- Step 6: Let the participants come back and raise their questions and concern to respective group
- Summarize with facilitators Note

Assessment of hot environments and people working in them

There are two ways to find out how heat at work is affecting, or may affect, a person. These are to assess the environment being worked in (that is, to measure heat stress), or to assess the direct effects of heat on a person (that is, to measure heat strain).

Prevention and Control measures for hot environments

- **Engineering control**

  Engineering controls are the most effective means of reducing occupational heat exposure, including:

  - Planning during the workplace construction if a hot environment is anticipated
  - Shielding the radiant heat at the source through insulation and reflective barriers
  - Exhausting heat and water-vapour (steam) to the outside
  - Reducing temperature and humidity through ventilation or air-conditioning
  - Reducing physical exertion by changing processes or using machines designed to assist.

- **Administrative control**
  - Apply a work schedule to allow for heat acclimatization
  - Increase frequency and length of rest breaks
  - Schedule hot jobs during cooler times of day
  - Provide cool drinking water near the work location
  - Slow down work pace or assign additional workers to decrease workload
  - Provide workers with accurate written and verbal instructions, frequent training programs and other information on heat stress
- **Personal Protective Equipment**
  - Wear clothing that allows free movement of airflow and insulated or cooled clothing for short-term exposure such as maintenance jobs
  - Wear heat reflective clothing near heat sources such as a hot furnace
  - Use sunscreen and sun block when working outdoors
  - Wear a hat and light clothing to protect skin when working in the sun

3.1.1.2. Cold Work Environment

Interaction of six basic parameters leads to a tendency for negative heat storage from discomfort to cold stress.

Several types of workplaces are cold, such as;

- Outdoor work in areas with low temperature.
  - Extreme situations can be found in artic areas.
  - Construction,
  - Agriculture and workers in food processing industry
- Military
- Fishermen and sailors are also at risk of cold stress

Activity # 3 Small group discussion on thermal comfort assessment

Format

Small group activity and discussion

Time: 45 minutes

Materials needed

- One copy of Handout
- Thermal assessment checklist
- Pens and pencils
- Marker and Flip chart

Instructions

Step 1: Divide the participants into small groups of approximately four-five people each.

Step 2: Review the unit and gather up the materials needed for the activity.

Step 3: Select one nearby work place and assess the thermal comfort using thermal comfort assessment checklist.

Step 4: Come back and analyse the results.

Step 5: Present your findings with recommendations.

Cold Work Environment

Cold stress

Cold stress is the existence of an environment capable of causing cold strain. In the case of cold stress, the stress factors are mainly environmental, e.g. low temperature, wetness and air movement. Cooling of body parts may result in various cold injuries – non-freezing injuries, freezing injuries - and hypothermia, which is the most serious.

Health effects of cold working environment

- **Frost nip:** is the mildest form of cold injury. It affects the toes, fingers, cheeks, nose, and earlobes, causing the skin to turn white.
- **Frost bite** is a common injury caused by exposure to extreme cold, or contact with cold objects. It happens when tissue temperatures fall below freezing point. Symptoms include; a patchy inflammation of the skin, accompanied by slight pain, blistering accompanied by a burning or prickling sensation.
- **Immersion foot or trench foot** occurs in individuals whose feet have been wet and cold for extended periods of time (days or weeks), but not frozen. Injury occurs to nerve and muscle tissue. The symptoms are numbness, swelling, and in some cases superficial gangrene. Medical treatment of the affected areas is required.
- **Hypothermia:** affects cardiovascular, respiratory, CNS and neuromuscular systems. It occurs when core body temperature decreases enough to affect body functions-usually below 35ºC (95ºF).

Prevention and control of cold stress

- Cold stress situations can be prevented by avoiding work in cold temperatures.
- If this type of work is needed, the periods in the cold should be short and controlled.
- The workers need proper clothing to keep warm. Emergency procedures must be developed.

Exercise # 1

1. Identify and list group of workers who are at risk of heat and cold working environment.
2. Explain health effects of extreme temperatures
3. Discuss the prevention and control methods for both heat and cold stress

Thermal Comfort

❖ Thermal comfort is very subjective and people will feel differently about what is the "ideal" thermal environment. Issues of thermal comfort manifest themselves at much less extreme conditions than those that may cause thermal stress.

3.1.2. Noise

Time: 2 hours

Learning objectives: the aim of this session is to strengthen the trainees' capacity of taking the required actions in prevention and control of noise hazards in different noisy workplaces. At the end of this topic, the trainees are expected to:

- Define and differentiate noise and sound
- Describe nose limits/ noise exposure standards
- Characterize different health effects associated with exposure to noise
- Apply appropriate noise controlling strategies at workplace

Training approaches/methods:

  - Interactive Presentation
  - Brain storming
  - Pyramiding
  - Group discussion
  - Demonstration
  - Spider diagram
  - Questions and answers
  - Exercising Cross over groups

- **Materials required:**
  - Presentation slides
  - Printed materials/Handout
  - Flip chart and marker
  - Sound level meter
  - Real life videos and Photos

➢ Sound and Noise

- Sound is a pressure variation (wave) that travels through air and is detected by the human ear. Sounds are actually pressure waves caused by a vibrating body, which radiate from the source.
- Noise is eexcessive or unwanted sound which potentially results in annoyance and/or hearing loss (can be from occupational and/or non-occupational sources).
  - The 'sound frequency' is the number of pressure variations per second, and is expressed in Hertz (Hz).
  - Normal human ear can detect frequencies roughly in the range 20 to 20 000 Hz.
  - The highest sensitivity is in the range between 2000 – 4000 kHz, and it decreases towards higher and lower frequencies.

The sound level measured relative to other sound levels or a base reference level. Its unit is called decibel (dB). Several scales A, B, C weighted scales were developed to match the response for sounds of low, moderate, high intensity. dB(A) is the most commonly used scale which accounts the middle range of frequencies the human ear is most sensitive.

Table 4: Occupational Exposure Limits (Noise)

Duration per day (Hours)	Sound levels (dBA)
8	90
6	92
4	95
3	97
2	100
1-1/2	102
1	105
½	110
¼ or less	115

When is noise to loud?

If two people 3 feet apart shout must to be heard, the background noise is too loud (above 85 decibels).

Activity # 1 Small group discussion

Discussion points

- Discuss the major source of noise in your working environment
- Identify at risk working group for noise hazard

Approach

Brain storming

Time: 20 minutes

Materials needed: Pens, Marker and Flip chart

Instructions:

- Step 1: Divide the participants into small groups of approximately four-five people each.
- Step 2: Choose one person to be the group's scribe. Discuss and write down the source of noise on the flip charts
- Step 3: After you list the source of noise, develop prevention and control methods.
- Step 4: After 15 minutes, everyone come to the big group and let each group attach their flip chart on the wall
- Step 5: Let the participants present and make a discussion.

Summary notes:

- **Health Effects of Excessive Noise**

The damage is related to the intensity, nature (continuous or intermittent), duration of the noise exposure and individual susceptibility. Hearing loss due to chronic noise exposure usually begins at 3000 Hz or 4000 Hz.

Signs of hearing loss

- Difficulty of hearing when people speak
- Inability to hear certain high pitched and soft sound
- Ringing in the ear

Possible health effects of noise include;

- **Noise-Induced Hearing Loss (NIHL):** Is a cumulative effect from repeated exposure and it is due to damage to the hair cells of the cochlea in the inner ear.
- **Tinnitus:** Ringing in the ears due to temporary exposure to high sound levels
- **Temporary Threshold Shift (TTS) -** Damage to the hair cells of the inner ear which can impair hearing temporarily, resulting from exposure to *high noise levels*.
- Physical damage to the eardrum and ossicles induced by excessively high noises e.g. explosions.
- **Sociocusis:** Noise induced *permanent hearing loss* Sometimes termed *noise induced permanent threshold shift (NIPTS)*
- **Annoyance/stress-** which is difficult to measure and quantify, but may cause psychological effects such as poor concentration, irritability and stress.
- **Acoustic trauma-** Injury to sensory neural elements of the inner ear by exposure to sudden or intense noise.

- **Work place Noise assessment**

The primary interest as far as workplace noise is concerned is with occupational noise exposure and compliance with an occupational noise exposure limit. Therefore a noise survey should be undertaken in areas where it is suspected that persons could be exposed to workplace noise in excess of the noise exposure limit.

- **Noise measurement**

The most common instruments used for measuring noise are:

- Sound level meter (SLM),
- Integrating sound level meter (ISLM), and
- Noise dosimeter.

It is important to understand instruments calibration, operation and reading that you use.

- **Noise prevention and control methods**

Reduction at source

- Acoustical design
  - Decrease vibrating energy
  - Change coupling b/n the energy and vibrating system
  - Change structure to produce less sound
- Substitution with less noisy equipment's
  - Change method of processing

Reduction of noise at path

- Increase distance b/n source and receiver
- Acoustical treatment of ceiling, walls and floor to absorb sound
- Enclosure of noise source
- Hanging Absorbers: 5 - 8 dB average and up to 15dB reduction.

Reduction of noise at receiver

- Personal protection (Hearing defender such as earplugs, canal caps and earmuffs)
- Isolating the workers and Reduce exposure time
- Job schedule

Exercise # 2 Unit summaries

1. Define and differentiate between sound and noise

2. Describe noise exposure limits/ standards

3. Explain health effects associated with exposure to excessive noise

4. Develop noise prevention and control strategies

3.1.3. Vibration Hazard

Time: 2 hour

Learning objectives: the main objective of this topic is to enable the trainees in taking the necessary interventions for prevention and control of workers exposure to vibration related hazards in different work setups. Upon completion of this topic participants are expected to:

- Define vibration
- Describe different health effects associated with exposure to vibration
- Evaluate and determine workers' exposure levels to vibration hazards
- Demonstrate the best options of vibration hazards prevention methods

Training approaches/methods:

- Interactive Presentation
- Group discussion
- Demonstration
- Buzz Group
- Pyramiding
- Brain storming
- Case study

Materials required:

- Presentation slides
- Printed materials/Handout
- Flip chart and marker
- Accelerometer
- Vibrating material or Real life videos and Photos

➢ **Introduction to vibration hazard**

Discussion points (use Buzz Group)

- What is vibration?
- What is the difference between vibration and noise?

Vibration is a mechanical phenomenon whereby oscillations occur about equilibrium. Vibration enters the body from the organ in contact with vibrating equipment. The

oscillations or movements may occur in different directions and frequencies, measured by the unit m/s^2. In working life, we consider two types of vibration related to health of workers.

a) **Hand-arm vibration (HAV):** is mechanical vibration, which when transmitted to the human hand-arm system, can result in vascular, bone or joint, neurological or muscular disorders. When a worker operates hand-held equipment such as a chain saw or jackhammer, vibration affects hands and arms.

Figure 9: Hand-arm vibration

b) **Whole-body vibration (WBV):** is the mechanical vibration that when transmitted to the whole body can result in low-back morbidity and trauma of the spine. When a worker sits or stands on a vibrating floor or seat, the vibration exposure affects almost the entire body.

Figure 10: Sample source of Whole-body Vibration

Activity # 5 Small group discussion on vibration hazard

Approach

Small group activity and discussion

Time: 30 minutes

Materials needed: Pens, Marker and Flip chart

Instructions:

- Step 1: Divide the participants into small groups of approximately four-five people each.
- Step 2: Choose one person to be the group's scribe.
- Step 3: Identify tools and equipment's that can cause vibration injury
- Step 4: Determine types of vibration (HAV or WBD) associated with the tools and equipment.
- Step 5: Explain the most at risk working group/industry
- Step 6: Describe the health effects associated with vibration
- Step 4: After 25 minutes, everyone come to the big group and let each group attach their flip chart on the wall

Summary notes:

➢ **Health Effect of Vibration**

Vibration exposure to the hand and arm is documented as causing specific negative health effects if the exposure is high and takes place for longer periods. The health effects are presented as hand-arm vibration syndrome (HAVS). It can cause three different types of clinical symptoms.

➢ **Hand-arm vibration syndrome**

a) Disturbed circulation

b) Neurological symptoms

c) Musculoskeletal symptoms

- A worker with disturbed circulation experiences “white fingers”; attacks with white, painful fingers.
- Hand arm vibration may cause carpal tunnel syndrome which affects the fingers and hands. Working in a cold and damp environment can aggravate the effect.
- Tingling, numbness, blanching of fingers and pain.

Figure 11: Health effect of HAV

Whole-body vibration may cause back pain and different musculoskeletal problems. However it is not clear how this exposure harms the body. One theory is that the vibration causes micro-fractures in the spine.

- **Workers exposure level to vibration hazard**

Vibration Directive

- **For hand - arm vibration**

  The daily exposure limit value(ELV): 5m/s^2

  The daily exposure action value(EAV): 2.5m/s^2

- **For Whole body vibration**

  The daily exposure limit value (ELV): 1.15m/s^2

  The daily exposure action value (EAV): 0.5m/s^2

Note: The **exposure limit value** (ELV) is the maximum daily level of vibration an employee may be exposed to.

- The **exposure action value** (EAV) is the level of daily exposure to vibration for any employee which, if exceeded, requires employers to take action to reduce risk.

Measurement of Vibration

- Vibration is usually measured by the use of accelerometers.

- Unlike noise measurements, vibration ones have a subjective element to them in that the accelerometer may be held against a vibrating tool by hand; may be fixed to it for example by plastic ties; or may be fixed to the operator's hand.

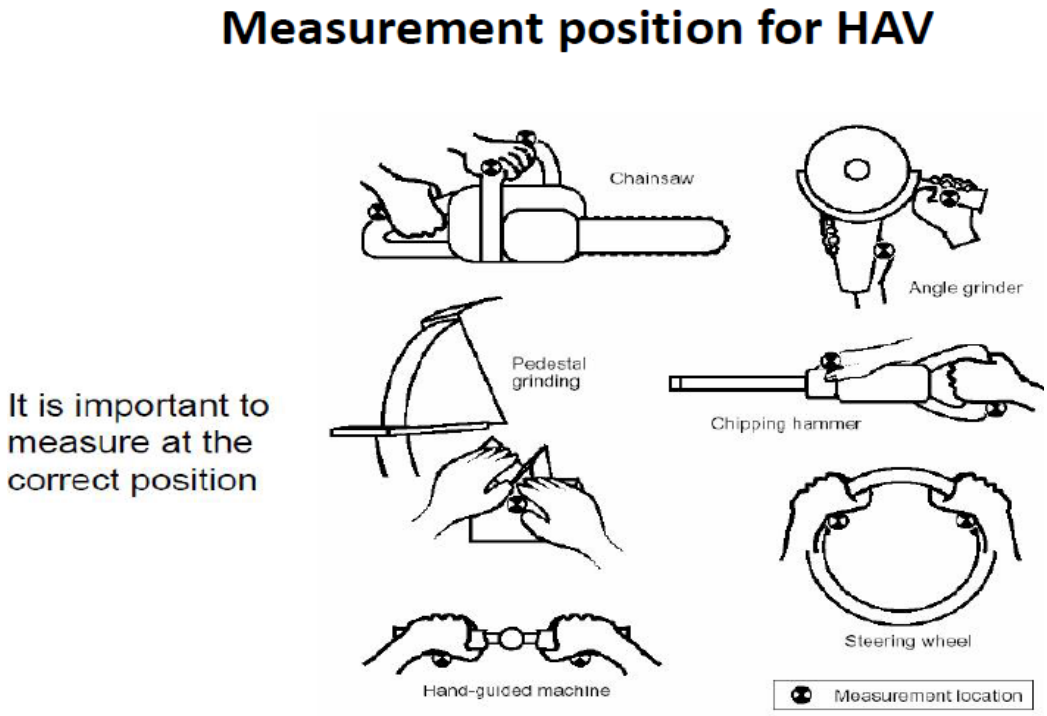


Figure 12: Hand-arm vibration measurement position

- **Vibration hazard prevention and control methods:**
  - Pre-placement screening
  - Routine medical checks
  - Use tool properly
  - Avoid unnecessary exposure
  - Minimize grip and push force
  - Select low emissions tool
  - Keep warm
  - Wear anti vibration gloves
  - Job rotation
  - Maintain floor
  - Training and education
  - Control exposure time

Summery Exercise # 3

1. Define vibration
2. Describe different health effect associated with exposure to vibrations
3. Discuss about the best option of vibration hazard prevention and control methods

3.1.4. Radiation Hazard

Time: 3 hours

3.1.4.1. Ionizing radiation

Time: 1:30 hour

Learning objectives: the purpose of this session is to enable participants understand the sources, nature, characteristics and associated health effects of radiation and then take appropriate corrective actions in prevention and control of workplace radiation hazards. At the end of this topic participants are expected to:

- Define terminologies related to radiation hazard
- Differentiate the nature of ionizing radiation and nonionizing radiations
- Identify radiation hazards at workplace
- Identify people who are at risk for radiation hazard exposure
- Discuss health risks associated with exposure to radiation
- Apply and cooperate for workplace radiation control actions

Training approaches/methods:

- Brain storming
- Presentation
- Group discussion
- Spider diagram
- Cross over groups

Materials required:

- Presentation slides
- Printed materials/Handout
- Flip chart and marker

Introduction

Discussion points (Cross over groups)

1. What is radiation?
2. What is ionizing radiation and nonionizing radiation?

Summary notes:

Definition

- **Ion-** an atom or molecule that carries either a positive or negative electrical charge.
- **Ionization**-the process whereby one or more electrons is removed from a neutral atom by the action of radiation.
- **Radiation**- the emission of atomic particles or electromagnetic radiation (Electromagnetic waves)from the nucleus of an atom. Radiation is emission (transmission) of energy as a wave or moving particles from the nucleus of an atom. The electromagnetic spectrum can be divided into two at a wavelength of about 10 nm, which distinguishes **NON-IONISING RADIATION** and **IONISING RADIATION**.

- **Ionizing radiation**
  - **particles** or **electromagnetic radiation** which have sufficient energy to affect atoms directly i.e. 'ionize' them, namely to create charged particles, or "ions", when they interact with matter.
- **Non ionizing radiation**
  - **electromagnetic radiation** that doesn't cause ionization. Includes UV, laser, infrared, microwave and radio frequency radiation.

There are five different types of ionizing radiation,

- Alpha (α),
- Beta (β),
- Neutrons (n),
- Gamma (γ),
- X-ray (χ).

The first three of these are particles and the latter are electromagnetic radiation.

Activity # 1 Small group discussion on Radiation hazard

Approach

Small group activity and discussion

Time: 20 minutes

Materials needed: Pens, Marker and Flip chart

Instructions:

- Step 1: Divide the participants into small groups of approximately four-five people each.
- Step 2: Choose one person to be the group's scribe.
- Step 3: Identify the source of radiation hazard
- Step 4: Determine the most at risk working group/industry
- Step 5: After 15 minutes, everyone come to the big group and let each group attach their flip chart on the wall
- Step 6: Let the participants present and make a discussion.

Facilitator notes:

Table 5: Examples of electromagnetic radiation

Type	Nature	Charge	Relative Mass	Range in Air	Penetration
Alpha	Particulate (helium nucleus)	+ +	4	0.4 - 2 cm	None
Beta	particulate (electron)	-	1/1800	5-20 cm	Slight
Neutron	Particulate (neutron)	0	1	long	High
Gamma	Electro-magnetic	0	0 High	Very long	High
X-ray	Electro-magnetic	0	0	Very long	High

Alpha-particles

Usually emitted by heavy radioactive elements such as uranium, radium, radon and plutonium. It is easily stopped by a sheet of paper, a film of water, skin or other thin material. It is only dangerous to man if the particles enter the body by inhalation or by ingestion.

Beta-particles

Have a longer range – typically around 10 meters in air. Glasses, thick clothes and Light metals like aluminum are sufficient as protection, otherwise may reach basal skin cells. May cause damage if it enters the human body via inhalation or ingestion.

Neutrons

Is a part of nuclei in an atom ejected from nucleus by the disintegration of certain radioactive atoms.Emitted in fission/ disintegration processes such as those occurring in nuclear reactors during operation. The biological effects of neutrons are for a given absorbed dose (Gy) larger than the effects of gamma or X-rays. High speed neutrons are "thermalized" by elastic collisions in hydrogenous materials (e.g., water, paraffin, concrete). The “hit” nuclei give off the excess energy as secondary radiation (alpha, beta, or gamma). Slow neutrons are captured by secondary shielding materials (e.g., boron or cadmium).

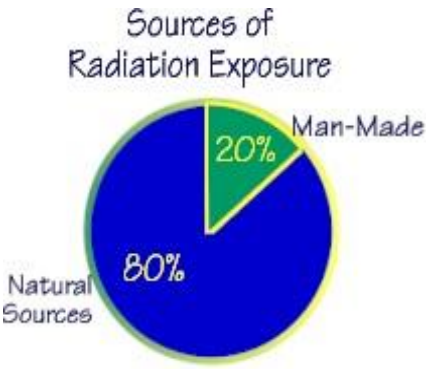
X-radiation

X-rays are photons (electromagnetic radiations) emitted from electron orbits, such as when an excited orbital electron "falls" back to a lower energy orbit. A few millimeters of lead are usually sufficient for adequate protection

Gamma-radiation

Gamma rays are photons emitted from the unstable nucleus of an atom, often as part of radioactive decay. Gamma radiation generally has higher energy than X-rays. A protective shield of several centimeters of lead or tens of centimeters of concrete.

Source of ionizing radiation



1. **Naturally Occurring**
2. **Consumer Products**
3. **Foods and Containers**
4. **Medical Procedures**
5. **Nuclear Plants**
6. **Radiological Sites**
7. **Government & Industry**

Natural sources:

- Cosmic rays (those originate from the outer space) γ-rays & x-rays
- Radioactive isotopes occur naturally
- Sometimes hot spots in geological formations

Anthropogenic sources:

- Mining, Nuclear power, Nuclear weapons, Medicine in diagnosis & treatment, industrial.

Types of workers exposed to ionizing radiation

- Atomic energy plant workers, dental assistants, dentists, electron microscope makers, radiologist, X-ray technician, mineral miners /Ra, thorium/etc.

Ionizing radiation can be measured by:

- **Becquerel**: measures the number of emitted particles
- **Gray**: calculates the effect of the ionizing radiation, given as Joule absorbed energy per kilogram
- **Sievert**: takes into account the tissue being radiated (1 Joule/kilogram)

The possible effects of ionizing radiation

Exposure of living tissue to ionizing radiation results in damage to the component cells. Such radiation damage can be useful to mankind (as in the treatment of cancer under carefully controlled conditions), but under most conditions it should be avoided as far as possible.

- **Damage to chromosomes:** Interfere with mitosis causing affected cell to die when it attempts to divide.
- **Effects on tissues**: bone marrow & lymphoid tissues, hemopoiesis cells are highly radio sensitive & show degenerative changes within minute after a dose is excess of 1sv.
- **Gastro intestinal tract:** Dividing cells in the mucosal epithelial of the small intestine are highly radio sensitive & are killed in sufficient numbers by a dose of 10sv.
- **Lens of the eye:** Formation of lens opacities, cataracts, threshold is from 2 to 3sv in a single dose.
- **Effects on embryo:** Embryonic growth is affected by rapid expose to 0.25 sv cause cancer in many babies. Ionizing radiation can damage the geneticmaterial in the sperm or the egg cells causing mutations.

➢ **Radiation Protection and Control**

Control of exposure to radiation can be divided into four main approaches. In practice a combination of all of these control approaches is often applied.

- **Time:** Limiting or minimizing the amount of time to which people are exposed to radiation will reduce the dose which they receive.
- **Distance:** Radiation intensity decreases sharply with distance, according to an inverse square law. In addition even air attenuates alpha and beta radiation.
- **Shielding:** Alpha particles may be completely stopped by a sheet of paper, beta particles by aluminum shielding. Gamma rays can only be reduced by much more substantial barriers. Barriers composed of lead, concrete or water give effective protection from energetic particles such as gamma rays and neutrons. Some

radioactive materials are stored or handled underwater or by remote control in rooms constructed of thick concrete or lined with lead.

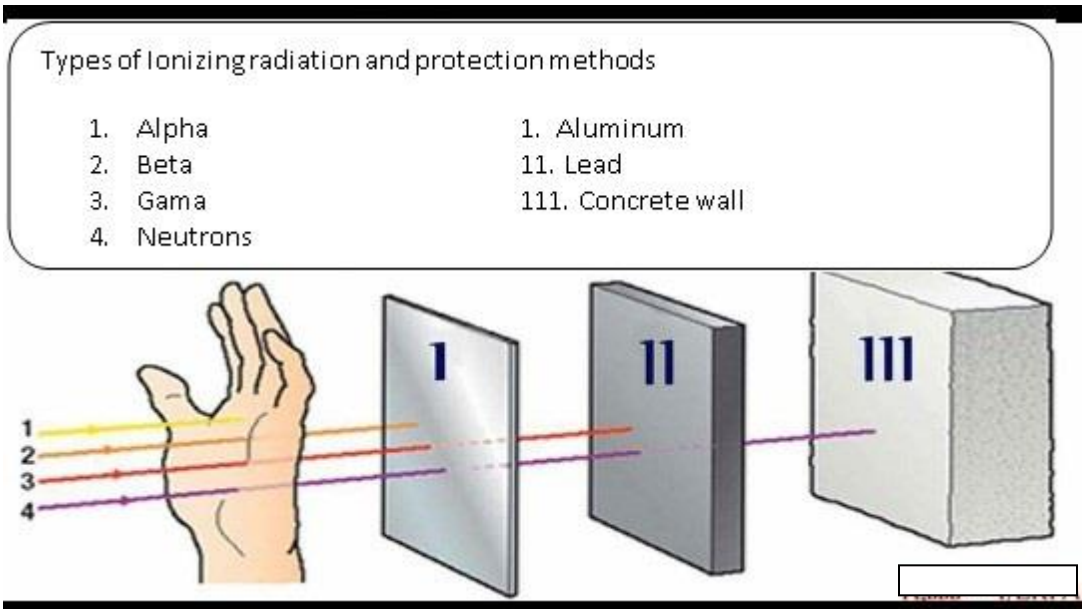


Figure 13: Effectiveness of Shielding for radiation hazard

- **Containment:** Radioactive materials may be used in "sealed sources" to prevent them spreading. The use of small working spaces, segregated areas and controlled ventilation are also used to contain the release of radioactive materials.

Summary exercise # 4

1. What is Ionizing radiation?
2. List types of ionizing radiation hazard with their sources
3. Mention the best option of ionizing radiation prevention and control methods

3.1.4.2. Lighting and Non-ionizing radiation

Time: 1:30 hour

Learning objectives: the objective of this topic is to support the trainees in taking corrective actions in controlling and prevention of work place light and non-ionizing radiation related health hazards. At the end of this topic participants are expected to:

- Define and differentiate lighting and non-ionizing radiation

- Describe major types of non-ionizing radiation hazards
- Characterize health effects associated with exposure to non-ionizing radiation
- Characterize effects of excessive and poor lighting
- Apply appropriate methods to control exposure to non-ionizing radiation and poor lighting condition.

Training approaches/methods:

- Interactive Presentation
- Spider diagram
- Brain storming
- Group discussion
- Questions and answers
- Cross over groups

Materials required:

- Presentation slides
- Printed materials/Handout
- Flip chart and marker

3.1.4.3.1. Non-ionizing radiation

Brief Presentation

Electromagnetic waves are produced by the motion of electrically charged particles. These waves are also called "electromagnetic radiation" because they radiate from the electrically charged particles. The electromagnetic spectrum can be divided into two at a wavelength of about 10 nm, which distinguishes NON-IONISING RADIATION and IONISING RADIATION. Visible light, infrared and microwaves are types of non-ionizing radiation. X-rays and Gamma rays are examples of ionizing radiation. The distinction between non-ionizing and ionizing radiation is simply one of associated energy. For the ionizing region of the electromagnetic spectrum, the energy incident upon a material is large enough to remove an electron from an atom orbit to produce ionization, whereas for the non-ionizing region the energy is not normally sufficient to produce ion pairs.

Types of Non-Ionizing Radiation

- **Ultraviolet (UV) Radiation**

UV is invisible radiation produced naturally by the sun (solar radiation) and artificially in industry via arcs (e.g. welding) operating at high temperatures.

- **Infrared (IR) Radiation**

IR radiation is emitted by hot bodies, e.g. furnaces and gas torches. Its primary effect is heating of surface tissues.

- **Laser Radiation**

The name laser is an acronym for 'Light Amplification by Stimulated Emission of Radiation'. Laser machines emit a concentrated beam of non-ionizing radiation.

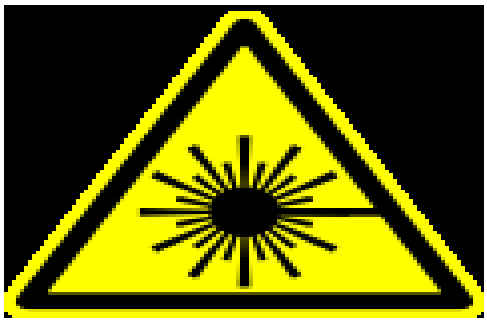


Figure 14: *Warning label for class 2 and higher laser radiation*

Table 6: Laser Classes

Class 1	Safe
Class 1M	Safe provided optical instruments are not used
Class 2	Visible lasers; Safe for accidental exposure
Class 2M	Visible lasers; Safe for accidental exposure providing optical instruments are not used
Class 3R	Not safe; Low risk
Class 3B	Hazardous; Viewing of diffuse reflection is safe
Class 4	Hazardous; Viewing of diffuse reflection is also hazardous; Fire risk

- **Microwave Radiation**

Microwaves are produced by molecular vibration in solid bodies and are usually described by the wave frequency generated.

Activity # 6 Small group discussion on non-ionizing Radiation hazard
Approach; Small group activity and discussion
Time: 30 minutes
Materials needed: Pens, Marker and Flip chart
Instructions:

- Step 1: Divide the participants into small groups of approximately four-five people each.
- Step 2: Choose one person to be the group's scribe.
- Step 3: Identify the source of non-ionizing radiation hazard
- Step 4: Describe the health effects associated with exposure to each types of non-ionizing radiation
- Step 5: Determine the most at risk working group/industry
- Step 6: After 25 minutes, everyone come to the big group and let each group attach their flip chart on the wall
- Step 7: Let the participants present and make a discussion.

Summary Notes:

- **Source of non-Ionizing radiation;**

- Dielectric heaters
- Microwave heaters
    - Including microwave ovens
- Broadcast communications
- Radar
- Cell phones
- Cathode ray tubes (VDTs)
- Wireless web

- **Health effects associated with non-ionizing radiation includes;**

- Headaches, sleeplessness, irritability, fatigue and memory loss
- Burning of the skin
- Cancer
- Conjunctivitis
- Cataracts

- **Evaluation of Non ionizing Radiation (NIR);**

Portable handheld ammeters are available to measure NIR. These electrons are collected by an anode and made to flow as an electric current which is measured by a suitably calibrated ammeter. The radiation data obtained are assessed against appropriate occupational exposure limits.

- **Preventive measures**

- It is not as easy to shield from exposures to non-ionizing radiation as it is regarding ionizing radiation.
- Lead shielding has no effect on this type of non-ionizing radiation.
- However, the guidelines concerning distance to source are very important. The radiation decreases when the distance increases.

3.1.4.3.2. Lighting

➢ **Recognition**

Brief Presentation

- Lighting is an essential provision for any workplace.
- Good lighting helps us
    - To see and to recognise hazards.
    - Read clearly labels and safety instructions.
    - It can reduce visual strain and discomfort.
    - Enable employees to perform their work comfortably and efficiently.

- The visible radiation portion of the electromagnetic spectrum is narrow, ranging between 400 and 700 nm. It is the sensitivity of the eyes to this visible radiation that enables us to see.
- In terms of occupational health and safety we are concerned with the subjective feeling of visual comfort, and good illumination which is described in terms of the quantity and quality of the lighting.
    - **Quantity** - this is the amount of illumination on the task. It is measured in lux and must be sufficient for the worker to undertake the task.
    - **Quality** - is the suitability of the illumination, for example the distribution of brightness in a visual environment, the colour of light, its direction, diffusion and the degree of glare.
    - The least desirable type of lighting is that from a single bulb in the middle of the room. Decreased contrast and improved visibility will result from increasing the number of lighting sources across a ceiling.
    - In general, for each visual task performed, a certain minimum quantity of light arriving on each unit area of the object in view is required, dependent primarily upon the nature of the work that is being undertaken.
    - Too little light can lead to eyestrain and headaches, too much light can result in glare. Lighting in the various areas of factories and offices can be classified according to three categories:

- Local lighting
- Localized lighting
- General lighting

- Research has shown that favorable lighting conditions exist when the illumination of the task is about three times greater that of its immediate surroundings, and when the immediate surroundings have three times the illumination of general workroom.
- For each visual task performed, a certain minimum quantity of light arriving on each unit area of the object in view is required. The values set out in theNew Zealand Standard NZS1680.2 series (Interior Lighting - Recommended Illuminances).

➢ **Evaluation of Illumination**

The instrument most commonly used for the measurement of illumination is a photoelectric light meter (often termed a 'Lux' meter).

Figure 15: Light meter

➢ **Glare**

Glare may be defined as any brightness within the field of vision where such character would cause discomfort, annoyance, interference with vision, or eye fatigue. Three different types of glare may be present separately or in combination.

- **Disability glare;**this will affect the capacity to see clearly, e.g. the undipped headlamp on a car or sunshine reflecting from a wet surface.

- **Discomfort glare;**this effect increases with time, e.g. a part of a visual scene (windows by day, lighting by night) may be too bright compared to the background.
- **Reflected glare;** this is seen in shining or polished surfaces which reflect a more or less distorted image of a bright light, fitting or window. This can be annoying or disabling, for it may be difficult or impossible to see whatever is beneath.

➢ **Good Illumination**

Guidelines for designing illumination of good quantity and quality are:

- Consider lighting at the design stage of any building or workplace
- Design for sufficient lighting in line with establishing guidance
- Integrate daylight and artificial light
- Avoid glare
- Minimize flicker
- Ensure adequate maintenance of glazing surfaces and light fittings

Summarize the session with revision of key areas via question and answer.

3.2. Ergonomics

- **Time: 6 hours**
- **Learning objectives:** this session is designed to equip participants with basic and fundamental ergonomics principles at work place and support actions for reduction of work related injuries/illnesses/accidents resulting from exposures to poor ergonomics. At the end of this session participants are expected to:
  - Understand the meaning and role of Ergonomics in improving health and safety at work.
  - Describe common health effects associated with poor ergonomic condition.
  - Demonstrate safe lifting methods for material movement
  - Exercise improved workstation design and plant layout in a work setup.
  - Improve their action for safe selection and use of hand tools/equipment for specific task.

Content

- Overview of Ergonomics at work
- Common Health Effects Due to Exposure for Poor Ergonomic Condition
- Manual Material Handling
- Design/Selection of Hand Tools and Equipment
- Ergonomics for specific groups; Workers with disability

Learning/Teaching Methods

- Interactive presentation
- Individual and group exercise
- Demonstration

Materials Required:

- Presentation slides
- Hand-out of Ergonomics glossary and guides
- Flip chart and marker
- Box/bags with 10 and 30 kgs
- Sample hand held tools or any equipment for daily use
- Video camera or smart phone with Jack/Real life videos and Photos

3.3.1. Overview of Ergonomics:

- Initiate the session with brainstorming questions to assess participants understanding about Ergonomics, its role in improving workplace health and safety and effects of poor ergonomic condition.
- Once about three participants reflect their idea, provide introductory presentation on the above mentioned agendas including session objectives.

Summary of the Session

Ergonomics is the science or field of study with the main aim of fitting the work task to the workers or users. Ergonomics strives to prevent serious injury and/or accidents by considering design conditions to accommodate the abilities and limitations of users in a specific context under which a specific activity is performed.

Any task can expose workers to ergonomic risk factors unless the condition is not well designed and if exposed for long period this risky condition can cause impacts both for the workers and for the organization.

Some of the impacts can be summarized as follows:

- Development of temporary or permanent disabling injuries and illnesses;
    - Musculoskeletal disorders/pain of bone, joint, muscle, tendon etc. of the back, shoulder, neck, and extremities.
- Minor to major workplace accidents that can cause both human and property damages;
    - Fire accident, slip, trip or fall accident, wrong sequence of process, material/property damage etc.
- Reduction of productivity both in terms of quantity and quality;

Therefore, the application of ergonomics will help to make a fit between the workplace conditions and abilities of the workers, considering human limitations and characteristics.

Understanding Ergonomics at Work

Facilitate a kick off group activity to initiate trainees appreciate poor ergonomic conditions at work and in everyday life.

- **Group Activity**;
  - Assign participants to manageable group size.
  - Give instruction to conduct walkthrough of the compound and identify poor design/ergonomic condition around the training compound.
  - Participants will reflect orally with group representative about their insight about ergonomic conditions around their compound.
- Summarize the topic with interactive Presentation supported by photos on sample poor ergonomic conditions in a typical work setup.

Ergonomic Risk Factors/Conditions

Interactive Presentation

Studies in our country are currently reporting great number of prevalence of work related MSDs where the risk factors and root causes are associated with poor design of tasks, materials used, posture applied, work processes etc.

Ergonomic risk Factors include;

- **Awkward postures** (e.g., bending, twisting)
- **Repetitive motions** (e.g., frequent reaching, lifting, carrying)
- **Forceful exertions** (e.g., carrying or lifting heavy loads)
- **Static postures** (e.g., maintaining fixed positions for a long time)
- **Pressure points** (e.g., grasping/contact loads, leaning against parts or surfaces that are hard or have sharp edges)
- Exposure to **Vibrating** tools and machines
- Exposure for **cold weather** will be very hazardous when mixed with vibrating materials.

The presence of compounding risk factors will aggravate the manifestation and severity of the impacts. This happens when more than one risk factor present in a given task; hence, reducing any one of the risk factors significantly reduce the probability of the injury or any effect.

Common Health Effects Due to Exposure for Poor Ergonomic Condition

Interactive Presentation

If tasks are performed in a poor ergonomic condition with risky condition repeatedly or over long period, it can lead initially to fatigue, discomfort, acute injury and accident. Moreover, through time this will lead to chronic illnesses that may include damage to bone, joints, muscles, tendons, ligaments, nerves, and blood vessels which is known as musculoskeletal disorders (MSDs). About one third of absenteeism due to sickness from work is reported as it is associated with musculoskeletal disorders.

Health effects of poor working procedure could happen in the form of;

- *Single-event injury*; i.e. acute or traumatic injury immediately after exposure
- *Cumulative trauma disorders*; chronic disorders after repetitive exposure for minor traumas.

Series of repeated micro-traumatic events may not lead the body to an immediate damage, but it will cause serious cumulative trauma disorders called “Musculoskeletal Disorders (MSD)”.

Brainstorming Question:

- Brainstorming Question for participants to mention some sign and symptoms of work related MSDs.
- Once majority of the symptoms mentioned, present the following points.

Common Signs and Symptoms of MSDs:

- Reduced grip strength of the hand
- Swelling or stiffness in the joints
- Reduced range of motion in the shoulder, neck, or back
- Dry, itchy, sore eyes, blurred or double vision if involve visual tasks
- Aching or tingling sensation
- Cramping, Recurring or continuous aching/pain/discomfort
- Numbness
- Stabbing or shooting pain on the affected body part
- Redness and swelling

It is important to anticipate before occurrence for safe practice; recognize and report when the signs and symptoms occur as early as possible for early intervention to prevent serious problems.

➢ **Common Work Related MSDs:**

Now a day, MSDs especially low back pain is the most commonly reported work related injury mostly linked to long sitting or standing at work, overexertion and repetitive bending from manual material handling i.e. lifting, pushing, and pulling as the common causes. However, the exact cause of low back problem is not clear since physical conditions of the person, emotional stress, long period inactivity, heavy labor, and pre-existing health conditions can aggravate or initiate the episode.

- ***Group exercise with Bingo game***; matching with Ergonomic Glossary for definition and risk/causes of specific MSDs;
- Assign participants to manageable group
- Distribute the matching template and give instruction for the exercise
- Let the winner group to reflect their response and let for comments by other group for any correction.
- Refer Ergonomic glossary for MSDs for final summery.

Summarize the exercise with brief presentation supported with pictures and examples for the common MSDs associated with work related causes; refer annex for ergonomics glossary.

Ergonomic Design principles and approaches:

i. Design/Selection of Hand Tools and Equipment

Figure 16: Design/selection of hand tools and equipment

Time: 20 min

Brief presentation of the Session

Different types of hand tools are being used to facilitate tasks and improve functionality at work. Good-quality hand tool should be used to fit the hand and the task. Hand tools can extend functionality; however, its design conditions could affect users grip strength, speed of operation and the safety, comfort and performance.

Brainstorming Question:

- Ask participants to mention sample types of hand tools that are being used at different work setup to improve user's functionality.
- Let participants reflect their idea about what criteria do they use to select a tool for their use.

Continue brief presentation

Exposure to awkward postures or harmful contact pressures while using hand tools can cause either acute/chronic injury on users. It is possible to reduce risk of injury if one select/use hand tools that fit his/her hand and job.

Brainstorming Question

- Ask participants to mention the root causes for accidents and injuries associated with the use of hand tools.
- Make sure the key conditions are discussed in their reflection

Accidents and/or injuries with hand tools mainly arise from human factors i.e. carelessness, not knowing the right tool for the job, ignorance of safety precautions and failure to maintain tools. Workers should be correctly instructed in how to use tools and how to use/keep them properly.

- Continue interactive presentation with key points.

Ergonomic concerns on hand tool and Factors that affect hand tool use

- Tool design (weight, structural shape, fit to the user and the task)
- Workstation design (size, shape and layout)
- Tools handle condition (Shape, Diameter, Length, Separation between handles Materials and texture of handles)
- The way tasks are scheduled
- Condition of tools (status of the tool)

Selection, use and maintenance

Basic issues to be considered in selecting, using and maintaining hand tools:

- Select the correct weight, size and tool for the user and the job;
- Avoid static load at the shoulder or arm due to the continuous holding of a tool at a raised position or the gripping of a heavy tool;
- Avoid awkward wrist angles while using tools;
- Reduce uncomfortable pressure on the palm or joints of the hand;
- Handles should have smooth finish, should be easy to grasp and should have no sharp edges or corners;
- Tools should be firmly fixed and regularly checked for splits and cracks;
- Tools should be kept free of grease and dirt, but the moving/adjustable parts should be well oiled;
- Cutting edges should be kept sharp for accurate working and avoid unnecessary pressure; but cutting edges should be sheathed;
- Properly insulated tools should be used for work on or near electrical apparatus;
- Tools should be properly stored in boxes, racks, holders or pocket belts and should not be left so that they might fall, roll or be tripped over;
- Damage tools should be immediately repaired or replaced.

Key Ergonomic tips in selecting and using hand tool;

- "Bend" the tool, not the wrist; use tools with angled or "bent" handles;
- Avoid high contact forces and static loading;
- Reduce excessive gripping force or pressure;
- Avoid extreme and awkward joint positions;
- Avoid repetitive finger movements, or at least reduce the frequency;
- Avoid or limit vibration;
- Minimize the amount of force needed to activate trigger devices on power tools.
- Select a tool without sharp edges and coated with soft material;
- The end of the handle shouldn’t press on the nerves and blood vessels in the palm of hands;
- Select a tool that has a non-slip surface for a better grip;

- Select a tool that can be used with your dominant hand or with either hand (where possible, should be appropriate for right and left-handed workers).

ii. Working Posture

All anatomical conditions have effect on the normality and abnormality of posture.

➢ Pose brainstorming Questions about normal and abnormal Postures.

- **Good posture;** is a state of muscular and skeletal balance that protects the supporting structures of the body against injury or progressive deformity.
  - Under such conditions muscles will function most efficiently and the optimum conditions will be achieved for the thoracic and abdominal organs.
- ***Poor posture;*** is a faulty relationship or an imbalance between various parts of the body which result in increased strain on the support structures and in which there is less efficient balance of the body over its base of support.

Tasks can be performed in wither of the three types of working posture i.e. Standing, Seated, Seat-Stand postures.

Tips on Working Posture

Sitting

Sitting with several "bad" postures for short periods may be better (or at least no worse) than using one "good" posture over long periods.

Individuals are encouraged to use three or more seated postures throughout the workday to allow various muscle groups time to relax and recuperate.

ator.

Adjust Lighting and Vision and Rest Break

- Make sure you have adequate lighting and minimal glare (Indirect lighting)
- Lights in front of the worker are hard on the eyes and lights behind the work bench produce reflected glare, hence lights should be at perpendicular position; shading windows and glare screen can reduce reflective effects.
- Keep clean if wearing glasses or contact lenses.
- Be curious to avoid eyestrain:

- Blink often, close your eyes for a minute, refocus by looking away from your monitor at something in the distance, roll your eyes up and down, left to right.
- Short, frequent breaks are more beneficial than longer infrequent one.

- Sitting for more than two to three hours without moving can put stress on the body.
- Breaks can be as simple as standing up and walking around your desk three times or change the task as a break.
- During these breaks stand, stretch, and move around. This provides rest and allows the muscles enough time to recover.
- Some simple exercises can be done at your desk such as slowly turning the head from side to side and holding for 10 seconds or spreading fingers apart and hold for 10 seconds.

➢ *Facilitate demonstration of good and poor sitting posture!*

- *Let participants to*
- *Invite two participants to demonstrate and encourage discussion among trainees about the best sitting posture with key indicators.*

iii. Manual Material Handling

Brief Presentation on the Session

Manual handling is the movement or support of any load by physical effort, including lifting, putting down, pushing, pulling, carrying, and moving which includes the use of mechanical aids like trolleys and wheelchairs.

Poor manual material handling causes one third of all workplace injuries i.e. MSDs pain and injuries to arms, legs and joints, and repetitive strain injuries of various body parts.

Group Activity

- Facilitate pair discussion among participants,
- Give instruction to write down conditions under which manual handling practice will be hazardous
- Then let them make four together for further discussion
- Let groups to present with their representative
- Share their experience about the exercise

Facilitate interactive presentation

- Too heavy and/or bulky load, placing unreasonable work demand.
- The load is to be lifted from the floor and above the shoulders.
- Task that involve frequent/repetitive movement.
- The task that is positioned in awkward posture
- The load that cannot be gripped properly.
- A task performed on uneven, wet, or sloping surfaces
- Workers are not familiar with the task

***Individual Exercise*:**

- Demonstration of Safe Manual Material Handling
- Invite at least three individuals to demonstrate safe manual material handling using available loads of different weights
- Let participants to test lifting of different weights, at different height and distance
- Let participants to reflect their observation

Note: Give stress for key area of ergonomic concern in manual material handling during demonstration.

Conclude the session with the following brief presentation

Best approach to design manual handling

- If possible avoid manual handling, use ergonomic assist equipment and automation techniques (*no people involved, no people at risk)*
- If to handle, load weight and size shall be kept small
- If to handle; the movement should be horizontal, not lifting/lowering & Pull
- If lifting is a must, the material:-
  - Best if between hip/knee and shoulder height
  - Should be close to & in front of the body
  - Shouldn't be too heavy(<25kg)
  - Should be compact, safe to grasp (firm box, handled)
  - Shouldn't have sharp edge, corner
  - If in containers should be easily movable from container

Manual Handling Guide

- Check the weight before handling
- Request help if it is heavy/not appropriate for handling
- Lifting frequency shouldn't exceed 5 lifts per minute
- Vertical lifting distance shouldn't exceed 3 feet
- Shouldn't be carried for longer than 1 minute
- Tasks that require large sustained pushing or pulling forces shouldn't exceed 30 sec duration
- Extended reach static holding tasks exceed 1 minute

iv. Workstation and Layout design;

Brief Presentation

Proper design of the workstation and layout is very important for productive work where if the workstation is poorly designed it can lead to;

- Develop MSDs or aggravate the situation;
- Systemic illness i.e. circulatory problems in the leg;
- Workers fatigue and discomfort that can affect efficiency and productivity;
- Commit errors that can affect the product quality;
- Human error that can lead to accident occurrence etc.

Therefore, a workstation should be designed to fit the needs of the individual worker depending on the height, reach and size; type of machine or tools being used and the task being performed.

Even minor ergonomic changes like the design of equipment, workstations or tasks that doesn't cost much can make significant improvements in worker's comfort, health and safety conditions and productivity.

Group Exercise

- Let participants out of the training room
- Make a mess two workstations in and around the training room
- Ask participants to be in two or three groups and redesign the room layout and workstation of specific tasks
- Observe and record all the process and their action with video camera

- Then let participants observe the records and evaluate their action from ergonomic point of view; any hazardous practice, process flow with hazardous nature and obstacles etc.

Note: Check key area of ergonomic concern in workstation design and manual material handling principles.

Conclude the session with the following general design principles

Basic Principles of Work Station/Layout Design;

In the workstation design the following improvements should be considered

- **Frequency of use**; place the most frequently used tools in the usual work area means closer to the worker;
- **Sequence of use**; place materials or tools based on the sequence with first used item to be found first and likewise for the others.
- **Importance of use**; the most important and critically valuable materials should be placed at easy access, closer and with known place and sign.
- **Group by function**; materials with similar function should place in a the same place; don't mix up tools with different function in the same place.
- **User groups**; understand who will be using the materials so that make sure it is placed at easily accessible and known place.

Examples: let participants' think of the food pyramid; have three shelves on it to pace actions for ergonomic improvements from tip/top to dawn where the top of the pyramid represents something that is necessary, but should be kept in small amount, like oils and fats.

v. Ergonomics for specific groups; Workers with disability

Introductory Presentation

The national legal framework i.e. proclamation No. 568/2008 provides VAT tax exemption for companies having 60% of their work force consisting or persons with disabilities. But not many organizations open their door for equal employment opportunity to people with disabilities. Literature repeatedly reported that very small proportion of individuals with disabilities have access to employment due to different discriminating factors. Even for those who are engaged at work, there are many limiting

factors that can affect their full function, integration and contribution of which the issue of access to basic health and safety services at workplace is the key concern.

Employees with disabilities are entitled to the same level of health and safety like everyone else. Hence, safety concerns need to be specially designed/adjusted to address the needs of people with disability at work and any necessary "reasonable adjustment" should be arranged to perform their task as required.

Discrimination against persons with disability (PwD) can start at home from families, relatives, neighbours and friends; however, at work place when it happen (from co-worker/manager/employer) the effect will severely affect individual's life.

Plenary Discussion

- Facilitate plenary discussion among participants to identify key health and safety issues that require special focus for workers with Disability.

***Note**:* make sure to consider in terms of their types of disability and give a focus for those points that need special adjustment.

- Design issues (Accessibility of built environment, design of tools, equipment, workstation layout, work schedule etc.)
- Exposures to Biological, chemical and physical agents;
- Information and communication (displayed information, on training);
- Emergency medical services and first aid;
- Warning devices and alarms;
- Workplace violence and employment issues;
- Issue of special need adjustment (personnel assistance, special materials etc.)

Group Activity: Access Audit Exercise

Method: Walkthrough of their compound

Duration: 10 min assessment and 5 min for presentation

Facilitator:

- Divide participants in to manageable groups
- Give instruction to conduct short walkthrough of a the compound or identify a known workplace in which participants had exposure

- Assign one group to conduct living as if by acting as individuals with different types of disabilities
- Identify any safety concern for workers with different types of disabilities
- Let the to present their finding using the attached template
- Consider the following condition for specific type of disability

1. **For people with visual impairment in office environment;**

- What issues has to be considered for inclusion of his/her access to all the facilities and information.

2. **For people with hearing impairment;**

- What issues should be considered to recruit him/her with full access to all the facilities and information in the working elements?

- What kind of job do you allow him/her to be engaged?

3. **For people with mobility impairment in a factory;**

- What issues should be arranged for inclusion of his/her access to all the facilities and information in the working environment?

Presentation Format for group work

Ser. No.	Types of Disability	Description of the possible barriers	Design consideration for inclusion of PwD at work
1			
2			
3			

Summarize the session with the following key concluding presentation

Summary Note: Highlight specific key conditions to be addressed for inclusion of a person with specific type of disability.

1. For people with visual impairment in office environment;
   Built environment accessibility and barrier free routs, writing and reading materials, assistive devices based on their need, assistive technology whenever possible, emergency alarming (audio) and exit, personal assistant etc.
2. For people with hearing impairment; emergency alarming (visual) and exit, sign language interpreter (personal assistant).
3. For people with mobility impairment in a factory;
   Built environment accessibility and barrier free routs, assistive devices based on their need, personal assistant, work bench adjustability, emergency alarming (visual/visual) and exit etc.

Ergonomics Improvement Strategies

Time: 40 Min

Brief Presentation

Like any other occupational hazards, strategies for improvements of ergonomic conditions follow the principle of hierarchical hazard control strategies. However, for the purpose of this training the strategies are presented in terms of Engineering improvement, administrative improvement and personal habit/assistive equipment.

Group Exercise:

- Ask participants to identify and make a list of different types of control strategies for the identified risk factors in the previous session.
- Let them post their points, followed by gallery walk with enriching action by other teams using a different colored marker and then determine which team has the most correct responses.

i. Engineering Improvements;

We may prefer to do *Engineering controls*, but they are costly and more time consuming. However, engineering controls are the most effective type of controls because they remove or minimize the exposure to the risk factor and it can be applied to every aspect of a task.

Example; Changes to workstations, equipment, tools, layout, work procedure and environment.

ii. **Administrative Improvements;** are changes to the work procedures associated with the work which can be of any type.

- Job enlargement; multiple tasks are added to a job.
- Job rotation; tasks are rotated throughout the work shift and workers.
- Work pace and duration; managing the pace based on worker's capacity.
- Training; safe lifting, machine operation with neutral posture, use of PPE.
- Shift schedule
- Work-rest cycles
- Exercises etc.

The objective of administrative control is to limit exposures of body parts to a particular risk factor and to give good recovery time.

iii. **Work Habit/Use of Assist Equipment;** are actions made to workers to reduce exposure to risk factors.

- Lifting habit
- Sitting posture
- Break habit
- Exercise habit
- Anti-Vibration gloves
- Knee pads
- Shoe inserts
- PPE to prevent MSDs and environmental stress:
  - This is a barrier between the employee and the risk factor; depends on using it as intended and its quality.

3.3. Chemical Hazards

Session Plan

Time Frame: 3 hour

Learning Objectives: the objective of this topic is to equip the trainees with the basics of chemical hazards, their health effects upon exposure, and prevention and control strategies. Upon completion of this session, participants are expected to:

- List the different forms of chemical hazards
- Identify common chemicals used in specific work setups
- Discuss the different health risks associated with exposure to specific chemical
- Conduct risk assessment for chemical hazards in the workplace
- Identify appropriate personal protective equipment required to provide interim control of chemical hazards at workplace
- Apply/use appropriate control strategy for specific chemical exposure

Content

- Introduction
- Classification of Chemicals hazardous to health based on health effects
- Classifications of Toxic Materials by Physical Properties
- Routs of entry into the body

Learning/Teaching Methods

- Brainstorming
- Group work
- Plenary discussion

Tools

- Markers
- Flip charts

3.2.1 Introduction

Thousands of different chemicals are used in large quantities in various industrial processes, and new chemicals are introduced every year. Depending on the intrinsic toxicity, route of entry, intensity and duration of exposure at numerous workplaces worldwide worker exposure to chemicals represents a serious health hazard. The majority of occupational health hazards arise from inhaling chemical agents in the form of vapors, gases, dusts, fumes, and mists, or by skin contact with these materials.

To recognize occupational factors or stresses, understanding about the chemicals used as raw materials and the nature of the products and by-products manufactured is important. This sometimes requires great effort. The required information can be obtained from the Material Safety Data Sheet (MSDS), which supplied by the chemical manufacturer or importer for all hazardous materials. The MSDS is a summary of the important health, safety, and toxicological information on the chemical or the mixture ingredients.

▪ Forms of Chemical Agents

Facilitators Activity:

Divide participants in to manageable groups and display the following questions on overhead projector in front of the room.

- List and discus the forms of chemical agents
- Outline the classification of hazardous chemicals and their health effects
- What are the routes of entry of chemicals in to human body?

Participants Activity: Group participants discuss and reflect their ideas for the audience.

Duration: 30 minute for discussion

30 minute for presentation

Method: Group discussion

Summarize using facilitator note

Summary of Facilitators Note

Chemicals can be transported by a variety of agents and in a variety of forms.

Dusts: Dusts are solid particles slightly heavier than air but often suspended in it for a period.

- The size of the particles ranges from about 0.4μm (fine) to 10μm (coarse).
- Dusts are created either by mechanical processes (e.g. grinding or pulverizing) or construction processes (e.g. concrete laying, demolition or sanding), or by specific tasks (e.g. furnace ash removal).
- The fine dust is much more hazardous because it penetrates deep into the lungs and remains there known as respirable dust.
- In rare cases, respirable dust enters the bloodstream directly causing damage to other organs. **Examples** of such fine dust are cement, granulated plastic materials and silica dust produced from stone or concrete dust.

- Repeated exposure may lead to permanent lung disease.
- Any dusts, which are capable of entering the nose and mouth during breathing, are known as inhalable dusts.

Gases: Gases are any substances at a temperature above their boiling point.

- Steam is the gaseous form of water.
- Common gases include carbon monoxide, carbon dioxide, nitrogen and oxygen. Gases are absorbed into the bloodstream where they may be beneficial (oxygen) or harmful (carbon monoxide).

Vapors: Vapors are substances, which are at or very close to their boiling temperatures.

- They are gaseous in form.
- Many solvents, such as cleaning fluids, fall into this category.
- The vapors, if inhaled, enter the bloodstream and some can cause short-term effects (dizziness) and long term effects (brain damage).

Liquids: Liquids are substances which normally exist at a temperature between freezing (solid) and boiling (vapors and gases).

- They are sometimes referred to as fluids.

Mists: Mistsare similar to vapors in that they exist at or near their boiling temperature but are closer to the liquid phase. This means that there are suspended very small liquid droplets present in the vapor.

- A mist is produced during a spraying process (such as paint spraying).
- Many industrially produced mists can be very damaging if inhaled, producing similar effects to vapors.
- It is possible for some mists to enter the body through the skin or by ingestion with food.

Fume: Fume is a collection of very small metallic particles (less than 1μm), which have condensed form of gaseousstate. The welding process commonly generates fumes. The particles tend to be within the respirable range (approximately 0.4 – 1.0μm) and

can lead to long-term permanent lung damage. The exact nature of any harm depends on the metals used in the welding process and the duration of the exposure.

Classification of hazardous substances and their associated health risks

Irritant: Is a non-corrosive substance, which can cause skin (dermatitis) or lung (bronchial) inflammation after repeated contact.

- People who react in this way to a particular substance ***are sensitized*** or ***allergic*** to that substance. In most cases, it is likely that the concentration of the irritant may be more significant than the exposure time.
- Many household substances, such as wood preservatives, bleaches and glues are irritants. Many chemicals used as solvents are also irritants (white spirit, toluene and acetone). Formaldehyde and ozone are other examples of irritants.

Corrosive

- Substances are ones which will attack, normally by burning, living tissue. Usually strong acids or alkalis, examples include sulphuric acid and caustic soda.
- Many tough cleaning substances, such as kitchen oven cleaners, are corrosive as are many dishwasher crystals.

Harmful

- Is the most commonly used classification and describes a substance if swallowed, inhaled or penetrates the skin, may pose limited health risks. These risks can usually be minimized or removed by following the instruction provided with the substance (e.g. by using personal protective equipment).
- There are many household substances which fall into this category including bitumen-based paints and paint brush restorers.
- Many chemical cleansers are categorized as harmful. It is very common for substances labeled harmful also to be categorized as irritant.

Toxic

- Toxic substances are ones which impede or prevent the function of one or more organs within the body, such as the kidney, liver and heart.

- A toxic substance is, therefore, a poisonous one. Lead, mercury, pesticides and the gas carbon monoxide are toxic substances.
- The effect on the health of a person exposed to a toxic substance depends on the concentration and toxicity of the substance, the frequency of the exposure and the effectiveness of the control measures in place.
- The state of health and age of the person and the route of entry into the body have influence on the effect of the toxic substance.

Carcinogenic

- Carcinogenic substances are ones which are known or suspected of promoting abnormal development of body cells to become cancers.
- Asbestos, hardwood dust, creosote and some mineral oils are carcinogenic. It is very important that the health and safety rules accompanying the substance are strictly followed.

Figure 17: Classification of Symbols

Mutagenic

- Mutagenic substances are those which damage genetic material within cells, causing abnormal changes that can be passed from one generation to another.
- Each of the classifications may be identified by a symbol and a symbolic letter – the most common of these are the polynuclear aromatic compound benzo-a-pyrene
- The effects on health of hazardous substances may be either acute or chronic.

3.4. Routes of entry to the human body

There are four principal routes of entry of hazardous substances into the human body

- **Inhalation**: - breathing in the substance with normal air intake. This is the main route of contaminants into the body. They enter the lungs where they have access to the bloodstream and many other organs;
- **Absorption through the skin**: - the substance comes into contact with the skin and enters through either the pores or a wound. Tetanus can enter in this way as can toluene, benzene and various phenols;
- **Ingestion**: - through the mouth and swallowed into the stomach and the digestive system. This is not a significant route of entry to the body. The most common occurrences are due to airborne dust or poor personal hygiene (not washing hands before eating food)

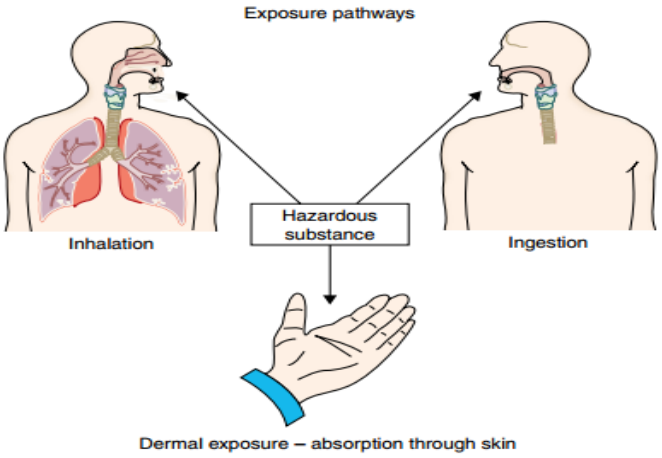


Figure 18: Hazardous substances-principals routes of entry into human body

- **Injection**: - it is a very rare route of entry. The abuse of compressed air lines by shooting high-pressure air at the skin can lead to air bubbles entering the bloodstream. Accidents involving hypodermic syringes in a health or veterinary service setting are rare but illustrate this form of entry route.

Health hazards of specific chemical agents

Facilitators Activity:

Ask the participants to discuss the following questions

- Outline the source and health effects of:
  - Asbestosis
  - Lead
  - Organic solvents
  - Mineral Dusts(silica, welding fume)
  - Pesticides(organophosphate)

Participants Activity: Group participants discuss and reflect their ideas for the audience.

Duration: 30 minute for discussion

30 minute for presentation

Method: Group discussion

Summarize using facilitator note

Summary of Facilitators Note

The health hazards associated with hazardous substances can vary from very mild (momentary dizziness or a skin irritation) to very serious.

Asbestos

Asbestos is the single biggest workplace killer. According to HSE statistics, there are 15 times as many deaths from asbestos as there are deaths from workplace accidents. It appears in three main forms – crocidolite (blue), amosite (brown) and chrysotile (white).

- The blue and brown asbestos are considered to be the most dangerous and may be found in older buildings where they were used as heat insulators around boilers and hot water pipes and as fire protection of structure.
- White asbestos has been used in asbestos cement products and brake linings.

- It is difficult to identify an asbestos product by its colour alone – laboratory identification is usually required.
- Asbestos produces a fine fibrous dust of respirable dust size which can become lodged in the lungs.
- The fibers can be very sharp and hard causing damage to the lining of the lungs over a period of many years.
- This can lead to one of the following diseases:
    - asbestosis or fibrosis (scarring) of the lungs;
    - lung cancer and mesothelioma cancer of the lining of the lung or, in rarer cases, the abdominal cavity.
- Typical sites of asbestos include ceiling tiles, asbestos cement roof and wall sheets, sprayed asbestos coatings on structural members, loft insulation and asbestos gaskets.

Lead:

Lead is a heavy, soft and easily worked metal. It is used in many industries but is most commonly associated with plumbing and roofing work. Lead enters the body normally by inhalation but can also enter by ingestion and skin contact. Medical surveillance in the form of a blood test of all employees who come into contact with lead operations, is required by the Regulations.

Uses/Occurrence

- Major uses are in the lead acid battery industry and the smelting and refining of lead and lead alloys.
- Also used in the production of solder, ceramics, glass, pigments, and ammunition.

Key health effects

- Effects on haemopoietic system (anaemia, reticulocytosis, basophilicstippled erythrocytes).
- Effects on central nervous system (encephalopathy).
- Peripheral neuropathy (impaired motor function in upper and lower limbs).
- Renal toxicity (tubular damage and interstitial fibrosis).

- Effects on GI tract (colic).
- Effects on reproductive system in males (reduced semen quality) and in pregnant females (possibility of impaired neurological development in offspring).

Organic Solvents

- Organic solvents are used widely in industry as cleansing and degreasing agents. There are two main groups – the hydrocarbons (includes the aromatic and aliphatic hydrocarbons, such as toluene and white spirit) and the non-hydrocarbons (such as trichloroethylene and carbon tetrachloride).
- All organic solvents are heavier than air and most are sensitizers and irritants. Some are narcotics, while others can cause dermatitis and after long exposure periods liver and kidney failure.
- Solvents are used extensively in a wide variety of industries as varnishes, paints, adhesives, glue strippers, printing inks and thinners.
- They are highest risk when used as sprays.
- One of the most hazardous is dichloromethane (DCM), also known as ***methylene chloride.***
- It is used as a paint stripper, normally as a gel. It can produce narcotic effects.
- The minimum personal protective equipment requirements are impermeable overalls, apron, footwear, long gloves and gauntlet and chemically resistant goggles or visor.
- Respiratory protective equipment is also required if it cannot be demonstrated that exposure is below the workplace exposure limit (WEL).

Mineral Dusts:

Silica: Silica is the main component of most rocks and is a crystalline substance made of silicon and oxygen.

- It occurs in quartz (found in granite), sand and flint.
- Harm is caused by the inhalation of silica dust, which can lead to silicosis (acute and chronic), fibrosis and pneumoconiosis.

- As silicosis develops, breathing becomes more and more difficult and eventually as it reaches its advanced stage, lung and heart failure occur.
- It has also been noted that silicosis can result in the development of tuberculosis as a further complication.
- Hard rock miners, quarrymen, stone and pottery workers are most at risk.
- Health surveillance is recommended for workers in these occupations at initial employment and at subsequent regular intervals.
- Prevention is best achieved by the use of good dust extraction systems and respiratory protective equipment.

Welding fume

Uses/occurrence

- The most important substrates are mild and stainless steel and their alloys, and aluminum and its alloys.
- The main types of welding are:
    - Manual metal arc (MMA)
    - Flux cored arc (FCA)
    - Metal inert gas (MIG)
    - Tungsten inert gas (TIG).

Key health effects

- **Lung cancer**: welding of stainless steel has been associated with an increased risk of lung cancer, asthma,
- **Acute effects**: irritation of eyes and throat, tightness in the chest at higher exposures.
- **Associated risks**: the production of ozone and the asphyxiant properties of shield gases in confined spaces should also be considered in MIG and TIG welding.

Pesticides

Uses/occurrence

Main categories are organophosphate, organochlorine, and carbamate pesticides. Exposure occurs mainly in agriculture, although pesticide use is very widespread. Exposure arises through preparation (decanting, mixing, spillage), application (spraying, coating, dipping), and through persons not directly engaged in application entering affected areas.

Key health effects

Organ-Ochlorine

- Pesticides cause a range of neurological effects.
  - Acute effects include headache, dizziness, nausea, vomiting, fatigue, convulsions, stimulated respiration, tremors, ataxia.
  - Chronic effects include intermittent muscle twitching, muscle weakness, tremors, ataxia, incoordination, slurred speech, visual impairment, memory loss, irritation, and depression.

Organophosphate

- Pesticides act by inhibiting acetylcholinesterase activity, resulting in a range of neurological effects.

Organophosphate poisoning

- Organophosphates (OPs) are used widely as insecticides. Most cases of acute OP poisoning occur in developing countries.

Acute OP poisoning

Acute poisoning presents with the symptoms of cholinergic toxicity due to inhibition of acetylcholinesterase (AChE), leading to a failure to break down acetylcholine post-synaptically. ‘Ageing’ of the enzyme may then occur, resulting in irreversible inhibition.

- Psychomotor effects: increasing confusion, anxiety, sleep problems
- Cardiac arrhythmia: bradycardia (dizziness, fainting) or tachycardia
- Tremor, muscle fasciculation
- Sweating
- Seizures
- Respiratory depression

- Coma
- Death may occur because of respiratory paralysis or cardiac arrhythmias.

Causal exposures/industries

- Agriculture
  - Pesticide applicators
  - Cotton growers
  - Market gardening
  - Sheep dippers
  - Crop-dusting pilots, pesticide loaders
- Agrochemical manufacture
- Terrorism, chemical warfare

3.2.2. Principles of good practice to control exposure to hazardous substances

Group Activity

Exercise:

- List and discuss general hierarchal control of exposure to specific chemicals
- Eliminating at source of chemical exposure at source is always ideal. Why? Discuss….
- What is the responsibility of employer to prevent chemical agents which raised at work place?
- Outline specific personal protective equipment's used for prevention of chemical agents

Method: Group discussion

Duration: 30 minute for discussion

30 minute for presentation

Summarize using facilitator note:

Summary of Facilitators Note

- Employers are expected to develop suitable and sufficient control measures by:
  - identifying hazards and potentially significant risks;
  - taking action to reduce and control risks;
  - keeping control measures under regular review.
- In order to assist employers with these duties, the following eight principles of good practice is important to follow:
  - Design and operate processes and activities to minimize the emission, release and spread of substances hazardous to health.
  - Take into account all relevant routes of exposure –inhalation, skin absorption and ingestion – when developing control measures.
  - Control exposure by measures that are proportionate to the health risk.
  - Choose the most effective and reliable control options which minimize the escape and spread of substances hazardous to health.
  - When adequate control of exposure cannot be achieved by other means, provide, in combination with other control measures, suitable personal protective equipment.
  - Check and review regularly all elements of control measures for their continuing effectiveness.
  - Inform and train all employees on the hazards and risks from the substances with which they work and the use of control measures developed to minimize the risks.
  - Ensure that the introduction of control measures does not increase the overall risk to health and safety.

Hierarchy of control measures of Chemical agents

The prevention or adequate control of exposure by measures other than personal protective equipment, so far as is reasonably practicable, taking into account the degree of exposure and current knowledge of the health risks and associated technical remedies. Measures for preventing or controlling exposure to hazardous substances include one or a combination of the following:

- Elimination of the substance;
- Substitution of the substance (or the reduction in the quantity used);
- Total or partial enclosure of the process;
- Local exhaust ventilation;
- Dilution or general ventilation;
- Reduction of the number of employees exposed to a strict minimum;
- Reduced time exposure by task rotation and the provision of adequate breaks;
- Good housekeeping;
- Training and information on the risks involved;
- Effective supervision to ensure that the control measures are being followed;
- Personal protective equipment (such as clothing, gloves and masks);
- Welfare (including first aid);
- Medical records;
- Health surveillance;

Personal protective equipment (PPE)

Personal protective used as a control measure only as a last resort. It does not eliminate the hazard and will present the wearer with the maximum health risk if the equipment fails. Successful use of personal protective equipment relies on good user training, the availability of the correct equipment at all times and good supervision and enforcement.

The ‘last resort ’ rule applies in particular to RPE within the context of hazardous substances.

There are some working conditions when RPE may be necessary:

- During maintenance operations;
- As a result of a new assessment, perhaps following the introduction of a new substance;
- Where alternatives are not technically feasible

The principal requirements of PPE are as follows:

- Personal protective equipment which is suitable for the wearer and the task;
- Compatibility and effectiveness of the use of multiple personal protective equipment;
- A risk assessment to determine the need and suitability of proposed personal protective equipment;
- A suitable maintenance program for the personal protective equipment;
- Suitable accommodation for the storage of the personal protective equipment when not in use;
- Information, instruction and training for the user of personal protective equipment;
- The supervision of the use of personal protective equipment by employees and a reporting system for defect

Types of personal protective equipment

There are several types of personal protective equipment such as footwear, hearing protectors and hard hats which are not primarily concerned with protection from hazardous substances; those which are used for such protection include:

  - Respiratory protection PPE;
  - Hand and skin protection PPE;
  - Eye protection PPE;
  - Protective clothing

- For all types of personal protective equipment, there are some basic standards that should be reached.
  - The PPE should fit well, be comfortable to wear and not interfere with other equipment being worn or present the user with additional hazards.
  - Training in the use of particular PPE is essential, so that it is not only used correctly, but the user knows when to change it.
  - Supervision is essential, with disciplinary procedures invoked for non-compliance with personal protective equipment rules.

3.4. Biological Hazard

Time: 4 hours

Learning objectives: at the end of this session participants are expected to:

- Describe the nature, types, and related health effects of biological hazards
- Identify workers who are at high risk for exposure to specific biological hazard
- Describe mode of transmission and route of exposure for biological hazards
- Identify appropriate personal protective equipment required for interim control
- Describe appropriate control strategy for exposure to specific biological agents

- **Training approaches/methods:**
  - Interactive presentation
  - Pyramiding
  - Crossover
  - Buzz group
  - Gallery method
  - Hot seating
- **Materials required:**
  - Presentation slides
  - Printed materials/Handout
  - Flip chart and marker
  - Real life videos and Photos

Introduction

Discussion points *(Buzz group)*

- What are bio hazards?
- What is the nature of biohazards?

Brief presentation

According to the UK Health and Safety Commission and the US Center for Disease Control and Prevention (CDC), biological hazards is defined as “infectious agents or products of such agents that cause human disease,” and biological agents as “any microorganism, cell culture, or human endo-parasite, including agents which have been genetically modified, which may cause any infection, allergy toxicity, or create a hazard to human health.” Biological factor is a broad term. It includes many agents, such as:

Bacteria, Fungi, Virus, Bacterial endotoxins, Mycotoxins, Peptidoglycans, Allergens (high molecular weight)

Additionally, biohazards encompass biological substances including medical waste, or samples of body tissues or fluids from a biological source, which may contain microorganisms, viruses or toxins that can adversely affect human health. The available evidence indicates that biological hazards may exist in almost any occupation.

Activity # 1
Discussion points:

- Describe types and related health effects of biological hazards
- Identify workers who are at high risk for exposure to specific biological hazards

Method

- Cross-over group

Time: 45 minutes
Material needed – Flip chart, markers, pens and pencils
Instructions:

- Step 1: Discuss in pair for 15 minutes on the discussion points
- Step 2: Let the pairs come together to make a group of 4 people
- Step 3: Choose one person to be the group's scribe. Discuss and write down on the flip charts
- Step 4: After 45 minutes, everyone come to the big group and let each group attach their flip chart on the wall and present
- Step 6: Let the participants raise their questions and concern to respective group

Farmers are at risk of developing both allergic and non-allergic respiratory diseases due to exposure to biological factors, such as allergens, fungi and endotoxins.

Workers in a waste disposal facility can easily come in contact with materials contaminated by body fluids, cut themselves or be stuck by a needle. This way they might be exposed to biological factors, resulting in diseases including hepatitis B, hepatitis C and HIV.

The risk is greatest among health care and laboratory workers who are threatened by human pathogens and among agricultural workers who are at risk from dust-borne biological allergens and toxins and by parasitic worms in warm climates.

Mode of transmission and routes of exposure

ii. *Direct mode of transmission and*

iii. *Indirect mode of transmission*

Activity # 2
Discussion points:

- What are the common modes of transmissions for biological hazards?
- Discuss routes of exposure for each specific biohazards

Method
Cooperative learning
Time: 45 minutes
Material needed – Flip chart, markers, pens and pencils
Instructions:

- Step 1: Make a group of 4 people
- Step 2: Let the group discuss on discussion points for 25 minutes
- Step 3: Choose one person to be the group's scribe. Discuss and write down on the flip charts
- Step 4: After 25 minutes, everyone come to the big group and let each group attach their flip chart on the wall
- Step 5: Let the group present their discussion points
- Step 6: Let the participants raise their questions and concern to respective group

The biological agents may cause a variety of health effects in humans, such as infectious diseases, acute toxic effects, allergies and even cancer. There are at least 193 important biological agents that show infectious, allergenic, toxic, or carcinogenic activities in the working population. Humans may come in contact with a number of different biological factors through their work, and dependent upon the kind of factor, different kinds of health effects may develop.

Workers at Risk of Biological Hazards;

At least 20 large occupational groups are exposed to these biohazards.

i. Outdoor workers

Outdoor workers, such as wildlife rangers, forestry workers, gardeners, farm workers, construction workers, archaeologists and military personnel,

ii. People who work with animals

These occupations include abattoir workers, animal handlers, animal pound workers, aviary workers, customs officers, meat workers, police officers, farmers, graziers, customs inspectors, laboratory workers, pet shop and quarantine kennel personnel, ranchers, shepherds, stockmen, veterinarians, wildlife rangers, wool sorters and zoo personnel.

iii. Workers exposed to human blood and bodily fluids

Include medical and hospital personnel, pathology and other laboratory workers, emergency workers, autopsy and mortuary workers, prison workers, professional sportspersons and sex workers. Sewerage workers and plumbers should also be considered in this category as they may be at risk from a range of pathogenic microorganisms carried in human faeces.

iv. Exposure to biohazards due to particular work environments

For example, fishing trawler crew, professional divers, marine biologists and lifeguards might be at risk from physical injury from shark bites, as well as fish or stingray stings, sea snake bites or venomous jellyfish stings, or infection of cuts and grazes by marine pathogens.

Mode of transmission and routes of exposure

i. Direct contact

- Person-to person contact. Spread of infectious agents by skin or mucous membrane contact, including blood or other body fluids, and transmission of infectious diseases via placenta in pregnant workers.

ii. Indirect contact

- Airborne transmission.
- Contaminated objects including needles, syringes and contaminated blood products, surfaces and materials.
- Food and drinking water.
- Animal-to-person contact.
- Soil, water and vegetation containing infectious organisms.

Prevention and control methods

Activity # 3

Discussion points:

- Discuss on prevention and control methods of biological hazards

Method

Small group discussion

Time: 45 minutes

Material needed – Flip chart, markers, pens and pencils

Instructions:

- Step 1: Make a group of 4 people
- Step 2: Let the group discuss on discussion points for 25 minutes
- Step 3: Choose one person to be the group's scribe. Discuss and write down on the flip charts
- Step 4: After developing the control methods, prioritize the control methods
- Step 5: After 20 minutes, everyone come to the big group and let each group attach their flip chart on the wall
- Step 6: Let the group present their discussion points
- Step 7: Let the participants raise their questions and concern to respective group

Control of Biological hazards

The five biohazard control measure categories: protective clothing, engineering, warnings, waste disposal, and training.

Table 7: Hierarchy of control as applied to Biohazards

Engineering/Bioengineering controls	○ Vaccines ○ Prophylactic anti-viral medications ○ Ventilation systems ○ Engineered safe needle devices ○ Automated equipment
Administrative controls	○ Policies and procedures ○ Routine practices such 'universal infection control ○ procedures' and other safe work procedures ○ Immunization programs ○ Training ○ Quarantine and isolation procedures
Personal Protective Equipment(PPE)	○ Gloves ○ Protective clothing ○ Eye protection ○ Face protection ○ Respiratory protection

3.5. Specific Hazards at Work

3.5.1. Slip, Trip and Fall Hazards

Time: 1 hour

Learning objectives: at the end of this session participants are expected to:

- Describe and differentiate between slip, trip and fall hazards
- Identify the causes of slip, trip and fall hazards
- Apply prevention and control strategy for slip, trip and fall hazards

- **Training approaches/methods:**
  - Interactive presentation
  - Crossover
  - Buzz group
  - Gallery method
- **Materials required:**
  - Presentation slides
  - Printed materials/Handout
  - Flip chart and marker
  - Real life videos and Photos

Introduction

Slips, trips and falls are the most common cause of injuries at work which are linked with poor ergonomic design of jobs or workstation. Slips and trips are also the most reported injury to members of the public.

Show Videos for the participants and give brief description about these hazards

- **Group Discussion (Brain-storming)**

  Time: 15 minutes

  Let the participant think about and describe on the following issues;

- Slip, Trip & Fall hazardous conditions you have observed
- Any accidents and/or injuries you have seen resulting from Slips, Trips & Falls
- Any behaviors you have observed that could have resulted in a Slip, Trip or Fall

Activity # 1

Discussion points:

- Differentiate between slips, trips and fall hazards?
- Discuss the causes of slips, trips and falls hazards?

Method

Use Cross-over

Time: 30 minutes

Material needed – Flip chart, markers, pens and pencils

Instructions:

- Step 1: Discuss in pair on the discussion points
- Step 2: Let the pairs come together to make a group of 4 people
- Step 3: Choose one person to be the group's scribe. Discuss and write down on the flip charts
- Step 4: After 30 minutes, everyone come to the big group and let each group present
- Step 5: Let the participants raise their questions and concern to respective

- **Slips:** Slips occur when there is too little friction between your feet and the floor surface, and you lose your balance. The most common causes of slips are wet surfaces, ice or other weather hazards, spills, and poor tread on footwear.
- **Trips:** Trips occur when your foot (or lower leg) hits an object and your upper body continues moving, throwing you off balance, or when you step down to a lower surface and lose your balance.
- **Falls**: Falls occur when you are too far off your centre of balance – either at the same level, or a lower level.

Prevention and control of slips, trips and falls hazards

An organisation should incorporate hazard identification routines into the work practices that shouldn't ignore even the very minor once.

Activity # 2

Discussion points:

- Discuss on prevention and control strategy of slips, trips and falls hazards

Method

Gallery methods

Time: 30 minutes

Material needed – Flip chart, markers, pens and pencils

Instructions:

- Step 1: Make a group of 4 people
- Step 2: Choose one person to be the group's scribe. Discuss and write down on the flip charts
- Step 3: After 20 minutes, everyone come to the big group and let each group attach their flip chart on the wall
- Step 4: Ask everyone to walkthrough and see each group flip chart for 10 minutes
- Step 5: Let the participants come back and raise their questions and concern to respective group

Causes of slips, trips and falls hazards

There are a variety of conditions that may cause slips, trips and falls;

- Wet or greasy floors
- Dry floors with wood dust or powder
- Uneven walking surfaces
- Polished or freshly waxed floors
- Loose flooring, carpeting or mats
- Transition from one floor type to another
- Missing or uneven floor tiles and bricks
- Damaged or irregular steps; no handrails
- Sloped walking surfaces
- Shoes with wet, muddy, greasy or oily soles
- Electrical cords or cables

- Open desk or file cabinet drawers
- Damaged ladder steps
- Ramps and gang planks without skid-resistant surfaces
- Metal surfaces – dock plates, construction plates
- Wet leaves or pine needles

Conditions causing slips, trips and falls hazards

- Poor lighting/glare/shadows
- PPE
- Improper footwear
- Improper cleaning methods & products
- Inadequate or missing signage
- Poor housekeeping
    - Like Safety itself, housekeeping is everyone's responsibility

Prevention and control of slips, trips and fall

Here are important points to prevent and control slips, trips and falls hazards;

- Conduct risk assessment and perform risk mapping
- Create Good Housekeeping Practices
- Reduce Wet or Slippery Surfaces
- Avoid Creating Obstacles in Aisles and Walkways
- Create and Maintain Proper Lighting
- Wear Proper Shoes
- Control Individual Behavior

Tips for slip, trip and fall preventions

Slips preventive measures include:

- **Wet surfaces**: Shorten your stride, walk with feet pointed out slightly, and make wider turns.
- **Spills**: Clean up immediately. If you are unfamiliar with the contents of the spill, contact your supervisors

- **Weather hazards**: Walk more slowly so you can react to traction changes. Wear slip resistant shoes or boots, and dry off shoes as soon as practical after entering a building (wet shoes on dry floors are as dangerous as dry shoes on wet floors). Wear sunglasses on sunny winter days so you can more easily see slippery areas.
- **Poor tread on footwear, or poor traction**: Wear slip resistant footwear, apply abrasive strips to smooth walking surfaces, post warnings.

- Trips preventive measures includes;
  - Do not allow carried packages to obstruct your view.
  - If glasses fog due to atmospheric changes, clear them immediately.
  - Use only proven walkways.
  - Close desk and file drawers when not in use.
  - Report burned out or missing lights, any uneven or broken pavement, sidewalks, or handrails.
  - Be aware of elevator threshold positions
- Falls preventive measures include:
  - NEVER stand on a chair to reach a high object. Always use a ladder.
  - When using ladders, select the proper type and size, and use it properly.
  - Walk up and down stairs, and never jump from the last step.
  - Use handrails, walk
  - Report any unsafe conditions.

3.5.2. Fire and Electrical Hazards

Time: 4 hours

Learning objectives: at the end of this session participants are expected to:

- Define, Identify and evaluate main fire risks at workplace
- Identify the classes of fire, fire extinguishers and fire fighting equipment's
- Explain basic principles of fire prevention
- Outline the requirements for an adequate and appropriate means of escape for a simple workplace.
- Identify the hazards associated with the use of electricity at the workplace
- Describe the control measures that should be taken when working with electrical systems or using electrical equipment.

Learning/Teaching Methods

- Brainstorming
- Individual exercise
- Group work
- Plenary discussion

Tools

- Markers
- Flip charts
- Papers/cards

3.5.2.1. Fire Hazards

Time: 2 hours

Learning objectives: at the end of this session participants are expected to:

- Define and Identify main fire risks at workplace
- Identify the classes of fire and appropriate Identify the fire extinguishers or fire fighting equipment's
- Explain basic principles of fire prevention
- Identify the hazards associated with the use of electricity at the workplace
- Describe the control measures that should be taken when working with electrical systems or using electrical equipment.

Content

- Introduction
- Definition of terms
- Classes of fire and extinguisher
- Hazards associated with electricity
- Safe use of electricity at work place

Learning/Teaching Methods

- Brainstorming
- Individual exercise
- Group work
- Plenary discussion

Tools

- Markers
- Flip charts
- Papers/cards

Introductory Presentation

Fire is a manifestation of uncontrolled combustion. It involves combustible materials, which are found around us in the buildings in which we live, work and play, as well as a wide range of gases, liquids and solids, which are encountered in industry and commerce. In the United Kingdom, fire brigades attend more than 40 000 fires in workplaces every year. These fires kill more than 30 people per year and injure almost 3000 people. In addition, insurance claims for fire damage in workplaces amount to an average of £10 million per week. Fire kills, injures and causes damage to property, and it can also have significant effects upon the future of companies.

Therefore, the prevention of fire can play an important role in the continuing viability of an organization. The general powers of fire authorities to fight fires are contained in the Fire and Rescue Services Act, which requires the fire brigade to operate in an efficient and organized manner, to ensure there is an adequate supply of water for fighting fires and gives them the right of entry to buildings if a fire is suspected.

Brainstorming

Individual Exercise:

- **Ask the participants to reflect on Fire is:**
  - Fast
  - Hot
  - Dark
  - Deadly
- **Duration: 30 minute**

Summarize the exercise with the following definition.

Fire is FAST

- In less than 30 seconds, a small flame can get completely out of control and turn into a major fire.
- It only takes minutes for thick black smoke to fill a house.
- In minutes, a house can be engulfed in flames.
- Most fires occur in the home when people are asleep.
- If you wake up to a fire, you won't have time to grab valuables because fire spreads too quickly and the smoke is too thick.
- There is only time to escape.

Fire is HOT

- Heat is more threatening than flames.
- A fire's heat alone can kill.
- Room temperatures in a fire can be 100 degrees at floor level and rise to 600 degrees at eye level.
- Inhaling this super-hot air will scorch your lungs.
- This heat can melt clothes to your skin.
- In five minutes a room can get so hot that everything in it ignites at once: this is called flashover.

Fire is DARK

- Fire isn't bright, it's pitch black.
- Fire starts bright, but quickly produces black smoke and complete darkness.
- If you wake up to a fire you may be blinded, disoriented and unable to find your way around the home you've lived in for years.

Fire is DEADLY

- Smoke and toxic gases kill more people than flames do.
- Fire uses up the oxygen you need and produces smoke and poisonous gases that kill.
- Breathing even small amounts of smoke and toxic gases can make you drowsy, disoriented and short of breath.
- The odorless, colorless fumes can lull you into a deep sleep before the flames reach your door.
- You may not wake up in time to escape

What Is the TRIANGLE Of FIRE?

- Participants' Activity: Triangle of Fire
  - Ask participants to write down on pieces of paper or cards the meaning of triangle of fire and to draw the triangle of fire
  - Then ask them to hand over their piece of paper or card to the person to their right.
  - Ask each participant to read out what they have on the card or paper and then comment on it.
  - Let the whole group respond and move onto the next person in any order until all have had their turn.
  - Duration: 30 minute for discussion
  - Method: individual and Group discussion
  - Summarize using facilitator note

- **Fire requires three variables to initiate**
  - Fuel,
  - Oxygen
  - Heat
- Three components are required for a fire to occur; these are a combustible material (fuel), sufficiently high temperature (heat), and supply of oxygen.
- These three elements described as 'The triangle of fire' and if the three elements are allowed to come together, there is the potential for a fire to occur.
- Fires are generally controlled by eliminating one side of the fire triangle; that is, if you remove the fuel, heat, or oxygen, you can prevent or extinguish a fire.

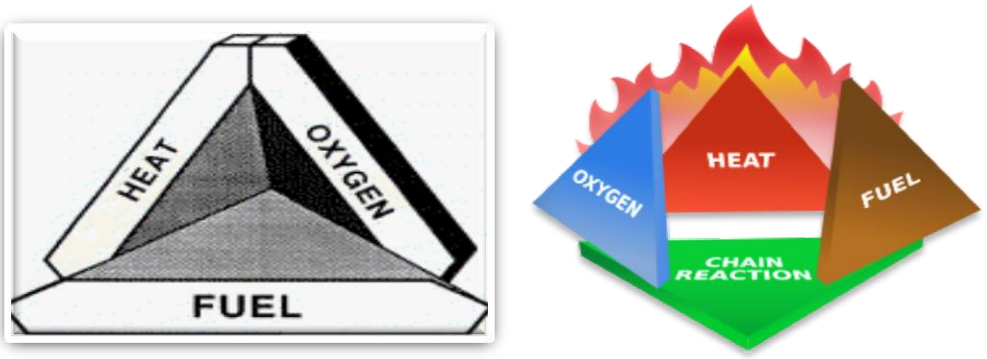


Figure 19: The fire triangle

Group Activity:

Facilitator Activity:
Divide participants in to manageable groups and ask them to list down the sources of ignition for fire, types of fuel existed at their work place on flipchart.

Participant Activity:

List and discuss the sources of ignition for fire existed at your work place
List and discuss the types of fuel existed at your work places

Duration: 15 minute for discussion
40 minute for presentation

Method: Group discussion

Summarize with the brief presentation

Heat/sources of Ignition

Workplaces have many sources of ignition, some of which are obvious but others may be hidden inside the machines.

The following are potential sources of ignition in the typical workplace:

- **Naked flames:** from smoking materials, cooking appliances, heating appliances and process equipment
- **External sparks:** from grinding metals, welding, impact tools, and electrical switch gear.
- **Internal sparking:** from electrical equipment (faulty and normal), machinery, and lighting.

- **Hot surfaces:** from lighting, cooking, heating appliances, process equipment, badly lubricated equipment and drive belts.

I. Fuel

Fuels take on a wide variety of characteristics i.e. solid, liquid, or even a vapor;

- **Solids:** wood, paper, cardboard, wrapping materials, plastics, rubber, foam, textiles (e.g. furnishings and clothing), wall paper, hardboard and chipboard used as building materials, waste materials (e.g. wood shavings, dust, paper), hair etc.
- **Liquids:** paint, varnish, thinners, adhesives, petrol, paraffin, toluene, acetone and other chemicals. Most flammable liquids give off vapors and flash flame or explosion can occur if the vapor catches fire in the correct concentrations of vapour and air.
- **Gases:** flammable gases include LPG (liquefied petroleum gas in cylinders, usually butane or propane), acetylene (used for welding) and hydrogen;

II. Oxygen

The oxygen side of the fire triangle refers to the oxygen content of the surrounding air. Ordinarily a minimum concentration of 15 percent oxygen in the air is needed to support flaming combustion;

➢ **Classification of Fire**

III. Individual Activity:

- Facilitator Activity:
  - Assign participants in to manageable groups
  - Ask the participants knowledge on the classifications of fire and fire extinguisher
- Participants Activity:
  - List the classes of fire and fire extinguishing you now.
- Duration: 30 minute for discussion

Facilitate plenary discussion and conclude with the following points.

Based on fuel and the means of extinguishing:

- **Class A:** Fires which involve solid materials such as wood, paper, cardboard, textiles, furniture and plastics where there are normally glowing embers during combustion
  - ➢ Extinguished by cooling, this can be achieved using water.
- **Class B:** Fires which involve liquids or liquefied solids such as paints, oils or fats and can be further subdivided into:
  - **Class B1:** fires which involve liquids that is soluble in water like methanol.
    - These can be extinguished by carbon dioxide, dry powder, water spray, light water and vaporizing liquids.
  - **Class B2:** fires which involve liquids not soluble in water, such as petrol and oil.
    - Can be extinguished by using foam, carbon dioxide, dry powder, light water and vaporizing liquid.
- **Class C:** Fires which involve gases such as natural gas or liquefied gases such as butane or propane/
  - ➢ Can be extinguished using foam or dry powder in conjunction with water to cool any containers involved or nearby.
- **Class D:-**Fires which involve metals such as almunium or magnesium.
  - ➢ Special dry powder extinguishers are required to extinguish these fires, which may contain powdered graphite or talc.
- **Class E:** Fires which involve high-temperature i.e. from cooking oils or fats in large catering establishments or restaurants.
- **Electrical Fires:** Fires involving electrical equipment or circuitry do not constitute a fire class on their own, but there are some pieces of equipment that can store, within capacitors, lethal voltages even when isolated.
  - Extinguishers specifically designed for electrical use like carbon dioxide or dry powder units should always be used for this type of fire hazard.

Fire fighting equipment and with respective bands

- **What type of fire fighting equipment available in your work place? And List them**

The primary purpose of fire extinguishers is to tackle fires at a very early stage to enable people to make their escape and controlling larger fires is the role of the fire fighters team. Fire extinguishers are all red cylinder with 5% of the area covered with the color code (band) on which class of fire should that specific extinguisher be used.

a. Water Extinguishers (red band)

This type of extinguisher can only be used on Class A fires and is not suitable for use on live electrical equipment, liquid or metal fires.

b. Water Extinguishers with additives (red band)

Suitable for Class A and Class B fires and will be indicated on the extinguisher and they are generally more efficient than conventional water extinguishers.

c. Foam Extinguishers (cream band)

This can be use for Class A and Class B fires and is particularly suited to extinguishing liquid fires such as petrol and diesel. It should not be used on free flowing liquid fires as it can rapidly spread the fire to the nearby material unless the operator is specially trained.

d. Powder Extinguishers (blue band)

This extinguisher is used on most classes of fire and achieve a good control of the fire including electrical equipment but will make that equipment useless. Since it can't cool the fire properly, hence can re-ignite and should not be used on metal fires. It has limitation as it can create loss of visibility and can affect people with breathing problems and are not suitable for confined spaces.

e. Carbon dioxide extinguishers (black band)

Especially suitable for electrical equipment as they will extinguish without causing any further damage but should not be used on metal fires and with electronics.

f. Wet chemical- Class ‘ E ’ extinguishers

Particularly suitable for deep-fat fryers. The intense heat in the fluid generated by fat fires means that when standard foam or carbon dioxide extinguishers stop discharging, re-ignition tends to occur.

- Fire extinguishers should be sited on exit routes, preferably near to exit doors or where they are provided for specific risks, near to the hazards they protect.
- Notices indicating the location of the fire fighting equipment should be displayed in the workplace at a visible place.

	Old colour BS 5406 / New colour BS EN3	Class A Paper or wood etc.	Class B Flammable liquids	Class C Flammable gas fires	Class D Metal fires	Electrical fires
Red	WATER	✓	Do not use ✗			Do not use ✗
Red	Fire hose reel	✓	Do not use ✗			Do not use ✗
Cream	FOAM	Note: Multi-purpose foams may be used ✓	Note: Specialist foams required for industrial alcohol ✓			Do not use ✗
Black	CO_2 GAS		Secondary ✓			Primary ✓
Blue	POWDER	✓	Note: Specialist DP required for solvents and esters ✓	✓	**Note:** Specialist dry powders may be required ✓	✓
Red	Fire blanket		Primary ✓	*General note* – May be used in conjunction with other extinguishing agents or fire extinguishing techniques		
Canary yellow		F	**Specialist hot cooking oil fires only** Specifically for dealing with high-temperature (360°C+) cooking oils used in large industrial size catering kitchens, restaurants and takeaway establishments with deep-fat frying facilities			

Figure 20: Types of fire extinguishers and Labels.

Fixed Fire Fighting Equipment Installations

Figure 21: Various freighting equipment – water extinguisher, fire blanket and hose reel

- Sprinkler installations has benefits such as a reduction in the amount of portable fire fighting equipment and it should consist water supply (preferably a stored water supply incorporating tanks), pumps, pipe work and sprinkler heads.
- The installation should be designed by taking into account the storage height, storage layout, ceiling clearance and sprinkler type (sprinkler orifice and sensitivity).
- All equipment provided to assist the control and escape from the premises i.e. fire detection and warning systems, emergency lighting, equipment provided to assist fire fighting should be regularly checked and maintained.

➢ **Fire Emergency Plans**

An emergency plan should include the action to be taken by staff in the event of fire, the evacuation procedure and the arrangements for calling the fire and rescue team and authority. In small enterprises, this can be the form of simple notice posted in positions where staff can read it and become familiar.

➢ **Fire routines and fire notices**

Routine procedures or action to be taken in case of fire with responsible persons should be posted throughout the premises. There are a number of basic components which should be considered when designing any fire routine procedures:

- Action to be taken on discovering a fire;
- Method of operating the fire alarm;
- Arrangements for calling the fire brigade;

- Stopping of machinery and plant;
- First-stage fire-fighting by employees;
- Evacuation of the premises;
- Assembly of staff, customers and visitors, and carrying out a roll call to account for everyone on the premises etc.

➢ **Fire notices**

- Briefly and clearly allocate specific duties for staffs and printed instructions for the action to be taken in the event of fire should be displayed throughout the premises.
- Instruction for the immediate calling of the fire brigade in case of fire should be displayed at telephone switchboards and security lodges.

➢ **Testing**

The alarm system should be tested regularly while the premises are in normal use.

➢ **Fire drills**

Once a fire fighting system is established, it must be tested at regular intervals (at least twice a year) in order to ensure that all staff including shift workers and part-time employees are familiar with the action to be taken in an emergency.

Fire Protection in Building

➢ **Means of Escape in Case of Fire**

It is essential to arrange means of escape for people to exit quickly from a workplace whenever there is a fire. Normally the entrances and exits to the workplace will provide escape routes.

➢ **Doors**

Doors should be opened in the direction of travel, such as:

- Doors from a high-risk area, such as a paint spraying
- Room or large kitchen;
- Doors that may be used by more than 50 persons;
- Some sliding doors may be suitable for escape purposes provided that it slide easily and are marked with the direction of opening.

➢ **Escape Routes**

Escape routes should meet the following criteria:

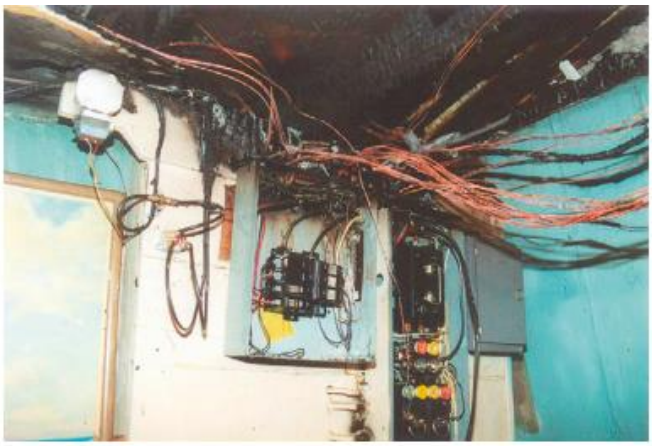
- Escape routes need to have more than direction when two or more are escaping to places of safety.
- Escape routes should be short and lead people directly to a place of safety.
- It should be possible to reach the safety area without returning to the fire.
- Escape routes should be wide enough for the volume of people using them.
- If the escape routes are likely to be used by people in wheelchairs, the minimum width will need to be 800 mm.
- It must be possible to open all doors easily and immediately from the inside, without using a key or similar device while the workplace is in use.
- Fire doors should be self-closing.
- Make sure that there are no obstructions on escape routes, especially on corridors and stairways.
- Escape routes must be well illuminated. Alternative sources of lighting should be arranged in case the power fails during a fire.
- If your workplace is small, it is enough to provide the staff with torches.
- Exit signs on doors should be provided where they will help people to find a safe escape route.

Figure 22: Fire exit sign

Escape times

Everyone in the building should be able to get to the nearest place of safety in between 2 and 3 minutes. This means that escape routes should be kept short. Where there is only one means of escape, or where the risk of fire is high, people should be able to reach a place of safety by using more than one route, in 1 minute.

3.5.2.2. Electrical Hazard



Introductory Presentation

Over 25% of fires are caused by electrical malfunction. Electricity is a widely used, efficient and convenient, but potentially hazardous method of transmitting and using energy. It is in use in every factory, workshop, laboratory and office. Any use of electricity has the potential to be very hazardous with possibly fatal results. Electricity has long been recognized as a serious workplace hazard, exposing employees to electrical shock; which can result in electrocution, serious burns, or falls that result in additional injuries or even death. It is often referred to as a “silent killer” because it cannot be tasted, seen, heard, or smelled. Studies reported that approximately 8% of all fatalities at work are caused by electric shocks. The majorities of the fatalities occur in the agriculture, extractive and utility supply and service industries, whereas the majority of other accidents happen in the manufacturing, construction and service industries.According to the Bureau of Labor Statistics Census of Fatal Occupational Injuries Research File for 1992–2005, electrocution is the fifth leading cause of work-related deaths for 16- to 19-year-olds, after motor vehicle deaths, contact with objects and equipment, workplace homicide, and falls. Electrocution is the cause of 7% of all workplace deaths among young workers aged 16 -19, causing an average of 10 deaths per year.

Group Activity

- What points you considered when talking about safe use of electricity?

Method: Group discussion

Duration: 30 minute for discussion

Summarize using summery note

What are the hazards associated with electricity at work places?

Summarize with the following points with brief presentation.

The following dangers are associated with electricity:

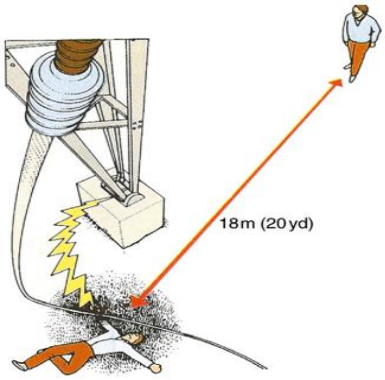


Figure 23: Distance between workers and high voltage lines

Keep 18 m clear of high voltage lines

- **Shock**:

Electric shock is the convulsive reaction by the human body to the flow of electric current through it A severe shock can cause much more damage to the body than is visible.

- Internal bleeding and
- Destruction of tissues, nerves, and muscles.
- **Ventricular fibrillation** (very rapid, ineffective heartbeat) cause**death within** a few minutes.

- **Heart paralysis** occurs at 4 amps, means the heart does not pump at all.
- Respiratory paralysis (may be fatal)/respiratory failure
- Muscular contraction (can't let go)/ muscular spasm
- The final injury may well be from a fall, cuts, burns, or broken bones.

Effect of electric shock and severity of injury depend upon several factors:

- Body resistance (wet or dry skin are major factors of resistance)
- Circuit voltage
- Amount of current flowing through the body
- Current path through the body
- Area of contact
- Duration of contact

➢ **Burns:**

The most common shock-related, nonfatal injury is a burn. Burns caused by electricity are three types: electrical burns, arc burns, and thermal contact burns.

- **Electrical burns**: Electrical burns are the result of the electric current flowing through tissues or bone. Tissue damage is caused by the heat generated by the current flow through the body. Electric burn usually more severe than those caused by heat, since they can penetrate deep into the tissues of the body.
- **Arc burns**: Arc or flash burns, are the result of high temperatures produced by an electric arc or explosion**.**
- **Thermal contact burns**: when the skin comes in contact with hot surfacesof overheated electric conductors, conduits, or other equipment.

The effect of electric current on the human body depends on its;

- **Pathway through the body** (e.g. Hand to hand or hand to foot),
- **The length of time of the shock** and
- **The size of the current**.

- **Arc eyes:**
  - From ultraviolet rays when looking at electric arc or welding flash
  - Symptoms like conjunctivitis
  - Temporary condition lasting three or four days
  - Does not affect contact lens
- **Fire:**

Electricity is one of the most common causes of fires and thermal burns in homes and workplaces. Over 25% of all fire shave a cause linked to a malfunction of either a piece of electrical equipment or wiring or both.

- From electrical arc
- Overloading of conductors
- Discharge of static electricity

- **Static:**
  - Caused when two materials are parted, e.g. Web from roller; solvent being poured from container
  - High voltage, low current
  - Causes spasm of voluntary muscles and violent body movement when injury results from hitting equipment not from the static itself.

- **What is safe electric use techniques carried out at work place?**

Safe use technique at work place

What are the rules for locking off electricity at work place?
Facilitate pair discussion

Conclude with basic Rules for locking-off from the facilitators note:

Individual exercise
What are the precautions should be taken at your work environment?

Conclude with precautions that should be taken at different point of electric contact: Supply, Equipment, Plug, Cable, Appliance, Inspection etc.

Facilitator notes on Safe use of Electricity

Electricity is Lethal:

- You can't see it;
- You can't smell it;
- If you feel it, it may be too late.

When considering the safe use of electricity a number of terms arise that have particular meanings. The following are some of related common terms:

- **Charged;** has acquired an electric charge:
  - through being connected to a live conductor
  - by electrical induction
  - of static electricity
- **Dead;** carrying no charge, disconnected from all sources of electricity and connected to earth.
- **Earthing;** connecting direct to the mass of the earth so as to prevent any charge building up or being acquired. In earthed circuits the connection from the appliance to earth must be solid and not pass through any means of breaking the connection, i.e. switches.
- **Excess current protection;** means to prevent a circuit or appliance being subjected to a current beyond its capacity, usually either a fuse or circuit-breaker set to operate at a predetermined current level
- **Double insulation;** the provision of two separate layers of insulation between the live parts and the part being handled. Double insulated appliances do not need to have an earth connection
- **Insulation;** the protection provided on a conductor to prevent it making contact with another conductor, with earth or being touched by a person. The insulation may also have to provide protection against mechanical damage to the conductor.

Safe electric use techniques carried out at work place

- All electrical machinery should have isolators with locking-off facilities.
- Before starting any maintenance, repair or other work that requires access into the machinery the isolator must be locked-off by padlock and identifying tag attached.
- Each padlock should have only one key. There should be no dupli-cates or master keys.
- Only the person who attached the padlock may remove it. Arrangements may need to be made to transfer padlocks (or keys) at shift change-overs.
- If more than one person is working on the equipment, multi-padlock hasps should be used and each person attach their own padlock.
- On major maintenance a single padlock can be used for a gang, in which case the supervisor/foreman carries the responsibility for the safety of the whole gang and for ensuring they are all clear of the equipment before removing the padlock.
- Before removing the last padlock on completion of the work, the equipment must be checked to ensure all tools have been removed, guards replaced and the equipment is safe to operate.
- Padlocks should either be issued on a personal basis or kept centrally and signed for at each use.
- Loss of padlock keys should be reported to the supervisor and manager before the padlock is removed forcibly.
- In an emergency, if the 'owner' of a padlock is not available, the authority of a responsible manager should be obtained before a padlock is removed.
- Any employee leaving a padlock on an isolator unnecessarily at the end of a shift should be brought back to work to remove it.
- Breach of these rules should be subject to disciplinary action.

➢ **Precautions that should be taken at different point of electric contact**:

- **Equipment/Appliance** be either:
  - Earthed or
  - Double-insulated

- **Appliance should be;**
  - In good condition and repair
  - Properly wired
  - Suitable for the supply voltage
  - The sheath of the supply cable securely clamp
  - Properly earthed unless double-insulated
- **Equipment Safety**
  - Use gloves and appropriate footwear
  - Store in dry place when not using
  - Don't use in wet/damp conditions
  - Ensure not a tripping hazard
  - Don't carry a tool by the cord
  - Don't pull the cord to disconnect it
  - Keep cords away from heat, oil, & sharp edges
  - Disconnect when not in use and when changing accessories
  - Remove damaged tools from use
- **Plug:**
  - Suitable for the supply outlet
  - Properly wired including clamping of the cable sheath
  - The earth wire should have plenty of slack in the plug so it is the last
  - Fitted with the correct fuse
- **Cable:**
  - Of suitable capacity for the appliance, both voltage and current
  - Of flexible type
  - In good condition without any damage to the sheath
  - Have earth conductor except in case of double-insulated equipment
  - Inspected regularly
- **Factors which affect the selection of suitable electrical equipment;**
  - Intended use of the circuit system
  - Building materials
  - Size and distribution of electrical load

- Location of equipment (such as underground burial)
- Presence of corrosives
- Temperature extremes
- Flammable, explosive and damp atmospheres

- **Cords can be damaged by:**
  - Aging
  - Door or window edges
  - Staples or fastenings
  - Abrasion from adjacent materials
  - Activity in the area Improper use can cause shocks, burns or fire
- **Inspection:**
  - All portable powered equipment (plug, cable and appliance) must be inspected regularly and have suitable dated tag attached.
- The following visual check and associated questions should be asked:
  - Are any bare wires visible?
  - Is the cable covering undamaged and free from cuts and abrasions?
  - Is the cable too long or too short? (Does it present a trip hazard?)
  - Is the plug in good condition (?
  - Are there no taped or other non-standard joints in the cable?
  - Are there any overheating or burn marks on the plug, cable, sockets or the equipment?
- **Records of inspection and testing**
  - Inspection Schedules
  - Inspection findings and the work done during maintenance must be kept together with records of the.

3.5.3. Psychosocial Hazards

Time: 3 hours

Learning objectives: at the end of this session participants are expected to:

- Identify work-related stress causing conditions
- Detect when stress is manifested by people at work
- Identify effect of stress on the worker and on the organization
- Apply and contribute for work-related stress management approaches

Training approaches:

- Interactive presentation
- Group and individual exercises for stress management
- Cross-over
- Role play

Materials required:

- Presentation slide
- Flip chart and marker

Introduction

Psychosocial risks with issues such as work-related stress and workplace violence are widely recognized challenges to occupational health and safety.

Activity #1 Small group discussion

Discussion points:

- What is stress for you?
- What kind of signs does a person with stress shows?

Method

Use Cross-over

Time: 30 minutes

Material needed – Flip chart, markers, pens and pencils

Instructions:

- Step 1: Discuss in pair on the discussion points
- Step 2: Let the pairs come together to make a group of 4 people
- Step 3: Choose one person to be the group's scribe. Discuss and write down on the flip charts
- Step 4: After 30 minutes, everyone come to the big group and let each group present
- Step 5: Let the participants raise their questions and concern to respective group

Summary notes:

The International Labor Organization define psychosocial hazards in terms of the interactions among job content, work organization and management, and other environmental and organizational conditions, on the one hand, and the employees' competencies and needs on the other.

Work-related stress is determined by work organization, work design and labour relations and occurs when the demands of the job do not match the capabilities, resources, or needs of the worker, or when the knowledge or abilities of an individual worker or group to cope are not matched with the expectations of the organizational culture of an enterprise; hence, coping means balancing the demands and pressures placed on you with your skills and knowledge. The following risk factors have been identified as being associated with work-related stress related ill health;

- Work demands
- Low levels of control
- Poor support from supervisors and/ or co-workers
- Lack of role clarity
- Poorly managed relationships
- Low levels of recognition and reward
- Poorly managed change
- Job insecurity
- Violence and harassment

❖ Give a brief description about these points with examples for each and initiate participants to express their idea about these points.

➢ **Discussion points (Brain storming)**

- What is your experience in relation to occupational stress?
- Which causes of occupational stress are available in your organization?

Give a chance for three participants to express their thought as initial overview and continue with presentation.

Activity # 2
Discussion points:

- How do you react (behavioral, physiological & emotional) to stress?
- Discuss the impacts of work related stress (on workers, organizations and country?

Method
Use Gallery Method and Role play
Time: 30 minutes
Material needed – Flip chart, markers, pens and pencils
Instructions:

- Step 1: Make a group of 4 people
- Step 2: Choose one person to be the group's scribe. Discuss and write down on the flip charts
- Step 3: After 20 minutes, everyone come to the big group and let each group attach their flip chart on the wall
- Step 4: Ask everyone to walkthrough and see each group flip chart for 10 minutes
- Step 5: Let the participants come back and raise their questions and concern to respective group

Impact of Work Related Stress

i. Effect on workers

Work-related stress may lead to varying health problems affecting physiological and psychological health, as well as the worker's cognition and behaviors. Stress reactions will result when there is a perceived imbalance between demands and environmental or personal resources.

ii. Impact of Stress on the Organization

The impact of work-related stress on workplace productivity and the broader economy is considerable as it can severely affect workers' achievement with respect to efficiency and accuracy. Work-related stress may affect corporate performance due to costs associated with;

- Increased absenteeism and staff turnover
- Poor competitiveness and public image of the enterprise
- Reduced motivation, satisfaction and commitment
- Greater rate of staff turnover
- Reduced performance and productivity
- Increased unsafe working practices and accident rates
- Increased complaints from clients/customers
- Replacement of absent workers
- Training of new workers etc.

➢ **Discussion Points (Small group discussion)**

- Pose the following questions by dividing participants in to manageable size;
  - How can we assess the work related stress in the organization?
  - How can we manage work related stress in the organization?
- Let then to present their thought on a flipchart and

Make a conclusion with the following summary points;

➢ **Work Related Stress Management**

Work stress can be effectively managed by applying a risk management approach. Risk management is essentially a problem solving approach to health and safety and provides a vehicle for the continuous improvement of work and working conditions and

then to the health of workers. Assessing the risks of work-related is very vital to identify the problem, characterize the effect of work related stress (where, whom and how) and know how can the stress problem can be solved also finally needs to be documented for future review and improvement actions.

Activity # 5

Discussion points:

- Is stress good or bad for you?

Method

Use Decision line

Time: 30 minutes

Material needed – Flip chart, markers, pens and pencils

Instructions:

Participants are asked to physically move an stand on a line that represents a continuum from stress is good to stress is bad. Participants then have to explain why they choose to stand at a particular point on the line.

Summary notes

No stress at all would mean a boring life for us. However, too much stress can exhaust us. We need to find a balance between performance and demands; an optimal performance level. Such a balance is needed in a good psychosocial work environment.

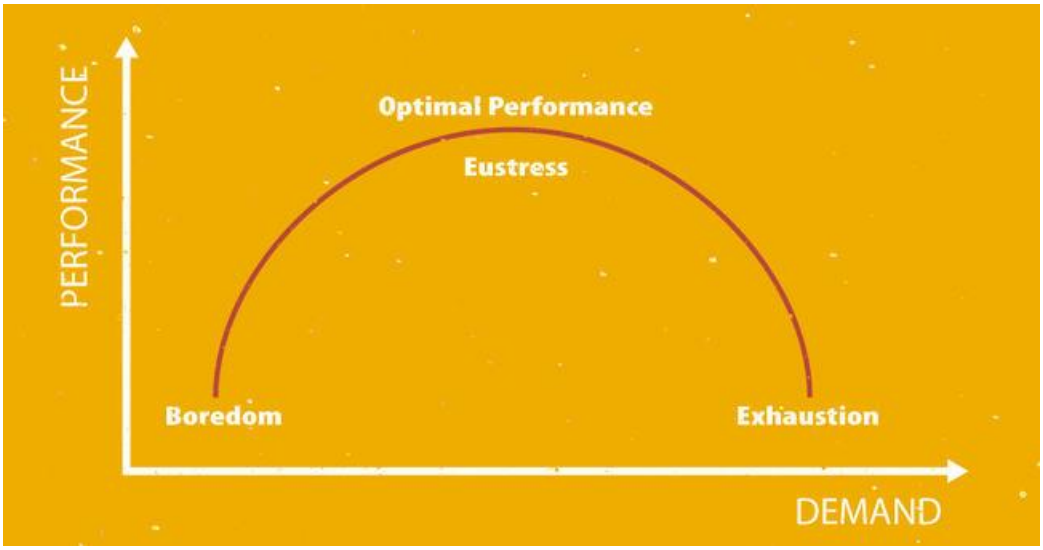


Figure 24: The relationship between performance and demands; a “stress” curve.

Part IV: Occupational Health and Safety Program at Organizational Level

Time: 3 hours

Learning objectives: at the end of this session participants are expected to:

- Understand basic elements for best OSH service at small scale enterprise
- Exercise occupational risk assessment at enterprise level.
- Identify the responsibilities of different actors to improve health and safety at workplace for individual and collective.

Content

- Key Elements for best OSH service at small scale enterprise
- Risk Assessment
- Workers Participation

Learning/Teaching Methods

- Interactive presentation
- Case Study
- Group activity

Materials required:

- Presentation slides
- Flip chart and marker
- Group and individual activity guide and checklists
- Sample templates
- Rolled Rope

➢ Occupational Safety and Health Program

Time: 1 hr

Introductory Presentation on the Session

Occupational Health and safety Management; is integrated set of organizational elements involved in the continuous cycle of planning, implementation, evaluation, and continual improvement, directed toward the reduction of occupational hazards, risks and associated effects in the workplace. In most cases, this is applied for well-organized

management system and difficult to achieve its objective in MSSEs due to the difference in work elements and organization to lead and implement.

Strong management commitment from the top is very crucial for the establishment of OSH program in any organization where the line management is responsible and accountable for the implementation of the OSH services. A health and safety program at workplace should not be seen as a one-time effort; it is a continuous, on-going approach for optimizing the work environment so as to promote and protect worker's.

Effective OSH program can be reflected through good management commitment and employee involvement and it should include the following three basic elements; such as well written and officially approved **policy**, **procedure** and **responsibility** are basic.

i. Policy

Effective safety and health management requires the development of a comprehensive policy that meets not only national and international standards but also contributes for the overall business performance of organizations.

Pair Work

- Encourage participants to mention some best characteristics for OSH Policy at enterprise level.

A Health and Safety policy should be:

- Set by employers with workers and their representatives
- Specific to the organization
- Concise: clearly written, dated and made effective by the
- Communicated and accessible to all workers and external parties
- Reviewed for continuous improvement

Key Note: the following are the minimum OSH policy content requirements to be reflected in the policy statement;

- Principles and objectives to which the *organization is* committed;
- Protect the safety and health of all members;
- Comply to the national laws and regulations on OSH; and
- Ensure workers participation in all elements of the OSH-MS.

ii. Procedures

- Development of appropriate internal policy/guideline
- Regular inspection of premises, machinery, tools, equipment, and work practices
- Appropriate written instructions for workers
- Investigation of incidents in order to take action to prevent similar incidents
- Recording system and recording formats
- Instruction and supervision program of workers
- Assigning responsible person for each program
- Implementation of control strategies
- Training and/or education procedure
    - For New staffs
    - For existing staffs as refreshment or about new materials/procedures
    - For visitors/customers etc.
- Registration and Reporting System
- Periodic management meetings to discuss about health & safety
- Emergency conditions, prevention, preparedness and response procedures

The following are the key actions best strategies to establish an emergency prevention preparedness and response system and procedure:

- Identify the potential for accidents and emergency situations
- Ensure the presence of internal communication and coordination in the event of an emergency
- Address first-aid and close medical assistance
- Ensure fire fighting system and means evacuation
- Information and training to members of the organization at all levels and regular exercises of the procedures
- Cooperation with external emergency services

One of the minimum exercise as a procedure to run a health and safety program in at enterprises of any level is to run regular occupational risk assessment.

➢ Risk Assessment

Time: 2 hours

Initiate the session with brainstorming question to assess participants understanding about occupational risk assessment.

This session will be facilitated through intensive group activities to equip trainees with basic skills of risk assessment process.

Brief Presentation

Risk Analysis is a systematic way of gathering, recording, and evaluating information that can lead to recommendations for decision or action in response to an identified hazard. It consists of three tasks: risk assessment (Science and evidence), risk management (Policy, preferences and values), and risk communication (Interactive exchange of information, opinions, and preferences concerning Risks).

Risk assessment is an important step in protecting workers and business, as well as complying with the law. It is a careful examination of what, in your work, could cause harm to people, so that you can weigh up whether you have taken enough precautions or should do more to prevent harm.

How to Assess Risks in Your Workplace

Brainstorming to initiate participant's engagement in risk assessment process;

- What is Hazard?
- What is Risk?

- **Hazard:** is anything that may cause harm, such as chemicals, electricity, working from ladders, an open drawer etc.
- **Risk:** is the chance, high or low, that somebody could be harmed by the hazard, together with an indication of how serious the harm could be.

What is risk assessment and its key elements?

Brief Presentation

The following are the five steps in risk assessment process:

- **Step 1:** Identify the hazards;
- **Step 2:** Decide who might be harmed and how;
- **Step 3:** Evaluate the risks and decide on precautions;

- **Step 4:** Record your findings and implement them;
- **Step 5:** Review your assessment and update;

When the enterprise is small, the risk assessment can be conducted by the owner; no need to be a health and safety expert; but if you are not confident, get help from someone who is competent.

Step 1: Hazard Identification

This can be performed with either of the following means:

- Walk around and observe
- Ask workers
- Refer accident and injury registration and reports
- Refer manufacturers' instruction or safety data sheets
- Remember about the long term effects of any hazard available in the workplace.

Table 8: Severity of Harm

Severity of Harm	Property Damage	Impact on Brand of Organizations	Damage to Human Life
1	Very Low	Very Low	Very low health impact, don't affect working capacity or don't cause disability i.e. Non-toxic dusts
2	Minimum Damage	Limited Impact	Very low health impact, can cause reversible health effect, i.e. irritant chemicals, food poisoning etc.
3	Minimum Damage	Significant Impact	Serious health impact, not killer but can cause irreversible impact on the body or health, like Noise, wrong manual handling practice, cut, burn etc.
4	Sever Damage	National Impact	Can cause 1-3 person or cause permanent disability
5	Serious Damage	International Impact	Can kill many people even at once or cause cancer on many people i.e. radioactive substances

➢ **Group Exercise:**

- Assign participants in to manageable size and give instruction.
- Identify available hazards in specific department/session of a company and assign severity level.
- Write the lists with flip chart and post.
- Facilitate panel discussion to enrich the lists with possible/available hazards and write it with a different colour.
- Conclude to what extent they were able to identify hazards and a risk assessment shouldn't miss even a minor hazard.

Step 2: Decide who might be harmed and how

Introductory Note

- It is necessary to be clear about who might be harmed; it will help you identify the best way of managing the risk.
- For each hazard identified, remember to identify how they might be harmed, i.e. what type of injury or ill health might occur. E.g. a person working on a task that involve repeated lifting task may suffer from back injury.
- Characterize which workers are affected by what type of hazard and how. Make sure workers who have particular requirements that might be at risk are addressed:
  - Young workers
  - Female workers
  - Employees with disability
  - New employees
  - Older workers

Extra thinking is required for some hazards and workers i.e. cleaners, visitors, contractors, maintenance workers who may not be in the workplace all the time like members of the public.

Group Exercise:

- Use the previous group to identify hazards and for the previously identified hazards, decide who might be affected and how.

- Let the group to present their discussion point with a representative.
- Conclude the discussion referring the previous sessions on occupational hazards and associated effects.

Step 3: Evaluate the risks and decide on precautions

- First look at what your organization is already doing;
- Think about what controls you have in place and how the work is organized;
- Then compare this with the good practice;
- Evaluate if there is more you should be doing to bring yourself up to standard;
- When controlling risk apply the principles of hierarchical hazard control strategies;

Make sure your action involve workers, so that you can be sure that what you propose to do will work in practice and won't introduce any new hazards;

➢ **Group Exercise:**

Continue the discussion with the previously assigned group to discuss on the available control measures implemented in that specific organization and check to suggest if there is more to be done.

- Use the following risk matrix for the discussion and exercise.

Table 9: Risk Assessment Matrix

	Chance of Occurrence →				
Hazard Level	**Never Happened in the World (1)**	**Never Happened in the organization (2)**	**Happened in the Organization (3)**	**Repeatedly happened in the organization (4)**	**Repeatedly happened in your department (5)**
1					
2					
3					
4					
5					

Key:		
Low	**Medium**	**High**
Follow up to maintain	Action to minimize risks	Immediate alternative action required

Step 4: Record findings and implement them

Key Note

- When writing down your results, keep it simple. When you have fewer than five employees you do not have to write anything down, though it is useful so that you can review it at a later date.
- Whenever there are many things to be improved that you could make, big and small, don't try to do everything at once. Make a plan of action to deal with the most important things first.
- Assign a deadline and responsible person for the planned action to control hazards.
- Check if the implemented solutions are according to the plan.

Step 5: Review the risk assessment and update

Key Note

You might bring new equipment, substances and procedures that could lead workers to new hazard, hence need to review actions in a continuous base.

Review the risk assessment again, where necessary amend it; check:

- Are there any changes?
- Are there still improvements need to make?
- Have your workers identified workplace problems?
- Have there been any learning from accidents or near misses?
- Make sure the risk assessment stays up to date.

Group exercise

Continue the discussion with the previously assigned group to discuss on prioritizing the risk using the risk matrix and finalize your risk assessment. Let the participants present with risk assessment format.

iii. Responsibilities

Everybody in the workplace is responsible for the reduction of work related health problems whatever the position that he/she is assigned for. Every individual in the organization should understand their responsibility for Health and Safety objectives and activities; hence, employee involvement is very important.

- **Group Exercise on workers Participation**
  - Start the session by an exercise called “Safety Network”.
  - Material needed: roll of rope/string
  - Facilitate the exercise that can take 10-15mints.
  - Conclude the exercise by giving emphasis how the participation of workers at all level will help to function the OSH-MS effectively with all its benefits.
- Conclude the session with the following summery presentation

There are two broad workers participations approach in health and safety;

- ***Indirect representation***: through representatives of workers; traditional approach;
  - Safety committee
  - Labour Union
- ***Direct participation***: an alternative active approaches;
  - Individual worker consultation
  - Team of individuals

- **Case study**

- Divide participants into smaller group and let them to read the case.
- Once they finish reading, facilitate plenary discussion on the key OSH issue that has been implemented and its outcome.
- Give emphasis on what key strategy was implemented as a value for workers participation.

Summary: Strong leadership commitment with full participation of workers is very important for the establishment of OSH-MS in the organization.

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Annexes

Annex I: Pre and Post Test Questions

ToT Training for Stakeholders of Micro and Small Scale Enterprises

Instruction: Answer the following questions accordingly

1. Mention at least two national legal documents in relation to Occupational health and safety;
   A. _____
   B. _____
   C. _____
2. How much is the Occupational exposure limit value for Noise in Ethiopia?
   A. 85dBA
   B. 90dBA
   C. 50dBA
   D. 70dBA
3. List down two benefits of good OSH programs for each of the parties (the employers and the workers);
   A. Employers
      i. _____
      ii. _____
   B. Workers
      i. _____
      ii. _____
4. Mention the five steps of risk assessment
   A. _____
   B. _____
   C. _____
   D. _____
   E. _____
5. What are the elements of OSH management system;
   A. _____
   B. _____
   C. _____
   D. _____
   E. _____
6. Do you think, a given factory can have its own OSH policy?
   A. Yes
   B. No

7. Which one of the following isfalse regarding the responsibilities of employees at work place?
   A. To follow instructions given by the employer based on the terms of the contract and work rules
   B. To handle with due care all instruments and tools entrusted to him/her for work

C. To report for work always in fit mental and physical conditions
D. To give all proper aid when an accident occurs threatens life or property in his/her place of work without endangering his safety and health
E. To provide work in accordance with the contract of employment

8. Which one of the following is true regarding to the responsibilities of employers at work place?
   A. Comply with the occupational health and safety requirements provided under the act
   B. Take appropriate steps to ensure that workers are properly instructed and notified concerning the hazards of their respective occupations
   C. Assign safety officer and establish an occupational safety and health committee
   D. Provide workers with protective equipment, clothing and other materials
   E. Register employment accident and occupational diseases and notify to the labor inspection
   F. All
9. The minimum number of employees required to establish *occupational health and safety committee* at enterprise level _____.
   A. 10
   B. 20
   C. 50
   D. 100
10. Under the Ethiopian labor proclamation No 377/2003 indicated the minimum number of employees required to establish *trade union* at enterprise level is;
   A. 10
   B. 20
   C. 50
   D. 100
11. What is the maximum work time permitted for young workers in a day?
   A. 6 hour
   B. 8 hour
   C. 7 hour
   D. 2 hour
12. The heat balance mechanisms over a period of time-affected by_____.
   A. Work rate
   B. Clothing
   C. Air temperature
   D. Radiant temperature
   E. Air Velocity
   F. Humidity(moisture)
   G. All
13. Chemicals can't be available in one of the following form:
   A. Vapors
   B. Gasses

C. Dusts
D. Fumes
E. Mists
F. Liquids
G. Can be available in all forms of the above

14. Which one is the right strategic order for hierarchal prevention and control measure of occupational health hazardous in all work places?

A. Elimination; Substitution; Administrative Control; Engineering control; Provision of personal protective equipment

B. Elimination; Substitution; Engineering control; Provision of personal protective equipment; Administrative Control

C. Elimination; Engineering control; Administrative Control; Substitution; Provision of personal protective equipment

D. Elimination; Provision of personal protective equipment; Administrative Control; Engineering control; Substitution

E. Elimination; Substitution; Engineering control; Administrative Control; Provision of personal protective equipment

15. The main ergonomics risk factors at work places are_____;

A. Forceful exertions
B. Poorly organized work procedure
C. Awkward postures
D. Repetitive motions
E. Static posture
F. Vibration exposure
G. Pressure points
H. All

16. What is the maximum frequency allowed per minute for a worker to manipulate a task?
A. 2 times
B. 4 times
C. 6 times
D. 10 times
E. 15 times

17. What is the maximum allowable day per week for a young worker to work?
A. 1 day
B. 3 days
C. 6 days
D. 7 days
E. Not fixed

18. Which one of the following indicates the prohibited time for young workers in daily program?

A. Morning; 08:00am – 12 pm
B. Afternoon; 01:00 pm -05pm
C. Evening; 06:00 pm-12 am
D. Night; 10:00 pm- 06:00 am
E. Night; 12:00 am- 07:00 am

19. Which one of the following is prohibited task for young workers? (More than one choice is possible)
    A. Underground task like mining, quarries etc.
    B. Construction task that involve work on scaffolding
    C. Road construction
    D. Activities linked to electricity installation
    E. Engage in illicit activities: selling drugs, sexual activities
    F. In sewers and digging tunnels
    G. Tasks in transport service that involve heavy weight lifting
    H. Metal melting
    I. Workplaces where there is extreme temperature (Hot and Cold)
    J. With toxic chemicals and pesticides
    K. Fishing task
    L. Manual handling materials combined with different risky condition for them like repetitive task, heavy for them, with falling hazard due to rough or slippery floor, on elevated working surface etc.
20. Circle the condition at which a young worker should never be forced to work; (More than one choice is possible)
    A. Work overtime (>7hr per day)
    B. Night work (from 10pm to 06 am)
    C. Work for him/herself or his/her family/relatives
    D. Work when you are sick or injured
    E. Perform hazardous tasks without protection
    F. Work on weekly rest day
    G. Work on public holidays
    H. Perform tasks that are not part of the job you agreed to do
    I. Take drugs, alcohol or other illegal substances
    J. Engage in illicit activities: selling drugs, arms, etc.
    K. Have sexual activity with him/ herself, friends, relatives or others

Annex II: Description of working sectors with a focus for the training manual

Table 10: Description of working sectors with a focus for the training manual

Classification	Specific Working Sectors
Agriculture, hunting, forestry and fishing	Farming work, Animal fattening, Khat farming, diary, irrigation, Fishing, and sheepherding.
Mining and quarrying	Stone crusher, sand collection, Quarrying, digging, and Mining (gold and silver production)
Manufacturing	Wood and metal work (Home and office furniture work), Metal work (Garage and welding), Edible oil factory, textile, garment and/or weaving and Milling
Electricity, gas and water	Electric cocking equipment work and/or maintenance, Car oil, Water pumping,
Construction	Construction (Finishing work, basement work, supper structure, Road construction)
Whole sale, retail trade, restaurants and hotel	Selling shop/ retailer/ open market, Kiosk, Hotel and restaurant and cafeteria (waiter, cocking, casher), Wholesale, Insecticide shop, Local beer and animal drug pharmacy.
Transport, storage and communication	Transport (Cart, bus station work, assistant driver) Metal store (metal, coffee, grain, loading and unloading)
Financing, insurance, real estate and banking	Bank and Insurance company (cleaner, messenger etc.)
Community, social and personal services	Domestic workers, Car wash, Copy house, Barber, Shoeshine, Gomista work (personal service)

Annex III: BINGO Safety Awareness Game

Instructions

1. Review the questions in the boxes
2. Review the answers on the next page
3. Match the best answer to each question, putting the answer no. in the box
4. To win the game, complete 5 boxes in one column or one row or one diagonal
5. When you think that you have completed a column, row or diagonal correctly stand up and yell, **"Bingo!".**

BINGO!	Column 1	Column 2	Column 3	Column 4
Row 1	Hazard	Accident	Hazard Elimination	Personal Protective equipment
Row 2	Engineering Control Strategy	Psychosocial Hazard	Proclamation 377/1996	Administrative control Strategy
Row 3	Universal Design	Substitution Approach	Reasonable Accommodation	Hazards due to poor Ergonomics
Row 4	Physical Hazards	Biological Hazards	Proclamation No. 568/2008	Chemical Hazards

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BINGO Safety Awareness Game

ANSWERS

1. Anything that has the potential to cause harm.
2. Extreme Temperature, Noise, Vibration, Radiation, Lighting.
3. Substances that can be used to facilitate the process and can be found in the form of Gases, Vapor, Solvents, Mist etc.
4. Virus, Bacteria, Molds, Animal bites etc.
5. Mismatch/unfit condition at work, Repetitive movement, frequent lifting, improperly adjusted workstations, heavy load etc.
6. Poor communication, poor support, mismatch of demand and capacity, bullying, harassment at work etc.
7. Provides VAT tax exemption for companies having 60% of their work force consisting or persons with disabilities
8. The last hazard control strategy.
9. Method to ensure equal access and use by everyone of buildings, facilities, equipment/materials, household utensils - virtually everything
10. Necessary and appropriate modifications and adjustments to ensure the inclusion and participation of persons with disabilities in all scopes of social life.
11. Unforeseen, uncontrolled, undesirable and sudden mishap which may result in minor or major injuries or death of the person involved, loss of property, interruptions in activities or functions in industry.
12. Measures taken to prevent or minimize hazard Exposure through the application of controls such as improved ventilation, noise reduction techniques, chemical substitution, equipment and facility modifications.
13. Governs the labor relation between employer and employers.
14. Avoiding the source of hazard.
15. A measure initiated to reduce worker exposure to various stresses in the work environment. An example is limiting the amount of time an employee can work around health hazards.
16. Replacing hazardous substances or sources or practices with less hazardous substance, source and practices.

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BINGO Safety Awareness Game

ANSWER Key

1. **Hazard**; anything that has the potential to cause harm.
2. **Physical hazards**; Extreme Temperature, Noise, Vibration, Radiation, Lighting.
3. **Chemical hazards**; Substances that can be used to facilitate the process and can be found in the form of Gases, Vapor, Solvents, Mist etc.
4. **Biological hazards**; Virus, Bacteria, Molds, Animal bites etc.
5. **Hazards due to poor Ergonomics;** mismatch/unfit condition at work, Repetitive movement, frequent lifting, improperly adjusted workstations, heavy load etc.
6. **Psychosocial hazards**; poor communication, poor support, mismatch of demand and capacity, bullying, harassment at work etc.
7. **Proclamation No. 568/2008**: Provides VAT tax exemption for companies having 60% of their work force consisting or persons with disabilities
8. **Personal Protective equipment**; the last hazard control strategy.
9. **Universal Design;** Method to ensure equal access and use by everyone of buildings, facilities, equipment/materials, household utensils - virtually everything
10. **Reasonable Accommodation;** Necessary and appropriate modifications and adjustments to ensure the inclusion and participation of persons with disabilities in all scopes of social life.
11. **Accident:** Unforeseen, uncontrolled, undesirable and sudden mishap which may result in minor or major injuries or death of the person involved, loss of property, interruptions in activities or functions in industry.
12. **Engineering Control Strategy**; Measures taken to prevent or minimize hazard Exposure through the application of controls such as improved ventilation, noise reduction techniques, chemical substitution, equipment and facility modifications.
13. **Labor Proclamation 377/1996:** governs the labor relation b/n employer and employers.
14. **Hazard Elimination**; avoiding the source of hazard.
15. **Administrative control Strategy**; A measure initiated to reduce worker exposure to various stresses in the work environment. An example is limiting the amount of time an employee can work around health hazards.
16. **Substitution Approach**; replacing hazardous substances or sources or practices with less hazardous substance, source and practices.

Annex IV: Ergonomic Glossary for Bingo Awareness Game

BINGO MSD Awareness Game

Instructions

1. Review the questions in the boxes
2. Review the answers on the next page
3. Match the best answer to each question, putting the answer no. in the box
4. To win the game, complete 5 boxes in one column or one row or one diagonal
5. When you think that you have completed a column, row or diagonal correctly stand up and yell, “Bingo!”.

BINGO!	Column 1	Column 2	Column 3	Column 4	Column 5
Row 1	Carpal tunnel syndrome	Osteoarthritis	Constriction	Musculoskeletal disorders (MSDs)	Nonspecific backache
Row 2	Chronic low-back pain	Raynaud’s Phenomenon	Cubital tunnel syndrome	Rotator cuff tendonitis	Cumulative trauma disorders
Row 3	Degenerative disc disease	Sprain	DeQuervain’s Disease	Strain	Tendonitis
Row 4	Digital neuritis	Thoracic outlet syndrome	Epicondylitis	Ganglionic cyst	Fatigue
Row 5	Mechanical contact stress	Tenosynovitis	Trigger finger	Ulnar nerve entrapment	BINGO!

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BINGO MSD Awareness Game

ANSWERS

1. A compression of the median nerve as it passes through the carpal tunnel in the wrist.
2. General soreness and fatigue of the low back. Pain is usually constant, and it accompanies most activities.
3. Binding, squeezing, or shrinking blood vessels so that circulation is reduced.
4. Compression of the ulnar nerve as it passes through the notch of the elbow.
5. Injuries and illnesses that generally occur as a result of exposure to repeated stresses over a period of time. They affect one or more parts of the soft tissues and bones of the musculoskeletal system and/or nerves and blood vessels servicing the musculoskeletal system.
6. Wear and tear of the discs that separate the vertebrae of the spine.
7. An inflammation of the tendon and/or its sheath at the base of the thumb.
8. Compression of the nerves along the sides of the fingers or thumbs, resulting in tingling and numbness.
9. An inflammation of the tendons at the elbow. Also called tennis elbow (lateral or outside part of the elbow) or golfer's elbow (medial or inside part of the elbow).
10. A condition that results when the body cannot provide enough energy for the muscles to perform a task. It results in an incapacity to continue to perform work at the same rate.
11. Swelling of the tendon sheath due to the buildup of synovial fluid inside the sheath. The cyst usually causes a bump under the skin.
12. The contact of the body with a hard surface or edge that results in the compression of tissue. Can also result when using a part of the body as a hammer or striking instrument.
13. Illnesses and injuries that affect one or more parts of the soft tissue and bones in the body. The parts of the musculoskeletal system are bones, muscles, tendons, ligaments, cartilage, and their associated nerves and blood vessels.
14. General soreness and fatigue of the low back.

15. Most common type of arthritis, especially among older people, sometimes called degenerative joint disease or “wear-and-tear” arthritis. Unlike other types of arthritis, it only affects the joints, not internal organs. It causes persistent stiffness and swelling of the joints.

16. A constriction of the blood vessels in the hands and fingers. Also called “white finger.”

17. Inflammation of one or more tendons at the shoulder. Also called “pitcher’s shoulder.”.

18. Overstretching or overexertion of a ligament that results in a tear or rupture of the ligament.

19. Overstretching or overexertion of a muscle or tendon.

20. Inflammation of the tendon.

21. Inflammation of the sheath around the tendon.

22. Compression of the nerves and blood vessels between the neck and shoulder often associated with prolonged overhead work.

23. A common term for tendonitis or tenosynovitis that causes painful locking of the finger(s) while flexing.

24. Compression of the ulnar nerve as it passes through the wrist, often associated with prolonged flexion and extension of the wrist and pressure on the palm.

25. Awareness creation game through matching.

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BINGO MSD Awareness Game

ANSWER Key

- ***Carpal tunnel syndrome*:** A compression of the median nerve as it passes through the carpal tunnel in the wrist.
- ***Chronic low-back pain*:** General soreness and fatigue of the low back. Pain is usually constant, and it accompanies most activities.
- ***Constriction:*** Binding, squeezing, or shrinking blood vessels so that circulation is reduced.
- ***Cubital tunnel syndrome*:** Compression of the ulnar nerve as it passes through the notch of the elbow.
- ***Cumulative trauma disorders*:** Injuries and illnesses that generally occur as a result of exposure to repeated stresses over a period of time. They affect one or more parts of the soft tissues and bones of the musculoskeletal system and/or nerves and blood vessels servicing the musculoskeletal system.
- ***Degenerative disc disease*:** Wear and tear of the discs that separate the vertebrae of the spine.
- ***DeQuervain's Disease*:** An inflammation of the tendon and/or its sheath at the base of the thumb.
- ***Digital neuritis*:** Compression of the nerves along the sides of the fingers or thumbs, resulting in tingling and numbness.
- ***Epicondylitis:*** An inflammation of the tendons at the elbow. Also called tennis elbow (lateral or outside part of the elbow) or golfer's elbow (medial or inside part of the elbow).
- ***Fatigue***: A condition that results when the body cannot provide enough energy for the muscles to perform a task. It results in an incapacity to continue to perform work at the same rate.
- ***Ganglionic cyst:*** Swelling of the tendon sheath due to the build up of synovial fluid inside the sheath. The cyst usually causes a bump under the skin.
- ***Mechanical contact stress***: The contact of the body with a hard surface or edge that results in the compression of tissue. Can also result when using a part of the body as a hammer or striking instrument.
- ***Musculoskeletal disorders (MSDs):*** Illnesses and injuries that affect one or more parts of the soft tissue and bones in the body. The parts of the

musculoskeletal system are bones, muscles, tendons, ligaments, cartilage, and their associated nerves and blood vessels.

- ***Nonspecific backache:*** General soreness and fatigue of the low back.
- ***Osteoarthritis:*** Most common type of arthritis, especially among older people, sometimes called degenerative joint disease or “wear-and-tear” arthritis. Unlike other types of arthritis, it only affects the joints, not internal organs. It causes persistent stiffness and swelling of the joints.
- ***Raynaud’s Phenomenon*****:** A constriction of the blood vessels in the hands and fingers. Also called “white finger.”
- ***Rotator cuff tendonitis*****:** Inflammation of one or more tendons at the shoulder. Also called “pitcher’s shoulder.”.
- ***Sprain:*** Overstretching or overexertion of a ligament that results in a tear or rupture of the ligament.
- ***Strain*****:** Overstretching or overexertion of a muscle or tendon.
- ***Tendonitis*****:** Inflammation of the tendon.
- ***Tenosynovitis*****:** Inflammation of the sheath around the tendon.
- ***Thoracic outlet syndrome*****:** Compression of the nerves and blood vessels between the neck and shoulder often associated with prolonged overhead work.
- ***Trigger finger*****:** A common term for tendonitis or tenosynovitis that causes painful locking of the finger(s) while flexing.
- ***Ulnar nerve entrapment*****:** Compression of the ulnar nerve as it passes through the wrist, often associated with prolonged flexion and extension of the wrist and pressure on the palm.

Annex V: General tip as Preventive Action for work related MSDs:

- Be familiar with the job requirements and the type of tools needed for the job.
- Choose the right size and shape of tool
- Select tools with the least vibration.
- Use the whole hand whenever possible, avoid pinching actions
- Maintain the wrist in a neutral position while working.
- Keeping the elbows bent to keep loads close to the body when lifting
- Know how to stand at the workstation to prevent awkward positioning
- Whenever possible avoid manual material handling
- If to handle manually, develop the habit of safe manual handling
- Use light loads and allowing for a safe lifting zone.
- Hands should be kept >25 degrees centigrade.
- Whenever possible request for help.
- Apply adequate relaxation, stretching and other vital exercise.
- Take adequate and frequent rest period etc.
- …more work materials and procedure modification should be initiated based on the type of task being engaged.

General Guidelines/Tips for Workstation Design

A. Avoid Static Loads and Fixed Work Postures

- Arrange the workstation in a way that alternate positions can be used to accomplish work. The body needs to move, and changing position throughout the day is better for your health.
- Design work stations for the neutral position to be maintained/for natural body posture (for example: keeping your wrists straight, keeping your back at its curvature, elbows at a ninety degree angle etc.)
- Alternate tasks throughout the workday to cut down the repetitive motion.

B. Reduce Musculoskeletal Disorders; by minimizing excessive/awkward reaching, bending and twisting movements;

- The safety zone for reaching is defined as the area between the knee/knuckles and the shoulders
- Reaching above shoulder height repeatedly should be avoided.

- Put the materials that you use most on a lower shelf and the less used items on the higher shelves, for sited works.
- Don't bend your wrist; Don't lift your elbow
- Don't reach behind your back
- Set the Work Height at 50 mm Below the Elbow

C. Furnish Every Employee with an Adjustable Chair and footrest

- Adjustable height to maintain a proper sitting height; thighs are about horizontal, the lower legs vertical, the feet flat on the floor,
- Elbows are at proper height in relation to work surface height;
- Adjust the footrest to prevent pressure at undersides of the thighs;
- The backrest should be large enough to be leaned against

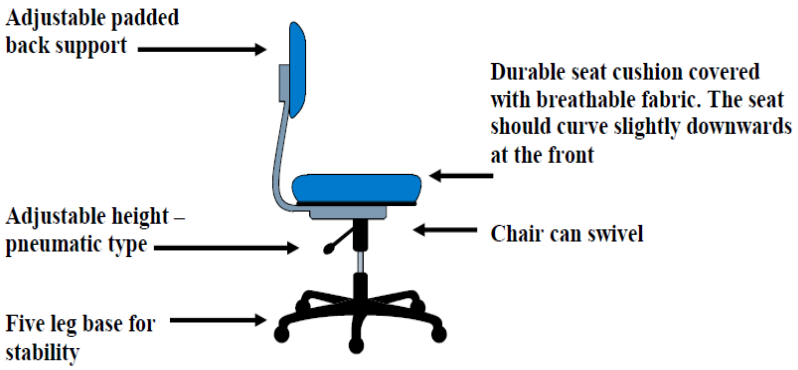

Figure 25: Design condition of Ergo-working chair

Individual Activity: Demonstration of proper Seated Posture;

- Ask all participants to sit in a proper posture
- Select sample participants to reflect what a proper sitting posture mean
- Check and comment the demonstration to highlight the key ergonomic principles for sitting work.

An ergonomic chair should meet at least the following criteria:-

- The chair should have a 5 pedestal base;
- The seat pan should feel comfortable and fit your shape;
- The seat chair height should be adjustable and the range of height adjustment should be sufficient to meet the needs of all users;
- The chair should have comfortable lumbar (lower back) rest that is reclined;
- The chair back rest should be large enough and should have a space for hip;

- The seat pan should still feel comfortable after you've been sitting in it for 60 - 120 minutes;
- Armrests and footrest are not necessary, but if desired armrests should be adjustable in height and width.
- The feet should rest flat on the floor or footrest.
- When seated upright in on the chair, the thighs should be parallel to the floor.

Note: For seated workstation, sitting with several "bad" postures for short periods may be better (or at least no worse) than using one "good" posture over long periods.

D. Use Gravity; Don't Oppose It; Example, when emptying/filling liquids

E. Conserve use of force;

- Avoid unnecessary acceleration and deceleration.
- Eliminate grasping motions by providing rolled edges and holes.

F. Design for most of the user population that use/work under it.

- Let the Small Person Reach and the Large Person Fit.

G. Use 2-Hand Motions Rather Than 1-Hand Motions

H. Use the Preferred Hand; the dominant hand is:

I. Keep Arm Motions in the Normal Working Area

- Avoid long benches
- Use arms for move backward and forward
- Keep the task closer to the worker
- Bend the tool – not the wrist!
- Make sure that work gloves fit well.
- Gloves decrease grasp strength by 20% and that strength is further decreased when poorly fitted gloves are used.

J. Place objects that need observation within the worker's visual field

Working Postures

Manual Handling will be hazardous when;

- Too heavy and/or bulky load, placing unreasonable work demand.
- The load is to be lifted from the floor and above the shoulders.
- Task that involve frequent/repetitive movement.
- The task that is positioned in awkward posture
- The load that cannot be gripped properly.

- A task performed on uneven, wet, or sloping surfaces
- Workers are not familiar with the task

Best approach to design manual handling

- If possible avoid manual handling, use ergonomic assist equipment and automation techniques; No human involved, no human is at risk!
- If to handle, load weight and size shall be kept small, shouldn't be too heavy;
- If to handle; material movement should be horizontal and Push, not lifting/lowering and pull/ no vertical movement;
- If lifting is a must, the material movement should between hip/knee and shoulder height level based on the weight of the material;
- It should be close to and in front of the body;
- Should be compact, safe to grasp (firm box, with handle);
- Shouldn't have sharp edge, corner;
- Lifting frequency shouldn't exceed 4-5 lifts per minute;
- Tasks that require sustained pushing or pulling forces should stay <30 sec;
- Reduce carrying distances whenever possible.

Annex VI: Reactions Caused by Work Related Stress

Table 11: Lists of Reactions Caused by Work Related Stress

Physiological	Behavioural	Emotional	Cognitive
• Migraines • Sleep disorders • Muscular tension • Weight disorders • Gastrointestinal • Blood pressure • Cholesterol • Allergies • Increasing heart rate • Increasing blood pressure • increasing muscle tension • Increased adrenaline production and secretion • Superficial breathing at higher frequencies. • elevated blood pressure • Sweaty palms; tightness in	• Absenteeism • Drug abuse • Use of medicine • Aggressiveness • Impatience • Eating disorders • Mood swings • decreasing productivity • increasing smoking • increasing drug use and/or alcohol consumption • making errors, and • reporting sick • Increased smoking • Aggressive driving • Having accidents	• Depression • Anxiety • Discouragement • Boredom • Memory loss • Dissatisfaction • Frustration • Irritability • Fear • Irritation • depressive mood • anxiety • Angry outbursts • diminished motivation • Lowered self-esteem • Depression • Jealousy	• decreased attention • narrowing of perception • forgetfulness • less effective thinking • less problem solving, and • Reduced learning ability • Errors in judging distance • Diminished or exaggerated fantasy life • Reduced creativity • Difficulty for decisions • Mental confusion • Lack of concentration • Diminished productivity • Lack of attention to detail • Orientation to past • Over-sensitivity to criticism

the chest • Headaches • Diarrhea • Tightness of muscles • Other speech difficulties • pupil dilation • Nausea and/or vomiting • Sleep disturbance • Fatigue • Proneness to accidents • Susceptibility to minor illnesses • Dryness of mouth or throat	• Carelessness • Eating too much • Fast (even incoherent) speech • Chewing fingernails	• Suspiciousness • Diminished initiative • Loneliness • Helplessness • Insecurity • Frustration • Lack of interest • Tendency to cry • Lacking in confidence • Exhaustion	

Annex VII: Sample OSH Policy

COMPANY
HEALTH AND SAFETY POLICY (Sample)

Company Name is committed to the Health and Safety Management System that protects our employees, contractors and the public.

Employees at all levels are responsible and accountable for *the company's* health and safety. Active participation by everyone, at all times, and in every job is necessary for the health and safety excellence this company expects.

Management will set an example and provide leadership in health and safety, set health and safety policies and procedures, and provide training, equipment and adequate resources to perform the job safely.

Workers will follow all rules, safe work policies and procedures, and cooperate with the employer in working towards improved health and safety at work.

Workers and management at all levels will be familiar with the requirements of the Alberta Occupational Health and Safety legislation as it relates to their work.

Our goal is a healthy and injury free workplace for all employees. By working together, we can achieve this goal.

_____ _____

Name and Title of Most Senior Manager ***Date***

Annex VIII: Sample Orientation Checklist

Item Description	Yes	No	N/A	Date
Work Site Tour and Introductions				
Health and Safety Manual; Reviewed and discussed				
Reviewed and Discussed Policies; o Health and Safety o Drug and Alcohol o Violence o Enforcement				
Responsibilities; Review and discuss responsibility to: o Refuse unsafe work o Know about the hazards present in the workplace				
OHS Legislation; Reviewed and discussed				
Hazards; Reviewed and discussed job-specific health and safety hazards				
Training; Reviewed and discussed job-specific training required				
Workplace Hazardous Materials Information System; Reviewed and discussed WHMIS program and location of MSDS				
Emergency Plans; Location of exits, muster point, alarms and fire extinguishers				
First Aid; Where to locate first aid treatment and supplies				
Reporting; Reviewed and discussed incident reporting procedures				
Personal Protective Equipment; Where to locate, care, maintenance and rules				
Employee signature	Supervisor signature			
Date	Date			

Annex IX: Sample Emergency Preparedness Assessment Checklist

Evaluation points
Is there a written emergency response preparation for each work site appropriate to the hazards at the site?
Does the plan include: 1. Communication procedures? 2. Emergency phone numbers? 3. List of responsible emergency response personnel? 4. Evacuation procedures?
Do employees at the site understand their responsibilities under the plan?
Are employees given emergency response training appropriate to their individual responsibility?
Are emergency response drills conducted annually or more often as required?
Are emergency response records kept?
Are all records of emergency responses (including drills) reviewed to correct deficiencies?
Is the appropriate number of employees trained in first aid as required by legislation?
Do first aid supplies and facilities meet legislative requirements?

Annex X: Risk Assessment Format

Table 12: Risk Assessment Format

Name of Person who conduct the RA and Date: _____
Organization: Signature_____

1. Identify Hazards	2. Who might be harmed and how?	3. Evaluate the risks and decide on precautions		4. Record findings and implement them			5. Review the risk assessment and update
		What are you already doing?	Further action is necessary?	Responsible Person	Date to be completed	Potentials of Implementation	

Stay Safe!

///…The End…///