East African Community
(EAC)

Federation of East African Freight
Forwarders Associations (FEAFFA)

THE EAST AFRICA CUSTOMS AND FREIGHT FORWARDING PRACTICING CERTIFICATE

# OCCUPATIONAL SAFETY, HEALTH AND ENVIRONMENTAL PRACTICES

FEAFFA in collaboration with East Africa Revenue Authorities

BR

Kenya Revenue Authority

RRA Rwanda Revenue Authority

Tanzania Revenue Authority

URA Uganda Revenue Authority

**East African Community (EAC)**

The East African Community (EAC) is a regional intergovernmental organization of six (6) Partner States, comprising Burundi, Kenya, Rwanda, South Sudan, Tanzania and Uganda, with its headquarters in Arusha, Tanzania.

**Federation of East African Freight Forwarders Associations (FEAFFA)**

The Federation of East African Freight Forwarders Associations (FEAFFA) is a regional private sector apex body of the Customs Clearing and Freight Forwarding (CFA) industry in East Africa. It aims at promoting a professional freight logistics industry for trade facilitation and regional economic growth. FEAFFA strives to address the challenges experienced by its members through training, provision of information, and other aspects of capacity building. It advocates for the full implementation of the East African Community (EAC) Customs Union. The East Africa Customs and Freight Forwarding Practicing Certificate (EACFFPC) is the Federation's and the industry's premier training program in East Africa since 2007.

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# FOREWORD

Customs Clearing Agents, Freight forwarders, and Warehouse Operators in the East African Community (EAC) region continue to play a vital role in the facilitation of trade particularly with regards to the assessment tax, storage of goods, transportation, and last-mile delivery to clients. This, in turn, facilitates cargo movement and clearance from all ports.

The agents handle goods worth millions of dollars on behalf of the shippers. Besides, they originate documents that facilitate movement and clearance of cargo culminating in errors that slow down the flow of business. The movement of cargo depends on how fast and correctly documentation is done for verification by the respective Customs Authorities. A delay in customs clearance increases the cost of doing business.

This pointed to the need for these agents to be equipped with the requisite knowledge, skills, and attitudes to carry out their work efficiently, just as their counterparts from customs.

The EAC region, with support from TradeMark East Africa (TMEA), has made significant steps towards bridging the knowledge and skills gap in the customs clearing and freight forwarding industry. The introduction of the East Africa Customs and Freight Forwarding Practicing Certificate (EACFFPC) in 2006, a regional training programme jointly implemented by the EAC directorate of customs, the East African Revenue Authorities (EARAs), the National Association of the Freight Forwarding Industry, and FEAFFA was a big step. Since its inception, over 7000 agents have graduated from this training.

A review of the programme in 2015 and a market survey conducted in 2020 supported by TradeMark East Africa (TMEA) highlighted key areas of improvement for the EACFFPC programme to achieve the aim of producing competent customs agents, freight forwarders, and warehouse keepers. The revised curriculum has therefore been designed to address these challenges and shortcomings. The revamped EACPPFC programme is designed to enhance the ability of freight forwarders to provide competitive and high-quality end-to-end services thereby reducing inventory costs and increasing safety levels in warehousing operations in the East African region.

With the revised EACFFPC curriculum, the dream of attaining a professional and compliant freight logistics industry in the East African region has been strongly boasted.

# ACKNOWLEDGMENT

The Curriculum Implementation Committee (CIC) is grateful to the EAC sectoral council on Trade Industry Finance and Investment for adopting the EACFFPC as an EAC training programme for clearing and forwarding agents in the region. This is a testimony to the effect the programmeme has had on the clearing and forwarding industry in the EAC region.

The CIC is also grateful to the EAC Directorate of Customs, the Commissioners of Customs of the East Africa Revenue Authorities, the Chairpersons of National Associations of clearing and forwarding agents, and the President of FEAFFA for their dedication and support to the EACFFPC programmeme.

Special appreciation for the National Curriculum Implementation Committees for providing their trainers to participate in the development and validation of the curriculum and training materials. CIC also acknowledges the FEAFFA secretariat for excellently coordinating the curriculum and training materials development and validation process.

The CIC in a very special way recognizes TradeMark East Africa (TMEA) who provided the financial support to update the curriculum, develop and publish the 2021 edition of the EACFFPC training materials. We remain indebted to you forever.

We also appreciate all EACFFPC trainers, students, and stakeholders for the constant feedback that has been incorporated in this edition of the training materials.

# OCCUPATIONAL SAFETY, HEALTH AND ENVIRONMENTAL PRACTICES

## 1.0 UNIT OVERVIEW

### 1.1 Unit Description

This unit describes the competencies required to manage the workplace environment, safety, and health. The unit addresses occupational health and safety, environmental legislations and conventions, workplace hazards, personal protective equipment, and managing fire and accidents in the workplace.

### 1.2 Summary of General Learning Outcomes

At the end of the unit, the trainee should be able to:

1. Ensure Occupational Safety and Health
2. Adhere to Environmental legislations/ conventions
3. Manage workplace hazards and risks
4. Handle hazardous Cargo
5. Use appropriate Personal Protective Equipment (PPE) in the workplace
6. Manage fire accidents in a workplace
7. Manage accidents in the workplace

## 2.0 OVERVIEW OF OCCUPATION SAFETY AND HEALTH

### 2.1 Specific Learning Outcomes

i. Describe the basic concept of occupational safety and health
ii. Identify common health and safety issues in the workplaces
iii. Describe the importance of OSH practice
iv. Describe common OSH practices.

### 2.2 Introduction

Every day, people die as a result of occupational accidents or work-related diseases. According to ILO, each year occupational accidents result in more than 4 days of absence of work). Additionally, over one million workers are injured at work every day in formal, registered workplaces.

Health is an important prerequisite for a successful private and social life and participation in work life. In addition to occupational accidents, a silent epidemic of work-related diseases (WRDs) has been recognized.

The World Health Organization defines the health of people as a basic right: 'The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition' and also contains a special objective for health at work. WHO has emphasized the development of health services as a system, aiming at universal service provision and providing occupational health services for all workers of the world. As the cornerstone of work-ability and physical, psychological and psychosocial functionality, health is an important determinant of workers' participation in work life. It is the most important determinant of work ability and has a strong impact on one's employability, work experience, workload and performance.

### 2.3 Concept of Occupational Health and Safety

**Occupational Safety**

- "Occupational" refers to issues related to working life.
- "Safety" is the condition of being free from hurt, injury or loss.

**Occupational Health**

- "Health" is defined by the World Health Organization (WHO) as "a state of complete physical, mental and social well-being and not just the absence of disease or infirmity".

- "Occupational health" is the branch of medicine that deals with the prevention and treatment of work-related injuries and diseases.

**"Occupational safety and health (OSH)"** is the discipline that deals with the prevention of work related injuries and diseases and the protection and promotion of workers' safety and health. It seeks to improve working conditions and the environment. Both safety and health issues must be addressed in every workplace.

According to the ILO and WHO, occupational health should aim at:

- The promotion and maintenance of the highest degree of physical, mental, and social wellbeing of workers in all occupations

- The prevention amongst workers of departures from health caused by their working conditions
- The protection of workers in their employment from risks resulting from factors adverse to health
- The placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological capabilities
- The adaptation of work to the worker and of each worker to his job.

## 2.4 Common Health and Safety Issues

Safety hazards cause accidents and the injuries that result can be serious. Safety hazards consist of things like sharp equipment, unsteady ladders, scaffolding that can fall down, ditches or trenches that can collapse and bury someone alive, water puddles on walkways where people can slip, poorly insulated or shorted electrical connections, poor lighting where workers cannot clearly see what they are doing, hot things that can burn, and confined spaces where poisonous gases can collect.

Different organizational workplaces will have their unique challenges to overcome, but there are health and safety issues familiar to every business, small or large including:

- Temperature, light, and air conditioning
- Harmful surroundings and hazardous substances, like asbestos
- Workstation health and safety, like computers and other display screen equipment (DSE)
- Manual handling
- Noise and sound exposure
- Slips, trips, and falls
- Handling heavy machinery, tools, and equipment

## 2.5 Importance of OSH Practice

Research has shown that safety and well-being at the workplace result to good business and profitability. Employers have primary responsibility for the occupational safety and health of workers. OSH performance is key to reputation management, particularly where businesses depend on the relationship with global consumers.

OSH focuses primarily on protecting employees in the workplace from accidents, injuries, and exposure to harmful substances. While accidents can happen at any time, it is still the employer's responsibility to ensure that they take steps to reduce the risk of incidents and maintain a safe working environment. Prioritizing OSH several key benefits, including:

- The reduced risk or accidents or injuries by identifying and mitigating hazards
- Improved efficiency and productivity due to fewer employees missing work from illness or injury
- Improved employee relations and morale (a safer work environment is a less stressful work environment)
- Reduced costs associated with accidents or injuries (healthcare and rehabilitative costs, losses in productivity, impact on employees' well-being)
- Lower insurance premiums resulting from fewer workplace incidents and workers' compensation claims.
- It helps in employee retention

## 2.6 OSH Practices

The most important aspect of a good Occupational Safety and Health policy is identifying the workplace hazards and ensuring that employees have the training, safety equipment, and other resources needed to work safely. Failure to implement effective policies and precautions can lead to injuries, reduced productivity due to the absence or loss of skilled labor, workers' compensation claims, and possible penalties from governmental agencies.

Safe working places dictates that employers should:

- Provide a safe working environment for all your employees
- Provide and maintain safe machinery and structures
- Provide safe ways of working

- Ensure safe use, handling, and storage of machinery, structures, and substances
- Provide and maintain adequate facilities
- Provide any information, training, instruction, or supervision needed for safety
- Monitor the health of workers and conditions at the workplace.

## 2.7 Learning Activities

Take a walk through your organization or any organization that has established offices and employees. Observe the way employees go about their work, the environment in which they are operating in and the various workplace equipment and tools available:

**Required:**

- The visible OSH practices within the organization
- The areas of concern in the organization in relation to OSH
- Recommendations on how the organization can improve the OSH practices in the organization.

## 2.8 Self-Assessment Questions and Activities

1. Explain what is occupational safety and health
2. What is the importance of OSH in the freight and logistics sector?
3. Discuss the roles and responsibilities of employees and management in the implementation of OSH in the freight and logistics sector

## 3.1 References


- Reese, D. C. (2016). Occupational Health and Safety Management: A Practical Approach, 3rd Edition. Routledge Francis Taylor
- Mansdorf S. Z. (2019). Handbook of Occupational Safety and Health, Third Edition. John Wiley & Sons, Inc.
- The Occupational Safety and Health Administration (OSHA) Laws and Regulation from different EAC Countries
- United Nations (2011). The Recommendations on the Transport of Dangerous Goods, 11th Edition, Volume I and II.
- World Health Organization (WHO). 2020. Health topics: Occupational health (Geneva). Available at: https://www.who.int/health-topics/occupational-health.
- International Labour Office (ILO). 2017. Wise Action Checklist, in Global Manual for WISE: Work Improvements in Small (Geneva), p.8. Available at: https://www.ilo.org/wcmsp5/groups/
- World Health Organization. WHO Global Strategy on Occupational Health for All. The Way to Health at Work. Geneva: WHO; 1995. http://www.who.int/occupational_health/globstrategy/en/, accessed on 15 April 2018.
- World Health Organization. WHA Resolution 60.26. Global Plan of Action on Workers' Health 2008–2017. Geneva: WHO; 2007.
- Alli, B. O. (2008). Fundamental principles of occupational health and safety / Benjamin O. Alli; International Labour Office – Geneva

## 4.0 ENVIRONMENTAL LEGISLATIONS AND CONVENTIONS IN LOGISTICS

### 4.1 Specific Learning Outcomes

i. Evaluate the impacts of logistics on the environment
ii. Analyse Environmental issues/concerns
iii. Evaluate the International Environmental Agreements / Conventions
iv. Discuss the role of Green Logistics in the freight and logistics industry.

### 4.2 Introduction

Logistics is a fast-growing sector of activity and mobility is essential to our way of life. At the same time, the transportation sector is the main source of environmental pollution. There are numerous environmental impacts in logistics transportation: pollution, noise, transport infrastructure occupying the urban space, and so on. Transport and road traffic in particular, produce fine particles that pollute the outside air. These particles are not only dangerous and carcinogenic to humans, but they are also toxic to ecosystems. The scope of logistics covers both inbound and outbound logistics, which involve the movements involved in sourcing and replenishing the raw materials, components, or finished goods needed for business processes, as well as the movements of goods from an organisation to its customers, back to suppliers or out for disposal and recycling.

### 4.3 Impacts of Logistics on the Environment

The impacts of logistics on the environment fall within three categories:

- **Direct impacts.** The immediate consequence of transport and logistics activities on the environment where the cause and effect relationship is generally clear and well understood. For instance, noise and carbon monoxide emissions are known to have direct harmful effects.

- **Indirect impacts.** The secondary (or tertiary) effects of transport activities on environmental systems. They are often of a higher consequence than direct impacts, but the involved relationships are often misunderstood and more challenging to establish. For instance, particulates, which are mostly the outcome of incomplete combustion in an internal combustion engine, are indirectly linked with respiratory and cardiovascular problems since they contribute, among other factors, to such conditions.

- **Cumulative impacts**. The additive, multiplicative or synergetic consequences of transport activities. They consider the varied effects of direct and indirect impacts on an ecosystem, which are often unpredictable. Climate change, with complex causes and consequences, is the cumulative impact of several natural and anthropogenic factors, in which transportation plays a role.

### 4.4 Environmental Issues/Concerns

There are several concerns emanating from the impacts of logistics on the social, economic, and ecological environments. These include:

- **Pollution in the aquatic environment**

The environmental impacts in logistics transportation also include oceans and groundwater. Each year, there are ecological catastrophes related to the sinking of oil tankers. This brings consequences in the ecosystem of oceans and sea coasts. In addition to the environments mentioned above, are the groundwater and rivers in rural areas the most damaged areas. As a result, aquatic species are threatened by this form of pollution and it is to be feared that some of them will disappear in the long term.

#### 1. Noise pollution

Transportation is a big noise. Road, sea and air traffic are responsible for this. Road transportation causes noises that could harm people and wildlife. In addition, there exist other kinds of noises caused by the motor unit, tires on the road and also the aerodynamic ones. The sound of vehicles becomes a real nuisance beyond 50 km / h. The noise caused by rail transportation is due to wheel-rail contact, squealing of brakes, or taking curves, from the diesel engine and aerodynamics. Air transportation noise

is very high around the airports and the aircraft passageways. Their intensity varies between 80 and 90 decibels. which affects the different species of birds that live around airports and humans. On the man, it is a discomfort and it can cause problems of communication, insomnia, and stress. These noises are also a nuisance for natural environments and wildlife.

## 2. Environmental Dimensions

Transportation activities support increasing mobility demands for passengers and freight, notably in urban areas. But transport activities have resulted in growing levels of motorization and congestion. As a result, the transportation sector is becoming increasingly linked to environmental problems.

### a. Climate change

The activities of the transport industry release several million tons of greenhouse gases each year into the atmosphere, accounting between 25 and 30% of all greenhouse gas emissions. There is an ongoing debate about to what extent these emissions are linked with climate change, but the debate relates more to the extent of these impacts than their nature. Some gases, particularly nitrogen oxide, also participate in depleting the stratospheric ozone (O3) layer, which naturally screens the earth's surface from ultraviolet radiation. The rise in air traffic, in addition to its emissions, has increased the number of contrails, which are mainly ice crystals formed from condensation around planes flying at high altitudes. They can contribute to climate change in a paradoxical fashion as, on the one hand, they can trap heat, and on the other, they are also reflecting solar radiation. In addition to being a contributor to climate change, transportation is also impacted by it, particularly over infrastructure (e.g. more floods due to rising sea levels) and operations (harsher operating conditions).

### b. Air quality

Highway vehicles, marine engines, locomotives, and aircraft are the sources of pollution in the form of gas and particulate matter emissions. They affect air quality and cause damage to human health. The most common include lead (Pb), carbon monoxide (CO), nitrogen oxides (NOx), silicon tetrafluoride (SF6), benzene and volatile components (BTX), heavy metals (zinc, chrome, copper, and cadmium), and particulate matters (ash, dust). Toxic air pollutants are associated with cancer, cardiovascular, respiratory, and neurological diseases. Carbon monoxide (CO), when inhaled, reduces the availability of oxygen in the circulatory system and can be extremely harmful and even deadly at specific concentrations. Nitrogen dioxide (NO2) emissions from transportation sources reduce lung function, affect the respiratory immune defense system, and increase the risk of respiratory problems. The emissions of sulfur dioxide (SO2) and nitrogen oxides (NOx) in the atmosphere form various acidic compounds that, when mixed in cloud water, creates acid rain. Acid precipitation has detrimental effects on the built environment, reduces agricultural crop yields, and causes forest decline.

### c. Noise

Noise represents the general effect of irregular and chaotic sounds on people as well as animal life. Basically, noise is an undesirable sound. The acoustic measure of the intensity of noise is expressed in decibel (dB) with a scale ranging from 1 dB to 120 dB. Long-term exposure to noise levels above 75 decibels severely hampers hearing and affects human physical and psychological well-being. Noise emanating from the movement of transport vehicles and the operations of ports, airports, and railyards affects human health through an increase in the risk of cardiovascular diseases. Ambient noise is a frequent result of road transportation in urban areas, which is the cumulative outcome of all the noise generated by vehicles (ranging from 45 to 65 dB), impairs the quality of life and property values.

### d. Water quality

Transport activities have an impact on hydrological conditions and water quality. Fuel, chemicals, and other hazardous particulates discarded from aircraft, cars, trucks, and trains or port and airport terminal operations can contaminate hydrographic systems. Because demand for maritime shipping has increased, marine transport emissions represent the most important segment of water quality impact of the transportation sector. The main effects of marine transport operations on water quality predominantly arise from dredging, waste, ballast waters, and oil spills. Dredging is the process of deepening harbor channels by removing sediments from the bed of a body of water. Dredging is essential to create and maintain sufficient water depth for shipping operations and port accessibility. Dredging activities have a two-fold negative impact on the

marine environment. They modify the hydrology by creating turbidity that can affect marine biological diversity. The contaminated sediments and water raised by dredging require spoil disposal sites and decontamination techniques. Waste generated by the operations of vessels at sea or at ports causes environmental problems since they can contain a very high level of bacteria that can be hazardous for public health as well as marine ecosystems when discharged in waters.

### e. Soil quality

The environmental impact of transportation on soil quality particularly concerns soil erosion and soil contamination. Coastal transport facilities such as ports have significant impacts on soil erosion. Shipping activities are modifying the scale and scope of wave actions leading to damage in confined channels such as river banks. Highway construction or lessening surface grades for port and airport developments have led to an important loss of fertile land. Soil contamination can occur through the use of toxic materials by the transport industry. Fuel and oil spills from motor vehicles are washed on roadsides and enter the soil. Chemicals used for the preservation of wooden railroad ties may enter the soil. Hazardous materials and heavy metals have been found in areas contiguous to railroads, ports, and airports.

### f. Biodiversity

Transportation also influences biodiversity. The need for construction materials and the development of land-based transportation have led to deforestation. Many transport routes have required draining land, thus reducing wetland areas and driving-out water plant species. The need to maintain road and rail right-of-way or to stabilize slope along transport facilities has resulted in restricting the growth of certain plants or has produced changes in plants with the introduction of new species. Many animal species are becoming endangered as a result of changes in their natural habitats and reduction of ranges due to the fragmentation of their habitat by transportation infrastructures.

### g. Land take

Transportation facilities have an impact on the urban landscape. The development of port and airport infrastructure is a significant feature of the urban and peri-urban built environment. Social and economic cohesion can be severed when new transport facilities such as elevated train and highway structures cut across an existing urban community. Arteries or transport terminals can define urban borders and produce segregation. Major transport facilities can affect the quality of urban life by creating physical barriers, increasing noise levels, generating odors, reducing urban aesthetics, and affecting the built heritage. The expansion of logistics activities has also been an indirect factor of land take in suburban and peri-urban areas.

## 4.5 Environmental Legislations Agreements /Conventions

In order to ensure the protection and sustenance of the environment, international treaties have been developed and signed. The treaties to be regarded as international must be intergovernmental, either bilateral agreements are between two governments, and multilateral Agreements are between more than two. Most environmental problems have a transboundary nature and often a global scope, and they can only be addressed effectively through international co-operation. Amongst the global environmental issues that environmental agreements are designed to respond to include: loss of biological diversity, adverse impacts of Climate Change, depletion of the ozone layer, hazardous waste, organic pollutants, marine pollution, trade in endangered species, destruction of wetlands, etc.

The International Environmental Agreements (IEAs) are signed treaties that regulate or manage human impact on the environment in an effort to protect it. The IEAs focus on different environmental categories including:

- **Nature:** conservation and protection of resources and systems
- **Species:** interaction with mammals, agriculture, and marine life
- **Pollution and climate:** pollution of the air, land, oceans, and freshwater systems
- **Habitat and oceans:** maintaining ecosystems
- **Freshwater resources:** regulation of lakes and rivers
- **Energy, nuclear issues, and conflict:** energy production, nuclear-weapon-free zones, and environmental weapons (bacteriological, chemical, toxin).

### 4.5.1 Scope of International Environmental Agreements

According to IEAs database, there are over 1,300 recorded multilateral and bilateral environmental agreements. The IEAs can be categorized based on their focus. An example of some of the areas and agreements are provided below:

**Air:**

- Geneva Convention on Long-range Transboundary Air Pollution (CLRTAP) (1979) and its protocols

**Biotechnology:**

- Cartagena Biosafety Protocol (2000) to the Rio Convention on Biological Diversity (1992) and its Supplementary Protocol on Liability and Redress (2010)

**Chemicals:**

- PIC Rotterdam Convention on Prior Informed Consent (1998)
- POP Stockholm Convention on Persistent Organic Pollutants (2001)
- Minamata Convention on Mercury (2013)

**Civil Protection and Environmental Accidents:**

- Helsinki Convention on Industrial Accidents (1992)
- Barcelona Convention (1976) as amended and its protocols
- OSPAR Convention (1992)

**Climate Change and Ozone Depletion:**

- UNFCCC Framework Convention on Climate Change (1992)
- Kyoto Protocol (1997)
- Paris Agreement (2015)
- Vienna Convention for the Protection of the Ozone Layer (1985)
- Montreal Protocol (1987) as amended

**Governance:**

- Aarhus Convention (1998) on access to information, public participation in decision-making and access to justice in environmental matters and its Protocol on Pollutant Release and Transfer Registers (2009)
- Espoo Convention on Environmental Impact Assessment (1991)

**Industry:**

- Helsinki Convention on Industrial Accidents (1992)

**Land use:**

- Alpine Convention (1991) and its protocols

**Nature and biodiversity:**

- CBD Convention on Biological Diversity (1992)
- Cartagena Protocol on Biosafety (2003)
- Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of the Benefits arising from their Utilization (2010)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES Convention) (1973)
- Bonn CMS Convention on the Conservation of Migratory Species (1979)
- Agreement on the conservation of African-Eurasian Migratory Waterbirds (AEWA-CMS) (1995)
- International Tropical Timber Agreement (ITTA) (1994)
- Ramsar Convention on Wetlands of International Importance (1971)

**Soil:**

- UNCCD Convention to Combat Desertification in Africa (1994)

**Waste:**

- Basel Convention on hazardous wastes (1989)

**Water:**

- Helsinki Convention on Watercourses and International Lakes (1992)
- Barcelona Convention (1976) as amended and its protocols

### 4.5.2 EAC and International Environmental Agreements

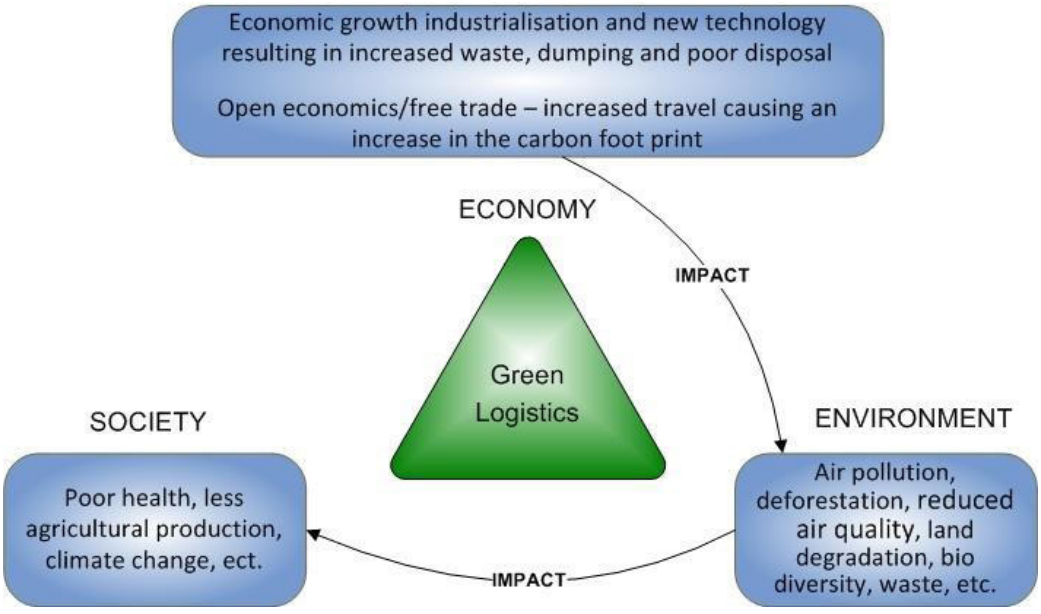
The EAC Partner States have signed and ratified several International Conventions and Treaties including among others:

- United Nations Convention on Biological Diversity (UNCBD);
- United Nations Framework Convention on Climate Change (UNFCCC);
- Cartagena Protocol on Biosafety (CPB);
- Convention on International Trade in Endangered Species of Wild Fauna and Flora
- Ramsar Convention on Wetlands of International Importance
- Stockholm Convention on Persistent Organic Pollutants (POPs).
- United Nations Convention on Combating Desertification (UNCCD).

## 4.6 Green Logistics

Green Logistics (Eco-logistics) refers to the set of sustainable policies and measures aimed at reducing the environmental impact caused by the activities of this business area. This logistics concept affects the configuration of processes, structures, and systems or equipment in the transport, distribution, and storage of goods.

The traditional approach to logistics often leaves environmental sustainability on the sidelines during decision-making. On the other hand, the aim of green logistics is to find a balance between ecology and economy.




Green logistics seeks to:

- Measure the carbon footprint of logistics operations to establish a starting point for considering sustainability measures and controlling their results.

- Reduce air, soil, water, and noise pollution by analysing the impact of each logistics area, especially those related to transport.

- Use supplies rationally by reusing containers and recycling packaging.

- Spreading sustainability to the supply chain, eco-logistics is also shaped by the design of products and their packaging. Both must be designed to minimize their environmental impact.

## Importance of Green Logistics

Logistics are an important function of modern transport systems. While traditional logistics seeks to organize forward distribution, that is the transport, warehousing, packaging, and inventory management from the producer to the consumer, environmental considerations opened up markets for recycling and disposal, and led to an entire new sub-sector: green logistics.

Inserting logistics into recycling and the disposal of waste materials of all kinds, including toxic and hazardous goods, has become a major new market. Reverse distribution is a continuous embedded process in which the organization (manufacturer or distributor) takes responsibility for the delivery of new products as well as their take-back. This would mean environmental considerations through the whole life-cycle of a product (production, distribution, consumption, and disposal).

Green Logistics Approaches and Strategies

### 1. Include eco-friendly criteria in your procurement policies

Sustainability criteria can be included in a company's purchasing and procurement policy when it comes to assessing suppliers' proposals. These can refer to:

- Product characteristics: e.g., buying eco-friendly packaging and limiting the use of plastic in packaging.
- Manufacturing processes: international regulations guarantee favorable environmental management.
- The supplier's location, prioritizing those closest to its facility.

### 2. Optimize transport management

Transport is a major carbon footprint area in the logistics chain. Aside from buying cleaner- running vehicles, to limit emissions, it is necessary to use systems that assist delivery route planning and prioritize load pooling. Not only do you achieve higher efficiency in fleet management, but you also cut back the overall emissions produced by the transport. Other transport strategies include:

- Selecting fuel-efficient vehicles and ensuring right sizing of fleets.
- Driver training to reduce accidents and improve fuel consumption.
- Monitoring fuel consumption.
- Monitoring vehicle utilisation in terms of both payload and empty running.
- Conducting preventative maintenance, as poorly serviced vehicles use more fuel.
- Dispose of used tyre casings, batteries, motor oil, and other vehicle waste responsibly.

### 3. Have a warehouse that follows sustainable construction and management standards

The boom in the logistics sector is driving demand for new warehouses or forcing companies to redesign their infrastructure to meet market requirements. As such, there are different ways in which eco-logistics can be reflected in warehouse design and incorporating energy savings options

### 4. Enable measures to reduce and recycle the waste produced in your warehouse

One of the measures to help apply environmental logistics in a warehouse is to use sustainable criteria to manage the generated waste. For example:

- Establish a waste sorting process according to materials to be recycled.
- Roll back in-warehouse paper usage by implementing IT solutions such as the use of warehouse management system software.
- Control special waste management so that they comply with appropriate recycling procedures.

### 5. Improve stock management and reverse logistics processes

Achieving a more efficient storage facility follows one of the eco-logistics core principles: reducing waste through overall process improvement. Some measures to achieve this are:

- Scale down movements within the warehouse through a combination of good storage location management and optimized picking plans.
- Prevent stock damage caused by manual handling of goods. Deploying robots and automated systems in the warehouse can resolve this issue.
- In the case of perishable goods, accurately manage the FIFO criterion to control expirations and prevent goods from spoiling.

- Establish quality control processes for returned products that leverage reverse logistics management.

### In warehouse and stock-keeping:

- Utilise proper stock management methods to avoid infestation, spoilage, damage, and expiration, all of which lead to waste and disposal.
- Exercise careful management and monitoring of hazardous chemicals to avoid spillage or leaking.
- Taking steps to better manage the production, collection, and disposal of waste, including packaging wastes.

### Reverse Logistics

Reverse logistics is the management of all the activities, involved in the flow of goods, demand information, and money in the opposite direction of the primary logistics flow, including a reduction in the generation of waste, and management of the collection, transport, disposal, and recycling of hazardous, as well as non-hazardous waste, in a way that maximizes the long-term profitability of the business.

Reverse logistics has been traditionally defined as the process of moving a product from its point of consumption to the point of origin to recapture value or ensure proper disposal. It is one of the fastest developing fields of commercial logistics, resulting in continuously changing scope and significance. Reverse logistics includes activities that:

- Avoid return of assets or items.
- Reduces materials in the forward system so that fewer items flow back.
- Ensures the possible reuse and recycling of materials and packaging.

## 6. Sustainable Energy Production

Organizations should where possible use sustainable energy for example wind and sola energies that do not have adverse environmental impacts. Where there are no sustainable energy sources and generators are used, such can be optimized by setting standard working hours for generators, properly servicing and maintaining generators wherever they are in use.

## 7. Sustainable Packaging

Packaging represents one of the greatest challenges to environmentally friendly logistics while at the same time is vital in shipping and storage. Packaging has consequences for the transportation, storage methods, and space requirements of a given space. Packaging can increase the unit cost if it hinders optimisation of storage space. Many industries have developed forms of packaging that can withstand the stresses of transport but do not justify the expense of returning them to the point of origin, being used once and then discarded.

Steps to take when planning packaging:

- Plan for biodegradable over-packing such as cardboard cartons.
- Where possible, plan for recovering packing materials, recycling them locally, or even returning them to the vendor for re-use. Suppliers and buyers should seek to recover and recycle or effectively dispose of the packaging.
- Reduce the size of packing, requiring less space to store and less fuel to transport.
- Investigate local companies that may engage in environmentally friendly solid waste disposal and recycling.
- Where packing cannot be made from bio-degradable material or material reduced, consider kitting and repackaging into sustainable packing before the last mile of distribution to avoid uncontrolled disbursement of wasteful materials.

## 8. Green Facility Management

There are many things organizations can do to ensure their facilities, are supportive of green logistics. These might include:

- Avoid wasting water by using water efficient taps, leak prevention, and recycling methods.
- Install energy-efficient light bulbs.
- Using interceptor tanks to avoid run-off pollution from fuel dispensing areas.
- Phase-out of ozone-depleting gases from air conditioning systems in offices, warehouses, and compounds.
- Develop a strategy for managing e-waste (old computers, communications equipment) and batteries.

## 4.7 Learning Activities

Visit the following websites

1. https://iea.uoregon.edu/

2. https://www.eac.int/environment/multilateral-environmental-agreements

**Required:**

1. For each country in EAC, identify the Multilateral Environmental Agreements (MEA) that the country has taken membership of.

2. Identify the agreements which have a direct effect on the freight and logistics sector

3. Make a summary of the roles of the freight and logistics sector in contributing to the intents and objectives of the agreements

## 4.8 Self-Assessment Questions and Activities

1. What are the impacts of freight and logistics sector to the environment?

2. What are the main Environmental Agreements that have a bearing on the freight and logistics sector?

3. Discuss the role of Green Logistics in the freight and logistics industry. How can firms in the freight and logistics sector adopt Green Logistics?

## 4.9 References


- Reese, D. C. (2016). Occupational Health and Safety Management: A Practical Approach, 3rd Edition. Routledge Francis Taylor
- Mansdorf S. Z. (2019). Handbook of Occupational Safety and Health, Third Edition. John Wiley & Sons, Inc.
- The Occupational Safety and Health Administration (OSHA) Laws and Regulation from different EAC Countries
- United Nations (2011). The Recommendations on the Transport of Dangerous Goods, 11th Edition, Volume I and 11.
- https://www.eac.int/environment/multilateral-environmental-agreements

## 5.0 WORKPLACE HAZARDS AND RISKS

### 5.1 Specific Learning Outcomes

i. Identify the classification of hazards in the workplace

ii. Identify the types of hazards in the workplace

iii. Evaluate strategies to manage workplace hazards and risk

### 5.2 Meaning of a Hazard

A "hazard" is anything with the potential to cause injury or damage to a person's health. The potential for harm is a natural and permanent property of hazards. Hazards can be found in virtually any workplace and come in many forms, such as:

- Chemicals;
- Electricity;
- Noise;
- Heat;
- Work at height;
- Unguarded machines;
- Bacteria;
- Viruses;
- Stressful work;
- Poor organization of work.

To better understand hazards and their potential effects, we can classify them as "safety hazards" or "health hazards".

- **Safety hazards** (and the resulting risks) are generally more easily identified than health hazards and are therefore easier to address. The high level of risk from an unguarded but dangerous machine, such as a die-cutting press, and the injury that can result are evident to all whereas health hazards and the resulting risks are often less obvious.

- **Health problems** caused by work can develop unnoticed and, in some cases, may not appear until much later in life. Early diagnosis and treatment may prevent the problem from worsening, and even save the worker's life. The effects of repeated and often low-dose exposure to a hazard over weeks, months, and years must also be taken into consideration. For example:

  - Exposure to some chemical pesticides (e.g. insecticides, fungicides, and herbicides) may result not only in poisoning (an immediate or "acute" health effect), but also in cancers that can take many years to appear. Such effects are often associated with repeated low-dose exposure;

  - Exposure to a dusty working environment can result in asthma, which may take time to develop. This, too, is often associated with repeated exposure and may result in recurrent long-term illness or asthma attacks;

  - Carrying heavy or awkward loads on a regular, or occasional basis may result in permanent pain, physical disability or impairment in later life. Permanent disabilities and illnesses are known as "chronic" health problems, meaning that they cannot be fully cured or reversed.

### 5.3 Types of Hazards and Risks in the Workplace

The knowledge of the types of hazards and risks in the workplace is important as this will enable an organization and its employees to develop mechanisms of managing the same. Several hazards and risks are discussed below:

- **Physical hazards** are environmental factors that can lead to injuries. These include exposed electrical wiring, falling objects, wet floors, and other conditions that can cause slips, falls, cuts, or other injuries. Some physical hazards don't necessarily need to make physical contact to cause harm, such as excessive noise levels, heat, and pressure.

- **Biological hazards** can lead to diseases, infections, and other serious health conditions. Mold and fungi, blood and other bodily fluids, bacteria, viruses, sewage, and vermin are all examples of biological hazards. Using Personal Protective Equipment (PPE) is vital to preventing exposure to biological hazards and protecting your health.

- **Chemical hazards** can be inhaled as gases or vapors, or come in contact with skin as a liquid or solid. They can cause skin irritation, burns, respiratory problems, blindness, or other serious health complications. Chemicals such as cleaning products, acids, pesticides, and petroleum products need to be handled responsibly with proper PPE to prevent exposure.
- **Ergonomic hazards** put a strain on muscles, tendons, and other connective tissues of the body. They can result from bad posture, not using dollies other mechanical assistance, and repetitive or awkward lifting/movement. They can lead to musculoskeletal injuries such as muscle sprains, ruptured or herniated discs, and carpal tunnel.
- **Psychological hazards** can lead to depression, concentration problems, inattention, or negligence. This type of hazard includes work-related stress, fatigue, harassment, and violence. These conditions can, in turn, lead to morale issues, reduced productivity and quality of work, and increased risk of injury.

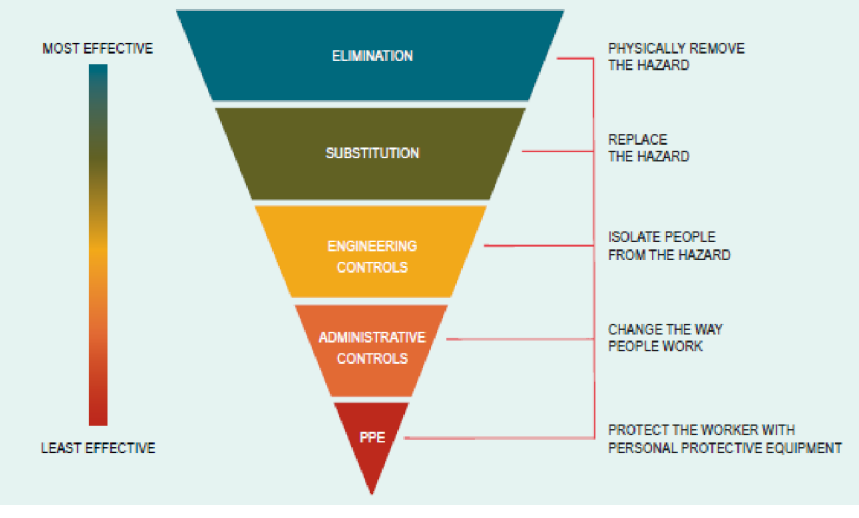
## 5.4 Minimizing or Eradicating Workplace Hazards and Risks

Occupational health problems arise largely from hazardous factors in the working environment. Since most hazardous conditions at work are in principle preventable, efforts should be concentrated on primary prevention at the workplace, as this offers the most cost-effective strategy for their elimination and control. The planning and design of workplaces should be aimed at establishing working environments that are conducive to physical, psychological and social well-being. This means taking all reasonable precautions to avoid occupational diseases and injuries.

### 5.4.1 Hierarchy of Controls for Workplace Hazards and Risks

A logical and effective strategy for reducing the level of risk is the Hierarchy of Controls, which provides guidance to both employers and workers. Its principles are illustrated below. Measures at the top of the triangle are more effective than those at the bottom and should thus be preferred wherever possible.

1. Elimination of hazards;
2. Substitution of hazards;
3. Engineering, technology, equipment, tools;
4. Safe work methods, practices, organization, information and training, hygiene and welfare;
5. Personal Protective Equipment (PPE).



### 5.4.2 Elimination or Substitution of Hazards

Eliminating (getting rid of) a hazard is the most effective risk control measure. Eliminating or (when elimination is impossible) substituting the hazard effectively reduces the risk of anyone being exposed, and thus of being seriously harmed, to zero or as near to zero as possible. Examples include:

- Electing a less risky substance or work process, e.g. A water- rather than a solvent-based paint;
- Replacing machine tools with intrinsically safer alternatives, e.g. Using a pneumatic tool instead of an electrical one;
- Substituting asbestos for safer alternatives (of which there are many);
- Replacing a noisy machine with a quieter one;
- On tall buildings, redesigning windows so that they can be cleaned from the inside rather than relying on potentially hazardous external access;
- Farming organically in order to avoid using a toxic pesticide;
- Switching to a less toxic pesticide or substituting a pesticide that would normally be sprayed to one applied in granular form.

If the measures identified can be implemented through elimination, the risk assessment for the hazard in question stops here; the risk has been reduced to zero or as close to zero as possible. Consequently, for this hazard only, there is no need to identify, decide on, and put into place any further control measures. If, however, it is determined during the risk assessment that elimination is not possible, it is time to consider other measures, starting with the next lower level of the Hierarchy of Controls (substitution/engineering controls, etc.).

### 5.4.3 Engineering Controls

These come in many forms, depending on the hazard, and have the advantage of providing collective protection not only for the individual, but also for all in the work area. For example, in controlling exposure to substances that are hazardous to health, engineering controls may range from small, on-gun solder fume extractors to dust hoods, fume cupboards, glove boxes, spray booths, and finally, large-scale industrial installations. All of these controls have the same requirements:

- Collect or prevent access to the hazard;
- Conduct it away from the worker reliably; and
- Keep exposure below the prescribed limits.
-
- Further examples of this type of control measure are:
- Guarding of machinery – if adequate protection is not provided by the manufacturer or if the machine is built to an older standard, improved guarding may be needed;
- Fitting noisy machines with a soundproof enclosure in order to reduce noise levels, even if some risk remains;
- Completely isolating and/or enclosing hazardous processes such as x-ray equipment or the solvent-gluing section of a workshop;
- Placing a handrail around a high work platform;
- Using something as simple as a wheelbarrow or handcart to move heavy loads;
- Placing work surfaces or workbenches at the right height for the persons working there and providing suitable seating;
- Using tools, e.g. spades, shovels, and brushes, that are the right length for the users so that they do not have to bend unnecessarily.

### 5.4.4 Administrative Controls

Administrative controls may also be introduced in order to reduce exposure to hazards. Safe working methods and practices are simple, cost-effective ways of controlling workplace risks. Many work accidents and illnesses occur simply because the employer has not thought through, implemented safe work methods, practices, and organization and because managers, supervisors, and workers are not well informed about or properly trained in correct safety and health procedures. Organizing jobs safely is the responsibility of employers and their managers and supervisors in cooperation with the workforce. Not only are risk control measures often simple and easy to put into operation; they also promote business efficiency.

Some of the administrative procedures are discussed below:

- **Organizational practices.**

Organizing the work may include:

  - Lengthening rest breaks;

- Providing additional relief workers;
- Introducing exercise breaks in order to vary body motions;
- Rotating workers through different jobs;
- Limiting exposure to hazardous operations through scheduling or by reducing employee exposure or implementing other rules;
- Providing effective training programmes.

- **Safe Work Procedures**

Work procedures should meet the requirements of national legislation and, except for the simplest tasks, be written down. This is especially important for maintenance, testing, examination, and repair of plant and equipment, transfer of chemicals – including loading and unloading – and identification of the contents of containers, including potential hazards and corresponding precautions. Work procedures must be developed and followed for all workplace hazards (e.g. operation of machinery, vehicles and work at height) to protect workers against the hazards identified in the risk assessment. Such a procedure should be devised after other appropriate measures for eliminating and minimizing risks (such as use of the appropriate chemicals, technology, and engineering controls for a specific purpose) have been chosen and should incorporate the most effective use of the control measures provided.

- **Maintenance**

The workplace, equipment, machines, tools, and facilities should be maintained, in an efficient state, in efficient working order, and in good repair, at all times. Proper maintenance contributes to work safety. Regular (scheduled) maintenance can prevent unexpected failures (e.g. periodic maintenance of fire extinguishers ensures that they can be operated when needed while failure to do so can allow a small fire to spread, causing serious harm to persons and property). There are two main types of maintenance:

- Planned preventive maintenance involving periodic checks and repairs; and
- Breakdown maintenance (also called corrective or reactive maintenance): making unplanned repairs to workplace facilities or equipment after sudden breakdown or failure. This is usually more hazardous than scheduled maintenance as there may be pressure to complete the repairs quickly so that the work can resume.

During maintenance, particularly where unplanned, hazardous conditions with potentially serious or even fatal consequences may arise. Thus, maintenance activities must also be risk-assessed to ensure that the appropriate control measures are in place. Maintenance can expose workers to all kinds of hazards. Great caution is needed in order to prevent, for example:

- Falls from height (e.g. While performing maintenance on roofs or raised parts of machinery);
- The fall of heavy items (e.g. While lifting heavy loads wrongly owing to time constraints);
- Being trapped or crushed by a moving part or machine (e.g. While entering the action area of a malfunctioning robot);
- Exposure to asbestos (e.g. while removing asbestos panels).

- **First Aid and Medical Assistance**

Accidents can happen even with safety and health measures in place. “First aid” is the immediate care given to victims of accidents or health emergencies (e.g. heart attacks) before healthcare workers arrive. Every workplace should have a well-stocked first aid box and at least one responsible person trained in first aid available during working hours. It is recommended that workers be trained in first aid and basic life support techniques in the event that they are requested to assist healthcare staff, and to prevent well-intentioned actions that can have serious or even deadly consequences if performed by unskilled workers (e.g. moving a worker after a fall from a height may cause or worsen damage to the spine, leading to paralysis and even death).

- **Housekeeping**

Better housekeeping involves, among other things, keeping workplaces tidy and passages clear and wetting dust before sweeping it up. The workplace is the workers' "home" for at least 8 hours a day and should be kept clean and tidy with the cooperation of everyone concerned.

- **Safety Signage**

Employers should post safety signs where there is a significant risk that cannot be avoided or controlled through safe systems of work or in any other way. These signs must comply with national regulations and be placed in visible and appropriate places, including on machinery. Because they must be understood by all, their text should be in the official language and translated into local languages if necessary. Visitors and any other external persons with access to the enterprise should be informed of the meaning of safety signage and the need to respect it; perhaps an explanatory leaflet can be distributed. The pictures should be clear and both text and pictures should be readable from a distance since getting too close to machinery in order to read them may present a life threatening risk of being hit or crushed.

Their size, colour, image, and wording (usually: DANGER, WARNING or CAUTION) must comply with existing national regulations in order to ensure that they are reasonably visible from a distance (usually at least 1.5–2 metres for general safety signs) when correctly installed and convey a clear message.

Examples of Safety Signs

### 5.4.5 Personal Protective Equipment (PPE)

The last level of risk control is PPE: individual equipment that offers protection from workplace hazards and reduces the risk of being harmed by them. It can be designed to protect various parts of the body in the form of, for example, helmets, safety goggles, face masks, respirators, earmuffs, aprons, harnesses, gloves, safety shoes and boots.

As stated above (under the Hierarchy of Controls), PPE should only be provided where other, more effective risk control measures are not sufficient to adequately control the risk. In such cases, employers are responsible for providing workers with individual means of protection against a specific hazard (such as noise, dust or a chemical). PPE must comply with national legislation and meet national or, where relevant, international standards. Workers must receive training in the proper use, maintenance, disposal and storage of PPE. Remember that PPE should be viewed as the last line of defence against hazards.

## 5.5 Learning Activities

Do a walk-through of your enterprise or any other organization of your choice. Wall through all the offices, stores, warehouses, kitchens, workshops, yards, etc. Note the nature of floors and other surfaces. Observe lighting and aesthetics as well.

**Required:**

1. Make a list of any visible and observable health, safety, and environmental hazards and risks that workers in the organization face

2. What strategies can you recommend to management to address the hazards and risks you have identified?

## 5.6 Self-Assessment Questions and Activities

1. Identify the classification of hazards in the workplace

2. Identify the types of hazards in the workplace

3. What strategies can be used to manage workplace hazards and risks.

## 5.7 References


- Reese, D. C. (2016). Occupational Health and Safety Management: A Practical Approach, 3rd Edition. Routledge Francis Taylor
- Mansdorf S. Z. (2019). Handbook of Occupational Safety and Health, Third Edition. John Wiley & Sons, Inc.
- The Occupational Safety and Health Administration (OSHA) Laws and Regulation from different EAC Countries
- United Nations (2011). The Recommendations on the Transport of Dangerous Goods, 11th Edition, Volume I and II.
- International Labour Office (ILO).2016. Personal Protective Equipment Helps You Stay Safe and Healthy (Geneva). Available at: https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---lab_admin/documents/instructionalmaterial/wcms_537874.pdf.
- World Health Organization (WHO). 2020. Health topics: Occupational health (Geneva). Available at: https://www.who.int/health-topics/occupational-health.
- International Labour Office (ILO). 2017. Wise Action Checklist, in Global Manual for WISE: Work Improvements in Small (Geneva), p.8. Available at: https://www.ilo.org/wcmsp5/groups/
- World Health Organization. WHO Global Strategy on Occupational Health for All. The Way to Health at Work. Geneva: WHO; 1995. http://www.who.int/occupational_health/globstrategy/en/, accessed on 15 April 2018.
- World Health Organization. WHA Resolution 60.26. Global Plan of Action on Workers' Health 2008–2017. Geneva: WHO; 2007.
- Alli, B. O. (2008). Fundamental principles of occupational health and safety / Benjamin O. Alli; International Labour Office – Geneva

## 6.0 HANDLING HARZADOUS CARGO

### 6.1 Specific Learning Outcomes

i. Explain the meaning of hazardous cargo
ii. Identify the regulations governing hazardous cargo operations
iii. Identify the classifications of hazardous cargo
iv. Handle requirements of hazardous cargo
v. Identify Storage requirements of hazardous cargo

### 6.2 Meaning of Hazardous Cargo

A dangerous good (also known as hazardous material or hazmat) is any substance or material that is capable of posing an unreasonable risk to health, safety, and property when transported in commerce. Hazardous cargo is considered to be hazardous because of its flammable, corrosive, poisonous nature or other properties.

Dangerous goods are separated into categories through a classification system is outlined by the UN Model Regulations. Each dangerous substance or article is assigned to a class. There are 9 classes of dangerous goods and the class is determined by the nature of the danger they present:

- Class 1: Explosives
- Class 2: Gases
- Class 3: Flammable liquids
- Class 4: Flammable solids
- Class 5: Oxidising agents & organic peroxides
- Class 6: Toxins and infectious substances
- Class 7: Radioactive material
- Class 8: Corrosives
- Class 9: Miscellaneous dangerous goods

### 6.3 Regulations on Hazardous Cargo

#### Carriage of Dangerous Goods by Sea – IMDG Code

The International Maritime Dangerous Goods (IMDG) Code is, by its own definition, "the standard guide to all aspects of handling dangerous goods and marine pollutants in sea transport". Its key objectives are to a) protect human life, b) prevent marine pollution, and c) facilitate free movement of dangerous goods. Developed by the International Maritime Organisation (IMO), it applies to all cargo-carrying ships and is amended every two years. It reportedly covers 3,500 dangerous goods transported in packaged form.

#### Carriage of Dangerous Goods by Air - DGR

The International Air Transport Association (IATA) developed the Dangerous Goods Regulations (DGR) as the global reference for shipping dangerous goods by air and the only standard recognised by airlines. It details shipper/operator responsibilities, transport and storage quantities, and forbidden goods. It also has provisions on training, security and incident reporting.

The second set of regulations, the International Civil Aviation Organisation's (ICAO) Technical Instructions, seeks to ensure airlines carry dangerous goods without the cargo posing a danger to the aircraft or its occupants.

#### Carriage of Dangerous Goods by Road - ADR

ADR what stands for Agreement International Carriage of Dangerous Goods by Road is a 1957 United Nations treaty that governs transnational transport of hazardous materials. ADR requires that vehicles transporting dangerous goods must ensure that:

- Vehicles carrying dangerous goods must be equipped with a tachograph (which records driving activity such as speed, distance) and spark arrester (a fire safety device)
- Vehicle must carry legible, conspicuous "emergency information panels" containing the class, UN number and PSN of the cargo
- The Vehicle owner must ensure cargo information provided by the shipper is accurate, and must relate this information in writing to the driver
- Driver must keep the written information in the driver's cabin at all times
- Driver must keep cargo safe by following rules on prevention of fires and explosions
- Driver must take route pre-determined by the vehicle owner and shipper
- Driver must be trained to handle the dangers of moving hazardous cargo

#### Carriage of Dangerous Goods by Rail - RID

RID is part of the Intergovernmental Convention for International Carriage by Rail (COTIF). COTIF concerns the movement of passengers and goods by rail across national borders. It controls the

conditions under which that transit is undertaken, and establishes a uniform system of law in order to facilitate the continuing development of international rail traffic.

### Carriage of Dangerous Goods by Inland Waterways - ADN

Internationally, the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN) exists to ensure high levels of security in the carriage of hazardous cargo on inland waterways, promote international trade in dangerous goods and prevent pollution during the movement of such goods.

## 6.4 Classification of Hazardous Cargo

### Class 1: Explosives

Class 1 goods are explosives - products that possess the ability to alight or detonate during a chemical reaction. Explosives are dangerous because they have molecules designed to rapidly change their state, which is usually a solid state into a very hot gas. There are 6 sub-divisions of explosives, which relate to the product's behaviour when initiated.

- 1.1: Substances and articles which have a mass explosion hazard
- 1.2: Substances and articles which have a projection hazard but not a mass explosion hazard
- 1.3: Substances and articles which have a fire hazard and either a minor blast hazard or a minor projection hazard or both
- 1.4: Substances and articles which present no significant hazard; only a small hazard in the event of ignition during transport with any effects largely confined to the package
- 1.5: Very insensitive substances which have a mass explosion hazard
- 1.6: Extremely insensitive articles which do not have a mass explosion hazard

Examples of explosives include fireworks, flares, and ignitors.

| Class 1 | | |
|---|---|---|
|  | 1 | Explosive substances and articles used to produce explosions or pyrotechnic effects |
| **Sub-Classes** | | |
|  | 1.1 | Explosives with a mass explosion hazard |
|  | 1.2 | Explosives with a severe projection hazard |
|  | 1.3 | Explosives with a fire, blast or projection hazard but not a mass explosion hazard |
|  | 1.4 | Explosives with a minor fire or projection hazard |
|  | 1.5 | An insensitive substance with a mass explosion hazard |
|  | 1.6 | Extremely insensitive articles |

## Class 2: Gases

Class 2 consists of compressed gases, gases in their liquefied form, refrigerated gases, mixtures of gases with other vapours, and products charged with gases or aerosols. These sorts of gases are often flammable and can be toxic or corrosive. They're also hazardous because they can chemically react with oxygen. They are split into three sub-divisions:

Division 2.1: Flammable gases
Division 2.2: Non-flammable, non-toxic gases
Division 2.3: Toxic gases

Examples of gases include aerosols and fire extinguishers.

| Class 2 | | |
|---|---|---|
|  | **2.1** | Flammable gas |
|  | **2.2** | Non-Flammable, compressed gas |
|  | **2.3** | Toxic or poisonous gas |

## Class 3: Flammable liquids

A flammable liquid is defined as a liquid, a mixture of liquids, or liquids containing solids that require a much lower temperature than others to ignite. These temperatures are so low that there is a high risk of the liquids igniting during transportation. This makes flammable liquids very dangerous to handle and transport, as they are very volatile and combustible. Flammable liquids are usually used as fuels in internal combustion engines for motor vehicles and aircraft. This means they make up the largest tonnage of dangerous goods moved by surface transport. Many household products also contain flammable liquids, including perfumery products and acetone (which is used in nail polish remover).

| Class 3 | | |
|---|---|---|
|  | **3** | Flammable liquids |

## Class 4: Flammable solids

Class 4 dangerous goods are classified as products that are easily combustible and likely to contribute to fires during transportation. Some goods are self-reactive and some are liable to spontaneously heat up. There are 3 sub-divisions for Class 4 dangerous goods:

Class 4.1 Flammable solids: These will burn easily than normal combustible materials. The burning of flammable solids is also fierce and rapid; they are also incredibly dangerous because they can decompose

explosively, burn vigorously, or produce toxic gases.

Class 4.2 Spontaneously combustible: These can be either solids or liquids. They ignite spontaneously when in contact with oxygen.

Class 4.3 Dangerous when wet: These goods react with water to generate flammable gas that can be ignited by the heat of the reaction.

Examples of flammable solids include metal powders, sodium batteries and seed cake (oil-bearing seeds).

| Class 4 | | |
|---|---|---|
|  | **4.1** | Flammable solids |
|  | **4.2** | Spontaneously combustible solids |
|  | **4.3** | Combustible solids when in contact with water |

## Class 5: Oxidising Agents and Organic peroxides

Class 5 dangerous goods are subdivided into 'oxidising agents' and 'organic peroxides'. These are often extremely reactive because of their high oxygen content. They react readily with other flammable or combustible materials, which means fires may break out and continue in confined spaces. These materials are also incredibly difficult to extinguish, which makes them even more dangerous.

Class 5.1 Oxidising Agents: Also known as oxidisers, these substances can cause or contribute to combustion as a product of chemical reactions. Oxidisers aren't necessarily combustible on their own, but the oxygen they produce can cause combustion with other materials.

Class 5.2 Organic peroxides: The molecular structure of these materials makes them extremely liable to ignition. This means they're liable to combust individually. They are designed to be reactive for industrial purposes, so they are unstable and can be explosive.

Examples include hydrogen peroxide and lead nitrate.

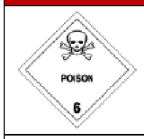
| Class 5 | | |
|---|---|---|
|  | **5.1** | Oxidizer |
|  | **5.2** | Organic peroxide (5.2 new ADR 2007) |

## Class 6: Toxins and Infectious substances

Class 6.1 Toxins: Toxic substances are liable to cause death because they're, as the name suggests, toxic. They can cause serious injury or harm to human health if they enter the body through swallowing, breathing in, or absorption through the skin. Some toxics will kill in minutes, however, some might only injure if the dose isn't excessive.

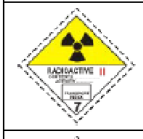
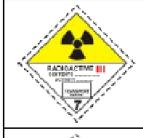
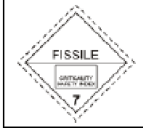
Class 6.2 Infectious substances: These are goods that contain micro-organisms that cause infectious diseases in humans or animals, otherwise known as pathogens.

Examples include medical waste, clinical waste, and acids.

| Class 6 | | |
|---|---|---|
|  | **6.1** | Toxic substances |
|  | **6.2** | Infectious substances |

## Class 7: Radioactive material

Radioactive materials contain unstable atoms that change their structure spontaneously in a random fashion. They contain 'radionuclides', which are atoms with an unstable nucleus. It's this unstable nucleus that releases radioactive energy. When an atom changes, they emit ionising radiation, which could cause chemical or biological change. This type of radiation can be dangerous to the human body. Examples include smoke detectors and yellowcake.

| Class 6 | | |
|---|---|---|
|  | **I** | Category I – White (symbol 7A) |
|  | **II** | Category II – Yellow (symbol 7B) |
|  | **III** | Category III – Yellow (symbol 7C) |
|  | **Fissile** | Criticality safety index label (symbol 7E) |

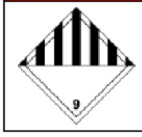
### Class 8: Corrosives

Corrosives are highly reactive materials that produce positive chemical effects. Due to their reactivity, corrosive substances cause chemical reactions that degrade other materials when they encounter each other. If these encountered materials happen to be living tissue, they can cause severe injury. Examples include batteries, chlorides, and flux.

| Class 8 | | |
|---|---|---|
|  | - | Corrosive materials |

### Class 9: Miscellaneous dangerous goods

This category covers substances that present a danger not covered in the other classes. Examples include dry ice, GMO's, motor engines, seat belt pretensioner, marine pollutants, asbestos, airbag modules and magnetised material.

| Class 9 | | |
|---|---|---|
|  | - | Miscellaneous dangerous compounds |

## 6.5 UN Number, Proper Shipping Name and Packing Group

Apart from class, dangerous goods are assigned a UN number, a proper shipping name (PSN) and a packing group that serve as identifiers.

- UN Number: This is a four-digit code preceded by the letters UN. A UN number can be assigned to a single substance (acetone, UN 1090) or a group of substances (adhesives, UN 1133; alcohols, UN 1987).
- PSN: This is the name that most accurately describes the goods and is written in upper case. For example, the PSN for lighters or lighter refills is LIGHTERS or LIGHTER REFILLS.
- Packing group: The UN has three packing groups for dangerous goods – I (high danger), II (medium danger) and III (low danger). This identifier helps determine the degree of protective packaging required. Packing groups are indicated by the letters X, Y and Z, where X is for packing groups I, II and III, Y is for packing groups II and III, and Z is only for packing group III. For example, Class 1 dangerous goods (explosives) are assigned packing group II.

## 6.6 Handling Requirements of Hazardous Cargo

### 6.6.1 Packaging

Since dangerous goods are a hazard to human life and property, packaging is of utmost importance. Here are some tips on securing a shipment:

- Use correct packaging. Packing material for dangerous goods are tested for sustainability and compliance with rules and regulations
- Cargo must be tightly packed, cushioned and secured to prevent damage and leaks
- Any cargo affected by water, moisture and heat must be stuffed in air, wind and watertight containers
- When combined with regular cargo during shipping, hazardous cargo must be placed within easy access – next to the container doors is best – for fast removal in an emergency

### 6.6.2 Labelling

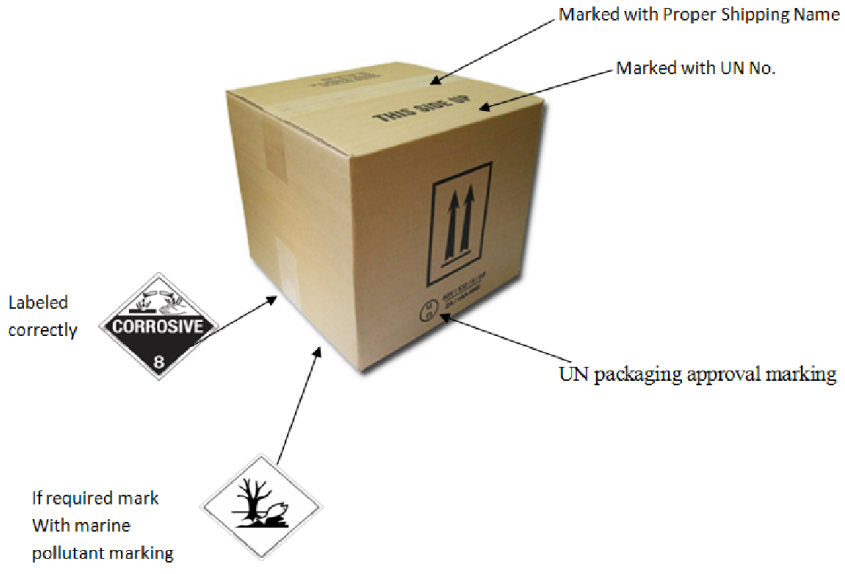
Labels, markings and placards are a legal requirement for dangerous goods. They are the first indicators of the cargo's hazardous nature and hold valuable information on how it should be handled. They should be legible, accurately placed and not obscured by old labels and markings.

- **Label:** It immediately identifies the cargo and communicates its hazards. A label is

attached on the packaging or overpack ("an enclosure used by a single consignor to contain one or more packages and to form one unit for the convenience of handling and stowage during transport", according to the UN Model Regulations). It must be placed close to the UN number and PSN, and not on a corner where it might fold.

- **Placard:** Another standard hazmat identifier, it looks a lot like a label but is larger and more durable. It is placed on containers, cylinders, trucks and other transport vehicles.
    - Containers carrying dangerous goods must display at least one placard on each side and one on each end of the unit (this is to say, on its four sides)
    - Rail wagons must be placarded on at least both sides
    - Freight containers, semi-trailers and portable tanks must be placarded on all four sides
    - Road vehicles must display appropriate placards on both sides as well as the rear
- **Marking:** An additional identifier placed on outer packaging, it is a combination of UN number, PSN, weight, specifications, precautions and emergency response guidelines. It ensures cargo is safely handled. Unlike labels and placards, markings do not have a specific style, colour and size. Some cargo (liquid dangerous goods, radioactive material, poisonous goods) requires specialised markings.

Markings, labels and/or placards on products are all channels of communication to the user. These communication channels will tell the user the characteristics of a consignment or product. The IMDG Code provides clear procedures related to authorization of consignments as well as advance notification, markings, labels, and documentation (by manual, electronic data processing or electronic data interchange techniques and placarding). The code specifies clearly that no person may offer to transport dangerous goods unless the goods are properly marked, labeled, placarded, described and certified on a document. Those who are transporting dangerous goods must indicate the UN Number and proper shipping name clearly on the consignment. In the case of marine pollutants, the word "marine pollutant" must be on the document accompanying the consignment. This requirement is particularly important in the case of an accident involving these goods, in order to determine what emergency procedures are necessary to deal properly with the situation. In the case of marine pollutants, the captain of the vessel needs to comply with the requirements of MARPOL 73/78.



### 6.6.3 Documentation

Just as important as packaging and labelling is documentation. Incorrect information can lead to the carrier making wrong handling, segregation, and stowage decisions, often with disastrous consequences. Documents for dangerous goods differ across transport modes but most have some basic information in common:

- Hazard class, UN number and PSN
- Name and address of exporter and importer
- Weight and quantity of goods
- Number and type of packaging (cartons, drums, containers)

Additional information that might be required includes identification of:

- Molten/elevated temperature substances
- Temperature-controlled substances
- Radioactive material
- Infectious substances
- Wastes

Some important and common documents used in the shipping of dangerous goods include:

- **Material Safety Data Sheet:** Basic information aside, it contains the physical and chemical properties of the goods (melting/boiling points), reactivity, toxicity, effect on human health, first aid and firefighting guidelines, requirements for protective equipment. It is provided by the manufacturer/supplier of the goods to the shipper, who submits it to the carrier.

- **Dangerous Goods (DG) Request:** When the shipper approaches the carrier with a dangerous goods shipment, they submit a DG request or dangerous cargo request.

- **Dangerous Goods (DG) Declaration:** Also prepared by the shipper, it is similar to a DG request but more detailed. Carriers accept a dangerous goods shipment on the basis of the DG request and DG declaration, both of which must have matching information. A DG declaration is called a shipper's declaration in air transport. In multi-modal shipping, a multimodal declaration form can be used to expedite the movement of goods between transport modes.

- **Dangerous Goods Manifest:** It is prepared by the ship's master with the objective of having all relevant cargo-related information in a single document. It is kept on the vessel's bridge, with a copy in the cargo control room, for easy access. A DG manifest is also a stowage plan because it pinpoints the location of the cargo on the vessel to ensure swift emergency response.

- **Transport Emergency (TREM) Card:** A document carried by the driver of a vehicle ferrying hazardous cargo, it contains relevant cargo information and instructions to the driver and emergency responders.

- **Container Packing Certificate:** When shipping dangerous goods by sea in containers, the loading company must provide a signed and dated certificate to the carrier confirming compliance with the IMDG Code and other relevant rules.

### 6.6.4 Segregation

Moving hazardous cargo also requires knowledge of which dangerous goods can be stored and transported together and which cannot. The IMDG Code defines the process of separating two or more substances that are considered mutually incompatible as segregation. Some common segregation don'ts includes:

- Don't store different types of explosives together
- Don't store substances that are a fire risk with oxidising agents
- Don't store a strong concentrated acid with a strong alkali

But by following segregation rules, some classes of dangerous goods can be loaded and transported with another class of dangerous goods. For example, an oxidising agent can be loaded with other oxidisers as well as with non-flammable gases and toxic gases. But it cannot be paired with flammables (solids, liquids and gases) and corrosives.

### 6.6.5 Storage Requirements of Hazardous Cargo

One of the most important aspects of managing the transport of dangerous goods is the stowage, segregation and separation of these goods. Hazardous substances must not be carried with goods which are liable to interact and cause danger. Incompatible hazardous substances must be adequately separated from each other during transport and storage. Improper stowage or segregation of dangerous goods may result in the release of toxic fumes, fire, spill, and degradation of the product's quality. For this reason, the IMDG Code has provided provisions in Volume 1 Part 7 titled "Provisions Concerning Transport Operations", which focuses on stowage and segregation.

The IMDG Code requires dangerous goods to be stored and segregated according to the hazard, class, and compatibility. The code also provides detailed information on these important factors in terms of where dangerous goods should be stowed and how they should be separated or segregated from other cargoes. Although the IMDG Code provides detailed information on ship stowage, the requirements can also be applied to storage ashore and even to container packing. The requirement offers a framework for port authorities when preparing their regulations for the safe transport of handling and storage of dangerous goods in ports. Dangerous goods which have to be segregated from each other shall not be transported in the same cargo transport unit.

In brief, the IMDG Code establishes a system whereby dangerous goods can be stowed in a safe way, considering their compatibility with other types of cargo and therefore preventing further damage in case of accidents.

## 6.7 Learning Activities

Visit an organization that deals with different types of hazardous cargo, such an organization can be any of the following:

i. A Port – sea ports, inland ports, border posts
ii. An inland Container Depot
iii. Customs bonded warehouse
iv. A warehouse for a logistics company
v. A transport and logistics company.

### Required

1. Identify different types of hazardous cargo. What classes of hazardous cargo are they?
2. From the packaging identify the requirements in terms of:
   a. Packing
   b. Labels
   c. Markings
   d. UN Numbering
3. How are the hazardous cargo stored? Are they in line with the IMDG Code for segregation and storage of hazardous cargo?
4. What recommendations would you give the organization in terms of effective management of hazardous cargo?

## 4.1 Self-Assessment Questions and Activities

1. What do you understand of hazardous cargo?
2. Which are the global regulations governing hazardous cargo operations for the different multimodal transport operations?
3. What are the international classifications of hazardous cargo?
4. What are the handling and storage requirements of hazardous cargo?

## 4.1 References


- Reese, D. C. (2016). Occupational Health and Safety Management: A Practical Approach, 3rd Edition. Routledge Francis Taylor
- Mansdorf S. Z. (2019). Handbook of Occupational Safety and Health, Third Edition. John Wiley & Sons, Inc.
- The Occupational Safety and Health Administration (OSHA) Laws and Regulation from different EAC Countries
- United Nations (2011). The Recommendations on the Transport of Dangerous Goods, 11th Edition, Volume I and 11.
- International Labour Office (ILO).2016. Personal Protective Equipment Helps You Stay Safe and Healthy (Geneva). Available at: https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---lab_admin/documents/instructionalmaterial/wcms_537874.pdf.
- World Health Organization (WHO). 2020. Health topics: Occupational health (Geneva). Available at: https://www.who.int/health-topics/occupational-health.
- International Labour Office (ILO). 2017. Wise Action Checklist, in Global Manual for WISE: Work Improvements in Small (Geneva), p.8. Available at: https://www.ilo.org/wcmsp5/groups/

## 5.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

### 5.1 Specific Learning Outcomes

i. Explain the meaning of Personal Protective Equipment (PPE)
ii. Explain the importance of Personal Protective Equipment (PPE)
iii. Use Personal Protective Equipment (PPE) for different work environment

### 5.2 Meaning of Personal Protective Equipment (PPE)

Personal protective equipment, or PPE, protects its user against any physical harm or hazards that the workplace environment may present. It is important because it exists as a preventative measure for industries that are known to be more hazardous, like manufacturing and mining.

PPEs are worn to minimize exposure to hazards that cause serious workplace injuries and illnesses. These injuries and illnesses may result from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. PPE may include items such as gloves, safety glasses and shoes, earplugs or muffs, hard hats, respirators, or coveralls, vests, and full body suits.

### 5.3 Importance of Personal Protective Equipment (PPE)

PPEs are important as it protects the user from possible injuries and fatalities. PPE provides a barrier to protect the worker from potential exposure to hazards. Key benefits include:

1. Head Protection
2. Eye and Face Protection
3. Respiratory protection
4. Hand & Skin protection
5. Hearing protection

### 5.4 Using Personal Protective Equipment (PPE) for different work environment

#### 1. Eye and Face Protection

Safety glasses, safety goggles, laser eyewear, face shields and helmets provide a level of protection as designated by the manufacturer. The hazard and the protection standards for each piece of eye and face protection PPE must be considered during selection. The minimum types of PPE necessary for physical and chemical hazards are listed below:

- Safety glasses, as a minimum, are required where there is a potential of eyes being struck by projectile objects. Side shields are required if there is a hazard from flying objects from the side.
- Direct vented goggles (those with perforated holes on the sides) are an acceptable substitute for safety glasses with side shields.
- Chemical splash goggles (those with indirect ventilation on sides) are required where protection is needed against chemical splashes or sprays. These may also be used where impact protection is required.
- Face shields are required where facial skin protection is needed. They can only be used in conjunction with eye protection. The face shield is not a substitute for the safety glasses or goggles.
- Shaded eye/face protection is required for radiant energy sources from arc and gas welding, soldering and brazing, laser, ultraviolet, and infrared.

| Face shields | Safety Glasses | Googles |
|---|---|---|
|  |  |  |
| **Googles** | **Disposable Medical Shield** | **Masks** |
|  |  |  |

## 2. Hand Protection

Gloves should be selected for each procedure to provide protection from the hazards. In some circumstances there may be several hazards and glove selection may involve different gloves for different steps of the procedure and/or several layers of gloves may be needed to address all hazards. In general, heavy loose gloves should not be worn around moving machinery. Moving parts can pull the glove, hand and arm into the machine. Gloves can protect hands from:

- Knives, sharp edges, splinters
- Chemicals
- Blood and bodily fluids
- Excessive vibration
- Hot objects
- Electricity
- Extreme cold

- Leather gloves protect your hands from rough surfaces
- Special insulated gloves can protect your hands from hot objects
- Cut-resistant gloves prevent or reduce cuts from knives or sharp edges
- Anti-vibration gloves reduce the effects of vibration from hand tools and machinery
- Disposable gloves protect against blood and germs
- Electrically insulated gloves are used to handle live wires or energized electrical equipment

There are many types of protective gloves:

| Latex Gloves | Coated Gloves | Leather Gloves | Wire Gloves | Specialty Gloves |
|---|---|---|---|---|
|  |  |  |  |  |

## 3. Skin and Body Protection

Laboratory coats, scrubs, uniforms and disposable body coverings provide a level of protection from splash hazards. Special hazards and material qualities such as flame resistance, specific chemical resistance, physical strength (e.g., leather) and visibility should be considered when selecting PPE for skin and body protection.

Personal protective clothing is required where employees may be exposed to such hazards as toxic or corrosive chemicals, biological pathogens, molten metal splashes, thermal extremes, etc. The protective clothing may take the form of aprons, coveralls, coats, pants, hats, hoods, sleeves, gloves, and totally encapsulating chemical protective suits. An example of special clothing is a vest to reflect light for outdoor night workers.

## 4. Respiratory Protection

In a laboratory, airborne contaminants are kept very low through adequate general room ventilation and by working with open containers of volatile materials inside a chemical fume hood or enclosure designed to effectively capture air contaminants at the source. When airborne contaminants cannot be adequately controlled by engineered exhaust ventilation respiratory protection may be needed. The use of respiratory protection has very stringent regulatory requirements. Although not respirators, different types of face masks are listed because they may be used for protection in various environments under certain conditions.

| Disposable gowns | Coveralls | Safety vest | Lab Coats |
|---|---|---|---|
|  |  |  |  |

| Dust masks | Half face Air Purifying Respirator | Full Face Air Purifying Respirator | Self -Contained Breathing Apparatus (SCBA)- |
|---|---|---|---|
|  |  |  |  |
| **Dust Mask** | **N95 Mask** | **Masks** | **Air Purifier** |
|  |  |  |  |

## 5. Head Protection

Head protection may be as simple as a disposable bouffant surgical cap to protect the head from aerosols during surgical operations, or a hard hat to protect from overhead hazards. Electrical work may require arc flash protection of the head, face, hands and body.

| Bump cap and Hard Hats | Bouffant cap |
|---|---|
|  |  |

## 6. Foot and Leg Protection

Foot protection may be simple disposable shoe covers to minimize spread of contamination. In food service and vivariums, slip resistant shoes may reduce the risk of slips, trips and falls.

| Safety Boots | Foot/shin guards | Knee pads | Shoe Cover |
|---|---|---|---|
|  |  |  |  |

## 7. Hearing Protection

In general, if workplace noise is loud enough that you cannot hold a conversation with a person one arm length away, then a noise assessment must be performed by EH&S prior to PPE selection. All hearing protection comes with a "Noise Reduction Rating" or NRR; the higher the rating, the better the protection.

Exposure to loud noise will inevitably cause hearing loss over time. There are two types of hearing protection: earplugs and ear muffs. All hearing protectors are designed to reduce the intensity (loudness) of noise for the inner ear.

Popular types of hearing protection devices include canal caps, earmuffs and earplugs.

| Ear plugs | Ear plugs | Canal caps | Ear muffs |
|---|---|---|---|
|  |  |  |  |

## 8. Fall Protection

A fall protection system is needed where there is a potential for injury due to falling while working at elevated height.

| Full body harness | Locking carabiner | Shock absorbing Lanyard | Anchor |
|---|---|---|---|
|  |  |  |  |

### 5.5 Learning Activities

Visit an organization that deals with different types of hazardous cargo, such an organization can be any of the following:

i. A Port – sea ports, inland ports, border posts
ii. An inland Container Depot
iii. Customs bonded warehouse
iv. A warehouse for a logistics company
v. A transport and logistics company.

**Required**

1. Identify the different types of Personal Protective Equipment (PPE) in use.
2. How are the PPEs used and for what purpose?
3. What recommendations would you give the organization in terms of effective use of PPEs?

### 5.6 Self-Assessment Questions and Activities

1. What is the meaning of Personal Protective Equipment (PPE)?
2. What is the importance of Personal Protective Equipment (PPE)?
3. What are the different types of Personal Protective Equipment (PPE) ideal for use in a freight and logistics firm?

## 5.7 References


- Reese, D. C. (2016). Occupational Health and Safety Management: A Practical Approach, 3rd Edition. Routledge Francis Taylor
- Mansdorf S. Z. (2019). Handbook of Occupational Safety and Health, Third Edition. John Wiley & Sons, Inc.
- The Occupational Safety and Health Administration (OSHA) Laws and Regulation from different EAC Countries
- United Nations (2011). The Recommendations on the Transport of Dangerous Goods, 11th Edition, Volume I and 11.
- International Labour Office (ILO).2016. Personal Protective Equipment Helps You Stay Safe and Healthy (Geneva). Available at: https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---lab_admin/documents/instructionalmaterial/wcms_537874.pdf.
- World Health Organization (WHO). 2020. Health topics: Occupational health (Geneva). Available at: https://www.who.int/health-topics/occupational-health.
- International Labour Office (ILO). 2017. Wise Action Checklist, in Global Manual for WISE: Work Improvements in Small (Geneva), p.8. Available at: https://www.ilo.org/wcmsp5/groups/

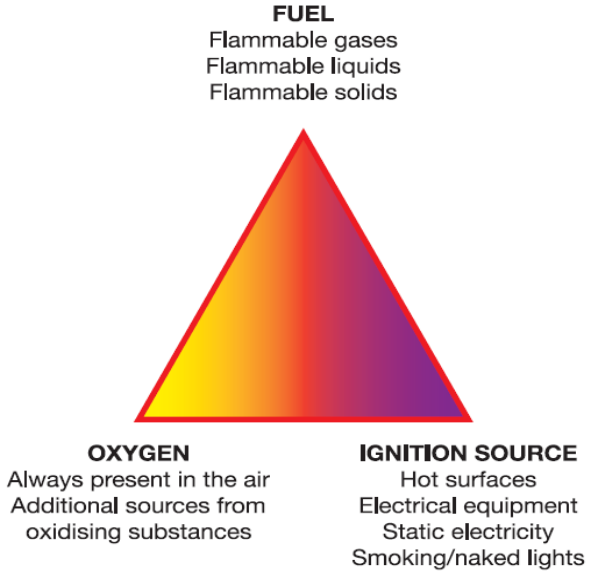
## 6.0 AVOIDING WORKPLACE FIRE ACCIDENTS

### 6.1 Specific Learning Outcomes

i. Explain the meaning of fire
ii. Identify the sources and causes of fire
iii. Identify Classes of fire
iv. Describe the principles of fire extinguishing
v. Identify types of fire extinguishers
vi. Explain the operation of portable fire extinguishers
vii. Explain the importance of fire assembly points
viii. Describe the methods of fire prevention.

### 6.2 Meaning of Fire

Fire is a form of a chemical reaction that involves the rapid oxidation of combustible fuel (material) with the subsequent liberation of heat and light. Fire is the rapid oxidation of any combustible material. It is a chemical reaction involving fuel, heat, and oxygen. These three elements, commonly referred to as the fire triangle, in the right proportions, will always produce a fire. Remove any one side of the triangle and the fire will be extinguished. Scholars have also introduced a 4th element in the equation, known as the uninhibited chain reaction, thereby giving the fire chemical reaction an additional side. This is referred to as the fire tetrahedron.




- **Heat** is required to ignite a fire, and will continue to be generated as the fire burns. For intentional fires, this could be as simple as the striking of a match. For accidental fires however, ignition can occur as a result of obstructing ventilation on machinery that heats up, or flammable materials being too close to heaters.

- **Fuel** can be anything that is combustible, such as wood, petroleum and spirits, and a number of gases. Solid fuels must reach a critical temperature in order to ignite, while many liquids release flammable vapours even when cold. Gases are the most hazardous and temperamental state, and can combust instantaneously.

- The air feeding a fire only needs to be made up of 16% **Oxygen** in order to react with the heat and fuel. Generally, at low/normal altitude, the level is over 20%.

### 6.3 Types of fire

As far as safety is concerned, there are two types of fire;
a) controlled (safe) fire.

- There is good control on the size, duration, temperature, smoke and fumes of fire.
- This is used in our daily life such as cooking, heating (by gas, coal or kerosene), car, aeroplane and rocket engines.
- It requires the presence of air (oxygen), fuel and heat (ignition source).
- These components are termed the fire-triangle.

b) uncontrolled (dangerous) fire.

- There is no control on the size, duration, temperature (1000 oC or more), smoke and fumes of fire.
- This type of fire occurs due to the accidental (or due to criminal act) spread of fire to catch combustible materials.
- In addition to oxygen, fuel and heat, this type of fire requires an uninhbited chain reaction.
- In an uninhabited chain reaction burning continues and may even accelerate.
- This chain reaction occurs due to the breakdown and recombination of the molecules that will add to the fuel of the fire.

### Effects of uncontrolled fire

a. Human loss: burning from extreme heat; suffocation from smoke and fumes and death
b. Structural damage: damage to labs, offices and buildings
c. Material damage: damage to instruments, equipment, furniture and supplies
d. Disruption of work
e. Financial losses

## 6.4 Causes of Fire in the Workplace

The sequence of events that leads from the initiation of a fire through to a major disaster with multiple fatalities is a simple path. There are 3 basic requirements for a fire to be created and sustained:

1. The presence of fuel or flammable materials;
2. The presence of a source of ignition;
3. The presence of oxygen in the air to support the combustion.

The ability to manage and reduce the risks associated with these three elements will reduce the likelihood of a serious fire considerably. The sequence of events that can lead to a major fire may include the following:

- The build-up of flammable materials in the workplace;
- The unintentional provision of a source of ignition;
- The failure to quickly detect the presence of the fire;
- The failure to control the fire and extinguish it.

The inability of the employer or controller of the premises to manage the fire can lead to human fatalities. The most common cause of a major fire becoming a major human disaster is the inability of persons trapped within the building to exit the building in a timely and safe manner.

Many more people are killed in fires by the inhalation of smoke and toxic gases than by the heat of the fire. The toxic gases may also cause loss of consciousness within minutes, so timely evacuation is imperative. The exact time for this to happen depends on many factors, but it is recommended that everyone within a building should reach either a place of safety or a protected zone within 2 to 3 minutes of becoming aware of an uncontrolled fire.

## 6.5 Sources of Fire

The sources of workplace fire may include:

- Faulty or misused electrical equipment
- Lighting equipment
- Naked flames, eg candles, gas or liquid-fuelled open-flame equipment
- Smoking materials, eg cigarettes, matches and lighters
- Electrical, gas or oil-fired heaters (fixed or portable)
- Cooking equipment and toasters
- Hot surfaces and obstruction of equipment ventilation, eg photocopiers
- Hot processes, eg welding by contractors.
- Possible acts of arson, deliberate ignition, vandalism and similar activities.

## 6.6 Classes of Fire

The classification of fire depends mainly upon the fuel involved. There are five classes of fire.

### CLASS "A"

These fires are fueled by ordinary combustible materials, such as wood, cloth, paper, and many plastics. This type of fire burns with an ember, leaves an ash, and is best extinguished by removing the heat side of the triangle. Extinguishers suitable for Class "A" fires should be identified by a triangle containing the letter "A"; if color-coded, the triangle will be green*.

### CLASS "B"

These fires are fueled by flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols and flammable gases. This type of fire burns on the surface of the fuels, and is best extinguished by a blanketing or smothering action. A fire of this type is fast-spreading and capable of engulfing a large area in a very short time. Extinguishers suitable for Class "B" fires should be identified by a square containing the letter "B". If color-coded, the square is red*.


### CLASS "C"

These fires occur in energized electrical equipment, where the electrical non-conductivity of the extinguishing media is of importance. Blanketing or smothering this type of fire with a non-conducting extinguishing agent is of prime importance. Water, or solutions containing water, is never to be used on a Class "C" fire. Extinguishers suitable for Class "C" fires should be identified by a circle containing the letter "C"; if color-coded, the circle is blue.


**NOTE:** If possible, shut off the source of electricity as soon as possible.

* Extinguishers suitable for more than one of the three classes of fire defined above may be identified by multiple symbols (ABC).

Generally, the extinguishing agent is referred to as DRY CHEMICAL.

### CLASS "D"

These fires involve combustible metals, such as magnesium, titanium, zirconium, sodium, lithium and potassium. Generally, the extinguishing agent is referred to as DRY POWDER. These extinguishers should be identified by a star containing the letter "D", if color-coded, the star is yellow.


### 2.2.5 CLASS "K"

These are fires in cooking appliances that involve combustible cooking media such as vegetable or animal oils and fats. The extinguishing agent is referred to as WET CHEMICAL. These extinguishers should be identified by the letter "K."


## 6.7 Principles of Fire Extinguishing

Fire extinguishing works on the principle of cutting off the supply of oxygen to the fire and bringing down the temperature. Any one or a combination of these general principles can be used to extinguish a fire:

- Cool the fire - Cooling
- Cut off the oxygen supply - Starving
- Remove the fuel - Smothering

An example of cooling a fire is spraying water on burning wood. This lowers the temperature of the wood below that at which it will burn. An example of cutting off the oxygen supply is covering a container of burning material until all the oxygen is consumed. An example of removing the fuel is turning off the fuel valve on an oxy-acetylene torch. In any of the three instances, the fire will go out.

### Cooling

Removing the heat is one of the most effective methods of fire extinction available, which is why water is a popular extinguishing material. The fire will go out so long as the heat generated by the fire is less than that which is absorbed by the water.

*Remember: water is not an appropriate extinguishing material to use on electrical fires, as well as those caused by cooking oils/fats or other flammable liquids.*

### Starving

While cooling removes the heat/ignition element of the 'fire triangle', starving the blaze of its fuel source approaches extinction from a different angle. A raging fire will burn itself out if it runs out of flammable materials, such as a bonfire out in the open that isn't in contact with any other wood or dry grass. Similarly, a gas fire will immediately extinguish if the gas supply is cut off – you only have to look at a gas stove or Bunsen burner to see that.

### Smothering

As the other key component present in the chemical reaction that causes combustion, removing oxygen from the equation is the final way of extinguishing a fire. For example, smothering a frying pan blaze with a fire blanket reduces the oxygen to below the 16% required to react, while covering a candle with a glass will snuff it out in a vacuum.

Smothering is a technique that is mostly applicable to solid fuel fires, although some materials may contain enough oxygen within their own chemical makeup to keep the blaze burning.

## 6.8 Types of Fire Extinguishers

There are different types of fire extinguishers because there are various types of fires. Each extinguisher is suitable for fighting certain types, and it's important for you to know the differences if it's your job to fight fires at work. Being able to immediately distinguish which extinguisher you need in an emergency could make a lifesaving difference. Fire extinguishers are classified as types A, ABC, BC or K. It is important to use the right type of extinguisher on the specific class of fire to avoid personal injury or damage to property. The wrong type of extinguisher could cause electrical shock, explosion, or spread the fire.

Each type of fire extinguisher contains different materials that make them suitable for fighting certain types of fires, and is designed to safely and effectively discharge its contents. The correct one must be used for the right class of fire, otherwise they may prove ineffective or in fact worsen the situation. For example, using a water extinguisher on an electrical fire or a carbon dioxide one on a burning oil fire is extremely dangerous.

There are five main types of fire extinguishers:

1. Water.
2. Powder.
3. Foam.
4. Carbon Dioxide (CO2).
5. Wet chemical.

Each type is easily identifiable by their names, colours, and sometimes their hoses. Depending on their size, some may not come with a flexible hose, such as smaller foam or aqua water spray extinguishers.

### 1. Water Extinguishers

There are two main types water extinguishers: standard water spray and dry water mist.

- **Standard water extinguishers**

These will be solid red and will have the word 'water' or 'aqua spray' printed across them in a signal red band, often with a white border. They are your classic model: they dispense water at a high pressure to extinguish flames. Water extinguishers are **only suitable for class A fires**, which means they can fight fires that involve wood, cardboard, paper, plastics, fabric and textiles, and other solid materials.


**Warning:** do not use water extinguishers on burning fat and oil fires and electrical appliances. Water extinguishers can sometimes contain chemical additives that improve their effectiveness by up to 300%. The chemicals remove the water's natural surface tension so that it soaks into burning materials more effectively when used.

- **Dry water mist extinguisher**

These types of fire extinguishers will be solid red and will usually have the words 'water mist' printed within a white rectangle.

Dry water mist extinguishers are unique in that many of them can **combat almost all types of fires,** including class F fires that are usually difficult to attack. The extinguisher's nozzle converts water into 'dry' microscopic particles, which are then drawn into the fire and simultaneously cool and suffocate it to extinguish the flames.

They are also effective for fire-fighting because they form a safety barrier between the user and the fire – which repels some of the heat – and do not leave hard-to-clean residue behind.


**Warning:** Although they are not currently classified as suitable for fighting class B (liquids) and C (gases) fires, dry water mist extinguishers have been identified as effective against them.

Other types will be better suited for fighting electrical fires, but dry mist extinguishers have usually had dielectrical tests carried out on them, which means that if they are accidentally used on electrical fires, they will not pose as significant a hazard as normal water extinguishers.

## 2. Powder Extinguishers

ABC powder extinguisher are types of extinguishers that will say 'powder' in white text over a blue rectangle, and underneath the rectangle will be written 'ABC powder'. As their name suggests, these are **designed to combat class A, B, and C fires** – those involving solids, liquids, and gases. The powder acts as a thermal blast that cools the flames so burning cannot continue. Due to their non-conductive nature, they are **also suitable for fighting electrical fires**. However, they do not effectively penetrate the spaces in equipment easily, so the fire could still re-ignite.


**Warning:** do not use on domestic chip or fat pan fires (class F).

The downside to ABC powder extinguishers is that they pose a danger of inhalation when used in confined spaces, so they must not be used in them. They also leave residue behind that is difficult to clean up and causes damage to soft furnishings, carpets, and electrical equipment. This is why it's advised you use a different type of extinguisher for fires involving electronics, such as in an office with computers.

## 3. Foam Extinguishers

Foam extinguishers are identifiable by the word 'foam' printed within a cream rectangle on their bodies. They are primarily water based but contain a foaming agent, which has rapid flame knock-down and a blanketing effect. It smothers the flames and seals vapours so that re-ignition cannot occur.

**They are suitable for fighting class A and B fires**. When used against class A fires, the user can simply point and spray. However, when used against class B fires – those with flammable liquids – they should not be sprayed directly into the liquid. This could cause the fire to be pushed and spread to surrounding areas. The best method of application is to spray the foam nearby so that it can build up and flow across it.


**Warning:** these should not be used on any other fire classes, especially electrical fires or chip or fat pan fires. Many foam extinguishers will have had dielectrical tests performed on them, so foam is less hazardous than water if it is accidentally sprayed on live electrical equipment. However, they should still not be used to fight electric fires as they are not specifically designed for them.

### 4. Carbon Dioxide (CO2) Extinguishers

These types of extinguishers can be identified by the text 'carbon dioxide' or '$CO_2$' printed in white on a black rectangle. They also have a distinct type of hose. Carbon dioxide extinguishers are **used for combating class B and electrical fires** – they suffocate the fire by displacing oxygen in the air. Because they do not leave any substances behind and so minimise damage done to equipment, unlike other extinguishers, they are particularly useful for offices and workshops where electrical fires may occur.


**Warning:** they must not be used on hot cooking oil and fat (class F) fires. The strong jet from the extinguisher would push the burning oils or fats and spread the fire to surrounding areas. Also bear in mind that while carbon dioxide is effective at smothering fires, once the gas has floated away, the fire may reignite if the source has not been removed. Furthermore: you must not hold the horn, base, or pipework on a $CO_2$ extinguisher while operating it. The gas becomes extremely cold during its discharge, and this could damage your hands.

### 5. Wet Chemical Extinguishers

These types of fire extinguishers are identifiable by the words 'wet chemical' printed across a yellow rectangle. It also has an extended hose that you can hold and point, which is useful when fighting fires on a kitchen top.

Wet chemical extinguishers are **designed for combating fires that involve class F fires**. They are effective because they are capable of stopping fires that are of an extremely high temperature, particularly cooking oils and fats. They also discharge gently, stopping the burning oils and fats from being pushed and splashing to surrounding areas or even the user.


The chemicals contained within the canister dispels the flames, cools the burning oil, and produces a soap-like solution that seals the surface and prevents re-ignition of the fire. The best method of application is to spray in slow circular motions. The user should empty the entire contents onto the oils or fats. Otherwise, the fire may re-ignite

.

**Warning:** wet chemical extinguishers are usually not recommended for class B fires – those involving liquids. Also, although they are capable of combating class A fires, they are not as effective as other extinguishers at doing so.

### 5.1 Operation of Portable Fire Extinguishers

Extinguishers have their limits. A portable fire extinguisher can save lives and property by putting out a small fire or containing it. Portable extinguishers are not designed to fight a large or spreading fire. Even against small fires, they are useful only under the following conditions:

- An extinguisher must be large enough for the fire at hand. It must be available and in working order, fully charged.
- The operator must know how to use the extinguisher quickly, without taking time to read directions in an emergency.
- The operator must be strong enough to lift and operate the extinguisher.
- It's easy to remember how to use a fire extinguisher- simply follow the steps - **PASS**
    - **P**ull - Pull the pin on the extinguisher
    - **A**im - Aim the nozzle at the base of the fire
    - **S**queeze - Squeeze the trigger to release the product
    - **S**weep - Sweep the nozzle from side to side (slowly)

**Pull the Pin:** Pull the pin at the top of the extinguisher that keeps the handle from being pressed. Break the plastic seal as the pin is pulled.

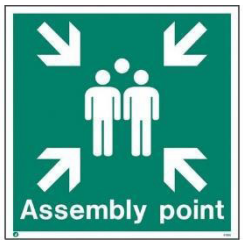
**Aim:** Aim the nozzle or outlet toward the fire. Some hose assemblies are clipped to the extinguisher body. Release the hose and point.

**Squeeze:** Squeeze the handle to release the extinguishing agent. The handle can be released to stop the discharge at any time. Before approaching the fire, try a very short test burst to ensure proper operation.

**Sweep:** Sweep from side to side at the **base** of the fire until it is out. After the fire is out, watch for remaining smoldering hot spots or possible reflash of flammable liquids. Make sure the fire is out.

### 5.2 Importance of Fire Assembly Points

A fire assembly point is a location where workmen/ staff/people and visitors can gather in the event of fire/leak/explosion and other emergency to ensure everyone is in a designated safe area. It ensures that people will know where to gather following an emergency evacuation.




Key considerations for Fire Assembly Points:

- Assembly points should be located outside of buildings
- Assembly points outside of the building should be clearly indicated. These points and the routes to them should be signposted with correct notices. Ensure all signage is unobstructed and easy to see, and that staff are aware on joining the company where their designated fire assembly point is.
- For larger sites, a well-formulated procedure should be in place to handle the evacuation of hundreds of people safely, ensuring they are moved through various exit points to a single assembly point.
- Where assembly points are sited is important. Consideration needs to be given to distance from the main building, and ease of accessibility by disabled people.
- Providing a sheltered, illuminated assembly point can be a good idea depending on the type of people who would be evacuated.
- It is important that employees and other persons visiting the building are advised which assembly area they must use in the event of evacuation. For employees, this should form part of their induction to the company. For visitors, it is good housekeeping to advise where the nearest exit points and assembly point is.

## 5.3 Methods of Fire Prevention

### 1. Controlling flammable materials

Flammable materials need to be restricted within the building and suitably stored. The amounts of stored materials should be kept to a minimum. Flammable liquids and gas bottles should be stored in external storage buildings. Flammable materials such as paper, fabrics, wood, plastics, packaging materials etc. should not be stored:

- Beneath staircases or in stair wells;
- Up against heating equipment;
- Close to electrical cabinets or equipment;
- Near to sources of hot work such as welding and grinding;
- Close to heat sources such as cooking or smoking.

### 2. Reducing the potential for ignition

The positioning of any sources of heat or ignition need to be considered in relation to the location of flammable materials. The following control factors should be considered within the Fire Plan:

- No smoking in the work place;
- Controlled access to minimize the potential for arson;
- Good housekeeping in areas where hot work is carried out;
- Safe procedures for the burning of waste materials;
- Effective electrical maintenance and inspection.

Poor electrical maintenance is one of the main ignition factors, and special precautions should be observed:

- Electrical equipment should be earthed to minimize the potential for static electricity creating a source of ignition;
- Each electrical circuit should have an adequate fuse or circuit breaker located in a well-constructed box in close proximity to the work station;
- Hard wired circuits should be used instead of extension cords to minimize the potential for damage to the wiring; insulation and to remove the practice of ganging multiple plugs and possibly overloading of circuits;
- Isolators should be arranged so that all electrical equipment has the potential to be isolated in an emergency.

### 3. Rapid identification of the presence of the fire

The provision of detectors connected to alarm and warning systems are important in the rapid identification of the presence of a fire. Fire detection can be achieved using a variety of battery or mains electrically powered equipment that may identify the presence of smoke, heat or flickering light. These equipment and devices need to be routinely inspected and tested. Their locations and distribution are critical. Their presence is vital especially in all areas of the building where flammable materials are being stored.

### 4. Effective emergency provision and procedures

The ability for all persons to timely evacuate the building is a vital control requirement. There needs to be a fire escape route established. All fire escape routes must be marked out, preferably with yellow floor paint and they must be a minimum of 70cms in width a d free of
obstruction. Where possible the fire escape route should be well lit with emergency lighting. All escape routes must exit the building to a safe place. All employees should be instructed and trained in the Fire Escape procedure. On a regular basis all employees should take part in a fire escape practice.

### 5. Control of the fire

Firefighting equipment must be selected and positioned to be as effective as possible. The following factors should be considered in the firefighting plan:

- The correct firefighting equipment is matched to the type of fire;
- The firefighting equipment is positioned at the exits to the building.
- The firefighting equipment is properly mounted in an unobstructed and marked position;
- Employees are selected and trained in the use of the extinguishers;
- The fire extinguishers are inspected as scheduled
- Numbers of emergency contact should be clearly indicated at the workplaces and means for such a contact should be available.

The following are examples of control measures.

- Fire detection devices, eg heat sensors and smoke alarms.
- Fire warning devices, eg fire alarms.
- Emergency fire-fighting equipment, eg extinguishers and fire blankets.
- Fire containment, eg fire doors.
- Safe exits and escape routes.
- Emergency fire procedures, eg arrangements for issuing warnings and calling the fire brigade.
- Fire evacuation plans.
- Special fire evacuation equipment, eg evacuation chairs for helping those with impaired mobility out of the building.
- Fire safety training and drills.

## 5.4 Learning Activities

Visit any organization of your choice preferably one that is within the transport and logistics sector. Take a walk through and observe the various fire management approaches in place.

### Required

1. Identify the different types of fire extinguishers in place.
2. The existence of fire assembly points
3. The existence of fire exits and signage
4. What areas of concern can you identify that expose the organization to fire risk?
5. What recommendations can you provide to manage to effectively reduce any risk from fires?

## 5.1 Self-Assessment Questions and Activities

1. What are the causes and sources of workplace fires?
2. What are the different types and classes of fires?
3. What are the principles of fire extinguishing?
4. What are the types of fire extinguishers?
5. How would you use fire extinguishers?
    a. What kinds of burning materials can be extinguished with a Class A fire extinguisher?
    b. What kinds of burning materials can be extinguished with a Class B fire extinguisher?
    c. What type of fire can be extinguished with a Class C extinguisher?
    d. What are the symbols that represent the different types of fire extinguishers?
6. Where should fire extinguishers be located? What is the importance of fire assembly points?
7. What are the different methods of fire prevention?

## 7.1 References


- Reese, D. C. (2016). Occupational Health and Safety Management: A Practical Approach, 3rd Edition. Routledge Francis Taylor
- Mansdorf S. Z. (2019). Handbook of Occupational Safety and Health, Third Edition. John Wiley & Sons, Inc.
- The Occupational Safety and Health Administration (OSHA) Laws and Regulation from different EAC Countries
- United Nations (2011). The Recommendations on the Transport of Dangerous Goods, 11th Edition, Volume I and II.
- International Labour Office (ILO).2016. Personal Protective Equipment Helps You Stay Safe and Healthy (Geneva). Available at: https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---lab_admin/documents/instructionalmaterial/wcms_537874.pdf.
- World Health Organization (WHO). 2020. Health topics: Occupational health (Geneva). Available at: https://www.who.int/health-topics/occupational-health.
- International Labour Office (ILO). 2017. Wise Action Checklist, in Global Manual for WISE: Work Improvements in Small (Geneva), p.8. Available at: https://www.ilo.org/wcmsp5/groups/

## 8.0 ACCIDENTS IN THE WORKPLACE – OCCUPATIONAL ACCIDENTS

### 8.1 Specific Learning Outcomes

i. Explain the meaning of occupational accidents
ii. Discuss the causes of accidents
iii. Discuss the consequences of accidents
iv. Identify accident prevention measures
v. Identify accident response measures
vi. Explain the importance of accident reporting and investigation

### 8.2 Meaning of an Occupational Accident

An accident means:

- A sudden and unforeseen event arising from an external factor
- That causes the employee to be injured or develop an illness.

An external factor may be, for example, slippery surfaces, a pothole, an object falling from above, or a sharp object that impacts with the hand. An external factor may also refer to acid, a virus, or bacteria.

The suddenness of an event means that the incident takes place quickly and without warning, such as slipping, falling or colliding with an object.

An unforeseen event means that the incident occurs independent of the employee's own will. If an employee deliberately injures him/herself, it is not an accident.

An "occupational accident" is an occurrence arising out of or in the course of work which results in a fatal or non-fatal injury. Like other undesired workplace events, occupational accidents are generally caused by various factors, some more evident than others, which form a causation chain leading to the accident.

### 8.3 Causes of Workplace Accidents

The workplace can be dangerous, even more so in an industrial environment. Numerous factors can cause accidents, ranging from overexertion to mishandling of hazardous materials. There are also a multitude of variables that can contribute to or influence a workplace incident. Following are eight of the most common causes of accidents in the workplace:

1. Lifting

Many employees are prone to sprain, strain or tear a muscle by virtue of lifting an object that is too heavy for them to lift on their own. Keep in mind that there is no harm in asking for help with objects that are difficult to lift.

2. Fatigue

Failing to take a break is another common cause of accidents. In order to recover from gruelling manual labour, it is essential that employees take adequate breaks. Not doing so can lead to a slew of physical issues, including atrophy and general exhaustion. The results of either of these can be far more devastating than taking a 10-minute breather.

3. Dehydration

Not staying hydrated can also bring about disastrous consequences. On exceptionally hot summer days, failing to drink adequate amounts of water can cause heat stroke or cardiac conditions. This can be avoided by simply drinking at least eight glasses of water per day. Management should stress the importance of proper hydration and rest, as it maximizes the efforts of personnel.

4. Poor Lighting

Inadequate lighting is responsible for a number of accidents each year. This is often overlooked when attempting to prevent accidents in the warehouse or workplace.

5. Hazardous Materials

Improper handling of hazardous materials or not wearing personal protective equipment (PPE) is another common cause of accidents in the workplace. By reading material safety data sheets and providing the appropriate protective attire, many workplace incidents can be avoided.

6. Acts of Workplace Violence

Sadly, violence among co-workers has become all too common. It is usually brought about by office politics or other sensitive issues. Integrating conflict resolution and peer mediation can help to reduce the risks of such outbursts.

7. Trips and Falls

Slick floors and high-traffic corridors can cause a trip or fall. Improper footwear may also contribute to these accidents, which not only can result in injuries but also workman's compensation-related cases.

8. Stress

Stress is one of the leading causes of death. It affects the human body in every facet imaginable. Stress can foster negative effects physiologically, emotionally and mentally, as well as debilitate or distract any worker. Therefore, it is essential to encourage a supportive team environment.

## 8.4 Consequences of Accidents

Accidents have various consequences to the various parties involved either directly or indirectly. The consequences could be minimal to severe such as death of an employee.

Workplace injuries can result in:

- **Physical injuries**, including loss of limbs, burns and trauma. The effects of these injuries can be permanent and life-changing, and could result in temporary or permanent loss of an employee. Losing a trained employee due to a workplace accident can cost the company significantly including being liable to cover sick pay, medical costs and compensation.

- **Fatalities.** Many employees get killed in a workplace accident in line of duty. If an employee dies at work, the organization could face enforcement action and significant fines, as well as a decrease in morale and performance.

- **Psychological repercussions.** A workplace injury can have significant psychological impacts on the affected employee, including anxiety, stress and depression. This might result in an employee having to take time away from work.

- **Loss of morale.** Workplace accidents can result in a significant decrease in morale, both for the injured employee and their co-workers. A loss of morale can, in turn, decrease work performance which can impact company turnover.

- **Increased costs.** A workplace injury could leave the company with legal fines, compensation, increasing insurance premiums, temporary staff costs, hiring costs and reduced profit from decreased performance. Some of the costs also include:

    - Cost in employee compensation as a result of injury
    - Productive time lost by an injured employee.
    - Productive time lost by employees and supervisors helping the accident victim.
    - Time to hire or train a worker to replace the injured worker until they return to work.
    - Property damage.
        - Time and cost for repair or replacement of damaged equipment, materials or other property.

    - Cost of continuing all or part of the employee's wages, plus compensation.
    - Cost of completing paperwork generated by the accident and compliance.
    - Penalties and sanction by industry and government agencies.
    - Cost of implementing remedial strategies as sanctioned.
    - Dented organization reputation.

## 8.5 Accident Prevention Measures

Accidents are unplanned occurrences that result in injuries, illness, death, and loss of property and/or production. While there is no way to completely eliminate accidents, there are certain plans, preparations, and actions that can be taken to reduce them.

- Develop and implement a Health and Safety Policy which should include information on:

    - How you manage safety in your workplace.

- Individual responsibilities regarding health and safety.
- How you manage specific workplace activities.

- Know the Hazards
  - Be aware of surroundings. Look around and identify workplace hazards that could cause harm.
  - Look for ways to reduce or eliminate hazards and implement them.
  - Report unsafe areas or practices.
  - Dress for the weather.
- Create a Safe Work Area
  - Keep an orderly workplace. Poor housekeeping can cause serious health and safety hazards. The layout of the workplace should have adequate egress routes and be free of debris.
  - Continually cultivate a safety standard.
  - Take breaks and move around regularly throughout the day. Small breaks (standing up and moving around) can make a big difference in combating the dangers of staying in a static position all day long.
  - Pay attention to workstation ergonomics.
  - Display hazard specific warning signs.
  - Regular inspections and maintenance of work equipment and machinery.
- Use Safe Lifting Techniques
  - Follow the following safe lifting practices:
    - Lift from a position of power
    - Keep the load close
    - Use a staggered stance
    - Don't twist while lifting
  - Training in body mechanics can reduce strain injuries and keep employees safe during lifting and moving.
- Personal Protective Equipment
  - The proper use of Personal Protective Equipment (PPE) can dramatically reduce the risk of injury.
  - Examples of PPE include gear such as earplugs, hard hats, safety goggles, gloves, air-purifying respirators and safety shoes.
- Regular Communication
  - Notify supervisors about safety hazards.
  - Speak up and be involved in safety planning.
  - Continually cultivate a safety standard.

Education and Training
- Ensure everyone has the proper safety training relating to the hazards of the job.
- Employees must be appropriately and regularly trained in health and safety measures and receive adequate training for all their duties.
- Appropriately trained employees are less likely to have workplace accidents as they understand how to carry out their duties correctly and safely.

## 8.6 Accident Response Measures

### Assess the situation

Before administering care to an ill or injured person, check the scene and the person. Size up the scene and form an initial impression. Pause and look at the scene and the person before responding. Answer the following questions:
- Is the scene safe to enter?
- What happened?
- How many people are involved? - What is my initial impression about the nature of the person's illness or injury?
- Does the person have any life-threatening conditions, such as severe, life-threatening bleeding?
- Is anyone else available to help?

After initial assessment:
- Respond as quickly as possible
- Apply first aid as called for
- Call or have someone call 9-1-1 for an ambulance if the injury is severe enough.

### Take control and secure the situation

Control potential secondary accidents. This includes denying access to people who don't need to be on the scene. If there's been a spill, for example, you don't want other employees wandering through and slipping on something.

### Assist the injured

With emergency services on the phone, they can help you keep the victim stable before the ambulance arrives. If the victim is conscious, talk to them and ask them questions to make sure they stay awake, especially if there is a head injury involved.

### Report the injury

Should you witness an accident and any type of injury occurs (even non-life threatening), you must report it to the supervisor so that the appropriate actions can be taken. If it is required, a report of the injury must be filed. Also, management should be made aware of the incident as well as any concerns.

## 8.7 Accident Reporting and Investigation

Collecting information on accidents can be useful in preventing occupational accidents and diseases and should therefore be investigated in order to answer the following questions (the "5Ws and 1H"):

- Who was injured, suffered ill health or was otherwise involved in the event under investigation?
- Where did the accident occur?
- When did the accident occur?
- What happened at the time of the accident?
- How did the accident occur?
- Why did the accident occur?

The accident report should include the essential information on how a person was injured or came to be ill so that the event or condition can be analysed, the circumstances understood, and the necessary steps taken in order to prevent its recurrence.

Employers must ensure that workers understand their obligation to report to their supervisors any hazardous situation or abnormality observed in the workplace. Workers should be aware of any reported cases and the circumstances under which they occurred so that they can help to improve working conditions. This information is valuable for prevention. Having a form on which to record incidents makes it easier to take corrective action.

## 8.8 Learning Activities

Undertake an institutional walk through. Observe and take note of the different accident related issues.

### Required

- Identify the different indicators or situations that can result in accidents in the organization
- Recommend accident prevention strategies to the organization based on your observations.

## 8.9 Self-Assessment Questions and Activities

1. What is the meaning of occupational accidents?
2. What are the causes of occupational accidents?
3. Discuss the consequences of accidents
4. How would you prevent accidents in the workplace?
5. What strategies would you use to respond to workplace accidents?

## 5.1 References


- Reese, D. C. (2016). Occupational Health and Safety Management: A Practical Approach, 3rd Edition. Routledge Francis Taylor
- Mansdorf S. Z. (2019). Handbook of Occupational Safety and Health, Third Edition. John Wiley & Sons, Inc.
- The Occupational Safety and Health Administration (OSHA) Laws and Regulation from different EAC Countries
- United Nations (2011). The Recommendations on the Transport of Dangerous Goods, 11th Edition, Volume I and II.
- International Labour Office (ILO).2016. Personal Protective Equipment Helps You Stay Safe and Healthy (Geneva). Available at: https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---lab_admin/documents/instructionalmaterial/wcms_537874.pdf.
- World Health Organization (WHO). 2020. Health topics: Occupational health (Geneva). Available at: https://www.who.int/health-topics/occupational-health.
- International Labour Office (ILO). 2017. Wise Action Checklist, in Global Manual for WISE: Work Improvements in Small (Geneva), p.8. Available at: https://www.ilo.org/wcmsp5/groups/

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