المؤسسة العامة للتأمينات الاجتماعية
General Organization for Social Insurance

BASIC STANDARDS FOR OCCUPATIONAL SAFETY & HEALTH (OSH)

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Introduction

Definition of Occupational Safety and Health (OSH)

Occupational safety and health (OSH) is generally defined as the science that is concerned with maintaining human safety and health, the safety of facilities, production equipment, raw materials and finished products, by providing safe work environments free from the causes of occupational accidents injuries or diseases. In other words, it is a set of procedures, rules and regulations within a legislative framework aimed at protecting people from the risk of injury and preserving property from the risk of damage and loss.

Safety Responsibilities:

Occupational accidents, injuries and diseases cause a lot of pain and suffering to the injured and their close family members, in addition to many economic losses, either directly or indirectly. To reduce these injuries, all workers in the work environment shall take personal responsibility for their own safety and the safety of others. However, there are special responsibilities and duties that are classified and categorized based on the nature of the work of individuals in the work organization and their powers; starting from the Head of the Department, then the Safety Officer, down to the Workers. These special responsibilities can be summarized in the following points:

First:Department Head Responsibilities:

- Supporting and spreading a culture of safety and professional preventive awareness among safety officials and workers.
- Monitoring and supervising the work environment and its performance.
- Taking appropriate measures when violating occupational safety and health requirements within the workplace.
- Being a member of special occupational safety and health committees and supporting safety programs.
- Monitoring occupational accidents and taking appropriate and sufficient measures to prevent their recurrence.
- Determining working hours in accordance with the weather conditions and the nature of work.
- Taking legal proceedings and measures to stop work with equipment and machinery that are damaged or that may cause risks within the work environment.
- Coordinating with the concerned authorities regarding occupational safety and firefighting to ensure the safety of the work environment.
- Monitoring safety reports and records of occupational injuries and accidents and issuing the required directives and instructions to handle and fix bad situations.
- Contributing and participating in the tours of safety officials to workplaces and directing the implementation and maintenance of their recommendations.
- Providing and supplying workers with the required personal protective equipment (PPE).
- Establishing and developing a mechanism for continuous periodic inspection of work means and the used protective devices and tools.
- Carrying out and implementing risk prevention policies and programs issued by the concerned departments and authorities.

Second: Safety Officer Responsibilities:

- Adhering to the use of personal protective equipment (PPE) appropriate to the nature of work, complying with the general safety guidelines in the work environment, and setting an example in this field.
- Introducing emergency exits and assembly points at the workplace before starting work.
- Participating, and obligating workers to participate, in the implementation of evacuation plans
- Verifying emergency phone numbers in the work environment and identifying their locations and how to use them.
- Training individuals before starting work and informing them of work hazards and prevention methods.
- Informing and training employees of new issues related to safety in the workplace.
- Monitoring the performance of employees and their use of machines and equipment, and correcting errors, if any.
- Requiring employees to use personal protective equipment (PPE) appropriate to the nature of work and checking its efficiency.
- Monitoring engineering controls in the work environment and reporting any defects in their performance.
- Participating in work improvement programs, studying the causes of accidents and developing appropriate solutions.
- Suspending work when sensing dangers.
- Contributing to promoting the culture of public safety and professional preventive awareness among workers.
- Taking appropriate measures when violating occupational safety and health requirements within the workplace.
- Requesting a schedule change at work in proportion to the weather conditions and the nature of work.
- Demanding legal proceedings and measures to stop work with equipment and machinery that are damaged or that may cause risks within the work environment.
- Carrying out and implementing risk prevention policies and programs issued by the concerned departments and authorities.
- Contributing and participating in the preparation of safety reports and records of occupational injuries and accidents and recommending necessary actions.
- Contributing and participating in the tours of safety officials to workplaces and carrying out and implementing the issued recommendations.
- Asking to provide the workplace with equipment and tools required to measure safety levels in the work environment.
- Writing safety reports and submitting them to the Department Head.

Third: Workers Responsibilities:

- Knowing and being familiar with emergency exits and assembly points at the workplace before commencing work, and participating in the implementation of evacuation plans.
- Knowing and being familiar with the locations of emergency numbers and telephones in the workplace and how to use them in an emergency.
- Complying with and adhering to safety instructions in the workplace, and using and maintaining personal protective equipment (PPE).
- Adhering to and complying with the proper work method, maintaining means of work, and reporting any malfunctions or defects.
- Respecting safety officials and other workers, committing to working seriously and diligently and not violating that.
- Reporting and notifying the Safety Officer when an error is observed in the environment or means of work.
- Refraining from interfering with work matters and affairs except as agreed upon.
- Taking into account not to start work before the safety officials or site officials arrive.
- Reporting any errors in the performance of workers or their use of machines and devices in incorrect ways.
- Monitoring and reporting of any defects in the performance of engineering controls.
- Reporting any accident as soon as it occurs, regardless of its size or location.
- Suspending work and reporting immediately when feeling threatened.
- Reporting devices and equipment that are damaged or that may cause dangers within the work environment.
- Implementing and applying public safety and risk prevention policies and programs issued by the concerned departments and authorities.

Occupational Risk Assessment

Occupational risk assessment is to identify work hazards and then classify them in terms of their likelihood and severity and set their priorities in order to control them. The assessment and control of occupational risks are of great importance; it is the key to managing work risks, which contributes to protecting workers from occupational injuries and diseases, thus reducing hours of absence from work. It also meets the statutory requirements of the relevant authorities. All of this leads to raising productivity and increasing job satisfaction.

First: Occupational Risk Assessment Stages:

- Hazard Identification Stage: Hazard is anything that can or may cause injuries or diseases to workers or damage to the facility or the environment, such as electricity, machines, forklifts, etc.
- Risk Identification Stage: Risk is the extent to which these hazards may occur (low, medium, high) and the degree of their severity (limited, dangerous, fatal).
- Risk Reduction and Control Stage.

Second: Types of Occupational Hazards:

- Mechanical Hazards: such as cutting, friction and crushing.
- Physical Hazards: such as slips, trips and falls.
- Chemical Hazards: such as gas vapors.
- Biological Hazards: such as viruses in medical laboratories.
- Environmental Hazards: such as water pollution.
- Fire Hazards.

Sequence of Hazard Controls

Elimination:
Eliminating and removing hazards, whether related to materials, processes or equipment. Elimination is considered one of the best methods of controlling hazards.

Reduction
It is by reducing exposure periods (Duration), limiting exposure times (Frequency), or substituting materials with less dangerous ones.

Insulation
By working inside a safe place away from danger.

Engineering Control
By setting up and installing ventilation systems to protect workers - in some cases - and performing adequate maintenance of equipment.

Administrative Control
By changing the method of work, rotating jobs, cleaning and arranging work sites, activating permit to work systems (PTW), training employees, and providing the required prevention and protection tools for workers.

PPE
Personal protective equipment (PPE) is the last line of defense to protect workers in the facility.

Ergonomics

Definition of: Ergonomics

Ergonomics or human factors engineering (HFE) is defined as the science that is concerned with designing the work environment to suit the limits and capabilities of workers. In other words, Ergonomics is the science, which focuses on studying the relationship between the worker and the machine and the work environment in which he works so that the worker can perform his work with the least possible amount of hazards and risks that may arise from the machine and the work environment. This science has emerged and there has been growing interest in it after noticing that many occupational diseases have occurred as a result of the inappropriateness of the machine with the human being, in addition to many neurological, orthopedic and spinal injuries.

Design of: Ergonomics

Ergonomics is concerned with design to achieve the desired goals and objectives for three factors: Designs for Work Environments, Designs for Workers, and Designs for Used Equipment and Machines. Ergonomics takes into account the following:

- Not using all the capabilities of the workers at work so that the minimum amount of the capabilities that are consumed are dealt with.
- Providing all means to achieve ease of use, which helps in the comfort of workers.
- Adapting as much as possible the works, tools, and environments to their users, and designing jobs and tasks that fit individuals as closely as possible.
- Taking into account differences in strength, size, endurance of individuals and the ability to receive and perceive information.
- Reducing work stresses and the rate of exposure to occupational injuries and accidents.
- Verifying and checking security and health factors, eliminating hazards and reducing the chances of errors.

Consequences of:Ignoring Workplace Ergonomics

Neglecting to work with the concepts, basics and rules of ergonomics leads to losing the sense of safety and comfort and causes occupational injuries and diseases. In addition, it involves a number of musculoskeletal disorders symptoms that result from the progressive growth of small amounts of damage that occurs on a daily basis due to repetitive movement or static or stationary postures that last for a long time, long-term handling of a poorly and badly designed product or as a result of using improper physical position for a long time. Such symptoms include the following:

- Musculoskeletal Disorders (MSD)
- Recurrent Illnesses
- Lower Back Pain
- Pressure in the Abdominal Cavity
- Repetitive Strain Injury (RSI)
- Repetitive motion disorders (RMDs) that can affect different parts of the body such as the neck, back, elbow, wrist, hands, pelvis and knees which is often due to the
- repetitive or wrong use of poorly designed product
  Carpal Neuritis

Factors: Affecting Work Design:

- **Gender:** Males have more stamina and muscle endurance than females.
  Age: Older and younger individuals are less able to carry out works that require great physical effort.
- **Lifting and Material Handling:** Failure to follow the correct methods of handling and lifting materials increases the possibility of injuries and occupational diseases.
  Muscular Strength: It varies from person to person.
- **Training:** Correct and proper training and practical application prevent injuries.
- **Exerted Force:** The greater the force, the greater the possibility of a work injury. It shall be taken into account not to overburden workers beyond their capabilities, which is due to several factors such as age, health status and gender.
- **Time Period:** The increased time period for performing work leads to workers being harmed and injured and causes an increase in the possibility of harm and disease. The same applies to the number of repetitions of work (daily, weekly, or monthly). The higher the repetition, the greater the risk of injury.
- **Lack of Rest Periods:** continuous work affects the health of workers negatively. Rest periods during work shall be taken into account according to the tasks performed by each worker.
- **Unfamiliar Works:** The works that the worker does in an unfamiliar way and which may affect his health and cause him future complications
  Personal Susceptibility to Harm: It shall be taken into account that some workers are more susceptible to the possibility of having injuries than others, for example: smokers or those who have certain medical conditions.

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- **Cramped Workplaces:** Lack of space may lead to work uncomfortably and cause health damage to workers.

- **Use of Equipment with Specified Damage:** Such as the use of vibrating equipment.

Controlling: Ergonomic Hazards

- Training workers, theoretically and practically, on how to work properly and comfortably.
- Establishing primary medical health care records for workers and studying their health conditions, taking into account their previous work, injuries and complaints.
- Following up and supervising workers and obligating them to take breaks.
- Checking and inspecting the quality of equipment and machinery and their compliance with specifications before purchasing.
- Carrying out the necessary periodic maintenance for equipment and devices.
- Removing, disposing of and preventing the use of all damaged tools and equipment.
- Conducting inspection tours, establishing periodic reports, developing solutions and following up on their implementation.
- Creating checklists for each workplace or job according to the work requirements.
- Speaking and talking with workers and listening to their complaints.
- Complying with and adhering to the use of personal protective equipment (PPE), taking into account that PPE are of high quality.

IFollowing engineering solutions to facilitate work, after studying the following:

1.Surrounding Environment:

- One of the important factors in ergonomics is the work environment, including:
  Ground Quality and Condition: The ground shall be good and not cause slips, trips and falls for workers.
- Level of Cleanliness: Floors shall be clean and tidy to prevent tripping or slipping.
- Weather Conditions: Attention shall be paid to ventilation, high and low air temperatures, wind, dust, etc. to prevent damage or injuries to workers.
- Environmental Conditions: Attention shall be paid to lightings and floor markings to facilitate work and prevent injuries and occupational hazards.
- The lack of sufficient space to allow workers to move freely and in a safe manner.

2.Risk Factors:

- Handling excessive loads by manual handling poses a high risk to workers.
- Working for long periods without taking an appropriate rest, which leads to fatigue and job burnout.
- Repeating manual handling for long periods of time, especially if the work involves repetitive bending of the body, neck, or head, rotating the upper half of the body for several times, or stretching arms for many times.

2.Control Criteria:

- Replacing manual work that requires manual activities and physical skills with electronic devices in order to remove and relieve pressure on the human element and reduce errors.
- Supervising and controlling well experienced workers.
- Using the appropriate and correct tools and equipment for the job.
  Qualifying and training workers.
- Ensuring and verifying that the environmental conditions are appropriate and conducive to work.
- Having adequate rest periods.
- Avoiding manual handling as much as possible.
- Reducing work periods and limiting repetitions at work as much as possible.
- Using and wearing appropriate personal protective equipment (PPE) suitable for the nature of the work.

Ergonomics: In Office Work

The goal of ergonomics in office work is to design a comfortable work environment to help you increase efficiency and productivity with minimal risks. Currently, one of the most important risks affecting occupational safety and health in office work is the use of computers. The correct sitting posture while working with a computer is one of the most important things that everyone who uses the computer or the occupational safety and health officials who work to provide a safe working environment for workers to protect the spine and joints and avoid muscle tension and excessive stress on the muscles by applying the following instructions:

- Avoid sitting for a long time, and take a break.
- Keep your head straight while sitting and avoid neck bending.
- The desk shall be close to you to ensure that you sit with a back straight (no hunching).
- Avoid placing the phone headset between the shoulder and the head, because this leads to an
- excessive burden on the cervical vertebrae and neck muscles.
- The computer screen shall be placed directly in front of your eyes.
- Avoid getting too close to the screen and keep a distance of 75-45cm.
- Put the keyboard 10-15 cm away from your hand.
- Both arms shall be parallel to the ground
- The legs shall be bent at an angle between 110-90 degrees.
- Be sure to keep your feet flat on the ground.

Ergonomics: For Manual Material Handling

Manual handling is any work that requires a person to lift, lower, push, pull, install or carry any materials. To protect workers during manual handling, the following procedures shall be followed:

- Identifying all high-risk works that may cause occupational diseases to workers.
- Setting a plan to reduce, replace or eliminate all high-risk works.
- Educating and training employees to know the risks of their work and ways to avoid them.
- Taking into account the work design in terms of working hours, rest hours, work rotation and productivity rate.
- Taking into account the age and health status of workers and the weight, size and shape of materials.
- Providing workers with any required manual handling aids.
- Committing by the senior management and intervening directly to protect workers from occupational diseases.
- Developing occupational safety and health policies and procedures and approving them by the senior management.
- Defining occupational safety and health roles and responsibilities for all employees.
- Following up the implementation and application of roles and responsibilities and setting strict procedures for violating them.

Proper Load Lifting Techniques:

- Remove obstacles and trip hazards from roads.
- Face the side where you will move the load and place one foot next to the load and the other foot behind it.
- Take a full squat, keeping your feet in the same position as before.
- Pull the load toward you after you have brought your arms and elbows close to your body.
- Keep your back straight. Close your chin to your chest. Put your body in a position where your weight is concentrated on your feet
- Grip the load firmly and place your palm under the angle of the load closest to your body and the other palm under the side of the load farthest from your body to stabilize the load. The
- fingers alone have little strength.
- Lift the load using your legs, and begin the lift by pushing up with your back foot.

Personal Protective Equipment (PPE)

First: Helmet

- Workers shall wear a helmet in specific areas, which include construction sites, factories operating places, and places where there are works that may lead to falling or flying materials, and when performing work that may expose workers to electric shocks.
- The helmet shall be inspected to ensure that all parts are intact.
- The helmet shall be replaced if it becomes damaged.
- The helmet shell shall not be modified by drilling holes or painting.
- The helmet strap shall be adjusted to fit the head size. There shall be a distance of 2.5 cm to 3.18 cm between the headbands and the cap of the helmet.
- When using other PPE such as ear protectors or face shields, these PPE shall be compatible
- with the helmet and not hinder its wearing.
- The helmet shall be used and stored in accordance with the instructions of the manufacturer.

Types of Helmets:

- **Type I (Class A):** Used to protect the head from falling or flying objects, collision with stationary or fixed objects and electric shocks less than 2200 volts.
- **Type II (Class B):** Used to protect the head from falling or flying objects, collision with stationary or fixed objects and electric shocks less than 20000 volts.
- **Type III (Class C):**Used to protect the head from falling or flying objects, collision with stationary or fixed objects but does not protect against electric shocks.

Second: Face and Eye Protectors

- The choice of face and eye protection shall be based on the expected danger arising from the work to be carried out. Eye goggles shall be worn when exposure to flying particles, dust, chemicals or harmful rays is expected.
- Workers shall be provided with safety glasses with side shields or eye goggles that fit over pre-existing and eyeglasses prescription.
- In addition to face and eye protection, neck protector or guards shall be provided when needed to protect workers against hazards such as flying particles, splashes of dangerous liquids, etc.
- Eye goggles shall always be worn under/beneath the face shield.

Types of Face and Eye Protectors:

- Glasses with shock-resistant side barriers are made of transparent glass or plastic that does not cause the refraction of light rays. It is used to prevent volatile solids.
- Glasses with side barriers are made of rubber with clear lenses. It is used in works that involve chemical activities.
- Glasses are made of opaque glass to protect the eyes against heat radiation. It is used in smelting, metal casting and welding.
- Face shield protective cover made of transparent plastic used in works that involve chemical activities.
- Face shield protective cover made of glare- and spark-proof material, equipped with opaque lenses in the eyes area, and used in arc welding work.

Third: Safety Shoes

Types of Safety Shoes

- Hard-Toed / Steel-Toed Shoes: It is used to protect the foot against falling-object hazards.
- Boots Made of Carbon-Free Rubber: It is used in electrical works.
- Rubber Shoes Lined From The Bottom With Metal Foil: It is used to protect workers against sharp and hard objects.

Fourth: Hearing Protectors

- Hearing Protectors shall be used when working in high noise areas (90 dB and above).
- Workers shall not be exposed to high noise levels that exceed the permitted limits. Chart No. (1) identifies Noise Intensity Level and Duration of Exposure, and Chart No. (2) shows the Intensity Level of Intermittent Noises.

Chart No. (1): Noise Intensity Level and Duration of Exposure

Duration of Exposure (H)	Noise Intensity Level (dB)
16	80
8	85
4	90
2	95
1	100
2/1	105
4/1	110
8/1	115

Chart No. (2): Intensity Level of Intermittent Noises

No. of Knocks Allowed During the Daily Work Period	Noise Intensity Level (dB)
10	150
30	145
100	140
300	135
1000	130
3000	125
10000	120
30000	115

Types of Hearing Protectors:

1.Earplugs: It is used when there is dangerous noise and is made of compressible materials.

2.Earmuffs: It is used when there is a loud noise. It is made of rubber or plastic and consists of two layers containing foam rubber.

3.Protective Helmet (Headgear): It is used when there is a very loud and excessive noise. It is made of high-strength plastic and is lined from the inside with foam rubber and equipped with ear covers to protect the head (bones of the head) against the hazards of excessive noise.

Fifth: Body Protectors:

- Body protectors shall be used when dealing with rays, chemicals, or to provide heat protection.
- Body protectors shall be sized appropriately for the user.
- Body protectors shall be constantly cleaned so that single-use tools shall be disposed of.
- Body protectors shall be checked by specialists periodically to ensure their efficiency to work and free of defects.

Types of Body Protectors:

- **Plastic Protectors:** It is used in electrical work.
- **Earmuffs:** It is used when there is a loud noise. It is made of rubber or plastic and consists of two layers containing foam rubber.
- **Protective Helmet (Headgear):** It is used when there is a very loud and excessive noise. It is made of high-strength plastic and is lined from the inside with foam rubber and equipped with ear covers to protect the head (bones of the head) against the hazards of excessive noise.

Sixth: Respiratory Protection

- Respiratory protectors shall be used in areas with potentially harmful health hazards such as dust, smoke, chemical and petroleum mists and vapors of harmful substances.
- Dust masks shall not be used to protect against dangerous vapors and gases.

Types of Respiratory Protection:

Protective Masks: They shall be used if the air contains solid particles such as dust, and they shall be made of a material connected to a box containing a purifying substance such as cotton and covering the nose and mouth.

Chemical Purification Masks: They shall be used if the air contains harmful fumes and gases. They are rubber mask that covers the nose and mouth tightly and is connected to a filter containing a chemical substance that absorbs the surrounding gases or vapors before they reach the respiratory system. It is necessary to know the suitability of the material used with the toxic gases and vapors that are intended to be disposed of.

Protective Devices that Provide Oxygen or Clean Air: These devices consist of masks connected to a tank of oxygen or fresh air and are used in the event of a lack of oxygen or the concentration of harmful gases in the air reaching very dangerous levels.

Seventh: Safety Belt

This belt shall be used when working in high places (1.8 meters and above), as well as in the construction and maintenance of pipes. The belt shall conform to specifications in terms of design and be made of natural fibers such as cotton, linen, synthetic fibers or leather.

Safety Standards in the Building and Construction Sector

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Digging or Excavating:

Before starting digging or excavating, the worker shall be aware of the following:

- Depth of Digging or Excavating.
  Type of Soil.
- Nearby constructions, buildings and institutions, which may be affected by the vibration of soil.
- Water Level Height.
- Presence of pipes or cables, or the possibility of releasing carbon or toxic materials.
  Creating and developing a plan for digging or excavating, taking into account the depth of digging or excavating, the Type of soil and the types of cables and pipes that may be found in the soil.
- Developing an emergency plan and establishing evacuation and rescue methods.
  If it is known or suspected that there are any underground pipes, conduits, cables or structures, mechanical excavators shall not be used unless all such obstructions are detected with digging hand tools.
- The drilling / excavation process shall always start from top to bottom, bearing in mind that the walls shall be at an appropriate slope according to the soil of the ground being excavated.
  The sides of the excavation, which are more than 1.5 m in depth, shall be secured from
- collapsing with sturdy wooden beams that prevent the soil from digging workers.
- A gap / space of at least 0.6 m (2 ft.) in width shall be left around all sides of the excavation.
  The pits/holes shall be surrounded by barriers, lights and signs to indicate their presence
- and prevent others from falling into them.
- Crossing bridges erected over excavations shall be provided with bars and panels to prevent falls and slips.

- All workers shall use and wear all personal protective equipment required to perform works.

Demolition

Before any demolition activities can take place, electric power to all services within the structures shall be shut off.

- Demolition shall begin at the top of the structure and proceed downward. The surrounding areas shall be secured and evacuated from residents and pedestrians. The demolition process shall be carried out under the supervision of an expert in this field.
- Water shall be sprayed on the buildings to be demolished so that dust does not spread in the air.
- The place where the demolition process takes place shall be surrounded by a fence to prevent pedestrians from entering it. In addition, warning signs shall be placed indicating the demolition process.
- Buildings close to the demolition site shall be evacuated and reinforced in a way that prevents them from being affected by the demolition process.
- Workers shall be provided with suitable personal protective equipment (PPE) for protecting them against falling objects on the head, shoulder and feet.

Scaffolding:

Safety Standards in Scaffolding Design

- The components or parts of the scaffolding shall be intact and free from breakage and corrosion (rust).
- Any component or part of the scaffolding that is defective and may cause harm to workers shall be disposed of and destroyed immediately.
- The components or parts of the scaffolding shall be stored properly to protect against damage.
- The panels furnished on the scaffolding work platform, whatever their type, shall be cohesive and connected to prevent scaffolding from sliding or moving.
- The scaffolding shall not be installed on any moving material.
- The base of the scaffolding shall be supported by wooden beams to help and maintain stability.
- The scaffolding work platform shall be completely covered with planks without openings.
- The wood panels shall be at least 23 cm wide and 3.8 cm thick.
- The planks on the scaffolding work platform shall be 15 cm to 30.5 cm above the end of the frame.
- Pipes and connections in scaffolding whose height is more than 38m shall be designed by a professional engineer.
- Work platforms shall be surrounded by upper, middle and floor barriers.
- Scaffolding in fixed construction shall be tied so that there is every 7.9 m vertical bundle and every 9.1 m horizontal bundle.
- Exits shall be provided with ladders fixed since manufactured in movable scaffolding or with internal stairs.
- The horizontal distance traveled to reach the nearest exit - such as stairs - in emergency situations shall not exceed 15 m (50 ft.)

- The ladder shall exceed 1 m above the upper protection barrier or the floor

Suspended Scaffold (Crane)

- Workers shall use the ladder installed on the scaffold to climb on it.
- Fall protection systems shall be adhered to and personal protective equipment used.
- An inspection shall be carried out by the Safety Officer to ensure the safety of all scaffolding at the site before use and the scaffold inspection card shall be clearly marked.
- Tools shall not be carried in hand when climbing the ladder, but can be placed in a bag hanging in the middle of the body or used a rope to lift it.

- Guardrails shall always be raised when using the scaffold.

Mobile Scaffolding Work Rules

- The height of the movable scaffold shall not exceed (4) times the smallest rib at the base.
- The work platform shall be complete and there shall be no voids.
- Workers shall not climb on the scaffold while the scaffold is running.
  The wheels shall be locked and fixed if the scaffold is used.

- The scaffold shall be supported with the outriggers in case Climb on and use it

Fall Protection Systems :

- Fall protection systems shall be applied if any person works at a height of 1.8 m (6 ft.) and include:

- handrail system, personal means to prevent falls, limited stop system, continuous follow-up system, and safety net system

Handrail System:

- The diameter or thickness of the materials from which the handrail is made shall not be less than 6 mm (1/4 inch).
- The distance between the work platform guard and the handrail shall not be more than 30 cm (12 inches.)
- The upper guardrail shall be placed between (0.95 m - 1.15 m) and the middle guardrail shall be Halfway between the upper and ground protective barrier and the ground guard at 10 cm connected to the bottom.
- The upper guardrail shall withstand a compressive force of at least 90 kg (200 pounds) in both directions.
- The middle guardrail shall withstand a compressive force of no less than 68 kilograms (150 pounds.)
- The distance between the vertical columns constituting the balustrade shall not be more than 2.4 m (8 ft.)
- In the event that a middle part is not used, the distance between the vertical columns shall not exceed 0.48 m (19 inches.)
- The materials from which the handrails are made shall be free of any sharp materials that may cause injury to workers.

Personal Fall Prevention:

- The system consists of a safety belt, a tie point, connectors, and a safety rope. The safety belt shall be designed so that the person does not fall freely for a distance of more than 1.8 m (6 ft.) and does not hit any equipment or installations below.

- The safety belt shall stop its user completely for a movement distance of not more than 1.07 m (3.5 ft.) after a free fall distance of 1.8 m (6 ft.)
  All cleats, hooks and anchor points shall withstand a force of at least 2,300 kg (5,000 lbs.).

Specific Stopping System:

- Free fall shall not be allowed more than 0.6 m (2 ft.)
- The rope shall be tied at a tie point that can withstand at least twice the force of the fall impact or 1,400 kg (3000 lbs.) whichever is greater.
- The length of the rope shall be chosen so that it does not allow access to the edge of the work platform.

Continuous Follow-Up System:

- In the event that it is not possible to provide a means of preventing falls, a continuous follow-up system is used by selecting a trained person with great experience and reliability to ensure the safety of workers.
- This person is able to identify workplace hazards and be able to warn workers about the dangers of falls.
- He is constantly present at the work site and can clearly see all workers. Be close to employees and can talk to them directly.
- No other task other than constantly following up on workers shall be assigned.
- No mechanical equipment or persons other than those assigned to work shall be permitted to be present.

Safety Net System

- It shall be installed below the work surface or platform at a distance of not more than 9.14 m (30 ft.).
- The maximum allowed opening in the netting is not more than 0.76 m (2 in. 36 square inches) with the length not exceeding 0.15 m (6 in.)
- The tie ropes shall withstand the force of not less than 2,300 kg (5,000 lbs.)
- The safety net shall withstand an impact force from a drop of a circular package 0.8 m (30 in) in diameter and weighing 181 kg (400 lbs) from a worktop or platform or from a height of at least 1.1 m (42 in).)
- All materials falling on the net shall be lifted and removed as soon as possible and before the start of the next shift. The use of a defective or inoperable net shall not be allowed.
- The safety net shall be checked at least once a week to ensure its suitability and the durability of its connection.
  It shall be extended from each side of the platform, taking into account the compatibility of the network extension relative to its distance from the platform, according to the following table:

Minimum External Network Extension	Vertical Distance From Working Platform To Safety Net
up to 1.53 m (5 ft)	up to 1.53 m (5 ft)
From 5 (1.53 ft) to 3.05 m (10 ft)	From 5 (1.53 ft) to 3.05 m (10 ft)
From 3.05 m (10 ft) to 9.14 m (30 ft)	From 3.05 m (10 ft) to 9.14 m (30 ft)

Warning Rope System

- Flags shall be installed every 1.8 m (6 ft) and are visible to all.
- The installation shall be made so that the height of the lower part of them is not less than 0.9 m (34 in) and the height of the upper part is not less than 1 m (39 in.). T
- The fixing poles shall bear a horizontal force of not less than 7 kg. (16 lbs.) without falling.
- Warning ropes shall be installed around the roof or ceiling and at a distance of at least 1.8 m (6 ft) from the edge.

Stairs:

General Requirements

- Stairs shall be intact and in good condition. Improper stairs shall be kept away from the work site so that they are not accidentally used until they are repaired or damaged.
- Iron ladders shall not be used near exposed electrical equipment which shall carry a warning sign.
- Ladders shall not be used on cranes or moving surfaces.

Stepladders

- No more than one person shall be climbing the ladder at the same time. This type of ladder shall not be used to climb into openings or high places.
- The four legs of the ladder shall be opened completely and not supported on a wall as a support.
- It shall not be standing at the top of the ladder.
- If the floor on which the ladder stands may lead to its sliding, it shall be fixed in any fixed object or a person is required to install it.

Connecting Stairs

- There shall be an increase of 90 cm above the place to be climbed.
- The ladder is placed on the place to be climbed with an inclination of 1:4, meaning that the horizontal distance separating the base of the ladder and the object to be climbed to is ¼ of the total length of the ladder.
- The top of the ladder shall be attached to a secure object or building.
- The two connections shall be connected at least 1.2 m apart. There shall be a person standing at the base of the ladder when it is being used to install it.
- You shall not carry any tools with you in your hands because this hinders your climbing on the ladder, tools can be carried by a bag secured on the waist belt or by a rope. Ladders that are used for electrical work shall be made of materials that do not conduct electricity.

Safety Standards in Cement Plants and Concrete Works

Safety Standards in Cement Plants and Concrete Works: Necessary Safety Precautions in Cement Plants:

- When extracting raw cement materials, the drilling conditions shall be observed and the appropriate personal protective equipment shall be used to protect workers against the harmful noise and dust resulting from such a process.
- Gloves shall be used when handling cement to prevent it from contacting the skin, provided that such gloves shall be intended for such materials.
- Workers inside cement plants shall adhere to using masks to protect the respiratory system against the harmful substances and dust resulting from the manufacturing process.
- In enclosed spaces, good ventilation and exhaust fans with air purifiers shall be provided.
- Ovens shall be handled from as far away as possible. Workers in this field shall use personal protective and heat-insulating equipment such as a protective jacket, gloves and goggles to protect the eyes against glare and heat.
- Working hours for workers whose work requires to be kept close to ovens and other sources of heat shall be as few as possible so that workers take turns to perform work if necessary to reduce the expended effort.
- Toxic gases such as carbon monoxide and carbon dioxide resulting from burning processes and some other stages of the manufacturing process shall be avoided. The used masks shall prevent such gases from entering the body. The concentration of gases in the atmosphere shall be constantly measured, and all necessary measures and precautions shall be taken.
- Carts for transporting cement and other raw materials inside the cement plants shall be tightly closed.
- Good ventilation shall be provided at blast furnaces, packing and sifting platforms to expel heat and dust.
- The magma shall be transported mechanically or by insulated containers, taking precautions to prevent spillage and using the necessary personal protective equipment.
- Hot work areas shall be provided with showers for cold water.
- Melting furnaces shall be repaired, maintained or cleaned only when they have completely cooled down. Such work should be done by the younger and healthier workers.
- The health status of workers in the cement industry shall be constantly monitored, and the required precautions shall be taken.

Safety Precautions for Working with Concrete Machinery:

- A fence shall be placed around concrete mixing machines in case it is rotating to prevent people from approaching it.
- Some concrete mixing machines are in the form of discs or clamps that are installed and
- workers climb into them, so a mesh fence shall be placed around these machines to protect
- workers against the risk of falling into them.
- A safety switch shall be provided to stop the movement of mixers in case of maintenance and cleaning.
- In the case of concrete cranes, a field guide shall be provided to direct the crane commander to the correct place to place concrete and alert him in the event of a possible danger. If the
- workplace area is large, a wireless communication device shall be provided to secure communication between the field guide and the crane commander
- The crane commander shall be clever, vigilant, astute, alert, and well trained to do such works.
- Concrete cranes shall be equipped with safety levers to prevent them from falling in the event of a malfunction.
- The concrete pumping trolley shall be fixed to the ground with special anchors before starting work.
- Concrete pumping sites shall be free of workers and there shall be inspections to ensure that pits and other lined areas are clear of workers before starting to push concrete.
- Sand containers shall be fenced and no one can climb into them without a safety belt or an observer to avoid the risk of falling and burial in the sand.
- In the case of pumping concrete by pipes through prepared pumps, the structures prepared to receive the concrete shall be well supported so that they can withstand the sudden heavy pressure on them by the concrete.
- Workers shall stay away from the workplace while the concrete is being pumped, making sure that there are no people near the places where the concrete is being poured.
- When using the cranes, make sure that there are no overhead electrical wires or any other obstacles that the booms may encounter. In the event of such obstacles, the Electricity Company shall be informed to cut off the electricity and take the required precautions.
- Concrete plants have to be taken the same due diligence in cement plants.
- Vibrating concrete machines shall be surrounded by a protective barrier to prevent approaching the machine.
- The floors of the ready-mix concrete plants shall be provided with a drainage system for the
- water resulting from the condensation of steam, and the floors shall be designed in a manner that prevents slipping.
- Iron excesses shall be removed from the roofs of columns and concrete walls after removing wooden structures
- Workers shall strictly wear safety shoes and gloves to protect against cement materials.
- Concrete pole cranes shall be remotely controlled. The area around the transportation and unloading of concrete blocks shall be evacuated from workers.
- The precast concrete column assembly area shall be surrounded by a fence that prevents it from being used by workers as a place to sit or sleep. The poles shall also be secured with tools that prevent them from sliding or rolling.

Safety Standards for Manual Works and Hand Tools

Safety Standards for Manual Works and Hand Tools

Carpentry:

- Safety Precautions When Using Woodworking Tools and Machines
- Sawdust and the resulting residues from the carpentry process shall not be removed by hand or from the surrounding area while the machine is working.
- There shall be a clear mechanism for the disposal of sawdust chips to maintain the arrangement of the workplace
- Mechanical devices shall be used as much as possible to minimize injuries.
- All cutting tools and saw blades shall be covered and as far as possible from workers
- Circular saws shall be equipped with a solid, strong and adjustable cover to protect the saw blades and suit the work
- The hole that contains the saw on the table shall be as small as possible.
- Portable circular saws shall be of good design so that when the blade rotates, it is automatically covered by a cover provided with the saw.
- All hand saws and circular saws that do not work shall be wrapped in a strong protective case
- Longitudinal saws connected to machines shall be equipped with automatic tension regulators.
- Large machines installed on the ground shall be equipped with protection beams around the

Turnery / Woodturning:

Safety Precautions for Lathes:

- Do not operate any machinery unless you have learned (according to technical rules) how to operate it.
- You shall use a brush to remove the feathers, with the direction opposite to you.

- Skin contact with irritants such as cutting oils, solvents, bases and acid shall be avoided
  No rings, gloves, or loose or ripped clothing shall be worn when working on moving machinery.
- It shall be ensured that the guardrails are installed on the machine before operating.
  No maintenance or cleaning shall be done for the machine while it is working.
- The hand shall not be used to slow or stop the machines while rotating or spinning.
- After completing the work, the power supply shall be disconnected from the machine.
- The area for moving the arm of the circular drill shall be cleared, with this location specially marked.
- Manual wrenches and similar tools shall not be left on machines.

- Attention shall be paid to the position of the hands and feet while handling the machine

Welding and Cutting:

Safety Precautions for Gas Welding and Cutting:

- No copper or silver materials shall be used in any process containing acetylene.
- Workers in this field shall wear all required personal clothing, such as a protective mask with shaded lenses to protect the face and eyes, and gloves, in addition to wearing full body protective equipment.
- Adequate fire extinguishers shall be provided while working in welding or cutting.
- Cylinders shall be kept away from heat sources such as radiators, ovens, and smoking areas.
- Both oxygen and fuel hoses shall be painted in the appropriate color that indicates it.
- Gas cylinders shall be stored in the correct upright position, especially acetylene gas (acetylene gas dissolved in acetone in an acetylene cylinder). If these gas cylinders are stored horizontally, the probability that the two gases will be separated from each other increases, and thus the acetylene gas will be chemically unstable, which will cause an internal explosion.
- Oxygen cylinders shall be kept away from acetylene cylinders in the warehouse with an area of 6.6 meters or with a non-combustible insulating wall with a height of at least 1.6 meters.
- Gas cylinders shall be stored in a well-ventilated area, separating empty and full cylinders
- Empty gas cylinders shall be marked to distinguish them from others.
- The cylinders shall be fixed in the warehouse with a strong chain to prevent them from falling.
- External warehouses shall be insulated from the sun.
- Cylinder valve caps shall be in place when not in use.
- The pressure of the acetylene regulators shall not exceed 15 pounds per square inch (psi) because acetylene can explode if this limit is exceeded.

Safety Requirements for Electric Welding:

- Flammable or combustible materials shall be removed from the workplace, or covered with a fire retardant.
- Welding jackets shall be worn by welders and their assistants. Shaded and appropriate goggles shall be worn in addition to gloves, safety shoes and special leg covers to increase body protection
  welders shall not stand in water during the welding process.
- Protection barriers shall be placed around the welding area to protect pedestrians from glare and flying sparks.
- Ventilation holes shall be provided to remove harmful fumes and gases from welding from the workplace
- Pneumatic pumping systems shall be provided to expel gases and vapors emitted from welding work if the air openings fail to expel them.
- The workplace shall be secured with appropriate fire extinguishers

Car Maintenance

Safety Requirements in Car and Vehicle Workshops:

- In order to achieve public safety, the workshop shall not be operated for anything other than the intended purpose without the approval of the competent authorities
- Car and vehicle workshops shall be equipped with all means related to safety and fire prevention.
- The workshop shall have sufficient doors for entry and exit of cars and escape exits for workers when needed
- The number of emergency exits depends on the number of workers in the workshop and its area. Basic requirements such as lighting and ventilation systems, and guiding and warning signs shall be provided.
- Workshop personnel shall be trained in the field of safety, rescue and firefighting and.
- The floors of the workshop shall be free of grease and oils, in order to maintain public safety.
- The safety officer shall carry out monthly checks and periodic maintenance tests for the workshop itself and all equipment, machines, electrical and mechanical installations, as well as all safety means and firefighting equipment, and shall monitor and repair any malfunction

Building Specific Requirements:

- The premises of the workshop shall be constructed of non-combustible materials.
- The floors shall be well compacted, covered with tiles or cement, resistant to fire, and with a relative slope that allows the flow of fluids in emergency cases, which ends in a collection pit.
- Doors and windows shall be made of metal. Window glass shall be heat-reflecting.
- The workshop shall have sufficient doors for cars to enter, and the number of doors depends on the area of the workshop and the number of cars that the workshop can accommodate. It shall be taken into account that all doors and exits lead to open public roads, in order to facilitate the evacuation process in cases of danger
- The roads leading outside shall always be clear of obstructions.

Industrial Safety Requirements:

- The workshop shall be adequately ventilated.
- The multi-activity workshop "denting – painting –mechanics" shall be divided into separate sections for each activity
- There shall be no open flame sources in areas where explosive or flammable materials are present.
- All electrical devices used in car and machine repair workshops shall have a grounded socket to avoid the static electric charge.
- The floors of the workshop shall be free of grease and oils to prevent workers from falling and injuring, and the repair residues shall be removed promptly.
- Adequate and continuous ventilation shall be provided and to get rid of the carbon gas caused by smoke
- Adequate ventilation shall be provided in the places of welding work.

Fire Prevention:

- Rags moistened with grease and oils shall be placed in a metal box with a lid.
- The inspection pit shall be free of traces of gasoline and oils.
- Cans of paint and solutions shall be placed in metal cabinets with ventilation holes in a place out of the reach of non-specialists.
- Smoking shall be prohibited inside the workplace. No smoking signs shall be placed.
- Workshops shall be equipped with a number of suitable fire extinguishers of dry powder and carbon dioxide gas, distributed appropriately at a rate of no less than one extinguisher for every four cars. The number of extinguishers shall be estimated according to the size of the workshop, according to the number of cars it can accommodate, after consulting the civil defense
- The workshops shall be equipped with a number of clean dry sand buckets, the number of
- which shall be twice the number of the prescribed extinguishers.
- The sources of firefighting water required to fill the hose reels shall be provided, and the filling shall be appropriate in terms of water quantities and storage.
- Portable lamps shall be of a resistant type and covered with metal mesh to protect them from shock.

Hand Tools

Basic Safety Rules For Using Hand Tools

- The worker shall identify the function of each hand tool in the toolbox and use the tool designated for each purpose only
- The worker shall not use any tool, whether manual or electric, unless he is trained to use it.
- When working near electrical circuits, only hand tools covered with insulating material shall be used
- All tools shall be checked before use and any faulty tools shall be replaced or repaired.
- The edges of the cutting tools shall be kept sharp. The sharpness of the tools shall not be tested on your fingers.
- When performing work from a high surface, make sure that your body and tools are securely fixed so that their fall does not injure any of your colleagues or passers-by.
- Hand tools shall be carried in the boxes or belts designated for this, with the ends of tools with sharp and pointed ends down.
- Tools shall be handled by hand from one person to another and never thrown. When transporting sharp or pointed tools, they shall be in their containers and handles facing the recipient.
- Cleanliness and proper storage of tools shall be maintained.
- None of the fastening and loosening tools shall be used as a hammer so as not to break it and hurt your hand.
- No joints shall be inserted into the loosening or fastening tool to increase the usability of the wrench.

- The necessary personal protective equipment shall always be worn.

Precautions for Pneumatic Tanning Tools

- Workers shall read and follow the instructions in the manufacturer›s manual on the proper ways to use and maintain these tools
- The nail gun, nail gun or nailer shall be unplugged before it is serviced or inspected. The tool shall also be checked before each use and ensure that all safety measures are provided
- The tool shall not be taken out of the hose.
- Tanning shall not be attempted in places far from you, and a ladder shall be used to reach higher places.
- The feet or knees shall never be used as a support or attachment to the work piece to be nailed.
- The trigger shall not be pressed while moving the pistol from one place to another.
- The trigger shall not be pointed at your body or at another person even if it is not connected to a compressed air source or assuming it is empty of nails.
- The trigger shall not be depressed unless the barrel of the gun is directed at a safe work surface.
- The gun shall be disconnected from the air source before clearing blockages, adjusting the gun, handling it to another operator, or leaving it unattended.

- The necessary personal protective equipment shall be worn

Safety Standards for Mechanical Works

Safety Standards for Mechanical Works

Heavy Equipment :

Safety Standards for Heavy Equipment Works:

- Equipment shall be maintained on an ongoing basis and shall be ensured that it is suitable and fit for the work to be performed.
- Equipment shall only be operated by persons who have received training in how to use it and demonstrated the ability to do so
- Moving parts such as belts, gears, levers, transmissions and other dangerous parts shall be covered with protective barriers.
- Tractor bulldozers and tipper frames shall be lowered to the ground when not in use. In the event that it is required to lift it for maintenance or others, it shall be based on pillars.
- A heavy equipment operator shall be provided with an assistant to direct his movements and warn him of dangers.
- To tow trailers and wagons, only strong and secure chains shall be used, and shall be tied and attached in a safe manner.
- When refueling, the engine shall be turned off
- Good ventilation systems shall be provided in case the work requires the use of heavy equipment in closed or semi-enclosed places.
- The equipment shall not be used to carry passengers in any way unless there are designated seats for them.
- The speed limit, warning signs and pedestrian paths shall be adhered to while working
- Pedestrians shall be always given the right of way
- Your legs, arms and hands shall be in the cockpit.
- Workers shall stay away from the edges of the stands, platforms and raised floors.
- All directions shall be checked when starting to move and crossing intersections.
- Standing and walking under the crane shall never be allowed.
- The speed shall be reduced and the warning horns shall be sounded at intersections

Lifting Equipment, machines and tools

- Operators of cranes shall be in good health, be trained to operate the crane they will be working on, and have a valid license.
- A replacement worker shall be provided to the crane operator if the work requires a long time so that both of them get some rest.
- The crane shall be equipped with a means to show the operator the maximum load that can be lifted.
- The load shall not exceed the maximum load as specified by the manufacturer.
- The cranes / hoisting machine shall only be operated after stopping it on a stable and level ground
- At least two hoops (two turns) shall be provided around the pulley if the winch rope is extended to its maximum length.
- Automatic Leveling Outriggers shall be provided to support the crane if it is installed on a transport vehicle.
- Only one person who is easily distinguishable and noticeable from others shall be provided to guide the crane operator with approved signals that both persons are proficient in.
- The winch ropes shall be strong and suitable with lugs to adjust the loads.
- Loads shall be lifted vertically and shall not be swayed or dragged.
- The load shall be lifted close to the ground before lifting it high to ensure its stability and whether its weight is within the capacity of the crane.
- The crane operator shall not leave the cab or control panel until he is sure that the load is properly lowered.
- Care shall be taken against colliding with workers or getting trapped between the moving part of the crane and any fixed object in the vicinity of the circle centered by the crane, when the crane is moving or rotating to transport loads.
- The hook of the hoisting machine shall be equipped with a safety clip.
- Persons shall not ride on the winch hook or on top of the load.
- If it is required to use a crane to lift workers, a specially prepared cage shall be used.
- Worn or defective link chains, nails, chains and ropes shall not be used.
- Chains shall not be shortened or tied together, whether with knots or nails.
- The connections shall be made by using means of rings “iron bars” or other means prepared for that.
- When lifting any load on wires supported by multiple posts, the posts shall be distributed in equal dimensions around the center of gravity.
- Hoists shall be provided with mechanical or electrical brakes and a safety device to prevent suspended loads from falling.

- When the power is cut off suddenly during operation, the power supply shall be disconnected from the cranes so that the crane does not operate suddenly when the electric current returns.
- The end of the track of the cranes operating on overhead rails shall be secured by a means that prevents the cranes from continuing to move
- Hoists that are used on public roads shall be equipped with warning light and sound instructions, as well as front and rear lights.
- Every crane shall have the required technical maintenance and replace the damaged parts as soon as possible.
- The crane operator shall be assigned a cabin containing all the necessary operating keys, and all health and safety conditions shall be met.
- All overpasses with winches and stairs leading to them shall be provided with fall guards.
- Each crane shall be provided with a suitable fire extinguishing device.
- The signal operator and all workers in the loading area shall be provided with the required personal protective equipment

Forklifts

Safety Requirements for Forklifts

- The forklift driver shall have a valid license in the Kingdom of Saudi Arabia.
- The forklift driver shall be medically fit and in good health.
- The forklift driver shall have received safety training for the work of driving forklifts.
- The speed limit within the work areas shall be adhered to.
- The forklift shall be used according to the manufacturer›s instructions.
- The lifted loads shall not exceed the lifting capacity rated by the manufacturer. Forklifts shall be checked regularly.
- Forklifts shall have a seat belt, fire extinguisher and warning lights. Forklifts shall beep while reversing.
- Forklifts shall be fitted with Side mirrors. Preliminary checks of the warning lights, rear beep and fire extinguisher shall be done before using the forklift.
- Any forklift malfunction shall be reported to the responsible personnel.
- Officials shall stop work with forklifts if they are unsafe or in bad weather Loads shall be stable when driving to avoid falling.
- The loads shall be at a low level, i.e. the height of the fork shall be between (۲0-10 cm) above the ground. Driving shall be in reverse while loading so that the driver can see clearly.
- The forklift shall not be left in the running position unattended.
- Persons shall not be loaded onto the forklift in any part of its parts unless there are designated seats for that.
- Workers shall not place any part of their body between the moving parts of the forklift.

Traction Machines, Equipment and Conveyors

Safety Precautions for Traction Machinery, Equipment and Conveyors

- The links for tractors and carriages shall be of solid and sound material and shall be fitted with locks that prevent their separation so that the tractor does not push away from the pulling vehicle or pushing it on slopes or hills.
- Loads shall be distributed on the tractor or conveyor in an orderly manner on wheels so that the random arrangement does not lead to the tractor or tanker tipping over.
- The driver of the tractor or tanker vehicle shall be a qualified driver and hold an appropriate license to drive such tractor or tanker vehicle.
- A clear view shall be made in front of the tractor driver or the transporting vehicle in the event that it is loaded with high loads that block his view (in front and behind) in order to avoid collisions.
- The driver shall be provided with the appropriate means of protection against falling loads
- Workers shall not be allowed to ride on tractors or transport vehicles other than its driver unless they are equipped with seats for passengers.
- If the engines of tractors or transporting vehicles run on fuel that emits harmful gases, the place where the tanker is used shall be well ventilated so that the concentration percentage does not exceed These gases in the atmosphere of the workplace are within the permissible limits Also, this equipment shall not be used in an enclosed place for a long time.
- When using tankers to transport long tubes and poles longer than the base of the tanker, visible warning signs or light warning devices shall be hung at the end of the tubes or poles so that workers can see it, and the driver can mark the end so as not to hit things and people.
- Tractors and trolleys shall not be overloaded with loads greater than the maximum permissible and rated load, and the minimum load shall be written Carrying grate allowed in a visible place on the tanker.
- Workers shall take precautions against electrical hazards when using electric carriers.
- Tractors and transport vehicles and their parts shall be inspected, maintained and lubricated daily to ensure that all their parts are intact, and the periodic inspection of these parts and the result of this examination shall be recorded in a card specific to each tractor or transport vehicle.
- Tractors and transport vehicles shall be equipped with warning signals, front and rear lights, and an audible and optical warning for reverse movement, and it operates automatically when the rear movement begins.
- Protective clothing shall be dispensed to the drivers of electric transport vehicles. If they run on batteries, acid-protective glasses, gloves, aprons, and rubber-soled shoes shall be provided to protect against electricity and acids to be used when necessary.
- All tractors and vehicles shall be equipped with the appropriate extinguishing equipment.

- All tractors and transport vehicles shall be provided with a box containing the necessary and necessary first aid needs.

Conveyors (Conveyor Belts, Pulleys, Tracks, Etc.

- The requirements to prevent the dangers of machines and equipment shall be taken into account. Sufficient distances shall be left on both sides of the conveyors that pass in tunnels so that it is easy for people to pass through them to carry out lubrication, cleaning or repair operations, and these corridors shall be provided with adequate and appropriate lighting.
- The sides and ends of the tankers shall be surrounded by suitable protective barriers that prevent workers from getting their hands between the tanker and the fixed sides, and prevent the materials transferred to it from falling.
- Appropriate protective barriers in the form of a bridge shall be placed under conveyors operating at an elevated level to protect passers-by below from the danger of falling materials transported on them.
- Persons shall be prohibited from riding on conveyors, and vertical rails may be placed on the conveyor›s path at a distance that prevents persons from getting on board.
- The auger shall be completely covered to prevent workers› hands from getting inside the auger.
- The cover is provided with a part that can be opened for inspections and cleaning of this part.
- It shall be noted that this cover is connected to the transmission of the auger so that it stops the movement of the auger immediately if this cover is opened.
- All moving parts such as belts, gears, arms, transmissions and other dangerous parts shall be covered with protective barriers and make sure that there is no exposed protrusion in these parts that may lead to injury.

Truck Driving:

- No vehicle shall be allowed to drive inside the Kingdom except for those who hold a Saudi driving license.
- The tonnage shall not exceed the permitted limit by regulation and the capacity of the truck.

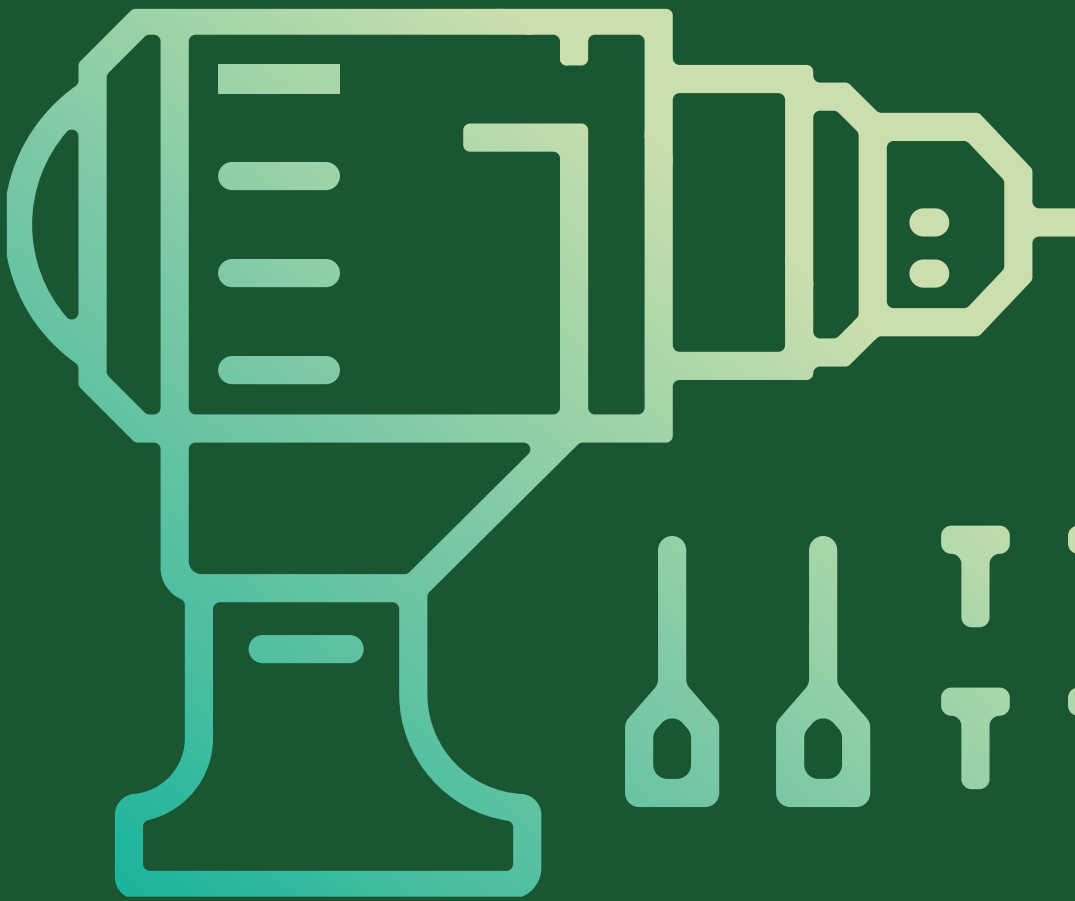
  Materials carried on trucks shall not be protruding from the truck chassis because this exposes other vehicles or pedestrians when stopped to collide with it.
- In the event that materials from the load shall be visible from the truck chassis, a red flag shall be placed on it and illuminated in bad weather or at night.
- Items that are not stable and liable to fall shall be secured with straps or covered so that they do not fall off.
- When loading sand, dust, wheat and the like, the containers in which such materials are carried shall be tightly closed and covered well so as to prevent any leakage because such materials can cause obstruction of vision or slipping, as well as other damages.
- All wheeled equipment, when transported by truck, shall be tied and secured, and the wheels shall be securely locked or have wedges placed so that they do not rotate.

- No worker shall remain with the charged equipment while the truck is in motion.
- In the height of the load, the level of bridges, tunnels and power lines shall be taken into account. .
- The allowed speed limits shall always be adhered to
- The truck shall always have a fire extinguisher ready and suitable for the truck and the materials carried on it.
- The truck shall be switched off before refueling.
- There shall be a daily inspection of the vehicle before working on it, and this shall include brakes, lights, mirrors, horns, tires and other important safety items in the truck.
- The driver shall write down all things that he deems to be invalid or to be repaired

When using trucks with rear trailers (trailers), in addition to the above, the following shall be taken into account:

- Only those who are well qualified or authorized to do so shall drive such trucks.
- The trailers shall be equipped with rear lights and brake lights to avoid collision with them at night.
- The trailers are well connected at the head of the vehicle and the truck and to have an additional safety chain.

Safety Standards for Electrical Works



Safety Standards for Electrical Works

To prevent electrical hazards, the following shall be observed :

- The electrical works shall be designed by experienced and specialized electrical engineers, and the technical assets shall be taken into account in the design, which includes preparing the technical specifications and plans necessary for the implementation of the project.
- The implementation of electrical works shall be by competent and skilled technicians and under the supervision of specialized engineers, and these works shall conform with the standard specifications or equivalent international standards.
- The instructions contained in the technical bulletins attached to the electrical appliances that are prepared by the manufacturers of electrical appliances shall be adhered to.
- Damaged or defective electrical appliances shall be avoided. Ensure that all electrical appliances are well grounded, i.e. connected to a ground line.
- The use of extension cords that are used for the purpose of extending the wires to conduct the current shall be prohibited.
- The load capacity of electrical sockets shall be taken into account and not overloaded.
- The electrical connections shall be kept away from walking places, from any chemical or thermal source that may lead to melting of the insulating jacket, and from any pressure that may lead to its damage.
- One link does not connect to another.
- Unused electrical sockets shall be covered.
- Leave space around electrical appliances and other heat-generating equipment so that the air can cool them.
- All appliances shall be disconnected after work is completed.
- Any defects or damage to electrical wires, equipment and tools shall not be tolerated.
- Any appliance that emits sparks or smoke shall be disconnected from the power supply.
- In the event of a power outage, all motorized devices shall be turned off.
- Electrical equipment and machinery shall be fed by main and subsidiary distribution panels to facilitate the process of control and protection.
- Special and independent circuits shall be made for large fixed devices such as air conditioners. Lighting circuits, fans, power circuits, and air conditioners shall be separated from each other and be extended in separate pipes and separate boxes.
- Ultra-low voltage systems such as telephone antennas, telephones, bells, fire alarm systems...etc.

- The electrical loads on the three sides shall be balanced as evenly as possible.

- The insulating materials used in machines, electrical wiring and panels shall be of the highest quality, with a good and sufficient degree of insulation.
- The insulating materials used in machines, electrical wiring and panels shall be of the highest quality, with a good and sufficient degree of insulation.
- All electrical wiring shall be tightly tied, and the wires shall be tied together inside the junction boxes by means of terminal clamps equipped with brass screws, provided that the additional insulation is insulated with an insulating tape.
- Delivery boxes shall be strong, spacious, with tight fitting lids, and shall not be left uncovered in any way.
- Good and appropriate electrical equipment and tools shall be used in carrying out electrical work. Regular maintenance shall be carried out with appropriate tests.
- The power shall be disconnected from the two lines (face and neutral) by the breaker or by removing the fuses before cleaning any light bulb, even if it is turned off.
- Do not attempt to repair electrical wiring, fixtures and equipment yourself, but you shall call the specialist.
- Do not extend wires and cables under carpets or Close the doors and seats so as not to be exposed to wear and stumble passers-by.
- Cables and wires shall be kept away from water and heat sources such as hot water pipes or hot appliances.
- Do not pull on the cord when unplugging, but gently pull the plug from the socket.
- Cables, connections and devices shall be checked from time to time, as they are subject to wear and tear, especially at the plug, near the connectors, and frayed wires that cause contact, shock, and sometimes fires.
- Light switches shall not be touched with hands wet with water.
- Do not operate electrical appliances while standing on wet ground or if the person is wet with water or barefoot.
- Dust and dirt shall not be left to accumulate on engines and electrical appliances, and they shall be kept clean constantly.
- You shall not check or attempt to repair electrical appliances that are connected to electricity.
- Flammable materials such as curtains, clothes and papers shall be kept away from light sources and all electrical appliances.
- Corroded wires shall be replaced with new ones and not try to wrap them with masking tape.
- Buildings and installations shall be avoided under or near electric power transmission lines

Safety Standards of Physical Factors

Noise

Definition of Noise:

Noise is defined as a dissonant mixture of sounds in the work environment that, in the long run, may lead to impaired hearing or complete deafness.

Types of Noise:Continuous Noise: such as the noise emitted and produced by machines, equipment and industrial processes within the work environment.
Intermittent Noise: such as the noise emitted and produced by explosions and hammers, which rises suddenly and then decreases rapidly.

General Requirements for Control of Occupational Noise:

- Warning signs shall be placed in the noise areas to warn workers that they shall wear hearing protectors and not approach such areas unless necessary.
- A primary and periodic medical examination shall be done for workers in accordance with the requirements of the competent authorities in the Kingdom of Saudi Arabia.
- Workers shall be made aware of the damages of noise and trained in the methods of control.
- Workers exposed to high levels of noise shall be enrolled in a Hearing Conservation Program that aims to prevent, assess and evaluate hearing and resolve hearing loss-related problems in the workplace.

Engineering Controls to Reduce Noise Exposure

- The distance between the operator and noise sources shall be increased, by moving machines or the work area.
- Noise sources shall be prevented with silencers and good maintenance.
- The machine (which is noisy) shall be replaced with a less noisy / quieter machine.

In the event that it is not possible to use the previous solutions, the duration of noise exposure shall be reduced.

Hot Environments, Heat Stress and Heat Exhaustion

Necessary Safety Precautions to Reduce Risks of Heat Stroke or Heat Exhaustion:

- Workers shall wear loose-fitting, airy, light-colored clothing to reflect more heat, or wear a cooling vest for hot weather.
- Sunglasses shall be worn while working in a sunny environment to protect the eyes against ultraviolet rays.
- Wide-brimmed helmets or wide brim floppy hats (sun shade hats) shall be worn if helmets are not required to be worn while working in open areas exposed to the sun.

- Shady areas shall be provided for workers in open areas exposed to the sun to cool down their bodies when needed.
- Workers shall drink large amounts of water more than the amount that quenches their thirst to compensate for the amounts of water lost by the body due to perspiration.
- Before starting work, an initial examination shall be conducted for workers in hot climates, such as those working on smelting furnaces, and others. Provided that unfit and unhealthy workers (such as those with heart - skin - kidney diseases) shall be removed and expelled.
- A periodic health examination shall be conducted to detect any change in the health status of workers.
- Heat insulating materials shall be used to cover heat sources such as ovens.
- Workers shall adapt to work in hot weather gradually.
- The signs and symptoms of heat exhaustion shall be known so that appropriate action can be taken as soon as they appear before the situation get worse.
- When working in places exposed to low temperatures such as (refrigerators, or open and cold areas), then workers shall be placed under constant observation and surveillance and provided with protective work clothes (gloves, socks, shoes, heavy woolen or fur-lined clothes, etc.). The required initial and periodic medical examinations shall also be performed.
- Workers shall be made aware of the dangers of exposure to low temperatures.

Workers shall be trained and educated, including:

- Hazards of working in hot weather.
- The importance of drinking water (2 liters of water at least between every two to three hours.)
- Dangers and Hazards of drinking caffeinated drinks that help lose fluids.
- The importance of eating a balanced diet and adding a small additional amount of salt to the diet.
- To avoid the harmful effects of exposure to low temperatures, and to provide a safe working environment for workers in low temperature work environments, exposure and rest periods shall be regulated. Provided that the duration of each period shall be determined according to the temperature in the work environments as follows:

Table 3: Safe Levels Periods of Exposure to Low Temperatures:

Temperatures		Maximum Allowable Exposure Time Per Day
From	To	
-1°C	-18°C	There is no maximum period as long as the worker is healthy and wears sufficient and appropriate clothing.
-19°C	-35°C	The total exposure time shall not exceed four hours alternately, one hour of work followed by one hour of rest
-36°C	-57°C	The sum of the total exposure periods per day shall not exceed one hour in two periods of 30 minutes each with an interval of 4 hours. It can be divided into four periods of 15 minutes each, with an interval of two hours between each exposure.
-58°C	-74°C	The total time allowed for exposure per day shall be estimated at five minutes. Provided that the worker shall be provided with a fully closed head cover, fitted with a tube attached to the body starting from the bottom of the leg, allowing sufficient time for the inhalation air to warm up.

Table 4: Upper Limits of High Temperatures and Periods of Work and Rest:

Work / Rest Period	Affective Temperature / Type of Exertion		
	Light	Moderate	Vigorous Strenuous
Work Constantly / Around The Clock	30°C	26.7°C	25°C
75% Work - 25% Rest	30.6°C	28°C	25.9°C
50% Work - 50% Rest	31.4°C	30°C	28°C
25% Work - 275% Rest	32°C	31°C	30°C

Lighting

Workplace Lighting Safety Requirements:

- Light neither shall not fall, nor reflected from a shiny surface directly on the eyes.
- Window glasses and light openings shall always be in a clean condition inside and out and not be obscured by any obstacle.
- Natural or artificial light sources shall be distributed to provide uniform lighting free from direct glare, reflected light and shadows.
- The great difference in the intensity of lights in close places shall be avoided so that such difference shall not exceed (1:3).
- The appropriate colors shall be used to paint walls and ceilings, in order to obtain the appropriate amounts of light reflection.
- Additional (supplementary) lighting needed to perform precise work shall be provided. Emergency lighting shall be provided when needed to illuminate exits and corridors in the event of a main power outage.
- The condition of medical fitness, which is (sightedness), shall be observed for professions that require meticulous work.
- Eyes shall not be exposed to any glare or dazzling light without proper protection.
- Eyes shall not be exposed to any glare or dazzling light without proper protection.

The level of the lighting shall not be less than the minimum level as shown in Table 0.
Table 0: Minimum Lighting Levels for Works and Places Mentioned in Front of Each Minimum Lighting Level

Professional Visual Activity	Recommended Limit (Lux)
Corridors and Roads	30
Raw and Manufactured Materials Stores and Warehouses	100
Low Precision Works such as: A- Assembling of Large Parts and Construction and Building Works. B- Ordinary Inspection Work - Working in Front of Machines or Tables C- Ordinary Office Work...etc.	300
Medium Precision Works such as: A- The initial stages of polishing - difficult examination work. B- Color quality testing - sorting and classifying products. C- More difficult checks work - accounts work.....etc.	700
High Precision Works such as: A- High-precision works in front of machines. B- Intermediate stages of polishing. C- Computers, typewriters...etc.	1000
Very High Precision Works such as: A- Welding very delicate parts B- Assembling and testing watches and jewelry. C- Precision painting and turning works. D- Engineering design and drawing...etc.	1500

Radiation Safety in the Workplace

The facility shall undertake the required procedures and conditions to protect against the dangers of harmful ionizing radiation, taking into account the following:

- Areas that are exposed to radiation sources or where x-rays are being taken shall be surrounded by a barrier of ropes and approved warning signs shall be placed in visible places.
- Persons who have not received special training in radiation safety matters shall be prohibited from entering this barrier zone.
- The import, export, manufacture, possession, circulation, transfer, storage or disposal of radiation devices or radioactive materials shall be prohibited without obtaining a license from the competent authorities.
- The use of ionizing radiation or working with it in any capacity whatsoever shall be prohibited, except after obtaining a license to do so from the competent authorities.
- Anyone who is licensed to use or store radiation devices or radioactive materials shall inform the competent authority of any loss or accident that may expose any person to a group of radiation exceeding the permissible limits, within (24) hours of the accident and in addition to the reasons that led to such an accident.
- The employer shall conduct a periodic examination of the machines, tools and devices, to confirm that they perform their work in a good manner, provide the required protection, and ensure that there is no leakage of radiation.
- The employer shall conduct a periodic examination of the machines, tools and devices, to confirm that they perform their work in a good manner, provide the required protection, and ensure that there is no leakage of radiation.
- The employer shall use appropriate alerts to warn workers of the dangers of ionizing radiation and provide them with all necessary information in this regard, in addition to training them before joining work and during their period of employment on the precautions that shall be observed to preserve their health and safety from radiation.
- Technical means that would prevent or limit the arrival of harmful and ionizing radiation to workers shall be used, such as: protective barriers manufactured from lead, or reinforced concrete to block harmful radiation, or welding booths to block ultraviolet rays, colored barriers, or reflective barriers to infrared rays red or ultraviolet, and other means.
- Workers shall be provided with appropriate clothing and protective equipment such as gloves, goggles, aprons, protective shoes, etc.
  A preliminary medical examination shall be conducted for workers upon joining work to discover any apparent or latent disease condition that may cause workers to be severely affected when exposed to harmful and ionizing radiation. The report of such examination shall be
- kept for comparison with the following examinations.

- A periodic medical examination shall be carried out on workers in accordance with the requirements of the competent authorities in the Kingdom of Saudi Arabia to discover any occupational disease as a result of exposure to harmful and ionizing radiation, and to ensure that workers continue to be fit for the nature of work.
- Periodic measurement of radiation doses shall be carried out, by providing each worker with a radiation meter. The employer shall prepare a record in which he shall constantly record all the doses absorbed by each worker during the period of his employment
- Workers, under the age of eighteen years (juniors) shall not be employed in work that involves exposure to harmful radiation.
- Special containers for radioactive waste shall be provided and organized, and identification and warning signs shall be placed thereon.
- Records shall be organized for radioactive waste in the laboratory.
- Forms related to materials imported and exported from the laboratory shall be filled out.
- Scientific methods shall be observed in the event of a radioactive contamination case.
- Eating or drinking shall not be allowed inside the radioactive preparation laboratory.
- Hands shall be washed thoroughly with water after each use of radioactive isotopes.
- It shall be ensured that the amount of radioactive waste that is stored in the workplace is the
- least amount that can be practically achieved.
- It shall be ensured that hands and clothing are not contaminated before leaving the site for public places.
- In the event of the presence of symptoms of an increase in the radiation dose or suspicion of this, the medical officer shall be informed immediately
- A physician or occupational safety and health engineer shall be present at these locations.

Safety Standards in Handling Chemicals

Safety in Using Chemicals at Works

Pollutant Prevention Measures:
Engineering Safety Measures:

- Eliminating the risk factor by replacing hazardous materials with less hazardous materials.
- Closure of industrial operations with the availability of precautions to prevent leakage of equipment.
- Once it is not possible to carry out operations in sealed devices, the risk factors shall be eliminated from the source of their emission, as much as possible, with the air being mechanically drawn to safe private places outside the workplace.
- Examination of working conditions by measuring the concentration and spread of pollutants in the work atmosphere.
- Preventive steps shall start before operating the facility, when constructing buildings, these preventive steps shall not conflict with safety requirements. Therefore, the industry steps shall be studied in detail, with an indication of the steps that involve a risk of pollutants spreading, and that this operation shall be placed at the farthest ends of the facility in relation to the direction of the wind so as not to carry and spread the pollutants in the rest of the factory sections.

Medical Prevention:

Initial Medical Examination: shall be conducted before the worker joins work and such an examination aims to discover any underlying disease case that may increase the severity of injury when exposed to pollutants. The results of the initial medical examination shall be taken as a statement of the state in which the worker was at the beginning of his joining the work, in order to compare these results with the examinations conducted. قد تزيد شدة الإصابة
Health Awareness: It requires all means to educate workers about the involved work risks and to indicate the best methods of prevention and the importance of medical examinations and the absence of serious symptoms.
The use of personal protective equipment is considered the last line of defense to prevent pollutants and shall fit the nature of work.

Hazardous Chemicals

Procedures for Controlling Chemicals Hazardous to Health:

- The facility and its branches shall provide protection means against chemical risks resulting from dealing with solid, liquid and gaseous chemicals, taking into account the following:
- Workers shall not be exposed to chemicals and carcinogenic materials, not exceeding the maximum permissible concentration.
- The necessary precautions shall be provided to protect the facility and workers when transporting, storing, handling and using hazardous chemicals and disposing of their waste.
- A file shall be kept of the hazardous chemicals handled, and this file shall include all data related to each substance and a record for monitoring the work environment and workers' exposure to the danger of chemicals.
- Identification cards shall be placed for all chemicals in use at work, indicating their scientific and commercial name, chemical composition, degree of danger, and related safety precautions and emergency procedures. The facility shall obtain all these materials from its supplier upon supply.
- Workers shall be trained on the methods of dealing with dangerous chemicals and carcinogens, inform and make them aware of their dangers, the methods of safety and prevention of these risks.

Safety Requirements in Design and Installation:

- There shall be completely closed systems for making and trading operations.

- The dangerous operation shall be isolated from the workers dealing with, or from other operations.
- Plant operations or work systems shall minimize the generation, suppression or containment of hazardous dusts or fumes.
- There shall be partial closure with localized suction ventilation.
- There shall be adequate general ventilation.

Improper Work Systems and Practices:

- The number of exposed workers shall be reduced and nonessential shifts excluded.
- Workers' exposure time shall be reduced.
- Regular cleaning of contaminated walls and surfaces shall be done.
- Engineering control procedures shall be used and maintained properly.
- Means shall be provided for the safe storage and disposal of chemicals hazardous to health.

Personal Protection:

- Personal protective equipment shall be provided to reduce its impact on health.
- Eating, drinking and smoking in polluted places shall be prohibited.
- Adequate facilities for washing and changing clothes shall be provided.
- There shall be adequate arrangements in the event of an emergency.

Flammable, Dangerously Reactive or Explosive Chemicals

Safety requirements in design and installation:

- There shall be processes or work systems that minimize the generation of hazardous dusts or fumes.
- There shall be partial closure with localized suction ventilation.
- There shall be adequate general ventilation.
- Ignition sources shall be removed or controlled.

Operations using flammable chemicals shall be isolated from:

- Other operations.
- Stationary ignition sources.
- Stock in large quantities of flammable chemicals or stock in large quantities that could lead to a hazard in the event of a fire.
- Frontiers and off-site facilities are not under the control of the employer.
- An inert atmosphere shall be provided for completely closed manufacturing and circulation systems.
- Fire detection and alarm devices shall be provided.
- Means to detect pressure increases and to automate the gas suppression device shall be installed to prevent explosion, for example, in connection with dust explosions.
- A doctor or safety engineer shall be available on site.

Safe Work Systems and Practices:

- There shall be adequate use and maintenance of the engineering control measures provided.
- The quantities of chemicals kept in the workplace shall be reduced to a minimum.
- The quantities of chemicals circulating and used in buildings shall be reduced.
- Chemical storage arrangements shall be separated from the activities of normal operations.
- Incompatible chemicals shall be separated.
- The number of exposed workers shall be reduced and non-essential shifts shall be excluded.
- There shall be arrangements for spilled materials removed immediately.
- There shall be arrangements regarding the safe disposal of chemicals.
- The instructions on the chemical information label shall be followed for the disposal of

chemicals.
- Appropriate equipment such as non-sparking tools shall be provided.
- Appropriate signs and warnings shall be used within the work environment.

Personal Protection:

- Personal protective equipment shall be appropriate to deal with these materials, as they are not affected by the fire.
- There shall be adequate preparations for an emergency incident.
- Evacuation means and fire alarm systems shall be secured and constantly evaluated.

Transportation:

- Hazardous chemicals shall be transported in a safe manner within the prescribed speed limits and using the lanes designated for transport vehicles.
- Tanks in which chemicals are transported shall be made of a material suitable for the outdoor environment and for the chemicals carried. Its containers shall be designed according to internationally approved rules and shall have a wide opening that allows for inspection, and shall be equipped with an appropriate pressure relief device. When designing, the climatic conditions of the Kingdom shall be taken into account.
- Metal plates shall be installed on the outside of the transport units on all sides to warn of the tank content and its danger, and shall be coated with a reflective paint in the required color and weather resistance.
- All vehicles transporting dangerous chemicals in liquid form shall use a yellow flashing lamp on the driver's trailer.
- The approval of the responsible authorities shall be obtained regarding the means of transport and drivers transporting hazardous materials, with the availability of emergency plans for emergencies and accidents.
- The driver of hazardous chemicals shall have a copy of the Material safety data sheet (MSDS) for carry-on materials.
- Avoid mixing chemicals during transportation.

Storage:

- The licensing authority shall not be entitled to expand, change, build or remove the licensed warehouse unless approval is obtained from the regulatory authority or the concerned
- The licensed store owner shall abide by the following:

1.Designing the warehouse in a way that reduces the risk of fire, spillage, penetration into the ground and injuries, and ensuring the separation of heterogeneous materials from each other.
2.Providing emergency exits that are easy to open in the dark or in cases of heavy exhalation.
3.Providing adequate ventilation.
4.Designing smooth, non-slippery floors, free of cracks, with special channels that have the ability to collect leakage of contaminated firefighting water.
5.Grounding of all electrical equipment inside the store, providing electrical circuits with earth leakage circuit breakers and overload protection devices.
6.It is forbidden to build a dining room or a changing room as an essential part of the store, provided that these buildings shall be separated from the storage area by a distance of not less than 10 m.
7.Materials shall be stacked so as not to obstruct forklifts, handling equipment or emergency equipment.
8.The height of the stored materials shall not be more than 3 m unless it is used in the case of using the racking system.
9.It is prohibited to carry out battery charging, thermal packaging or welding work inside the storage area.

10.A chart shall be prepared to showing the nature of the hazard in each part of the storage area, including a list of the locations and quantities of the stored chemicals with their hazardous characteristics. The locations of emergency equipment, fire resistance and available emergency methods shall also be determined, by developing them weekly and keeping them in a place far from the storage site.
1.There shall be a separation distance of 3 m from any production facility for non-combustible materials and 10 m between flammable materials and any source of combustion.
2.Spills and leaks shall be dealt with according to the Material safety data sheet (MSDS).
3.A trained and experienced supervisor shall carefully supervise the operations in the warehouse.

Safety Standards in Chemical Labs

Safety Requirements and Precautions in Chemical Labs
Duties of Supervisors of Chemical Labs:

- A list of the chemicals used in each experiment shall be made with a risk assessment for each substance and the treatment used in case of exposure to or ingestion of the substance.
- The workers inside the laboratory shall be warned if there is a carcinogenic substance among the materials used in the laboratory, so they shall be careful while dealing with it, and such carcinogenic substances shall be replaced by alternative substances.
- Experiments with handling of hazardous materials shall be designated and additional arrangements made in case of an emergency, and international hazard labels affixed to the packaging shall be used.
- Chemicals shall be stored in the appropriate place, taking into account their compatibility and incompatibility.
- Large and clear labels shall be placed with safety instructions that shall be followed by laboratory users, obligating them to view and use these labels and punishing the negligent users who are not abiding by safety instructions.

Duties of chemical lab users:

- Flammable liquids shall be kept away from direct flames.
- Be sure of the name and concentration of the chemical you are dealing with.
- Fluid withdrawal shall be done safely and using a pipette.
- The experiment shall be performed carefully, calmly and focused to avoid accidents.
- Accidents that occur, no matter how small, shall be reported.
- Side conversations with your colleagues shall be avoided during the experiment.
- Hands shall be washed after completing the experiment.
- You shall not deal with any material unless you are sure of what it is.
- You shall seek first aid immediately if you have any accident.
- Safety precautions for each experiment shall be adhered to.
- You shall not smell or inhale the smells of chemicals.
- Do not touch or taste chemicals.
- Chemicals or related devices shall not be taken outside the laboratory.
- While the test tube is being heated over a flame, the test tube shall not be directed at your face or your co-workers.
- You shall not approach the flame with your head or finger.
- You shall not try to force stubborn bottles apart.
- Chemical experiments shall not be carried out without permission to do so.
- Chemical experiments shall never be done on your own or outside of work hours.
- Eating and drinking are prohibited in chemical laboratories.

Safety Conditions and Precautions in Research Labs and Preparation Labs:

- The written information on the packet shall be read well.
- Be sure of the required material use.
- Be sure of the written safety warnings and classification on the packet.
- If there are no warning signs on the packet, shall not mean that they are not dangerous.
- Use health protective equipment required at work.
- Open the packet carefully.
- Open the packet in a good ventilation place (gas extraction cabinet).
- Do not use polluted gloves during using stationery tools or replying to the phone or any something like that.
- Close the chemical substances packet well after using.
- Keep the working place cleaned and ordered.
- If the chemical substances are poured, you shall follow the correct procedures to clean them according to MSDS.
- Ask for first aid in case of having an accident.
- Get rid of the chemical wastes by following the correct way written on MSDS.
- Store and install the gas cylinders _ if any _ by the safe and correct way.
- Classify the chemical substances in a list according to their risk and how to deal with them in case of exposure.

Laboratory Necessary Safety Procedures, Devices and Equipment :

- Read the structure of the Button collective alarm system outside the labs for all building staff.
- Install a private alarm system for each lab.
- Make enough fire extinguishers available to each lab nearly to the lab exit and they shall be
- known for all even with the existence of automatic systems.
- Make a fire blanket _ made of wool 100% _ available in each lab and put it in a prominent and known place with an explanatory sign.
- Put warning signs in the places of chemical substances such as poisonous and flammable chemical substances and glass bottles holders containing dangerous substances.
- Make metal or resistant plastic waste bins available to collect materials waste and other waste bins for crashed/broken glass with taking care not to mix chemical substances to avoid reactions.
- Fridges and cupboards shall be prepared specifically to store chemicals and shall have good ventilation.
- Fridges and coolers shall be resistant to the explosion of such materials.
- All existing materials in the fridge shall be titled and checked from time to time.
- Flammable or fast burning substances such as acetone, carbon disulfide. Alcohol or petrol shall be kept in a dark place away from the sun.
- Container bottles shall be kept in a right angle position, slightly spaced and put on the lower shelf with wet sand.
- Non-flammable substances such as salts shall be put on upper shelves.
- Acids shall be kept on Separate and corrosion-resistant cupboards, oxidizing acids such as chromic acid, nitric and Sulfuric shall be separated from organic acids. The used amount

- shall be put in bottles with mini stoppers, and sodium carbonate shall be placed on the floors.
- Acids shall be kept away from glycerol (such as acetone, carbon disulfide. Alcohol or petrol) and put in right angle bottles.
- Sodium metal and potassium metal shall be kept in bottles filled with kerosene, completely closed and put away from Sun.
- Ammonia shall be kept in a cold place away from acids and flammable substances in bottles filled to its three-quarters of size only and immersed in sand.
- Chemical substance fridges shall not be used to store food and drinks and warning signs shall be put to keep chemical substances only.
- The titles of chemical substances prepared to be stored shall be obvious and understandable easily.
- The Explanatory labels shall contain complete information about the material risks and how to stock and handle them, Personal protective equipment required to be used and necessary first aid when touching that material.
- Schedules shall be painted with absorbent materials for radioactive substances for easy getting rid of in case of pollution.
- A specified place equipped with suction tools shall be made available to deal with materials that emit harmful dust or fumes, or to use volatile materials.
- A respirator (scot) shall be made available in the lab to handle caustic soda and other harmful substances.
- A safety shower and a fountain for washing eyes shall be provided and it shall be easily accessible, there are no obstacles in front of it, and far from electrical connections.
- A safety shower and a fountain for washing eyes shall not be placed far from chemical substances stock place with a distance crossed in less than 10 seconds.
- The first aid bag, which its contents are compatible with the possible lab risks _ shall be made available.

  Fire extinguishers, which are compatible with fires of chemical substances, shall be made available.

Fire Safety Standards

Firefighting

Design and Planning:

- Temporary buildings shall be designed to minimize the risk of fire spreading from one building to another.
- Places under temporary buildings shall be closed and shall not be used to store materials.
- Providing places for the passage of firefighting devices throughout the sites.
- The passage to the fire hydrant shall be kept clear of obstructions at all times.
- Flammable materials shall be stored in secluded locations away from buildings and operating equipment.
- Non-flammable containers for throwing cigarette butts and the like shall be placed in places
- where smoking is permitted.
- All containers designated for throwing discarded papers, waste and the like shall be made of a non-combustible material.
- Machines and equipment, especially electrical equipment, shall be checked regularly to ensure that they are working properly.
- Workers shall be trained in firefighting works, master the fire escape plan and be aware of all escape points and exits.

Fire Escapes:

General requirements for emergency exits

- It is forbidden to put locks that hinder the speed of exit.
- Directions to emergency exits shall be marked.
- The floor of the exits shall be equal to the floor from the outside when exiting.
- The width of the outlet shall not be less than 70 cm.
- It is forbidden to put obstacles in front of the emergency exits.
- The road leading to the exit shall be well lit.

Distance of reaching the exit:

- The distance that a person crosses from the farthest point to reach the safe place. The estimation of this distance depends on the types of buildings, as each type requires a specific time to evacuate:
- The distance to the exit in all buildings constructed of fire-resistant materials, shall not exceed 30 m (100 feet).
- Buildings are constructed of fire-resistant materials, including easily combustible materials.
- The distance to the exit shall not exceed 18 m (60 feet).
- The distance to the exit in all buildings constructed of combustible materials, shall not exceed 12 m (40 feet).

Stairs:

- Stairs are considered one of the important means of evacuation that depend mainly on the exits of the people present in the upper roundabout of the building, and therefore adequate protection shall be made for them against the spread of exhalation or fire when a fire occurs.
- They are divided into two types:

Internal stairs:

- The stairs are located inside the building and are connected to its floors through lobbies and openings leading to stairwells. In order to protect these stairs from the danger of fire, the following points shall be taken into account:
- Its construction materials and materials used for lining walls and ceilings shall be fire-resistant.
- The walls around the stairs shall be of a fire-resistant material for a long time.
- The openings of the doors and hallways connected to the staircases shall have doors to stop the spread of exhalation, so that the exhalation does not penetrate to the stairwells, and then cannot be used.
- The stairwells shall be appropriate, taking into account the estimated distances to reach them, so that it is easy for those present to use them without trouble or hardship.
- Stairs shall lead to the designated evacuation area.
- The units required for the width of the ladder shall be taken into account according to the number of people, the time required for evacuation and the flow rate.
- Visibility and lighting shall be clear in the stairwells, and natural light is preferred during the day.
- Adequate ventilation shall be observed that does not allow the accumulation of exhalation or fumes in stair locations.
- The height of the handrails in these stairs shall not be less than 85 cm.
- If the width of the ladder is not more than two units, one handrail shall be installed on the empty side.
- If the width of the ladder is three units, handrails shall be installed on both sides.
- If the width of the ladder exceeds four units, a third handrail shall be installed in the middle of the ladder in addition to the two side handrails, and it shall rise to the ceiling or not be less than 2 meters (7 feet) in height.
- The stair shall be no less than 25 cm (10 inches) long and no more than 19 cm (7.5 inches) high.
- The number of stairs shall not be more than 16 and not less than three in each space between two breaks.
- Ceiling height shall not be less than 2m (7ft).

External stairs:

- The stairs installed outside the building and are often exposed to the open air, and resort to installing them in the event that the internal stairs are not sufficient as a means of escape, and the following are required:
- Their locations shall be appropriate and the estimated distances to reach them shall be taken into account.
- The materials for building stairs shall be fire-resistant and not affected by changes in the atmosphere such as heat, cold and humidity.
- The stairs shall be far from windows and building openings from which flames or exhalation are likely to escape, with a distance of no less than 2 m.
- The openings of the doors and hallways leading to the stairwells shall have doors to stop the spread of exhalation and fire-resistant.
- External stair lighting shall be visible at night.
- The above-mentioned proportions shall be taken into account in the internal stairs with respect to the stairs, the resting area, the height of the handrails, and the degree of bearing the weight.

Flammable Liquids

- Flammable liquids shall not be stored in buildings unless such buildings are specially designed for that purpose and isolated in appropriate locations.
- Flammable liquids shall not be drained from one container to another, unless the containers are electrostatically treated with a chemical bonding coating, and funnels shall be used to prevent spillage of these fluids.
- Flammable liquids shall not be approached less than 15m from any source of flame.
- The equipment shall not be refueled until after the engine has been switched off.
- There shall be fire extinguishers of suitable sizes and types ready for use in the places where flammable liquids are stored to deal with these materials in the event of a fire.
- Workers shall be trained in the use of fire extinguishers and the steps to be taken in the event of a fire.

Fire Extinguishers:

General Requirements:

- Fire extinguishers shall be certified by a specialized reference and indicate the capacity, type and method of use.
- Fire extinguishers shall be fully packed.
- Fire extinguishers shall be suitable for the type and quantity of materials subject to combustion.
- All obstructions in front of fire extinguishers shall be removed.
- Fire extinguishers shall be in a clear and easy to see place.
- Conducting periodic inspections on them to ensure their validity and maintenance work when needed.
- Periodic maintenance history data shall be written on fire extinguishers.
- Exposing fire extinguishers to atmospheric factors and air pollutants shall be prevented as much as possible.
- Workers shall be trained to use fire extinguishers periodically.
- Types of fire extinguishers and their uses.

Types of Fire Extinguishers and Their Uses:

Fire class	Carbon dioxide extinguisher	Water Extinguisher	Dry powder	Foam
Class A Solids	Non effective	Very effective	Effective	Very effective
Class B Flammable liquid materials	Very effective	It is forbidden to be used	Effective	Very effective
Class C Electrical equipment connected to electric current	Very effective	It is forbidden to be used	Effective	It is forbidden to be used

Specifications of hanging fire extinguishers:

- The estimated distance from the place of the fire to the location of the fire extinguisher in case the fire is of Class A shall not be more than 23 m (75 ft.) and more than 15 m (50 ft.) in case the fire is of Class B and Class C.
- Fire extinguishers weighing 18 kg (40 lbs.) and less shall be hung at a height of 1.5 m (5 ft).
- Fire extinguishers weighing more than 18 kg (40 lbs.) shall be hung at a height of 1.07 m (3.5 ft.)
- The distance between the base of the extinguisher and the floor shall not be less than 10 cm (4 inches).

Fire Extinguishers Distribution Specifications:

- Before distributing fire extinguishers and determining their number, the potential risks shall be known. The types of risks are classified into three categories:

Light risks:

- The places that have small amounts of flammable solids or small quantities of flammable materials such as photocopier inks. These places include schools, offices and places of worship.

Medium risk:

- The places that have quantities of flammable solids and more flammable materials than places where there are light risks. Examples of these places are dining halls, car showrooms and commercial markets.

Severe risks:

- The places that have storage quantities of flammable solids and flammable materials, where it is expected that with this volume of materials the fire will spread quickly in the event of a fire.

Distribution of Class A fire extinguishers:

- The type of risks in a place shall be classified (light - medium - severe) and then the area to be protected is determined. Schedule (6) below shall be guided by.
- The estimated distance from the place of the fire to the location of the fire extinguisher shall not, in any case, exceed 23 m (75 ft).

Schedule 6: fire extinguishing equipment distribution guide of fire Class (A)

Fire Extinguishing Equipment Capacity	Max Estimated Distance	The space that the equipment is defined to protect (ft2)		
		Light risks	Medium risks	Severe risks
2A	75 feet	6000	300	
3A	75 feet	9000	4500	
4A	75 feet	11250	6000	4000
6A	75 feet	11250	9000	6000
10A	75 feet	11250	11250	10000
20A	75 feet	11250	11250	11250
30A	75 feet	11250	11250	11250
40A	75 feet	11250	11250	11250

- If the space of the place to be protected is less than 279 m2 (3000 feet), the place shall be provided with fire extinguishing equipment of the smallest size (2A).
- If the shape of the land area is circular, its radius equals 23 m2 (75 ft2) and has no obstacles, one fire extinguishing equipment can be put in the middle and in this case, you can protect an area estimates 17700 ft2 by using fire extinguisher suits the existing risks in the location.
- If the shape of the land area is rectangular, the largest area of a square that can be drawn in which any point in it can't be far from 23 m2 (75 ft2) shall be 11250 ft2 (1045 m2) and the side length of this square is nearly 106 ft2 drawn inside the circle which its radius equals 75 ft2. Therefore, it is obvious that the largest area that can be protected by fire extinguishing equipment without violation of the estimated distance condition is 11250 ft2.

- An Explanatory Example:
  A rectangular shape building and its sides equal 450 ft x 150 ft (its area 67500 ft2), How Many fire extinguishing equipment is required to protect it from the fires Class A in the cases of simple, medium and severe risks with showing the performance rates of fire extinguishing equipment.

- Solution:
  The largest area that can be covered by the fire extinguisher is 11250 ft2 and by dividing the building area on this area equals the number of fire extinguishers (67500÷11250= 6 fire extinguishers). According to the Schedule 6, the simple risk requires 6 fire extinguishers (Class 4A), the medium risk requires 6 fire extinguishers (Class 10A) and the severe risk requires 6 fire extinguishers (Class 20A).
  Fire Extinguishers distribution of Class B:
  Class B Fires can be classified into two groups:
  Flammable liquid fires which its depth is less than 0.635 cm (1/4 inch).
  Burning liquid fires are more than 0.635 cm.

- The General Rule of fire extinguishers distribution of Class B is that the more fire extinguishers are closer to the risk place, the more it is better.

Schedule 7: fire extinguishers rates of Class B:

Risk Type	Minimum Performance Rate of Fire Extinguisher	The Maximum Distance between the risk location and equipment location
Light Risk	5B 10B	30 ft 50 ft
Medium Risk	10B 20B	30 ft 50 ft
Severe Risk	20B 40B	30 ft 50 ft

- It is noticed that in the above Schedule that the traveled distance is 50 ft because this fire
- Class requires rapid intervention as this Class fire spreading is fast.
- The distance between the fire extinguishers shall be equal and the traveled distance shall be taken into account according to Schedule 7.

mportant instructions before the beginning of extinguishing fire:يجب

- Notify the civil defense.
- Ensure getting all individuals in the location off.
- Stand on a distance estimated 2 to 3 meters from the fire location.
- Stand in the wind direction in case of air currents.
- Ensure that the fire extinguisher suits the fire Class to avoid larger damages.

How to use the fire extinguisher:

- Pull a safety clip that exists in the handle.
- Test the fire extinguisher to check its validity by pressing once on the handle, then go to the fire location.
- Hold the fire extinguisher by one hand and the hose end by the other.
- Lower the nozzle when approaching the fire location.
- Direct the hose horizontally to the firebase and beginning from the nearest fire point to you and move the hose to the right and left until extinguishing the fire.
- After finishing the extinguishing process, come back steps with looking at the fire location as the fire may get inflamed again.
- If the fire is on a large space, the extinguishing process shall be made by cooperating between two or more than one individual, each of them carries a fire extinguisher.

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