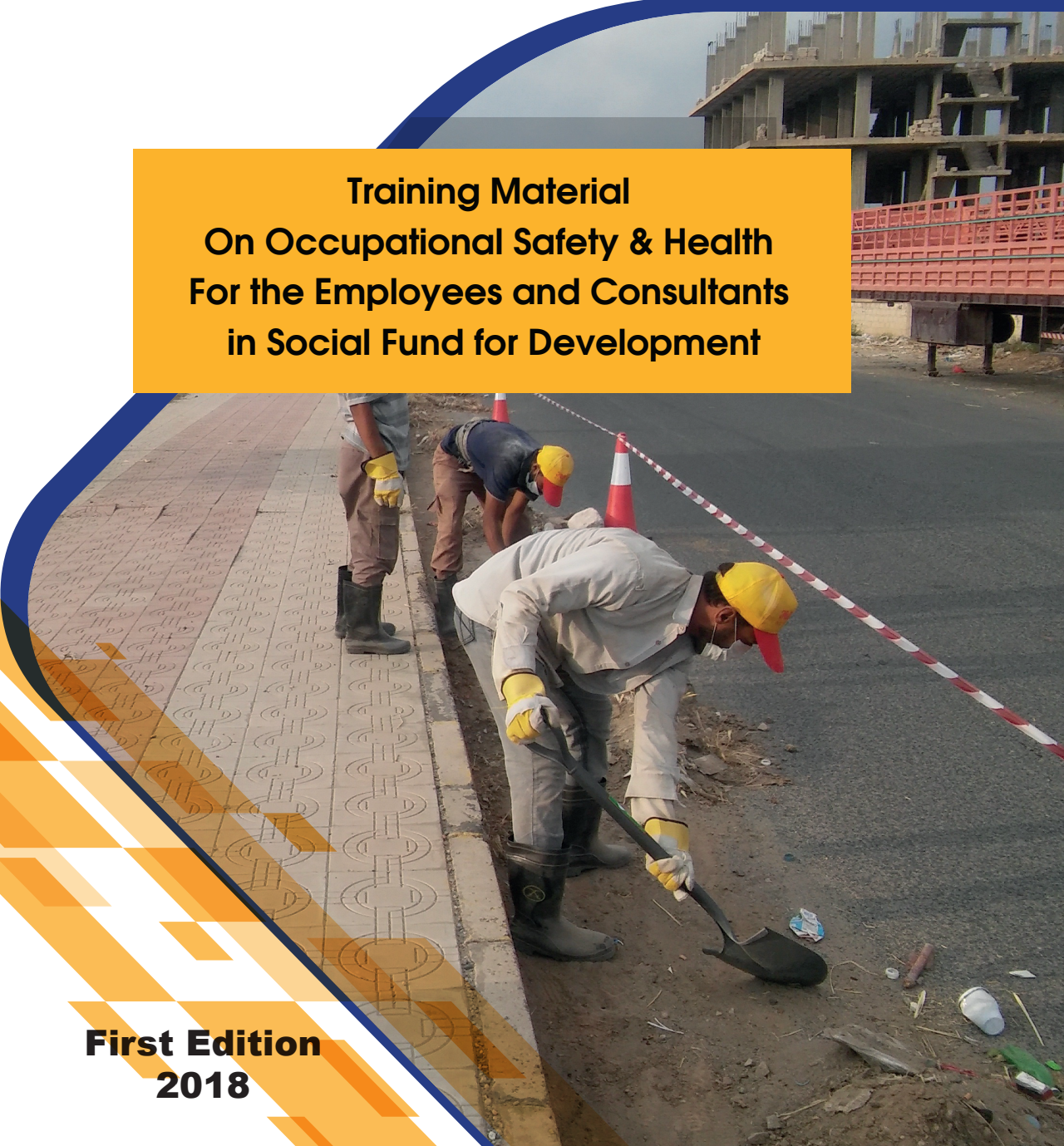


**Training Material
On Occupational Safety & Health
For the Employees and Consultants
in Social Fund for Development**

**First Edition
2018**



**Training Material
On Occupational Safety & Health
For the Employees and Consultants
in Social Fund for Development (SFD)**

*Technical Unit
Department of Occupational Safety & Health*

2018

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Contents

1	The Word of the Managing Director	8
2	Foreword	9
3	Objective / Training Material Targeted Persons	10
4	Concepts and Terminologies	11
5	The Origin and History of Occupational Safety	14
6	The Science of Occupational Safety & Health / Scope / Objectives	15
7	The Most Important Global References on Occupational Safety	16
8	Responsibilities of Occupational Safety Manager / Responsibilities of Workers	18
9	Accidents and injuries and their causes	19
10	Risk Management	25
11	Analysis of Risks of Jobs	28
12	Forms of Potential Risks Tables in SFD's Projects and the measures of handling them	30
13	Classification of General Risks	43
14	Physical Risks	43
15	Engineering Risks	49
16	Chemical Risks	61
17	Equipment of Personal Protection	62
18	Risks in Construction Works and Protection against them	72
19	Digging Works	72
20	Destruction Works	78
21	Some of the Risks of Workplace in Yemen	83

22	Material Storage at work location	88
23	Manual Tools and Kits	91
24	Scaffoldings and Ladders	97
25	Working in closed areas	98
26	Lifting and Handling	102
27	Sliding, falling and risks of falling materials	103
28	Handling Chemicals at site	105
29	Planning, Cleaning and Arranging	107
30	Lockout / Tag out	108
31	Site Work Permits	108
32	Working in Road Construction Projects	109
33	Environmental Management	110
34	Indicative signs at workplace	111
35	Occupational Safety & Health in office / Ergonomics	113
36	The Risk of Mines and unexploded ordnance (UXO) at the workplace	120
37	Investigation of Accidents and Work Injuries	122
38	Insurance Procedures in SFD	125
39	List of References and Sources	129

The Word of the Managing Director

Occupational safety and health is of particular importance from the perspective of social protection in the first place and with respect to the standards and responsibilities at the level of professional considerations. It is an issues that requires much effort in terms of raising awareness, discipline and training. This is apart from the sense of moral and legal responsibility. As part of SFD's efforts to promote this important aspect, this training manual is issued in order to assist and raise the awareness of those who are involved in the management and implementation of the field activities of projects.

Eng. / Abdullah Ali Al-Dailami
SFD Managing Director

Foreword

The bestowal of SFD is growing and it has various developmental interventions expanding its activities, plans implementation mechanisms every now and then. However, SFD in the implementation and supervision of projects, developmental and humanitarian interventions mainly depend on cadres and human forces that are of field expertise and distinctive supervisory skills.

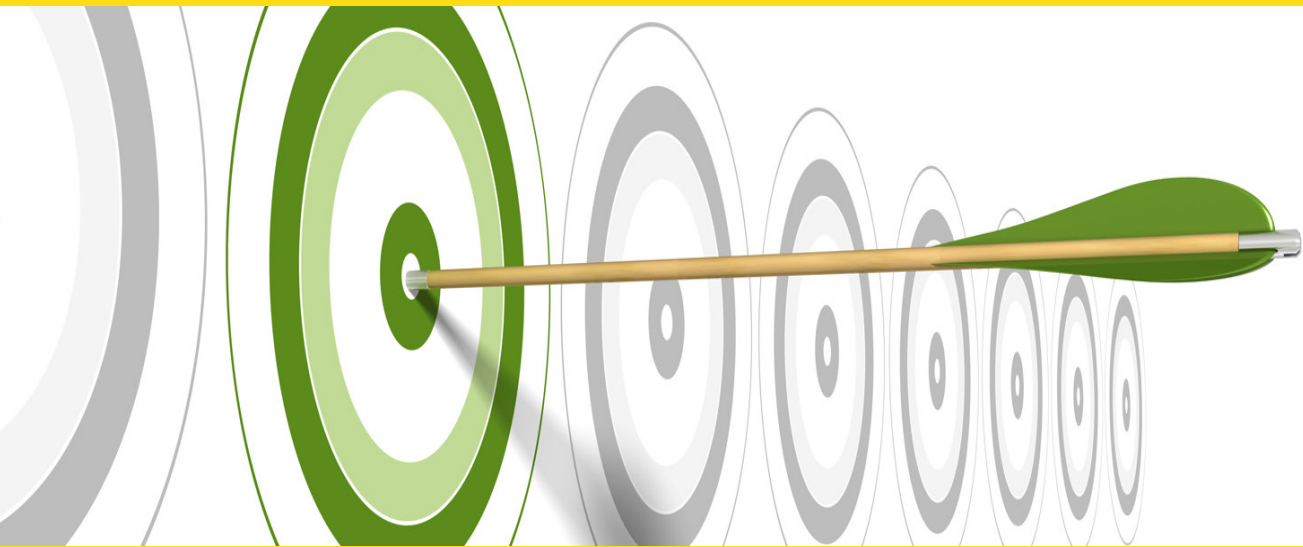
Project officers and consultants are among the most important cadres and pillars that control the success of the different SFD's interventions. Therefore, the matter requires preparing cadres and empowering them to implement different types of activities effectively and efficiently. This will be done only by providing them continuous training and building their knowledge capacity and skills in line with SFD's orientation in each phase and in accordance with the current variables to ensure high quality of the SFD's interventions and activities and for beneficiaries' satisfaction with the different services.

In the forefront of this subject comes the issue of occupational safety and health in all projects of SFD. The safety of people and the preservation of their spirit and psychological and social safety are the matters that SFD considers and cares about.

In coronation of the persistent orientation of SFD for the management of standard Occupational Safety & Health system, Occupational Safety & Health Department was launched to assist officers and consultants, which in turn shall issue this guide as part of an ambitious project to enable project officers and consultants to learn about the most important public information in Occupational Safety & Health they need in order to manage and control the safety procedures in the sites and projects in commensuration with SFD's projects.

Purpose of this Material

This material aims to provide trainers and trainees with knowledge and skills which will enable them to raise awareness in the field of Occupational Safety & Health in order to reduce project injuries and accidents, raise the awareness of staff and the beneficiaries who are benefiting from SFD's interventions and projects.



The Target (Parties and Specialists) of the Material

This material has been written in a simple style that is easy to understand and handle theoretically and practically by consultants and specialized trainers in the field of Occupational Safety & Health in order to raise the awareness of officers, consultants, technicians and workers working in the projects of SFD.

Concepts and Terminologies

• **accident**

It is an act that occurs suddenly during work or because of it that may cause damages and loss in the entity or work location without causing any injury to workers, or which may cause an injury to a worker or more in addition to the damages to the entity.

• **Work Injury:**

It is the injury caused by an accident which happened to a worker during performing his job and work or during his way to or from the job.

• **Occupational Injury:**

It is the injury occurring to technical staff as a result of the work they perform for a long period of time.

• **Hazard:**

It is the possibility of the occurrence of something that may cause damage.

• **Risk:**

It is the potential occurrence of damage.

• **Hazard:**

It is the possibility of the occurrence of something that may cause damage.

Example to illustrate hazard and risk:

A bottle containing adhesive, there is a permanent possibility that someone may deal with it improperly. This is called (hazard) and not risk even if it is kept in a cupboard stored on the specialized shelves the risk is still there. But if the scene is changed and someone drinks this bottle, the hazard has turned into (risk).

• **Risk Management**

It is the procedure of measuring and assessing risks and the development of strategies to manage them:
These strategies include the transferring of risk to some other direction, avoiding, minimizing negative impacts and accepting some or all of their consequences. It can also be defined as an administrative activity aiming at controlling risks and reducing them to acceptable levels. More precisely, it is the process of identifying, measuring, controlling and reducing risks facing the company or organization.

• **Risk Assessment:**

It is the determination of the quantitative and qualitative assessment of risks associated with a well-defined situation.

• **Confined Spaces:**

These are the places that are constantly closed. These places are large in size with limited means of entry and are not designed for work or for permanent staying.

• **Heat Exhaustion:**

It is a functional disorder of body which results when the body loses large amounts of fluids and salts after being exposed to hot weather for a long period of time, especially when exerting excessively hard efforts or actions.

• **Heat Shock:**

It is a type of heat exhaustion that occurs as a result of rapid increase of body's internal temperature. It is very serious and it shall be treated immediately because it may be fatal.

• **Decible:**

Decibel unit (abbreviated db) is a unit used in measuring sound intensity.

• **Lux:**

Lux is the unit for measuring light intensity adopted by International unit system.

• **Electric arc:**

It is an electric short circuit charge or spark which occurs due to the collapse of the electric isolator of the surrounding gas causing a continuous discharge that leads to the flow of electric current in medium which is not conductive such as air.

• **Material Safety Data Sheet (MSDS)**

It is a form that contains data on the properties of a certain material. It is an important element of occupational safety. It provides workers and paramedics with procedures for handling and dealing with this material in a safe manner, including information such as physical properties (melting point, boiling point, flash point, etc.), (Toxicity, health impacts, first aid, and interactivity, method of storage and disposal, and protective equipment, and handling procedures in case of spills. The exact format of the data sheet can vary from source to source within the country according to the method specified in the national requirements. MSDS is a widely used classification system for the information concerning chemicals.

• **Personal Protective Equipment (PPE):**

PPE are equipment and means used in occupational safety, including clothing, helmets, protective glasses or any other equipment designed to protect the body of the person wearing them from injuries or hazards.

• **Asbestos:**

Asbestos are inorganic materials containing many natural minerals in which silicate salts are incorporated in its composition. Asbestos is used in the construction and roofing of houses, internal and external insulators, drainage pipes, fumes and ventilation. Asbestos causes chronic pulmonary disease caused by the inhalation of asbestos fibers which are characterized by being extremely small. They reduce the efficiency of lungs and respiratory system in general.

• **Material Storage:**

It is the process of storing materials at work sites such as cement, soil and iron.

• **Scaffold:**

It is a temporary structure used to carry persons and materials for the purpose of building works or restoring buildings and entities.

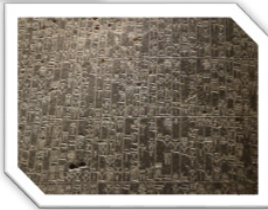
• **Work Permit:**

Work Permits are official written documents used to monitor the works that have been identified as potentially hazardous or located in a more dangerous location. Work permit is used to determine the detailed conditions (requirements) to be complied with.

• **Ergonomics:**

Is the science which is concerned with the compatibility of humans with things they use, things they do and the environment in which they work and move.

The Origin and History of Occupational Safety



The interest in occupational safety and health began at the start of civilizations. During the Babylonian civilization in Iraq, the Laws of Hammurabi (known as Hamorabi law) were introduced. These were set of laws consisting of 282 legal laws written by King Hammurabi, the sixth king of Babylon (ruled from 1750 BC to 1792 BC), on a large cylindrical monument. Among the laws inscribed there were laws concerning people's safety and health. They included laws punishing the supervisors who did not do these job properly (who caused damages to others).

If a worker lost his arm because of a mistake or negligence of a supervisor, the arm of the supervisor shall be similarly chopped. If a house collapsed and the people of that house died, the supervisor shall be sentenced to death because he did not follow the proper methods in building that house.

The Pharaohs also recognized some diseases caused by some industries. They developed a comprehensive description of the diseases that affect the makers of sharpening weapons due to inhaling flying dust, because at the time their weapons were made of granite.



In England, the introduction of labor and safety laws began in 1802. The interest in safety increased due to accidents and disasters. The concept of industrial security grew and developed into a more comprehensive concept, not only with respect to industry but also related to all occupational safety and health activities.



In America, the first Department of Occupational Safety and Health of the US Department of Labor (OSHA), emerged in 1971.





Science of Occupational Safety and Health

What is the science of occupational safety and health?

Occupational safety and health is the science of protecting workers at all work sites from potential accidents that may cause injuries to the worker or death, God forbid, and also damages to property in the facility and locations.

This science has roots in several criteria and requirements that must be followed for the purpose of maintaining our safety and safety of people around us, which is the responsibility of everyone, in order to guarantee living in a safe and comfortable work environment.

Scope of the Science of Occupational Safety and Health

Occupational safety and health is incorporated in all areas of life (industrial / health / construction / chemical / personal ... etc). For example When dealing with electricity and household appliances, it is essential to follow the general safety requirements. Also, when a person is driving a vehicle he or she cannot ignore the traffic safety rules such as (traffic guide plates, requirement to fasten seatbelt, adherence to speed limit).

Objectives of the Science of Occupational Safety and Health

- Protect the humans from injuries caused by the hazards of the work environment by avoiding their exposure to accidents, injuries and occupational diseases.
- Maintaining the various components forming the physical element of the facilities and the equipment and systems within the facility from damage and loss as a result of accidents.
- Provide and implement all occupational safety and health requirements that will ensure the safe environment required for the prevention of risks to the human and material components.
- Occupational Safety and Health as a scientific approach aims to plant and firmly establish safety and faith in the hearts of workers while conducting their jobs as well as reducing the anxiety and panic happening to them while living their lives among or with tools, materials and machines which carry potential risk and threats to their lives under unsafe conditions seriously endangering their lives from time to time.

The Most Important Reference on the International Systems of Occupational Safety and Health

OSHA

OSHA is the abbreviation for The Occupational Safety and Health Administration.

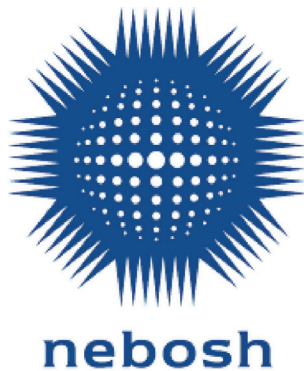
- **Established:** 1971
- **Country:** USA
- **Programs Management:** Government
- It is predominated by practical aspects, standards and methods of implementing dangerous works and how to use and extract information from them (OSHA standards).
- It is an application program that gives you the basic keys to know everything that matters to safety in any activity.
- OSHA programs are very clear and their tests and examinations measure the student's level of acquiring of the scientific content and skills required regardless of linguistic skills.
- The qualified lecturers are accredited to conduct the training and provide them with the cards to attend and pass the course and tests.
- Non-profitable.



NEBOSH

NEBOSH: is the abbreviation for The National Examination Board in Occupational Safety and Health

- **Year of Establishing:** 1979
 - **The country where it originated:** Britain
 - **Programs Management:** an independent British non-profit organization.
-
- It focuses mainly on the philosophy of management of occupational safety and health in different facilities with respect to the globally adopted management systems.
 - It follows the method of risk management and assessment and analysis together with the practical aspects of safety, and how to secure them in a philosophical manner, avoiding talking about the numbers or applied detailed codes in which OSHA program has a wealth.
 - The tests of NEBOSH are very precise and a true criterion with respect to the level of the student and the extent of the ability and capability concerning the linguistic writing (editing).
 - It does not use independent lecturers, and depends on training agencies that have the human resources and qualifications necessary to provide training. Mostly, these are big British companies and training centers with branches or representatives (offices) in the Arab region.



Duties of the Occupational Safety Officer

To make working conditions safe for all workers and establish precautions necessary to prevent workers' exposure to health risks and work hazards utilizing the following methods:

- Prepare plans for occupational safety and health programs, including the necessary annual plans.
- Participation in the Occupational Safety Committee.
- Regular inspection of premises and detection of hazards.
- Study the causes of accidents and develop radical solutions to ensure that they will not happen again and investigate work accidents.
- Supervising the selection of appropriate PPE and selecting the tools for each operation.
- Promoting the dissemination of preventive culture.
- Making accurate statistics on work accidents.
- Supervise the implementation of occupational safety programs approved by the Safety Committee.
- Analyze ongoing operations in projects and develop proper and safe operating instructions for each process.
- Training the workers on the correct technical work methods and supervising them during training.

Duties of the worker

- The obligation to carry out instructions and guidelines given to him concerning his safety and health when performing the work.
- Obligation to adopt all steps that remove or reduce the risk that may be encountered in the workplace.
- The necessity to use equipment and means of protection designed to protect them from occupational hazards
- Shall not commit any act or any misuse that results in disruption or failure of the performance of the tools used in the execution of the works.
- Report to those who are responsible concerning any hazardous work situations.
- Report any accident or injury occurring during work.
- Wear work uniforms (appropriate to the type of work or as specified in the instructions).
- Participate in awareness programs and training in the field of occupational safety in a positive way.
- Perform the work that he was trained to do and specifically assigned to him.



Accidents, Injuries and Causes

Accidents and injuries are one of the most important natural obstacles to the business and cause huge material losses for countries as well as losses in individuals and disruption of the project.

- **Accident:** is the occurrence of something unexpected and undesirable resulting in an injury or death or destruction.
- **Injury:** Injury is caused by an accident that occurred during performing a work or because of it. The injury may be due to exhaustion or negligence of work.

Causes of accidents and injuries

There are many causes for accidents and injuries but these causes can be divided in to two parts:

- **The First:** Uncertain or unsafe working conditions.
- **The Second:** the improper or unsafe behavior of individuals.

-The First Unsafe working conditions:

It means the circumstances surrounding the worker or individuals (locations or site, work environment, machinery and equipment, training, equipment preparations, means of guidance).

1-Workplace:

It is the place where the worker or individual performs his assigned work.

Workplaces are considered to be among the circumstances and causes of accidents and injuries that lack the healthy and safe conditions in terms of:

- a. The space or area of the place of work: The place shall be sufficient enough in terms of width and length to perform the work comfortably and not crowded with respect to office work. For field work it shall be organized and made free of obstacles or waste which may cause accidents.
- b. Height of the workplace: the height should be appropriate and at least three meters in confined places.
- c. floors: the floors shall not be slippery and they shall be suitably leveled in case of office work, while for field work floors these must be free of any spills or materials causing slippage or impediments such as power lines / residues of waste or pipes. Vision must be clear in the corridors of work and materials should not be allowed to accumulate in them.



- d. Windows: to ensure appropriate ventilation and natural lighting.
- e. Atmosphere of the workplace: this includes several elements:
 - Heat: Must be suitable for performing the work.
 - Ventilation: There must be a renewal of the air and ensure providing different means of good ventilation.
 - Lighting: It must be sufficient whether natural or artificial lighting and shall commensurate with the type of work being performed in the workplace.
 - Noise: work towards reduction of the noise caused by machines or equipment which may affect the hearing system of workers and individuals.

2- Equipment and machinery:

The equipment and machinery must be safe and sound in terms of specifications and installation during operation to avoid causing any danger that may affect the workers and individuals. They shall always be maintained properly. Their maintenance shall be carried out periodically at the predetermined time so that all expected failures can be identified.

3 – Arrangements and preparations required for Machinery and Equipment:

Due attention should be given to place or install barriers as required for the sharp machines during their operation depending on each type.

4. Training:

All employers and responsible officers shall prepare and implement training programs for all employees, each as per the type of work in a sufficient manner to make it possible for them to act according to the ideal and proper training methods.

5- Guidance and instructions:

It is the duty of officials or employers of any workplace (or at any workplace) to provide guiding signs and general instructions as well as warning signs to alert individuals to hazards in the workplace or machines.

6. Personal Protection Tasks:

Appropriate personal protection tasks should be provided for all work so that individuals and employees can use them during work. The importance of these protective tasks shall be introduced to workers and individuals for the prevention of work risks.



Secondly: Unsafe Behavior in Work:

The improper and incorrect behavior of the employees during the course of their work has significant impact regarding the occurrence of accidents and injuries, and the percentage of accidents and injuries resulting from improper behavior is almost 90 % of the total accidents and injuries in any work site. The remaining 10% falls on unsafe working conditions. Improper behaviors and actions are due to the following reasons:

1 – Carelessness and Negligence:

This is when the worker neglects the performance of the work assigned to him, for example, the worker or individual works with excessive speed without any care or thinking while performing the work.

3. Lack of adequate training:

This is one of the most dangerous behaviors that result in accidents and injuries, this is when the worker or the individual operates any equipment or machine without having been trained to operate it or not having any relation to his work or to do a work he does not know.

4 – Absent Mindedness:

This is the case when the mind of the individual or the worker does not focus on the work he is doing, but his mind is focusing on other topics such as holidays, visits and picnics.

5– Personal Problems:

Personal problems cause great and huge damages to work especially when these problems dominate the life of the worker or individual. Therefore, personal and social problems of workers shall be addressed inside or outside the work place.

6. Deliberate Actions:

They are the actions done by some individuals to their colleagues which are of childish nature leading to Injury and the occurrence of incidents. Example of such act are jokes, ridicule, uttering of inappropriate words ets.

7 – Revenge:

This is when some individuals plot against their colleagues to cause injuries to them at work in retaliation to issues or problems which happened outside work place.



8 – Non-Compliance with Instructions and Guidelines:

Such action's cause accidents and injuries to individuals due to lack of interest in implementing the instructions and special guidelines related to various operations.

9 – Cleanness and Arrangement:

Lack of cleanness and arrangement of the workplace or the work performance may cause accidents and injuries. Cleaning the workplace must be done on daily basis before departure. The same shall be made with respect to the arrangement of machinery and equipment.



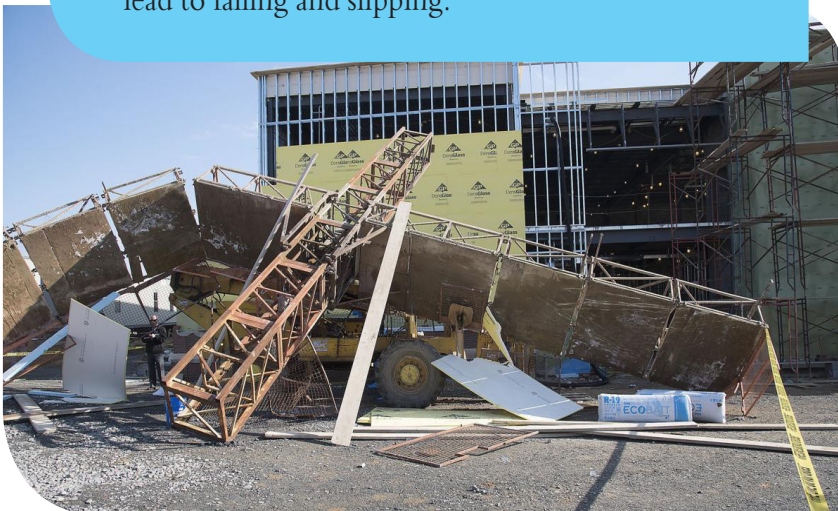
• Example of Unsafe Conditions in Construction Projects:

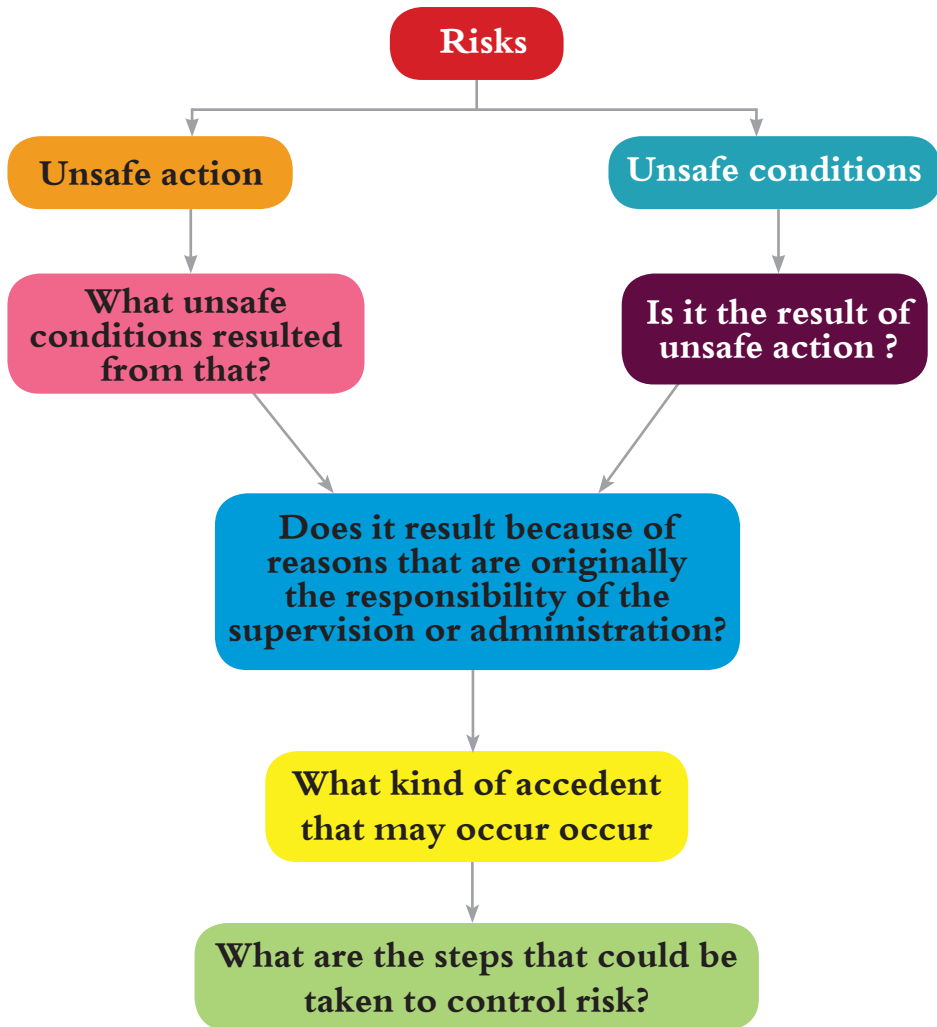
- The nature of some work sites (narrow, deep, sloping, etc.).
- Arranging materials on site randomly.
- Not cleaning the site and not removing the remnants of work regularly as in excavations or in the places of removal of thorny figs, or quarry sites.
- Leaving excavations open in areas or passages used for movement and passing.
- Poor lighting, noise, dust, heat, fumes, etc.
- The organization or agency does not adopt a clear safety policy
- Absence of information or bad instructions and bad training in the field of occupational safety.



• **Example of Unsafe Works
in Construction Projects:**

- Tying a worker with partially torn ropes for digging a well may lead to the rupture of the rope and falling of the worker.
- Digging works or moving stones by a woman, disabled or old person.
- A worker loading stones on a cart with expired tires and broken arms,
- Design of ladder or scaffold with damaged or cracked wood.
- Using an ax with a cracked wooden hand that may get broken and fall on the head.
- A worker without experience cuts a stone.
- A worker driving a car without knowing how to drive.
- A worker removes thorny figs without knowledge of how to deal with figs.
- A worker suddenly jokes with another worker during the work.
- Wearing unsuitable clothes, like wearing wide or open clothes, may get caught by the components of the work or when wearing inappropriate shoes may lead to falling and slipping.





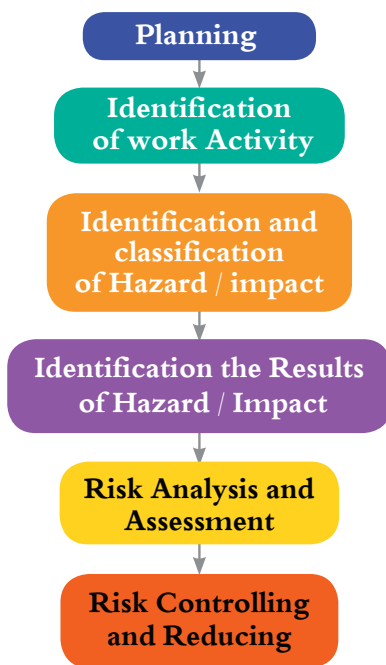


Risk Management

Generally, risk management is a process of measuring and assessing risks and developing strategies to manage them. These strategies include risk transfer, avoidance and minimizing their negative impacts. Traditional risk management focuses on risks arising from physical or legal causes (e.g. natural disasters, fires, accidents, death and litigation). On the other hand, financial risk management focuses on those risks that can be managed using financial instruments. Regardless of the type of risk management, all major companies as well as groups and small companies have a risk management team. In the case of ideal risk management, the prioritization process is followed so that risks with high losses and high probability of occurrence are first addressed while the risks with the least losses and lower probability of occurrence are subsequently dealt with. This process may be very difficult and the balance between high risk and low losses against risks of low probability and high losses may be poorly handled. Intangible risk management identifies a new type of risk that is 100% likely to occur but they are ignored by the institution because of the lack of knowledge and ignorance of institution. As an example of this: the risk of knowledge that occurs when applying incomplete knowledge as well as the risks of relationships that occur when there is ineffective cooperation. All these risks directly reduce the productivity of the so called knowledge workers (those working on the knowledge) and reduce the effectiveness of spending, profit, service, quality, reputation and the type of quality of gains. Risk management also faces difficulties in allocating and distributing resources. This illustrates the idea of cost of opportunity (or opportunity cost) as some of the resources spent on risk management could have been used for more profitable activities. Once again, the ideal risk management process reduces spending while minimizing risk negative outcomes to the minimum possible extent.

• **The system of assessment of general risks and their effects:**

Risk identification and assessment is a significant matter and the development of necessary solutions is very important. The solutions may be engineering in order to minimize risks in the work environment and may be administrative advice, guidance and awareness according to global norms and standards. The criticism should be realistic and constructive which aim at the proper application as per global systems. Risk assessment is done through building the mental capacity to be able to detect risks through imagining their occurrence and develop necessary solutions. This requires the responsible authorities to identify and categorize the general risks. Risk assessment is carried out primarily through a series of stages:



• **Steps of Risk Management Process**

1) **Planning**

It includes planning the process, the blueprinting the scope of work and the basis for the risk assessment and establishing the assessment team.

2) **Classification of activities**

At this stage, the activity of the institution is classified and divided from the beginning of the stage until the end, whether this is the general or partial activity of the establishment.

مدى احتمالية حدوث المخاطرة					التأثير / الحدث	مدى تأثير المخاطرة في حالة حدوثها
منخفض جدا	منخفض	متوسط	عالي	عالي جدا		
				Risk1	عالي جدا	
					عالي	
					متوسط	
		Risk2			منخفض	
					منخفض جدا	

3) Identification and classification of Hazard / impact

At this stage, the risks of each step of the production process are identified and the source of the risks affecting the person, the institution and the surrounding environment is determined and classified



The Common Ways of Identifying Risks are:

- **Goals-based identification:** The organizations and teams working on a project all have objectives. Any event that expose the achievement of these goals to risk, whether partial or total, is considered hazardous.
- **Scenario-based Identification:** In the process of scenario analysis different scenarios may be created and may become alternative methods to achieve a certain goal or an analysis of the interaction of forces in a market or a battle. So, any event that generates a scenario different from the one envisaged and is not desirable is identified as a hazard.
- **Classification-based Identification:** is to detail all potential sources of risks.
- **Review of Common Risks:** in many institutions there are list of potential risks.

4) Identification of Risk/ Impact

At this stage risks and results are identified.

5) Risk Analysis and Assessment

At this stage severity of risks is measured in terms of causing losses and potentiality of occurrence.

6) Risk Control and Mitigation

After the identification and assessment of risks, and impacts are measured according to the legislations and laws, all modern technologies used to handle risks are located within one of main groups.

- Elimination of the Hazard.
- Substitution
- Isolation
- Engineering Control
- Administrative Control
- Using PPE



Job risk analysis

Job-related accidents and injuries occur every day at work sites, and often occur because workers do not have the necessary training to do the work safely. One way to prevent work injuries is to develop a system of safe working methods and train workers. Access to safe working methods is one of the benefits of applying a job risk analysis system.

- **What is a job risk analysis system?**

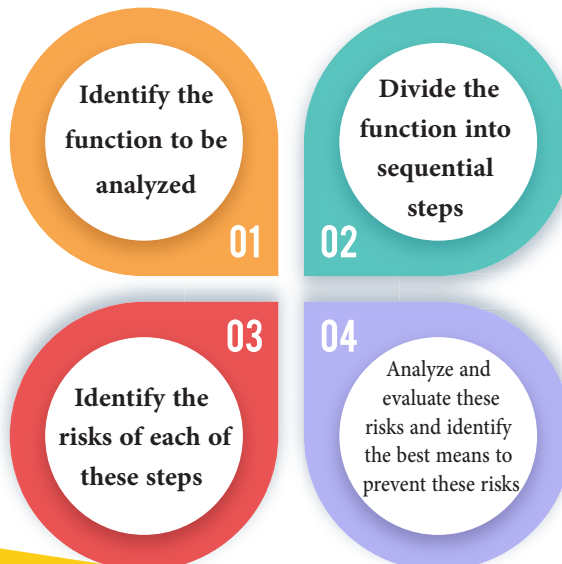
The Job Risk Analysis System is a system that helps introduce the principles of safety and health applications in operations. In the job risk analysis system each step of the completion of any work or function is examined to identify the risks associated with each step as well as to determine the best ways to control and prevent these risks. In other words, job risk analysis is a careful study and record of each step of the job or work, identifying the associated risks (in terms of occupational safety and health) and determining the best ways to do this function after reducing or eliminating these risks.



- **What are the benefits of applying a job risk analysis system?**

One of the most important benefits of applying a job risk analysis system is knowing the unknown risks of doing each function and job and also raising the level of occupational safety and health awareness among workers. It also improves the level of communication among workers and supervisors. After completing the application of this system and preparing written methods of doing jobs, this can also be as training for workers. The application of the system will lead to reduction of accidents and thus reducing the cost resulting from these accidents.

- **The Four Elements of Applying the Job Risk Analysis System**



1. Determine the job to be analyzed.
2. Divide the job into sequential steps.
3. Identify the risks of each of these steps.
4. Analyze and assess these risks and identify the best ways to prevent these risks.

1- Determine the job to be analyzed:

A job risk analysis system can be performed for all jobs to identify which job should be analyzed first, i.e. give priority. The following factors should be taken into account:

- Review the records of injuries and choose jobs where the percentage injuries is high.
- Selection of new jobs or the jobs that have been modified.
- Selection of jobs performed on long periods.

2 - Division of the function into sequential steps:

After selecting the job to be analyzed, this job shall be divided into sequential steps taking into consideration that this division is not to be prolonged (not more than ten steps).

3. Identify the risks of each of these steps:





After dividing the job into steps, the risks of each step shall be identified.











4. Analyze and assess these risks and determine how best to prevent these risks:

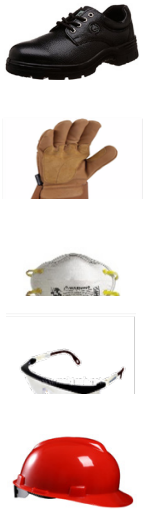
The last step in the job risk analysis system is to analyze risks and determine how best to prevent them and overcome them according to available possibilities.














Tables Forms of Potential Risks in SFD's Projects and the Procedures of Handling Them




Item	Risks	Safety Procedures	Tools
leveling	<ul style="list-style-type: none"> •Existence of infrastructure extensions. •Existence of soft soil – old tombs. •Location is close to traffic • Use of hazardous substances •Equipment that is not qualified to carry out the activity • Rocky slopes – landslides 	<ul style="list-style-type: none"> • Prior coordination with the official authorities • Traffic regulation. • Prevent the use of hazardous substances. • Implementation of activities by trained persons in each activity • Contractor shall supply and carry out the necessary work on the Site to mitigate the environmental impact represented by: <ol style="list-style-type: none"> 1- Fencing the site with zinc or wood ... etc to prevent the entry of non-workers to it. 2- Constructing a bathroom with dimensions 1.5 × 1m with and 2.5 m height as temporarily, made of wood or bricks ... etc.), digging a pit and toilet and provide water for this bathroom. 3- Storage of materials in a systematic manner on the site and provide sufficient space for movement and handling. 4- Removal of wood and residues outside the work area during the implementation period (ad hoc landfills). 5- The obligation to place annoying equipment away from populated areas and operate them at the appropriate times, as well as the obligation to store hazardous materials away from workers and work and not to change oils or leave the residues of grease in the work area. 6- Commitment to repair public services (electricity - telephone - water - sewage), which may get broken during the implementation of the project as regularly. 7- Monitor by the daily safety officer regarding movement or changes in the areas of rock slopes. 8- In the case of the projects of sewerage, paving or afforestation, the contractor shall be obliged to regulate the traffic in the streets in coordination with the Traffic Department and not to open work on any street until after the completion of work in the other streets so that there is mobility. Also, strips and warning signs shall be placed for pedestrians and cars to making movement easy and solving all problems with locals and local authority. 	    





Item	Risks	Safety Procedures	Tools
Excavation	<ul style="list-style-type: none"> Workers fall in the pits as a result of walking near the edge. Collapse of the excavation areas on workers and equipment. Collapse of service lines on the sides of the excavation. Collapse of buildings adjacent to the excavation sides. Injury of workers inside the excavation area with excavation equipment and machinery Injury of workers with burns or other injuries due to the use of explosive materials. Workers are injured by electric shock due to the presence of a nearby electrical source. Workers are injured by electric shock due to the presence of a nearby electrical source. 	<ul style="list-style-type: none"> Fix a tight, safe and secure fence around the excavation area Put appropriate warning signs around and inside the site. <ul style="list-style-type: none"> pits sides must be supported to avoid the risk of collapse. Machines shall not get close to the edges of the pits or unloading vehicles close to edges. Do not store materials close to the edges of pits and keep away for an adequate and safe distance. Not to put the outlets of excavation at pits edges. The entrances and exits of the excavation site must be identified and the excavation area shall be provided with safe and sufficient ladders with at least 1 m height from the surface of the pit. 	    
Removal Works	<ul style="list-style-type: none"> Collapse of ceilings and walls on workers. Injury and clogging of the fallen materials from the top. Injury to the face, eye and body with volatile objects. Respiratory is infected with the flying dust. Stumbling on the remains of materials resulting from demolition and cracking. Risks arising from equipment and machinery 	<ul style="list-style-type: none"> identification of the areas to be demolished and knowing the potential risks and how to address them. commitment to that the person who will do the demolition activity shall have experience in this field. Using appropriate tools to do the demolition work. 	    


Item	Risks	Safety Procedures	Tools
Filling	<ul style="list-style-type: none"> • Non-compliance with technical specifications causes: <ul style="list-style-type: none"> - Traffic accidents. - Workers fall. - Work injuries. - Environmental damage to workers and surrounding environment. 	<ul style="list-style-type: none"> • Ensure that there are visible signs to determine the layers of the fill. • Ensure that the fill soil does not contain any building residues or large stones. • Make sure that filling is properly positioned and leveled for each layer. <p>Ensure to immerse the fill with water before the concrete is poured.</p> <ul style="list-style-type: none"> • Preparing and arranging for suitable traffic procedures at the landfill site, including: (signs, triangles, barriers). • Provide safety tools. 	






Item	Risks	Safety Procedures	Tools
leveling	<ul style="list-style-type: none"> • Falling during the work of cutting stones from a high place. • Scaffold collapse due to non-compliance with specifications • Workers fall from the scaffold. • Instability of the scaffold floor. • Scaffold collapse due to overload. • The moving scaffold was overturned by moving it while the workers were on it. • Eye injuries. <p>Fragments due to the dispersal of fragments of stones during cutting.</p> <ul style="list-style-type: none"> • Injury due to the use of explosive materials, as cracking and manual gunpowder are very dangerous. 	<ul style="list-style-type: none"> • Be very careful when making the explosion and alert neighboring sites, especially the houses near the blast sites. • Use alternative materials for explosives. • It is forbidden to work with stones from the bottom of the site so that there is no fall of rocks from the top and that may cause damage to the worker who cuts the stones. <p>It is forbidden to break stones without wearing a protective eyeglass by the workers who is breaking the stones so that his eyes not to be hit with any shards of stone.</p> <ul style="list-style-type: none"> • Wear long boots when making or cracking stones to keep the leg and feet safe. • Gloves must be worn when stones are flipped, lifted, loaded or loaded in the stones transportation means. • The appropriate equipment and machinery should be used when cracking or cutting stones such as the iron rod, the nail, the cutter, etc. • Workers should be made aware of not working under rocky slopes, for example, in terraces or cutting stones. • Preparation and installation of metal or wooden scaffolds with specific technical specifications. • Use appropriate safety equipment. • Ensure that workers have the necessary skills to perform the tasks assigned to them. 	    






Item	Risks	Safety Procedures	Tools
Carpentry	<ul style="list-style-type: none"> • The fall of the hand tools during work from scaffolds or ladders may cause injury to workers below the ladders or scaffolds. • Poor electrical wiring at the work site that is full of sawdust may cause fire. • The possibility of asthma, lung cancer due to inhaling wood dust for long periods. • The accumulation of sawdust and lack of cleanliness of the site may lead to fire especially in the absence of smoking prevention measures. • Not wearing appropriate personal protective equipment like not wearing safety glasses may lead to the entry of wood dust to the eye. • Poor ventilation in the carpentry site. • Poor hand tools such as a damaged hammer handle. 	<ul style="list-style-type: none"> • Ensure that skilled workers in the specialized business are selected. • Wear appropriate protective equipment. • Ensure the soundness of abrasive stone and the availability of protection of abrasive stone. • Ensure the safety of electrical equipment and the absence of cutting or cracking in electrical wiring. • Clean the place of sawdust regularly. • Adhering to safety instructions, especially smoking prevention instructions. • Train workers to act in emergency situations. 	     


Item	Risks	Safety Procedures	Tools
Aluminum Work	<ul style="list-style-type: none"> • Lack of employment experience leads to increased injury rate. • Cutting Works, and sharp edges may result in severe incisions. • Flaying small pieces on the face or eye may in some cases lead to blindness. • The fracture of the abrasive stone during cutting works and the impact on the worker's body may result in deep cuts. 	<ul style="list-style-type: none"> • Ensure the selection of skilled workers in the specialized works. • Wear appropriate protective equipment. • Ensure the safety of abrasive stone and the presence of abrasive stone's protection (guard). • Ensure the safety of electrical equipment and the absence of cuts or cracks in electrical wiring. 	  

Item	Risks	Safety Procedures	Tools
Electrical Works	<ul style="list-style-type: none"> • Electric shock • Electric touch • Fire • Impediment due to the random electrical extensions 	<ul style="list-style-type: none"> • Contracting with experienced employees • Periodical check of the wires and electric switches panel to verify that no burn shows or defects in the electric extensions • Selecting high quality electric cutters • It should not be allowed to handle electricity except by specialists. • Wearing the appropriate safety equipment • Verify that electric extensions are not passing in the workers' passages and vehicles • Verification that no inflammable materials are close or near or the water source is close to the power supply source. 	   


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Item	Risks	Safety Procedures	Tools
Working in Heights	<ul style="list-style-type: none"> • The main danger of the works implemented in high places is represented by worker's falling from high location or being exposed to injury by a falling object from top. Both cases entails fatal consequences • There are many factors that may cause accidents and injuries, including, equipment that are not subject to maintenance or inspection before using them. Or lack of training the employee on how to use the equipment. If the work place is overwhelmed by mess and tools and equipment have not been secured properly, they may easily fall from height on people exist on the bottom, particularly if an excluding place has not been constructed. • External factors may contribute such as winds, thermal exhaustion, instability of the building and the factors relevant to the factor itself, cause falling accidents and injuries. This includes places above or at or under the level of the ground, • A person need not to fall from height to be harmed or injured or deadly injury as the serious accidents may occur in heights less than the level of 1,5 . cm 	<ul style="list-style-type: none"> • Avoidance: totally overcoming of risk or hazard • To prevent: it shall be always sought to prevent fall accidents by following all appropriate preventive measures, ensuring the fulfillment of all requirements necessary to reduce distances and minimize the consequences of falling. • Use of PPE • Ensuring the soundness of scaffolds and ladders inspecting them before, during and after use, applying inspection cards in this respect. • Ensuring the security of small work equipment to avoid falling. It is sufficient to have the PPE during work in heights. 	    


Item	Risks	Safety Procedures	Tools
Painting Works	<ul style="list-style-type: none"> • Volatile vapor of chemical materials (smelling paint cans or tenor to recognize the content of the can) • Improper ventilation • Smoking, eating and drinking at work sit may cause diseases or fires.. • Infection of skin diseases due to direct contact between chemicals and the worker's body. • Falling down from ladders during work because of placing ladders in corridors and improper places. • The falling that resulted in cracks and fractions. • Sliding or defect in the ladder. • Using a ladder on soft ground. 	<ul style="list-style-type: none"> • When you stand on a leader or behind a door to do painting work be careful to close the door. • Check the ladder before using it as it may be broken. The distance of the ladder base from the wall should be at a proportion of 1:4 • The legs of the ladder should be free of paint or oil to prevent sliding. • Place the ladder to the wall and be careful to fix the legs of the ladder. • A slide preventing material should be placed at the bottom of the ladder to prevent sliding • It is prohibited to extend the body out of the ladder • No loose clothing shall be worn and work clothing should be dressed. • It is prohibited to stand on the last stair of the ladder. • When working on ladders, a safety shoes should be worn and no other type of shoes should be worn • No more than one person shall stand on the ladder. 	    


Item	Risks	Safety Procedures	Tools
Accurate Restoration Works	<p>Exposure to injury by the hazards of chemical materials by touching – smelling – breathing – burns</p> <p>Infectious exposure to viruses, microbes and germs that may exist in organic materials such as Manuscripts, mummies and wood</p>	<ul style="list-style-type: none"> • There must be safety regulations and user guidelines which must be clear to be strictly complied with such as (wearing protective clothing especially the masks, gloves, glasses and caps) • Not to touch chemicals and to deal with them and with other flammable materials extra care. • Smoking should be strictly prohibited except in smoking area away. 	


Item	Risks	Safety Procedures	Tools
Restoration works (reconstruction of Walls and construction in the buildings and walls	<ul style="list-style-type: none"> • Falling from Height - The fall of parts of a wall or ceiling on a worker or a group of workers. • Potentiality of injury with burns and eye and breathing infection while preparing gypsum and marble dust and wood 	<ul style="list-style-type: none"> • follow the instructions of the right and sufficient shorting and the safe scaffolding installation. • wearing protective clothing (coverall, shoes, helmet, protective glasses masks, gloves, glasses) 	

Item	Risks	Safety Procedures	Tools
Historical Excavation Works	<ul style="list-style-type: none"> Falling in excavations – Collapse of excavation on workers inside it. Infection by germs, bacterium / viruses Exposure to bites of rodents (snakes, scorpions, poisonous insects) 	<ul style="list-style-type: none"> Ensuring that fronts of excavation is not cracked and shorting and securing it. Wearing safety equipment (coverall, shoes, helmet, protective glasses and gloves. Provision of first aid kits at site. 	

Item	Risks	Safety Procedures	Tools
Transportation works	<ul style="list-style-type: none"> Exposure to car accidents Exposure to robbery and theft and the relevant injuries of such acts. Miscellaneous Injuries. Transfer of overloads causes injuries. The impact of transferred trashes on the road 	<ul style="list-style-type: none"> Follow safety measures while driving. Provision of proper protection for properties (antiques) or heritage sites. Follow the measures of safe transport – raising awareness of workers on the loads acceptable for lifting Organize the traffic process inside the work site 	

Item	Risks	Safety Procedures	Tools
Working in asphalted roads	<ul style="list-style-type: none"> • Injuries • Existence of trashes • Fall of workers from equipment • Traffic accidents • Spoiling of infrastructure 	<ul style="list-style-type: none"> • Placing traffic signs and indications at a safe distances from intervention regions. • Coordination with traffic authority to divert the road. • Use of control and traffic men to organize the traffic at site. • Forcing workers to wear safety equipment pertaining to traffic. • When working in improper times (at night), bending provisions shall be imposed to protect workers and beneficiaries which are prohibited at the business of SFD in general. • Developing a guide for tools , caution and the required safety when working at site. • Removal of trashes from excavation to a safe distance from the excavation region. • Using awareness tools at the edges of the excavation when deepening the excavation. • Putting caution tapes at a safe distance from the excavation region. • Seeking skillful employees who have experience in excavation. • Rain seasons and rain water shall be taken in consideration and how to divert them away from excavation region. • Regular removal of excavation trashes from the site. 	

Item	Risks	Safety Procedures	Tools
Welding and steel cutting works	<ul style="list-style-type: none"> Lifting weights over the capacity of the worker may lead to injuries in the backbone. The fall of heavy parts on the limbs of the worker or being injured by sharp ends may lead to bone damage and cut serious injuries and crushes 	<ul style="list-style-type: none"> Ensuring the appropriate experience of workers Wearing appropriate PPE Ensure the soundness of electric extension and that there are no cracks on the extensions and there are fuses in case any electric shocks. Ensure of the appropriate ventilation at work site. Compliance with safety instructions and cleanness of the work place. Ensure that there are safety systems for the cutting equipment. 	

Item	Risks	Safety Procedures	Tools
Sanitary work(foundries – sewerage) Confined spaces	<ul style="list-style-type: none"> Fall of workers Collapse of sewerage on workers Suffocation during work Rock sliding Edges collapse Drowning of workers crushes 	<ul style="list-style-type: none"> Take trashes away from sewerage manholes so no worker falls into the bottom of the sewerage. Raising the awareness of workers to use scaffolding during the construction work to avoid falling from the walls. Also, everybody shall avoid using TNT for rock excavation and instead they shall breakers. TNT use for excavation should be prohibited. Using side shorting in excavations. Not to bring down small electrical generators when excavating sewerages or wells. 	

General Risk Classification

Firstly: Physical Risks

Physical risks are the risks that workers are exposed to due to being exposed to inappropriate effects such as excessive heat, humidity, excessive cold, inappropriate lighting, noise, or exposure to increased or decreased atmospheric pressure that result in different health damages to workers.

1- Heat

This means the increase of temperature surrounding the Man beyond the tolerate limit which may cause many risks or ultimately could cause death. The amount of heat is measured by a unit called calorie which is the amount of temperature required to raise the temperature of one kilogram of material one Celsius degree.

• Acts in which workers are exposed to harmful effects of temperature are:

- Working in the open area under the heat of sun.
- Working underground in mines and tunnels.
- Working next to furnaces and fireplaces i.e in the iron and steel industry.
- Working next to boilers and in front of the ovens and bakeries.
- Working next to heaters.

• Damages affecting workers when exposed to high temperatures:

1. Psychological and neurological disorders and distressfulness. This is manifested in the increase of work errors thus increasing the possibility of injury and lack of concentration in the work.
2. Feeling tired and exhausted.
3. Thermal shock: It is a thermal stress that occurs as a result of the rapid rise of the body's inner temperature; it is very serious and must be treated immediately because would be fatal. The thermal shock can be distinguished by observing the following symptoms:
 - a. Dry skin and heat
 - b. Turbulence and / or cramping
 - c. Unconsciousness or fainting.



4. Contractions in voluntary muscles in the legs and abdominal wall.
- 5 - Heat stress which causes the expansion of blood vessels in the skin causing the blood to rush to it and increase the heartbeat, dizziness, headache, vomiting and fainting.
- 6 - The sunburn arises from exposure to high temperature degrees with high humidity, which prevents the body from getting rid of heat. The affected person feels severe headache and dysfunction. The body's temperature begins to rise and is followed by convulsions and loss of consciousness. If the affected person is not taken to hospital, death would occur.
- 7- Skin and eye inflammation occur as a result of chronic exposure to high heat.

Methods of Prevention:

- Protect workers from exposure to high temperatures.
- Exclude workers with heart and kidney disease from working in places where the temperature rises.
- introduce a shifting system, for example, the group working under the sun shall be shifted to work inside the workshop, and then move the group who was working inside the workshop to work under the sun thus reducing the exposure to heat.
- Use of personal protective equipment for workers to prevent high temperature.
- Provide large amounts of fluids and tablets containing mineral salts to compensate the loss of fluids and salts by the body due to exposure to heat.
- Perform primary and periodic medical examination to workers exposed to high temperature.
- Transfer the affected worker to a cold place and carry out the first aid in the case of a sunburn.

2- Coldness:

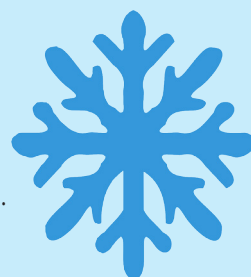
This means the decrease of temperature to the extent which affects the person in the working environment making him unable to perform his vital duties properly and exposes him to risk that may end up in death.

• Symptoms experienced by workers when exposed to high degrees of cold:

- Paleness of color and harmful effects on the fingers and limbs.
- Circulatory disorder and a sharp heart drop in heart functions.

• Methods of Prevention:

- Exclude workers with heart disease from working in cold places
- Give workers warm fluids to raise body temperature.
- Wearing heavy clothes for protection from cold.
- Transfer the casualty to a warm place and carry out first aid work.



3. Lighting:

This means increase or decrease of the intensity of lighting beyond the required limit, and then affecting the safety of the eye.



• Works in which workers are exposed to intensive lighting:

- Exposure to glare during cutting and welding operations.
- Exposure to dazzling lighting as it happens to workers in the cinema and TV halls due to the intensity of camera lighting.

• Work in which workers are exposed to poor lighting:

- Workers in mines, tunnels and underground.
- Laborers in the laboratories of photography, radiology, etc.

• Damages to Workers When Exposed to Inappropriate Lighting:

- Poor visual acuity.
- the opacity of the eye lens (cataract).

• Methods of Prevention:

- Provide lighting that is appropriate for the type of work either natural or artificial lightning. Making sure that the distribution of windows, skylights, natural light openings shall allow the homogenous distribution of light in a regular manner in the workplaces and the glasses are always clean from inside and outside and shall not be blocked by an obstruction.
- Ensure that the source of natural or industrial light shall give homogeneous and appropriate lighting and take the necessary precautionary measures to avoid dazzling lighting or reflected light.
- Wear personal protective tools such as special glasses for welding and cutting.
- Use appropriate painting colors that provide appropriate lighting.



4. Noise:

Noise exposure is one of the most common causes of health hazards faced by site workers. Noise is defined as the undesirable sound that we are constantly exposed to. It is the mixture of sounds that spread in the work environment or in public street, such sounds affect workers' activity and reduce their productivity as well as the causing them long-term loss of hearing which may result in full deafening.



• Types of Noises:

- Continuous noise (textile machines)
- Intermittent noise (sounds of hammers and explosions)
- Road noise (consecutive collisions or crashes)
- White noise (steam release from boilers)



• Jobs in which workers are exposed to the harmful effects of noise:

- Manufacture of textile, Blacksmithing and plumbing.
- Milling and screening operations for minerals and stones purification.
- Work at airports at the landing and boarding sites
- Tests of motor vehicles in the automotive industry and diesel



• **Harms that may affect workers
as a result of exposure to noise:**

- Non-auditory effects: Difficulty of communication, irritability, nervousness and lack of concentration.
- Auditory effects: It affects the auditory system and leads to deafness. These effects are divided into two types:
 - a) Temporary auditory effects: They affect the hearing strength but disappear as soon as exposure is over.
 - b) Permanent auditory effects: They occur as a result of the decomposition of sensory cells and a person suffers from what is called occupational deafness.



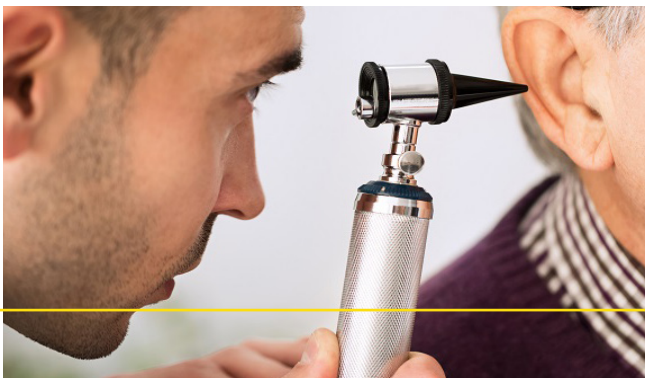
• **Methods of prevention:**

1- Engineering Solutions:

- Prevent noise originating from its source by improving the design of equipment and devices.
- Increase the distance between the worker and noise source.
- Use personal protective tools for workers (earplugs - earphones - helmets covering the head and ears).

2- Administrative Solutions:

- Reduce the time of workers' exposure to noise.
- Switch functions and tasks.
- Perform primary and periodic medical examination to workers exposed to noise to determine their level of hearing at the start of work and exclude those with hearing impairments from working in noisy places.
- shifting individuals for specific periods of time.



5- Atmospheric Pressure:

It means the variation of pressure on human body as a result of staying in a specific atmosphere or as a result of doing specific works like working inside tunnels or diving activities.

• Jobs in which workers are exposed to varied pressure:

- When rising to the upper atmosphere in the aircrafts.
- When digging the trenches and tunnels into deep depths.
- When doing diving work to deep depths.

• Methods of prevention:

Minimize the pressure effect by gradual ascending of worker from the trenches and tunnels to controlled pressure rooms where the worker shall stay for longer periods as the pressure goes down till reaching the normal atmospheric pressure.

6. Moisture:

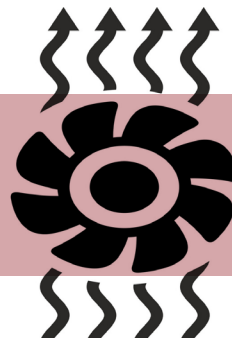
Moisture may be a key factor in some industries such as textile industry. Some industrial processes such as dyeing, tanning, etc., where fluids may be much and the resulting moisture may cause respiratory diseases, rheumatic and neurological diseases due to increased moisture in the atmosphere or due to the wetness of the body or clothes.

• Methods of Prevention:

- With respect to the moisture in the atmosphere, it shall be ensured that its percentage in atmosphere does not exceed the safe limit.
- For the moisture resulting from wetness, it shall be disposed off by getting rid of fluids and can be reduced by providing workers with impermeable clothes such as gloves, clothing and rubber boots.

7- Ventilation:

- Suitable ventilation should be provided in workplaces, whether natural or artificial.



Secondly: Engineering Risks

1 – Electricity Risks:

Electricity is one of the most important sources of energy and the driving force. It is used in most aspects of life. However, despite the many benefits of electricity, it has some risks on humans and materials if it is not used according to the proper technical regulations and according to safety instructions. Any negligence in taking safety precautions in respect of electricity may cause serious accidents to individuals and facilities. Before we refer to the electrical hazards **we must know that there are two types of electricity which are as follows:**

1 – Current Electricity (Dynamic):

It is that electricity that is produced by electric generators and batteries of different types. in form of an alternating current (AC) or direct current (DC). The electrical current passes in specific circuits such as wires and cables.



2– Static Electricity:

It is the electricity produced as result of friction of two non-conductive objects or one conductive object with another non-conductive object. It is generated in the form of different charges that accumulate on the surfaces of these objects. Examples of instruments and equipment that generate this type of electricity are mobile belts, conveyors belts, electric mixers in the fields of paints manufacturing, printing inks, in the movement of some liquids inside pipes, during the loading and unloading of petroleum materials as well as due to the friction of some types of clothing made from artificial threads in the human body.

• **Electric risks are divided according to their impact into two main parts:**

1 – Risks affecting human:

As a result of contact with parts of the electric current while standing above the ground or touching parts of a building and if the electric circuit is closed the electrical current passes **resulting in the following:**

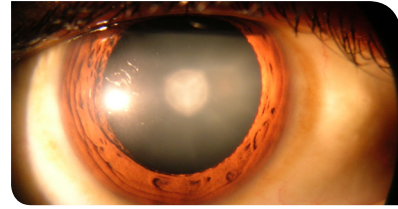
a– Electric shocks: may lead to death and the intensity of the trauma suffered by humans varies from one person to another.



b- Burns: Their severity varies from minor burns resulting from weak currents to severe burns caused by high pressure currents which lead to the destruction of most of the skin layers.



c- Eye dazzle: electrical shock results in electric shock then opacity in the lens occurs as a result of the entry or flow of direct current – and when the eye is exposed to electric flash an inflammation occurs; this happens to the electrical welding worker (during electrical welding).



2- Risks affecting facilities and materials:

In this case, explosions, fires or damages of equipment due to the misuse of electricity.

• Causes of electrical accidents:

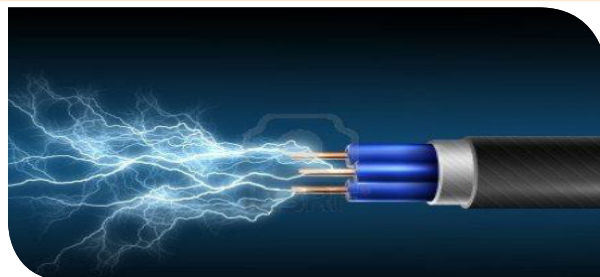
- Overload, circuit shortage
- Use of damaged electrical equipment or tools.
- Misuse of equipment and electrical tools.
- Touching electrified parts.
- Not connecting the devices and equipment to the ground (earthing).



• Preventive Measures against Electrical Risks:

1. When installing electrical wiring for lighting purposes, it shall be in insulated pipes from the inside and shall not be left uncovered so that the moisture does not seep or affect the heat and lead to electric shortage.
2. The dangling wire should not be tied to shorten it, or drive nails on it to bring it closer to the walls. For the purposes of such shortening, the wire shall be cut according to the required length size.
3. The wires and cables used in the electrical connections shall be suitable for the current passing through them and metal structures of the electrical devices shall be connected to the ground.
4. Not overload any electric socket more than its limit or when any keys or electrical connections getting hot.
5. Connect equipment and devices to a suitable static ground assembly for discharging any electrical charges as soon as they are generated.

6. Warning instructions should be placed next to electrical current and conductors indicating the amount of voltage passing through these devices, especially in devices that carry high pressure current. These instructions should be clear so that they can be read easily.
7. Persons in charge of maintenance of electrical devices shall be technical workers. No repairs or installations shall be carried out for the electrical devices unless it has been verified that no electrical current passes through them and they are connected to the ground. The appropriate personal protective equipment shall be used.
8. Periodic maintenance of the electrical appliances shall be carried out. When any damage or any danger is detected, the damage shall be repaired and the causes of the risks shall be removed immediately.
9. Do not expose the electric wires covered with rubber or plastic to the sun or heat to avoid damage the rubber if exposed for a long time.
10. Do not paste colored papers or tapes on the wires in the celebrations or for the purpose of decoration since they can capture (catch) fire from any spark or as a result of contact with a hot lamp.
11. Sockets box should be allocated for each set of connections and a n electric breaker to cut off the current in case of emergency. The automatic circuit breaker should be used to disconnect electricity in case of electrical shock.
12. The keys used within the chemical stores shall be of the isolator type specified for this purpose.
13. The power supply should be cut off from all installations in the case of evacuation of buildings and shops after the end of the work and when leaving the house for a long time. In case of travelling, the electricity must be disconnected from the house.
14. It is strictly forbidden to connect or directly fix electrical switches on walls, ceilings or any material connected to the current because there is always a strong possibility that the wires behind the keys are not well insulated and exposed to moisture and as such may result in a short circuit and thus cause a fire.



2- Mechanical Risks:

Mechanical risks are all those risks that human is exposed to in the workplace like collision or contact between his body and a solid object occurring during the motion of one of them. A worker who falls down on the ground is in a motion case while the ground is in a standing posture. Also, the ash scattered from the lathe or bunches frequently causes injury to the workers The contact of a part of the workers body with a moving part may be a direct cause of injury such as the insertion of the fingers between the gears or the contact of the worker's clothing with a rotating part of machines such as axis which pulls the worker to the machine causing injury.



• Means of protection for equipment and machinery:

1. Barriers
2. Devices
3. Protection at site and safe distance
4. Supply the equipment with raw materials in an automatic manner (automatically)
5. Different and various protection methods

• Preventive measures to avoid accidents and injuries of machines:

- Inspect the machines before use and ensure their validity and suitability before use.
- Training workers on the correct and safe methods on the use of machines.
- Provide appropriate personal protective equipment for each operation and each machine.



4. Fire hazards:

Usually fires start on a small scale because most of them arise from small sparks due to negligence in following the methods of fire prevention, but they quickly spread if not fought. **These risks are divided into three types:**

- **Personal risk:**

(Hazard to individuals), which are the risks that expose the lives of individuals to injuries, which necessitates the provision of measures to avoid hazards when fire breaks out.



- **Destructive risk:**

(Hazard to property) which are fire hazards that affect the components and contents of the building causing damages to them.



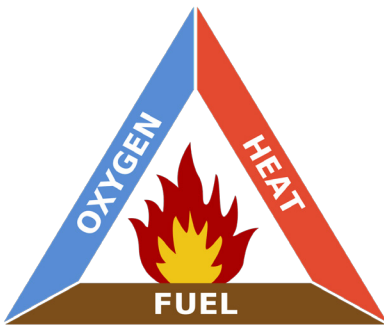
- **Exposure risk:**

(hazard to the neighborhood), which are the risks that threaten the nearby locations of the fire and therefore called external hazard.



- **Combustion process (ignition theory)**

It is that chemical phenomenon that occurs as a result of the combination of the flammable substance with the oxygen in the air due to the effect of temperature which is different for different materials. The degree of the temperature for each material is called (point of ignition). Thus, it is clear that for a fire to occur three elements shall be available and that is what is called the ignition triangle.



- **Flammable material:** it is called Fuel which is any flammable material in the three forms solid, liquid, and gas.

- **Oxygen:** oxygen is available in air (19- 21%).

- **Temperature:** It is the temperature reaching the degree necessary for ignition. The source of the ignition temperature is spark, flame, friction, sunlight, chemical reactions ... etc.

- **The way heat is transferred:**

Objects exchange heat with their surroundings, ie, their temperature in normal conditions is not constant, ie, the heat is transferred from the hot object to the object which has lower temperature. **That occurs through one of the following means:**

- Contact and conduction.
- Conveying currents
- Radiation

- **Fire extinguishing methods (fire theory):**

Fire extinguishing theory is based on breaking one or more of the three aforementioned fire-related factors that cause fire breakout. The fire theory is based on breaking the ignition triangle by removing one or all of its sides. **There are three methods for extinguishing fires. They include the following:**



Fire Cooling

Which is reducing the temperature of the flammable material by using water that is thrown on the fire and depends mainly on the ability of water to absorb the heat of the substance that is caught on fire.



Fire stifling:

The fire is choked using barrier that prevents air oxygen from reaching it by closing the ventilation outlets and openings in the fire area to reduce the oxygen content in the air to the percentage that does not allow the ignition to continue or to cover the chemical flammable material, or by replacing the oxygen with water vapor, carbon dioxide or dry chemical powders or halogen fumes.



Starving the Fire:

The fire is starved by limiting the amount of flammable materials that is by moving the goods and materials available in the fire place away from the impact of heat and flame, for instance withdrawing flammable liquids from the tanks in which the fire is located, moving the goods from inside the stores at risk of the heat of the fire or removing the plants and trees in the agricultural areas to stop the spread of fire.

• **Fire classification:**

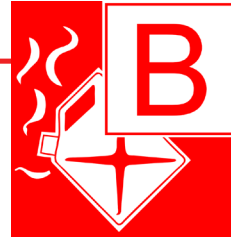
1- Class (A) Fires

This fire grows or is formed in solids that are often of a porous nature (carbon compounds) such as paper, wood, fabrics and other plant fibers.



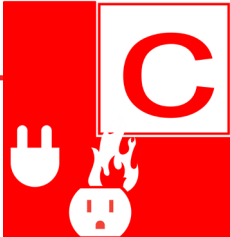
2- Class (B) Fires:

Fires that occur with flammable liquids.



3- Class (C) Fires

The fires that occur with electrical equipment and the electrical switches panel.



4. Class (D) Fires

These are fires that occur in certain metals such as magnesium.



5. Class (E) Fires

They are fires that occur in cooking oils.



- **Fire Extinguisher:**

It is a cylindrical tool, containing a material that can react with fire so that fire can be extinguished.

- **Specifications of a good fire extinguisher:**

- 1- Must be approved by the international standards for fire extinguishers.
- 2 - Ensure its suitability for use, and its suitability to the place where it is located.
- 3 - Ensure that they are sufficiently full.
- 4 - Training to handle them, and be ready for use in the event of fire outbreak.

- **Types of fire extinguishers:**

There are many types of fire extinguishers, which are used depending on the condition, for example fire extinguishers of buildings differ from those used in cars.

The most important types of fire extinguishers:



1. Carbon dioxide (CO₂) Extinguisher:
It is a fire extinguisher that relies mainly on carbon dioxide to extinguish the fire, and is a suitable extinguisher for fires caused by electricity.



2. Foam Extinguisher:

It is used to extinguish category (B) fires (due to benzene, oils and kerosene) that break out from liquid and solid materials, and are not used for fires caused by electricity because they are good electrical conductors, putting the person at risk.



3. Dry Powder Extinguisher:

It is the most common type and is used for all types of fires.

Guidelines of Fire Prevention and how to act in case of fire

The personnel should be aware of the actions to be taken to prevent fire and how to act when a fire occurs. This includes the procedures of advertising and notification of the dangers of fire, evacuation rules and initial fire control measures until the arrival of the firefighters. Therefore training of all the personnel on these actions constitutes a duty to ensure that they carry out this duty when fire occurs

1. Regular inspection and checking of premises: Regular inspections of all work sites, even if all buildings are properly designed and equipped with fire protection requirements, are the most important work of the Occupational Safety and Health Committee. **The inspection should include the following cases:**

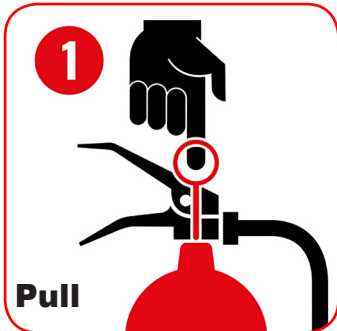
- Storage operations, especially flammable materials or materials that help ignition or materials that are self-ignition.
- Sources of sparks and other thermal sources.
- Ensure the availability and safety of fire extinguishers and their suitability for operation.
- Ensure the implementation of instructions for hygiene and collection and disposal of exhausts and others.

2- Cleaning, smoking prevention, carrying matches, lighters and proper storage

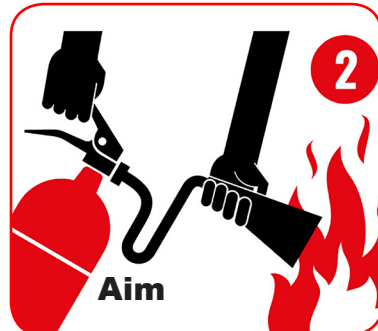
- Smoking should be strictly prohibited in workplaces where there are flammable materials.
- Placing signs (no smoking) in smoke-free areas and strictly implementing these instructions by supervisors, visitors and workers.
- It is prohibited to carry matches and lighters in places where smoking is prohibited.
- Do not store flammable materials in open or glass containers. (Quickly dry up such substances and do not store them near heat sources such as fireplaces and heaters).
- Always be sure not to keep any papers or debris on roofs, in gardens or around buildings because they are easily ignited by any spark touching them.
- Be sure not to let matches or cigarette residues ignited before throwing them in the designated containers.



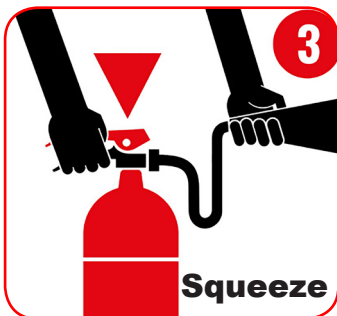
How to Use the Extinguisher (PASS)



1- Remove the safety nail



2- Steer and point the extinguisher hose towards the fire base



3- Press the extinguisher piston



4- Move the hose right and left on the flame base

Basic procedures when extinguishing fires

- Notify your colleagues that there is a fire before starting extinguishing the fire.
- Use the fire extinguisher suitable for the fire type and make sure of its readiness through the pressure standard (gauge) of the extinguisher.
- When fighting the fire in a room always stand in a posture with the door of the room behind your back.
- Stand at an appropriate distance from the fire.
- When fighting fire in open places, put your back in the direction of the wind so that no smoke or substance of the extinguisher flies on you during extinguishing the fire.
- Always steer the substance of the fire extinguisher towards the fire base and fight the fire from right to left or from bottom to top
- If the fire is out of control, leave the place and abide by the emergency plan for such cases in your workplace.

Parts of Fire Extinguisher





Thirdly: Chemical Hazards:

Chemicals play a significant role in the lives of individuals and peoples so that the luxury and progress of peoples is measured by the discovery of chemicals and their use in various aspects of life. The use of chemicals is double-edged weapon, if it is used in the best way, it reflects the shining aspect and becomes useful to humanity. If these chemicals are misused, then they reveal the ugly face that causes destruction to humanity and wastes the lives of individuals.

Chemicals are found in the working environment in one of the following forms:

- Gases and vapors.
- Soil (organic-inorganic).
- Fluids (acids – alkali – solvents).

Therefore, chemicals are considered to be the most dangerous risks faced by human beings for many reasons, **including the following:**

- The chemicals take more than the form as they exist in the forms (liquid – gas – solid).
- Chemicals are able to enter human body quickly through (respiratory and digestive system and skin contact).
- The effect on the body organs: chemicals interact with some parts of the body and therefore they badly affect body organs such as Lung fibrosis and septicemia.
- The degree of severity that is caused by this substance in the body may occur immediately after entering the body or occurs after a period of time.
- Some of these substances have no taste, no color, no smell and therefore it is difficult for the human to feel them or discover them quickly.
- The rapid spread of these materials from their places expands the base of their impact and damages.
- The presence of these substances in the body leads to imbalance and affect the efficiency of some the body organs.
- they may have impact on some work equipment such as rust, corrosion, explosion and self-fire.



Personal Protective Equipment (PPE)

PPE is protective equipment and tools used to protect the worker from injuries and risks that may surprise him during the working hours at the site or the workshop.

In fact, personal protective equipment (PPE) is precautionary tools that minimize or reduce potentiality of a studied or experienced risk. So, wearing or using them with responsible awareness and in a proper manner ensures that risks are minimized.

Personal protective equipment is used when there are cases of possible injury, absorption, inhalation or direct contact.

1. Risks of Operations such as: roads paving, paints coating -Ceramics – construction works
2. Environmental risks such as: smoke – dust – gase
3. Chemical hazards.
4. Radiological risks.

5. Mechanical risks such as: sharp objects or volatile part

Statistics on a wide range of occupational injuries in different workplaces show that a large proportion of such injuries among workers are in the head, eye, face, foot and hands. The following are the main reasons and factors behind these injuries:

1. A large proportion of workers do not wear PPE.
 2. Those who wear certain types of protective equipment are not fully protective.
- Studies showed that 70% of the workers who suffer hand injuries have not worn the necessary gloves, and 30% of the remaining injured were wearing gloves but they were injured because the gloves were either inappropriate or damaged.

• **The following were noticed:**

- Helmets are worn by only 16% of the proportion of workers with head injuries.
- 1% of the workers were wearing a face protection shield and yet suffered facial injuries.
- 23% of workers with foot injuries wore protective shoes.
- 40% of the workers were wearing eye protection tools but were injured in the eye.



Important note:

1. Personal protective equipment shall be used when other procedures such as (engineering-administrative) fail. Therefore, PPE is considered necessary preventive measure.
- 2 - Engineering control procedures are particularly important for the protection of hearing and breathing which have specifications that require workers to take all preventive control measures.
3. The type of risk must be determined in the workplaces first and then the protective equipment to be used should be identified.
4. Good quality protective equipment should be used.
5. Personal protective equipment shall be worn in a manner appropriate to the person using them.
6. All employees who are required to use personal protective equipment (PPP) must be trained in the correct manner for the use of this equipment by their direct supervisors.
7. In the case of non-use of personal protective equipment, they shall be placed in plastic bags and kept in a Clean condition
8. The use of PPE requires knowledge of hazards and good training for staff who should be aware that PPE alone does not reduce or prevent risk.

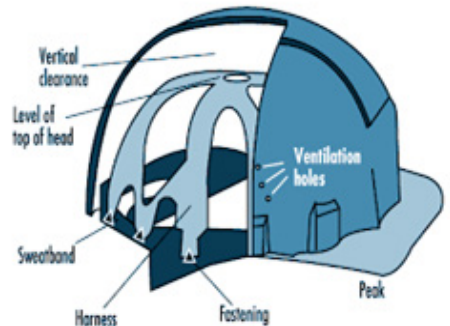


Personal Protective Equipment (PPE)

1- Head Protection:

The scalp may be exposed to puncture wound, bruises, which can occur often in the forehead (because they are always at risk) and their occurrences are 86% and 26%. Concussion may occur as a result of falling objects on the head.

- A hard helmet treated with plastic is used to protect the head and resist heavy shocks without breaking and also resist penetration by falling objects.
- The helmet is fitted inside with a strap and a plastic lining that is adjusted to fit the size of the head. The benefit of this lining is that it absorbs the shock of the fallen objects on the helmet from outside, when there is a safety distance between this lining and the body of the helmet.
- Before using helmets their appropriateness must be verified and that there are no cracks or shocks in them and lining is not torn.
- Some types of helmets are made of aluminum. It is prohibited to use such type of helmets when working with electrical devices.



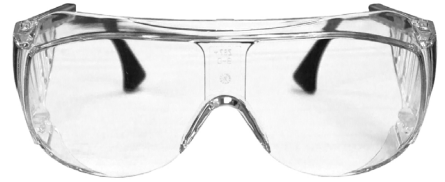
Head Risks

1. Falling equipment or collision.
- 2- Electricity risks.

2 – Eye and Face Protection:

To protect your eye and face from chemical and mechanical hazards, you must wear Safety Goggles, Safety Glasses, or Face Shield.

Below are the examples of the jobs or works that require the use of eye and face protection equipment:



1-Chipping / Grinding



2-Chemicals Handling



3- Furnaces Operations



4- Dust Generation



5 -Welding Operations



In this type of protective equipment eye and face protective shield is mostly used. **This shield or this protection shall be:**

1. Convenient to an acceptable degree.
2. Tight
3. Dependable.
- 4- Can be Cleaned and disinfected
5. Be in good condition.

3- Ear Protection:

All workers working in high noise areas with a severity exceeding 85 db should wear ear protection equipment so as not to gradually lose their hearing sense due to the long period of exposure to this noise. They may even reach a point where they lose their hearing permanently. The officer of the Occupational Safety and Health Department shall be responsible for measuring the noise level in the workplace. In light of the measurement results, the appropriate ear protection equipment is selected.



Ear protection equipment:

1. Ear Muffs:

It covers the outer ear and functions as a sound barrier. It provides ear protection from the risk of high noise as it reduces the noise intensity by 15-35 dB and it is used when the noise level in the workplace ranging from 90 to 120 db.

2. Ear Plugs:

The ear plug is placed inside the ear canal. It is made of plastic or rubber and it can reduce noise reaching the ear ranging within 20-30 dB. It is used in places where noise intensity is within 85-115 dB.

In some places where the noise intensity is very high up to 130 db, the earplugs are worn with ear muffs. So the noise in this case is reduced by 50 db.



4. Hand protection:

In most work environments, hands and arms are exposed to burns – incised wounds – electric trauma – chemicals. Safety gloves are used to protect hands. **There are several types of these gloves as follows:**

1. Protective gloves made of cloth and tanned leather used to protect hands from shrapnel and sharp objects when handling materials with sharp ends.

2 - Protective PVC OR LATEX Gloves are used to protect hands during the handling of chemicals such as acids and alkali as well as NEOPRENE gloves.

3. Heat Resistance Gloves are used when working on hot equipment such as steam pipes or to hold hot glass containers in the laboratory and during welding operations.



5. Foot Protection:

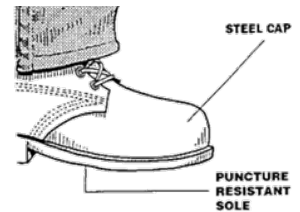
Statistics on a wide range of foot and leg injuries indicate

- 66% of the injuries did not wear protective shoes.
- 33% wore normal shoes.
- 85% of those who wore protective shoes were injured things that collided with the unprotected parts of the shoe
- There are liquid minerals / hot surfaces / wet surfaces / sliding surfaces so workers should use protective shoes or shoe-neck.



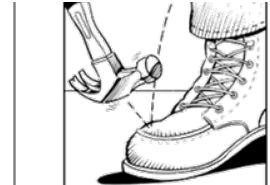
Important Note:

- Protective shoes must be strong and able to withstand shocks, and these shoes must also be in conformity with the specifications described in the specifications manual.



• Types of safety shoes:

- Leather safety shoes, the front of which is covered with steel to protect the fingers from the danger of falling things. There is also a piece of steel between the sole to protect against the risks of penetration by sharp materials such as nails and these types also prevent slippage in the workplace.
- Long rubber safety shoes to work in places that are always wet. Such safety shoes are used by firefighters.
- Rubber safety shoes designed for electrical workers, providing them with great protection against electric shock.
- Rubber safety shoes which are antistatic and are used in places with flammable materials so that static electricity charges do not cause fire in these materials.



6. Respiratory Protection:

Various breathing devices are used to enable the person who wears them to work in places where oxygen is insufficient to breathe and cause danger to life, or places with toxic gases or soil that are harmful to health.

The appropriate respirators are selected for work after identifying the nature of the substances to which the workers are exposed and the degree of severity, and after the necessary measurements of the oxygen ratio are conducted.

Types of Respirators:

Breathing apparatus is divided into two parts:

- 1- Air-Supplying Respirators
- 2- Air-Purifying Respirators

1- Air-Supplying Respirators:

Examples of these respirators is the Self-contained Breathing Apparatus (SCBA) which consists of a cylinder of compressed air that lasts for an hour or half an hour (depending on the size of the cylinder) and a pressure regulator is fitted on it that makes air exits through a hose connected to the protective mask. The cylinder is carried on the back to move from place to another. On the cylinder a whistling device is installed to alert the user five minutes before the air finishes.

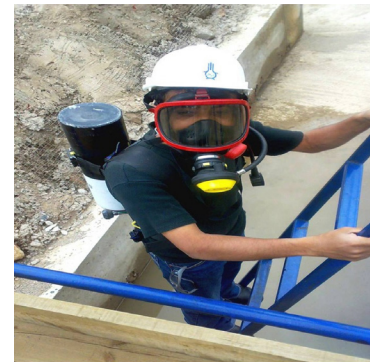
2- Air-purifying Respirators:

There are Five (5) types of these devices:

- 1- Respirators for fumes and gases.
2. Breathing apparatus to catch dust.
- 3- Breathing apparatus for fumes, gases and catching dust.
- 4- Respiratory apparatus for toxic gases
- 5- Air-purifying respirators with fan (suction fan).

• Notes:

- These types of respirators can purify the air that humans breathe from hazardous substances, but cannot supply the air necessary for breathing.
- These devices are never used at places where the oxygen content is less than 19.5%.
- These devices are never used at places where the concentration of toxic substances is not known or when the concentrations of these substances are high enough to reach to the level which is immediately dangerous to life or health (IDLH).
- It should be ensured that the type of filter used with these devices and that it suits



the risk in place so that the filters are not used for dust in places where there is toxic gases and vapors and vice versa.

- Filters are discarded after expiring. If the filter is opened and used, the use date is recorded and disposed of after six months.
- If air purifying respirators are used, it is recommended to leave the place immediately

in the following cases:

- 1- In case of difficult breathing.
- 2 -In the case of smelling or tasting of the materials in place.
- 3- In case of feeling dizzy.
- 4 – In case the device is damaged.

• Fit Testing

After testing the appropriate respiratory apparatus for the hazard type in the workplace, a test should be carried out to ensure that this device is suitable for the person who will use it and it should be ensured that toxic substances

are not entered through the Seals. These tests are as follows: (these tests should be conducted before entering the workplace directly)

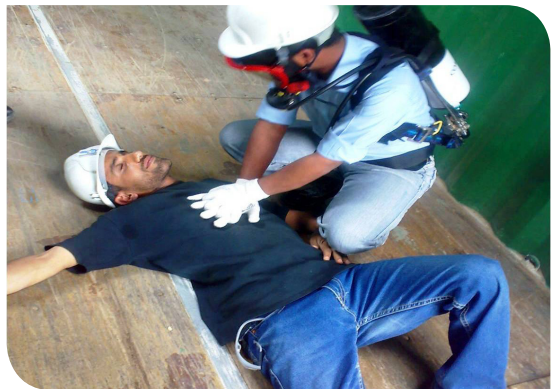
1- Negative Pressure Testing

This test is conducted before entering the workplace that is contaminated with toxic and dangerous substances. This shall be done by closing the air intake openings in the filter with the palms of both hands (as shown in the figure). Breathing starts until the mask begins to collapse then breathing shall be stopped for 10 seconds.

If the device remains in the same state of collapse, this verifies that the device is well sealed.

2-Positive Pressure Testing

- The air outtake openings shall be closed.
- Quietly start exhaling to generate a small amount of positive pressure inside the mask.

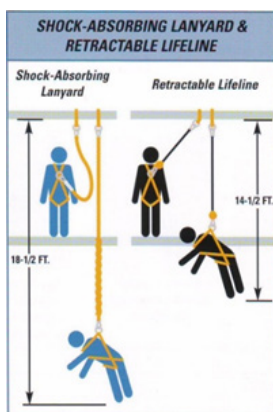


- The mask is well sealed if there is no leakage of air between the face and mask.
- In the event of any leakage of air, change the position of the mask on the face and seal it well and then perform the test again (as shown in the figure)



7- Protective Belt and Life Line:

- Safety belts and rescue lines are used when working in high places in order to secure the worker from the risk of falling. Currently parachute belt is used instead of using the normal belt.
- In the case of working in confined space or in tanks, a special belt “safety harness” and safety line are used, so that the worker can be egressed in a straight position that does not expose him to injury when he is egressed taken out in case of emergency.



Risks of construction works and their prevention

Excavation Works

Excavation and soil works are among the most important construction works. Excavation and filling operations involve excavation, reclamation, replacement and attribution in so-called soil works.

When drilling and other work, the soil condition varies greatly, and no soil of any nature can be relied upon to support its weight or its heaviness by itself for any period of time whether this period is long or short.

The Occupational Safety and Health Administration (OSHA) has issued the first code and specifications for excavation works in 1971 to protect workers from the risks they may be exposed to in the excavation works, the most important of which are collapses.

■ Risks of Excavation works

- Workers fall in the excavation as a result of walking near the edge.
- Collapse of the excavation sides on the workers and equipment.
- Collapse of service lines on the sides of the excavation.



- Collapse of buildings adjacent to the sides of the excavation.
- Injury of workers inside the excavation area by the excavation equipment and machineries.
- Injury of workers with burns or other injuries due to the use of explosive materials.



- The suffocation of workers with toxic gases in the excavation areas.
- The fall of citizens, children or cars due to the lack of special alarm signals at night.
- Injury of employees due to not wearing appropriate safety equipment
- Injury of workers or equipment by electrification due to the presence of a nearby electrical source.



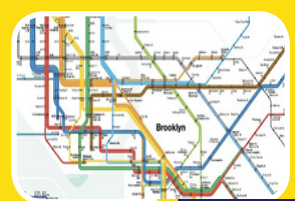
■ **General Requirements Before Starting Excavation:**

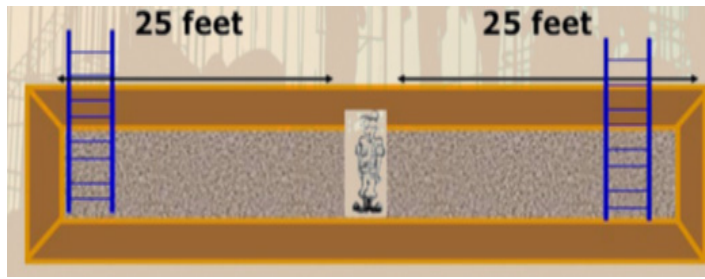
The following factors shall be taken in consideration when planning any excavation works:

- Traffic conditions near the excavation site.
- Buildings and facilities adjacent to the drilling site.
- Soil type and level of groundwater in the excavation area
- Surface, underground and buried services (buried utilities).
- Weather Conditions.

■ **The Requirements before Starting Excavation: The following instructions shall be followed:**

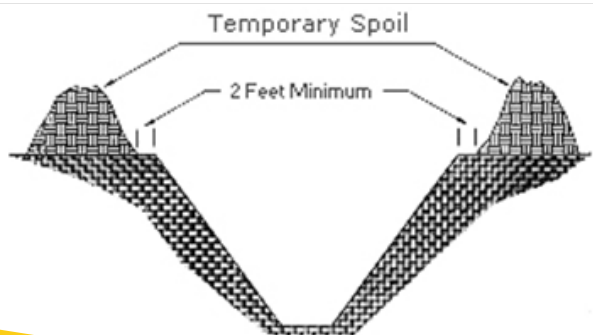
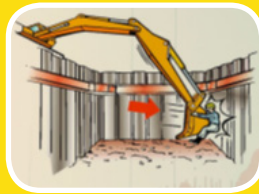
- obtaining complete information related to all services that exist under (beneath) the excavation site (for example, electrical wiring, pipelines, telephone wires, sewage pipes). The location of these services shall be specified with the utmost precision. The site's engineering drawings or drilling of the testing trenches shall be referred to.
- Appointing an authorized and reliable person who performs daily inspection on the excavation area to ensure that there are no collapses at the edges of the excavation, failure of the means of protection, or lack of unsafe working conditions at the excavation site.
- The excavation area must be bulkheaded or fenced off to prevent the fall of individuals, equipment or hazardous materials, and warning lights should be placed at night
- Safe distances must be left between workers during excavation so that no worker is injured.





■ In the case of drilling to the depth of 125 cm (4 feet) or more, the follow instructions **should be followed**:

- The pit must be equipped with safe corridors and stairways so that the workers distance to reach the ladder shall not exceed 25 feet (6 and 7 meters) to be used by the workers while lifting the sand outside the pit.
- The accumulation of sand from the pit must be prevented on either side of the excavation, and the output of the excavation should be kept at a distance of not less than 60 cm away from the edge of the excavation, to avoid its falling into the pit and cause injury to the workers inside.
- The height of the excavation output on both edges of the pit should not exceed one-and-a-half of the distance the output of the pit and the excavation (Not more than 90 cm).
- Workers must be prevented from working in a pit where an automatic machine is working nearby.
- Heavy equipment should not get close to the edges of excavation works directly or to pour any materials.
- The percentage of toxic and flammable gases is to be checked on daily basis before the start of excavation to ensure that these substances were not accumulated inside the pit.



■ Types of Soil:

Solid Rocky Soil:

It is solid soil whose sides can be left in the shape of right angle maintaining its strength throughout the excavation operations (Granite rocks) and excavation angle is up to 90° .

- Soil Type A:

It is a soil that has a bearing capacity pressure of 1.5 tons per foot square (loamy soils) and excavation angle is 53° .



- Soil Type B:

It is a soil with bearing capacity of more than 0.5 per square foot and less than 1.5 tons on the foot square (clay soil) and excavation angle is 45° .



- Soil Type C:

It is a soil with a bearing capacity of less than 0.5 tons per foot square (sandy soil). The excavation angle is up to 34° .



■ Excavation Protective Systems:

There are three basic systems for protection during excavation or trenches works:

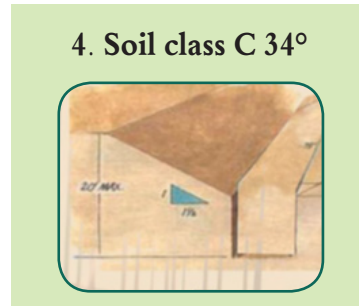
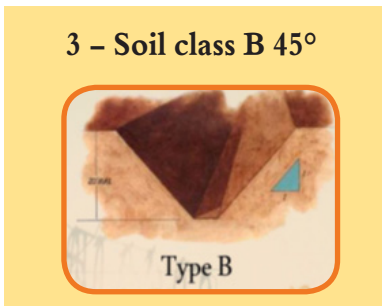
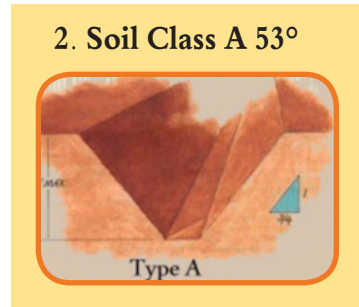
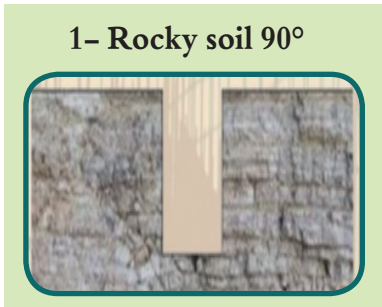
1. Sloping and Benching Systems.
- 2- Shoring System.
3. Shields System.

Protection systems or prevention systems must have the ability to resist without failure all loads that will occur or are likely to occur.

1 – Sloping and Benching Systems:

a) Sloping systems:

The maximum slope allowed for excavation works that are less than 20 feet (6 meters) depending on the type of soil and the horizontal angles of slope are as follows:

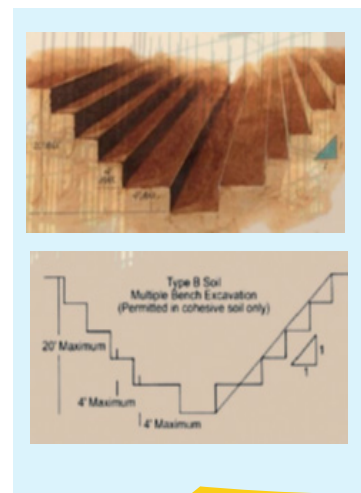


b) Benching System

There are two types of benching system:

- Simple Type.
- Multiple Type.

The soil type determines the ratio of the horizontal length to the vertical length of the excavated side in the form of benching. As a general rule, the bottom of the excavation should not exceed the vertical height of 4 feet for the first bench, while the following benches may reach a height of 5 feet (1.5 m) for soil of type (A) and to 4 feet (1.2 m) for soil type (B) and up to 20 feet depth for excavation.



c) Shoring Systems:

The shoring system is a system of support for the faces of excavation. It is used to prevent movement of soil or underground facilities or foundations. The shoring method is used when the site or the excavation depth has a slope or inclination to its maximum allowed limit is not practical. The shoring system consists of columns, slabs for horizontal joining and reinforcement supports and slabs for the excavation walls.

There are two basic types of shoring:

- Wooden blocks.
- Aluminum.



1-Hydraulic shoring

It is a prefabricated supports or horizontal bonding tie slabs made of aluminum or iron. The hydraulic shoring system gives a safety advantage over the wooden block system as the workers do not need to go down to the excavation to install or remove the hydraulic shoring.

All types of shoring are installed from the top to the bottom and removed from the bottom to the top.



2. Pneumatic Shoring:

It works in a similar way to hydraulic shoring. The only difference between them is the use of air pressure instead of the hydraulic pressure.

One of the disadvantages of this system is the necessity of providing air compressor in the site.



d)Shielding Systems:

1. Trench Boxes:

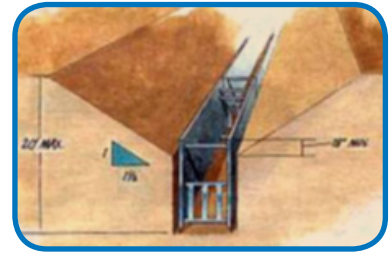
It is different from the shoring system – or shoring the full height support of the sides – or the shoring of the trenches sides. The boxes system is mainly to protect workers from any collapses of the excavation and other similar accidents. In this system the gap between the boxes and the side of the excavation should be as small as possible. Also, the gap between the boxes and the side of the excavation shall be re-filled to prevent the side or lateral movement of the box.



2- Combined Use:

Trench boxes are used in open areas – but they can also be used together or combined with sloping gradient system for sides or a benching system for the excavation sides.

The box must be extended at least for 18 inches higher than the surrounding area if there is a slope towards the pits. This can be achieved by providing a benching next or adjacent to the boxes.



Demolition works

Before starting the demolition works, an engineering survey of the building or facility must be carried out by a qualified engineer to determine the layout of the building, the state of facility, the floors and walls, the possibility of sudden collapse of any part of the building and the existence of other potential or actual demolition risks.



■ Risk of Demolition Works

Firstly: Health Risks:

a. Exposure to lead:

The risk of lead substance is generated in the form of toxic dust or toxic fumes caused by the cutting and burning of steel work coated with materials which include lead as one of their ingredients. Therefore, before the demolition works begin, it is necessary to obtain sufficient information on this matter. If there is high possibility that workers will be exposed to high concentration of lead exceeding the limit, appropriate protective equipment should be provided.





b. Exposure to Asbestos:

Dust and asbestos fibers are generated when any demolition work involving layers of paint in the form of asbestos, thermal insulation, fire-resistant partitions or cement asbestos sheets. Materials containing asbestos or materials which include asbestos in their composition shall be removed by specialized contractors before starting any demolition work. All precautionary measures, including the use of appropriate respiratory protection equipment (dust masks with highly efficient filters).

c. Exposure to Dust Containing Silica:

Exposure to soil containing silica may endanger workers at demolition sites if they are exposed to high doses of such dust. Therefore, it is necessary to use proper protective equipment (respirators) while working at demolition sites.

d. Exposure to Polychlorinated Biphenyl (PCB):

PCBs are toxic substances used as fluid filler for electric insulators in electric transformers and condensers. They are still used in some cooling and heating equipment. Therefore, it is necessary to ensure that they are present or not before demolition and take all necessary measures and means for disposal and the use of PPE before starting demolition works.

Secondly: Access to Confined Spaces:

Tanks, wells or sewers may contain poisonous gases or vapors. Also, the oxygen level is low within these confined spaces, which poses a great risk to the lives of workers when they enter them. Therefore, it is necessary to ventilate these places and test the atmosphere before allowing workers to enter or before the permitting the demolition (the need to use the appropriate access permits and the use of all necessary precautions and appropriate rescue procedures).



Thirdly: Noise:

The use and operation of various demolition equipment produce and cause high noise levels that may exceed the average level that is allowed to be exposed to within eight hours per day (90 db). Therefore, tasks that may expose workers to doses of noise above the allowable level should be specified and workers should be provided with suitable ear protection kits that reduce noise to the allowed limit as well as the need to install appropriate signs to warn against noise hazards and alert employees to the need to use PPE.

Fourthly: Vibrations:

Air compressor Equipment produces vibrations of higher rates than it is permissible causing workers to be injured with stiffness of the fingers. These risks can be reduced by using vibration resistant gloves and selecting equipment that produces less vibration.



Fifthly: Work Environment Risks:

- 1- The collapse of the roofs and walls on the workers.
- 2 - Getting stuck or trapped by the falling materials from the top.
- 3 - Injury of the face, eye and body with volatile objects during work.
- 4 - Stumbling with the remains of materials resulting from demolition and breaking.



■ Requirements before Starting Demolitions:

- Not to initiate any demolition works unless it is verified and ensured that safety procedures and equipment are available.
- No demolition work is initiated unless no objection certificates (NOCs) are obtained from all service authorities (electricity, water, roads, sewage, traffic etc.).

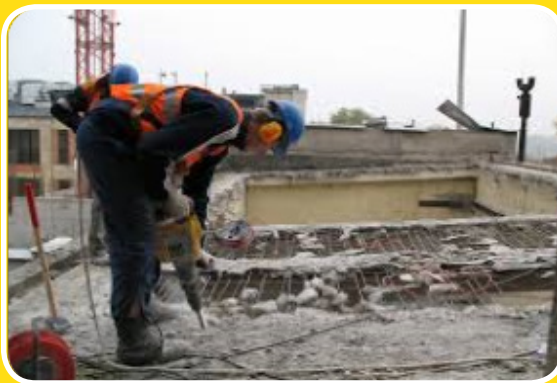
Before starting the demolition works, an engineering survey of the building or facility must be carried out by a qualified engineer to determine the layout of the building, the state of facility, the floors and walls, the possibility of sudden collapse of any part of the building and the existence of other potential or actual demolition risks.

- Any adjacent building where workers, employees or properties exist and may be at risk should be inspected in the same manner, taking into account the type of neighboring buildings such as hospitals where noise, dust or vibrations can impose adopting a specific method of demolition.
- An initial survey should be carried out to find out if there are any asbestoscontaining materials in the old buildings as well as lead and Polychlorinated Biphenyl (PCB). The survey should assess all components of the building and the facility including the places to be accessed and which will not be accessed. It is also necessary to take all required measures and procedures to control the above-mentioned materials and protect workers.
- It should be determined whether there are building materials, hazardous chemicals, explosive gases, flammable materials or hazardous materials that have been used to construct any building, pipes, or tanks or there are other equipment in the property. When these risks are identified, their type and concentration must be reported to the competent authority and all necessary measures should be taken to control or eliminate such hazards prior to commencement of the demolition.

■ Demolition Risks Protection Procedures

- A 6 meters wide perimeter around the demolition area should be used as a prohibited area and people should be removed from the area.
- Demolition of buildings that are higher than (ground floor or first) using the shovel (horizontal demolition) is not permitted and alternative suggestions or proposals shall be provided for demolition from top to bottom and inside the building or any other method. This should be studied case by case, either by hand demolition, hammer or Hydraulic demolition equipment.
- Before starting the demolition, any part of the building adjacent to the facility or building to be demolished must be separated by a distance of 3 meters. The mechanical hammer shall not be used for demolition.
- The risk of glass crushing should be controlled as it endangers the lives of people and expose them to injury by glass shards.
- In the case of stopping of the demolition, no construction elements shall be left there which may form risk and prone to fall.

- The walls or other construction parts shall not be dropped on the floors in the form of loads heavier than the capacity of these floors in multi-floors buildings.
- Mechanical equipment shall not be used on floors of work surfaces, unless these floors or surfaces are durable enough to withstand the overload.
- No large amounts of debris should be left at site and contractor shall get rid of them on regular basis.
- All workers and employees involved or participating in the demolitions work must be informed of the demolition plan so that they can carry out the tasks assigned to them in a safe manner. Also, they should be provided with the necessary PPE (safety shoes, safety helmet, appropriate gloves, ear protection, eye protection, etc., according to the work nature and resulting risks)
- All types of electricity, water and sewage and other service lines shall be stopped in the demolition area. This shall be made in coordination with the competent authorities.
- Enclosed spaces with gates shall be used at the end of discharge to drop demolition materials on the ground or in debris containers.
- Pipe tracks should be designed and implemented so that they can withstand the resulting shocks or impacts due to the falling of demolished materials.



- Workers should not be allowed to operate where there are structural collapse risks until they are corrected by supports, supports or other effective means.
- In most of the demolitions there are adjacent waste transport vehicles, which requires a specialist to coordinate traffic and ensure smooth traffic.
- it is not allowed to remove rubble from the bottom places until rubble works are stopped in the upper floors.

Some Risks in the Yemeni Work Environment



Firstly: cutting, transporting and constructing with stones:

Construction work and stone cutting are among the most important activities undertaken by construction workers in the Yemeni environment, despite the various accompanying risks.

■ Mechanism and stages of quarrying:

1- The Stage of Extracting Rocks From the Ground:

It is the process of extracting the stone from rocky mountains which causes a great deal of pollution and noise. Sometimes explosives are used.

2- The stage of Cutting and Preparing Stone Pieces:

After the process of rocks extraction from the ground, the rocks are transferred from quarries to stone saws by large trucks to be cut according to the required sizes and shapes. With the development of the technology (used in stones cutting), modern machines and equipment have been manufactured to cut stones using laser and producing them according to shapes that are designed by computer.

3 – Stone chipping, engraving and processing of the surface of stone pieces.

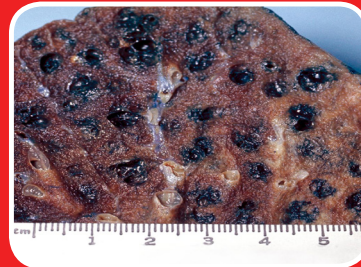
The stone face is engraved manually or mechanically using electric machines, or using air compressor machines, where different forms of construction stones are produced.

Stone Construction and Installation Stage: There are two cases of stone construction:

- 1- Rock Stone Construction
- 2- Cladding or facing walls with stones after the process of concreting or building the walls

■ Risks of Cutting, Transporting and Stones Construction:

- 1- Employees are affected with the disease of pneumonia as a result of inhaling the dust filled with silica during the stones cutting.
- 2- Employees are injured by shrapnel of rock stones as a result chipping work on the rocks.
- 3- Workers when transporting different heavy stones, which may cause damage to the back paragraphs, in addition to the possibility of falling from the hand of the worker that may hit the foot or hand.
- 4- Injury of worker on the saw seriously injured because of the sharp ends or hit with stone due to breaking.



Preventive measures in the cutting, transport and construction of stones:

- 1- Washing hands well before eating and drinking and never eat, drink and smoke when chipping stones or in places filled with dust.
- 2- Taking a good bath after leaving the work site. Change clothes other than work uniform.
- 3- Wear safety equipment that are suitable for the type of work. (Mask of a good quality and clean it constantly – protective glasses – long boots – it is recommended to wear special coverall – suitable gloves).
- 4- Ensure the ability to see the course of the passage during the transfer of stones and that there are no obstacles or excavations.
- 5- Put the stones quietly during the construction process and not to throw them.
- 6- Ensure the stability of the ladder or scaffold used during the construction work.
- 7- Develop engineering solutions to reduce dust reaching the worker during the process of stones cutting.
- 8- Take break to breathe clean air.
- 9- Avoid carrying any heavy stones by hands and instead use manual transportation means (hand cart).
- 10- Use of suitable hand tools during cracking.

Secondly: Cement Transporting and Mixing

The history of cement goes back to the Roman era, which is one of the most important elements of modern construction, but it carries great risks that are almost not recognized by many employees.

It is a soft bonding material that becomes hard and solid, thus possessing cohesive and contiguous elements in the presence of water, making it able to bind the concrete components together.



■ Risks when dealing with cement material:

Many chronic diseases caused by cement dust (such as lung maintenance, lung pneumonia, eczema, dermatitis, irritation of the eye and respiratory system).

■ Protective measures when dealing with cement:

- 1- Wear safety equipment when dealing with cement (suitable gloves - mask - long plastic shoe - glasses).
- 2- Wash hands thoroughly after completing the work and avoid eating or drinking during work.
- 3- It is preferable to perform periodic and routine lung examination for the workers who deal with cement material.



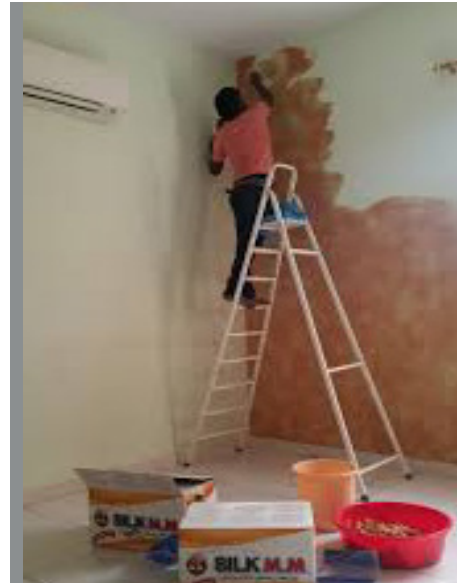
Thirdly: Painting Works

Although the painting process is characterized by being easy, but it includes many risks, the most important of which involve dealing with chemicals.



■ Risks during paint works:

- 1- Workers may suffer many diseases in the event of not wearing appropriate safety equipment (lead poisoning).
- 2- Work on high elevation (mobile stairs, platforms and scaffolding).
- 3- Working in narrow spaces.
- 4- Risk of eye injury.
- 5- Risk of injury due to falling objects.
- 6- Exposure to molds, fungi and bacteria due to the waste of birds and rodents.
- 7- Having to stay close to flammable materials.
- 8- Performing repeated physical tasks. (Standing for long periods of time, lifting heavy or inappropriate objects, exposure to heat, ultraviolet “UV”, stress).



■ Preventive Measures When Dealing With Paints:

- 1- Access to the required knowledge and training to work at heights.
- 2- Determining the appropriate ladder, scaffold or platform for the type of work and checking them before the start of work.
- 3- Avoid the critical postures of the body like working directly behind a door which may lead to falling.
- 4- Taking frequent breaks
- 5- Know how to prevent injury by electric hazards, not to work close to uncovered electric currents, keep safe distance away from active electric equipment and lines of facilities.
- 6- Wear the appropriate PPE and shoes.
- 7- Keep workplaces free of mess and equipment.
- 8- Keep good ventilation during painting.
- 9- Know how to avoid being exposed to birds droppings and birds.
- 10- Know about chemical risks and MSDS data.



Storage of Materials at Work Sites

There is no doubt that when starting a project, we need building materials that include cement, sand, asphalt, iron, brick and as such. the like, each of these material shall have specific storage characteristics to prevent damaging and spoiling.

Types of materials that we store at site.:

- 1- Cement storage.
- 2- Bricks storage
- 3- Iron storage
- 4- Sand storage.

Firstly: Cement:

it should be assured that cement is in compliance with the specifications as its properties are highly affected by various technological factors such as the ratio of raw materials, degree of purity, degree of burn and its softness as well as the duration and method of storing cement before use.

• Cement Storage

In order to store cement, it is necessary to keep it completely dry and prevents it contact to moisture, whether from air or soil. **The following steps illustrate the method of storage:**

- 1- Packed cement shall be kept on laminate flooring that is higher than the ground to prevent contact with moisture.
- 2- It should be taken into consideration that the storage height does not exceed 10 bags since more altitude and high temperature will lead to cement hardening at the underneath storage layers
- 3- Take into consideration following the methods and rates of cement withdrawal from the warehouse at the primacy of supply, so as to avoid the expiration of cement before use.
- 4- Cement shall be covered with a tarpaulin to prevent heat of the sun and rainwater from cement.
- 5- Cement should not be used in any work if it appears on it impurities or strange substances.

Experiments have shown that cement storage reduces its strength due to degradation and slow interaction of lime which is not combined with moisture, despite the proper



precautions whether in the work location or in the warehouse. It is considered that the power of stored cement is reduced as follows:

- * Storage for (3 months), strength reduction is (1520-) %
- * Storage for (6 months), strength reduction is (2030-) %
- * Storage for (12 months), strength reduction is (3050-) %
- * Storage (2 years), strength reduction is (4050-) %
- * Storage for (241/ years), strength reduction is (5060-) %

Secondly: Bricks

After the completion of the concrete works, brick construction shall be done which is the process of laying the brick and binding them with the mortar so that it produces a coherent homogeneous mass that can distribute the concentrated loads on it. There are many types of bricks depending on the material it is made of or according to the purpose of its use.

- Bricks Storage

- 1- Brick should be stored near the work site.
- 2 -The bricks should be stored in the form of chairs. The height of the chair shall not be more than 10 in terms of thickness.
3. When starting the construction with bricks, brick shall be stored at both sides of the walls that will be build in order to make it easy for the worker and to save time.
- 4 – Avoid storing to store the bricks in one line and should be stored in different places.



Thirdly: Reinforcing Steel

It is divided into two types:

- a) Plain Smooth Steel
 - b) High-strength Steel
- Steel Storage

- 1- The required steel for the project should be known before starting the project.
- 2 – Iron bars should be placed over roots of wood so to avoid moisture which causes rusting of steel.



3. Each type of steel shall be placed separately according to the diameter.
- 4 – The steel bars should be covered with a tarpaulin to protect it from rainwater and from moisture to avoid rust.



Fourthly: The Sand Storage

Sand is one of the concrete component. It is used to produce mortar for construction. **The grains of sand should be as follows:**

- a- Solid
- b - Strong
- c - Clean
- d - Free of impurities.
- e - Free of tree roots and big gravels.

This can be determined in accordance with the standard specifications.

Storage of Sand:

- 1- It is preferred to store the sand in a covered place to avoid sun and wind.
- 2- Sand must be stored near the work site to make it easy for the worker.
- 3- Sand shall be stored in a clean and dry floor.

• **Additional Notes for the Storage Work:**

- Storage shall not be on the passage or on the way of workers and equipment.
- It is prohibited to place materials on the edges of the work site to avoid theft.
- Storage is preferable to be close to the location where the materials will be used.
- Weather conditions and type are closely connected to the type of storage.



Tools and Hand Tools

Hand tools are an essential part of our working life. It is difficult to find any workplace free of such hand tools that help us to facilitate many operations. Workers who use equipment and hand tools are exposed to many risks such as wounds or electric shocks.

■ Risk During the use of these hand tools:

- 1- The use of equipment that is not suitable for the type of work.
- 2- Misusing the hand tools.
- 3- Use of hand tools that are made of poor materials or specifications.
- 4- Fall of the hand tools when not keeping them in their right places.
- 5- Not using the appropriate protection and preventive measures.

■ Preventive Measures during the Work with Kits and Hand Tools:

1. Never use several unsuitable tools. Appropriate tools should be obtained.
2. Never use a temporary replacement kit, which are designed for another purpose.
3. Make sure that the equipment is of the right size to perform the work safely.
4. Damaged or broken kits should be removed away and never used.
5. Hand tools should be checked to make sure they are in good condition before use.
- 6 - Wrenches of distorted or old jaws should not be used.
7. Never use cutting tools with weak blades or points.



8. Never use hammers with flatted or fragile heads.
9. Never use tools with cracked or split wooden handles.
10. Keep the surfaces and handles of the tools clean from oil which could slip from hand when used.
11. Do not use files that do not have handles.
- 12 - Keep tools in a clean condition and when the work is finished, tools must be cleaned and put in their proper place (kit box) or fixed on the wall.
- 13 - To work in electrical devices use tools that are of insulated handles.
14. Do not keep tools in your pocket during work and it is preferable to put them in a special bag having their sharp ends covered so as not to cause injuries.
15. It should be made sure that all electrical hand tools are grounded and that the insulating material on the electrical wires are good.
16. It should be made sure that all the electrical hand tools have switch on / off before using them.
17. It should be made sure that the compressed air hose which is connected to the air-based hand tools is well connected before using these tools so that the air hose does not get loose causing work injury to the worker using the tool.
18. Do not fold air hose which is connected to the hand tools to stop the air supply, but close the airlock.
- 19 - Do not throw tools up or down and it is preferred to use a special box and a rope to raise or put down the tools when working in high places.
20. Do not use electrical tools in hazardous areas (places where there are fumes of flammable materials) unless such equipment is designed to operate in such places.
21. The abrasive stone should be examined using abrasive machines making sure that there are no cracks in it and not worn out. Also, it should be made sure that the protective covers are in place on abrasive machines before use. Safety Goggles should be used to prevent volatile shrapnel.
22. It should be ensured that the protective covers are in place on all tools that have rotary parts prior to use.





Scaffolds

Due to the possible occurrence of injuries resulting from the fall of objects and persons from high places that may result in total or partial disability or death, it is important to talk about safety requirements when designing or working on a scaffold. A scaffold is a platform mounted on wooden or metal poles that are installed in a special way to carry and install this scaffold. This scaffold is used to carry workers working in high-altitudes and to carry the equipment and materials necessary for work.

■ Scaffolds Accidents are usually caused by:

1- Design defects:

- a. Shortage in support and fastening methods, such as clamps and ropes.
- b. The use of nails in an insufficient number or in an inappropriate length.
- c. Lack or absence of preventive rails, handrails or toe boards.
- d. Shortage in the width of blanks or boards and not installing them or balance them properly.
- e. Lack of the means of access to scaffolding (ascending and descending).



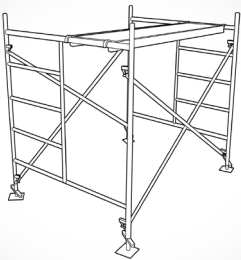
2- Defective scaffolding materials:

- Use of defective types of wood (fractured – cracked
- knots – wet or very dry).

3- Misuse:

- Overloading of Scaffold
- Falling objects or jumping on scaffolds.
- Use of moving loads on the scaffold.
- Remove or destroy protective boards, foot boards or part of the scaffold construction.
- The use of scaffolds for other purposes which the scaffolds are not made for.

■ **Types of Scaffolding:**



1- Frame Scaffolds:

Frame scaffolds are made of steel and it is simple in its structure. They can be installed fast provided that the surface on which the scaffold is installed is leveled. Also, there should not be barriers in the workspace.



2- Tube and Clamp Scaffolds:

These scaffolds are used for hard works in which frame scaffolds cannot be used due to the existence of barriers or difficulty of access. Also, it needs more installation time. This type of scaffolds are used more in industrial works.



3- Modular System Scaffolds

This type of scaffold is characterized by the easy installation and no need to specialized persons to install it because the places of installation are stable.



4- Rolling Scaffolds

This type of scaffold is used in painting works, electrical installations, air-conditioning and warming systems. Rolling scaffolds have wheels at the base and means of safety to stop movement while working.

■ General Requirements and Conditions:

- 1 – Each scaffold should be designed to withstand not less than four times the working load.
- 2 – The installation and modification of scaffolds shall be done by specialized and qualified persons in this work.
- 3- It is prohibited to build and install scaffolding on barrels and stalls where they are exposed to collapse.
- 4 – Standard preventive rails are made of wood or pipes or iron corners. It consists of top rail the height of which shall be at least 42 inches and a horizontal midrail located at the mid distance between the top rail and ground of the plat form.
- 5 – Installation of the protective rails on vertical posts. These posts are at equal distances from each other, the length of each distance is 8 feet.
- 6- These rails should be strong enough to withstand the load at any point in it and any direction – the volume of the load is 200 pounds.
- 7- Toe-board : the scaffold plat form is provided with toe-boards that shall be mounted at the sides and edges of the platform ground to prevent the fall of tools and materials. The minimum length of these boards shall be 4 inches.
- 8- Ways of Access to the scaffold.
- 9- It is not allowed to use mobile ladder if the length of the plat form is more than 12 feet. Also, when using mobile ladders, a distance from the ladder on the platform should be left at not less than 3 feet. On the other hand, when using unmovable ladders, it is preferable to use them in scaffold of more than 12 feet. It should be considered to make flat at each 30 feet.
- 10 – The scaffold must be mounted to the building or to any solid structure in case the scaffold height exceeds four times the dimensions of its base.
11. The strength and durability of any scaffold depend on the base. Most scaffolding accidents are due to the weakness of the base.
- 12 – Metal plates must be installed below the legs of the scaffold for the durability of fastening.

- 13 - Scaffolding is connected to the building with distances not exceeding 30 feet horizontally and 26 feet vertically.
14. Fall protection means shall be provided against falling from scaffolds of a height exceeding 10 feet
15. It should not be allowed to coat scaffolds with any painting to hide any defects in the panels.
- 16 - it should not be allowed to store materials and tools on scaffolds and scaffolding must be free from any of such materials at the end of each shift of work.
- 17- A minimum distance of 10 feet should be left between the scaffolds and the power supply lines.
- 18- In the case of suspended scaffolds, the splicing ropes shall bear 6 times the total load of the scaffold + its weight.



Ladders

Ladders General Requirements:

- Everything in area near the ladders should be removed from top to bottom.
- The stairs should be at equal level and unified dimensions. They should be properly mounted.
- The distance between stairs should be between 10 – 14 inches.
- The ladder should be free of any objects that cause sliding and should be clean.
- Ladders should be used for the specific case purposes.
- Do not connect two ladders together to make a long one unless it is so designed.
- Secure and fix the ladder to prevent its movement during the work.
- The ladder ground level should be horizontally flattened and completely fixed.
- Do not use the ladder on sliding floors unless precautions are secured.
- Check that the ladder is free from any crack defects or missing parts.
- Make sure that the ladder's stairs are sliding-proof
- The distance of the ladder base from the wall shall be 14% of the height from the ground.
- The width of the ladder shall not be less than 11.5 inches.
- The ladder should withstand four times the permissible weight on it.
- Wooden ladders should not be painted or coated with lacquer.
- The ladder should be bunched and tied at 1 meter from the surface.
- Non-movable ladders of 8 meter height should be secured for rolling protection. A rest area after each fifty meters.
- Ladders next to electrical regions should be of wooden or fiberglass type.
- Do not use the last two stairs in the ladder. Two stairs at the top of the ladder should be left.
- Your face should always be to the ladder when going up and at least one hand should be catching the stair of the ladder.
- Do not carry things that may make you lose balance.



Working in Confined Spaces

Confined or closed spaces are the places that have been designed for individuals to work in. Also, their exit means and passages are not done easily and quickly. OSHA standards define confined spaces as the continuously closed places which are large areas and have limited means of entry and not designed for work or for constant existence in there.

■ Confined Spaces that require an access permit and which are as follows:

- Manholes
- Oil tanks
- Tunnels
- Underground tanks
- Pipelines
- Wells
- sewer pipes
- Granaries
- Ships containers
- Boilers
- Excavations

■ Potential Hazards in Confined Spaces:

1. Atmospheric Hazards
2. Mechanical & Electrical Hazards
3. Physical Hazards
4. Engulfment Hazards

1- Atmospheric Hazards:

a- Shortage or Surplus Oxygen:

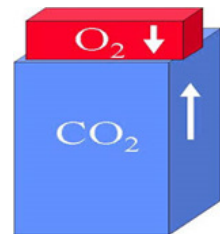
The permissible ratio of oxygen in atmosphere in confined spaces should not be less than 19.5% and not exceeding 23.5%.

b- Ignition Hazards:

The inflammable materials that may be found in confined spaces are: petroleum materials – methanol – hydrogen sulphide – Carbon monoxide

c- Poisonous Gases:

– the most dangerous poisonous gases that may exist in confined spaces are: hydrogen sulphide – Carbon monoxide



2- Mechanical & Electrical Hazards:

- The unexpected move of mechanical equipment inside confined spaces may cause injuries to workers, an example of these equipment are: mixers – heaters ... etc.
- Electrical discharge of electrical engines in confined spaces.



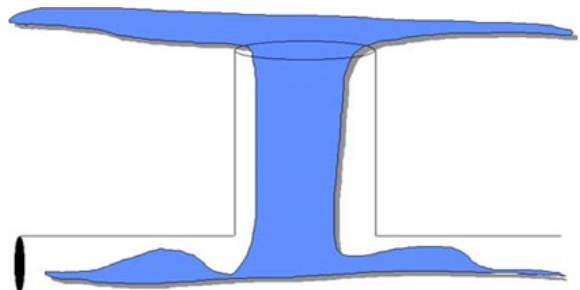
3- Natural and Physical Hazards:

- Variation and Variety of Temperatures (coolness, heat)
- Availability of burning chemicals
- Availability of insects and reptiles in confined spaces.
- Severe noise.
- Hazards of Sliding, stumbling and falling
- Poor lighting
- Not using good equipment and machines may cause injuries to workers.
- Limited ways of access and exit in confined spaces.



4- Engulfment:

- Movement of material in the confined spaces causes various types of injuries.
- Bringing in petroleum materials to the tanks while work is going on in the tanks.
- The movement of crops in granaries and engulfment on workers inside.
- The collapse of the sides of excavation while workers are doing their work there.



■ Access Procedures and Work in Confined Spaces:

Before the access and work in confined spaces, whether tanks or well, an access permit should be issued to access these places. The access permit shall include the following information at minimum:

- Name and location of the confined space.
- Purpose of access to the confined space.
- Date and validity period of the permit
- Names of persons who will access to work in the confined space.
- Names of persons who will be available outside the confined space.
- Name of the in charge supervisor of the work.
- List of potential hazards
- Way of insulating and controlling these hazards.
- The acceptable requirements of access: oxygen ratio, concentration ratio of flammable materials, concentration of poisonous materials.
- The available means of rescue operations.
- Means of communication with persons who will get access to work in confined space.
- The required PPE.
- All other required special conditions to secure the work in confined spaces.

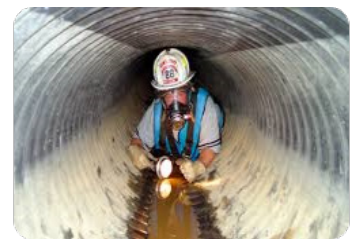
• Ventilation of Confined Spaces:

Mechanical ventilation is conducted by the appropriate air-suction. It is preferable turn on these suctions by compressed air.



■ Responsibilities of the Persons who will Go into the Confined Space:

- Before going into the confined space, it should be made sure that the oxygen ratio is not less than 19.5 %
- Make sure that the ratio of inflammable vapors is not exceeding 10 %
- Make sure that the concentration of poisonous materials is less that the permissible approved doses.
- Making sure that all gauges are turned off and secured as well as all the electric connections are safely insulated.
- The provision of all PPE that are required to perform the work safely.
- Ensure provision of proper way of communication with the persons outside the confined space.



– Instantly leaving the confined space in the occurrence of emergency.

■ **The responsibility of the person assigned to observe the place outside the confined space:**

– Shall be available at the access point ready to act in emergency cases. He shall not be assigned any other duties except the observation.

– Shall have knowledge and be aware of the use of air-supply respiratory systems as well as the use of extinguishers.

– Shall observe the safety line connected to workers in the confined space and be alert of the incoming signs from them, whether by these lines or by any other way of communication.

– Observe the turned off gauges and switches in continuous basis.

– Keeping the place next to the confined space free of all obstacles.

– Ask workers in the confined space to instantly leave in case of the occurrence of any dangerous situation.

– Seek assistance from the emergency and rescue team in case of the need to save or get any person out of the confined space.

■ **Personal Protection Equipment (PPE):**

When you are not in a position to control the risks in confined spaces, wearing protective equipment will be the only option to control the risks including:

– Safety Helmet

– Appropriate Work Uniform

– Goggle Glasses

– Safety Gloves

– Appropriate Safety Shoes

– Breathing Compressed Air Cylinder that is suitable for work in the confined space

– Poisonous harmful gas and inflammable and exploding materials detecting devices

– An appropriate Flashlight (normal or explosive-proof)

– Safety belt

– Safety line

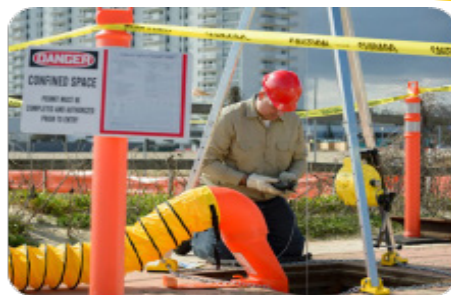
– Rescue ladder

– Rescue machine (pulley)

– Communication device

– extinguisher

– Any other means of protection required for work



Lifting & Handling

Handling and manual loading are very common construction works in Yemen environment. It is also considered the majority jobs where work injuries and chronic injuries occur.

■ Safety Measures for the lifting and manual handling works:

- Estimation of load and work volume before lifting. One load shall not exceed 55kgs.
- Clear vision is required when lifting or move any load. Also, all obstacles shall be removed and sufficient space shall be provided for the load.
- Making sure that there are no sharp ends or wires and gloves shall be worn.
- When standing next a material the distance between worker's both feet shall be 20 cm to 30 cm.
- Holding the material to be moved from the ends and the back side of the body shall be straight without changing the holding position during the move.
- Not to fold or bend the back during work and if injury occurs the work shall be stopped.
- Verification of the contents of the barrel and the cylinders when moving them taking the preventive measures in case they get loosed.
- Ensure that the locks of the barrels and cover of cylinders are tightly sealed using mechanical tools for the moving operations.
- Place the cylinders and barrels in vertical position.



Sliding and Falling And The Risks of Falling Objects

Falling is the most common risks that causes severe injuries to workers. About 150 – 200 worker are exposed to death and about 100000 workers are exposed to injuries per annum due to the accidents of falling from different construction sites.

■ Ways and systems of Falling Prevention:

- 1- Handrail system
- 2- Personal Equipment of falling prevention
- 3- Specified suspension system
- 4- Constant follow-up system
- 5- Safety networking system
- 6- Warning slings system

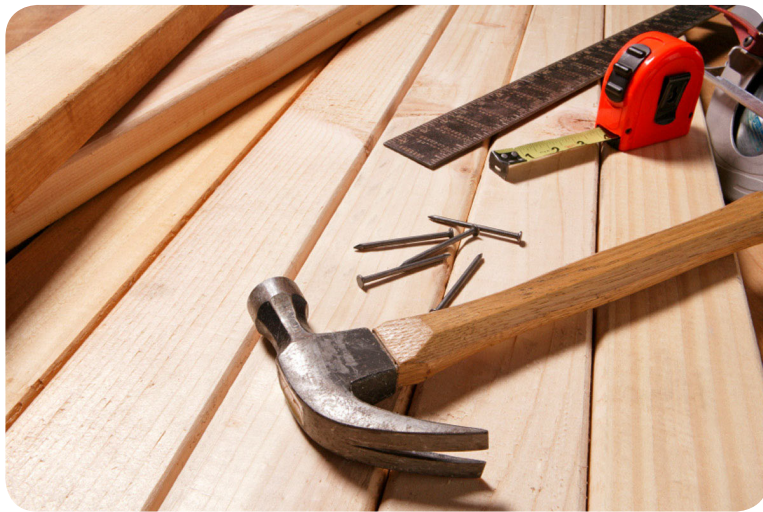
■ Safety Measures of Falling Protection:

- Keeping the work site clean and organized to avoid the frequent sliding and falling
- Using the falling equipment protection.
- Using the appropriate corridors and avoiding short passages with holding the handrail and stairs.
- Wearing the approved safety shoes.
- Removal of trashes and oils that are available on the roofs and floors.
- Report any damages or obstacles that restrict the movement of employees.
- Making sure that all temporary openings in all passages are tightly closed.
- Not to leave obstacles in the corridors and stairs like welding wires, electric wires and such other tools.
- Do not rush or run in corridors since that may cause accidents.



■ **Safety Measures for the protection from the falling materials and equipment:**

- Remove all materials and tools from the edge of the surfaces or drilling a distance of half a meter (equivalent to two feet) to avoid falling.
- Always wear safety helmet correctly.
- Identify all portable tools of manual and electrical equipment, lifting operations and scaffolding safety.
- All workers are equipped with the appropriate equipment to protect against falling.
- Training all employees working in high places on the method of using the means of protection against falling.
- Examining of fall-protection equipment before and after use.
- Use full body belts, short ropes and life lines.
- Removal of damaged and invalid equipment.
- Do not connect two short ropes with each other.





Handling Chemicals at Site

There are many equipment and materials involved in the composition of very harmful chemicals that may not be observable to a simple worker. The chemicals material exists in the work environment in one of the following forms:

- Gases and vapors
- Dust (organic – inorganic)
- Fluids (acids – Alkalis – dissolvent)

Therefore, chemicals are considered the most dangerous items facing human being for several reasons including but not limited to:

- Chemicals exist in more than one form, they exist in (liquid – gaseous – solid)
- The ability of their penetration to human body is very fast through (respiratory system, digestive system and skin contact)
- Their impacts is high on some of the parts of the body. Therefore, they have very bad effects such as lungs fibrosis and septicemia
- The effect of some high organs of the body and therefore it affects a bad influence such as lung.

Safety requirements that shall be provided for the safety of workers against chemical hazards:

The effective technical means for the prevention from harmful chemicals shall be provided such as:

- Replace the harmful chemicals with other non-harmful or less harmful chemicals.
- Separate harmful operations in ad hoc places with less number of exposed

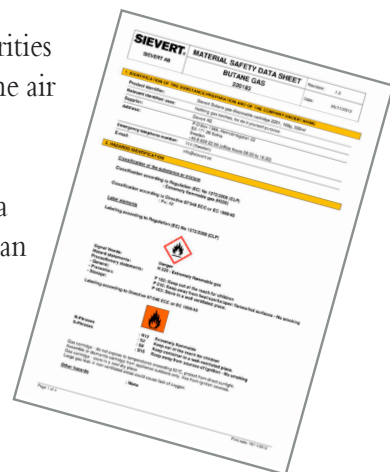


workers with the provision of preventive measures to this few number of workers.

- Use the methods of deposition or softening to remove dust or harmful fumes.
- Apply ventilation, whether general or positioned ventilation near the source of harmful gases, vapors or fumes, or dust to collect them all and remove them before reaching the surrounding of workers breathing.
- Brooming by suction or after wetting to remove dust and impurities from the place of their deposition so as not to come up again to the air and inhaled by workers if ordinary mopping ways are used.

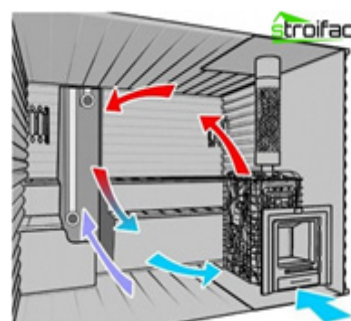
■ Chemical Material Safety Data Sheet (MSDS)

MSDS is the abbreviation of Material Safety Data Sheet which is a sheet connected to the safety of hazardous chemicals where you can find all necessary information about the substance. It is available on the cans, materials and barrels containing the chemical materials.



■ Method of Prevention from Chemicals:

- The necessary periodic measurements of the chemical hazards in the work environment shall be conducted according to the activity type being exercised and shall be recorded and periodically compared to verify that they are within the permissible limits.
- PPE should be provided to workers according to their work nature being performed by them. PPE shall comply with the relevant technical specifications.
- Sufficient water should be provided for shower and use by workers after the end of their duty and before their departure from the work place to remove any harmful chemical pollution stuck on their bodies.
- A food place should be provided for workers away from the work place (exposure) and it should be prohibited to eat food, drink or smoke inside the work place.
- Workers should be educated on the chemical hazards that exist in the work place and how to protect themselves and to comply with the warnings and instructions issued by the chemical companies.
- Sufficient ventilation should be provided in the warehouses to ensure the soundness of stored materials considering the review of their industrial means accordingly and operating them within the frame of their technical rules.





Planning, Cleanness and Arrangement

The bad arrangement and organizing of the work environment is one of the main reason of the occurrence of accidents in work places, whether in offices or projects. It gives also an impression of the work behaviors and acts of workers. The work site of bad arrangement and order is unsafe site. On the other hand, a clean and properly planned and arranged site is a safe site of less accidents and injuries.

Therefore, there procedures that should be complied with which are as follows:

- Raising awareness on the importance of cleanliness and how to follow the instructions.
- Proper planning and familiarizing workers on Hazards Identification Plan that may face their work at site.
- Make the proper ways with instructive signs and warnings and clean the paved roads from dust and obstructions.
- Provide drinking water which should be cold and clean in the workplace with the supply of one use paper cups..
- Providing smoking areas with fire protection.
- All trashes should be removed on daily basis after the end of each daily work and clean the work site and provide barrels for trashes collection at all work sites.
- Provision of properly equipped food places with proper ventilation and laundries
- Providing car and vehicles parking and not to park close to work site.



Lockout/ Tag out Signs

These signs are used for controlling the control devices to lockout or tag out electric circuits or cut off electric switches as well as the mechanical valves or any other system. They are also used to prevent accidents or injuries so as to warn each worker in the work site during performing their duties on equipment. There should be a work permit and check with the safety officer and the issuer of the permit that the signs of lockout are available and these signs should be indicated on the work permit.



Work Permit at the Site

Work permit is an official written document to monitor the works that have been specified to contain potential hazards or located in locations which are riskier. The work permit is used to identify the detailed situations and conditions of the work that shall be complied with. When work permit is issued, it shall be monitored by the issuer and the person who received it.



• Types of Work Permits:

1. Hot Works: which are the works that require carrying out cutting and welding.
2. Works in Confined Spaces: are the entry to enclosed or confined places such as sanitary or wells, etc.
3. Cold Works: are the works in which hand tools are used such as excavating with manual equipment or dye works...etc.
4. Gas works: these works require accuracy and follow-up because they are the most dangerous such as working in labs and gas wells.

Important Notes:

The work permit shall be placed in the work place itself and the person responsible for receiving the permits shall be present to follow up safety.





Working on Projects Close to Roads

Some projects are implemented close to roads and path lines. There are procedures and guidelines to be complied with during road work to avoid any accidents and reduce injuries which are:

- Before the start of any project and closing roads or section of them, a work permit should be applied for from the specialized source to issue the permit before closing the road.
- Placing barriers and signs around the excavation walls at an appropriate distance. Also, warning signs shall be made at a minimum distance of fifty meters to protect workers from any potential risks and to protect citizens and their properties.
- Provision of adequate night lighting with signs and instructions on reflective boards.
- A flagman shall be provided if the work requires so at night in the open public roads to issue instructive signs.
- If the work is at night, the flagman should wear lampshade pectoral and he should be also provided with a lampshade flag for illustration.





Environment Management

Environment protection and pollution prevention are among the hard tasks that shall be maintained to reduce damage on social communities around the project region. That may cause problems with the surrounding communities.

• **The Preventive Measures of Environment Management at Site:**

- Workers' training and launching awareness campaigns at work site to make the workers aware of the environment procedures, trash management and water preservation.
- Report about any spilling leakage regardless of the size or the volume.
- Reporting and warning against the increasing levels of noise.
- Removal of polluted materials to the specified containers to keep the site clean.
- Guide all workers on how to treat, manage and transport trashes generating from their work region.



Instructive Signs at Work Site

Work place hazards need to be defined and described to alert workers about the risk resulting from these hazards. This can be done through distinctive colors and instructive signs.

There are various legislatives in this respect including legislatives of the American Occupational Safety and Health Administration. (OSHA), and also, the American National Specifications and Standards Institute (ANSI). Distinctive color describes and identifies the type of risk. As such, it assists worker in recognizing the extent of hazard which will lead to the reduction of potential injuries.

The table below illustrates the instructive colors symbols of OSHA and ANSI

Color	Meaning	Application
RED	DANGER	Instructive Banners, Secured Containers
RED	STOP	Stop buttons in emergency cases and identification of fire quipment
Fluorescent Orange Orange - Red	BIOSAFETY	Signs of Mineral materials Trashes
Yellow	CAUTION	Warning of the risks of jumping and falling – safe containers for explosive materials and corrosive materials
Orange	WARNING	Parts of equipment – rolling equipment that may cause injuries and crushing
Green	SAFETY	The places of Firs Aid Kits – Places of Safety Equipment: Safety Kits (Equipment) – Breathing Systems
Blue	Information	Banners – Ads Board
Black, White/ Yellow or (a blend) of Black and White or Yellow	Boundaries	Traffic Signs, Ladders, Directions
Magenta	Radiation Caution	X-ray, ALFA,, BITA, GAMA radiating materials

• **Caution signs as divided by OSHA:** caution and instructive signs in OSHA’s specifications are divided into three types as follows:

Danger Signs:

- They illustrate the existence of risk that is about to occur and the need to take precautionary measures.
- OSHA’s specifications stipulate the use of red color, black color and white color in the signs as per the following shape or form:



Caution Signs:

- Caution of Potential hazards caution or unsafe acts
- The main color of these signs is yellow (the background of the board) and the black color (the window), the yellow color for writing the letters in case of writing in the window of black color. Writing in black alphabets shall be on yellow board. **on per the following shape or form: instructive signs:**



- They are use when general guidelines and suggestions regarding safety matters are needed.
- It is specified by OSHA that the background shall be in white color. The window shall be in green color and the writing in white color as per the shape or form below.

Caution Signs by ANSI:

1. Danger Signs
2. Warning Signs
3. Caution Signs
4. Notice Signs
5. General Safety Signs
6. Fire Safety Signs



Occupational Safety and Health in Office

Office employees represent the largest group in most public and private institutions. Some people may think that this type of work is comforting and does not include any health risks, but studies in this field proved otherwise.

- **Why security and safety rules during the work in office?**

Some people think that office jobs that depends on sitting for long periods of time are among the easiest jobs and are free of any hardships or miseries. On the contrary to what the community believes or thinks, this is not true.

- Sitting for very long periods of time reduces the efficiency of the function of pancreas and causes the weakening of insulin flow to blood, As a result the person may become diabetics.
- Sitting for long period of time reduces blood flow to brain which negatively affects the brain functions.
- Sitting the whole day affects the function of the digestive system and makes it inefficient. This makes a person prone to constipation, bloating and acidity.
- The body sluggishness affects the flow of sufficient blood to bones causing pains in the back and neck. It also causes damages to the backbone
- Sitting for long periods of time increases the accumulation of fats in the arteries specially heart arteries which is dangerous to the general health.
- Body sluggishness as a result of sitting in a specific position for long time causes bones weakness and osteoporosis.



Ergonomics

It is the science that deals with the compatibility of humans with things they use, things they do, the environment they work in, and move around and even where they play and have fun. If this compatibility and stability are achieved properly, the stresses on humans will be reduced and will consequently feel more comfortable. This will enable them to perform their duties faster and easier and the number of mistakes will be less..

- **The most important Risks affecting Office Staff are:**

- | | |
|--|---------------------------------------|
| 1. Eye stress | 2- Backbone diseases |
| 3- Crawl or numbness of hands and feet | 4- Arteriosclerosis and heart failure |
| 5- Fatigue, nervousness and tiredness | 6- Neck pain |
| 7- Pain in the knee. | |

- **Work Place Designing:**

When designing and furnishing offices its suitability to user should be taken in consideration.

- **How to sit down before a computer:**

Sitting before a computer for long periods of time may have a negative impact on the body unless it is done properly. If sitting is not done properly, this will



result in backache, pains in the neck and knees. In addition, feeling of sharp stitching will be felt in the hand and fingers. **Some advices are given below to keep the posture safe while sitting so to increase comfort throughout the day:**

- The body should be in a straight posture and both hips pushed backward as much as possible on the chair.
- Adjust the height of the chair so that the feet are at the level of the floor and the knees on the same level of hips or slightly less.
- Adjust the back on the chair to be at angle 100 to 110 degrees.
- Ensure appropriate support for the back from the top to bottom.
- Baggy pillow may be used if needed. In case the chair has the property of adjustable back according to the posture needed use this property to adjust sitting posture continuously.
- Adjust the arms to make both arms relaxed. The arms shall be removed if they cause an impediment.
- Sit close to the keyboard. Put the keyboard in a position facing the body directly.



The way to sit properly

The top of the screen must be at the viewing level.

Shoulder to be relaxed.

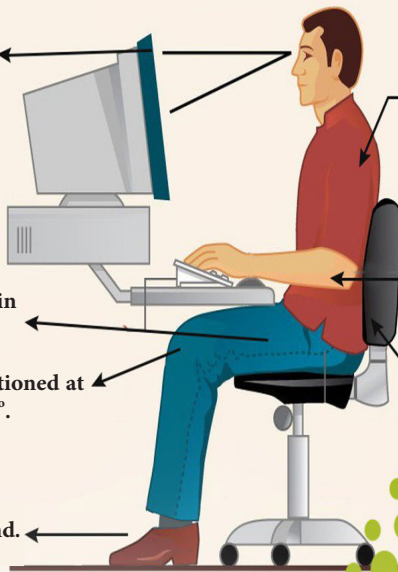
The thigh must be fully in touch with the chair.

The hand is parallel to the ground.

The legs must be positioned at an angle of 90° to 100°.

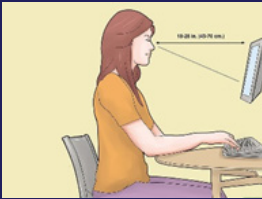
The chair should have a footrest to touch the lower back.

The legs must touch the ground.



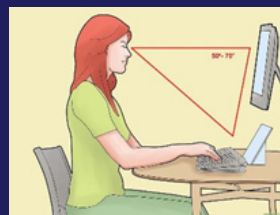
Make sure the keys are in the middle exactly as your body.

- Adjust the height of the keyboard. Make sure your shoulders are relaxed and your elbows in open posture. Make your wrist and hands in straight posture.
- Adjust the slope of the keyboard depending on your sitting posture. Use keyboard stands to adjust the level of the slope.
- If you are sitting in a straight posture try to adjust the slope of the keyboard away from you. But if you are in the posture with your body little to the back, use the slope a bit to the front to help keeping your posture straight for the wrist.
- Use the wrist supports to help keep your posture balanced and rely on solid surfaces. You should use the wrist supports only when you like to rest your hands while clicking the keyboard not when writing.
- Put the mouse in the nearest position to the keyboard.
- Adjust the position of the screen. The screen should be adjusted so that the neck is in a balanced posture which will help you get relaxed. Always put the screen in the middle in front of you above the keyboard. Make the upper limit of the screen at

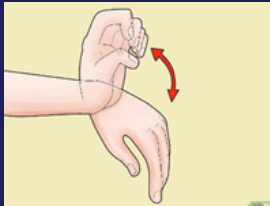


the height of 5 cm to 8cm from the level of the eye while sitting. If you are wearing glasses adjust the screen downward so as to achieve a comfortable level for reading.

- Sit at a distance of one arm length from the screen and adjust it as per your sight requirement. Reduce the brightness of the screen by changing the screen positions carefully to enable looking at it in a straight manner and a bit lower.
- Adjust the position of the curtains as required.
- Adjust the angle of the screen and modify the screen so as to reduce the brightness coming from the different light sources.
- Adjust the original documents so that it is directly in front of you. Use the papers stand. If you do not have enough space to use the papers stand, then use a documents stand in parallel to the screen.



- Put your phone near your hands. Use wireless headphones to reduce your phone wires.
- Use a keyboard drawer that has joints so that to help you get the optimal posture for the feeding devices. However, the drawer must have sufficient space to fit the mouse and to allow free movement of legs. It must also have the properties of exceeding the height and slope. The drawer should not make you far from your work platform and the devices.
- If you do not have a keyboard drawer with joints, you may need to adjust the height of your platform plus the height of the chair or use a pillow for the chair so that your sitting posture will be comfortable. Remember to use a stand for the feet if your feet are hanging in the air.
- Take a break during the working day to relax your muscles. Studies show that continuous sitting causes great harms to health. Try to walk in the place for few minutes or stand up and do stretching exercises or anything to reduce the daily periods of sitting.



- Take periods for stretching exercises for 1 or 2 minutes every 20 to 30 minutes. After every hour of work, take a break or change your tasks for at least 5 to 10 minutes. Always try to stay away from your computer during lunch.
- Avoid eye fatigue by relaxing and refocusing your eyes from time to time. Look away from the screen and focus on something far. Keep your eyes covered with your palm for 10 to 15 seconds. Use proper posture when working and keep moving as much as possible.

• **Lighting in office business:**

- Lighting sources
- **External Sources:** Sun.
- **Internal sources:** (internal lighting)
- **Harms:**
 - Causing headaches.
 - Causing eye diseases and poor vision.
 - Tension.
 - Lack of efficiency in performance and productivity



- **Disturbance and noise in office work:**

- Sources of Nuisance:
 - **Internal:** (telephones, voices of employees, equipment and machines)
 - **External:** (cars)
- **Harms :**
 - Causing headaches for staff (employees)
 - Mental and physical harms
 - Less performance and less efficiency of work

- **Ventilation in the office business:**

- **Sources of ventilation:**
 - **External Sources:** Winds
 - **Internal sources:** fans, air conditioners, windows.
- **Harms :**
 - Exposure to physical diseases
 - Exposure to mental illness
 - Office tools are damaged



- **Electricity in office work:**

Electrical accidents in offices occur due to poor connections and bad use of electrical appliances

- **Damage :**
 - Causing physical harm to employees.
 - Causing fire damage to the office.
 - Causing damage to electrical devices .



- **Fire Hazards in Office Work:**

- **Sources of fire :**
 - Flammable material.
 - Furniture and office equipment.
 - Electricity sources.
 - Smoking
- **Damages:**
 - Causing material and human damages
 - causing damage to office components
 - causing loss of important data
 - Causing suffocation



• **General Instructions for Office Safety:**

- Save the telephone numbers of emergency, medical assistance and firefighting.
- Switch off electrical equipment before departure and replace dangerous and damaged wiring.
- Keep the workplace, corridors and passages clean and organized.
- Use ladders to access the shelves and do not put an overload on them.
- Keep fire outlets free from any obstacles.
- You should block the light so that it does not fall directly on your eyes. Also, avoid the light falling on any polished surface, and it is better to put the lamp behind you.
- When you work on your computer you should avoid the flashlight that is reflected on the screen and try to focus your eyes on something other than the screen from time to time to reduce the strain of the eyes, taking into account that the placement of the keyboard and mouse in a way that does not adversely affect the safety of the arm and shoulder.
- Your posture when sitting of chair should be comfortable so the backbone should be in straight posture and the back of the chair supports the lumbar spine at the bottom of the back. The height of the chair should be adjusted in the seating posture and the chair should have a base that provides maximum stability
- Give yourself regular periods of break, stand up from the chair, stand up on your feet, move around for some time, fold your hand, move your neck in a circular way to the right and to the left. Do that again and again from time to time because that will help your tensed muscles relax as it is considered exercises for your body muscles.
- It should be considered that no smoking and give us this bad habit that causes many diseases to human being. Retain smoking completely in your work place, especially in confined offices. Provision of proper ventilation and refresh the air from time to time in your work place.
- Make sure of the provision of safety requirements in your work place which lays in the soundness of floors, electric extensions and smoke outlets, warning devices, firefighting and first aid kits. Do not forget that you should be trained and competent of the way of using such devices in emergency cases.
- Do not use electric heaters to make tea, coffee and hot drinks in your office because that will expose you fire hazards.

Hazards of Mines, Unexploded Ordnance (Missiles, Bombs, Shells)(UXO) at Sites



Notice:

The observations included in this chapter are educational and for raising the knowledge level of safety inspectors and to guide them to potential hazards so as to avoid them and protect themselves and workers. It does not mean that inspectors will be able to deal with mines and UXO.

• Mines

It is an amount of explosive materials such as TNT «wrapped in an outer metal, wooden or plastic shell and equipped with a detonator and fuse which is equipped with ignition device.

• Types of mines

Landmines, marine mines

• Types of landmines

1. Anti-tank mines.
2. Anti-personnel mines.
- 3 - Shallow water mines.
- 4- Light mines.

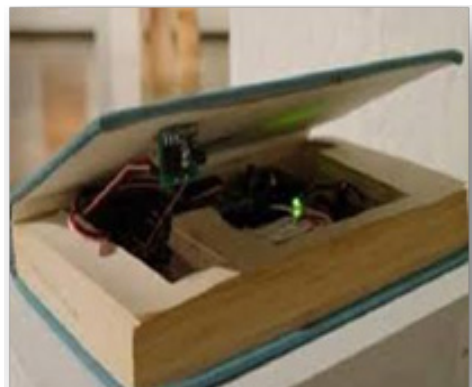


- **Signs of the Existence of Potential Mines**

- 1 - The presence of mine posts near the work site.
- 2 - Local signs such as red spray on stone / stones in the form of a pillar.
- 3 - Work in a site or area where there are trenches and bullets residues.
- 4 - Small clear drops in a sandy area.
- 5 - Growth of green patches attracting attention in semi-dry area on the passages and others.
- 6 - The locals of the region are avoiding or moving away from certain locations.
- 7- Animals' dead bodies and skeletons are scattered at a location close to the work site or at the site.
- 8 - The existence of abandoned buildings and houses near the work site.
- 9 - The presence of valuable materials in isolated area , such as a weapon or telephone.

- **Safety measures to avoid mining areas:**

- 1 - Avoid entry to abandoned places and houses for any reason.
- 2 - Make sure by asking the locals of the region if the work site was an area of a previous military conflict.
- 3 - Do not play or touch any material or piece of strange shape and inform the local authorities.
- 4 - Ask the locals before moving in uninhabited areas.



Investigation in Accidents and Work Injuries

The purpose of the investigation is to comply with the local and international legislatives requirements in the field of safety and to prevent their reoccurrence.

• **The factors that should be sought to identify the causes of the accident:**

These can be divided into five groups and investigation shall be conducted through posing sit of question as explained below:

- 1- Task
- 2- Materials (equipment)
- 3- Work Environment
- 4- Personal Circumstances of the individual
- 5- Management

• **Task:**

- a. Has the proper method of performing the work been used?
- b. Are the appropriate equipment available?
- c. Have these equipment been used?

• **Equipment:**

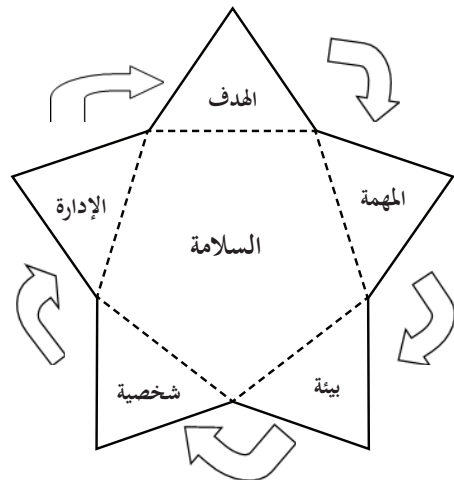
- a. Was there a previous defect? What is the defect? What is the reason?
- b. Is the design of the equipment bad?
- c. Are hazardous materials being used? Are they define and described in a safe manner?
- d. Have protective equipment been removed?
- e. Is there a defect in the energy system?

• **The Surrounding Circumstances:**

- a. What was the condition of weather before the accident?
- b. Was the weather hot or cold?
- c. Was there a state of emission (Pollution)?

• **Personal circumstances**

- a. Is the worker properly qualified for the job?
- b. Is the training system sufficient?
- c. What is the workers health status?
- d. Is there a situation of work pressure?



- e. Is the worker not fit for the current job?
- f. Was the worker careless (irresponsible) ?
- g. Was there a joke or quarrel between him and the workers?

• The Management:

- a. Have workers been informed concerning the safety guidelines and instructions?
- b. Are there any written work systems?
- c. Is there compliance to work systems?
- d. Is there sufficient supervision of the work?
- e. Are the workers trained on the work?
- f. Have risks been already identified?
- g. Has the risk been corrected (rectified) before?
- h. Is there a periodic preventive maintenance?

• How to collect information and facts related to the accidents?

1- Actual Evidences:

Before collecting information and facts, it is necessary to carefully inspect the scene to highlight a clear picture of everything related to the accident, such as:

- The location of injured workers
- Equipment and materials used
- Personal protective equipment
- Protection Equipment and control devices
- The extent of cleanliness of the place
- Level of lighting and noise in the place

2. Witnesses of the Accident:

Witnesses of the accident are considered the most important sources of information with the need to discuss each individual alone. At the outset, you should calm him down and listen carefully to him during his speech and ask him the following questions:

- a. Where were you and what were you doing during the accident?
- b. What did you see and heard at the time of the incident?
- c. How were the working conditions?
- d. In your personal opinion, what is the cause of the accident?
- e. How can such accident be avoided in the future?



3- Outcomes & Recommendations:

At this stage of the investigation, most of the facts should have been known and then recommendations and instructions shall be issued to prevent or mitigate the reoccurrence of the incident.

4. Reporting:

At this stage all the circumstances of the accident shall be recorded and kept in a special accident register for the purpose of conducting an annual statistics.



Insurance Procedures in the Social Fund for Development (SFD)

The Occupational Safety and Health Administration is concerned with maintaining the safety and health of employees. The aim is to protect them from potential accidents and hazards during work through the various SFD branches by applying a set of measures designed to protect employees or minimize the occurrence of injuries to the minimum limit. **These procedures are in accordance with the following sequence:**

- Conducting training courses in the field of occupational safety and health for consultants and project technicians.
- Units that are responsible for field projects shall provide a first-aid kits (tools or equipment) for each project which can be increased to two boxes of first aid kits as in the case of the projects with scattered components.
- Units shall provide occupational safety and health materials for projects of specialty as required.
- The consultants and technicians at sites are obliged to educate the employees on the occupational safety at the start of the project and before permitting them to begin carrying out the tasks in the field and at any time a new component is implemented or whenever necessary, specially, in work items or parts where risks ratios are high. It should be recorded and signed in the site records that the required awareness process has been carried out for the participating workers.
- In general, the awareness process should focus on occupational safety awareness for workers by avoiding or preventing them from working in hazardous or potentially dangerous locations which are exposed to or could experience collapse at any moment and avoid working in locations that may be prone to rock fall.

SFD encounters injury cases that may occur to the participating worker during work - God forbid. Such cases are as follows:

The First Case:

- When the injury is simple and the cost of treatment is less than or equal to one hundred and fifty thousand Yemeni riyals), the expenses shall be disbursed from the project allocation by the branch manager in accordance with the necessary substantiating documents (injury registration form - check-up prescriptions - medicines bills). The number of injury cases should not exceed two cases in each project and ten cases in all the projects of the branch during the year, on condition the Department of Occupational Safety and Health is provided with copies of the documents concerning specified number under the branch authority, the matter shall be referred to the department of occupational safety and health in advance for obtaining a written approval of what it deems fit after

submission of the proposal to the managing director.

- When treating injury cases from the project budget, all substantiating bills related to the injury shall be forwarded to the insurance company for reimbursement in line with to insurance procedures.

The Second Case :

When the injury is more serious or significant and the medical expenses exceed one hundred and fifty thousand riyals, the insurance company shall be contacted utilizing the agreement signed with the company in this regard in line with the terms of the insurance policy. **These cases and the procedures to be followed are indicated below:**

1. All employees of SFD are insured under life insurance. For consultants and daily paid workers, they are insured against personal accidents.

2. In case of the death of an employee in due to an accident – God forbid – the Human Resources Unit shall be provided with the following:

- The original attested medical report which explains the causes of death.
- Burial permit
- The report of traffic department or director general of the Security Directorate
- The original death certificate issued by the Civil Status Authority.
- The original legal heirs certificate from court
- original decree concerning the appointment of guardian in case of minors and original power of attorney in case of a legitimate authorization.
- Copies of the birth certificates of the sons / daughters.

1. In the event of the death of a consultant due to an accident, the Human Resources Unit shall be provided with the following:

- The original attested medical report which explains the causes of death.
- Burial permit
- The report of traffic department or director general of the Security Directorate
- The original death certificate issued by the Civil Status Authority.

2. In the event of death of a daily paid worker due to an accident at work, the Human Resources Unit shall be provided with the following:

- The original attested medical report which explains the causes of death.
- Burial permit + the report of traffics or director general of the Security Directorate
- The report of the supervisor of the worker or any investigation that has been conducted at work site.
- Beneficiary family card with copy to the unit or the program where the deceased was working.



3. In the event of a worker is injured, the Occupational Safety and Health Administration shall be notified in order to communicate with the human resources for the purpose of contacting the insurance company to identify the hospital or carry out the treatment of worker and submit the following documents:

- The original copy of the medical report of the hospital where the injured worker has been taken which include the description of the injury and his status.
- The original copy of the medical prescription with original invoices attached and a covering letter from the branch for the total payable amount after performing the necessary review of the supporting documents. Also, it is important to indicate whether the named worker is still under medication or not, to avoid closing the claim file at the end of the year by the insurance company. A copy of the same shall be forwarded to the Unit or the program where the injured worker is working.

● **Accordingly due to the importance:**

in case of the death of a staff member or when a consultant or daily wage worker was exposed to an accident resulting in his injury or death - God forbid - a form of injury / death notification related to life insurance should be filled and signed by the branch administration. This shall be submitted or sent without delay during a period not exceeding 48 hours to enable concerned parties to inform the insurance company. Copy of the same should be forwarded to the unit or program in which the injured or deceased was working in.

- The Social Fund for Development SFD is not responsible if the claim is not accepted by the insurance company because of the delay in submitting the injury notification form by the branch on due time or not providing all the above documents.



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