OSHA 30 Hour - Construction Industry Training

International Board of Safety Professionals
https://ibspusa.org/


OSHA®

O S H A

Occupational

Safety

Health

Administration

This program is the best value for ambitious students and employers who want to get the most out of their safety training experience. If you have high-career goals, are passionate about the field, and want to develop the skills needed to effectively manage safety in your workplace, this program provides the benefits you need to succeed.

Top 10 Most Frequently Cited Standards

Federal OSHA maintains a list of the top 10 most frequently cited standards following inspections of worksites to alert employers, so they can take steps to find and fix recognized hazards before preventable injuries and illnesses occur. For fiscal year 2014, the most frequently cited standards include:

1. 1926.501 Fall Protection (Construction)
2. 1910.1200 Hazard Communication (p. 59)
3. 1926.451 Scaffolding (Construction)
4. 1910.134 Respiratory Protection (p. 67)
5. 1910.178 Powered Industrial Trucks (p. 77)
6. 1910.147 Lockout/Tagout (p. 29)
7. 1926.1053 Ladders (Construction)
8. 1910.305 Electrical, Wiring Methods (p. 93)
9. 1910.212 Machine Guarding (p. 78)
10. 1910.303 Electrical, General Requirements (p. 92)

For more information about commonly cited standards, visit: www.osha.gov/Top_Ten_Standards.html.

Health

The protection of the bodies and minds of people from illness resulting from the materials, processes or procedures used in the workplace.

Safety

The condition of being protected from or unlikely to cause danger, risk, or injury.

Environmental protection

Arrangements to cover those activities in the workplace which affect the environment (in the form of water, air and soil) and, possibly, the health and safety of employees and others. Such activities include waste and effluent disposal and atmospheric pollution.

What are hazards?

A hazard is a source or a situation with the potential for harm in terms of human injury or ill-health, damage to property, damage to the environment, or a combination of these.

Hazards at work may include noisy machinery, a moving forklift, chemicals, electricity, working at heights, a repetitive job, or inappropriate behavior that adversely affects a worker's safety and health.

An unwanted event is a situation or condition where there is a loss of control of the hazard that leads to harm.

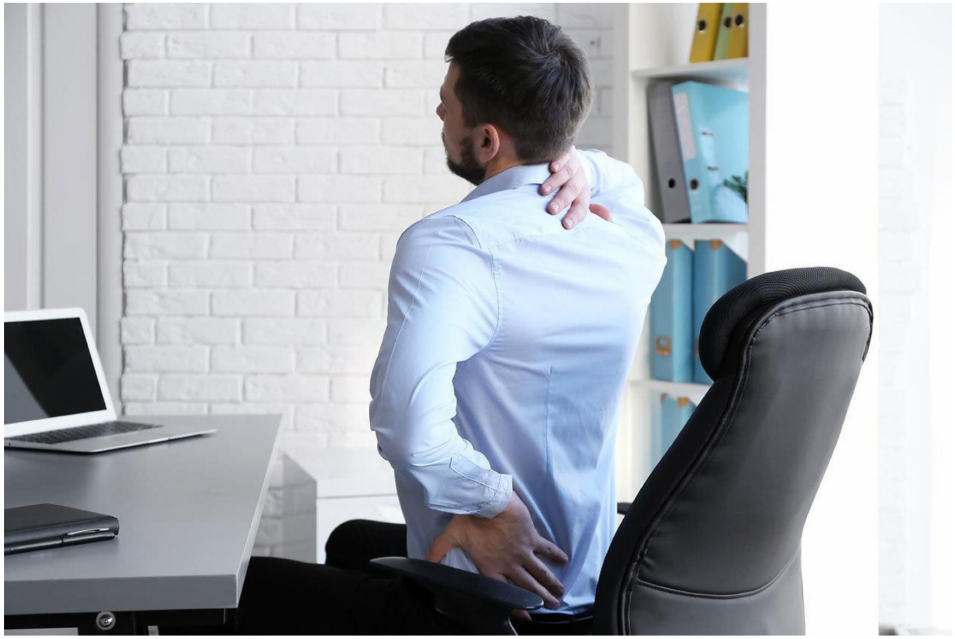
What is risk?

A risk is the chance of something happening that will have a negative effect. The level of risk reflects:

- the likelihood of the unwanted event
- the potential consequences of the unwanted event.

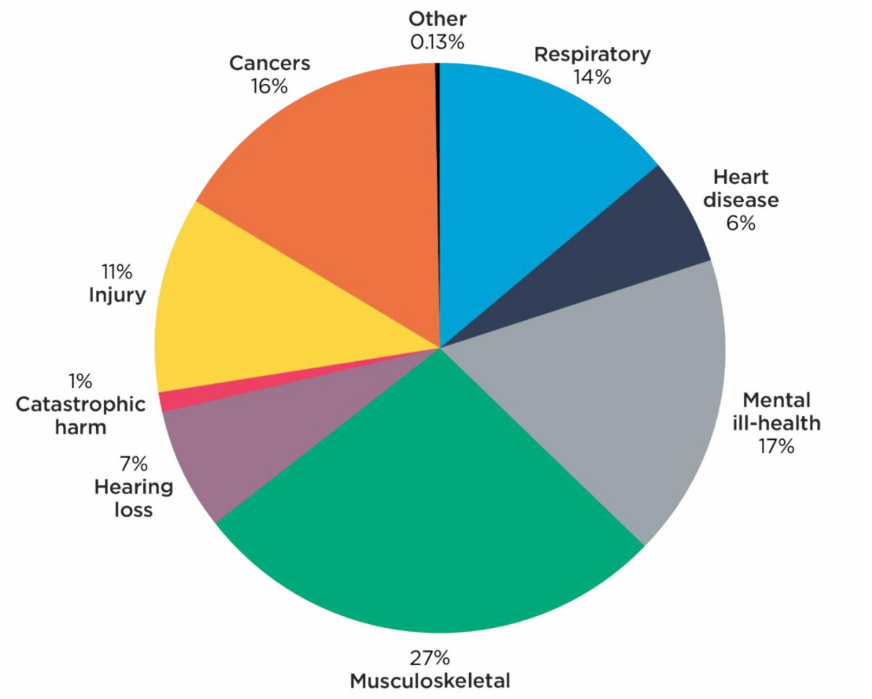
Work-related ill-health

Work-related ill-health is concerned with those illnesses or physical and mental disorders that are either caused or triggered by workplace activities. Such conditions may be induced by the particular work activity of the individual or by activities of others in the workplace. The time interval between exposure and the onset of the illness may be short (e.g. asthma attacks) or long (e.g. deafness or cancer).



Work-related injury & deaths

The ILO estimates that some 2.3 million women and men around the world succumb to work-related accidents or diseases every year; this corresponds to over 6000 deaths every single day. Worldwide, there are around 340 million occupational accidents and 160 million victims of work-related illnesses annually.



Unsafe Acts & Unsafe Conditions

Unsafe acts are actions or behaviors that can lead to accidents or injuries. They are typically committed by individuals who fail to follow safety rules, take shortcuts, or engage in risky behavior.

Unsafe Acts

80% of all injuries on duty are the result of unsafe Acts by people.

Some examples of unsafe acts are:

Speed – operating a machine at a speed it is not designed to run at.

Working without authority – entering a confined space before it has been declared safe.

Adjusting moving machinery – lubricating bearings or changing the drive belts while the machine is still running.

PPE not worn – not wearing safety goggles when grinding.

Unsafe Acts & Unsafe Conditions

Unsafe conditions refer to situations in the workplace that have the potential to cause harm or injury to employees.

Unsafe Conditions

A study attributes 20% of all injuries on duty to unsafe working conditions.

Some examples of unsafe conditions are:

Poor guarding – inadequate or inefficient

Defective Conditions – hand tools, equipment, substances

Poor Layout – work flow, overcrowding and congestion

Loud noise – can't hear instructions etc.

Inadequate illumination or ventilation – can't see clearly or breathe properly.

Hazard & Risk

What are the Top 5 safety hazard types in workplace?

1. Safety hazards
2. Physical hazards
3. Biological hazards
4. Chemical hazards
5. Ergonomic hazards

1. Safety hazards

These are the most common workplace hazards. They will occur in most workplaces at one point or another, especially in the utility industries where employees work with machinery.

Safety hazards include:

- Slips, trips, and falls caused by cords running across the floor, oily or wet floors, and blocked aisles.
- Falls from roofs, ladders, scaffolding, stairways, and other elevated surfaces.
- Electrocution caused by frayed cords, improper wiring, and missing ground pins.
- Moving machinery parts and unguarded machinery.
- Struck by objects falling from above or thrown by a machine.
- Confined spaces.

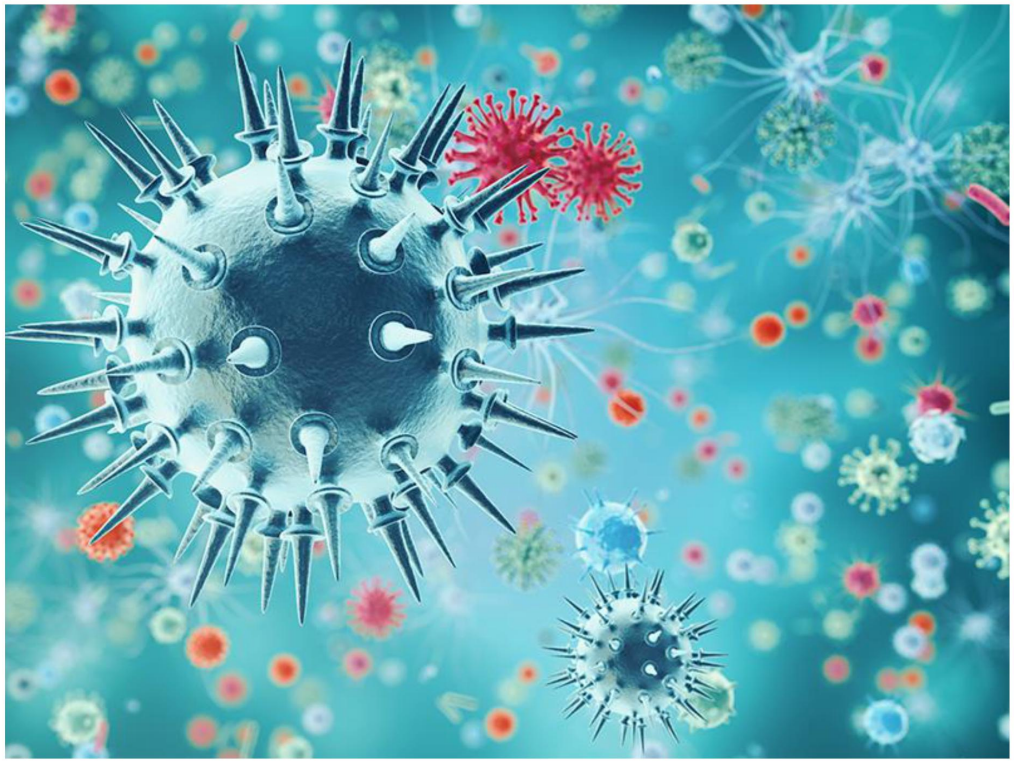
2. Physical hazards

Physical hazards are environmental factors that can harm the body even without physical contact. They affect those who work in extreme weather conditions or harmful environments with:

- Constant loud noise.
- Exposure to radiation, i.e. ionising, non-ionising, EMFs, and radio waves.
- Exposure to sun rays and ultraviolet rays.

3. Biological hazards

Biological hazards are caused by exposure to harmful substances associated with infectious plant materials, animals or people. People working in hospitals, laboratories, zoos, schools, daycares, restaurants, etc., are the most vulnerable to biological hazards. This is because they are constantly exposed to things like blood and other body fluids, bacteria, viruses, fungi, animal droppings, insect bites, and different types of plants.



4. Chemical hazards

This type of workplace hazard threatens employees whose occupations expose them to any chemical preparation, whether solid, liquid, or gas. Some substances are safer than others, but to workers sensitive to chemicals, even the most common solutions can cause breathing problems, skin irritation, and other illness. Chemical hazards are caused by:

- Liquids such as paints, cleaning products, acids, solvents, etc.
- Vapours and fumes from exposure to solvents or welding.
- Gases such as propane, carbon monoxide, helium, acetylene, etc.
- Flammable materials such as petrol, diesel, and other explosive chemicals.
- Pesticides

5. Ergonomic hazards

Ergonomic hazards can affect employees across all industries, but more so those whose work responsibilities or work conditions put a strain on their bodies. Manual roles involving heavy lifting or sitting for long periods can cause severe damage. What starts as sore muscles could end up being Carpal Tunnel Syndrome, Tendinitis, or a lower back injury. The most common ergonomic hazards include:

- Poor posture.
- Vibration.
- Frequent lifting.
- Using too much force.
- Improperly adjusted office furniture

Occupational Health and safety

Management System

PDCA-Plan Do Check Act cycle in occupational health and safety management system standard.

All management systems use the PDCA cycle methodology in their approach. It is a model that connotes the PLAN DO CHECK ACT. The PDCA Cycle is also known as the Deming cycle.

It is a four-step model for problem-solving and continuous improvement in a management system.

The Current and well-known Occupational health and safety management system standard OHSMS ISO 45001:2018 also follows a simple part of PDCA methodology in its approach.

PLAN DO CHECK ACT CYCLE FOR ISO 45001:2018

ISO 45001 has ten clauses and clauses that fit into the PDCA methodology. The Ten clauses are

1.Scope

2.Normative Reference.

3.Terms and definitions.

4.Context of an organization.

5.Leadership

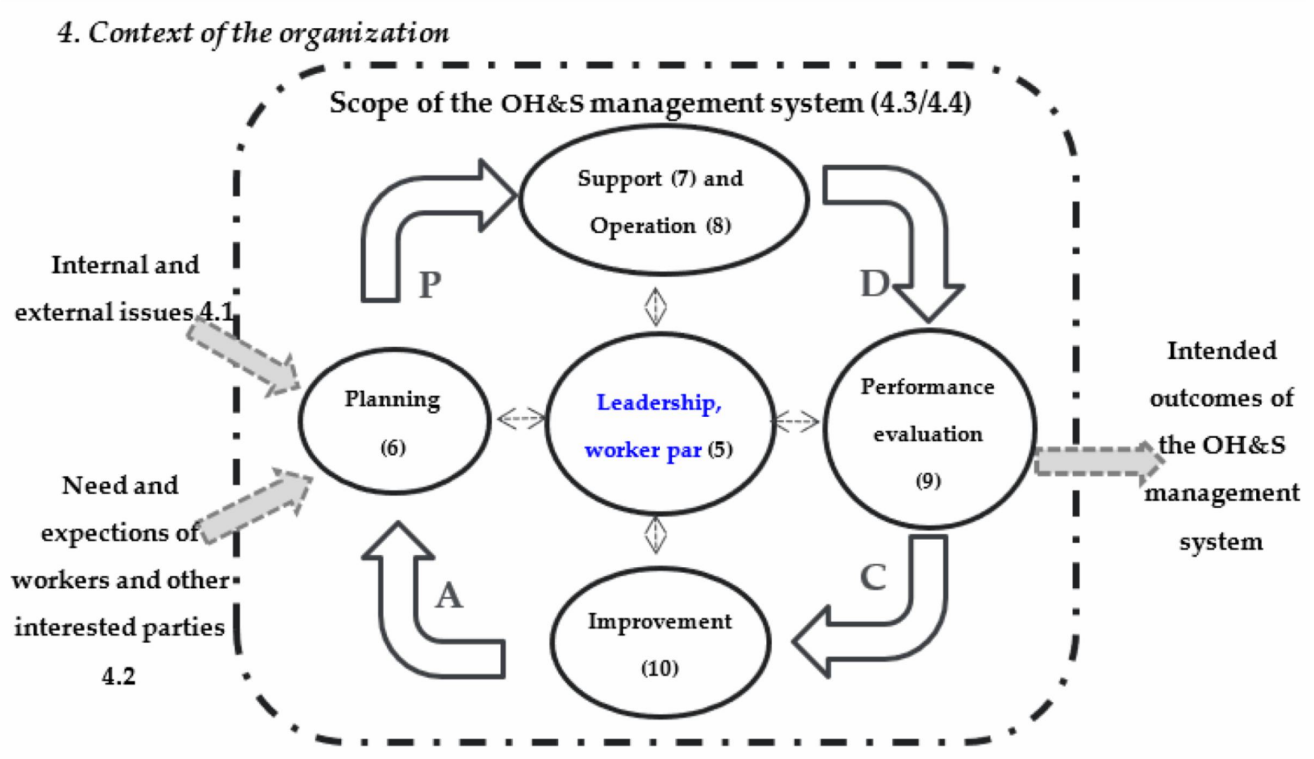
6.Planning.

7.Support.

8.Operation.

9.Performance Evaluation.

10.Continual improvement.



The Ten clauses are divided into the PDCA methodology as seen below

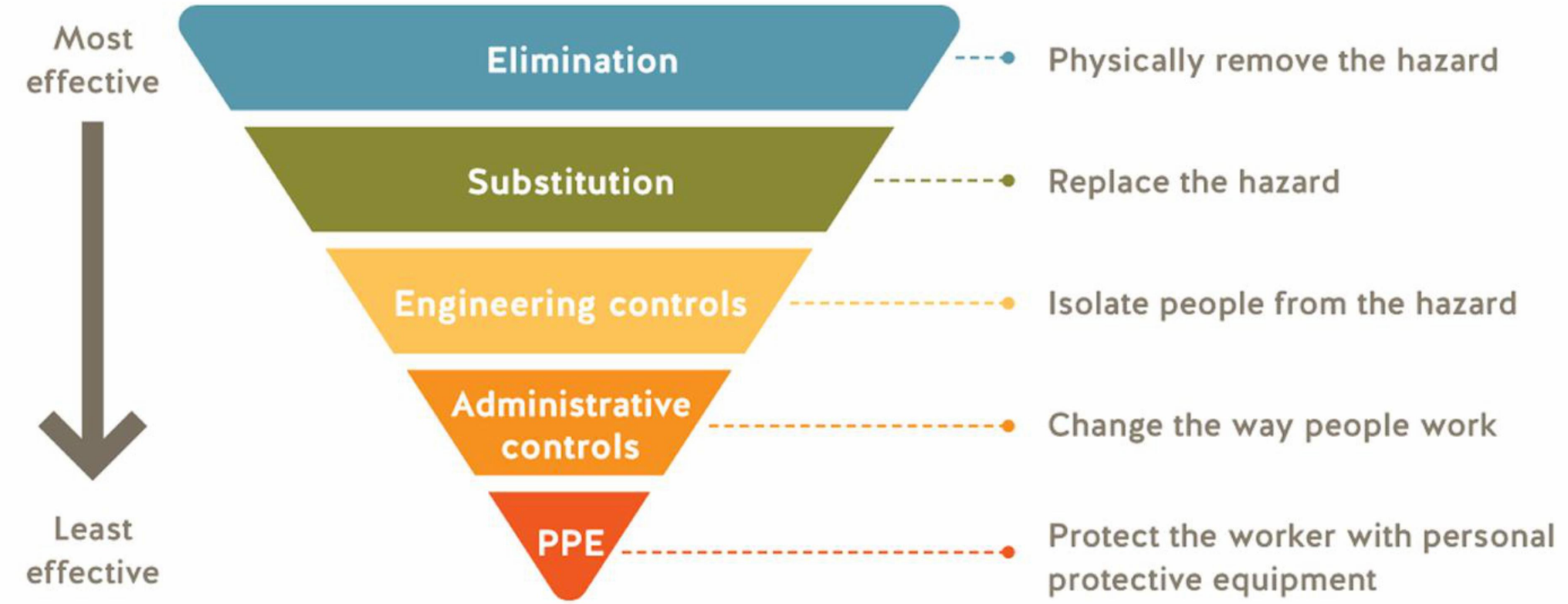
- **For PLAN – Clause 4, 5, 6,7, 8.**
- **DO- Clause 5,6,7,8,9.**
- **CHECK- Clause 9.**
- **ACT- Clause 10.**

- ✓ **Plan.** Define the processes and objectives required to achieve the results defined in the OH&S Policy of the organization.
- ✓ **Do.** This step implements the objectives and processes.
- ✓ **Check.** When checking, we measure and monitor all processes against OH&S policies and objectives, as well as legal requirements. We also report the results within this step.
- ✓ **Act**. Taking the required action to ensure that performance is continually improved

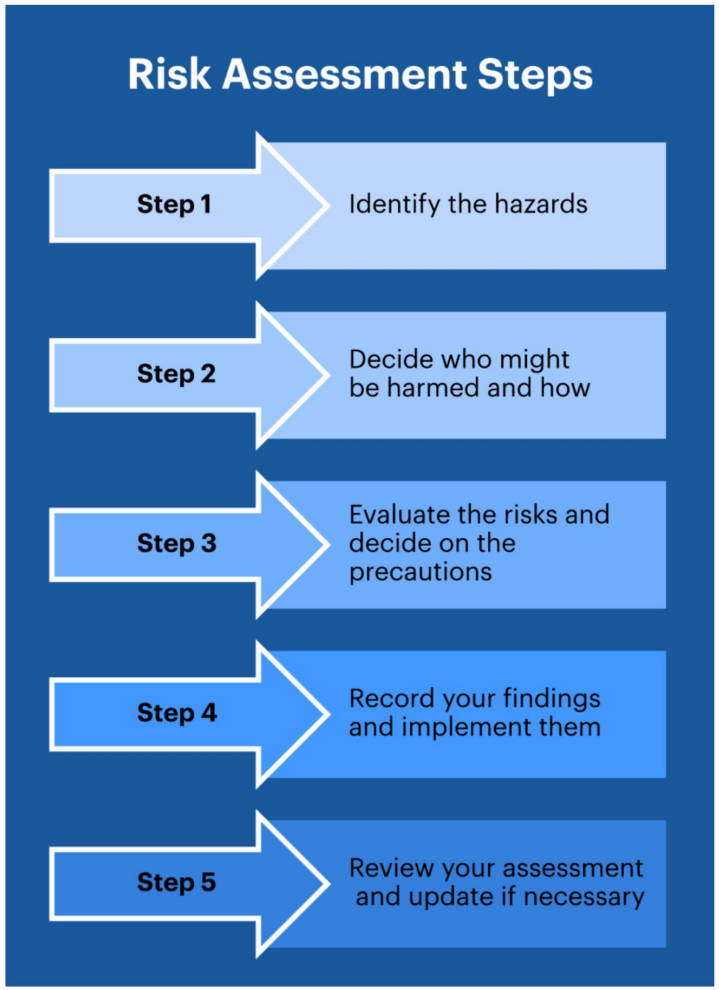
HIRA

The hierarchy of controls / Control The Risks

When considering how to reduce the risk, there's a certain order you should follow. This is called the hierarchy of controls. It's important to follow the hierarchy, as shown below, rather than start with the easiest control measures.



Risk management is a step-by-step process for controlling health and safety risks caused by hazards in the workplace.



Record your findings

If you employ 5 or more people, you must record your significant findings, including.

The Hazards (Things That May Cause Harm).

Who Might Be Harmed And How.

What You Are Doing To Control The Risks.

Review the controls

You Must Review The Controls You Have Put In Place To Make Sure They Are Working. You Should Also Review Them If :

They May No Longer Be Effective.

Changes To:

- Staff
- A Process
- The Substances Or Equipment Used

Risk Assessment

Identify hazards

Look around your workplace and think about what may cause harm (these are called hazards). Think about:

- ❑ how people work and how plant and equipment are used
- ❑ what chemicals and substances are used
- ❑ what safe or unsafe work practices exist
- ❑ Look back at your accident and ill health records as these can help you identify less obvious hazards.

Assess the risks

Once you have identified the hazards, decide how likely it is that someone could be harmed and how serious it could be. This is assessing the level of risk.

Decide:

- ❑ who might be harmed and how
- ❑ what you're already doing to control the risks

Risk Rating

Severity	
Severity = Level of potential harm	
1	Negligible
2	Minor injury
3	Injury, illness, time off work
4	Major injury, disabling illness
5	Fatality

Likelihood	
Likelihood = Chance of harm	
1	Very Unlikely
2	Unlikely
3	Fairly Likely
4	Likely
5	Very Likely - Imminent

Risk	
Severity x Likelihood = Risk	
1 - 6	Acceptable
8 - 10	Tolerable if strictly monitored, but try to improve
12 - 25	Unacceptable, further controls are mandatory

Risk assessment Matrix 5 x 5

Likelihood		Severity				
		1 Negligible	2 Minor Injury	3 Injury or Illness	4 Major Injury	5 Fatality
	1 Very Unlikely	1	2	3	4	5
	2 Unlikely	2	4	6	8	10
	3 Fairly Likely	3	6	9	12	15
	4 Likely	4	8	12	16	20
	5 Very Likely	5	10	15	20	25

Risk assessment template

Machine		Reference/ Version	
Machine Identification		Date of Assessment	
Production		Next Assessment Due	
Assessor's Name		Job Title	
Date of Assessment:		Date of Assessment:	

Hazard	Injury	Who at Risk	Existing Control Measures	Risk Score			Further Control Measures Needed	Action	
				Severity	Likelihood	Risk Rating (S x L)		By Whom	Due Date

Company name: **Assessment carried out by:**

Date of next review: **Date assessment was carried out:**

What are the hazards?	Who might be harmed and how?	What are you already doing to control the risks?	What further action do you need to take to control the risks?	Who needs to carry out the action?	When is the action needed by?	Done

PTW

Permit to Work Systems

General principles

The following aspects should be considered with respect to Permit to Work Systems:

•Human factors;

•Management of the work permit systems;

•Poorly skilled work force;

•Unconscious and conscious incompetence;

•Objectives of the work permit system;

•Types of work permits required; and

•Contents of the work permits.

Contributory factors for an assessor to consider concerning the Work Permit System

The Safety Report should address the following points:

- ❑ Whether staff have been sufficiently informed, instructed, trained and supervised to minimise a potential human failing during operation of the work permit system;
- ❑ Whether the work permit system includes sufficient safety information, maintenance instructions, correct PPE and equipment for use;
- ❑ Whether the work permit contains sufficient information about the type of work required (Equipment removal, excavation, hot/cold work, repairing seals, vessel entry, waste disposal, isolation);
- ❑ Whether there is sufficient provision available to fulfil the requirements of the work permit system;
- ❑ Whether the employees responsible for control of the maintenance work are identified within the work permit system and that the work is properly authorized by a responsible person;

Contributory factors for an assessor to consider concerning the Work Permit System

- ❑ Whether the work permit system is managed, regularly inspected and reviewed;
- ❑ Whether all work permits are kept on file;
- ❑ Human factors (stress, fatigue, shift work, attitude);
- ❑ Whether sufficient precautions are taken prior to initiating a work permit (isolation, draining, flushing, environmental monitoring, risk assessments, communication, time allotted for the work);
- ❑ Whether staff are aware of the type of environment they are working in during the operation of a work permit (flammable, corrosive, explosive, zones 0, 1 & 2, electricity supplies);
- ❑ Whether the person responsible for operating the plant is aware of the type of maintenance involved and how long it is likely to take; and
- ❑ Whether the work permit system involves a formal procedure whereby the maintained plant or equipment is handed back to operation.

JSA

What is a Job Safety Analysis?

A job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job operation. In a JSA, each basic step of the job is to identify potential hazards and to recommend the safest way to do the job. Other terms used to describe this procedure are job hazard analysis (JHA) and job hazard breakdown.

What are the benefits of doing a Job Safety Analysis?

One of the methods used in this example is to observe a worker actually perform the job. The major advantages of this method include that it does not rely on individual memory and that observing or performing the process prompts the recognition of hazards. For infrequently performed or new jobs, observation may not be practical.

What are the four basic steps?

Four basic stages in conducting a JSA are:

1. selecting the job to be analyzed
2. breaking the job down into a sequence of steps
3. identifying potential hazards
4. determining preventive measures to overcome these hazards

What is important to know when "selecting the job"?

Factors to be considered in setting a priority for analysis of jobs include:

- ❑ Accident frequency and severity: jobs where accidents occur frequently or where they occur infrequently but result in serious injuries.
- ❑ Potential for severe injuries or illnesses: the consequences of an accident, hazardous condition, or exposure to harmful products are potentially severe.
- ❑ Newly established jobs: due to lack of experience in these jobs, hazards may not be evident or anticipated.
- ❑ Modified jobs: new hazards may be associated with changes in job procedures.
- ❑ Infrequently performed jobs: workers may be at greater risk when undertaking non-routine jobs, and a JSA provides a means of reviewing hazards.

How do I break the job into "basic steps"?

After a job has been chosen for analysis, the next stage is to break the job into steps. A job step is defined as a segment of the operation necessary to advance the work. See examples below.

Sequence of Events	Potential Accidents or Hazards	Preventive Measures
Park vehicle		
Remove spare and tool kit		
Pry off hub cap and loosen lug bolts (nuts)		
And so on.....		

How do I "identify potential hazards"?

To help identify potential hazards, the job analyst may use questions such as these (this is not a complete list):

- ❑ Can any body part get caught in or between objects?
- ❑ Do tools, machines, or equipment present any hazards?
- ❑ Can the worker make harmful contact with moving objects?
- ❑ Can the worker slip, trip, or fall?
- ❑ Can the worker suffer strain from lifting, pushing, or pulling?
- ❑ Is the worker exposed to extreme heat or cold?
- ❑ Is excessive noise or vibration a problem?
- ❑ Is there a danger from falling objects?
- ❑ Is harmful radiation a possibility?
- ❑ Can contact be made with hot, toxic, or caustic products?
- ❑ Are there dusts, fumes, mists, or vapours in the air?

Potential hazards are listed in the middle column of the worksheet, numbered to match the corresponding job step. For example:

Sequence of Events	Potential Accidents or Hazards	Preventive Measures
Park vehicle	a) Vehicle too close to passing traffic b) Vehicle on uneven, soft ground c) Vehicle may roll	
Remove spare and tool kit	a) Strain from lifting spare	
Pry off hub cap and loosen lug bolts (nuts)	a) Hub cap may pop off and hit you b) Lug wrench may slip	
And so on.....	a) ...	

How do I "determine preventive measures?"

The final stage in a JSA is to determine ways to eliminate or control the hazards identified. The generally accepted measures, in order of preference, are:

1. Eliminate the hazard
Elimination is the most effective measure. These techniques should be used to eliminate the hazards:
•Choose a different process
•Modify an existing process
•Substitute with less hazardous product
•Improve environment (e.g., ventilation)
•Modify or change equipment or tools
2. Contain the hazard
If the hazard cannot be eliminated, contact might be prevented by using enclosures, machine guards, worker booths or similar devices.
3. Revise work procedures
Consideration might be given to modifying steps which are hazardous, changing the sequence of steps, or adding additional steps (such as locking out energy sources).
4. Reduce the exposure
These measures are the least effective and should only be used if no other solutions are possible. One way of minimizing exposure is to reduce the number of times the hazard is encountered. An example would be modifying machinery so that less maintenance is necessary.

In listing the preventive measures, do not use general statements such as "be careful" or "use caution". Specific statements which describe both what action is to be taken and how it is to be performed are preferable. The recommended measures are listed in the right hand column of the worksheet, numbered to match the hazard in question. For example:

Sequence of Events	**Potential Accidents or Hazards**	**Preventive Measures**
Park vehicle	a) Vehicle too close to passing traffic b) Vehicle on uneven, soft ground c) Vehicle may roll	a) Drive to area well clear of traffic. Turn on emergency flashers b) Choose a firm, level parking area c) Apply the parking brake; leave transmission in PARK; place blocks in front and back of the wheel diagonally opposite to the flat
Remove spare and tool kit	a) Strain from lifting spare	a) Turn spare into upright position in the wheel well. Using your legs and standing as close as possible, lift spare out of truck and roll to flat tire.
Pry off hub cap and loosen lug bolts (nuts)	a) Hub cap may pop off and hit you b) Lug wrench may slip	a) Pry off hub cap using steady pressure b) Use proper lug wrench; apply steady pressure slowly
And so on.....	a) ...	a) ...

Protecting Employees from Workplace Hazards

- Employers must protect employees from workplace hazards such as machines, hazardous substances, and dangerous work procedures that can cause injury
- Employers must:

  Use all feasible engineering and work practice controls to eliminate and reduce hazards

  Then use appropriate personal protective equipment (PPE) if these controls do not eliminate the hazards.

- **Remember, PPE is the last level of control!**

Personal Protective Equipment's

Examples of PPE

Eye - safety glasses, goggles

Face - face shields

Head - hard hats

Feet - safety shoes

Hands and arms - gloves

Bodies - vests

Hearing - earplugs, earmuffs

Establishing a PPE Program

- Sets out procedures for selecting, providing and using PPE as part of an employer's routine operation
- First -- assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of PPE
- Once the proper PPE has been selected, the employer must provide training to each employee who is required to use PPE

Training

Employees required to use PPE must be trained to know at least the following:

- When PPE is necessary
- What type of PPE is necessary
- How to properly put on, take off, adjust, and wear
- Limitations of the PPE
- Proper care, maintenance, useful life and disposal

Eye Protection

Some Causes of Eye Injuries

- Dust and other flying particles, such as metal shavings or sawdust
- Molten metal that might splash
- Acids and other caustic liquid chemicals that might splash
- Blood and other potentially infectious body fluids that might splash, spray, or splatter
- Intense light such as that created by welding and lasers

Safety Spectacles

- Made with metal/plastic safety frames
- Most operations require side shields
- Used for moderate impact from particles produced by such jobs as carpentry, woodworking, grinding, and scaling

Welding Shields

Protect eyes from burns caused by infrared or intense radiant light, and protect face and eyes from flying sparks, metal spatter, and slag chips produced during welding, brazing, soldering, and cutting.

Laser Safety Goggles

Protect eyes from intense concentrations of light produced by lasers.

Face Shields

- Protect the face from nuisance dusts and potential splashes or sprays of hazardous liquids
- Do not protect employees from impact hazards

Head Protection

Some Causes of Head Injuries

- Falling objects
- Bumping head against fixed objects, such as exposed pipes or beams
- Contact with exposed electrical conductors

Classes of Hard Hats

Class A

- General service (e.g., mining, building construction, shipbuilding, lumbering, and manufacturing)
- Good impact protection but limited voltage protection

Class B

- Electrical work
- Protect against falling objects and high-voltage shock and burns

Class C

- Designed for comfort, offer limited protection
- Protects heads that may bump against fixed objects, but do not protect against falling objects or electrical shock

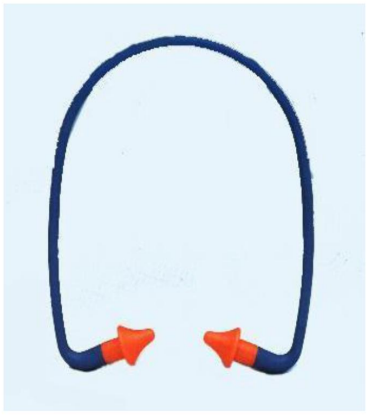
Hearing Protection

Examples of Hearing Protectors

Earmuffs

Earplugs

Canal Caps



Foot Protection

Some Causes of Foot Injuries

- Heavy objects such as barrels or tools that might roll onto or fall on employees' feet
- Sharp objects such as nails or spikes that might pierce the soles or uppers of ordinary shoes
- Molten metal that might splash on feet
- Hot or wet surfaces
- Slippery surfaces

Safety Shoes

- Have impact-resistant toes and heat-resistant soles that protect against hot surfaces common in roofing, paving, and hot metal industries
- Some have metal insoles to protect against puncture wounds
- May be designed to be electrically conductive for use in explosive atmospheres, or nonconductive to protect from workplace electrical hazards

Hand Protection

Some Causes of Hand Injuries

- Burns
- Abrasions
- Cuts
- Punctures
- Fractures
- Amputations
- Chemical Exposures

Body Protection

Some Causes of Body Injuries

- Intense heat
- Splashes of hot metals and other hot liquids
- Impacts from tools, machinery, and materials
- Cuts
- Hazardous chemicals
- Contact with potentially infectious materials, like blood
- Radiation

Body Protection

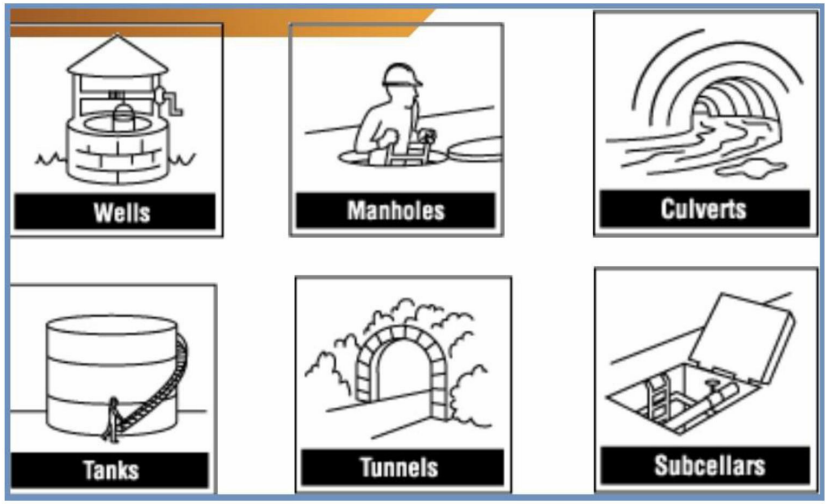
Confined Space

Confined Space

- Any enclosure having a limited means of entry & exit and it is not designed for continuous occupancy.
- There will be a presence of any hazardous substances such as flammable and toxic gases, oxygen deficiency, hot or humid atmosphere or any combination of it.

Some examples of confined spaces:

- Columns, vessels
- Storage tanks
- Pipelines
- Valve boxes
- Manholes
- Ventilation ducts
- Boilers, steam generators
- Heat exchangers
- Sewers, sumps, pits
- Barge compartments
- Excavations



Confined Space Hazards

- ❑ Oxygen deficiency or enrichment
- ❑ Presence of flammable, combustible or pyrophoric materials (HC, Sludge etc.)
- ❑ Presence of toxic gases, corrosive or hazardous materials (H2S, Co, NH3 etc.)
- ❑ Poor illumination, Ventilation & Communication
- ❑ Falling / Tripping hazards
- ❑ Hazard due to electricity or moving machinery
- ❑ Hazard due to nature of work carried out inside confined space.

Safety precautions required for a Confined Space

1. Permit must be procured form operations, making sure of the following
   - ❑ Draining, depressurization and purging or cleaning should be performed
   - ❑ Gas test should be conducted to ensure no hazardous atmosphere is present
   - ❑ Space ventilation

2. A Pre task meeting must be conducted with all authorized entrants prior to entering confined space.

3. The attendant (Stand by man) shall be assigned at the entrance to maintain communication with employees working inside to ensure their safety. A log book shall be maintained at the entrance to keep track of the people inside the space.

4. Safety attendant must be trained and authorized to use gas testing equipment.

Safety precautions required for a Confined Space

5. Entrants must wear body harness, and if necessary a life line be attached to the harness to avoid entry-rescue

6. Lighting should be provided, if necessary a maximum of 24 volts, lighting should be used attached a GFCI (ground-fault circuit interrupter)

7. Only intrinsically safe or explosion-proof equipment shall be used inside

8. Depending on the situation, emergency rescue team may be put on standby

9. If an emergency occurs within the confined space, the standby person must not enter it until rescue team arrived

10. Barricade the area with warning sign board.

Electrical Hazards

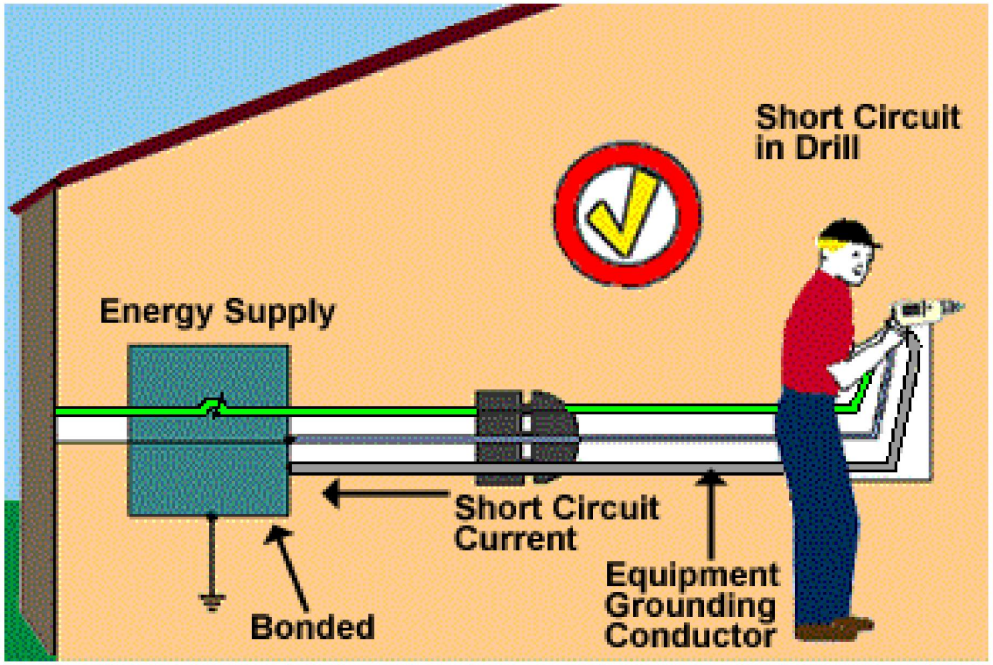
Hazards Associated with Electricity

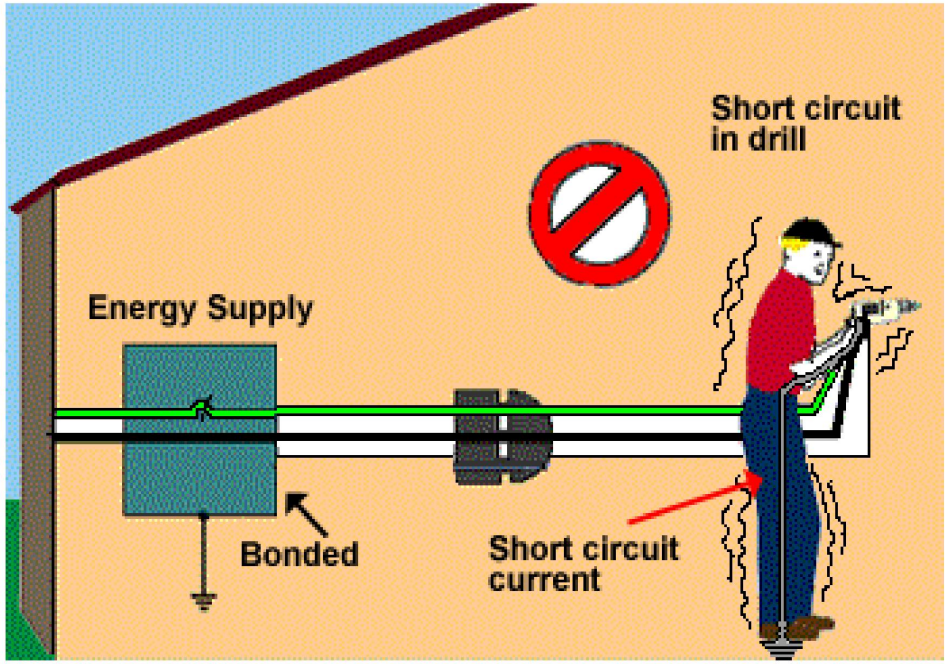
- ❑ Inadequate wiring
- ❑ Exposed electrical parts
- ❑ Wire with bad insulation
- ❑ Undergrounded electrical systems and tools
- ❑ Overloaded circuits
- ❑ Damaged power tools and equipment's
- ❑ Using the wrong PPE and tools
- ❑ Overhead Power lines
- ❑ All hazards are made worse in wet conditions.

Electrical Protective Devices

- Fuses
- Circuit Breakers
- Ground-fault circuit interrupters

Grounding


Short Circuit
in Drill
Energy Supply
Short Circuit
Current
Equipment
Grounding
Conductor
Bonded


Short circuit
in drill
Energy Supply
Bonded
Short circuit
current

Precautions to be taken to avoid electrocution

- The authorized person approved by the relevant Maintenance Team can carry out electrical work
- Electrical safety floor mats made from a special grade of insulating rubber shall be provided in front of switchboards or high-voltage equipment to protect personnel against accidental electric shock.
- Warning tape on top of buried cables and electrical cable tiles must be provided as an early warning notice for excavations.
- All portable electrical equipment must be approved by the Maintenance Team and shall be used as per suitability for the relevant area only.
- Do not reach blindly into areas that may contain energized parts.
- Do not enter into a space where adequate lighting and working space is not available.
- Only Industrial type plugs and sockets shall be used on all locations other than offices and houses

Precautions to be taken to avoid electrocution

- ❑ All testing and measuring equipment used for the electrical works should be tested, calibrated and documented.
- ❑ Ensure all equipment's are grounded and should be attached GFCI / ELCB.
- ❑ Inspect electrical equipment's before use.
- ❑ Electrical Panel, Junction boxes, pull boxes and fitting must have approved covers.
- ❑ Unused openings in cabinets, boxes and fittings must be closed.
- ❑ Don't overload on a circuit.
- ❑ Maintain the distance from overhead power lines during the Crane activity and scaffolding erection and other activities.
- ❑ All cable of power tools / portable tools should be double insulated.

Precautions to be taken to avoid electrocution

- ❑ Don’t use damage extension cords and don’t touch live wire and another wire at a different voltage.
- ❑ Damaged equipment must not be touched until the isolated.
- ❑ Disconnect the power when not in use and when changing accessories.
- ❑ Use the appropriate PPE for the job.
- ❑ Competent, qualified and approved personnel should be carry out testing & energizing of the equipment.
- ❑ Electrical lock-out and tag-out system should be used when working on electrical equipment’s.
- ❑ In the event of fire on electrical panel or equipment, the electrical power supply must be isolated and suitable Fire Extinguisher shall be used to extinguish the fire

Hot Work

Hot Works

Hot work is any occupational activity that produces heat, flames, or sparks that are capable of starting fires or explosions.

Welding and cutting hazards (Hot Work)

- ❑ Risk due to toxic gas & fumes generated while welding or cutting.
- ❑ Fire or explosion started by flame, sparks and hot material from the activities.
- ❑ Electrical shock from arc welding equipment
- ❑ Burn hazard due to heat generated while welding or cutting.
- ❑ Weld bead particulars or slag entering unprotected eyes during chipping.
- ❑ Inhalation of welding fumes.
- ❑ Falling Gas cylinders.
- ❑ Radiation from UV and Infra-Red (flash eye)

Safety Precaution for a Hot Work

- ❑ Hot Work will start with a valid hot work permit.
- ❑ If it is inside GC or Refinery then need to cover the welding point with proper fire blanket.
- ❑ Frequent gas test to be carried out
- ❑ Wet the area with water and pressurized firewater hose to be kept near the hot work area.
- ❑ Combustible materials to be removed from welding point.
- ❑ Keep the certified and valid fire extinguisher near the hot work area.
- ❑ Trained and certified fire watcher should be present.
- ❑ Equipment, which will be used for hot work to be inspected before starting up the job.

Safety Precaution for a Hot Work

- All welding machine must be connected with GFCI (Ground Fault Circuit Interrupter) or ELCB (Earth Leakage Circuit Breaker) and approved spark arrester.
- All welding machines must be ground with static-earthing device.
- All cable must be properly insulated and electrode holder, plugs and sockets must be in good condition.
- The equipment or pipe, spool should be supported on a secured and firm base during welding or grinding.
- All valves, flanges, drains, canals etc. where gas leaks or presence of flammable atmosphere is possible should be covered.

Working at Height

Safety Precaution for Work at Height

- The work is properly planned, organized. Appropriately supervised and carried out ensuring safety of workers and integrity of worksite.
- The worksite including its access as well exit is safe with necessary protection against fall from height.
- Similarly the workers to be deployed for work at height are trained and aware of potential hazards.
- PPE, appropriate fall arrest system such as Safety Harness, Safety Nets etc. shall be used to protect the person from fall.
- The personnel working at height must use appropriate & approved Full Body Safety Harness and attached to a secure anchorage.

Safety Precaution for Work at Height

- ❑ All the straps of safety harness shall be securely tightened to the body parts.
- ❑ The tools and equipment to be used at height must be kept properly secured to prevent its accidental fall or tripping hazard.
- ❑ The area in the vicinity of work at height should be barricaded and danger notice posted to alert the personnel.

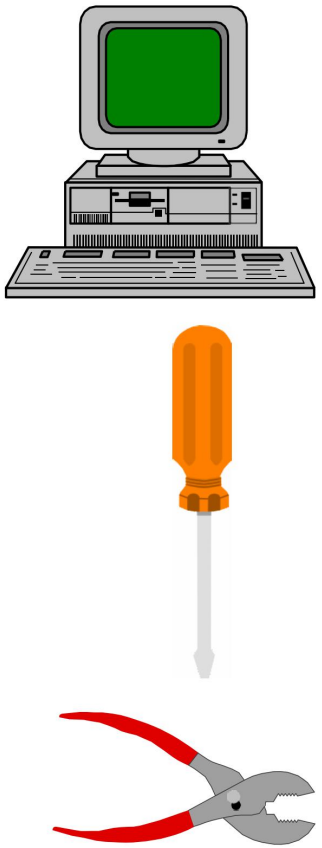
Man Basket: Workers should keep all body parts inside the man basket while it is being lifted or positioned. Workers must wear a personal fall arrest system, and Helmet with chin strap must be worn at all times.

Sloping Roofs: Employee worked in roofing activities on slope roofs with unprotected sides and edges 6 feet (1.8 meters) or more above shall be used appropriate Safety Harness, Safety Net and Guardrail or a combination of these.

Ergonomics & Manual Handling

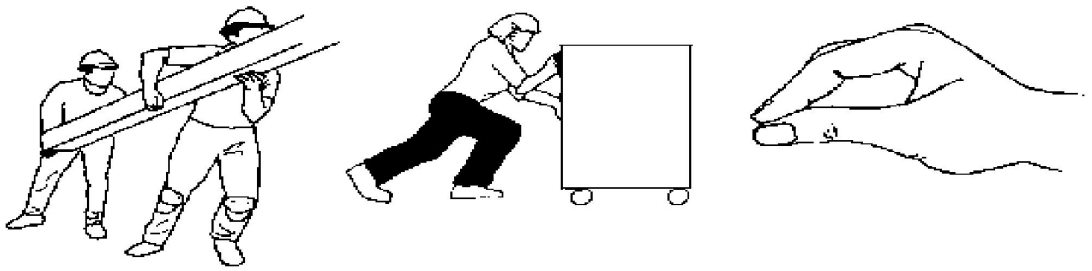
ERGONOMICS

- Mismatch between the physical requirements of the job and the physical capacity of the human body.
- More than 100 different injuries can result from repetitive motions that produce wear and tear on the body.



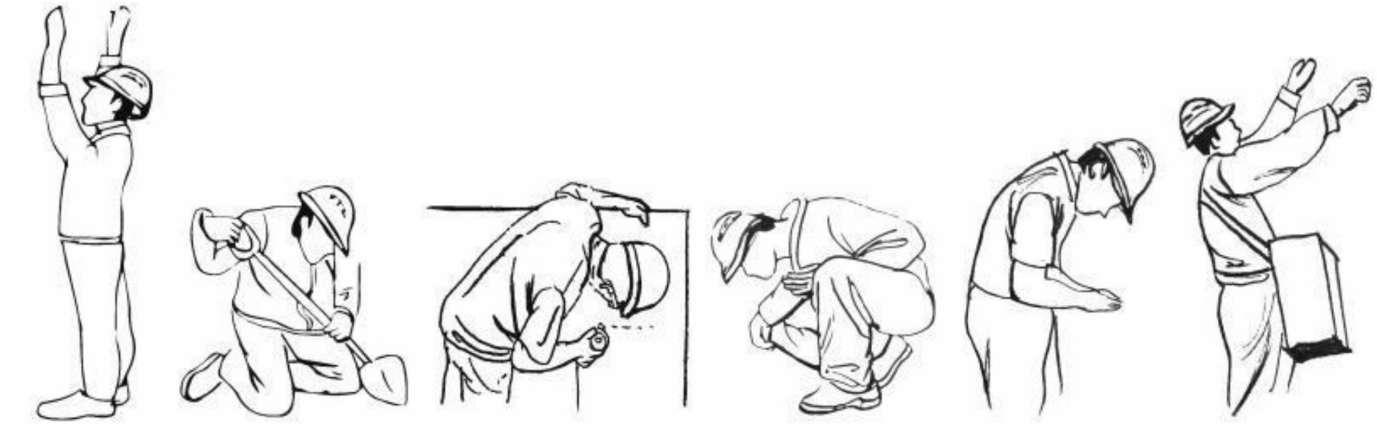
FORCEFULNESS

Forcefulness is the amount of physical effort required by the person to do a task and/or maintain control of tools and equipment. The effort depends on type of grip, object weight, object dimensions, body posture, type of activity, slipperiness of object, temperature, pinching, vibration, duration of the task and number of repetitions.



AWKWARD POSTURE

Awkward posture is a deviation from the ideal working posture of arms at the side of the torso, elbows bent, with the wrists straight. Awkward postures typically include reaching behind, twisting, working overhead, kneeling, forward or backward bending, and squatting.

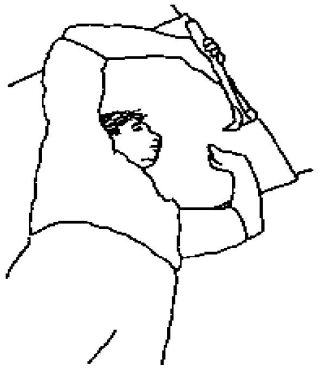


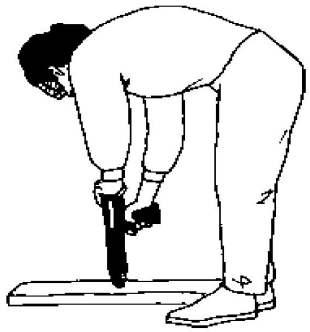
REPETITIVENESS

Repetitiveness is performing the same motions repeatedly. The severity of risk depends on the frequency of repetition, speed of the movement or action the number of muscle groups involved, and the required force. Machine or line pacing incentive programs, piecework and unrealistic deadlines influences repetitiveness.

STATIC LOADING

Static loading or sustained exertions are physical effort or body postures that are held and require muscle contraction for more than a short time. As muscles remain contracted, the blood flow to the muscles is reduced.





EXTREME TEMPERATURES

Extreme temperatures: Low temperatures reduce sensory feedback, dexterity, blood flow, muscle strength, and balance. High temperatures increase the rate at which the body fatigues.

HAND-ARM VIBRATION

Hand-arm vibration is vibration (generally from equipment or a hand tool) that goes through the hand and arm, then travels through the rest of the body. Vibration can also affect the lower back, especially when driving a vehicle. Vibration reduces blood flow and sensory response.

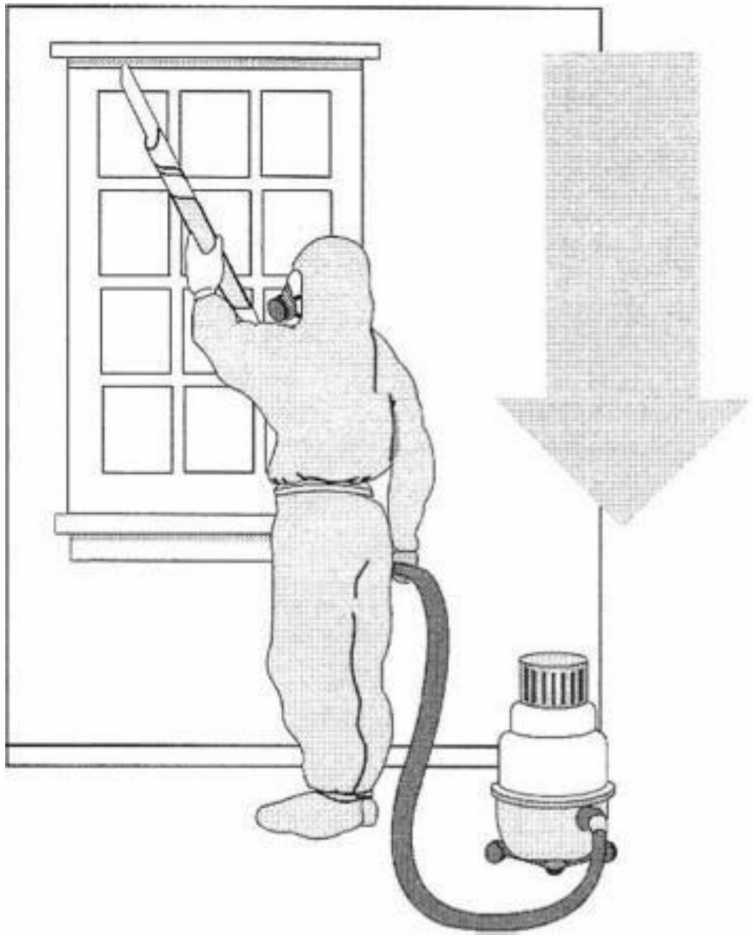
HAZARD PREVENTION AND CONTROL

- Engineering controls
- Work practice controls
- Personal protective equipment

WORK PRACTICE CONTROLS

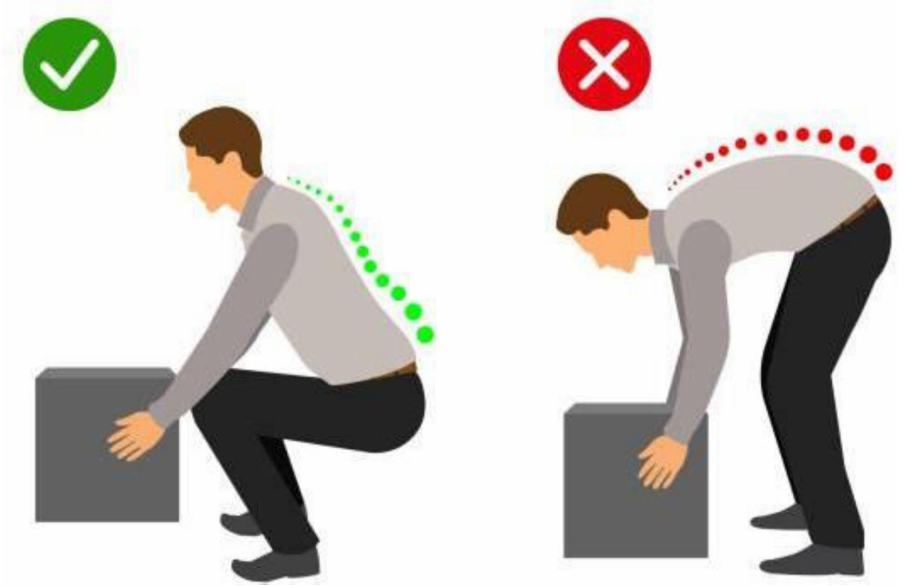
Reduce the duration, frequency or severity of exposure to a hazard.

- Gradual Work Introduction
- Recovery Pauses
- Job Rotation
- Job Design
- Work Methods Training



SAFE LIFTING PRACTICES

- Test the weight of the load
- Ask for help or use mechanical assistance
- Be sure path is free of obstruction
- Keep load close to your body
- Minimize twisting and bending



TRAINING AND EDUCATION

Supervisors and managers training

- 1. Recognize early signs and symptoms of work-related musculoskeletal disorders
- 2. Recognize and correct hazardous work practices.
- 3. Understand and emphasize the importance of the ergonomics program.
- 4. Information about their safety and health responsibilities

Engineers, maintenance and purchasing personnel:

- 1. Engineers and maintenance personnel training should include how to correct musculoskeletal hazards through job and workstation design and maintenance.
- 2. Purchasing personnel should be trained to understand basic ergonomic concepts of tool, equipment and furniture design. This will help them make more informed choices in their purchasing

MANUAL HANDLING

- Manual handling is a common activity in most workplaces
- It includes lifting, lowering, pulling, pushing, carrying, moving, holding or restraining an object
- Injuries and musculoskeletal disorders affect the back, neck, shoulder, arms & hands
- It can be prevented through a systemic approach of identification, assessment and control of risks associated with manual handling.

Hazards Associated with Manual Handling

- **Heavy**

Hazards Associated with Manual Handling

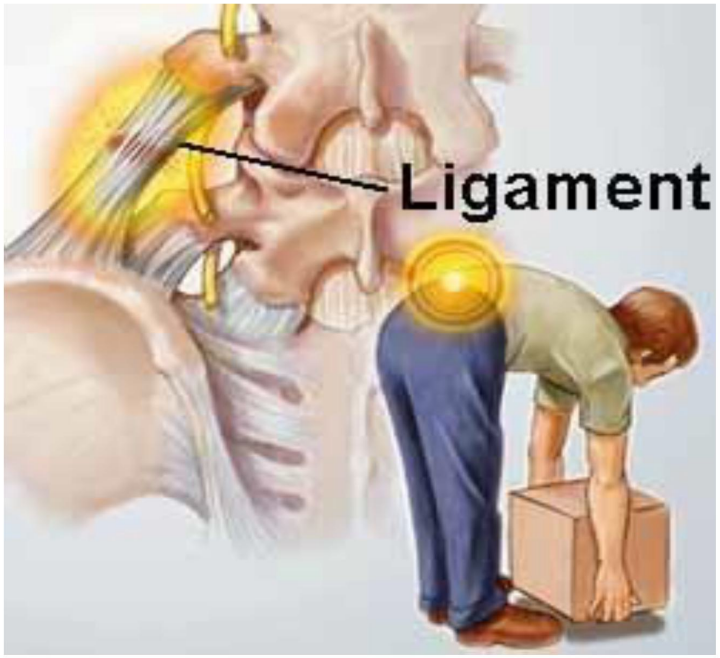
- **Odd shapes**

Absence of grip to hold the load

Common Injuries From Manual Handling

Wrist Sprains

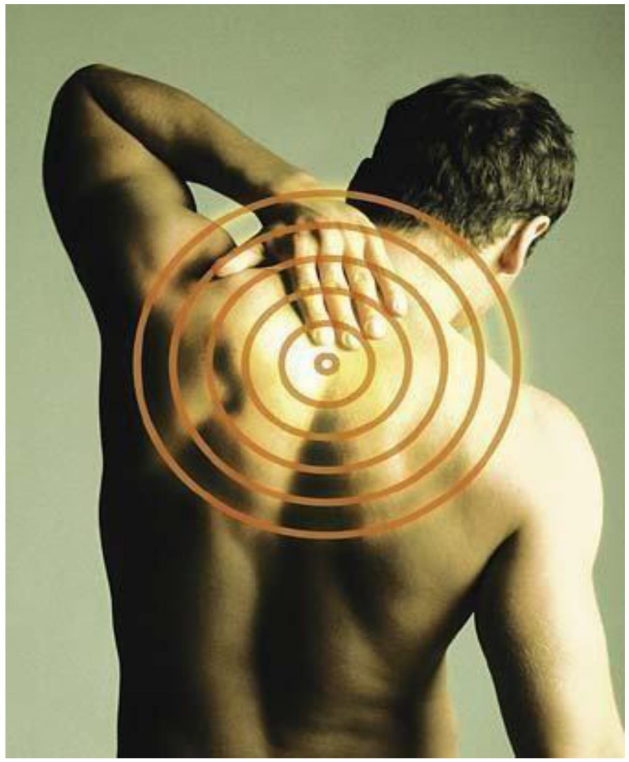
Back Sprains



Common Injuries From Manual Handling

Shoulder pain

Upper back pain



Proper Manual Handling –Individual

Step 1: Hold the load firmly

Step 2: Keep the load close to you

Step 3: Lift the load by pushing up your leg

Step 4: Ensure your legs are stable before moving off

ALWAYS KEEP YOUR BACK STRAIGHT WHILE LIFTING

Selection of PPE for Manual Handling

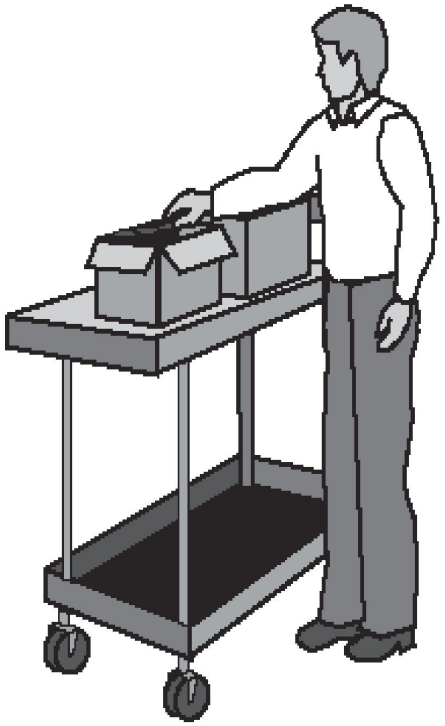
- Are there any sharp or point edges?
- Is it enough to prevent injuries or occupational diseases?
- Does the PPE fit you correctly?
- Does the PPE wear out easily?
- Is it based on chemical properties of the substance?
- Does it minimize contact with chemicals?
- Is it easy to clean and maintain?

Selection of PPE for Manual Handling

- Safety boots
- Protective gloves
- Helmets
- Working apron or overalls
- Goggles or safety glasses
- Face mask or respirators

Job Designs to Prevent Manual Handling Injuries

- Team handling for heavy or odd shape loads
- Breaks to reduce muscular fatigue
- Handlers job rotation between heavy and light activities
- Rearrange workplace to reduce twisting, stretching & stooping
- Keep heavy loads around waist level
- Use of mechanical handling aid
- Package heavy materials into smaller container



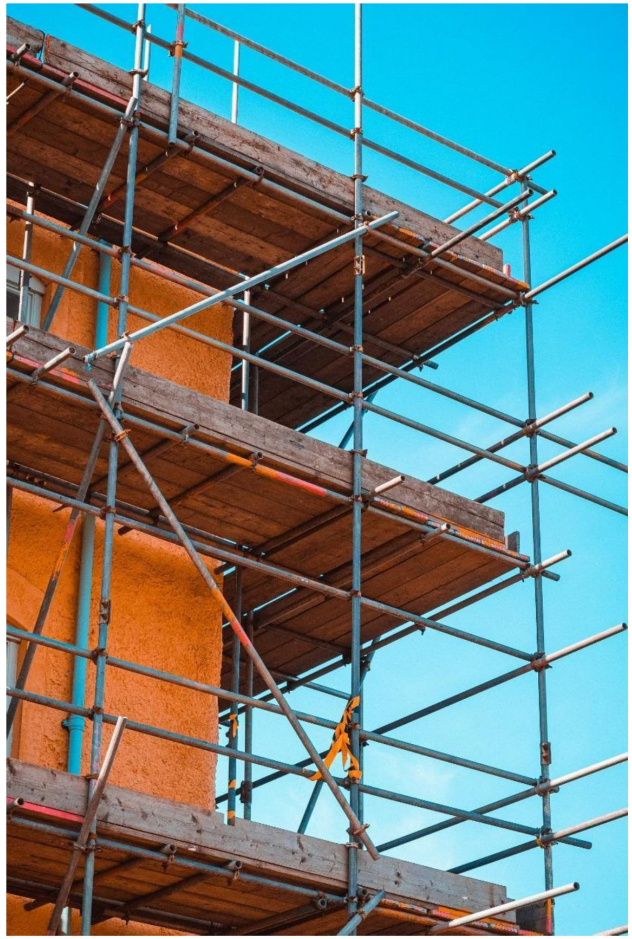
Scaffolding

What is a Scaffold?

- An elevated, temporary work platform

Three basic types:

1. Supported scaffolds -- platforms supported by rigid, load-bearing members, such as poles, legs, frames, & outriggers
2. Suspended scaffolds -- platforms suspended by ropes or other non-rigid, overhead support
3. Aerial Lifts -- such as “cherry pickers” or “boom trucks”



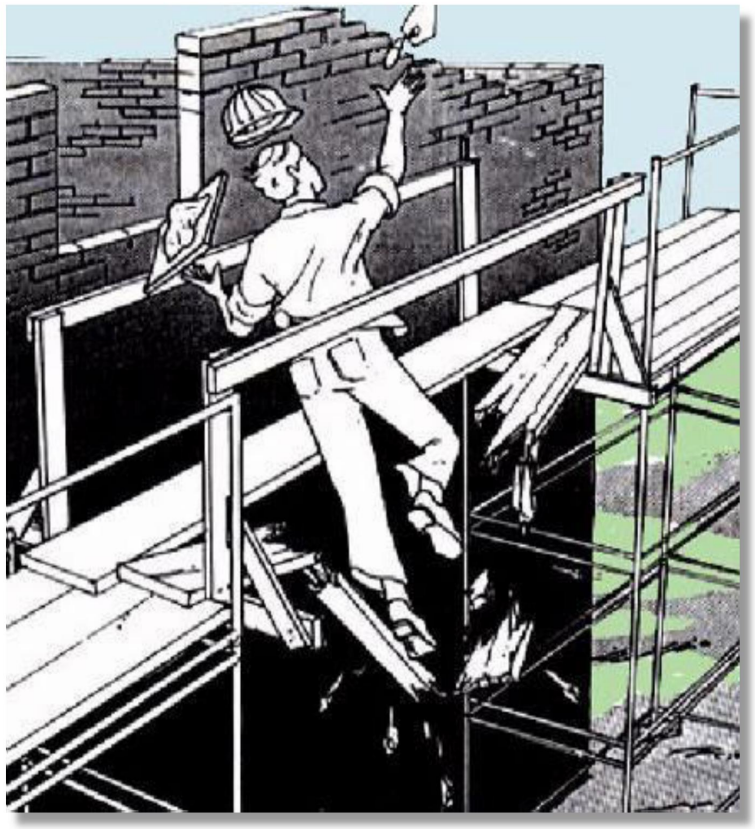
Hazards

Employees working on scaffolds are exposed to these hazards:

- ❑ Falls from elevation – caused by slipping,

unsafe access, and the lack of fall protection

- ❑ Struck by falling tools/debris
- ❑ Electrocution – from overhead power lines.
- ❑ Scaffold collapse - caused by instability or overloading
- ❑ Bad planking giving way



Safety Requirements for Scaffoldings

- An estimated 2.3 million workers deal with scaffolding each year.
- More than 9500 workers were injured and 80 killed in scaffolding–related accidents.

Definitions

- **Light Duty Scaffold:** Designed to carry a working load not to exceed 25 pounds per square foot.
- **Medium Duty Scaffold:** Designed to carry a working load not to exceed 50 pounds per
  - square foot.
- **Heavy Duty Scaffold:** Designed to carry a working load not to exceed 75 pounds per square foot.
- **Guardrail:** a rail secured to uprights and erected along the exposed sides and ends of platforms.
- **Maximum intended load:** the total of all loads including the working load, the weight of the scaffold, and such other loads as may be reasonably anticipated.

How to calculate load capacity of scaffolding?

Three Types of scaffolding (OSHA)

Light Duty : 25 lbs/ft² = 125 kg/m²
3m (length) × 1.25m (width)

Medium duty : 50 lbs/ft² = 250 kg/m²
2m (length) × 1.25m (width)

High duty : 75 lbs/ft² = 370 kg /m²
1.5m(length) × 1.25m (width)

Load increase inversely proportional length decrease.
Light duty scaffolding:
Bay = L×W = 3×1.25 = 3.75m²
Capacity = 125× 3.75= 468 kg

General Requirements

- Scaffolds and their components shall be capable of supporting without failure at least four times the maximum intended load.
- Unstable objects such as barrels, boxes, loose bricks, concrete blocks shall not be used to support scaffolds or blanks.
  - Nails or bolts used in the construction of scaffolds shall be of adequate size and in sufficient numbers at each connection. Nails shall be driven full length.
  - An access ladder or equivalent safe access shall be provided.
  - Employees shall not work on scaffolds during storms or high winds.
  - Tools, materials, and debris shall not be allowed to accumulate in quantities to
  - cause hazards.
  - Wire or fiber rope used for scaffold suspension shall be capable of supporting at least six (6) times the intended load.

General Requirements

- OSHA has determined a 10–foot fall protection for scaffolding.
- All planking or platforms shall be overlapped (minimum 12 inches) or secured from movement.
- Scaffolds cannot be erected, or used, closer than 10 feet (3.1m) near energized power lines.
- OSHA requires that scaffolding must always be secured when the height of the scaffold exceeds four (4) times the minimum base width.
- Guardrails not less than 2x4 inches and not less than 36 inches or more than 42 inches high, with a mid rail and toe boards, shall be installed at all open sides on all scaffolds more than 10 feet above the ground or floor. Toe boards shall be a minimum of 4 inches in height.
- The entire scaffold shall be tied and securely braced against the building at intervals not to exceed 30 feet horizontally and 26 feet vertically.

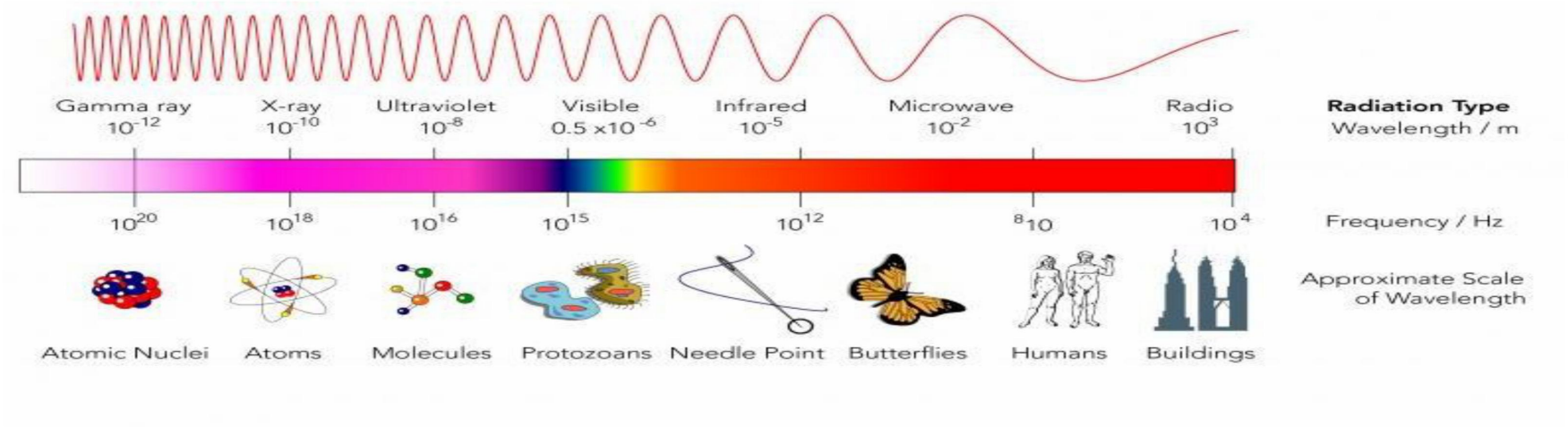
Radiation

Radiation

- The process of emitting energy in the form of particles or waves.
- Matter's is composed of very, very small particles called atoms.
- Radiation comes from atoms that are in the process of changing

Radiation Types

- Non-Ionizing Radiation
  - Visible light/heat/radio waves/microwaves
  - Does not have sufficient energy to cause ionization
- Ionizing Radiation
  - Physical change in atoms by making them electrically charged—called ionization

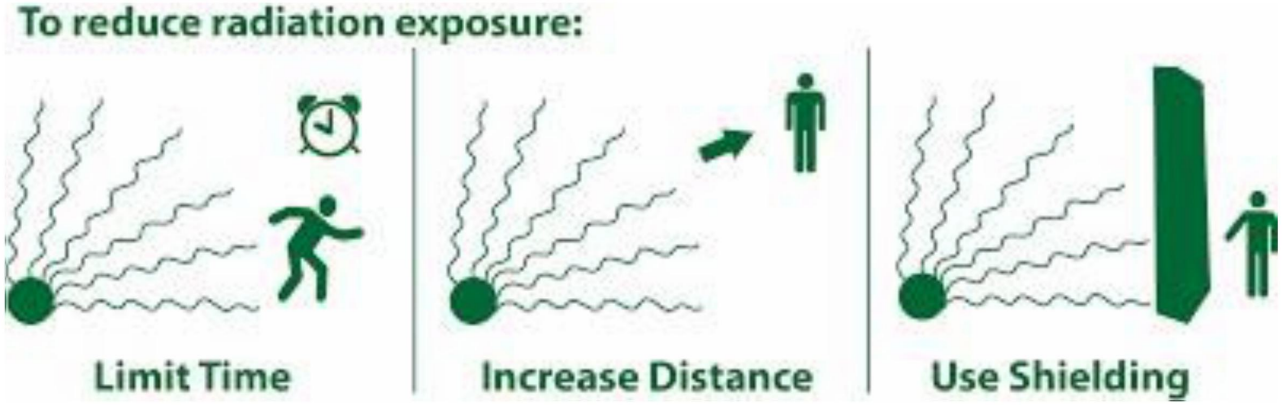


Hazards of Non-Ionizing Radiation

- Its energy is transformed into thermal and chemical energy.
- Thermal energy generates heat, and chemical energy can cause reactions which may damage the molecule in our tissues.
- Some energy can cause burns (IR), and can cause cataracts and can burn the cornea and injure the retina
- UV can cause blindness.

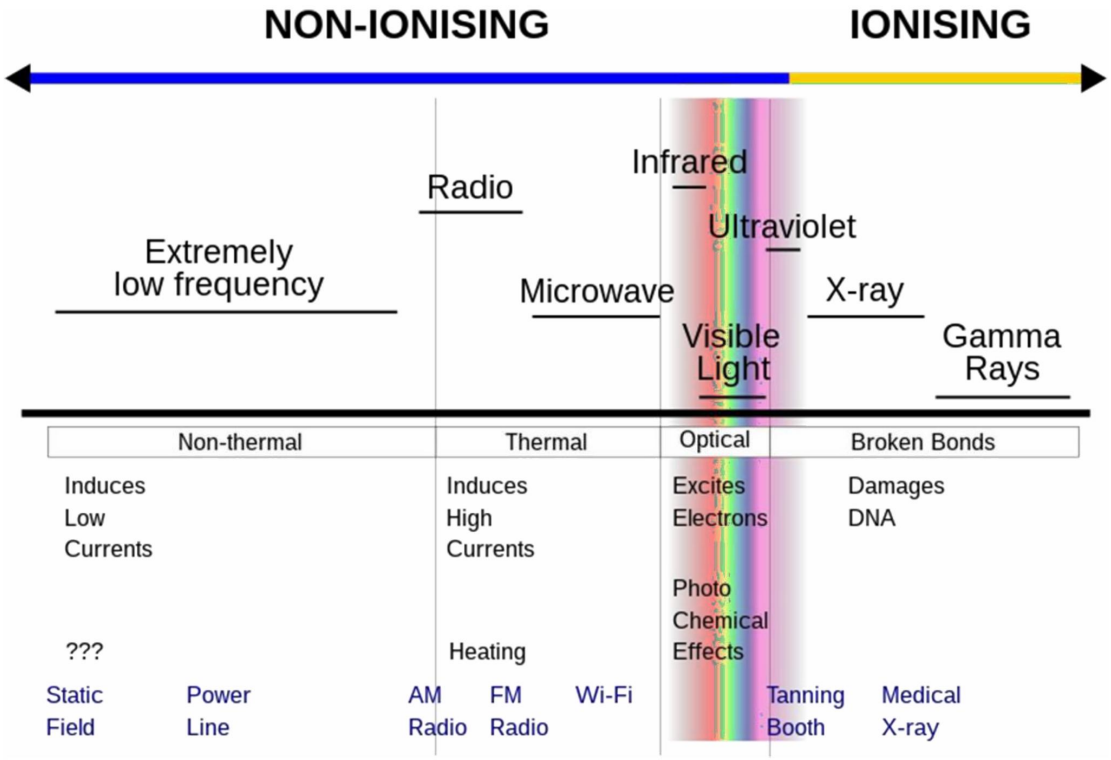
Protection

- Appropriate engineering controls and safe work practices.
- Apparatus are designed to prevent the escape of harmful light – follow the manufacturer's instructions for replacing bulbs and making repairs.
- Make sure all shields and guards are in place whenever the bulb is energized.
- Use the proper eye protection.

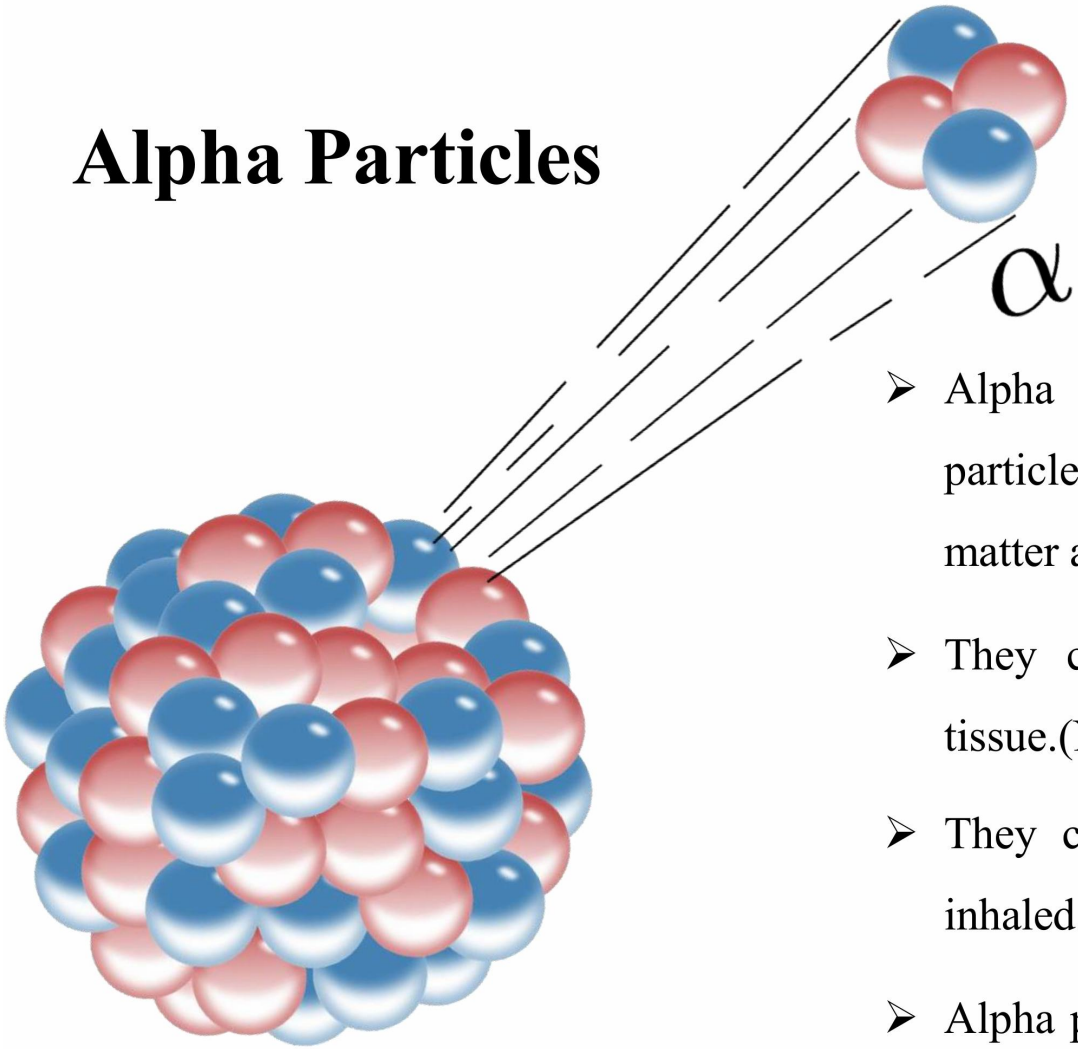


Ionizing Radiation

- Is radiation that has sufficient energy to remove electrons from atoms.
- The major types of radiation emitted as a result of spontaneous decay are Alpha and Beta particles, and Gamma rays. X rays, another major type of radiation, arise from processes outside the nucleus.



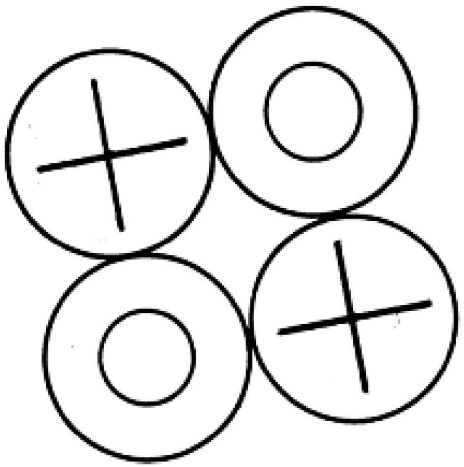
Alpha Particles



- Alpha particles are energetic, positively charged particles that rapidly lose energy when passing through matter and do not penetrate so far.
- They can cause damage over their short path through tissue.(Not a hazard outside the body)
- They can be very harmful if they are ingested or inhaled.
- Alpha particles can be stopped completely by a sheet of paper.

Alpha Particles

- Positively charged
- Emitted from uranium and radium
- Do not penetrate far
- Not a hazard outside the body
- Harmful if ingested or inhaled

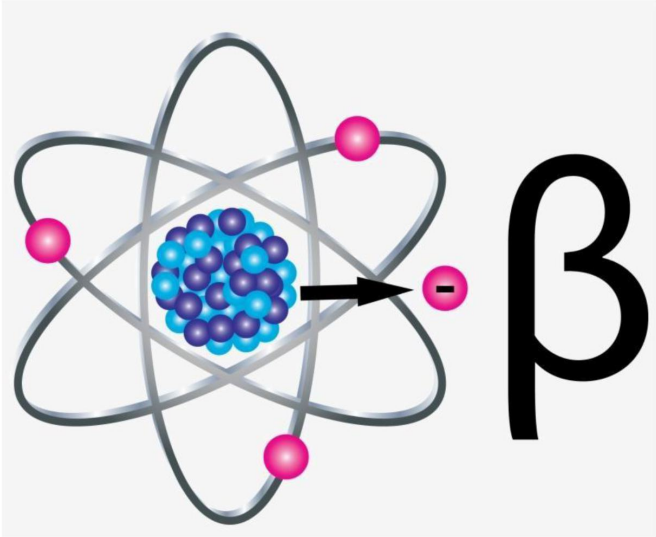


Alpha Particles:

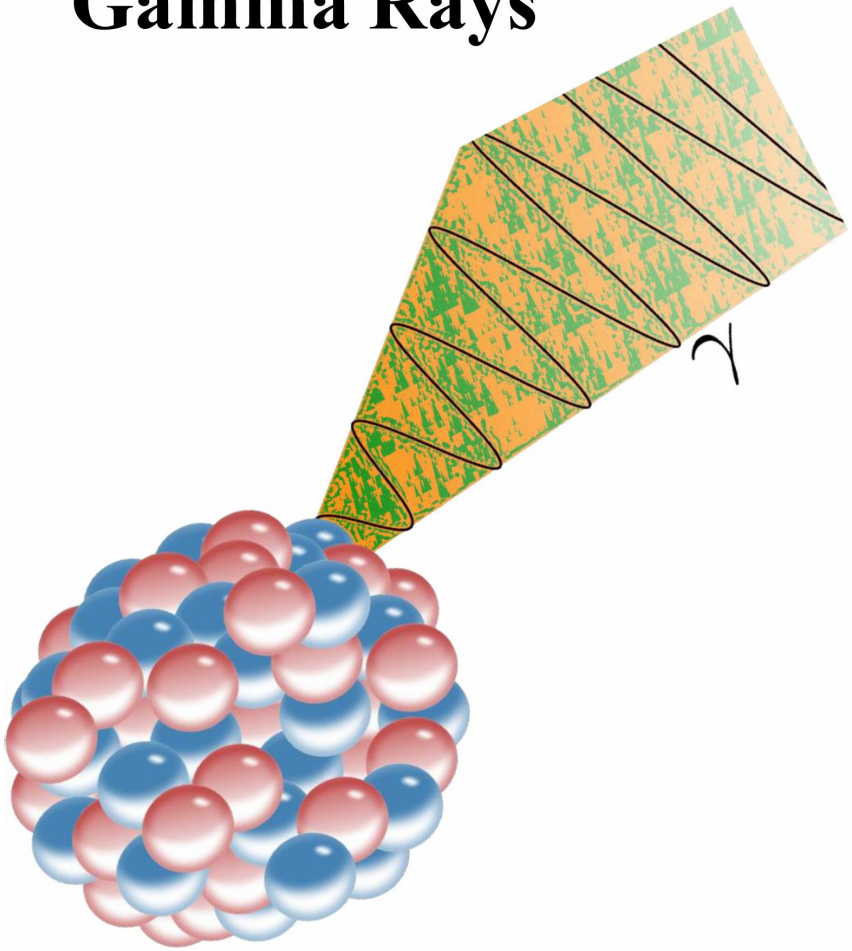
2 Protons (+ charge)
2 Neutrons (neutral)

Beta Particles

- Beta particles are fast moving negatively charged particles.
- Beta particles are more penetrating than Alpha particles.
- Some Beta particles are capable of penetrating the skin and causing radiation damage.
- They can be very harmful when they are inhaled or ingested.
- Can be stopped by a layer of clothing or by a few millimeters of aluminum.
  - Electrons emitted from tritium, carbon-14, strontium-90
  - Capable of penetrating skin
  - More hazardous when inhaled or ingested
  - Stopped by clothing or aluminum foil



Gamma Rays

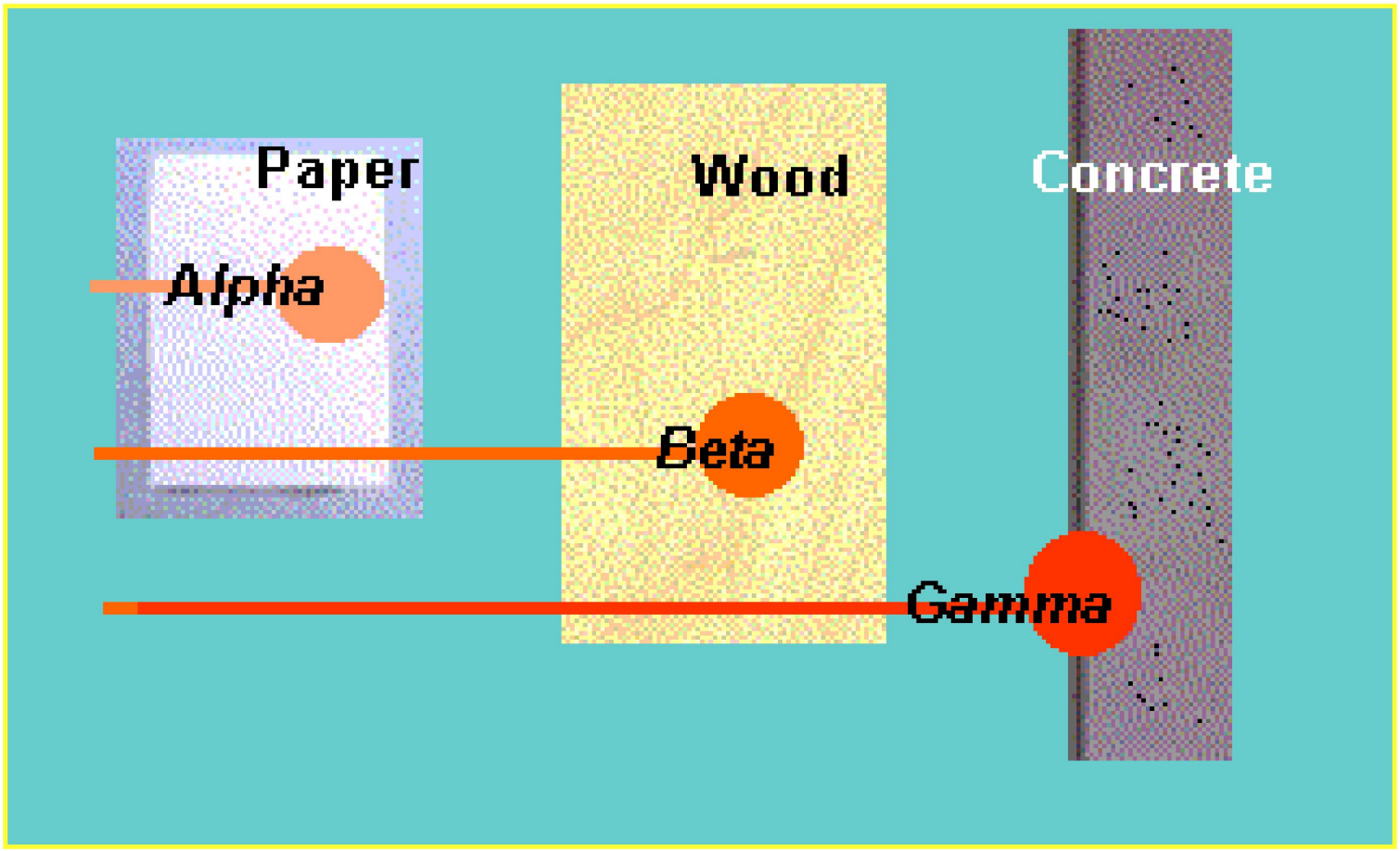


- Gamma rays are weightless packets of energy called photons.
- They have neither a charge nor a mass and are very penetrating.
- Gamma rays can easily pass completely through the human body or be absorbed by tissue, thus constituting a radiation hazard for the entire body.
- Several feet of concrete or a few inches of lead may be required to stop the more energetic gamma rays.
    - Packets of energy called photons
    - No charge or mass, very penetrating
    - Emitted from potassium-40, plutonium-239
    - Absorbed by tissue
    - Only stopped by thick concrete or lead

X - Rays

- X-rays are high-energy photons produced by the interaction of charged particles with matter.
- X-rays and gamma rays have essentially the same properties, but differ in origin.
- X-rays are emitted from processes outside the nucleus.
- X-rays are lower in energy and less penetrating than gamma rays.
- A few millimeter of lead can stop medical x-rays.

Penetrating Powers

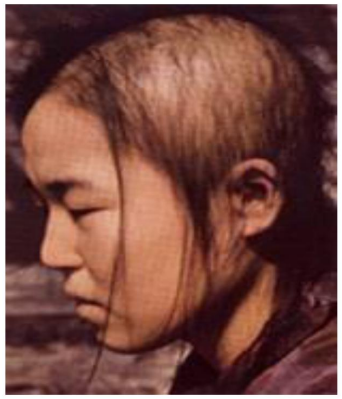


Risk from Exposure to Radiation

- Radiation is carcinogen, can cause cancer.
- It may also cause other adverse health effects, including genetic defects in the children of exposed parents or mental retardation in the children of motors exposed during pregnancy.
- Knowledge about risks from radiation is based on studies of over 100,000 survivors of the atomic bombs at Hiroshima and Nagasaki.
- Effects of wide range of radiation doses.

Acute Health Effects

- Changes in the blood cells
- Vascular changes
- Skin irritation
- Gastrointestinal effects
- Radiation sickness:
  - Diarrhea
  - Nausea
  - Vomiting
  - High fever
- Hair loss
- Burns



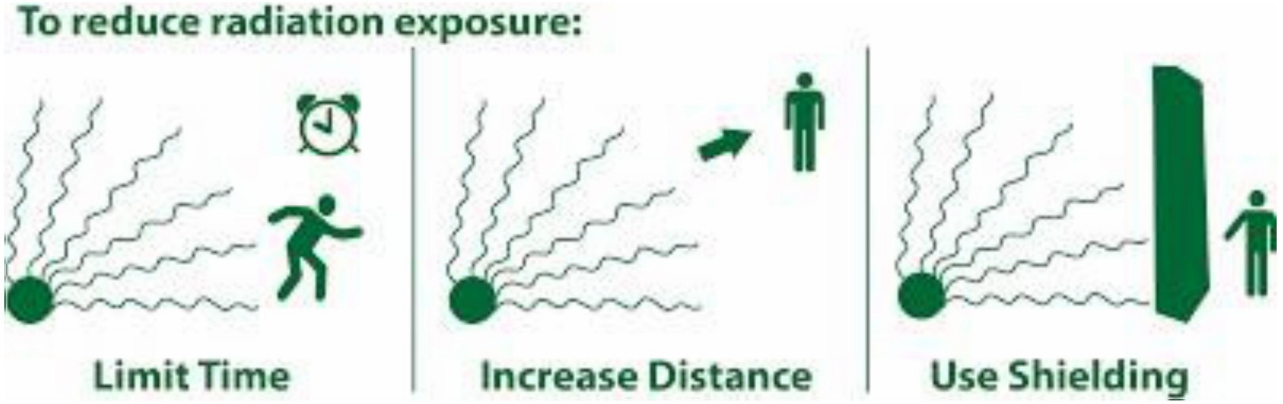
Radiation Protection Concepts

There are three concepts in basic radiation protection. They are:

1 Time

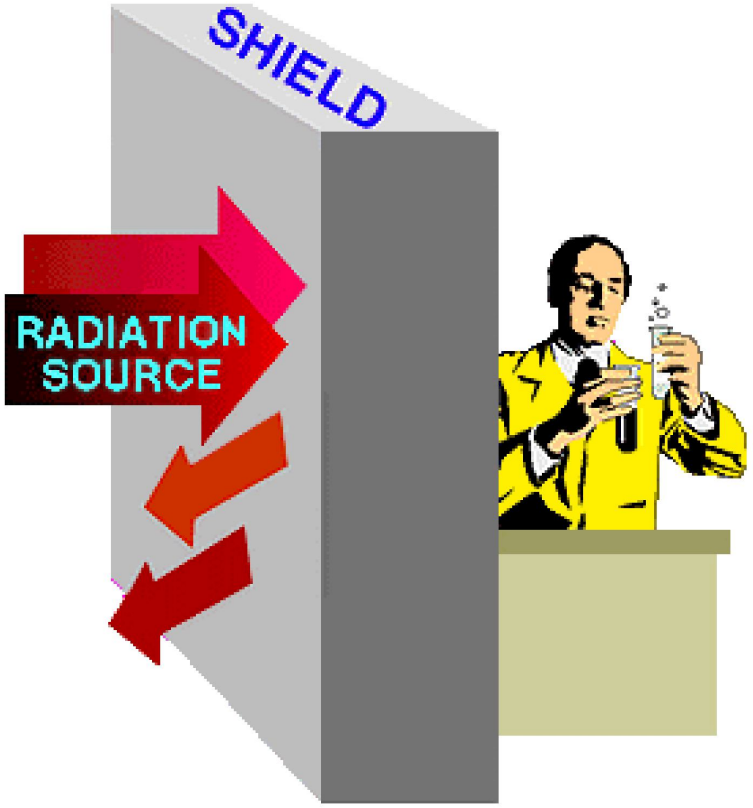
2 Distance

3 Shielding



Shielding

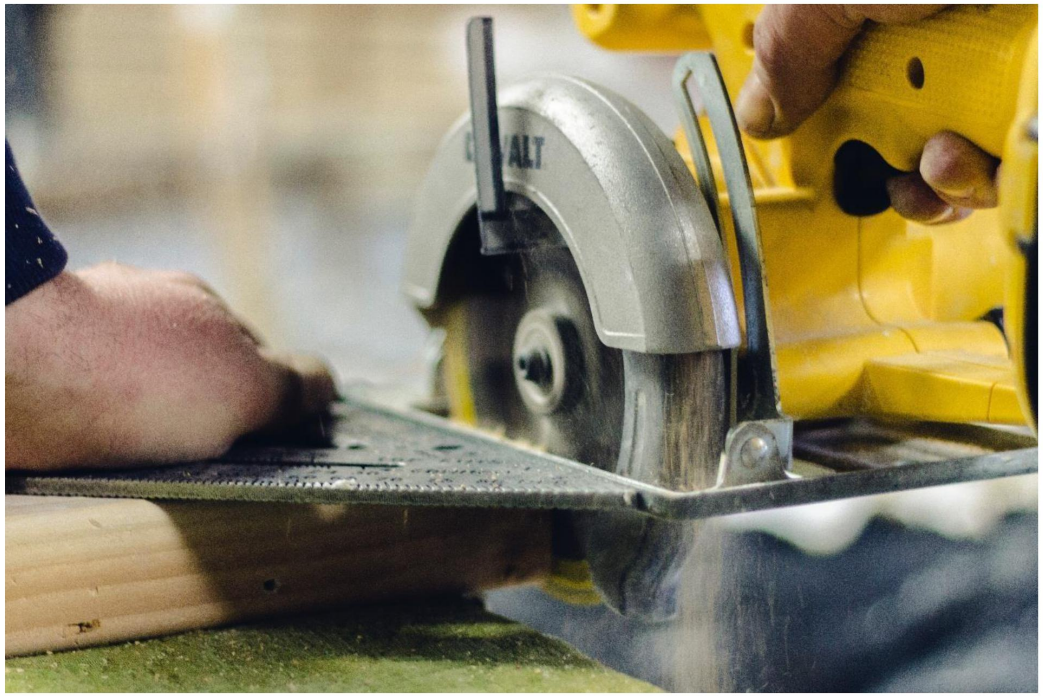
If you increase the shielding around a radiation source, it will decrease your exposure.



Hand and Power Tools

Hazards

- Workers using hand and power tools may be exposed to these hazards:
- objects that fall, fly, are abrasive, or splash
- harmful dusts, fumes, mists, vapors, and gases
- frayed or damaged electrical cords, hazardous connections and improper grounding



Compressed Air Cleaning

- Don’t use compressed air for cleaning
- Exception - where reduced to less than 30 psi with effective chip guarding and PPE

General Safety Precautions

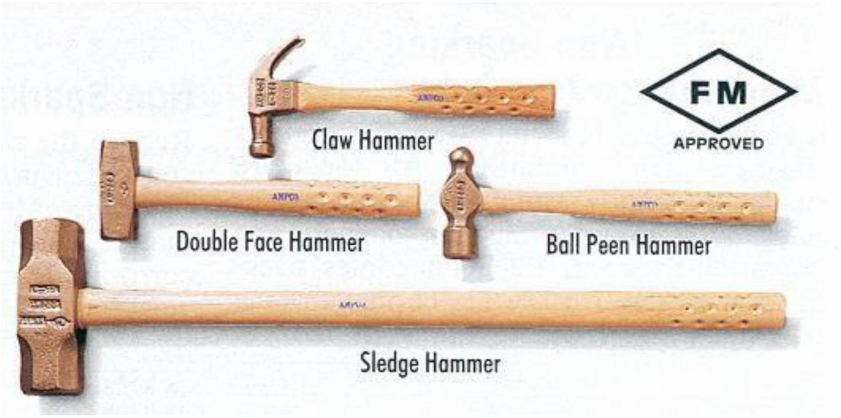
Appropriate personal protective equipment should be worn due to hazards that may be encountered while using portable power tools and hand tools.

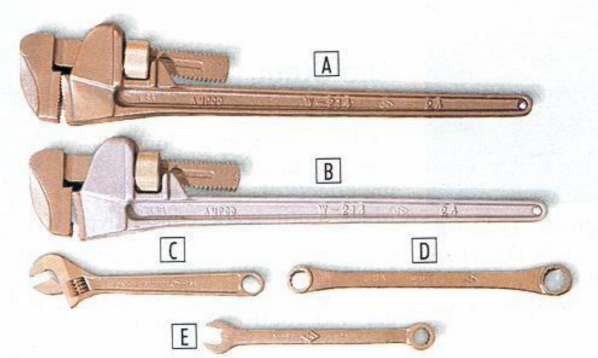
Floors should be kept as clean and dry as possible accidental slips with dangerous hand tools to prevent or around.

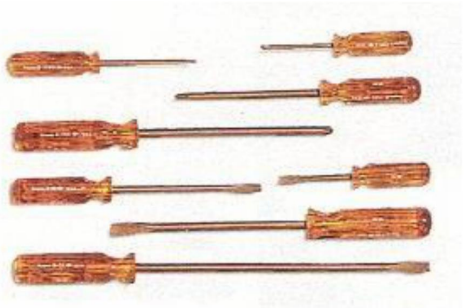
Hand Tools

Hand tools are non-powered. They include anything from axes to wrenches. The greatest hazards posed by hand tools result from misuse and improper maintenance.

Some Non-Sparking Tools







Power Tools

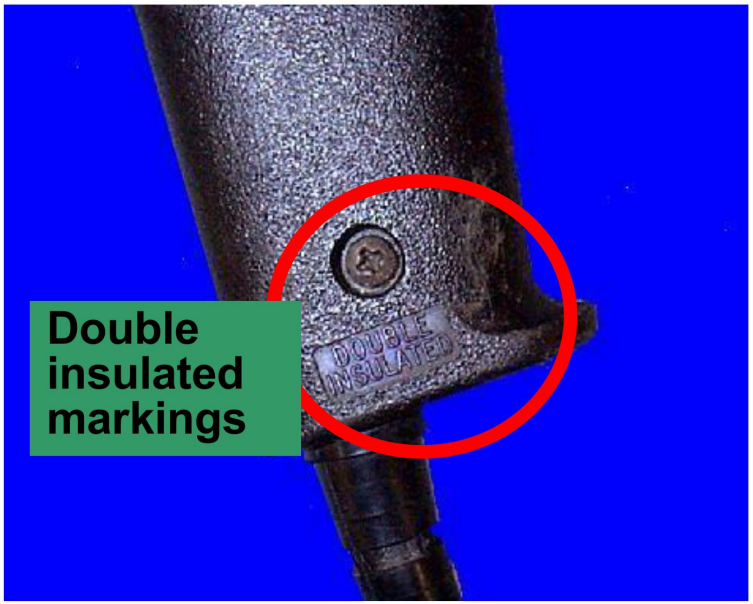
Power Tools – Precautions Electric Cords

- Don’t carry portable tools by the cord
- Don’t use electric cords to hoist or lower tools
- Don’t yank cord or hose to disconnect it
- Keep cords and hoses away from heat, oil, and sharp edges

Electric Power Tools

To protect a worker from shock, these tools must:

- have a 3-wire cord plugged into a grounded receptacle
- be double insulated, or
- be powered by a low-voltage isolation transformer



Plug with a grounding pin

General Safety Precautions-Electric Tools

- Employees using electric tools must be aware of several dangers; the most serious is the possibility of electrocution.
- Among the chief hazards of electric-powered tools are burns and slight shocks which can lead to injuries or even heart failure.

Powered Abrasive Wheel Tools

- Powered abrasive grinding, cutting, polishing, and wire buffing wheels create special safety problems because they may throw off flying fragments.
- Before an abrasive wheel is mounted, it should be inspected closely and sound- or ring-tested to be sure that it is free from cracks or defects.

Portable Circular Saws

- Among professionals, the circular saw is probably the most commonly used power saw and perhaps themost commonly abused.
- Familiarity should not breed carelessness.
- The following are specific safety musts when using any portable circular saws.

Guarding Portable Circular Saws

Guard these saws above and below the base plate or shoe. The lower guard must cover the saw to the depth of the teeth.

Portable Drills

- Available in a variety of types and capacities, portable power drills are undoubtedly the most used power tools.
- Because of their handiness and application to a wide range of jobs, drills often receive heavy use.
- For this reason, you'll need to check with care your drill's capacity limitations and accessory recommendations.

Pneumatic Tools

- Pneumatic tools are powered by compressed air and include chippers, drills, hammers, and sanders.
- There are several dangers encountered in the use of pneumatic tools.
- The main one is the danger of getting hit by one of the tool's attachments or by some kind of fastener the worker is using with the tool.
- Eye protection is required and face protection is recommended for employees working with pneumatic tools.

Caring for the Compressed Air System

- Using pneumatic tools requires an efficient compressor system to adequately power the tools.
- Several basic guidelines should be followed to insure efficient and continued operation of the compressor.

Jacks

- To set up a jack, ensure:
- The base is on a firm, level surface
- It's centered
- The jack head is placed against a level surface
- You apply the lift force evenly
- Lubricate and inspect jacks regularly

Jacks - Capacity

- The manufacturer's rated capacity must be marked on all jacks and must not be exceeded
- All jacks must have a stop indicator that is not exceeded

Summary

Hazards are usually the result of improper tool use or not following one or more of these protection techniques:

- Inspecting the tool before use
- Using PPE (Personal Protective Equipment)
- Using guards
- Properly storing the tool
- Using safe handling techniques

Cranes

What is Crane?

A crane is a machine for lifting and lowering a load and moving it horizontally, with the hoisting mechanism an integral part of the machine.

OSHA definition, section-1910.179(a)(1)

Major Causes of Crane Accidents

- Contact with power lines
- Overturns
- Falls
- Mechanical failures

How Do Accidents Occur?

- **Instability** – unsecured load, load capacity exceeded, or ground not level or too soft
- **Lack of communication** - the point of operation is a distance from the crane operator or not in full view of the operator
- **Lack of training**
- **Inadequate maintenance or inspection**

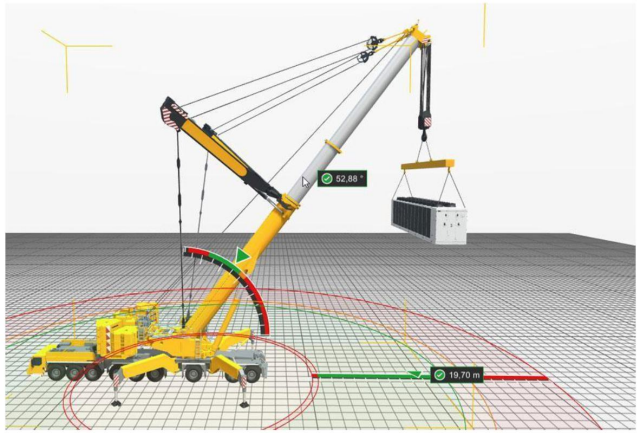
CRANE SAFETY

Planning Before Start-Up

- Level the crane and ensure support surface is firm and able to support the load
- Contact power line owners and determine precautions. Know the location and voltage of overhead power lines.
- Know the basic crane capacities, limitations, and job site restrictions, such as the location of power lines, unstable soil, or high winds.
- Make other personnel aware of hoisting activities.
- Barricade areas within swing radius.
- Ensure proper maintenance and inspections.
- Determine safe areas to store materials and place machinery.

CRANE SAFETY

Only people that have trained are permitted to operate cranes

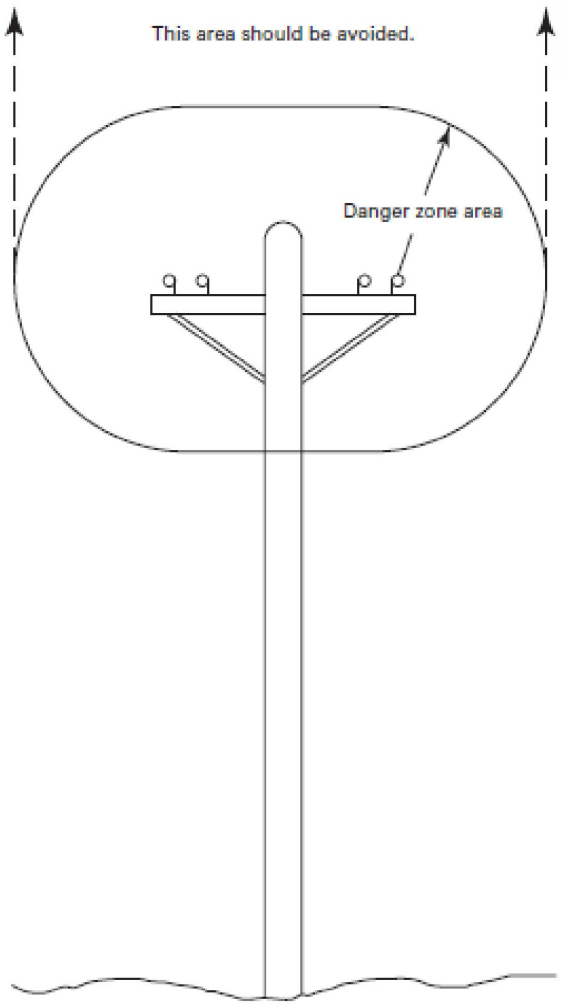


Barricades around the swing area of a revolving cab must be used when operating a crane in areas where pedestrians or traffic pass close by.

CRANE SAFETY

Never operate cranes closer than 10 feet from power lines. Voltages greater than 50,000 volt require greater distance.

Normal Voltage, kV (Phase to Phase)	Minimum Required Clearance, ft (m)
Up to 50	10 (3.05)
Over 50 to 200	15 (4.60)
Over 200 to 350	20 (6.10)
Over 350 to 500	25 (7.62)
Over 500 to 750	35 (10.67)
Over 750 to 1,000	45 (13.72)



CRANE SAFETY

Before lifting carefully inspect all rigging, slings, hooks, etc.

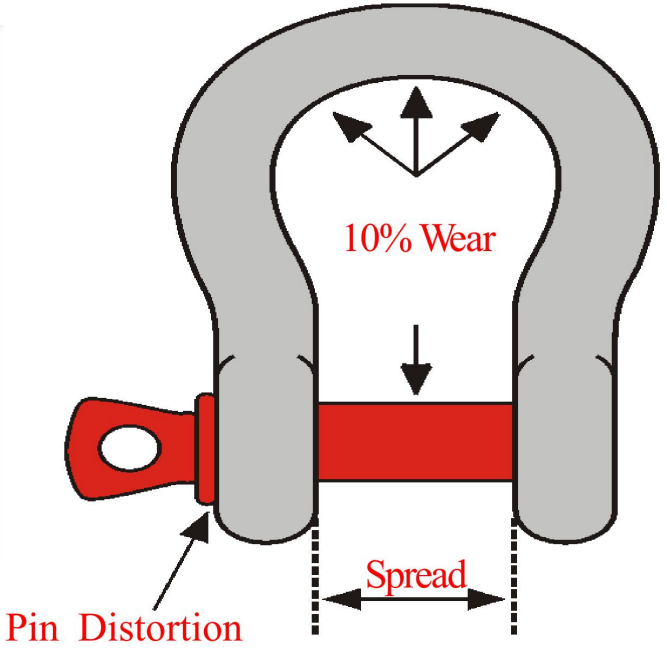
Report any damage or defects to your supervisor right away.

Typical Web Sling Damage

Synthetic web slings must be labeled to indicate their load rating capacity.

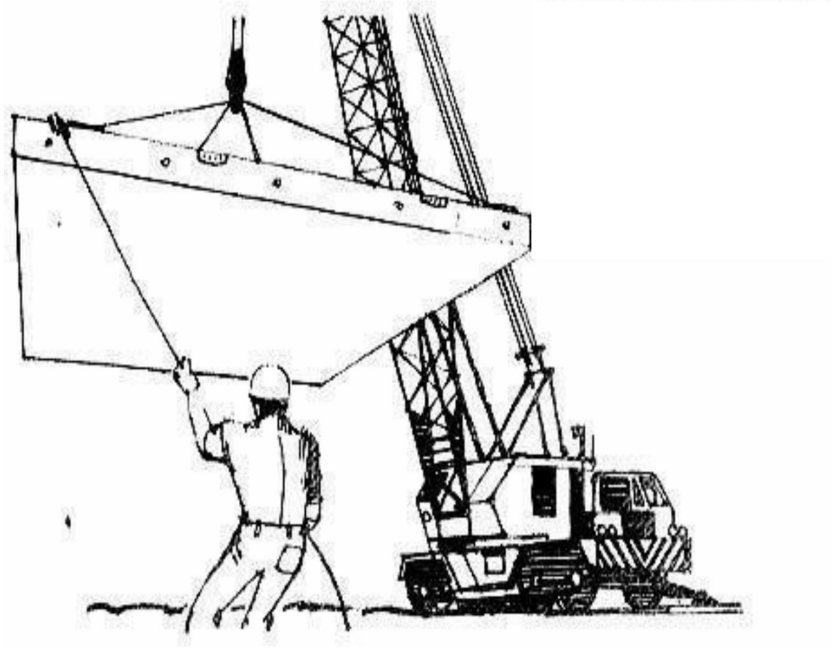
Typical Wire Rope Damage

Typical Web Sling Damage



- Absence of capacity or identifying marks
- Heat or chemical damage
- Body spread
- Reduction in diameter of pin and/or body greater than 10%

CRANE SAFETY



When it is necessary to guide a suspended, use tag lines.

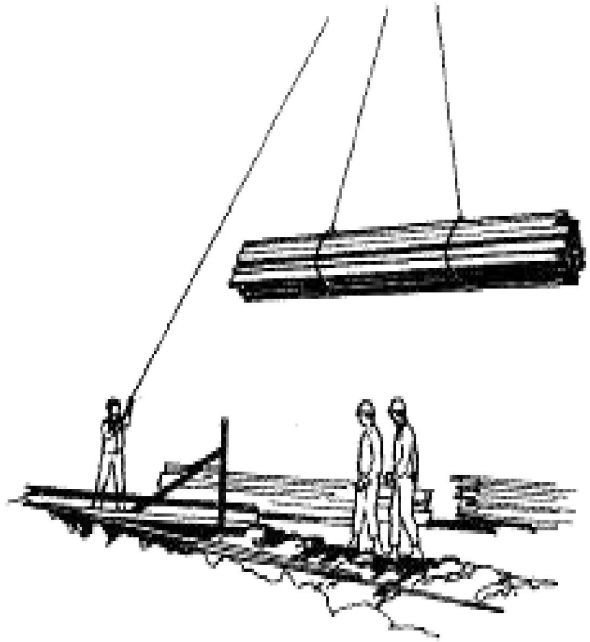
CRANE SAFETY

Don’t distract the crane operator. Only one signalman at a time.

Never ride the load, ball or hook.

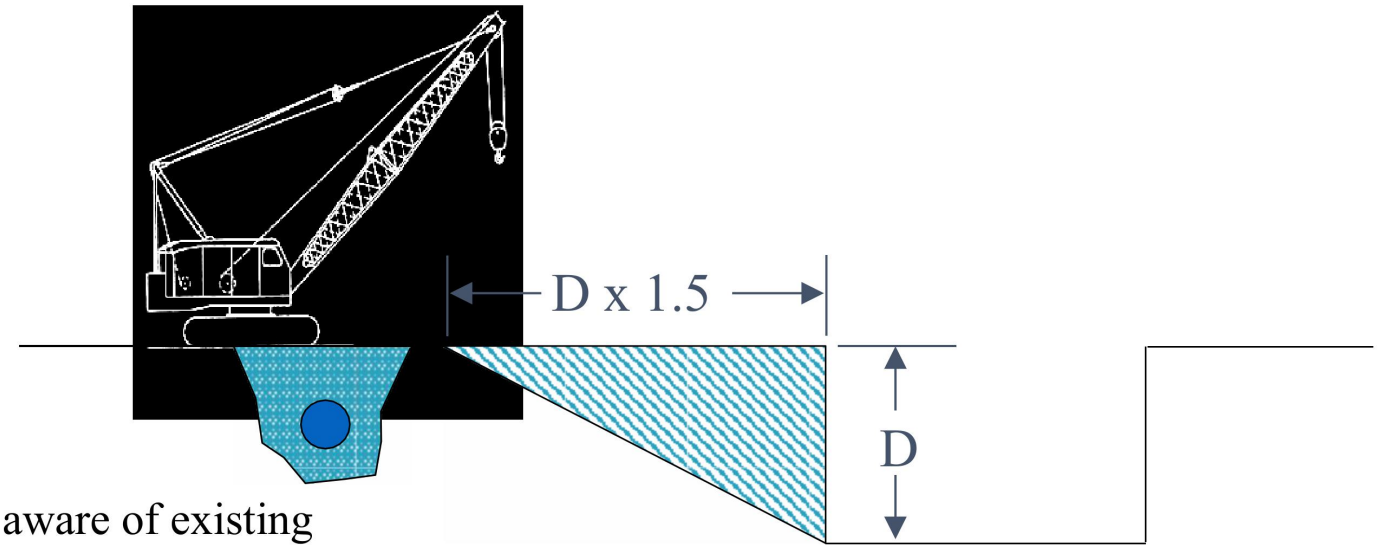
CRANE SAFETY

- Keep out from under suspended loads.
- Watch out for materials that could fall on you if hit by the moving load.
- Make sure you provide yourself a way out when directing load drops.



Working Near Excavations

Recommended Safe Work Practice: *Affected Zone*



Be aware of existing underground utilities and backfill.

Affected Zone (Depth x 1.5)
*Average Soil Only

Competent Person

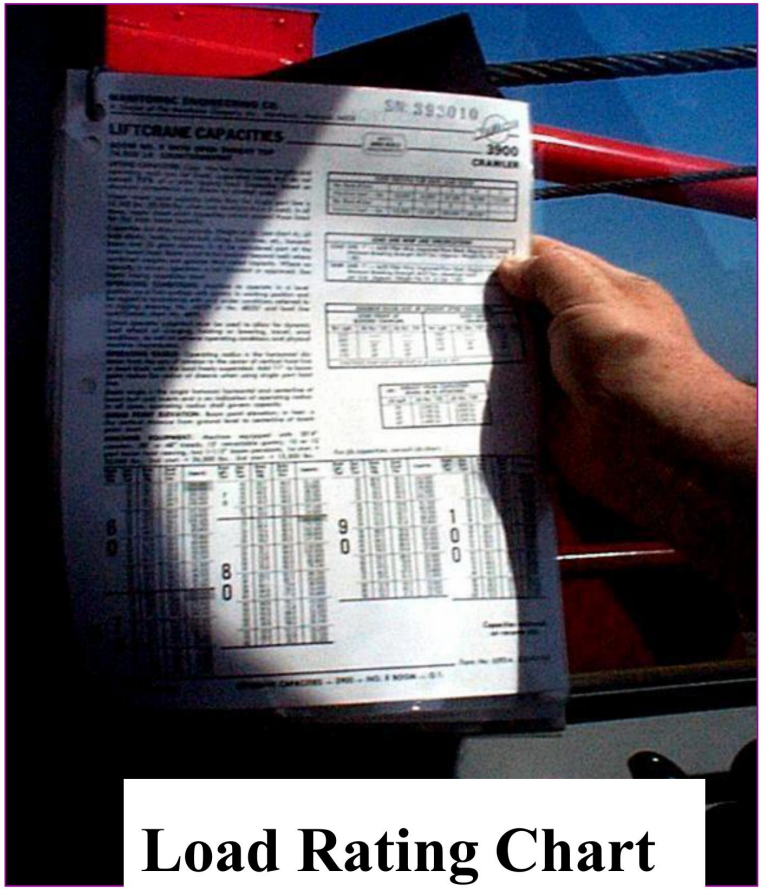
- The competent person must inspect all machinery and equipment prior to each use, and during use, to make sure it is in safe operating condition.

- If it needs fixing, take it out of service and don't use it until it is fixed

Load Capacity - Speed - Warnings

Make sure the crane operator can see the:

- Rated Load Capacities
- Operating Speeds
- Special Hazard Warning or Instruction



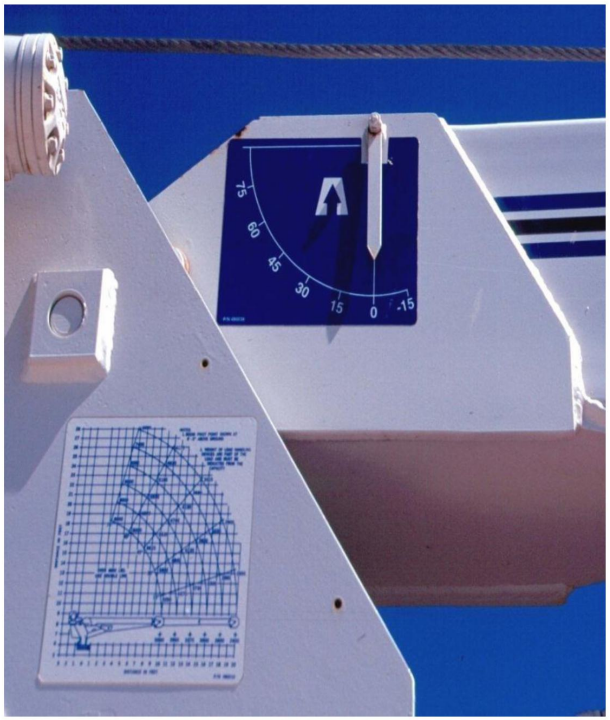
Load Rating Chart

Length of a telescopic boom (meters)

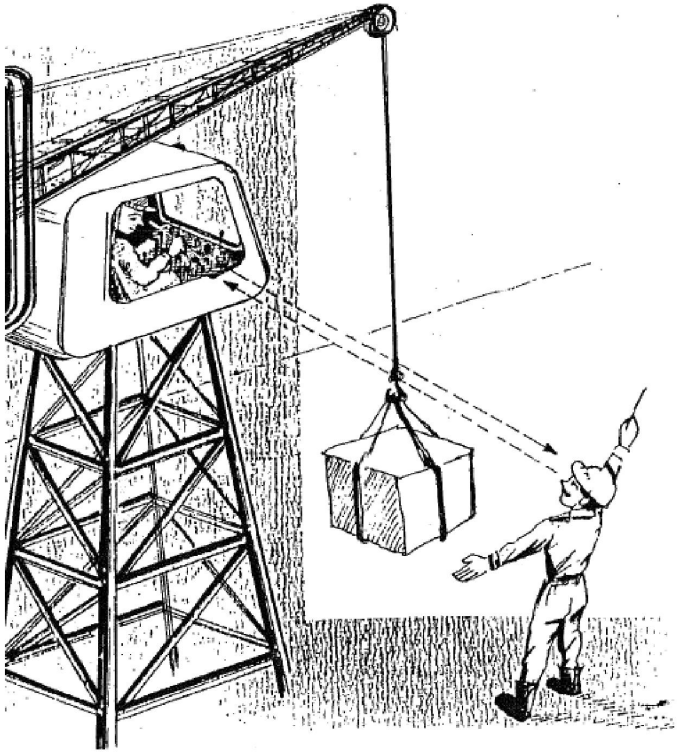
Вылет (радиус)м	13,2		17,7	22,2	26,7	31,3	35,8	40,3	44,8	49,3	53,8	58,3	62,8	67,3	72
3	200	143													
3,5	142	133	125												
4	133	123	123	122	107										
4,5	125	115	115	115	105	85									
5	117	107	108	107	103	84	70								
6	105	95	95	94	94	82	69								
7	93	84	85	84	84	80	68	52	40						
8	82	76	76	76	76	76	66	51	38,5						
9	73	69	69	68	69	68	63	49	37	30,5					
10	62	62	63	62	63	62	59	47	35	29,3	24,4				
11			58	57	57	57	56	45	33	27,9	23,7	19,2			
12			53	53	53	52	53	43,5	31	26,4	22,8	18,8	15,6		
14			44,5	44,5	44,5	44	44,5	40	27	23,9	20,9	17,6	14,9	12,6	10,6
16				38	37,5	38,5	38	36,5	24,8	21,6	19,1	16,3	14,1	12,1	10
18				33	32,5	33	32,5	33	22,3	19,8	17,4	15,2	13,2	11,5	9,5
20					29	28,8	29,2	28,9	20,2	18	16	14,1	12,4	10,9	9
22					25,8	25,3	26,1	25,4	18,4	16,4	14,7	13,2	11,6	10,3	8,5

Safe Load Indicator (SLI)

Boom Angle Indicators



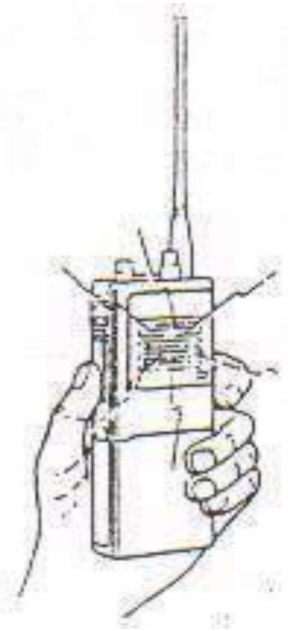
Crane Signals



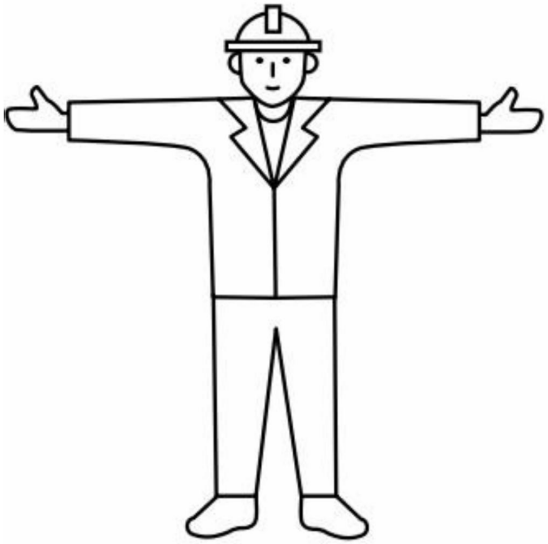
Types of signals:

There are two types of signals-

1. Radio signal
2. Hand signal

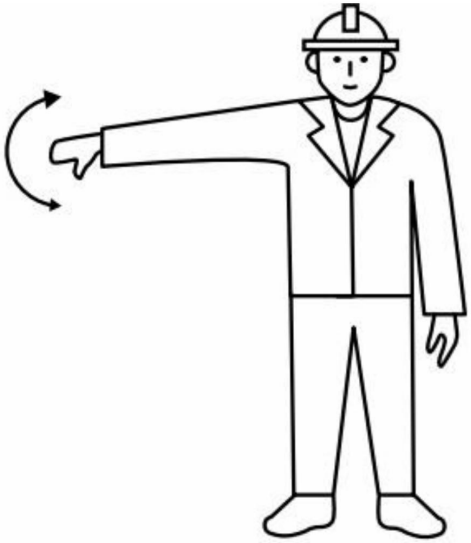


ISO Recommended crane hand signals (ISO 16715:2014)



Operations start (follow my instructions)

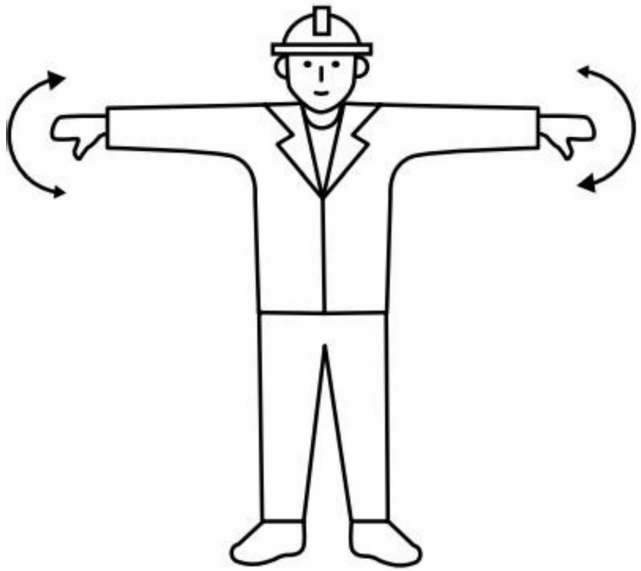
Outstretch both arms horizontally with the hands open and the palm facing forward.



Stop (stop normally)

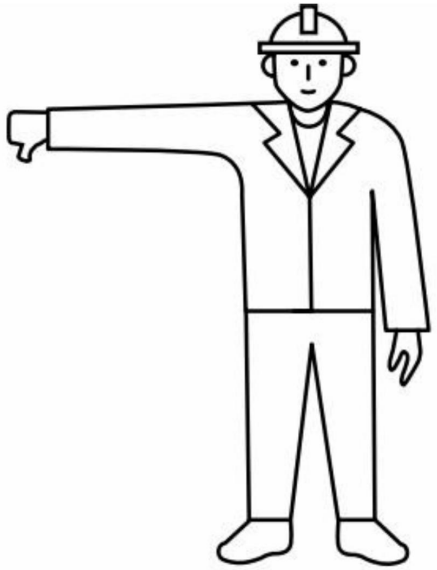
Arm extended, palm down, move arm back and forth horizontally.

ISO Recommended crane hand signals (ISO 16715:2014)



Emergency Stop (stop quickly)

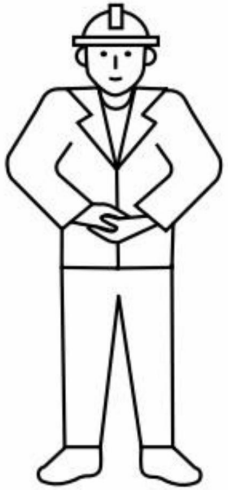
Both arms extended, palms, down, move arms back and forth horizontally



Lowering of boom

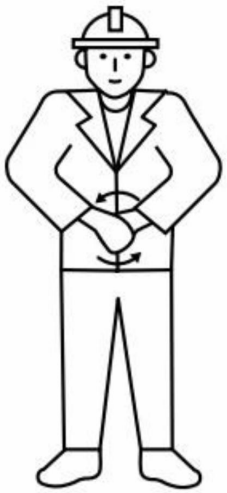
Keep one arm extended horizontally with the thumb down.

ISO Recommended crane hand signals (ISO 16715:2014)



Case Operation (stop following my instructions)

Clasp the hands at chest height in front of body.



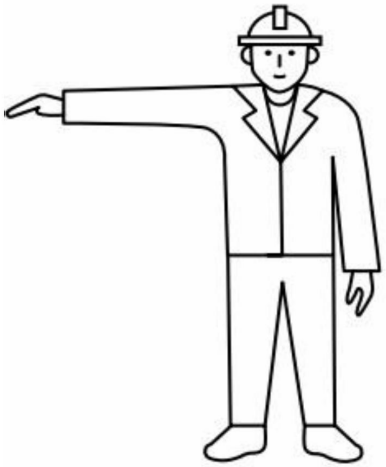
Inching or dead slow

Rub palms in circular motion against each other. After this signal, any other applicable hand signal shall apply.

Raise/lift the load at a steady rate

Raise one arm above the head, with the hand closed and the index finger pointing upwards. Make a small horizontal type circle with the forearm

ISO Recommended crane hand signals (ISO 16715:2014)



Travelling/slewing in the direction indicated

Hold the extended arm in a horizontal position in the required direction, with the hand open and the palm facing downwards.

Travelling away from me

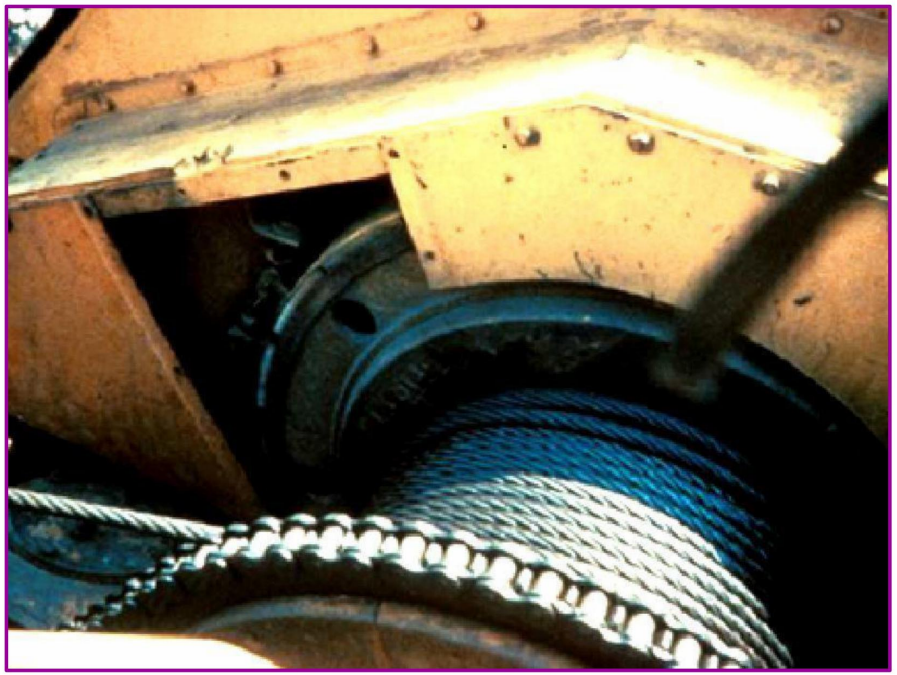
Keep both arms at the sides of the body with the forearms held horizontally to the front, both hands open, and the palms facing forward. Repeatedly move the forearms up and down between the horizontal and the vertical positions.

Traveling towards me

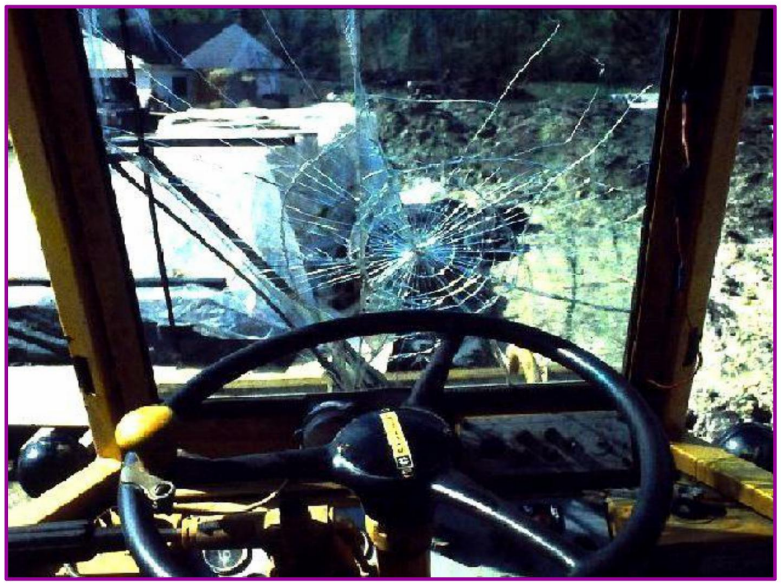
Keep both arms at the sides of the body with the forearms held vertically, both hands open, palms facing upwards. Repeatedly move the forearms up and down.

Guard Moving Parts

Unguarded Chain Drive

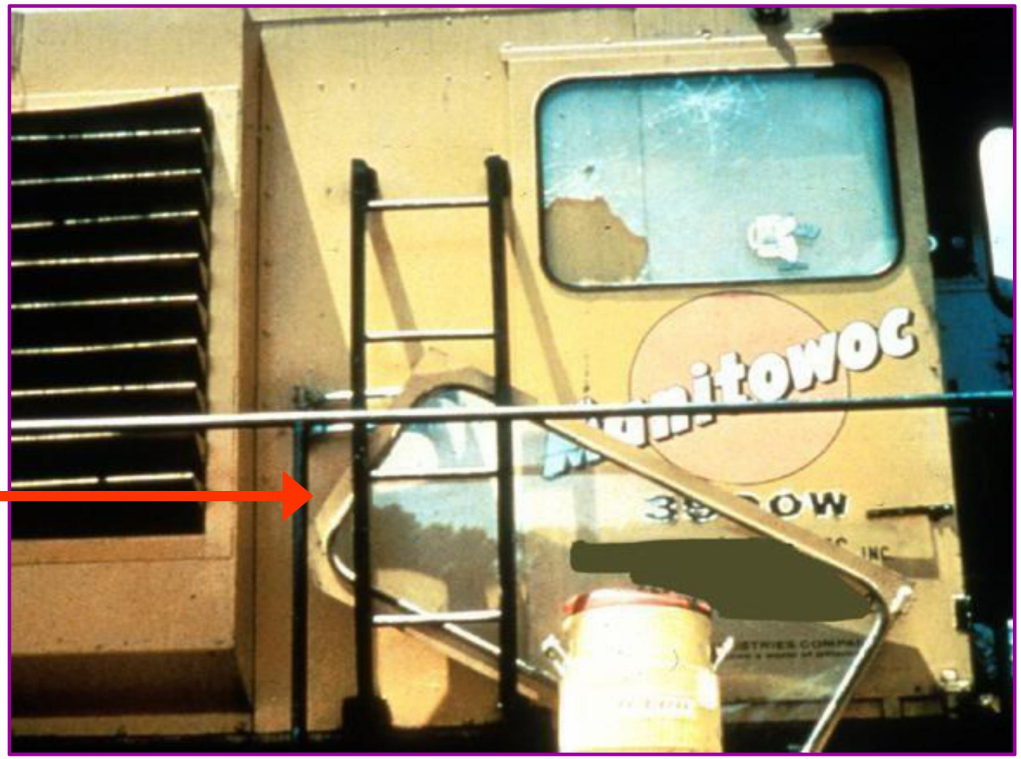


Operator Visibility



Make sure broken windows or other obstructions do not prevent the operator from seeing

Ladders



Use ladders to get to the upper portion of the cab

Guardrails

Runways and steps need to have guardrails, handholds and slip resistant surfaces

Supporting Surface

Cranes must be on a firm supporting surface and level within 1 percent

Sheaves

The grooves must be smooth and free from surface defects which could cause rope damage

Tire Inspections

Conduct regular inspections
of tires for excessive wear or damage

Fire Safety

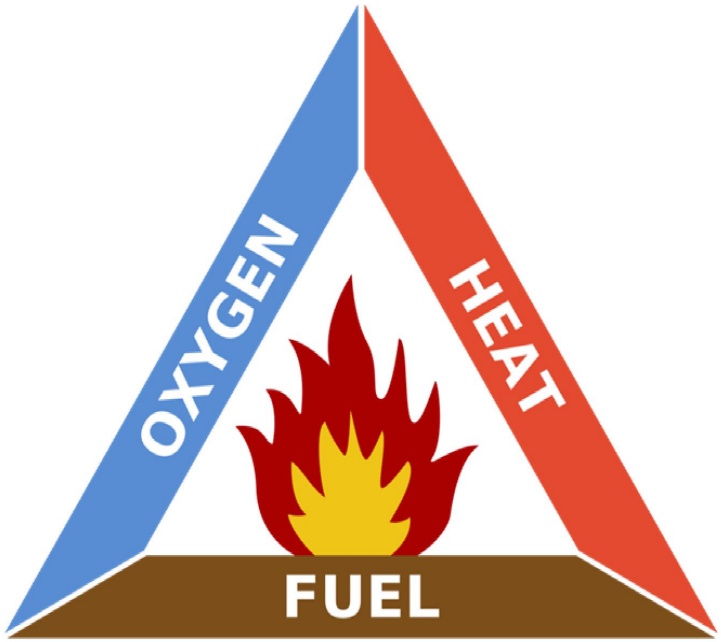
Fire

- Fire is a chemical reaction. It occurs when fuel, oxygen and an ignition source are brought together. Or
- Fire is a rapid chemical reaction of oxidant with fuel accompanied by the release of energy, indicated by incandescence or flame.

$$C_xH_y + O_2 \longrightarrow CO_2 + H_2O$$

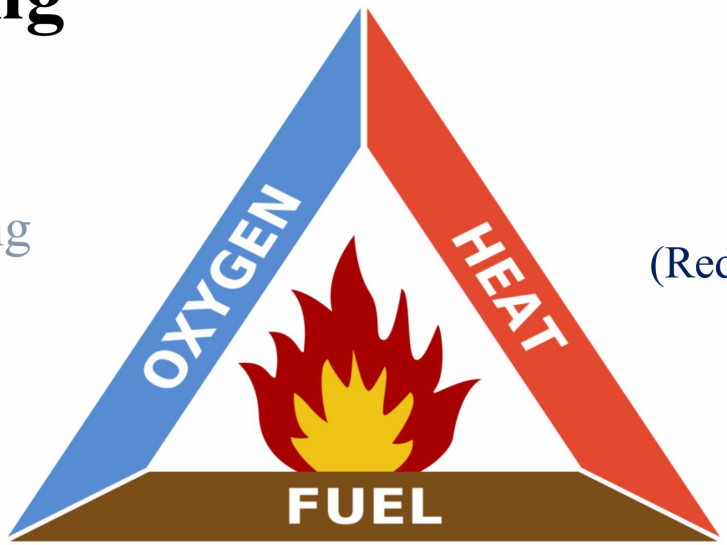
Fire Triangle

Oxygen, heat, and fuel are frequently referred to as the "fire triangle."



Fire Extinguishing

Smothering
(Reducing the oxygen)



Cooling
(Reducing the heat)

Starving
(Reducing the fuel)

Removal of any of these elements will extinguish the fire.

Fire Extinguishing

- **Smothering (Reducing the oxygen):** Smothering by cutting off oxygen supply (e.g., by applying foam, carbon dioxide).
- **Cooling (Reducing the heat):** Cooling the fuel by removing heat (e.g., by applying water).
- **Starving (Reducing the fuel):** Starving the fire by removing the fuel.(e.g., stopping gas flow during a pipeline fire).

***Inhibition:** Inhibition by stopping the chain reaction. (e.g., by applying dry chemical powder).

Fuel

A combustible material or substance that is consumed during the combustion process. In a typical workplace, fuels can include paper and cardboard; wood and soft furnishings; structural materials; petrol and diesel fuels, butane, acetylene and other gases, solvents and other chemicals.

Oxygen

Oxygen consumed during combustion when it is chemically combined with the fuel. Oxygen is present in air at a concentration of 21%. During a fire oxygen can also come from other sources, including certain oxygen-rich chemicals (usually called oxidizing agents), such as ammonium nitrate.

Sources of Ignition/Heat

Heat or ignition source is essential to start the combustion process. Once combustion has started it generates its own heat which is usually sufficient to keep the fire burning (in other words once the fire starts the heat source can be removed and the fire stays alight). Some examples will be described later.

Classification of Fires

- The classification of a fire is important to the firefighter when discussing extinguishment.
- Each class of fire has its own requirements for extinguishment.
- The four classes of fire are discussed here, along with normal extinguishment methods and problems

Classification of Fires

Fire Extinguisher Class Chart			
A		**Class A:** Ordinary Combustibles	Wood, paper, cloth, trash, plastics, and other solids that are not metal
B		**Class B:** Flammable or combustible liquids or gases	Gasoline, oil, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, flammable gases
C		**Class C:** Electrical	Energized electrical equipment (plugged-in)
D		**Class D:** Metals	Magnesium, titanium, zirconium, sodium, lithium, and potassium
K		**Class K:** Combustible cooking	Grease or oil, such as vegetable oils, animal oils, or fats in cooking appliances

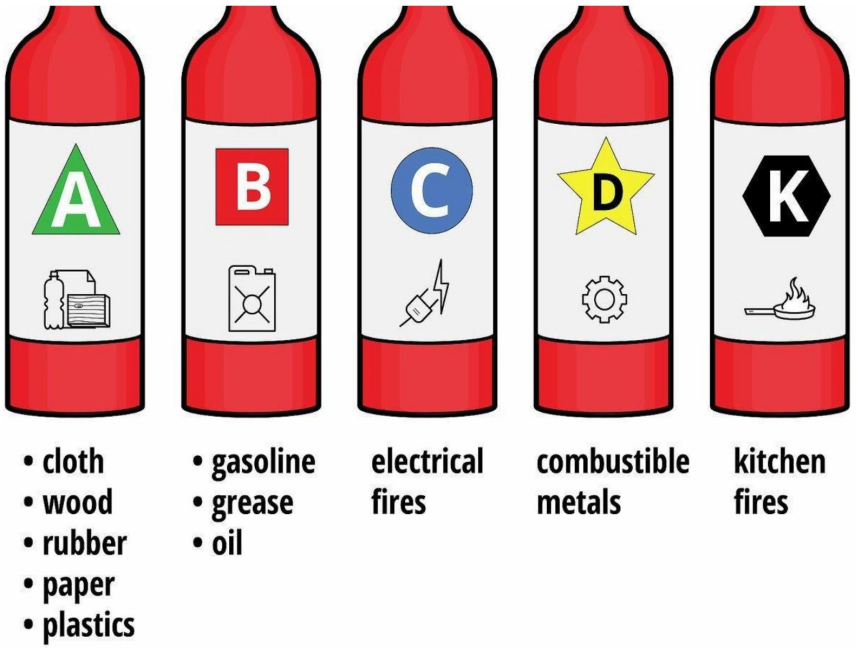
*US Standard

CLASSIFICATION		RISK
A	CLASS A	These are fires that involve solid materials like paper, wood or textiles.
B	CLASS B	These are fires that involve liquids, like oils, petrol or diesel.
C	CLASS C	These are fires that involve flammable gases, such as propane, butane or methane.
D	CLASS D	These are fires that involve metals, like aluminium, magnesium, titanium or swarf.
E	CLASS E	These are fires that involve live electrical equipment, like computers or phone chargers.
F	CLASS F	These are fires that involve cooking oils and fats, such as in deep-fat fryers.

UK Standard

Fuel Classifications

- Class A: Wood, paper, cloth, trash, plastics-solids that are not metals.
- Class B: Flammable liquids-gasoline, oil, grease, acetone. Includes flammable gases.
- Class C: Electrical- energized electrical equipment. As long as it's "plugged in."
- Class D: Metals- potassium, sodium, aluminum, magnesium. Requires Metal- X, foam, and other special extinguishing agents.
- Class K: Cooking oils and fats, such as those used in commercial kitchens, restaurants, and food processing facilities.



Use of Fire Extinguisher

It's easy to remember how to use a fire extinguisher if you remember the acronym PASS:

- **P** — **Pull the pin**
- **A** — **Aim the nozzle**
- **S** — **Squeeze the handle**
- **S** — **Sweep from side to side**

First Aider Training

What is First Aid?

First aid refers to medical attention that is usually administered immediately after the injury occurs and at the location where it occurred. It often consists of a one-time, short-term treatment and requires little technology or training to administer.

The Aims of first aid

Preserve life

This doesn't just refer to the injured party, but yourself and anyone helping you.

Prevent the situation from getting worse

If you are in no danger yourself, try to stop the situation from becoming worse by removing any obvious dangers (such as stopping traffic, clearing people away from the casualty, opening a window to clear any fumes, etc.).

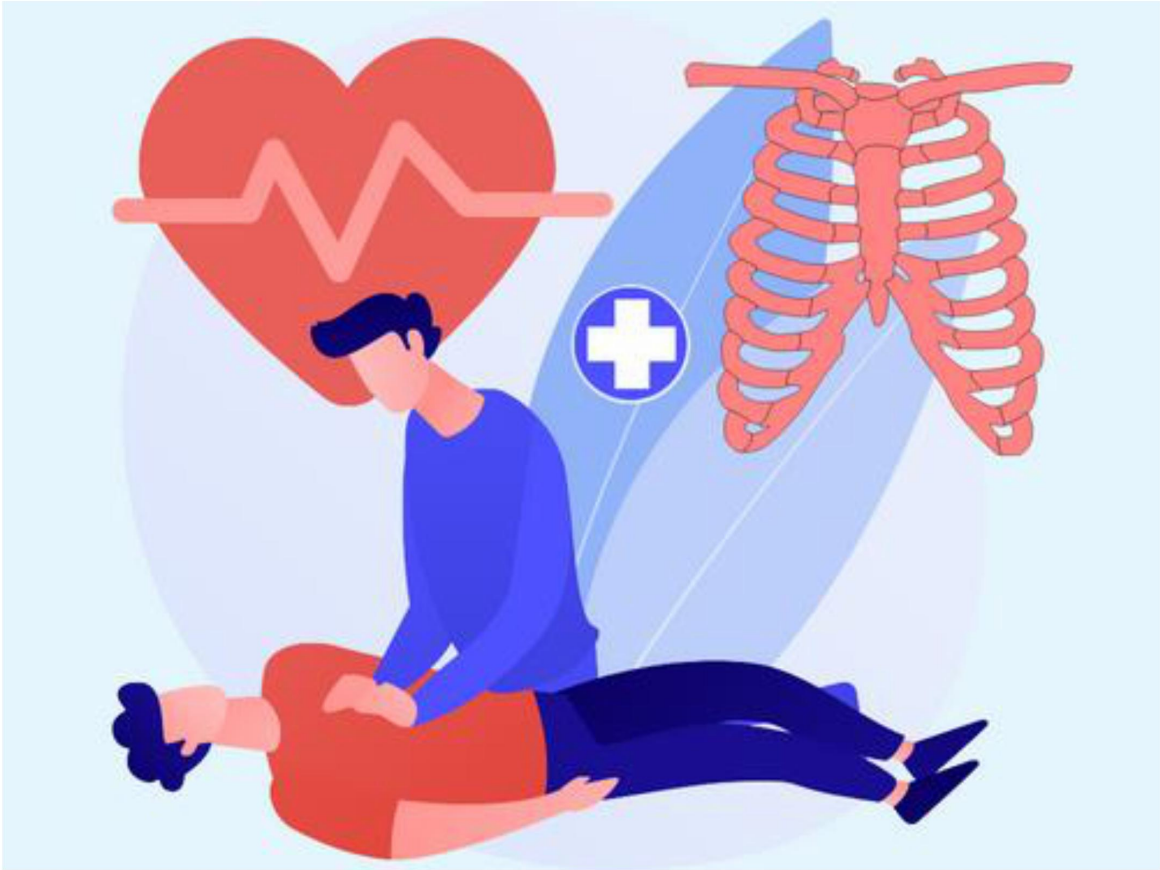
Promote recovery

Your role as a first aider is, after ensuring that the situation can not get worse, helping the casualty to recover from their injury or illness, If the injury is severe, then the best you can do is try to keep them alive until the emergency services arrive.

What is CPR?

Cardiopulmonary Resuscitation

CPR – or Cardiopulmonary Resuscitation – is an emergency lifesaving procedure performed when the heart stops beating. Immediate CPR can double or triple chances of survival after cardiac arrest.



What is an AED?

Automated External Defibrillators

AEDs can greatly increase a cardiac arrest victim's chances of survival. To minimize the time to defibrillation for cardiac arrest victims.

Minor Injuries

Minor injuries can be painful, but they don’t threaten your life, mobility or long-term survival.

Major Injuries

A major injury is any injury that could potentially lead to death, prolonged disability or permanently diminished quality of life.

FORE GIVING CARE

When a person is injured or becomes suddenly ill, your quick action can prevent the injury or illness from worsening, and it may even save the person’s life.

Signs of an Emergency

Unusual Sounds

- Screaming, moaning, yelling or calls for help
- Unusual silence

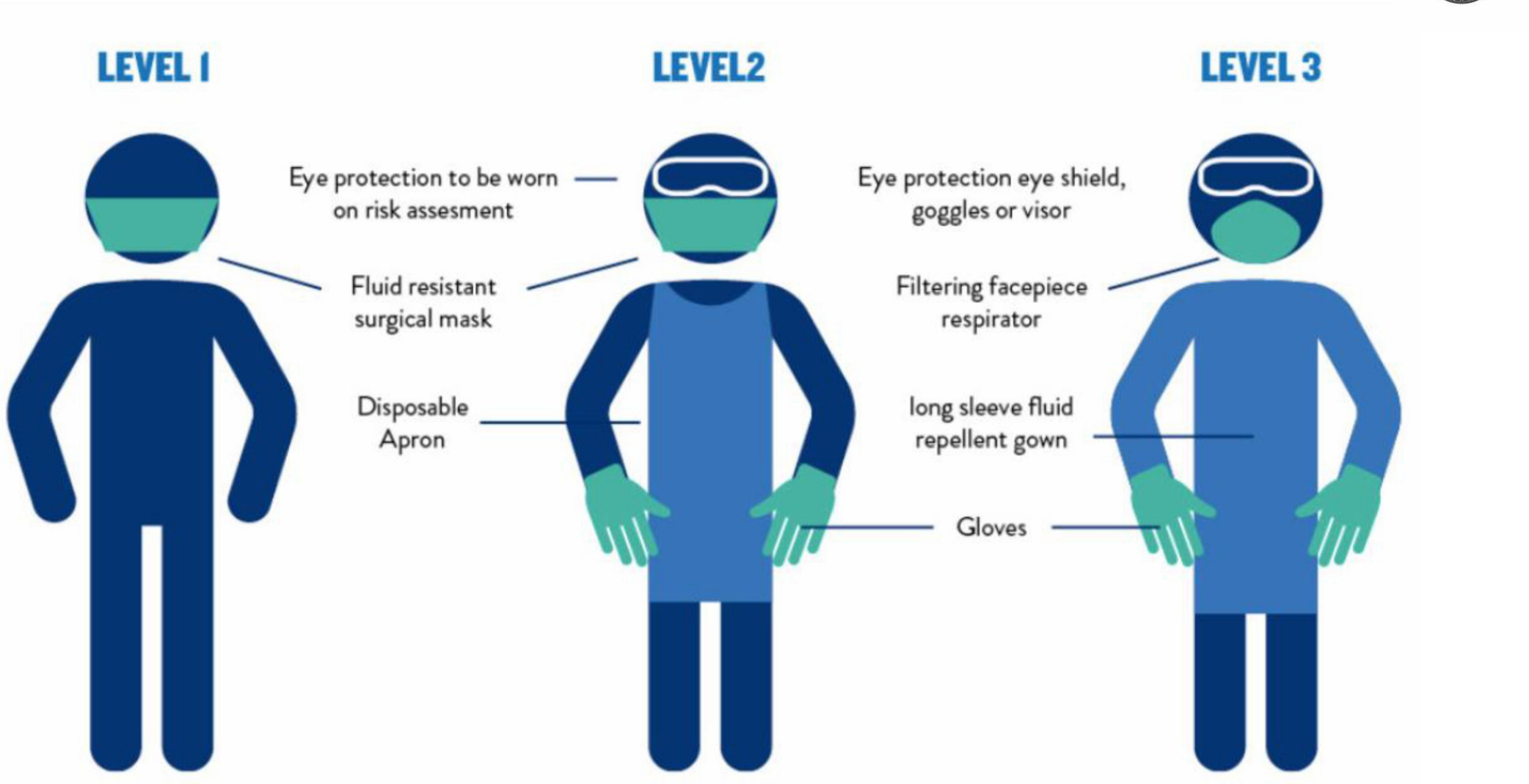
Unusual Behaviors

- Confusion in a person who is normally alert
- Unusual drowsiness
- Personality or mood changes

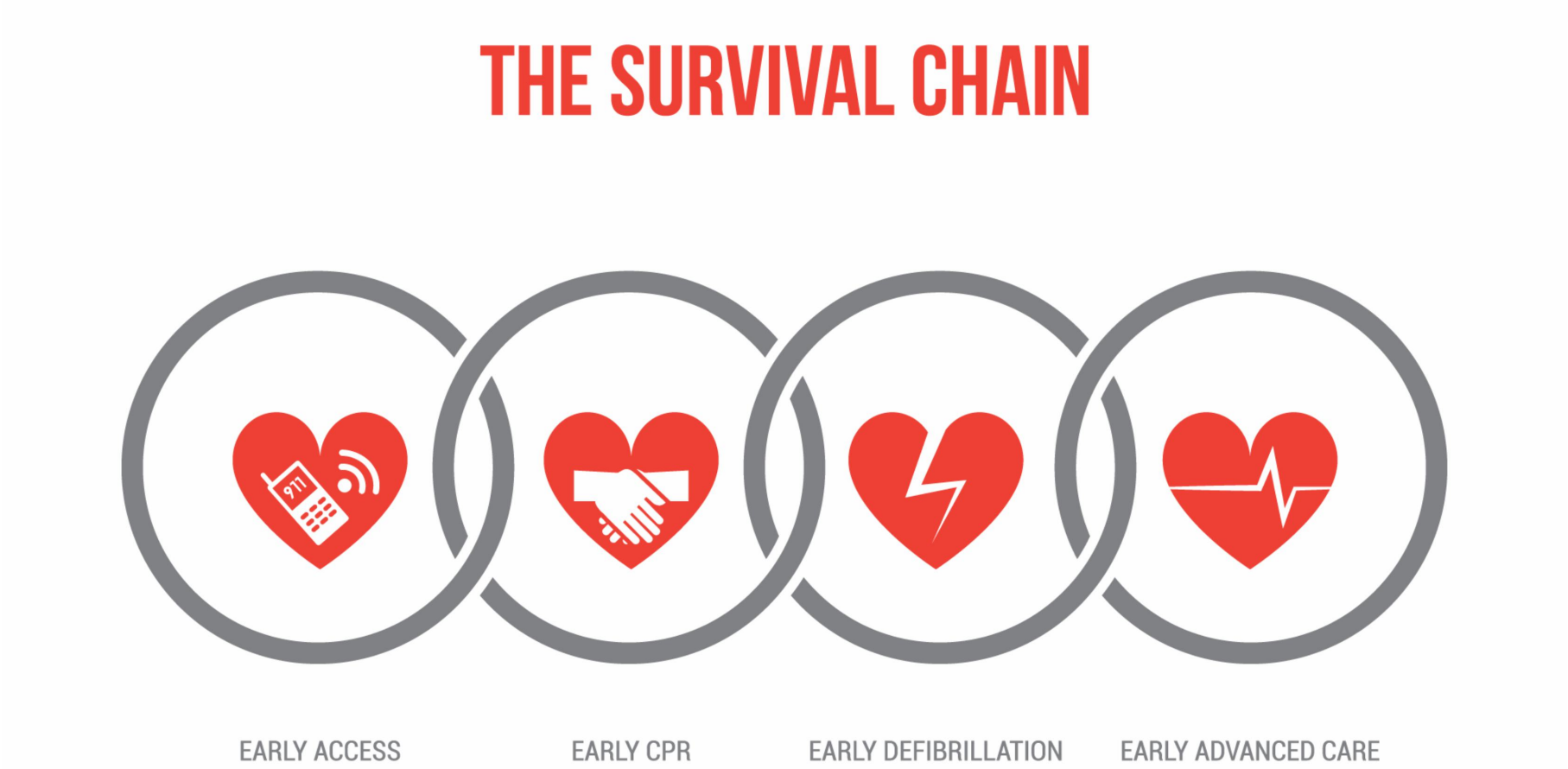
Unusual Sights

- A stopped vehicle on the roadside or a car that has run off of the road.
- Downed electrical wires
- Sparks, smoke or fire
- A person who suddenly collapses or is lying motionless

Personal Protective Equipment (PPE)



Chain of Survival Behaviors



Why are CPR & AED so important?

Bystander CPR improves survival.

The location of Out of Hospital Cardiac Arrests (OHCA) most often occurs in homes/residences (73.4%), followed by public settings (16.3%), and nursing homes (10.3%).

If performed immediately, CPR can double or triple the chance of survival from an out of hospital cardiac arrest.

Checking ABCs

A = CHECK THE AIRWAY

Make sure the person has an open airway. If the person is speaking, moaning, or crying, the person's airway is open

B = CHECK BREATHING

Check for normal breathing for 5 to 10 seconds. A person is breathing normally if air is moving into and out of the lungs and the chest is rising and falling in a normal,

C = CHECK CIRCULATION

Quickly look at the person from head to toe for signs of life-threatening bleeding.

Cardiopulmonary Resuscitation (CPR)

CPR is used when a person is unresponsive and not breathing

Compression-Only CPR

Compression-only CPR uses chest compressions (without rescue breaths) to pump the heart.

Cardiopulmonary Resuscitation (CPR)

- ***Adult or Child***

  Do 30 chest compressions.

  Put 2 hands in the center of the person's chest.

  Push deeply and steadily, allowing the chest to recoil between compressions .

Cardiopulmonary Resuscitation (CPR)

- Give 2 breaths:
- Open the airway.
- Place your barrier device over the person's mouth and nose, and i using a flat plastic shield, pinch the person's nostrils.
- Give just enough air to make the chest start to rise.

CPR Compression Depth

ADULT

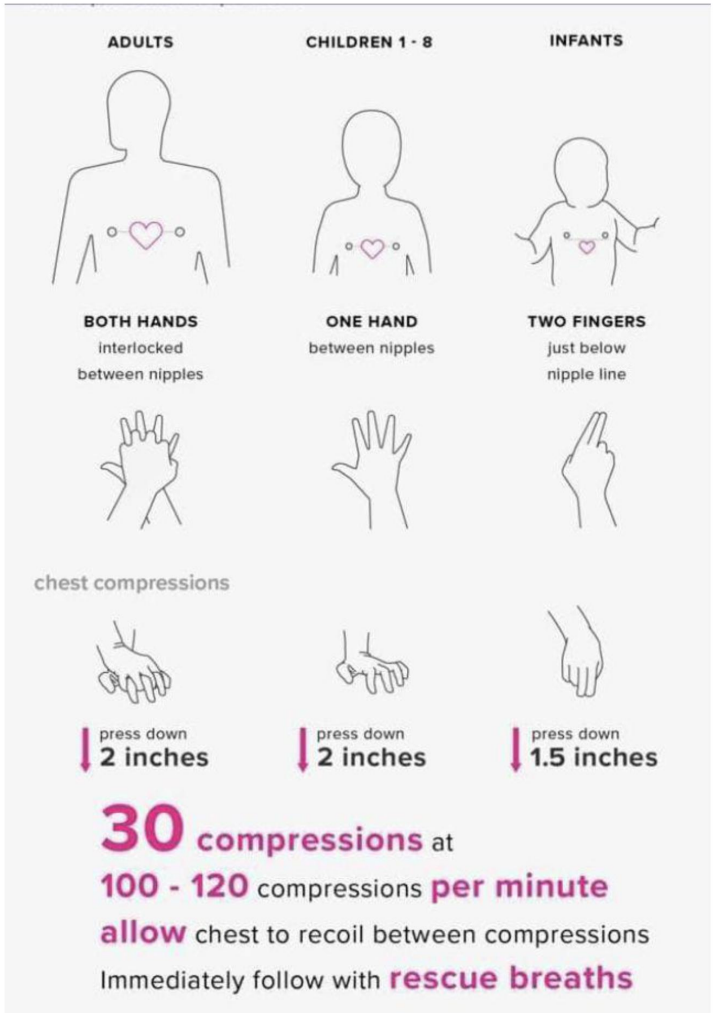
At least 5 cm (2 in.)

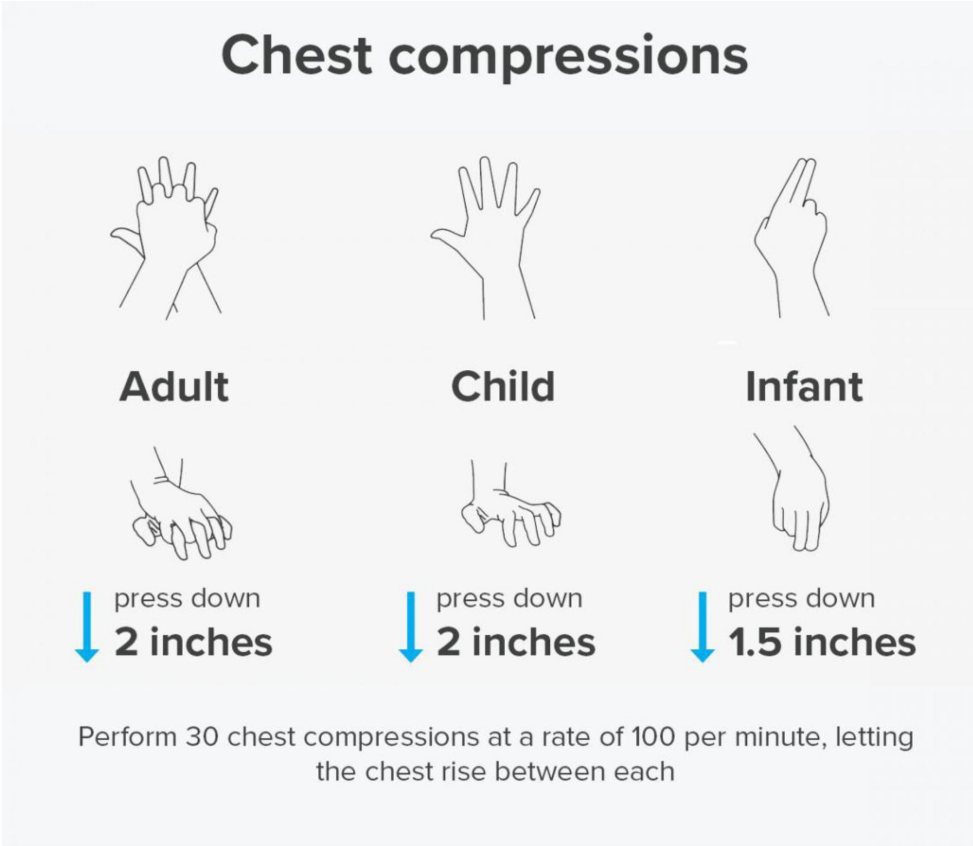
CHILD

At least 1/3 of the chest's depth

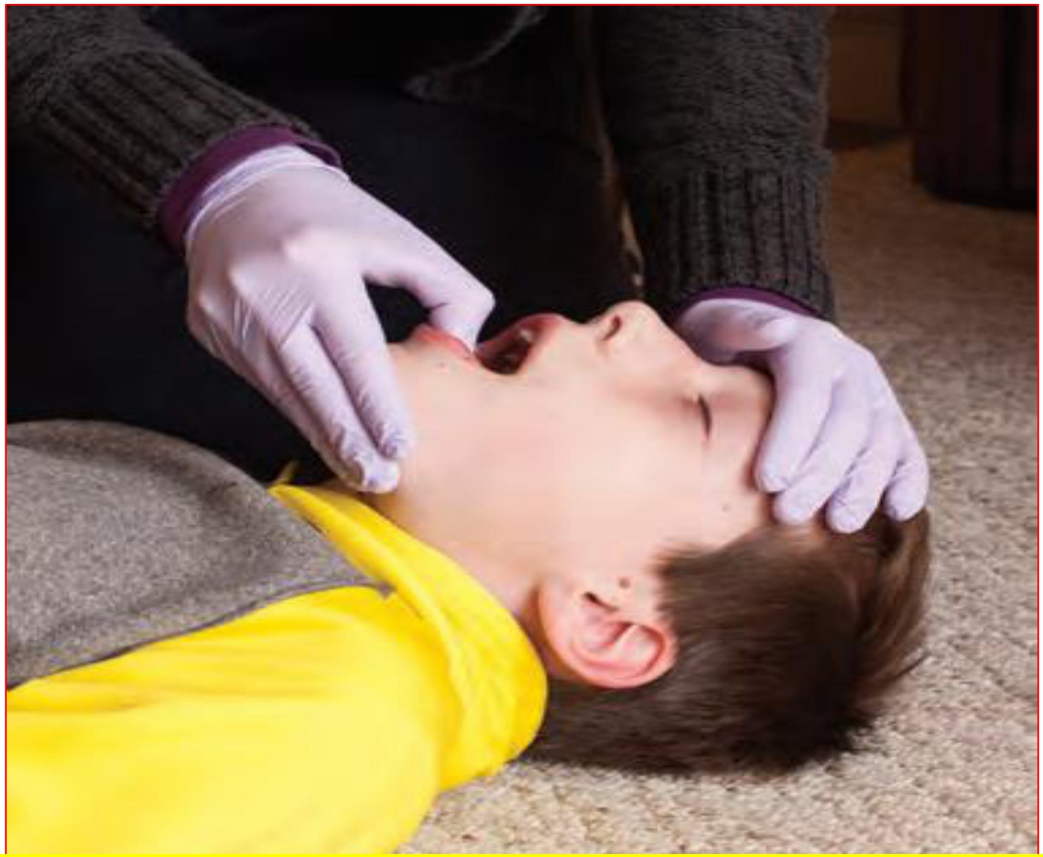
BABY

At least 1/3 of the chest's depth


ADULTS
CHILDREN 1 - 8
INFANTS
BOTH HANDS
interlocked
between nipples
ONE HAND
between nipples
TWO FINGERS
just below
nipple line
chest compressions
press down
2 inches
press down
2 inches
press down
1.5 inches
30 compressions at
100 - 120 compressions per minute
allow chest to recoil between compressions
Immediately follow with rescue breaths


Chest compressions
Adult
Child
Infant
press down
2 inches
press down
2 inches
press down
1.5 inches
Perform 30 chest compressions at a rate of 100 per minute, letting the chest rise between each

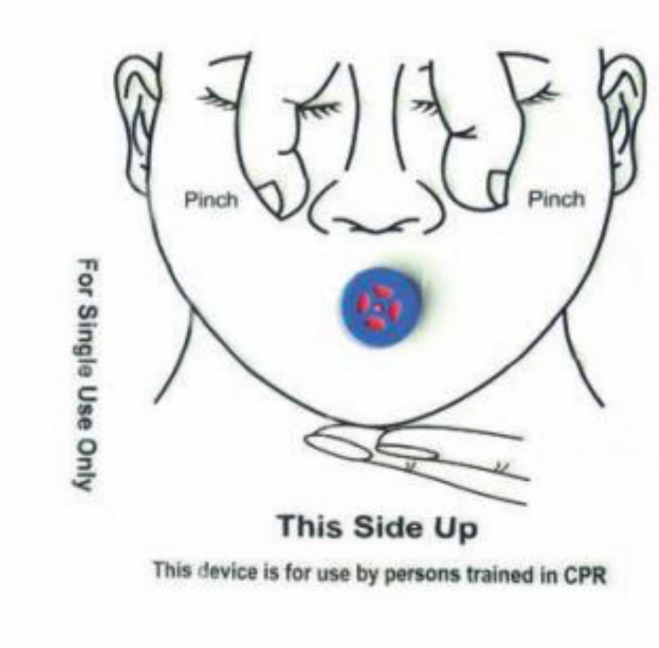
What to Do If the Rescue Breaths Don't Go In



If the chest does not rise after the first breath, try repositioning the head. If that doesn't work, look in the person's mouth for an object. Continue to look into the person's mouth after each set of compressions until the airway is clear.

CPR Breathing Barriers

CPR **breathing barriers** are used to protect you from contact with saliva and other body fluids, such as blood, as you give rescue breaths. Breathing barriers also protect you from breathing the air that the person exhales. The most basic and portable type of breathing barrier is a **face shield**, **pocket mask.**



When is an AED needed?

AEDs are used to revive someone from sudden cardiac arrest. This usually occurs when a disruption in the heart's electrical activity causes a dangerously fast heartbeat (ventricular tachycardia) or a fast and irregular heartbeat (ventricular fibrillation).

The defibrillator

Once the AED is with you, open the defibrillator case.

You will find:

Scissors – to assist in cutting the clothes

Towel – to dry the chest

Razor – to remove any thick hair

AED pads – to place on the persons chest

Don’t worry – the AED will talk you through what you need to do!

WHEN IS THE AED USED?

The AED is used when the person is:

- Unresponsive,
- Not breathing.

For children ages between 1 to 8 years or

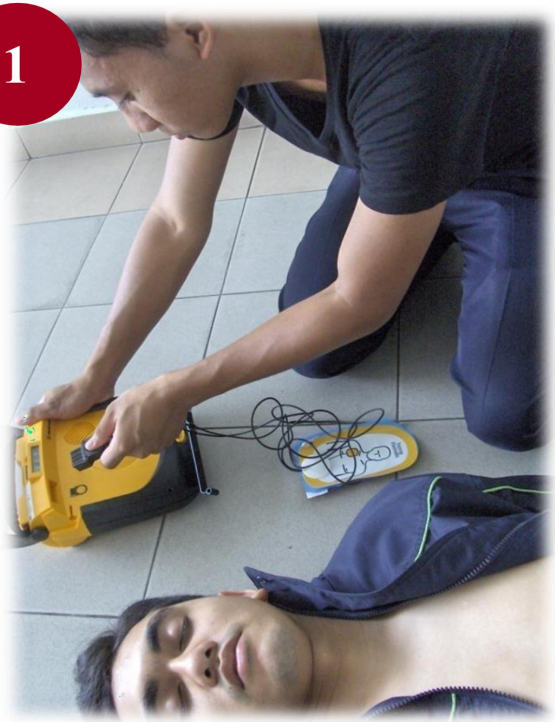
Weigh less than 25 kg, pediatric pads should be used!

However, if there are no such pads, adult defibrillation pads should be considered.

Follow the voice prompts!

Plug the cable into the AED and apply defibrillation pads onto chest while CPR is in progress.

1

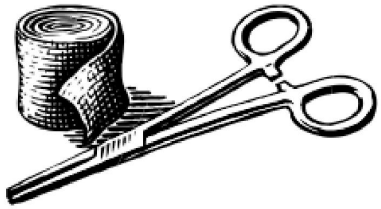


2

3

What's In a First Aid Kit ??

- Kits vary in contents but most kits have the following items:
- Band-Aids / adhesive bandages
- gauze pads and tape
- scissors, cold pack
- wound bandage / compress
- eye pads / eye wash solution
- first aid / burn cream
- antibiotic ointment
- face shield or barrier mask for providing CPR.
- First aid instruction booklet .



Basic First Aid Instructions
Minor Wounds

Minor wounds include abrasions, lacerations, punctures and incisions. The most significant issues to consider with any open wound are control of bleeding and infection

Signs and Symptoms:

- Break, cut or opening in the skin
- Bleeding – may be minor, moderate or severe

First Aid:

- If bleeding, apply direct pressure with a clean cloth or absorbent pad
- Wash area with antibacterial soap and clean until there appears to be no foreignmatter in the wound
- Cover area with an adhesivebandage or gauze wrap

Crush Injury

Occurs when a body part is subjected to a high degree of force or pressure . Example: smashed fingers in door.

Signs and Symptoms:

→ Pain and swelling

→ Discoloration and sometimes deformity

First Aid:

→ Apply ice just as you would with a bruising injury

→ If pain is severe and does not lessen with ice or there is decreased sensation, weakness, or paleness of the skin in the affected area, seek emergency care

Minor Cuts

These guidelines can help you care for minor cuts and scrapes,

1.Wash your hands. This helps avoid infection.

2.Stop the bleeding. Minor cuts apply gentle pressure with a clean bandage or cloth and elevate the wound until bleeding stops.

3.Clean the wound. Apply an antibiotic or petroleum jelly.

4.Cover the wound. Apply a bandage, rolled gauze or gauze held in place with paper tape. **Change the dressing.**

Minor Burns

For minor burns (first-degree burns or second-degree burns involving a small area of the body)

•Gently clean the wound with water..
•The burn may be dressed with a topical antibiotic ointment is the preferred agent for most burns, and is available over the counter in many locations.
•If there is concern that the burn is deeper and may be second or third degree in nature, seek medical care.

For major burns (second- and third-degree burns)

Burns are tissue damage from hot liquids, the sun, Hot work / flames, chemicals, electricity, steam and other causes. Kitchen-related injuries from hot drinks, soups and microwaved foods.

1.Remove the victim from the burning area, remembering not to put the rescuer in danger.

2.Remove any burning material from the person.

3.Call 999 or activate the emergency response system in your area if needed.

Bleeding

Symptoms and signs

- A wound with, or without, an embedded foreign object pain from skin surface wounds.
- Discoloration of the skin

Apply direct pressure to the bleeding wound

- Use a sterile or clean bulky pad and apply it firmly with hand pressure. Apply a bandage to keep the dressing in place.
- If bleeding is severe, DO NOT waste time looking for suitable padding, but be prepared to use the patient's hand or your hand to hold the wound together if the patient is unable to do this unaided.
- Seek for medical support.

Raise the injured area

- If the wound is on a limb, raise it in a supported position to reduce blood flow to the injured area.
- Use disposable gloves if possible. If gloves are not available, place your hands inside a plastic bag.
- If there has been any contact with blood or any other body fluids, wash your hands or any blood splashed on the skin thoroughly with soap and water as soon as possible after the incident.

If a foreign body is embedded in the wound

- DO NOT remove it but apply padding on either side of the object and build it up to avoid pressure on the foreign body.

- Hold the padding firmly in place with a roller bandage or folded triangular bandage applied in a crisscross method to avoid pressure on the object.

If blood leaks through the pressure pad and bandage

- Apply a second pad over the first. Use a tea towel or similar bulky fabric and apply maximum pressure to the area.
- For major uncontrolled bleeding quickly remove the blood-soaked pad and bandage and replace it with a fresh bulky pad and bandage. The continuing bleeding may be due to the pad slipping out of position when the first bandage was applied.

Nose Bleeding

How you can help

- **1. Apply firm pressure, elevation and rest**
- The patient needs to hold the head well forward and breathe through the mouth while pinching the entire soft part of the nose for 10 to 20 minutes.
- The patient must be sitting down and at total rest until the bleeding stops.
- **If bleeding continues after 20 minutes of pressure, continue the pressure and call for an ambulance.**
- **2. Once the bleeding has stopped**
- Tell the patient not to blow their nose for a few hours because this may restart the bleeding.

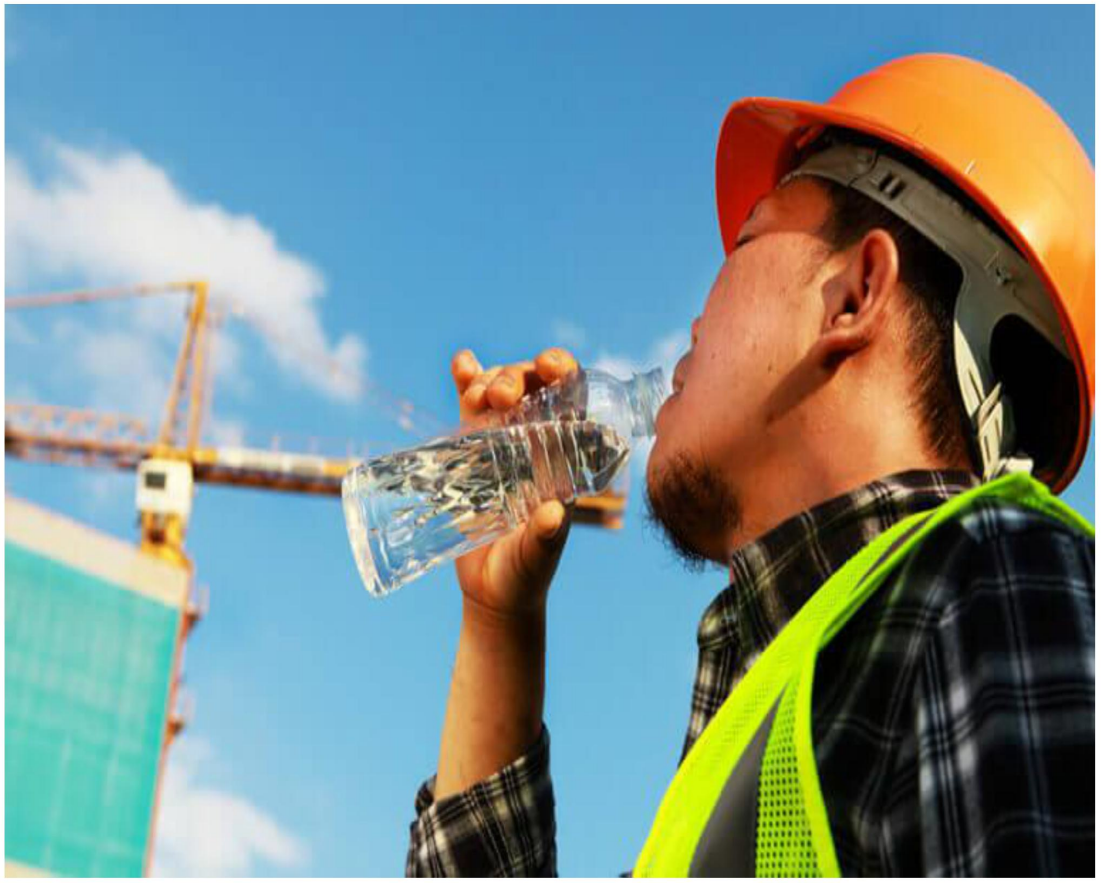
Other wounds

How you can help

- Gently clean with soapy water or saline. If there are pieces of gravel embedded in the wound, ask the patient to try to remove them while the area is soaking in soapy water.
- Dry the area well by blotting with gauze swabs or a pad of tissues.
- If a protective dressing is necessary, apply a non-adherent sterile dressing and fix it in place with a light roller bandage or tape.

Who’s at risk of becoming dehydrated?

Anyone can become dehydrated if they don’t take care of themselves and drink water.

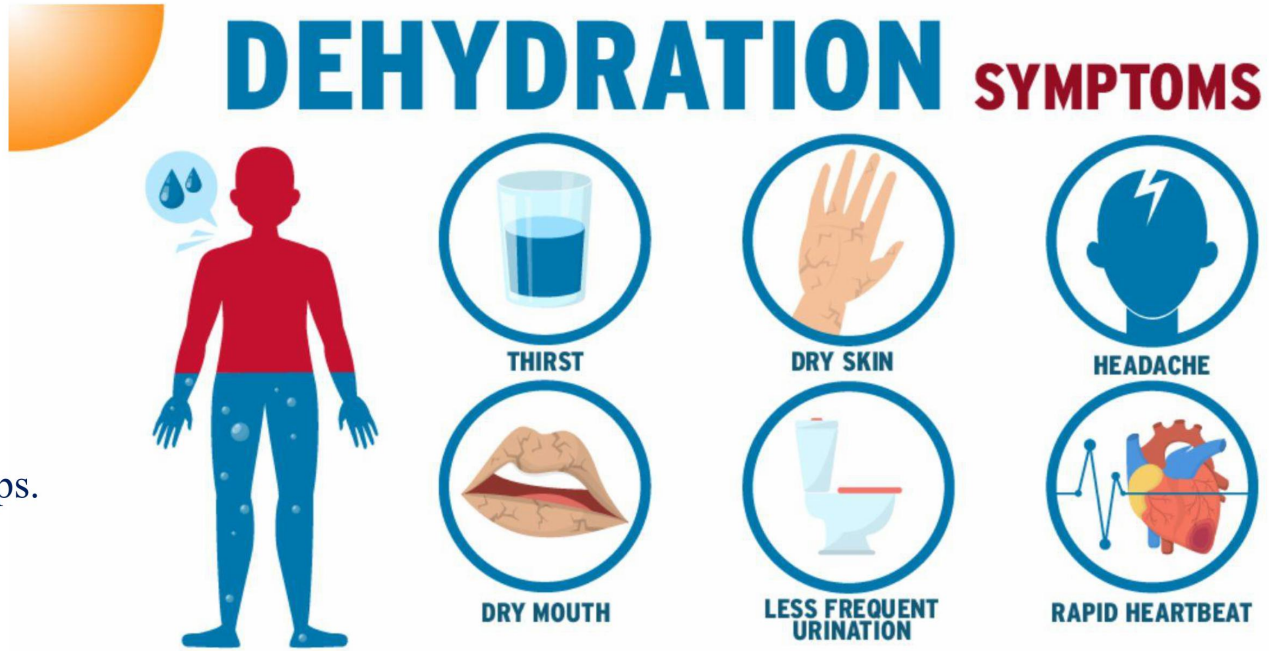


What are the signs of dehydration?

If you suspect that you or someone else is severely dehydrated, seek immediate medical attention.

Signs of dehydration include:

- Headache, delirium, confusion.
- Tiredness (fatigue).
- Dizziness, weakness, light-headedness.
- Dry mouth and/or a dry cough.
- High heart rate but low blood pressure.
- Loss of appetite but maybe craving sugar.
- Flushed (red) skin. Swollen feet. Muscle cramps.
- Heat intolerance, or chills.
- Constipation.
- Dark-colored pee (urine). Your pee should be a pale clear color.



International Board of Safety Professionals

Thank You