

Familiar with industrial training institute

Objectives: At the end of this lesson you shall be able to

- explain about DGT affiliated institutions under MSDE
 - familiarise with working of ITI using organisational chart of ITI
 - state the function of store procedures in training institutes.
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Introduction**Directorate General of Training (DGT)**

Directorate General of Training (DGT) in Ministry of Skill Development & Entrepreneurship is an apex organization for development and coordination of the vocational training including Women's Vocational Training of the employable youth in the country and to provide skilled manpower to the economy.

Two verticals of Directorate General of Employment & Training (DGE&T) working under Deputy Director General (Training) & Deputy Director General (Apprenticeship Training) along with their support systems were transferred to Ministry of Skill Development & Entrepreneurship (MSDE).

DGT affiliated institutions offers a wide range of training courses catering to the needs of different segments in the Labour market. Courses are available for school leavers, ITI pass outs, ITI instructors, industrial workers, technicians, junior and middle level executives, supervisors/foremen, women, physically disabled persons and SC/STs.

It also conducts training oriented research and develops instructional media packages for the use of trainees and instructors etc.

DGT acts a secretariat and implementing arm of National Council for Vocational Training (NCVT).

Training Institutes under DGT

- 13350 Industrial Training institutes (ITIs)
- 31 Central Institutes
- 10 Advanced Training Institutes (ATIs)
- 2 ATI-EPIs (Advanced Training Institutes - Electronic Process Instrumentation)
- 2 Foremen Training Institutes (FTIs)
- 1 Central Training Institutes (CTI)
- 1 National Vocational Training Institute (NVTI) for Women
- 15 Regional Vocational Training Institutes (RVTIs) for Women
- 12 Private Institute for Training of Trainers (IToTs)
- 2 State Government IToTs
- Central Staff Training and Research Institute (CSTARI)
- National Instructional Media Institute (NIMI)

Familiar with the working of Industrial Training Institute system including stores procedures

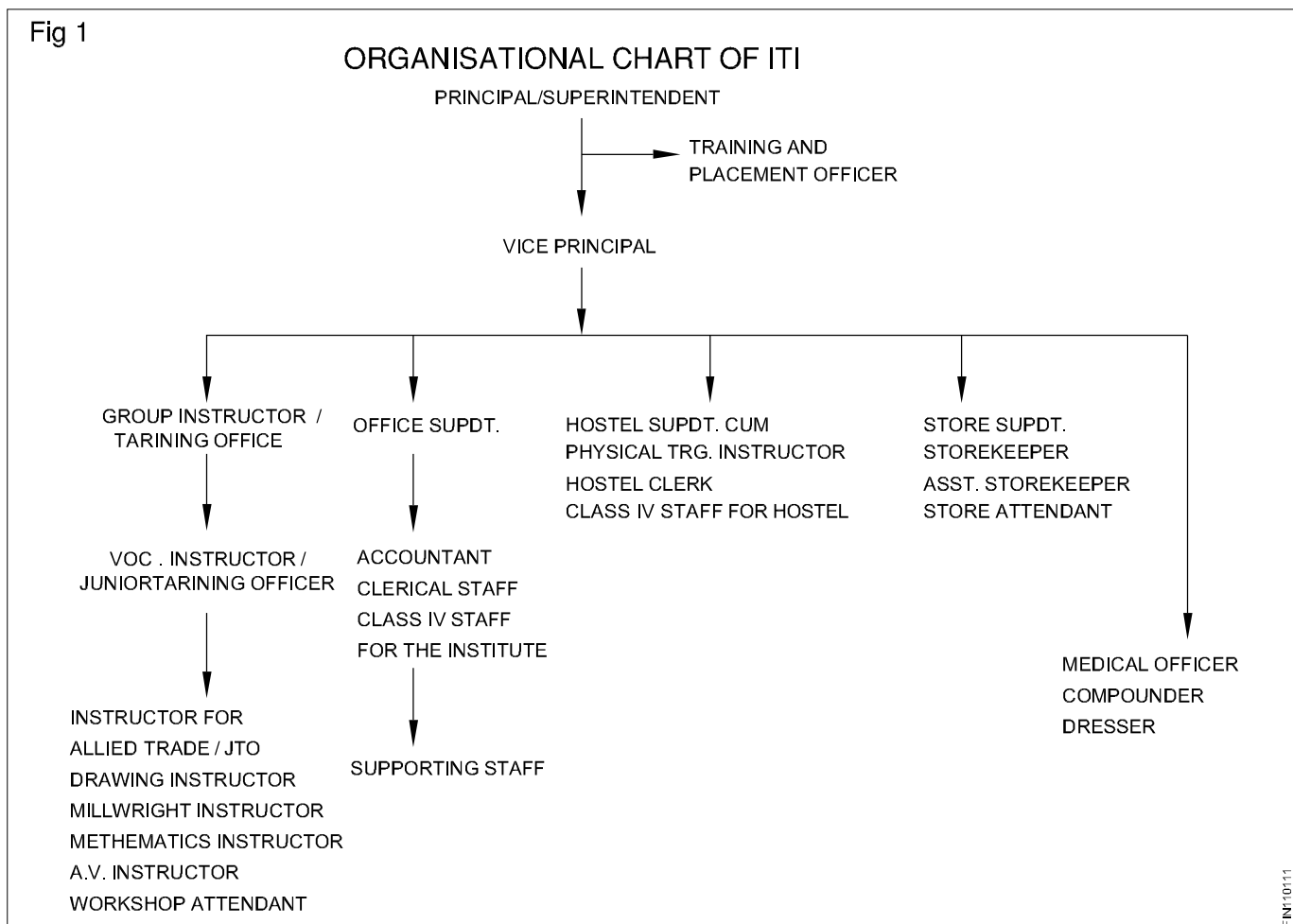
Objectives: At the end of this lesson you shall be able to

- to familiarise with working of ITI
- identify the staff structure of the institute
- identify the available trades in the institute and their function
- brief about the stores procedure.

The industrial training institute throughout India follow the same syllabus pattern given by the National council for Vocational Training (NCVT). In India there are about 13,350 Government ITIs and Private ITI 's Based on the Govt. of India, Ministry of Skill Development and Entrepreneurship (MSDE) Annual report of 2016-2017. The Government Industrial Training Institute in each state work under the Directorate of Employment and Training which is a department under the Labour Ministry in most of the states.

The head of the industrial training institute is the Principal, under whom there is one vice-principal, Group Instructor(s) Training officers and a number of Vocational Instructor(s) Assitant Training Officer(s) and Junior Training Officer and so on as shown in the Organisation Chart of ITI. (Fig 1)

In every industrial training institute there is a store and the in charge of the store is storekeeper for inward and outward movement of tools, equipment and consumable. The instructor will indent the training requirement on receiving from stores, the instructor will issue the training requirement to the trainees according to the graded exercises as per syllabus.

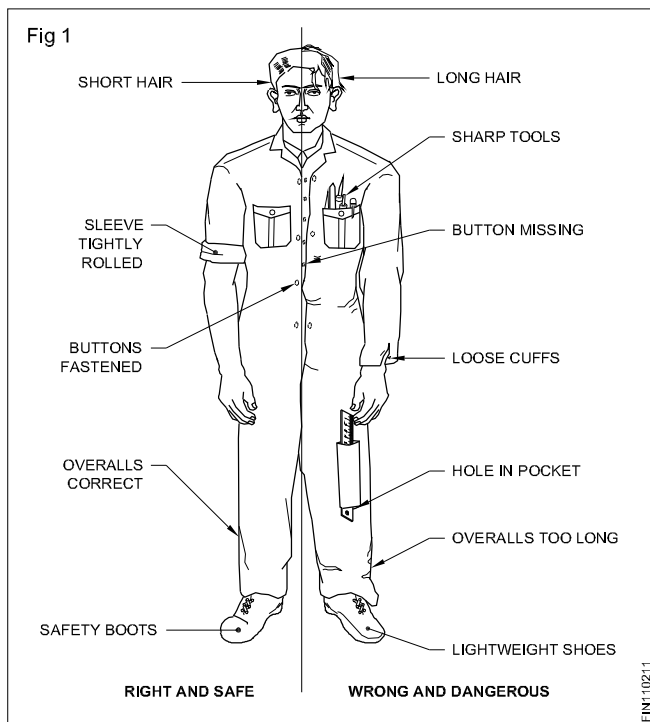


Importance of safety and general precautions observed in the industry/shop floor

Objectives: At the end of this lesson you shall be able to

- **state the importance of safety**
- **list out the safety precautions to be observed in a industry/shop floor**
- **list out the personal safety precautions to be observed in machine shop**
- **list out the safety precautions to be observed while working on the machines.**

Generally accidents do not happen; they are caused. Most accidents are avoidable. A good craftsman, having a knowledge of various safety precautions, can avoid accidents to himself and to his fellow workers and protect the equipment from any damage. To achieve this, it is essential that every person should follow safety procedure. (Fig 1)



Safety in a workshop can be broadly classified into 3 categories.

- General safety
- Personal safety
- Machine safety

General safety

Keep the floor and gangways clean and clear.

Move with care in the workshop, do not run.

Don't leave the machine which is in motion.

Don't touch or handle any equipment/ machine unless authorised to do so.

Don't walk under suspended loads.

Don't cut practical jokes while on work.

Use the correct tools for the job.

Keep the tools at their proper place.

Wipe out split oil immediately.

Replace worn out or damaged tools immediately.

Never direct compressed air at yourself or at your co-worker.

Ensure adequate light in the workshop.

Clean the machine only when it is not in motion.

Sweep away the metal cuttings.

Know everything about the machine before you start it.

Personal safety

Wear a one piece overall or boiler suit.

Keep the overall buttons fastened.

Don't use ties and scarves.

Roll up the sleeves tightly above the elbow.

Wear safety shoes or boots

Cut the hair short.

Don't wear a ring, watch or chain.

Never lean on the machine.

Don't clean hands in the coolant fluid.

Don't remove guards when the machine is in motion.

Don't use cracked or chipped tools.

Don't start the machine until

- the workpiece is securely mounted
- the feed machinery is in the neutral
- the work area is clear.

Don't adjust clamps or holding devices while the machine is in motion.

Never touch the electrical equipment with wet hands.

Don't use any faulty electrical equipment.

Ensure that electrical connections are made by an authorised electrician only.

Concentrate on your work. Have a calm attitude.

Do things in a methodical way.

Don't engage yourself in conversation with others while concentrating on your job.

Don't distract the attention of others.

Don't try to stop a running machine with hands.

Machine safety

Switch off the machine immediately if something goes wrong.

Keep the machine clean.

Replace any worn out or damaged accessories, holding devices, nuts, bolts etc as soon as possible.

Do not attempt operating the machine until you know how to operate it properly.

Do not adjust tool or the workpiece unless the power is off.

Stop the machine before changing the speed.

Disengage the automatic feeds before switching off.

Check the oil level before starting the machine.

Never start a machine unless all the safety guards are in position.

Take measurements only after stopping the machine.

Use wooden planks over the bed while loading and unloading heavy jobs.

Safety is a concept, understand it. Safety is a habit, cultivate it.

Approach on soft skills

Objectives : At the end of this lesson you shall be to

- **state the concept of soft skill**
 - **list the important common soft skills**
 - **brief the employability aspect of training**
 - **brief the further learning scope.**
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Concept

Soft skills - refer to the cluster of personality traits, social graces, facility with language, personal habits, friendliness, and optimism that mark people to varying degrees. The same can also be defined as-ability to interact communicate positively & productively with others. Sometimes called "character skills".

More and more business are considering soft skills as important job criteria. Soft skills are used in personal and professional life. Hard skills/technical skills do not matter without soft skills.

Common Soft Skills

- Strong work ethic
- Positive attitude
- Good communication skills
- Interpersonal skills
- Time management abilities
- Problem-solving skills
- Team work
- Initiative, Motivation
- Self-confidence
- Loyalty
- Ability to accept and learn from criticism
- Flexibility, Adaptability
- Working well under pressure

Job area completion of training: This highlights the employability aspect on completion of training. The trainee should be aware of various prospects available in present market scenario along with scope for self-employment. For example a trainee with NTC engineering trade may opt for:

Various job available in different industries in India and Abroad.

After successful completion of ITI training in any one of the engineering trade one can see appointment in engineering workshop/Factories (Public Sector, Private Sector and Government Industries) in India and Abroad as technician/Skilled worker.

Self employment

One can start his own factory/ancillary unit or design products manufacture and became an entrepreneur.

Further learning scope

- Apprentice training in designated trade.
- Craft Instructor certificate course.
- Diploma in relevant Engineering.

Personal Protective Equipment (PPE)

Objectives: At the end of this lesson you shall be able to

- state what is personal protective equipment and its purpose
- name the two categories of personal protective equipment
- list the most common type of personal protective equipment
- list the conditions for selection of personal protective equipment.

Personal Protective Equipment (PPE)

Devices, equipments, or clothing used or worn by the employees, as a last resort, to protect against hazards in the workplace. The primary approach in any safety effort is that the hazard to the workmen should be eliminated or the workmen through the use of personal protective controlled by engineering methods rather than protecting the workmen through the use of personal protective equipment (PPE). Engineering methods could include design change, substitution ventilation, mechanical handling, automation, etc. in situations where it is not possible to introduce any effective engineering methods for controlling hazards, the workman shall use appropriate types of PPE.

As changing times have modernized the workplace, government and advocacy groups have brought more safety standards to all sorts of work environments. The Factories Act, 1948 and several other labour legislations 1996 have provisions for effective use of appropriate types of PPE. Use of PPE is very important.

Ways to ensure workplace safety and use personal protective equipment (PPE) effectively.

- Workers to get up-to date safety information from the regulatory agencies that oversees workplace safety in their specific area.
- To use all available text resources that may be in work area and for applicable safety information on how to use PPE best.
- When it comes to the most common types of personal protective equipment, like goggles, gloves or bodysuits, these items are much less effective if they are not worn at all times, or whenever a specific danger exists in a work process. Using PPE consistently will help to avoid some common kinds of industrial accidents.
- Personal protective gear is not always enough to protect workers against workplace dangers, Knowing more about the overall context of your activity can help to fully protect from anything that might threaten health and safety on the job.

- Inspection of gear thoroughly to make sure that it has the standard of quality and adequately protect the user should be continuously carried out.

Categories of PPE-Small's'

Depending upon the nature of hazard, the PPE is broadly divided into the following two categories.

Non- respiratory : Those used for protection against injury from outside the body, i.e. for protecting the head,eye, face, hand, arm, foot, leg and other body parts

Respiratory: Those used for protection from harm due to inhalation of contaminated air.

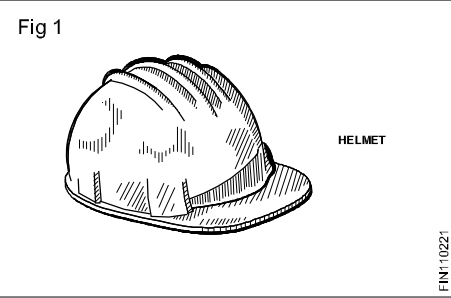
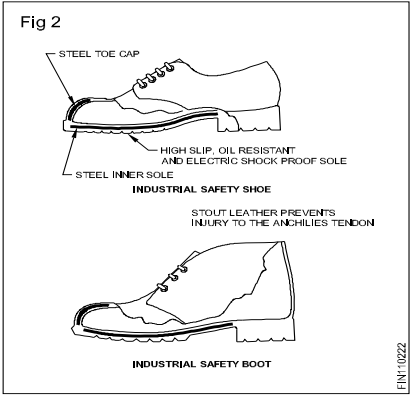
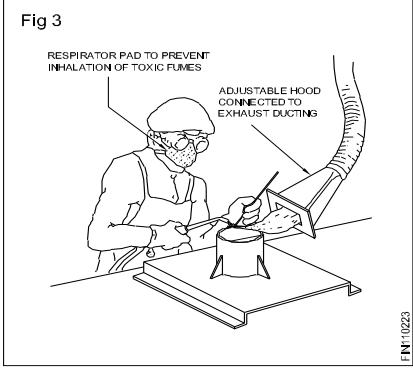
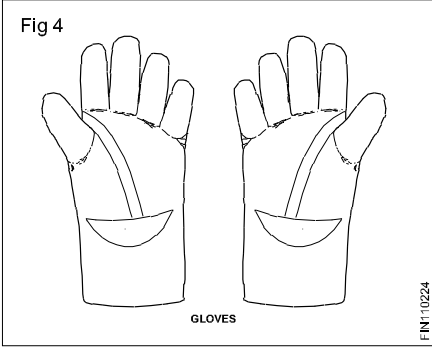
They are to meet the applicable BIS (Bureau of Indian Standards) standards for different types of PPE.

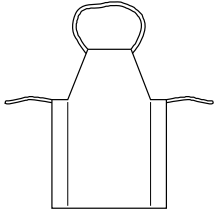
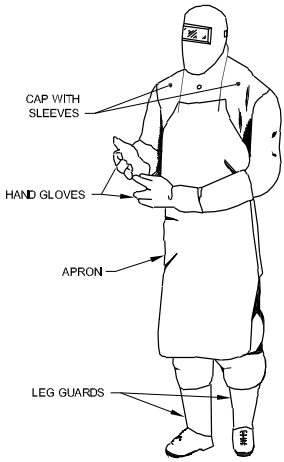
The guidelines on 'Personal Protective Equipment' is issued to facilitate the plant management in maintaining an effective programme with respect to protection of persons against hazards, which cannot be eliminated or controlled by engineering methods listed in table 1.

Table 1

No	Title
PPE1	Helmet
PPE2	Safety footwear
PPE3	Respiratory protective equipment
PPE4	Arms and hands protection
PPE5	Eyes and face protection
PPE6	Protective clothing and coverall
PPE7	Ears protection
PPE8	Safety belt harness

Personal protective equipments and their uses and hazards are listed in Table 2

Types of protection	Hazards	PPE to be used
<p>Head protection (Fig 1)</p>  <p>Fig 1</p> <p>HELMET</p> <p>FIN110221</p>	<ol style="list-style-type: none"> 1. Falling objects 2. Striking against objects 3. Spatter 	<p>Helmets</p>
<p>Foot protection (Fig 2)</p>  <p>Fig 2</p> <p>STEEL TOE CAP</p> <p>HIGH SLIP OIL RESISTANT AND ELECTRIC SHOCK PROOF SOLE</p> <p>STEEL INNER SOLE</p> <p>INDUSTRIAL SAFETY SHOE</p> <p>STOUT LEATHER PREVENTS INJURY TO THE ANKLES/TENDON</p> <p>INDUSTRIAL SAFETY BOOT</p> <p>FIN110222</p>	<ol style="list-style-type: none"> 1. Hot spatter 2. Falling objects 3. Working wet area 	<p>Leather leg guards</p> <p>Safety shoes</p> <p>Gum boots</p>
<p>Nose (Fig 3)</p>  <p>Fig 3</p> <p>RESPIRATOR PAD TO PREVENT INHALATION OF TOXIC FUMES</p> <p>ADJUSTABLE HOOD CONNECTED TO EXHAUST DUCTING</p> <p>FIN110223</p>	<ol style="list-style-type: none"> 1. Dust particles 2. Fumes/gases/ vapours 	<p>Nose mask</p>
<p>Hand Protection (Fig 4)</p>  <p>Fig 4</p> <p>GLOVES</p> <p>FIN110224</p>	<ol style="list-style-type: none"> 1. Heat burn due to direct contact 2. Blows spark moderate heat 3. Electric shock 	<p>Hand gloves</p>

Types of protection	Hazards	PPE to be used
<p>Body protection (Fig 8, & Fig 9)</p> <div data-bbox="116 264 550 548"> <p>Fig 8</p>  <p>APRON</p> <p style="text-align: right; font-size: small;">FIN110228</p> </div> <div data-bbox="116 582 550 1137"> <p>Fig 9</p>  <p>CAP WITH SLEEVES</p> <p>HAND GLOVES</p> <p>APRON</p> <p>LEG GUARDS</p> <p>LEG GUARDS</p> <p style="text-align: right; font-size: small;">FIN110229</p> </div>	<p>1. Hot particles</p>	<p>Leather aprons</p>

Quality of PPE's

PPE must meet the following criteria with regard to its quality-provide absolute full protection against possible hazard and PPE's be so designed and manufactured out of materials that it can withstand the hazards against which it is intended to be used.

Selection of PPE's requires certain conditions

- Nature and severity of the hazard
- Type of contaminant, its concentration and location of contaminated area with respect to the source of respirable air
- Expected activity of workman and duration of work, comfort of workman when using PPE
- Operating characteristics and limitation of PPE
- Easy of maintenance and cleaning
- Conformity to Indian / International standards and availability of test certificate.

Proper use of PPEs

Having selected the proper type of PPE, it is essential that the workman wears it. Often the workman avoids using PPE. The following factors influence the solution to this problem.

- The extent to which the workman understands the necessity of using PPE
- The ease and comfort with which PPE can be worn with least interference in normal work procedures
- The available economic, social and disciplinary sanctions which can be used to influence the attitude of the workman
- The best solution to this problem is to make wearing of PPE' mandatory for every employee.
- In other places, education and supervision need to be intensified. When a group of workmen are issued PPE for the first time.

First-aid

Objectives: At the end of this lesson you shall be able to

- **state what is first aid**
- **list the key aims of first aid**
- **explain the ABC of the first aid**
- **brief how to give first-aid for a victim who need first aid.**

First aid is defined as the immediate care and support given to an acutely injured or ill person, primarily to save life, prevent further deterioration or injury, plan to shift the victims to safer places, provide best possible comfort and finally help them to reach the medical centre/ hospital through all available means. It is an immediate life-saving procedure using all resources available within reach.

Imparting knowledge and skill through institutional teaching at younger age group in schools, colleges, entry point at industry level is now given much importance. Inculcating such habits at early age, helps to build good healthcare habits among people.

First aid procedure often consists of simple and basic life saving techniques that an individual performs with proper training and knowledge.

The key aims of first aid can be summarized in three key points:

- **Preserve life:** If the patient was breathing, a first aider would normally place them in the recovery position, with the patient leant over on their side, which also has the effect of clearing the tongue from the pharynx. It also avoids a common cause of death in unconscious patients, which is choking on regurgitated stomach contents. The airway can also become blocked through a foreign object becoming lodged in the pharynx or larynx, commonly called choking. The first aider will be taught to deal with this through a combination of 'back slaps' and 'abdominal thrusts'. Once the airway has been opened, the first aider would assess to see if the patient is breathing.
- **Prevent further harm:** Also sometimes called prevent the condition from worsening, or danger of further injury, this covers both external factors, such as moving a patient away from any cause of harm, and applying first aid techniques to prevent worsening of the condition, such as applying pressure to stop a bleed becoming dangerous.
- **Promote recovery:** First aid also involves trying to start the recovery process from the illness or injury, and in some cases might involve completing a treatment, such as in the case of applying a plaster to a small wound.

Training

Basic principles, such as knowing to use an adhesive bandage or applying direct pressure on a bleed, are often acquired passively through life experiences. However, to

provide effective, life-saving first aid interventions requires instruction and practical training. This is especially true where it relates to potentially fatal illnesses and injuries, such as those that require cardiopulmonary resuscitation (CPR); these procedures may be invasive, and carry a risk of further injury to the patient and the provider. As with any training, it is more useful if it occurs before an actual emergency, and in many countries, emergency ambulance dispatchers may give basic first aid instructions over the phone while the ambulance is on the way. Training is generally provided by attending a course, typically leading to certification. Due to regular changes in procedures and protocols, based on updated clinical knowledge, and to maintain skill, attendance at regular refresher courses or re-certification is often necessary. First aid training is often available through community organization such as the Red cross and St. John ambulance.

ABC of first aid

ABC stands for airway, breathing and circulation.

- **Airway:** Attention must first be brought to the airway to ensure it is clear. Obstruction (choking) is a life-threatening emergency.
- **Breathing:** Breathing if stops, the victim may die soon. Hence means of providing support for breathing is an important next steps. There are several methods practiced in first aid.
- **Circulation:** Blood circulation is vital to keep person alive. The first aiders now trained to go straight to chest compressions through CPR methods.

When providing first aid one needs to follow some rule. There are certain basic norms in teaching and training students in the approach and administration of first aid to sick and injured.

Not to get panic

Panic is one emotion that can make the situation more worse. People often make mistake because they get panic. Panic clouds thinking and causes mistakes. First aider need calm and collective approach. If the first aider himself is in a state of fear and panic gross mistakes may result. It's far easier to help the suffering, when they know what they are doing, even if unprepared to encounter a situation. Emotional approach and response always lead to wrong doing and may cloud one to do wrong procedures. Hence be calm and focus on the given institution. Quick and confident approach can lessen the effect of injury.

Call medical emergencies

If the situation demands, quickly call for medical assistance. Prompt approach may save the life.

Surroundings play vital role

Different surroundings require different approach. Hence first aider should study the surrounding carefully. In other words, one need to make sure that they are safe and are not in any danger as it would be of no help that the first aider himself get injured.

Do no harm

Most often over enthusiastically practiced first aid viz. administering water when the victim is unconscious, wiping clotted blood (which acts as plug to reduce bleeding), correcting fractures, mishandling injured parts etc., would leads to more complication. Patients often die due to wrong FIRST AID methods, who may otherwise easily survive. Do not move the injured person unless the situation demands. It is best to make him lie wherever he is because if the patient has back, head or neck injury, moving him would causes more harm.

This does not mean do nothing. It means to make sure that to do something the care givers feel confident through training would make matters safe. If the first aider is not confident of correct handling it is better not to intervene of do it. Hence moving a trauma victim, especially an unconscious one, need very careful assessment. Removals of an embedded objects (Like a knife, nail) from the wound may precipitate more harm (e.g. increased bleeding). Always it is better to call for help.

Reassurance

Reassure the victim by speaking encouragingly with him.

Stop the bleeding

If the victim is bleeding, try to stop the bleeding by applying pressure over the injured part.

Golden hours

India have best of technology made available in hospitals to treat devastating medical problem viz. head injury, multiple trauma, heart attack, strokes etc, but patients often do poorly because they don't gain access to that technology in time. The risk of dying from these conditions, is greatest in the first 30 minutes, often instantly. This period is referred to as Golden period. By the time the patient reach hospitals, they would have passed that critical period. First aid care come handy to save lives. It helps to get to the nearest emergency room as quickly as possible through safe handling and transportation. The shorter that time, the more likely the best treatment applied.

Maintain the hygiene

Most importantly, first aider need to wash hands and dry before giving and first aid treatment to the patient or wear gloves in order to prevent infection.

Cleaning and dressing

Always clean the wound thoroughly before applying the bandage lightly wash the wound with clean water.

Not to use local medications on cuts or open wounds

They are more irritating to tissue than it is helpful. Simple dry cleaning or with water and some kind of bandage are best.

CPR (Cardio-Pulmonary Resuscitation) can be life-sustaining

CPR can be life sustaining. If one is trained in CPR and the person is suffering from choking or finds difficulty in breathing, immediately begin CPR. However, if one is not trained in CPR, do not attempt as you can cause further injury. But some people do it wrong. This is a difficult procedure to do in a crowded area. Also there are many studies to suggest that no survival advantage when bystanders deliver breaths to victims compared to when they only do chest compressions. Second, it is very difficult to carry right maneuver in wrong places. But CPR, if carefully done by highly skilled first aiders is a bridge that keeps vital organs oxygenated until medical team arrives.

Declaring death

It is not correct to declare the victim's death at the accident site. It has to be done by qualified medical doctors.

How to report an emergency?

Reporting an emergency is one of those things that seems simple enough, until actually when put to use in emergency situations. A sense of shock prevail at the accident sites. Large crowd gather around only with inquisitive nature, but not to extend helping hands to the victims. This is common in road side injuries. No passerby would like to get involved to assist the victims. Hence first aid management is often very difficult to attend to the injured persons. The first aiders need to adapt multitask strategy to control the crowd around, communicate to the rescue team, call ambulance etc., all to be done simultaneously. The mobile phones helps to a greater deal for such emergencies. Few guidelines are given below to approach the problems.

Assess the urgency of the situation. Before you report an emergency, make sure the situation is genuinely urgent. Call for emergency services if you believe that a situation is life-threatening or otherwise extremely disruptive.

- A crime, especially one that is currently in progress. If you're reporting a crime, give a physical description of the person committing the crime.
- A fire - If you're reporting a fire, describe how the fire stated and where exactly it is located. If someone has already been injured or is missing, report that as well.
- A life-threatening medical emergency, explain how the incident occurred and what symptoms the person currently displays.
- A car crash - Location, serious nature of injuries, vehicle's details and registration, number of people involved etc.

Call emergency service

The emergency number varies - 100 for Police & Fire. 108 for Ambulance.

Report your location

The first thing the emergency dispatcher will ask is where you are located, so the emergency services can get there as quickly as possible. Give the exact street address, if you're not sure of the exact address, give approximate information.

Give the dispatcher your phone number

This information is also imperative for the dispatcher to have, so that he or she is able to call back if necessary.

Describe the nature of the emergency

Speak in a calm, clear voice and tell the dispatcher why you are calling. Give the most important details first, then answer the dispatcher's follow-up question as best as you can.

Do not hang up the phone until you are instructed to do so. Then follow the instructions you were given.

Basic first aid

Basic first aid refers to the initial process of assessing and addressing the needs of someone who has been injured or is in physiological distress due to choking, a heart attack, allergic reactions, drugs or other medical emergencies. Basic first aid allows one to quickly determine a person's physical condition and the correct course of treatment.

Important guideline for first aiders

Evaluate the situation

Are there things that might put the first aider at risk. When faced with accidents like fire, toxic smoke, gasses, an unstable building, live electrical wires or other dangerous scenario, the first aider should be very careful not to rush into a situation, which may prove to be fatal.

Remember A-B-Cs

The ABCs of first aid refer to the three critical things the first aiders need to look for.

- Airway - Does the person have an unobstructed airway?
- Breathing - Is the person breathing?
- Circulation - Does the person show a pulse at major pulse points (wrist, carotid artery, groin)

Avoid moving the victim

Avoid moving the victim unless they are in immediate danger. Moving a victim will often make injuries worse, especially in the case of spinal cord injuries.

Call emergency services

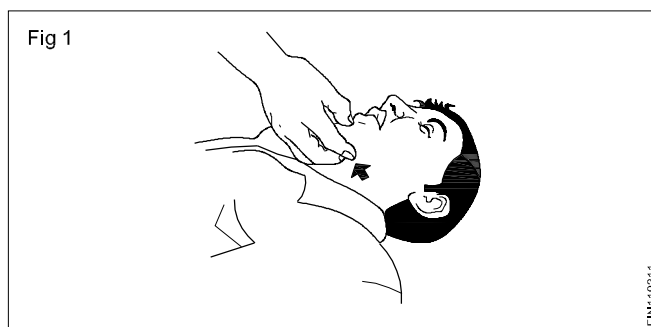
Call for help or tell someone else to call for help as soon as possible. If alone in at the accident scene, try to establish breathing before calling for help, and do not leave the victim alone unattended.

Determine responsiveness

If a person is unconscious, try to rouse them by gently shaking and speaking to them.

If the person remains unresponsive, carefully roll them on the side (recovery position) and open his airway.

- Keep head and neck aligned.
- Carefully roll them onto their back while holding his head.
- Open the airway by lifting the chin. (Fig 1)



Look, listen and feel for signs of breathing

Look for the victim's chest to raise and fall, listen for sounds of breathing.

If the victim is not breathing, see the section below

- If the victim is breathing, but unconscious, roll them onto their side, keeping the head and neck aligned with the body. This will help drain the mouth and prevent the tongue or vomit from blocking the airway.

Check the victim's circulation

Look at the victim's colour and check their pulse (the carotid artery is a good option; it is located on either side of the neck, below the jaw bone). If the victim does not have a pulse, start CPR.

Treat bleeding, shock and other problems as needed

After establishing that the victim is breathing and has a pulse, next priority should be to control any bleeding. Particularly in the case of trauma, preventing shock is the priority.

- **Stop bleeding:** Control of bleeding is one of the most important things to save a trauma victim. Use direct pressure on a wound before trying any other method of managing bleeding.
- **Treat shock:** Shock, a loss of blood flow from the body, frequently follows physical and occasionally psychological trauma. A person in shock will frequently have ice cold skin, be agitated or have an altered mental status, and have pale colour to the skin around the face and lips. Untreated, shock can be fatal. Anyone who has suffered a severe injury or life-threatening situation is at risk for shock.

- **Choking victim:** Choking can cause death or permanent brain damage within minutes.
- **Treat a burn:** Treat first and second degree burns by immersing or flushing with cool water. Don't use creams, butter or other ointments, and do not pop blisters. Third degree burns should be covered with a damp cloth. Remove clothing and jewellery from the burn, but do not try to remove charred clothing that is stuck to burns.
- **Treat a concussion:** If the victim has suffered a blow to the head, look for signs of concussion. Common symptoms are: loss of consciousness following the injury, disorientation or memory impairment, vertigo, nausea, and lethargy.
- **Treat a spinal injury victim:** If a spinal injury is suspected, it is especially critical, not move the victim's head, neck or back unless they are in immediate danger.

Stay with the victim until help arrives

Try to be a calming presence for the victim until assistance can arrive.

Unconsciousness (COMA)

Unconscious also referred as Coma, is a serious life threatening condition, when a person lie totally senseless and do not respond to calls, external stimulus. But the basic heart, breathing, blood circulation may be still intact, or they may also be failing. If unattended it may lead to death.

The condition arises due to interruption of normal brain activity. The causes are too many.

- Shock (Cardiogenic, Neurogenic)
- Head injury (Concussion, Compression)
- Asphyxia (obstruction to air passage)
- Extreme of body temperature (Heat, Cold)
- Cardiac arrest (Heart attack)
- Stroke (Cerebro-vascular accident)
- Blood loss (Haemorrhage)
- Dehydration (Diarrohea & vomiting)
- Diabetes (Low or high sugar)
- Blood pressure (Very low or very high)
- Over dose of alcohol, drugs
- Poisoning (Gas, Pesticides, Bites)
- Epileptic fits (Fits)
- Hysteria (Emotional, Psychological)

The following symptoms may occur after a person has been unconscious:

- Confusion
- Drowsiness

- Headache
- Inability to speak or move parts of his or her body (see stroke symptoms)
- Light headedness
- Loss of bowel or bladder control (incontinence)
- Rapid heartbeat (palpitation)
- Stupor

First aid

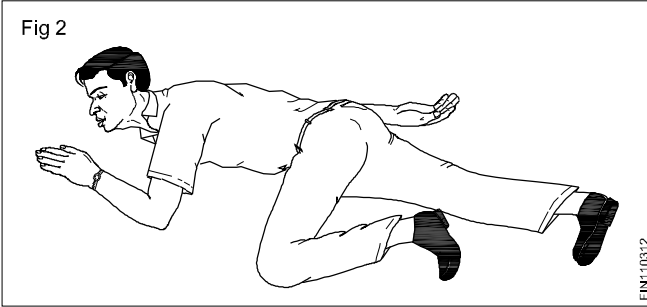
- Call EMERGENCY number.
- Check the person's airway, breathing, and pulse frequently. If necessary, begin rescue breathing and CPR.
- If the person is breathing and lying on the back and after ruling out spinal injury, carefully roll the person onto the side, preferably left side. Bend the top leg so both hip and knee are at right angles. Gently tilt the head back to keep the airway open. If breathing or pulse stops at any time, roll the person on to his back and begin CPR.
- If there is a spinal injury, the victims position may have to be carefully assessed. If the person vomits, roll the entire body at one time to the side. Support the neck and back to keep the head and body in the same position while you roll.
- Keep the person warm until medical help arrives.
- If you see a person fainting, try to prevent a fall. Lay the person flat on the floor and raise the level of feet above and support.
- If fainting is likely due to low blood sugar, give the person something sweet to eat or drink when they become conscious.

DO NOT

- Do not give an unconscious person any food or drink.
- Do not leave the person alone.
- Do not place a pillow under the head of an unconscious person.
- Do not slap an unconscious person's face or splash water on the face to try to revive him.

Loss of consciousness may threaten life if the person is on his back and the tongue has dropped to the back of the throat, blocking the airway. Make certain that the person is breathing before looking for the cause of unconsciousness. If the injuries permit, place the casualty in the recovery position with the neck extended. Never give anything by mouth to an unconscious casualty.

Fig 2



How to diagnose an unconscious injured person

- **Consider alcohol:** look for signs of drinking, like empty bottles or the smell of alcohol.
- **Consider epilepsy:** are there signs of a violent seizure, such as saliva around the mouth or a generally dishevelled scene?
- **Think insulin:** might the person be suffering from insulin shock (see 'How to diagnose and treat insulin shock')?
- **Think about drugs:** was there an overdose? Or might the person have under dosed - that is not taken enough of a prescribed medication?
- **Consider trauma:** is the person physically injured?
- **Look for signs of infection:** redness and/ or red streaks around a wound.
- **Look around for signs of Poison:** an empty bottle of pills or a snakebite wound.
- **Consider the possibility of psychological trauma:** might the person have a psychological disorder of some sort?
- Consider stroke, particularly for elderly people.
- Treat according to what you diagnose.

Shock (Fig 3)

A severe loss of body fluid will lead to a drop in blood pressure. Eventually the blood's circulation will deteriorate and the remaining blood flow will be directed to the vital organs such as the brain. Blood will therefore be directed away from the outer area of the body, so the victim will appear pale and the skin will feel ice cold.

Fig 3



Guidelines for good shop floor maintenance

Objectives: At the end of this lesson you shall be able to

- list the benefits of a shop floor maintenance
- state what is 5s
- list the benefits of 5s.

Benefits of a shop floor maintenance

Some of the benefits which may be derived from the utilization of a good Shop Floor Maintenance are as follows:

- Improved productivity
- Improved operator efficiencies.
- Improved support operations such as replenishment moves and transportation of work in process and finished goods.
- Reduction of scrap
- Better control of your manufacturing process
- More timely information to assist shop floor supervisors in managing their assigned production responsibilities.
- Reduction of down time due to better machine and tool monitoring.
- Better control of work in progress inventory, what is and where it is improved on time schedule performance.

5S concept

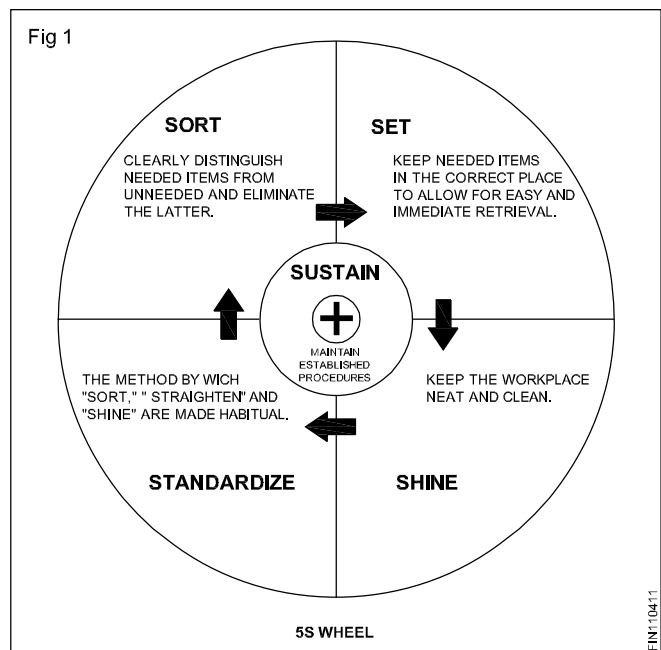
5S is a Japanese methodology for workplace organisation. In Japanese it stands for seiri (SORT), seiton (SET), seiso (SHINE), seiketsu (STANDARDIZE) and shitsuke (SUSTAIN).

The list describes how to organize a work space for efficiency and effectiveness by identifying and storing the items used, maintaining the area and items, and sustaining the new order. The list describes how to organize a work space for efficiency and effectiveness by identifying and storing the items used, maintaining the area and items, and sustaining the new order.

5S Wheel (Fig 1)

The Benefits of the 5s system

- Increases in productivity
- Increases in quality
- Reduction in cost



Importance of housekeeping

Objectives: At the end of this lesson you shall be able to

- list the steps involves in house keeping
- state good shop floor practices followed in industry

Housekeeping

The following activities to be performed for better up keep of working environment:

- 1 **Cleaning of shop floor:** Keep clean and free from accumulation of dirt and scrap daily
- 2 **Cleaning of Machines :** Reduce accidents to keep machines cleaned well
- 3 **Prevention of Leakage and spillage:** Use splash guards in machines and collecting tray
- 4 **Disposal of Scrap-** Empty scrap, wastage, swarf from respective containers regularly
- 5 **Tools Storage-** Use special racks, holders for respective tools
- 6 **Storage Spaces:** Identify storage areas for respective items. Do not leave any material in gangway
- 7 **Piling Methods-** Do not overload platform, floor and keep material at safe height.
- 8 **Material handling:** Use forklifts, conveyors and hoist according to the volume and weight of the package.

Good shop floor practices followed in industry

Good Shop floor practices are motivating action plans for improvement of the manufacturing process.

- All workers are communicated with daily target on manufacturing, activities.
- Informative charts are used to post production, quality and safety results compared to achievements.
- Workers are trained on written product quality standards.
- Manufactured parts are inspected to ensure adherence to quality standards.
- Production processes are planned by engineering to minimize product variation.
- 5s methods are used to organize the shop floor and production lines.
- Workers are trained on plant safety practices in accordance with Occupational Safety Health (OSH) standards.
- Workers are trained on "root cause" analysis for determining the causes of not following.
- A written preventive maintenance plan for upkeep of plant, machinery & equipment
- Management meets with plant employees regularly to get input on process improvements.
- Process Improvement Teams are employed to implement "best practices"

Disposal of waste material

Objectives: At the end of this lesson you shall be able to

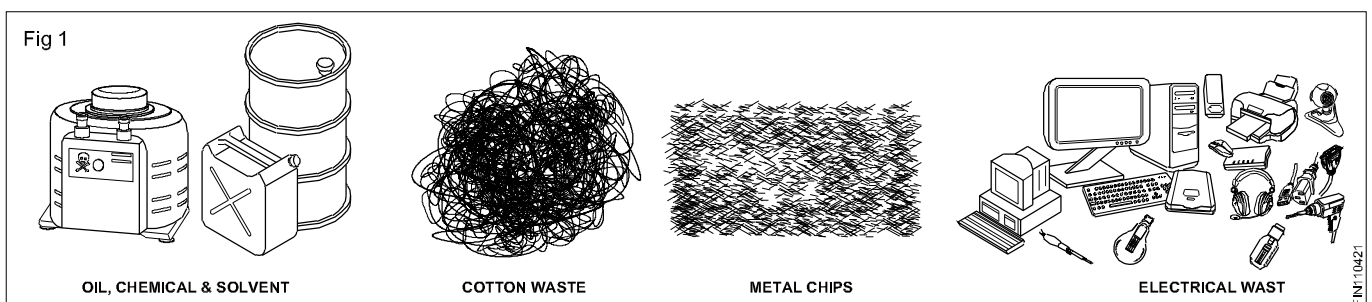
- state what is waste material
- list the waste materials in a work shop
- explain the methods of disposal of waste material.
- state advantage of disposal of waste material.
- state colour code for bins for waste segregation.

Waste material

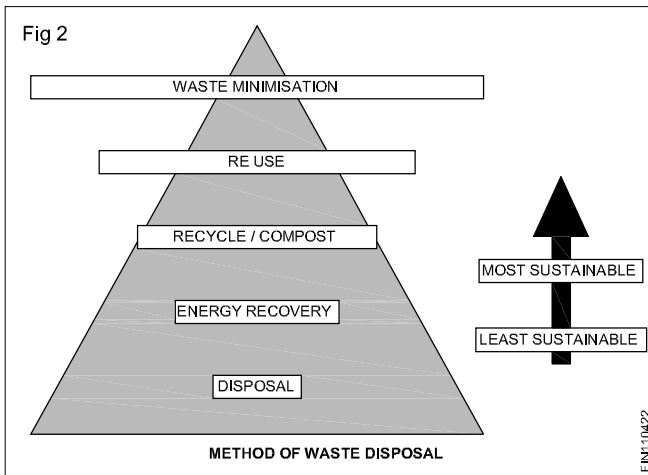
industrial waste is the waste produced by industrial activity such as that of factories, mills and mines.

List of waste material (Fig 1)

- Cotton waste
- Metal chips of different material.
- Oily waste such as lubricating oil, coolant etc.
- Other waste such electrical, glass etc.



Methods of waste disposal



Recycling

Recycling is one of the most well known method of managing waste. It is not expensive and can be easily done by you. If you carry out recycling, you will save a lot of energy, resources and thereby reduce pollution.

Composting

This is a natural process that is completely free of any hazardous by-products. This process involves breaking down the materials into organic compounds that can be used as manure.

Landfills

Waste management through the use of landfills involves the use of a large area. This place is dug open and filled with the waste.

Burning the waste material

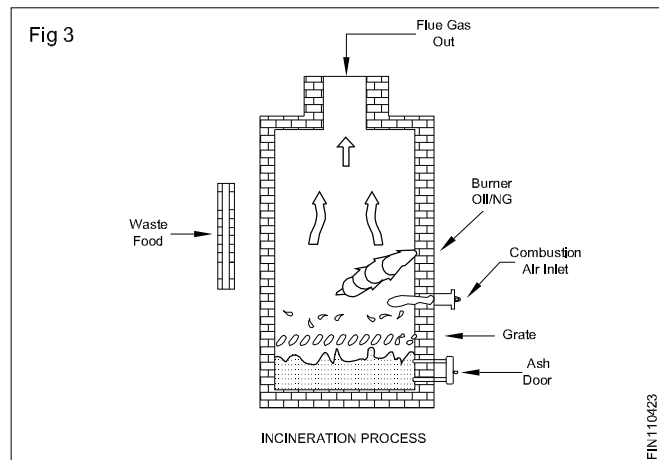
If you cannot recycle or if there are no proper places for setting up landfills, you can burn the waste matter generated in your household. Controlled burning of waste at high temperatures to produce steam and ash is a preferred waste disposal technique.

Advantage of waste disposal:

- Ensures workshop neat & tidy
- Reduces adverse impact on health
- Improves economic efficiency
- Reduce adverse impact on environment

Incineration (Fig.3)

It is the process of controlled combustion of garbage to reduce it to incombustible matter, ash, waste gas and heat. It is treated and released into the environment (Fig.3). This reduced 90% volume of waste, some time the heat generated used to produce electric power.



Waste compaction

The waste materials such as cans and plastic bottles compact into blocks and send for recycling. This process space need, thus making transportation and positioning easy.

Colour code for bins for waste segregation given in Table-1

Table-1

Sl.No.	Waste Material	Color code
1	Paper	Blue
2	Plastic	Yellow
3	Metal	Red
4	Glass	Green
5	Food	Black
6	Others	Sky blue

Occupational health and safety

Objectives: At the end of this lesson you shall be able to

- **define safety**
- **state the goal of occupational health and safety**
- **explain need of occupational health and safety**
- **state the occupational hygiene**
- **explain occupational hazards**
- **brief the occupational disease.**

Safety

Safety means freedom or protection from harm, danger, hazard, risk, accident, injury or damage.

Occupational health and safety

- Occupational health and safety is concerned with protecting the safety, health and welfare of people engaged in work or employment.
- The goal is to provide a safe work environment and to prevent hazards.
- It may also protect co-workers, family members, employers, customers, suppliers, nearby communities, and other members of the public who are affected by the workplace environment.
- it involves interactions among many related areas, including occupational medicine, occupational (or industrial) hygiene, public health, and safety engineering, chemistry, and health physics.

Need of occupational health and safety

- Health and safety of the employees is an important aspect of a company's smooth and successful functioning.
- It is a decisive factor in organizational effectiveness. It ensures an accident-free industrial environment.
- Proper attention to the safety and welfare of the employees can yield valuable returns.
- Improving employee morale
- Reducing absenteeism
- Enhancing productivity
- Minimizing potential of work-related injuries and illnesses
- Increasing the quality of manufactured products and / rendered services.

Occupational (Industrial) hygiene

- Occupational hygiene is anticipation, recognition, evaluation and control of work place hazards (or) environmental factors (or) stresses
- This is arising in (or) from the workplace.

- Which may cause sickness, impaired health and well being (or) significant discomfort and inefficiency among workers.

Anticipation (Identification): Methods of identification of possible hazards and their effects on health.

Recognition (Acceptance): Acceptance of ill-effects of the identified hazards

Evaluation (Measurement & Assessment): Measuring or calculating the hazard by Instruments, Air sampling and Analysis, comparison with standards and taking judgement whether measured or calculated hazard is more or less than the permissible standard.

Control of workplace hazards: Measures like Engineering and Administrative controls, medical examination use of Personal Protective Equipment (PPE) education, training and supervision.

Occupational hazards

"Source or situation with a potential for harm in terms of injury or ill health, damage to property, damage to the workplace environment, or a combination of these"

Types of occupational health hazards

- Physical Hazards
- Chemical Hazards
- Biological Hazards
- Physiological Hazards
- Psychological Hazards
- Mechanical Hazards
- Electrical Hazards
- Ergonomic Hazards

1 Physical hazards

- Noise
- Heat and cold stress
- Vibration
- Radiation (ionising & Non-ionising)
- Illumination etc.,

2 Chemical hazards

- Inflammable
- Explosive
- Toxic
- Corrosive
- Radioactive

3 Biological hazards

- Bacteria
- Virus
- Fungi
- Plant pest
- Infection

4 Physiological

- Old age
- Sex
- Ill health
- Sickness
- Fatigue.

5 Psychological

- Wrong attitude
- Smoking
- Alcoholism
- Unskilled
- Poor discipline
 - absentism
 - disobedience
 - aggressive behaviour

- Accident proneness etc,
- Emotional disturbances
 - violence
 - bullying
 - sexual harassment

6 Mechanical

- Unguarded machinery
- No fencing
- No safety device
- No control device etc.,

7 Electrical

- No earthing
- Short circuit
- Current leakage
- Open wire
- No fuse or cut off device etc,

8 Ergonomic

- Poor manual handling technique
- Wrong layout of machinery
- Wrong design
- Poor housekeeping
- Awkward position
- Wrong tools etc,

Safety Slogan

A safety rule breaker, is an accident maker

Safety Sign

Objectives: At the end of this lesson you shall be able to

- list three kinds of road sign
- describe the marking on the road
- describe the various police traffic hand signal and light signal
- list the collision causes.

In older days road locomotive carrying a red flag by day and red lantern by night. Safety is the prime motive of every traffic.

Kinds of road signs

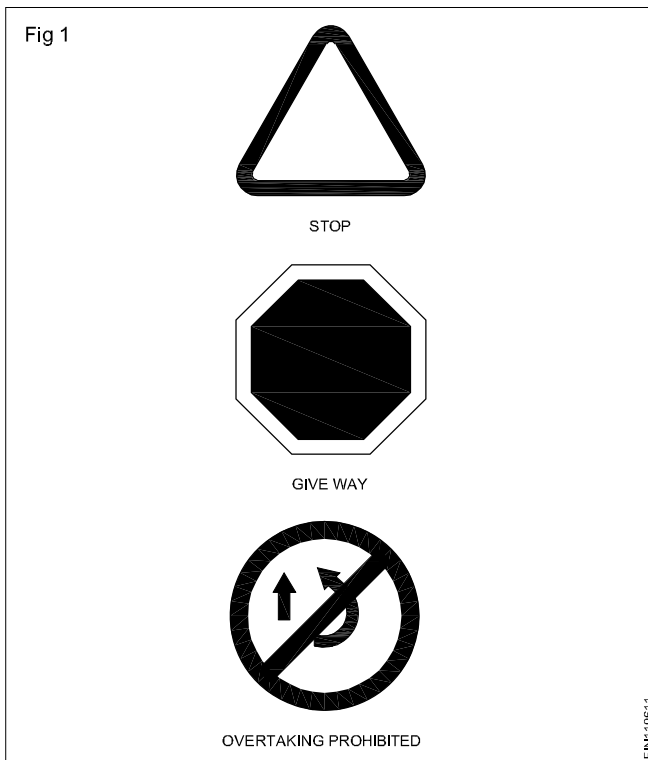
Mandatory

Cautionary and

Informatory

Mandatory sign (Fig 1)

Violation of mandatory sign can lead to penalties. Ex. Stop, give way limits, prohibited, no parking and compulsory sign.

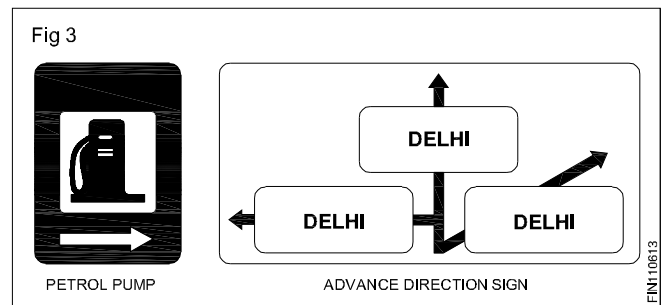


Cautionary signs (Fig 2)

Cautionary/ warning signs are especially safe. Do's and don'ts for pedestrians, cyclists, bus passengers and motorists.

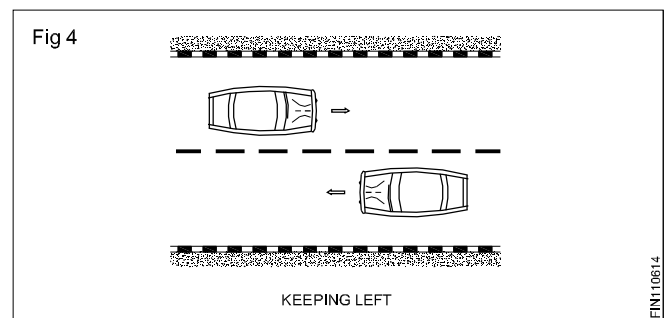
Information signs (Fig 3)

Information signs are especially benefit to the passengers and two wheelers.



Marking lines on road (Fig 4)

- Marking lines are directing or warn to the moving vehicles, cyclist and pedestrians to follow the law.
- Single and short broken lines with middle of the road allow the vehicle to cross the dotted lines safely overtake whenever required.
- When moving vehicle approaching pedestrian crossing, be ready to slow down or stop to let people cross.
- Do not overtake in the vicinity of pedestrain crossing.



Police signals

To stop a vehicle approaching from behind. Fig 5(1)

To stop a vehicle coming from front. Fig 5(2)

To stop vehicles approaching simultaneously from front and behind. Fig 5(3)

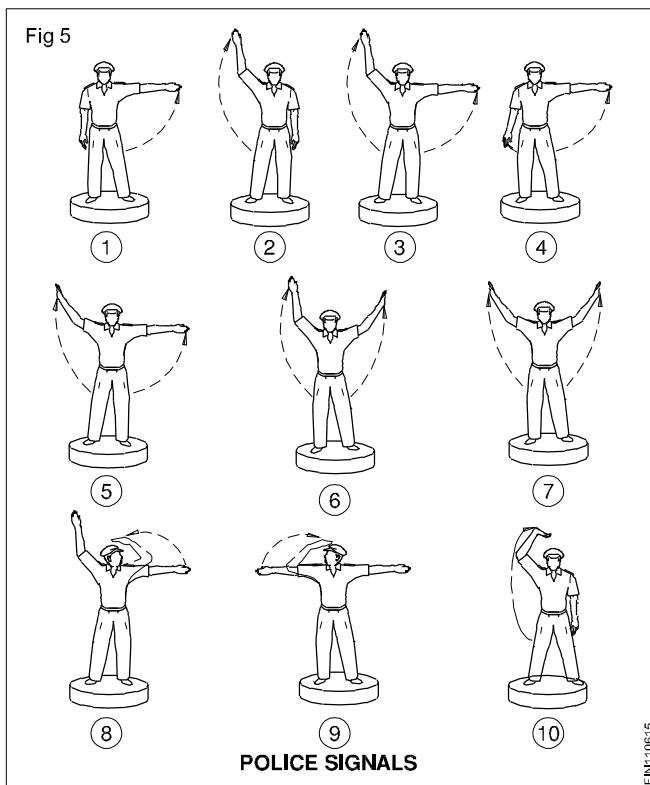
To stop traffic approaching from left and wanting to turn right. Fig 5(4)

To stop traffic approaching from the right to allow traffic from left turn right. Fig 5(5)

To allow traffic coming from the right and turning right by stopping traffic approaching from the left. Fig 5(6)

Warning signal closing all traffic. Fig 5(7)

Beckoning on vehicles approaching from left. Fig 5(8)



Beckoning on vehicles approaching from right. Fig 5(9)

Beckoning on vehicles from front. Fig 5(10)

Traffic light signals

Red means stop. Wait behind the stop line on the carriage way. Fig 6(1)

Red and amber also means stop. Do not pass through or start until green shows. Fig 6(2)

Green means you may go on if the way is clear. Take special care if you mean to turn left or right and give way to pedestrians who are crossing. Fig 6(3)

Amber means stop at the stop line. you may only go on if the amber appears after you have crossed the stop line or so close to it that to pull up may not be possible. Fig 6(4)

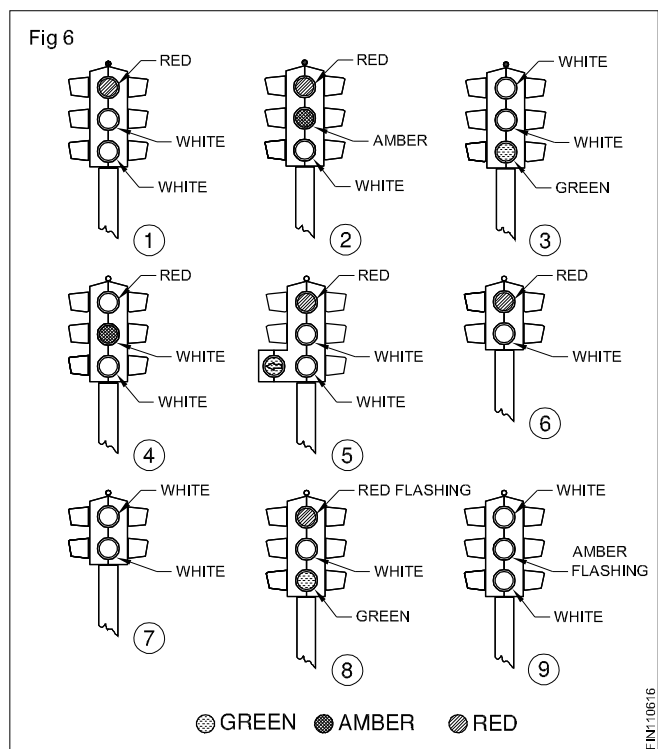
Green arrow means that you may go in the direction shown by the arrow. You may do this whatever other lights may be showing. Fig 6(5)

Pedestrians - do not cross. Fig 6(6)

Pedestrians - cross now. Fig 6(7)

Flashing red means stop at the stop line and if the way is clear proceed with caution. Fig 6(8)

Flashing amber means proceed with caution. Fig 6(9)

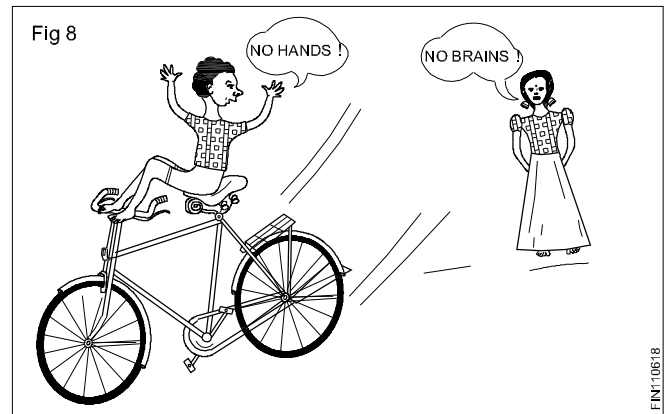
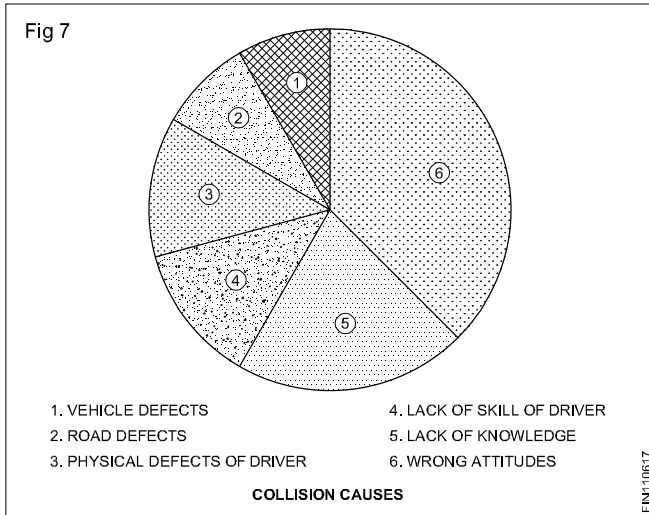


Collision causes

Three factors are responsible for collision

- Roads
- Vehicles and
- Drivers.

The fig 7 shows approximately proportionate causes of collision. In wrong attitudes such that avoid foolish acts at the wheel. Driving time is not play time. (Fig 8)



Safety practice

Objectives : At the end of this lesson you shall be to

- state the responsibilities of employer and employees
- state the safety attitude and list the four basic categories of safety signs.

Safety

The state of being safe, freedom from the occurrence or risk of injury, danger or loss.

Responsibilities

Safety doesn't just happen - it has to be organised and achieved like the work-process of which it forms a part. The law states that both an employer and his employees have a responsibility in this behalf.

Employer's responsibilities

The effort a firm puts into planning and organising work, training people, engaging skilled and competent workers, maintaining plant and equipment, and checking, inspecting and keeping records - all of this contributes to the safety in the workplace.

The employer will be responsible for the equipment provided, the working conditions, what the employees are asked to do, and the training given.

Employee's responsibilities

You will be responsible for the way you use the equipment, how you do your job, the use you make of your training, and your general attitude to safety.

A great deal is done by employers and other people to make your working life safer; but always remember you are responsible for your own actions and the effect they have on others. You must not take that responsibility lightly.

Rules and procedure at work

What you must do, by law is often included in the various rules and procedures laid down by your employer. They

may be written down, but more often than not, are just the way a firm does things - you will learn these from other workers as you do your job. They may govern the issue and use of tools, protective clothing and equipment, reporting procedures, emergency drills, access to restricted areas, and many other matters. Such rules are essential and they contribute to the efficiency and safety of the job.

Safety signs

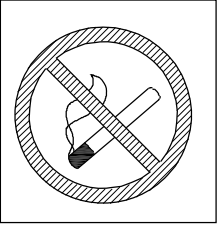
As you go about your work on a construction site you will see a variety of signs and notices. Some of these will be familiar to you - a 'no smoking' sign for example; others you may not have seen before. It is up to you to learn what they mean - and to take notice of them. They warn of the possible danger, and must not be ignored.

Safety signs fall into four separate categories. These can be recognised by their shape and colour. Sometimes they may be just a symbol; other signs may include letters or figures and provide extra information such as the clearance height of an obstacle or the safe working load of a crane.


The four basic categories of signs are as follows:

- prohibition signs (Fig 1 & Fig 5)
- mandatory signs (Fig 2 & Fig 6)
- warning signs (Fig 3 & Fig 7)
- information signs (Fig 4)

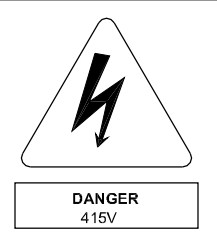
Prohibition signs
Fig 1

	SHAPE	Circular.
	COLOUR	Red border and cross bar. Black symbol on white background
	MEANING	Shows it must not be done.
Example		No smoking

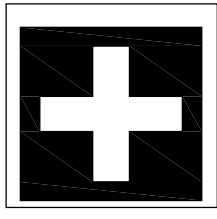
Mandatory signs
Fig 2

	SHAPE	Circular.
	COLOUR	White symbol on blue background
	MEANING	Shows what must be done
Example		Wear hand protection

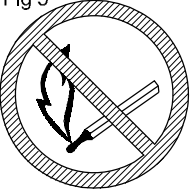
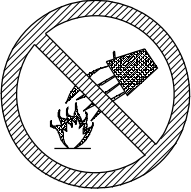
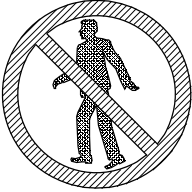
Warning signs
Fig 3

	SHAPE	Triangular
	COLOUR	Yellow background with black border and symbol.
	MEANING	Warns of hazard or danger.
Example		Caution, risk of electric shock.

Information signs
Fig 4

	SHAPE	Square or oblong.
	COLOUR	White symbols on green background.
	MEANING	Indicates or gives information of safety provision.
Example		First aid point.

Prohibition signs
Fig 5

		
SMOKING AND NAKED FLAMES PROHIBITED	DO NOT EXTINGUISH WITH WATER	PEDESTRIANS PROHIBITED






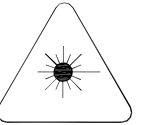

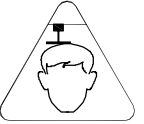




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Mandatory signs
Fig 6

		
WEAR HEAD PROTECTION	WEAR EYE PROTECTION	WEAR HEARING PROTECTION
		
WEAR FOOT PROTECTION	WEAR HAND PROTECTION	WEAR RESPIRATOR
		
WEAR SAFETY HARNESS/BELT	USE ADJUSTABLE GUARD	WASH HAND
MANDATORY SIGNS		

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Warning signs
Fig 7

		
RISK OF FIRE	RISK OF ELECTRIC SHOCK	TOXIC HAZARD
		
CORROSIVE SUBSTANCES	RISK OF IONIZING RADIATION	LASER BEAM
		
RISK OF EXPLOSION	OVERHEAD (FIXED) HAZARD	GENERAL WARNING RISK OF DANGER
		
OVERHEAD LOAD	FRAGILE ROOF WARNING SIGNS	FORK LIFT TRUCK

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Question about your safety

Do you know the general safety rules that cover your place of work?

Are you familiar with the safety laws that govern your particular job?

Do you know how to do your work without causing danger to yourself, your workmates and the general public?

Are the plant, machinery and tools that you use really safe? Do you know how to use them safely and keep them in a safe condition?

Do you wear all the right protective clothing, and have you been provided with all the necessary safety equipment?

Have you been given all the necessary safety information about the materials used?

Have you been given training and instruction to enable you to do your job safely?

Do you know who is responsible for safety at your place of work?

Do you know who are the appointed 'Safety Representatives'?

Response to emergencies - Power failure, System failure & Fire

Objectives: At the end of this lesson you shall be able to

- state the reason of emergency power failure
 - state the cause of system failure
 - state the fire safety and immediate actions.
-

1 If there is a power failure, start the emergency generator. This provides power to close the shutter, which is the first priority. The generator will also keep the UPSs and the cryogenic compressors running,

- Get a flash light.
- Look out for power transfer switch and switch over to normal power to emergency power by pressing the latch.
- Check the fuel valves open or not - Open the valves.
- Check to see that the main breaker switch ON the generator is in OFF position.
- Move the starter switch of the generator to run position. The engine will start at once.
- Allow few minutes to warm up the engine.
- Check all the gauges, pressure, temperature, voltage and frequency.
- Check the "AC line" and "Ready" green light on the front panel.

2 System failure

- If the bug or virus, invades the system. The system failure happens.

- Several varieties of bugs are there

1. Assassin bug

2. Lightning bug

3. Brain bug

For more details refer instruction manual for "System failure".

3 Fire failure

When fire alarm sounds in your buildings

1. Evacuate to outside immediately.

2. Never go back

3. Make way for fire fighters and their trucks to come

4. Never use an elevator

5. Do not panic

Reporting emergency

Objectives : At the end of this lesson you shall be able to

- explain the report an emergency
 - report through emergency services.
-

Report an emergency

Reporting an emergency is one of those things that seems simple enough, until actually when put to use in emergency situations. A sense of shock prevail at the accident sites. Large crowd gather around only with inquisitive nature, but not to extend helping hands to the victims. This is common in road side injuries. No passer by would like to get involved to assist the victims. Hence first aid managements is often very difficult to attend to the injured persons. The first aiders need to adapt multitask strategy to control the crowd around, communicate to the rescue

team, call ambulance etc, all to be done simultaneously. The mobile phones helps to a greater deal for such emergencies. Few guidelines are given below to approach the problems.

Assess the urgency of the situation. Before you report an emergency, make sure that the situation is genuinely urgent. Call for emergency services if you believe that a situation is life-threatening or otherwise extremely disruptive.

- A fire - If you're reporting a fire, describe how the fire started and where exactly it is located. If someone has already been injured, missing, report that as well.
- A life - threatening medical emergency, explain how the incident occurred and what symptoms the person currently displays.

Call emergency service

The emergency number varies - 100 for Police & Fire, 108 for Ambulance.

Report your location

The first thing the emergency dispatcher will ask where you are located, so the emergency services can get there as quickly as possible. Give the exact street address, if you're not sure of the exact address, give approximate information.

Operation of electrical mains/ Circuit breakers and electrical safety

- Objectives :** At the end of this lesson you shall be able to
- understand the operation of electrical mains/circuit breaker
 - state the importance of electrical safety.

Electrical safety

Electric shock

If a person happens to come in contact with an electrical live wire and if he has not insulated himself, then electric current flows through his body. Since the human body cannot withstand current flow more than a few tens of milliamps, the human body suffers a phenomenon generally known as electric shock. Electric shock may turn out to be hazardous to some of the parts of the human body and some times even to the life of the person.

The severity of an electric shock depends on:

- the level of current passing through the body
- how long does the current keep passing through the body.

Therefore, the higher the current or longer the time, the shock may result in a causality.

In addition to the above factors, other factors which influences the severity of shock are:

- age of the person receiving a shock
- surrounding weather condition
- condition of the floor (wet or dry)
- voltage level of electricity
- insulating property of the footwear or wet footwear, and so on.

Effects of electric shock

The effect of electric shock at very low voltage levels (less than 40 V) may only be an unpleasant tingling sensation. But this shock itself may be sufficient to cause someone to lose his balance and fall, resulting in casualty.

At higher voltage levels the muscles may contract and the person will be unable to break off from the contact by himself. He may lose consciousness. The muscles of the heart may contract spasmodically (fibrillation). This may even turn out to be fatal.

At an excessive level of voltage, the person receiving a shock may be thrown off his feet and will experience severe pain and possibly burns at the point of contact. This in most cases is fatal.

Electric shock can also cause burning of the skin at the point of contact.

Action to be taken in case of an electric shock

If the victim of an electric shock is in contact with the supply, break the contact the victim is making with the electricity by any one or more of the following.

- Switch off the electric power,insulate yourself and pull away the person from the electrical contact

or

Remove the mains electric plug. Avoid direct contact with the victim. Wrap your hands using dry cloth or paper, if rubber gloves are not available.

or

Remove the electric contact made by wrenching the cable/equipment/point free from contact using whatever is at hand to insulate yourself such as a wooden bar, rope, a scarf, the victim's coat-tails, any dry article of clothing, a belt, rolled up newspaper, non-metallic hose, PVC tubing, baked paper, tube etc. and break the contact by pushing or pulling the person or the cable/equipment/point free

or

Stand on some insulating material such as dry wood, rubber or plastic, or whatever is at hand to insulate yourself and break the contact by pushing or pulling the person or the cable/equipment/point free.

If you are uninsulated, do not touch the victim with your bare hands. Otherwise you also will get a shock and become a victim.

If the victim is aloft(working on a pole or at raised place), take suitable measures to prevent him from falling or atleast ensure that his fall is safe.

Treatment to be given for the victim of electric shock

Electric burns on the victim may not look big/large. But it may be deep rooted. Cover the burnt area with a clean, sterile dressing. Get a doctor's help to treat him as quickly as possible.

If the victim is unconscious after an electric shock, but is breathing, carry out the following first aid:

- loosen the clothing at the neck, chest and waist
- place the victim in the recovery position.
- Keep a constant check on the breathing and pulse rate. If you find them feeble, immediately give artificial respiration and press the lower rib to improve the heartbeat.
- Keep the casualty warm and comfortable.
- Send for a doctor immediately.

Do not give an unconscious person anything through the mouth.

Do not leave a unconscious person unattended.

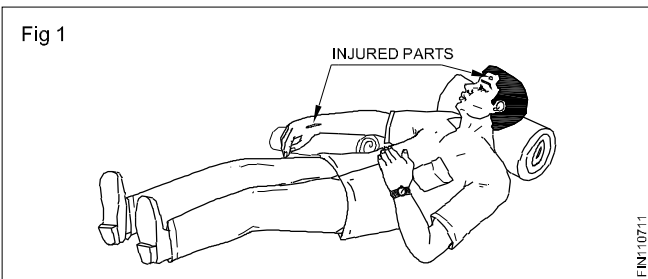
A person having received electric shock may also have burn injuries. DO NOT waste time by applying first aid to the burns until breathing has been restored and the patient can breathe normally unaided.

Treatment to be given in case of burns, severe bleeding

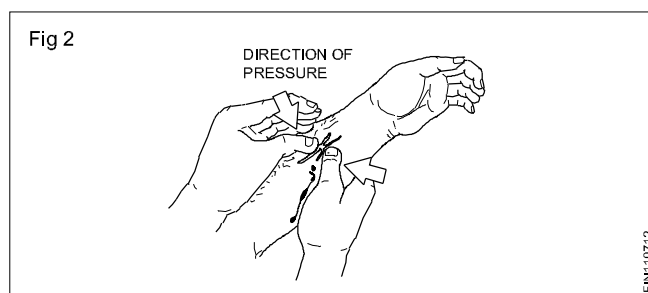
Burns caused due to electrical shock are very painful. If a large area of the body is burnt, clean the wound using clear water, or with clean paper, or a clean shirt. This treatment relieves the victim of pain. Do not give any other treatment on your own. Send for a doctor for further treatment.

A wound which is bleeding profusely, especially in the wrist, hand or fingers must be considered serious and must receive a doctor's attention. As an immediate first aid measure, carry out the following;

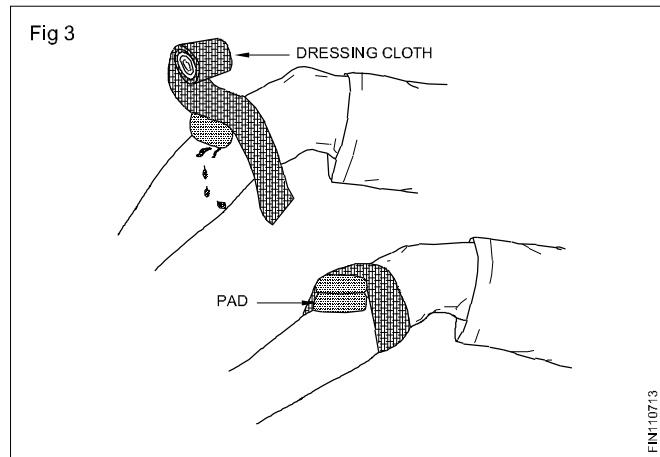
- make the patient lie down and rest
- if possible, raise the injured part above the level of the body as shown in Fig 1.



Squeeze together the sides of the wound as shown in Fig 2. Apply pressure as long as it is necessary to stop the bleeding.



When the bleeding stops temporarily, put a dressing over the wound using sterilized cotton, and cover it with a pad of soft material as shown in Fig 3.



If the wound is in the abdominal area (stab wound), caused by falling on a sharp tool, keep the patient bending over the wound to stop internal bleeding.

General procedural steps to be adopted for treating a person suffering from an electrical shock

- 1 Observe the situation. Choose the appropriate method (listed in earlier paragraphs) to release the person from electrical contact.

Do not run to switch off the supply that is far away or start searching for the mains switch.

- 2 Move the victim gently to the nearest ventilated place.
- 3 Check the victim's breathing and consciousness. Check if there are injuries in the chest or abdomen. Give artificial respiration/applying pressure on the heart if found necessary (refer in this lesson/exercise).

Use the most suitable method of giving artificial respiration depending upon the injuries if any on the chest/abdomen.

- 4 Send for a doctor.

Till the doctor arrives, you stay with the victim and render help as best as you can.

- 5 Place the victim in the recovery position.
- 6 Cover the victim with a coat, socks or any such thing to keep the victim warm.

Actions listed above must be taken systematically and briskly. Delay in treating the patient may endanger his life.

Area of control of switches - operation on emergency

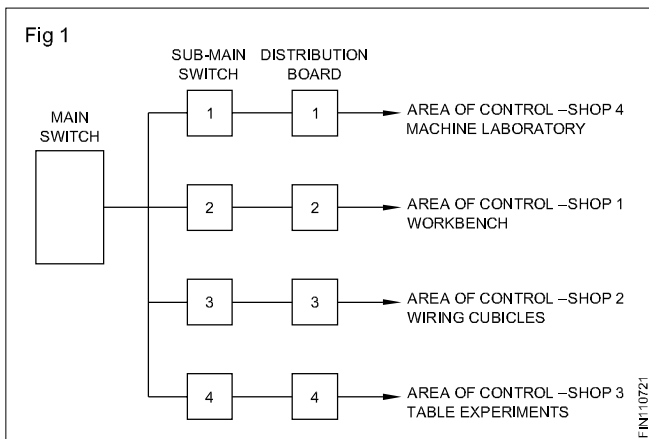
Objectives : At the end of this lesson you shall be able to

- explain the term 'emergency'
- explain the need to switch off the circuit during emergency
- explain the method of locating the area sub-main and switches in the shop floor
- explain the position of handle with respect to ON & OFF in case of iron clad switches, MCB and ordinary house hold sitches.

An emergency is an unexpected occurrence and requires immediate action. In a place like a workshop such a situation can arise when a person gets a shock due to electrical current or a person gets injured by the rotating part of a machine.

In such situations, switching off the supply will be the first and best solution to avoid further damage to the victim. For this, every person involved in the workshop should know which switch controls the area where the victim of shock remains.

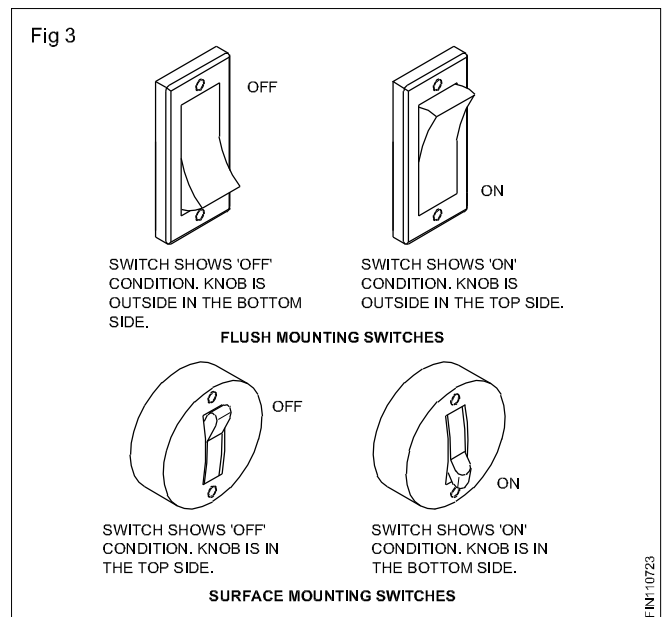
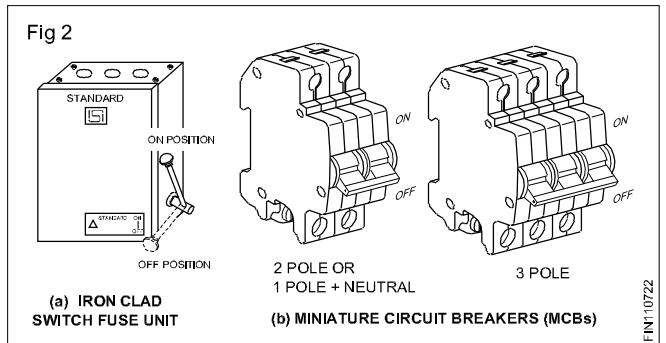
Normally the total wiring in a workshop is controlled by a main switch and the different areas within the workshop may have two or more sub-main switches as shown in Fig.1.



To ascertain the area of the sub-main control, switch off one of the sub-main switches and try to switch 'on' the lights, fans and power points in that suspected area. If they do not work, then the area covered by the fan, light and power points are controlled by the sub-main switch. One after another, switch off the sub-main switches and locate their area of control. Mark the area of control of the switch in the plan of the wireman's section.

In a well organised workshop, the main switch, the submain switches and distribution ways will have clear marking to show their area of control. (Fig 1) If this is not found, do this now. However, If you are not sure about the area of control the sub-main of the switches it is always better to switch 'off' the main switch itself.

The handle of iron clad switches and the knob of MCB should be pushed down to switch 'off' the circuits as shown in Fig 2. whereas in the ordinary switches, the switch off the circuit should be done by pushing the switch to upward position. (Fig 3)



The emergency situations could happen even at home Hence, identify the area of control of the switch and mark them in the main/sub-main/ distribution bound of your house switch board as a safety measure. Educate the intimates of the house how to switch off the circuit in case of any emergency.

Safety rules on electrical equipments

Objectives : At the end of this lesson you shall be able to

- explain the necessary of adopting the safety rules
 - list the safety rules and follow them.
-

Safety rules

Necessity of safety rules: Safety consciousness is one of the essential attitudes required for any job. A skilled electrician always should strive to form safe working habits. Safe working habits always save men, money and material. Unsafe working habits always end up in loss of production and profits, personal injury and even death. The safety hints given below should be followed by Electrician to avoid accidents and electrical shocks as his job involves a lot of occupational hazards.

The listed safety rules should be learnt, remembered and practised by every electrician. Here a electrician should remember the famous proverb, "Electricity is a good servant but a bad master".

Safety rules

- Only qualified persons should do electrical work
- Keep the workshop floor clean, and tools in good condition.
- Do not work on live circuits, if unavoidable, use rubber gloves rubber mats, etc.
- Use wooden or PVC insulated handle screwdrivers when working on electrical circuits.
- Do not touch bare conductors.
- When soldering, place the hot soldering irons in their stand. Never lay switched 'ON' or heated soldering iron on a bench or table as it may cause a fire to break out.
- Use only correct capacity fuses in the circuit. If the capacity is less it will blow out when the load is connected. If the capacity is large, it gives no protection and allows excess current to flow and endangers men and machines, resulting in loss of money.
- Replace or remove fuses only after switching off the circuit switches.
- Use extension cords with lamp guards to protect lamps against breakage and to avoid combustible material coming in contact with hot bulbs.
- Use accessories like sockets, plugs and switches and appliances only when they are in good condition and be sure they have the mark of BIS (ISI). (Necessity using BIS (ISI) marked accessories is explained under standardisation.
- Never extend electrical circuits by using temporary wiring.
- Stand on a wooden stool, or an insulated ladder while repairing live electrical circuits/appliances or replacing fused bulbs. In all the cases, it is always good to open the main switch and make the circuit dead.
- Stand on rubber mats while working/ operating switch panels, control gears etc.
- Position the ladder, on firm ground.
- While using a ladder, ask the helper to hold the ladder against any possible slipping.
- Always use safety belts while working on poles or high rise points.
- Never place your hands on any moving part of rotating machine and never work around moving shafts or pulleys of motor or generator with loose shirt sleeves or dangling neck ties.
- Only after identifying the procedure of operation, operate any machine or apparatus.
- Run cables or cords through wooden partitions or floor after inserting insulating procelain tubes.
- Connections in the electrical apparatus should be tight. Loosely connected cables will heat up and end in fire hazards.
- Use always earth connection for all electrical appliances along with 3-pin sockets and plugs.
- While working on dead circuits remove the fuse grips; keep them under safe custody and also display 'Men on line' board on the switchboard.
- Do not meddle with inter locks of machines/switch gears
- Do not connect earthing to the water pipe lines.
- Do not use water on electrical equipment.
- Discharge static voltage in HV lines/equipment and capacitors before working on them.

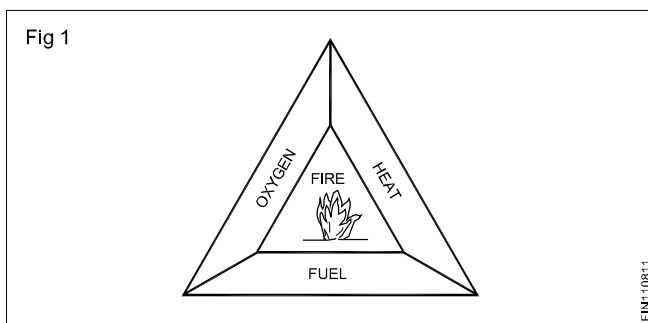
Safety practice - fire extinguishers

Objectives : At the end of this lesson you shall be able to

- state the effects of a fire breakout
- state the causes for fire in the workshop
- state the conditions required for combustion relevant to fire prevention
- state the general precautionary measures to be taken for fire prevention.

Fire is the burning of combustible material. A fire in an unwanted place and on an unwanted occasion and in uncontrollable quantity can cause damage or destroy property and materials. Fires injure people, and sometimes, cause loss of life. Hence, every effort must be made to prevent fire. When a fire outbreak is discovered, it must be controlled and extinguished by immediate correct action.

Is it possible to prevent fire? Yes, by eliminating any one of the three factors that cause fire. (Fig 1)



The factors that must be present in combination for a fire to continue to burn are as follows.

- Fuel** Any substance, liquid, solid, or gas will burn if given oxygen and high enough temperature.
- Heat** Every fuel will begin to burn at a certain temperature. Solids and liquids give off vapour when heated and it is this vapour which ignites. Some liquids give off vapour even at normal room temperature say 15°C, eg. petrol.
- Oxygen** Usually it exists in sufficient quantity in air to keep a fire burning.

Extinguishing of fires

Isolating or removing any of these factors from the combination will extinguish the fire. There are three basic ways of achieving this.

- Starving the fire of fuel by removing the fuel in the vicinity of fire.
- Smothering - i.e by isolating the fire from the supply of oxygen by blanketing it with foam, sand etc.
- Cooling - i.e. by using water to lower the temperature.

Preventing fires

The majority of fires begin with small outbreaks which burn unnoticed until they become big fires of uncontrollable magnitude. Most of the fires could be prevented with more care and by following some rules of simple commonsense.

Accumulation of combustible refuse (cotton waste soaked with oil, scrap wood, paper, etc.) in odd corners are of fire risk. Refuse should be removed to collection points.

The cause of fire in electrical equipment is misuse or neglect. Loose connections, wrongly rated fuses or cables, overloaded circuits cause over heating which may in turn lead to fire. Damage to insulation between conductors in cables also causes fire.

Clothing and anything else which might catch fire should be kept well away from heaters. Make sure the heater is shut off at the end of a working day.

Highly flammable liquids and petroleum mixtures (Tinner, Adhesive solutions, Solvents, Kerosene, Spirit, LPG Gas etc.) should be stored in a separated place called the flammable material storage area.

Blowlamps and torches must not be left burning when they are not in use.

Classification of fires and recommended extinguishing agents.

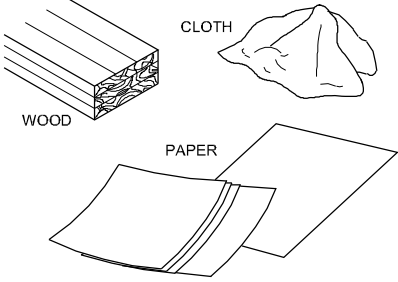
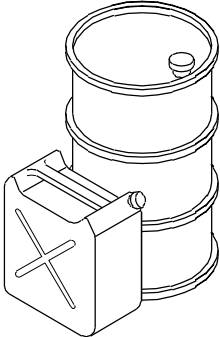
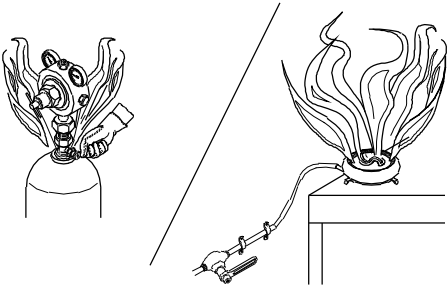

Fire are classified into four types in terms of the nature of fuel.

Different types of fire have to be dealt with different ways and with different extinguishing agents.

An agent is the material or substance used to put out the fire, and is usually (but not always) contained in a fire extinguisher with a mechanism for spraying into the fire.

It is important to know the right type of agent for a particular type of fire using the wrong one can make things worse.

There is no classification for 'electrical fires' as such since these are only fires in materials where electricity is present.

Fuel	Extinguishing
<p>CLASS 'A' Fire Wood, paper, cloth etc Solid materials</p>  <p>The illustration shows three types of solid materials: a rectangular block of wood with a grain pattern, a crumpled piece of cloth, and a flat sheet of paper.</p>	<p>Most effective i.e. cooling with water. Jets of water should be sprayed on the base of the fire and then gradually upwards.</p>
<p>CLASS 'B' Fire Flammable liquid. liquifiable solids</p>  <p>The illustration shows two types of flammable liquid containers: a large metal drum and a smaller metal canister with a handle and a spout.</p>	<p>Should be smothered. The aim is to cover the entire surface of the burning liquid. This has the effect of cutting off the supply of oxygen to the fire.</p> <p>Water should never be use on burning liquids.</p> <p>Foam, dry powder or CO² may be used on this type of fire.</p>
<p>CLASS 'C' Fire Gas and liquified gas</p>  <p>The illustration shows two types of gas fire sources: a gas cylinder with a valve and a gas burner with a flame.</p>	<p>Extreme caution is necessary in dealing with liquified gases. There is a risk of explosion and sudden spreading of fire in the entire vicinity. If an appliance fed from a cylinder catches fire - shut off the supply of gas. The safest course is to raise an alarm and leave the fire to be dealt with by trained personnel.</p> <p>Dry powder extinguishers are used on this type of fire.</p> <p>Special powders have now been developed which are capable of controlling and/or extinguishing this type of fire</p>
<p>CLASS 'D' Fire Involving metals</p>  <p>The illustration shows a fire burning in a metal container. A warning sign is placed in front of the fire, reading: "DANGER ONLY TRAINED PERSONNEL AND SPECIAL EXTINGUISHING EQUIPMENT".</p>	<p>The standard range of fire extinguishing agents is inadequate or dangerous when dealing with metal fires.</p> <p>Fire on electrical equipment.</p> <p>Carbon dioxide, dry powder and vapourising liquid (CTC) extinguishers can be used to deal with fires in electrical equipment. Foam or liquid (e.g Water) extinguisher must not be used on electrical equipment under any circumstances.</p>

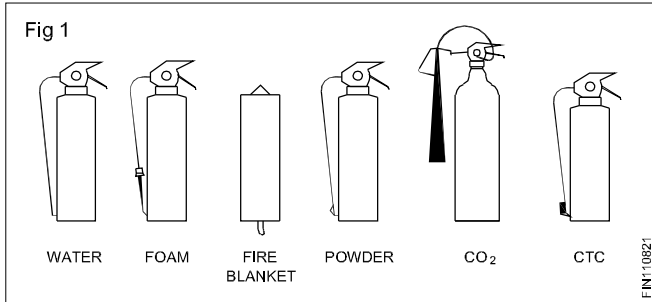
Types of fire extinguishers

Objectives : At the end of this lesson you shall be able to

- distinguish different types of fire extinguishers
- determine the correct type of fire extinguisher to be used based on the class of fire
- describe the general procedure to be adopted in the event of a fire.

A fire extinguisher, flame extinguisher or simply extinguisher is an active fire protection device used to extinguish or control small fires, often in emergency situation. It is not intended for use on and out off control fire.

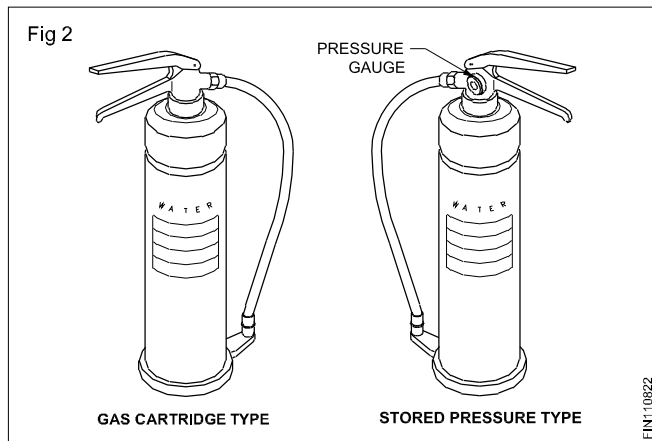
Many types of fire extinguishers are available with different extinguishing 'agents' to deal with different classes of fires. (Fig 1)



Water-filled extinguishers

There are two methods of operation. (Fig 2)

- Gas cartridge type
- Stored pressure type



With both methods of operation the discharge can be interrupted as required, conserving the contact and preventing unnecessary water damage.

Foam extinguishers (Fig 3)

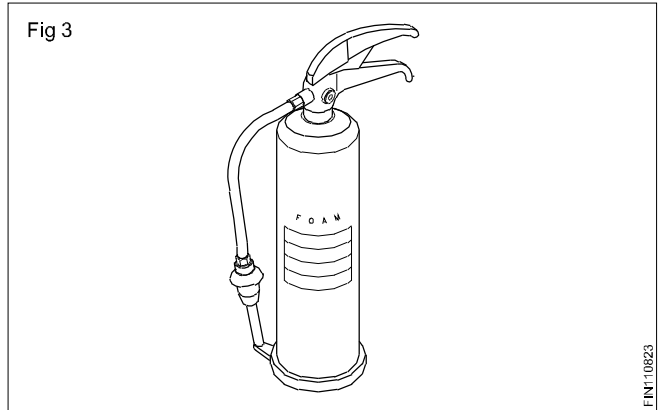
These may be of stored pressure or gas cartridge types.

Always check the operating instructions on the extinguisher before use.

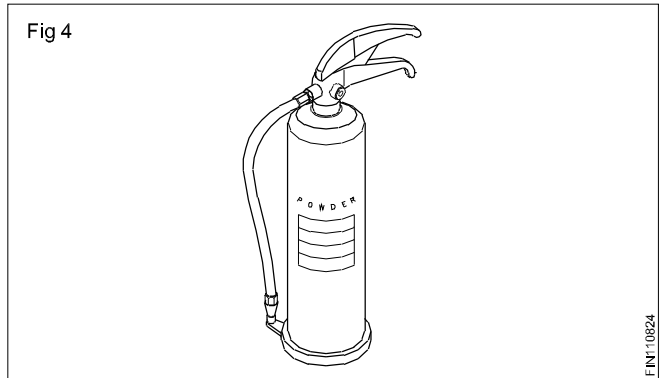
Foam extinguishers are most suitable for:

- flammable liquid fires
- running liquid fires

Must not be used where electrical equipment is involved.



Dry powder extinguishers (Fig 4)



Extinguishers fitted with dry powder may be of the gas cartridge or stored pressure type. Appearance and method of operation is the same as that of the water-filled one. The main distinguishing feature is the fork-shaped nozzle. Powders have been developed to deal with class D fires.

Carbon dioxide (CO₂)

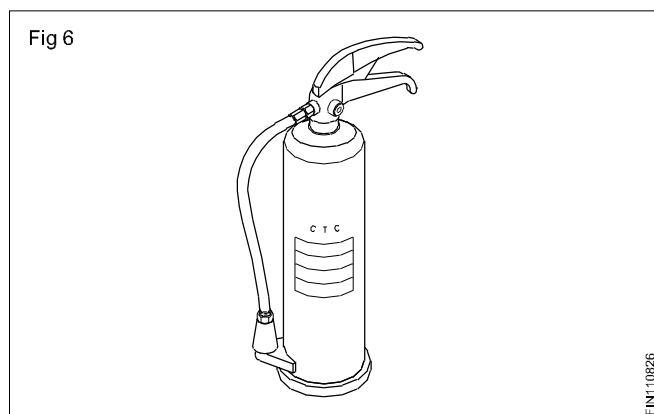
This type is easily distinguished by the distinctively shaped discharge horn. (Fig 5)



Suitable for class B fires. Best suited where contamination by deposits must be avoided. Not generally effective in open air.

Always check the operating instructions on the container before use, available with different gadgets of operation such as -plunger, lever trigger etc.

Halon extinguishers (Fig 6)



These extinguishers may be filled with carbon tetrachloride and bromochlorodifluoro methane (BCF).

They may be of either gas cartridge or stored pressure type.

They are more effective in extinguishing small fires involving pouring liquids. These extinguishers are particularly suitable and safe to use on electrical equipment as the chemicals are electrically non-conductive.

The fumes given off by these extinguishers are dangerous, especially in confined space.

General procedure to be adopted in the event of a fire to be adopted.

- Raise an alarm.
- Turn off all machinery and power (gas and electricity).
- Close the doors and windows, but do not lock or bolt them. This will limit the oxygen fed to the fire and prevent its spreading.
- Try to deal with the fire if you can do so safely. Do not take risk, getting in trapped.
- Anybody not involved in fighting the fire should leave calmly using the emergency exits and go to the designated assembly point. Failure to do this may mean that some person is unaccounted for and others may have to put themselves to the trouble of searching for him or her at risk to themselves.

Working on fire extinguishers

Objectives : At the end of this lesson you shall be able to

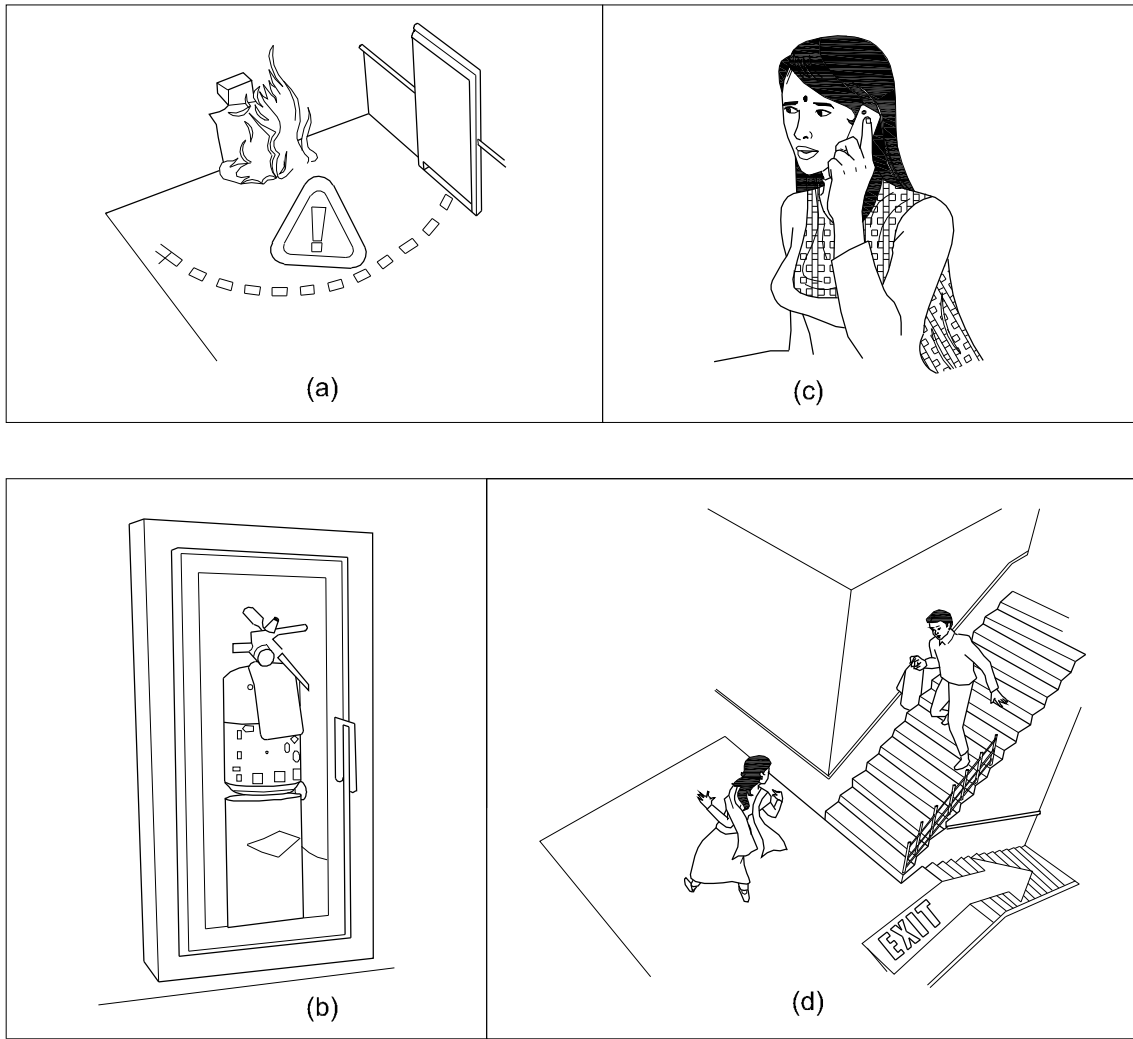
- state about the selection of the fire extinguishers according to the type of fire
- state the method of operation of the fire extinguishers
- explain how to extinguish the fire.

- Alert people surrounding by shouting fire, fire, fire when observe the fire (Fig 1a& b)
- Inform fire service or arrange to inform immediately. (Fig 1c)

- Open emergency exit and ask them to go away. (Fig 1d)
- Put "off" electrical power supply.

Don't allow people to go nearer to the fire

Fig 1



- Analyze and identify the type of fire. Refer Table 1.

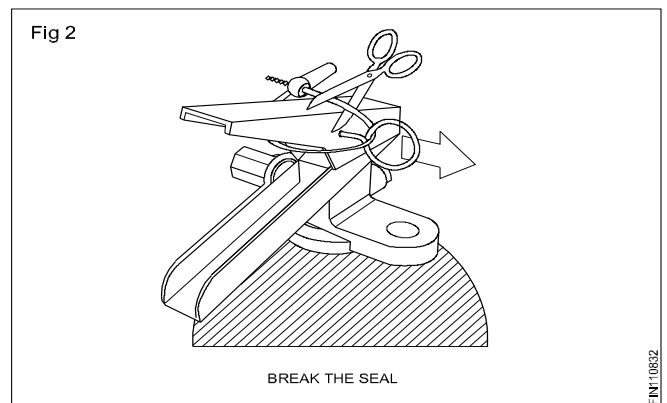
Table 1

Class 'A'	Wood, paper, cloth, soild material
Class 'B'	Oill based fire (grease gasoline, oil) liquefiable gases
Class 'C'	Gas and liquefiable gases
Class 'D'	Metals and electrical equipment

Assume the fire is 'B' Type (flammable liquifiable solids)

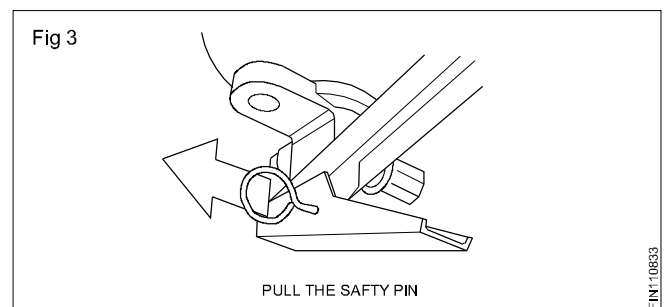
- Select CO₂ (Carbon di oxide) fire extinguisher.
- Locate and pick up co₂ fire extinguisher. Click for its expiry date.
- Break the seal (Fig 2)

Fig 2



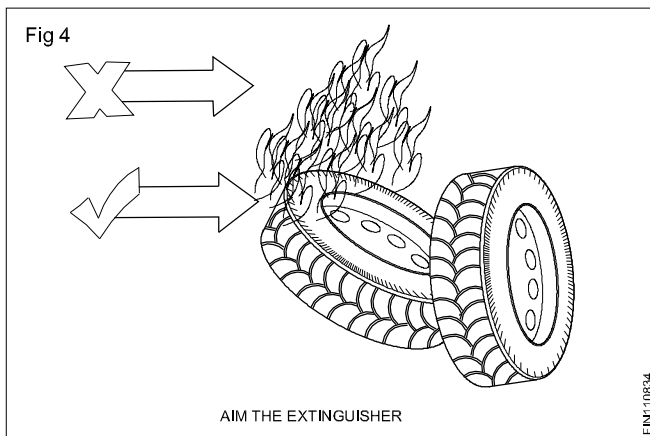
- Pull the safety pin from the handle (Pin located at the top of the fire extinguisher) (Fig 3)

Fig 3

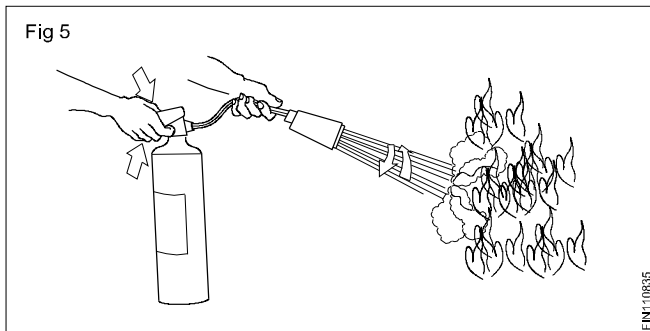


- Aim the extinguisher nozzle or hose at the base of the fire (this will remove the source of fuel fire) (Fig 4)

Keep your self low



- Squeeze the handle lever slowly to discharge the agent (Fig 5)
- Sweep side to side approximately 15 cm over the fuel fire until the fire is put off (Fig 5)



Fire extinguishers are manufactured for use from the distance.

Caution

- While putting off fire, the fire may flare up
- Do not be panicked before it is put off promptly.
- If the fire doesn't respond well after you have used up the fire extinguisher move away yourself away from the fire point.
- Do not attempt to put out a fire where it is emitting toxic smoke leave it for the professionals.
- Remember that your life is more important than property. So don't place yourself or others at risk.

In order to remember the simple operation of the extinguisher, remember P.A.S.S. This will help you to use the fire extinguisher.

P for Pull

A for Aim

S for Squeeze

S for Sweep

Safety, health and environment guidelines

Objectives : At the end of this lesson you shall be able to

- state safety, health and environment guidelines.
- state various section provided in factories act, 1948 on occupational safety and health.

Safety, Health and Environment guidelines as per

Rules & regulations followed in india are listed as follows:

- 1 The Environment (Protection) Act, 1986
- 2 The Environment (Protection) Rules, 1986
- 3 Environmental Impact Assessment of Development Projects 1994
- 4 The Prevention and control of pollution (uniform consent procedure) Rules, 1999
- 5 Manufacture, Storage and Import of Hazardous chemicals Rules, 1989
- 6 Manufacture, Storage and Import of Hazardous chemical (Amendment) Rules, 2000
- 7 Hazardous Wastes (Management and Handling) Rules, 1989
- 8 Bio-Medical Waste (Management and Handling) Rules, 1998
- 9 Batteries (Management & Handling) Rules, 2000
- 10 Ozone Depleting Substances (Regulation) Rules, 2000
- 11 The Air (Prevention and Control of Pollution) Act, 1981 as amended by Amendment Act, 1987
- 12 The Air (Prevention and Control of Pollution) Act, 1982
- 13 The Air (Prevention and Control of Pollution) Rules, 1982
- 14 The Tamil Nadu Air (Prevention and Control of Pollution) Rules, 1983
- 15 Noise Pollution (Regulation and Control) Rules, 2000
- 16 The Water (Prevention and Control of Pollution) Act, 1974 as amended in 1978 & 1988
- 17 The Tamil Nadu Water (Prevention and Control of Pollution) Rules, 1983
- 18 The Water (Prevention and Control of Pollution) Cess Act, 1977 as amended by Amendment Act, 1991.
- 19 The Water (Prevention and Control of Pollution) Cess Rules, 1978
- 20 Factories Act, 1948
- 21 Tamilnadu Factories Rules, 1950
- 22 The Gas Cylinders Rules, 1981
- 23 The Indian Electricity Act, 1910

- 24 The Indian Electricity Rules, 1956
- 25 The Petroleum Act, 1934
- 26 The Petroleum Rules, 1976
- 27 The Public Liability Insurance Act, 1991
- 28 The Public Liability Insurance Rules, 1991
- 29 Hazardous Wastes (Management and Handling) Rules, 2000

Poor working conditions affect a worker's health and safety. Unsafe or unhealthy working conditions are not eliminated to industries and can be anywhere. Whether inside or outside, the workshop workers may face many health and safety hazards. It also affects the environment of the workers. Occupational hazards have harmful effects on workers, their families, and other people in the community, as well as on the physical environment around the workplace.

The provisions made in as applicable to the Factories Act, 1948 (Act No.63 of 1948), as amended by the Factories (Amendment) Act, 1987 (Act 20 of 1987) are as follows:

Occupational safety and health

various sections provided in factories act, 1948 are under the following headings:

- Fencing of machinery
- Work on or near machinery in motion
- Employment of young persons on dangerous machines
- Striking gear and devices for cutting off power
- Self-acting machines
- Casing of new machinery
- Prohibition of employment of women and children near cotton-openers
- Hoist and lifts
- Lifting machines, chains, ropes and lifting tackles
- Revolving machinery
- Pressure plant
- Floors, stairs and means of access
- Excessive weights
- Protection of eyes
- Precautions against dangerous fumes, gases, etc

- Precautions regarding the use of portable electric light
- Explosive or inflammable dust, gas, etc
- Precautions in case of fire
- Power to require specifications of defective parts or test of stability
- Safety of buildings and machinery
- Maintenance of buildings
- Power to make rules to supplement this Chapter
- Cleanliness
- Disposal of wastes and effluents
- Ventilation and temperature
- Dust and fume
- Artificial humidification
- Overcrowding
- Lighting
- Drinking water
- Latrines and urinals
- Spittoon

Basic understanding on hot work, confined space work and material handling equipment

Objectives: At the end of this lesson you shall be able to

- state what is hot working
- brief confined space work
- use of material handling equipments.

Hot work

Hot work is defined as forging, gas cutting, welding, soldering and brazing operations for construction, maintenance/repair activities.

Hot work fire and explosive hazards. Workers performing hot work such as welding, gas cutting, brazing, soldering are exposed to the risk of fires from ignition or flammable or combustible materials in the space, and from leaks of flammable gas into the space, from hot work equipment.

A confined space also has limited or restricted means for entry or exist and is not designed for continuous occupancy. It includes but are not limited to tanks, vessels, silos, storage bins, hoppers, vaults, pits, manholes, tunnels, equipment housings, duct work, pipelines, etc.

Materials handling equipment

Materials handling equipment is a mechanical equipment used for the movement, storage, control and protection / protecting of materials, goods and products throughout the process of manufacturing, distribution, consumption and disposal.

Different types of material handling equipment

- Tools
- Vehicles
- Storage units
- Appliance and accessories

Racks

Pallet racks, drive-through or drive-in racks, push back racks, and sliding racks.

Truck/Trolley

Conveyor system

- Fork lift
- Cranes
- Pallet truck

Lifiting and handling loads

Objectives : At the end of this lesson you shall be able to

- state the types of injury caused by the improper method of lifting and carrying loads and how to prevent them
- state the 6 points in the process of manual lifting methods.

Many of the accidents reported involve injuries caused by lifting and carrying loads. An Electrician may need to install motors, lay heavy cables, do wiring, which may involve a lot of lifting and carrying of loads. Wrong lifting techniques can result in injury.

A load need not necessarily be very heavy to cause injury The wrong way of lifing may cause injury to the muscles and joints even though the load is not heavy.

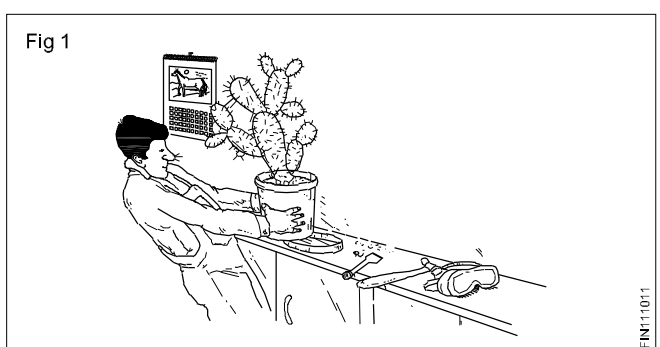
Further injuries during lifting and carrying may be caused by tripping over and object and falling or striking an object with a load.

Type of injury and how to prevent them?

Cuts and abbrasions

Cuts and abbrasions are caused by rough surfaces and jagged edges:

By splinters and sharp or pointed projections. (Fig 1)

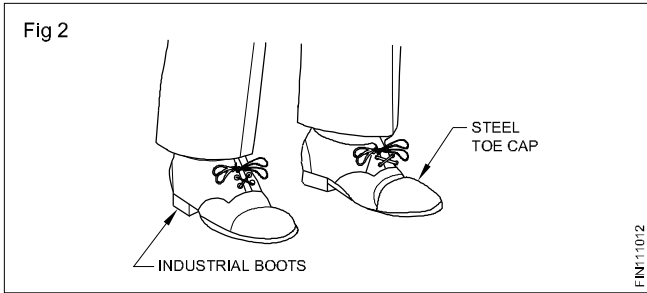


Leather hand gloves will usually be sufficient for protection, but the load should be checked to make sure of this, since large or heavy loads may invovle body contact as well.

Crushing of feet or hands

Feet or hands should be so postioned that they will not be trapped by the load. Timber wedges can used when raising and lowering heavy loads to ensure fingers and hands are not caught and crushed.

Safety shoes with steel toe caps will protect feet (Fig 2)



Strain to muscles and joints

Strain to muscles and joints may be result of:

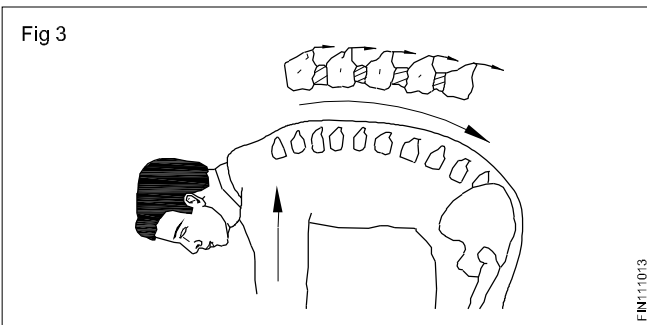
- Lifting a load which is too heavy, or of lifting incorrectly.

Sudden and awkward movements such as twisting or jerking during a lift can put severe strain on muscles.

Stop lifting'-lifting from a standing position with the back rounded increases the chance of back injury.

The human spine is not an efficient weight lifting machine and can be easily damaged if incorrect techniques are used.

The stress on a rounded back can be about six times greater than if the spine is kept straight. Fig 3 shows an example of stoop lifting.



Preparing to lift

Before lifting or handling any load ask yourself the following questions.

What has to be moved?

Where from and where to?

Will assistance be required?

Is the route through which the load has to be moved clear of obstacles?

Is the place where the load has to be kept after moving clear of obstacles?

Load which seems light enough to carry at first will become progressively heavier, the farther you have to carry it.

The person who carries the load should always be able to see over or around it.

The weight that a person can lift will vary according to:

- Age
- Physique, and
- Condition

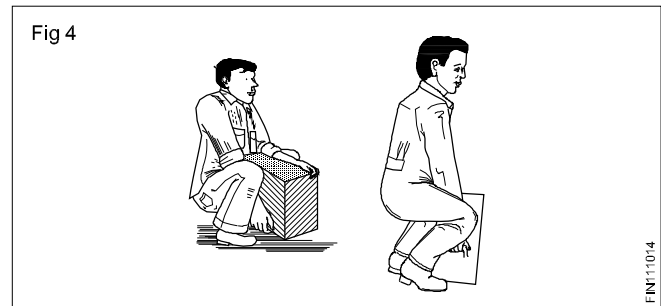
It will also depend on whether one is used to lifting and handling heavy loads.

What makes an object difficult to lift and carry?

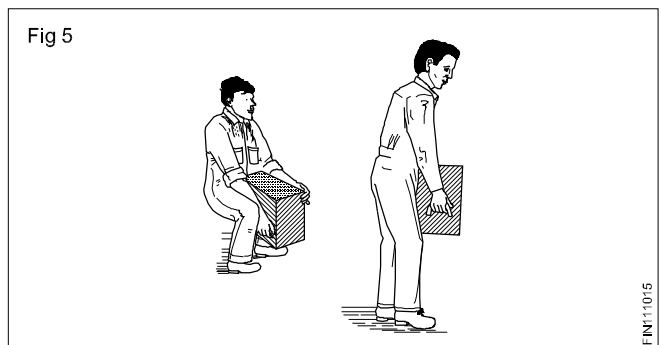
- 1 Weight is not the only factor which makes it difficult to lift and carry.
- 2 The size and shape can make an object awkward to handle.
- 3 Loads high require the arms to be extended in front of the body, place more strain on the back and stomach.
- 4 The absence of hand holds or natural handling points can make it difficult to raise and carry the object.

Correct manual lifting techniques

- 1 Approach the load squarely, facing the direction of travel
- 2 The lift should start with the lifter in a balanced squatting position, with the legs slightly apart and the load to be lifted held close to the body.
- 3 Ensure that a safe firm hand grip is obtained. Before the weight is taken, the back should be straightened and held as near the vertical position as possible. (Fig4)



- 4 To raise the load, first straighten the legs. This ensures that the lifting strain is being correctly transmitted and is being taken by the powerful thigh muscles and bones.
- 5 Look directly ahead, not down at the load while straightening up, and keep the back straight, this will ensure a smooth, natural movement without jerking or straining (Fig 5)



- 6 To complete the lift, raise the upper part of the body to the vertical position. When a load is near to an individual's maximum lifting capacity it will be necessary to lean back on the hips slightly (to counter balance the load) before straightening up.(Fig 6)

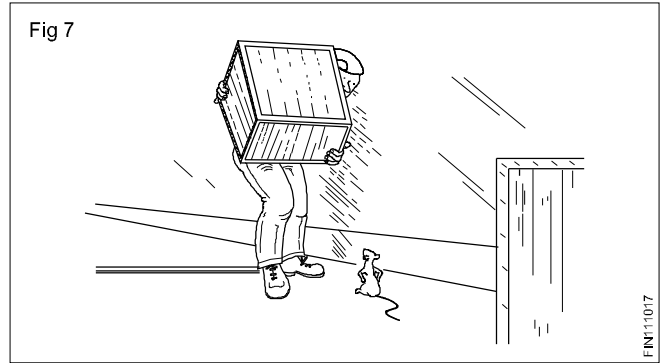


Keeping the load well near to the body, carry it to the place where it is to be set down. When turning, avoid twisting from the waist- turn the whole body in one movement.

Lowering the load

Make sure the area is clear of any obstructions. (Fig 7)

Bend the knees to a semi- squatting position, keep the back and head erect by looking straight ahead, not down at the load. It may be helpful to rest the elbows on the thighs during the final stage of lowering.



Moving heavy equipment

Objectives: At the end of this lesson you shall be able to

- name the methods followed in industry to move heavy equipment
- describe the procedure to be followed for moving heavy equipment on layers and rollers
- list the safety consideration while raising a load and moving a load.

Heavy equipments are moved in industry using any of the following methods.

Crane and slings

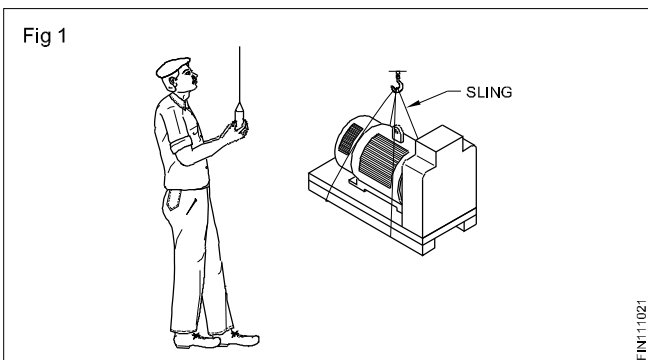
Winches

Machine moving platforms

Layers and rollers

Using crane and slings

This method is used whenever loads are to be lifted and moved. (Fig 1)



Examine the steel rope sling for any cut, abrasion, wear fraying or corrosion.

Damaged slings must not be used.

Distribute the weight as evenly as possible between the slings when using more than one sling. (Fig 1)

Keep the slings as near to vertical as possible.

Winches

Winches are used to pull heavy loads along the ground. They may be power-driven (Fig 2) or hand operated. (Fig3)

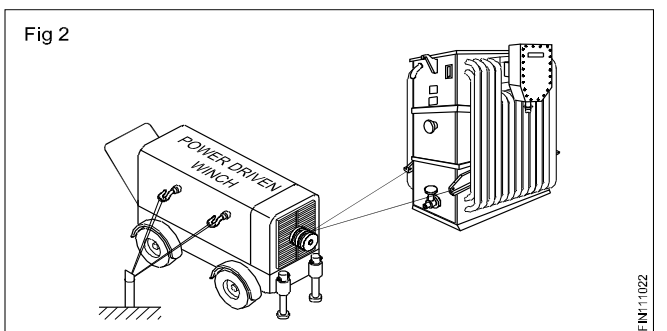
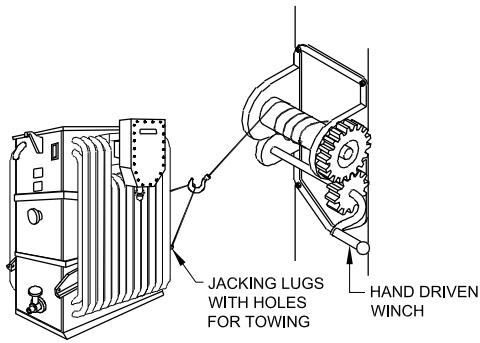


Fig 3



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Ensure that the safe working load (SWL) of the winch is adequate for the task.

Secure the winch to a structure which is strong enough to withstand the pull.

On open ground, drive long stakes into the ground and secure the winch to them.

Choose a suitable sling and pass it around the base of the load. Secure it to the hook of the winch.

Some heavy items have special lugs welded to them for jacking and towing purposes.

Safety consideration

Before using any winch, check that the brake and ratchet mechanism are in working order. Practise how to use the brakes.

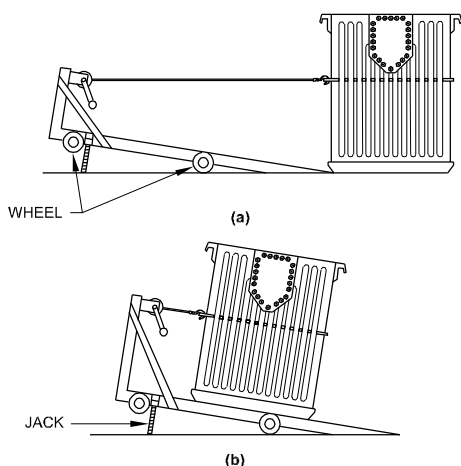
Keep hands and fingers well away from the gear wheels.

Keep the bearings and gears oiled or greased.

Machine moving platforms

This is a special device made to move heavy equipment in industry. Fig 4 shows the method of loading a heavy transformer.

Fig 4



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Pass a suitable sling round the load at a convenient height.

Attach the sling to the hook of the winch and draw the load on the platform until its centre of gravity lies between the front and rear wheels.

Lower the jacks so that the platform rests on its wheels.

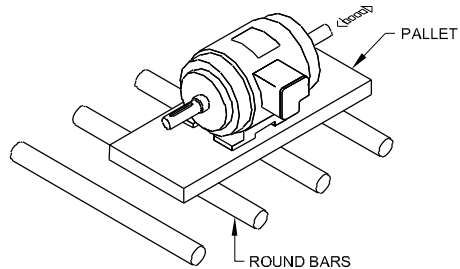
For unloading follow the procedure in the reverse order.

Using layers and rollers

Sometimes a load cannot be moved along the ground because of the irregular shape of its base or because it is not rigid enough.

Place such a load on a flat-bottomed pallet or 'layer' resting on the round bars. (Fig 5)

Fig 5



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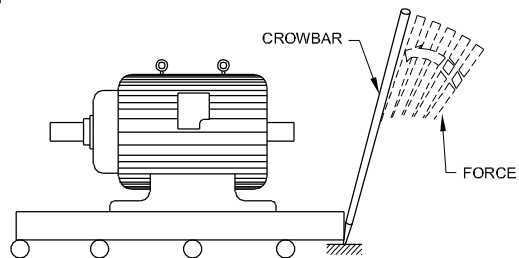
Ensure the bars (rollers) are long enough to project at each side of the load, for ease of handling.

They should be large enough to roll easily over any uneven surface along the route but should be small enough to be handled easily.

Two or three bars of equal diameter are sufficient for most loads but if four or more are used, the load may be moved faster as there is no delay when moving the rear bar to the front. (Fig 5)

Move the load by using a crowbar as shown in Fig 6. Keep the crowbar at the end of the pallet with an angle and a firm grip on the ground. Apply the force at the top of the bar as shown.

Fig 6



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Caution

When a load is on rollers, only shallow slopes can be negotiated.

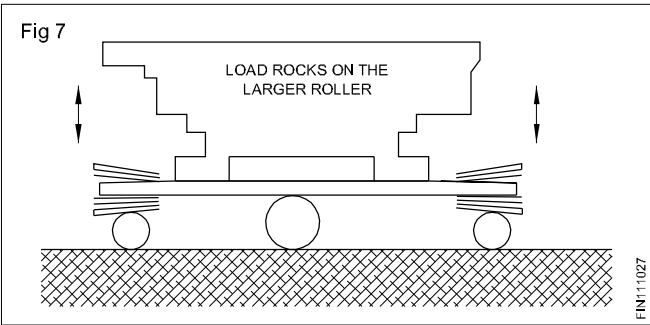
Hold the load in check all the time if it is on the slope.

Use a winch with an effective brake for this operation.

To negotiate a corner on rollers

For a moderate load, insert one roller a little larger in diameter than the others as the corner is approached.

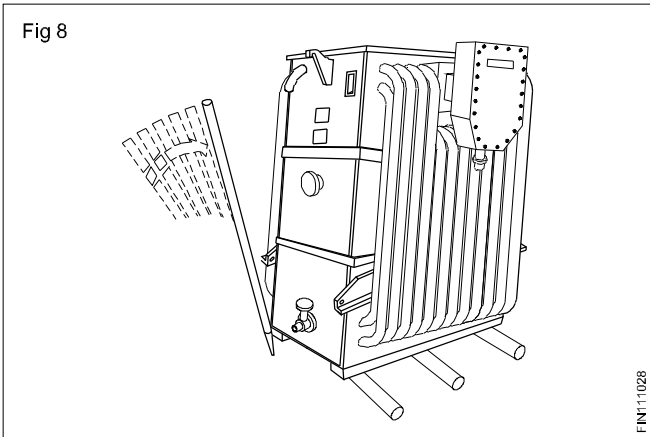
When this roller is under the centre of gravity of the load, the load can be rocked to and fro on the roller and swivelled around sideways. (Fig 7)



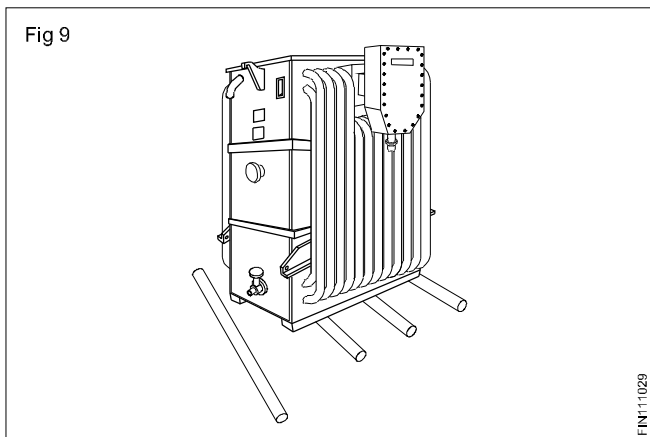
For heavier loads

Stop the load on the roller at the beginning of the corner.

Twist the load round on the rollers by pushing the sides with crowbars until the load is just over the ends of the rollers. (Fig 8)



Place some rollers at an angle to the front of the load. (Fig 9)



Push the load forward on to these rollers.

Twist the load further round and place the freed rollers in front of and at an angle to the load.

Continue until the load is pointing in the desired direction.

Safety consideration

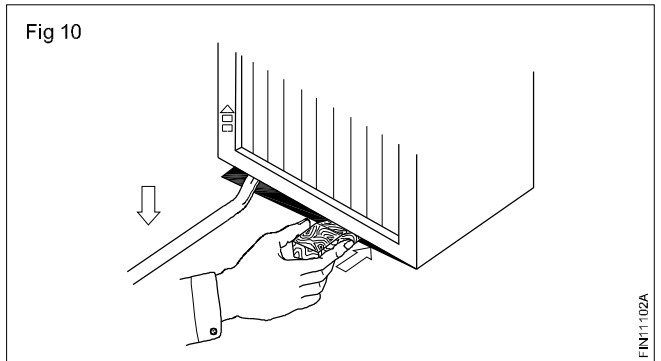
Moving heavy loads with crowbars or jacks

Make sure your hands are clear of the load before lowering it on to the packing or rollers.

Do not use your hands underneath the packing when positioning it. Use a push block.

Place the packing on the floor and push it under the load. (Fig 10)

Hold it by its side faces keeping the fingers well away from the lower edge of the load and from the floor. (Fig 10)



Raising a load

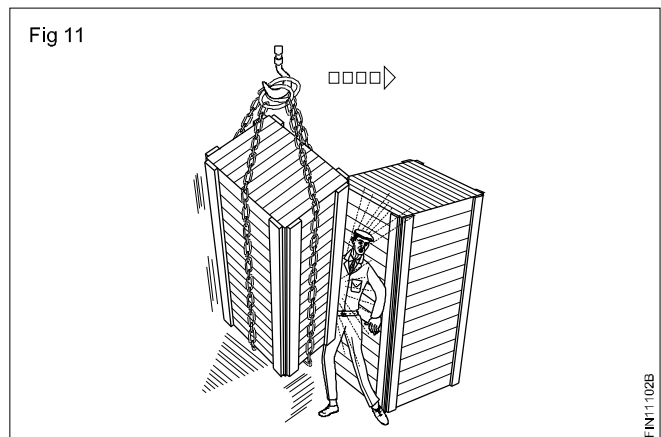
Check that the slings are correctly secured to the load and to the hook. Ensure they are not twisted or caught on a projecting part of the load.

Before starting to lift a load, if you cannot see an assistant on the far side of the load, verify that he is ready to lift the load and ensure that his hands are clear of the slings.

Warn nearby workers that the lifting is about to begin.

Lift slowly.

Take care to avoid being crushed against other objects as the load rises. (Fig 11) It may swing or rotate as it leaves the ground.

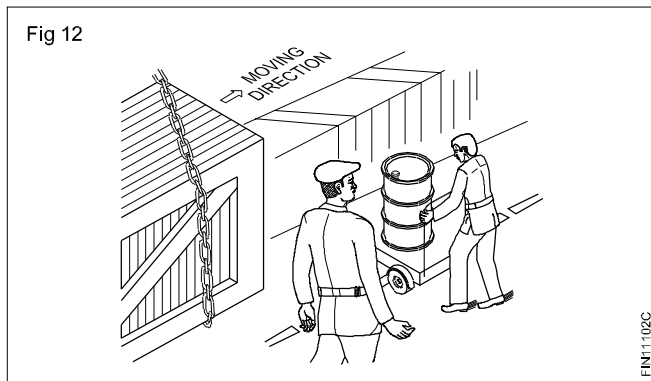


Minimise such movement by locating the hooks as accurately as possible above the centre of gravity of the load.

Keep the floor clear of unnecessary objects.

Moving a load

Check that there are no obstacles in the way of the crane and load. (Fig 12)

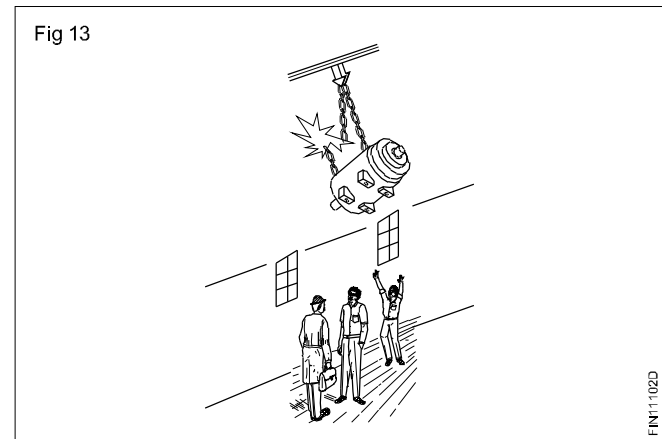


Stand clear off the load and move it steadily.

Be prepared to stop the load quickly if somebody moves into its path.

Allow for the natural swing of the load when changing speed or direction.

Ensure that the load will not pass over the head of other people. (Fig 13)



The tackle or sling may fall or slip.

Warn other workers to stand clearly away from the route of the load.

Remember that accidents do not happen, they are caused.