

## Guidance to newcomers about ITI system including stores

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

- **identify the staff structure of the institute**
- **identify the available trades in the institute and their functions.**
- **state the concept of soft skill**
- **brief the employability aspect on training.**

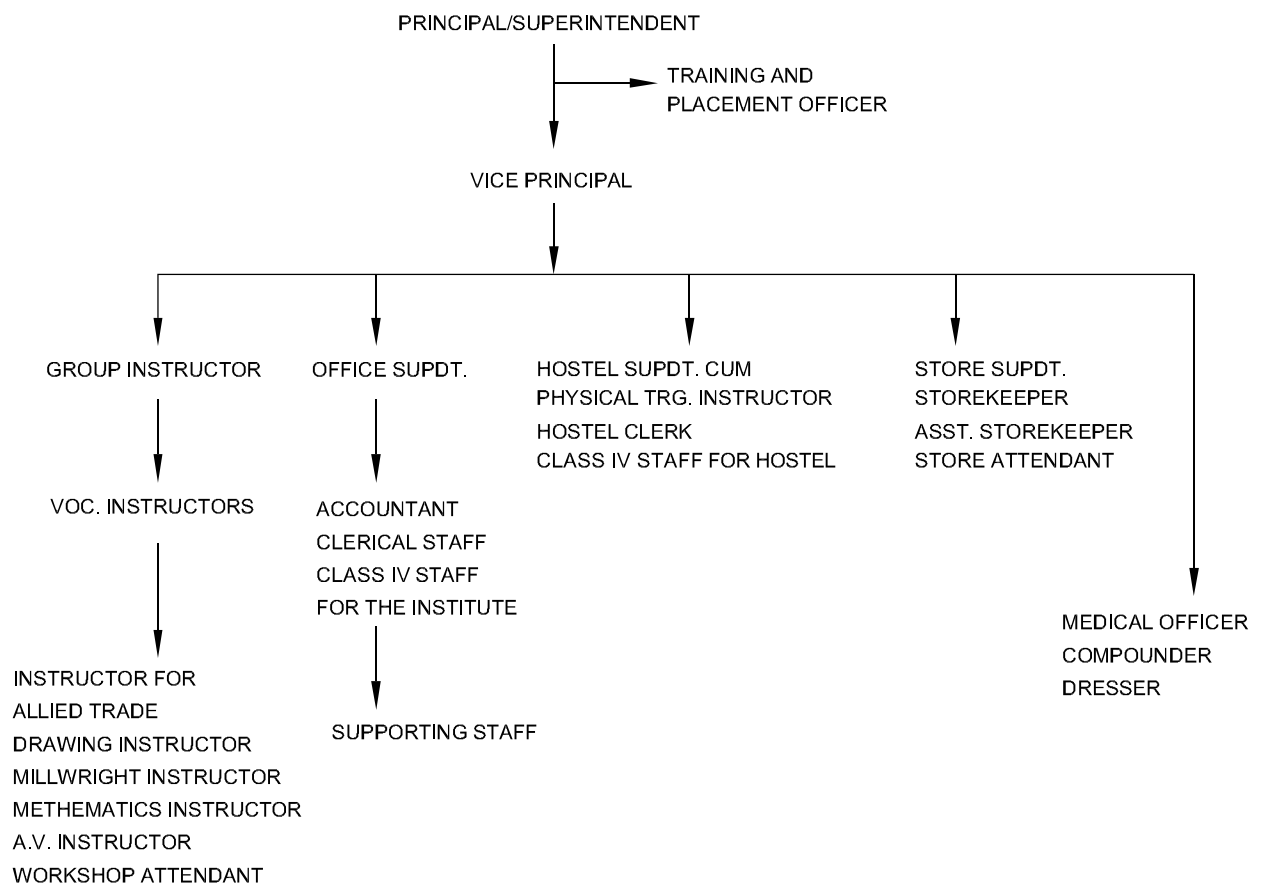
The Industrial Training Institute throughout India follow the same syllabus pattern given by the National Council for Vocational Training (NCVT) Board. In India there are Govt. ITIs and Private ITIs. Based on the Govt. of India, Ministry of Labour's Annual report of 2011-2012, the Govt. ITIs in each State work under the Directorate of Employment and Training which is a Department under the Labour Ministry in most of the States. Some of the ITIs are under the Central Government and are attached to the Advanced Training Institute which are named as Model Training Institutes.

The Head of the industrial training institute is the Principal, under whom there is one Vice-Principal, group instructor and a number of trade instructors as shown in the organisation chart of ITI.

Even though there are 62 trades selected for instructional training and 135 trades identified for apprentice training, according to the requirement of industrial needs, area and finance, a few selected trades are established under each ITI. The trainees are advised to be aware of all the trades available in their ITI, the type of training and the scope of these trades in getting self or job employment in the rural and urban areas.

Fig 1

### ORGANISATIONAL CHART OF ITI



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## Soft skill : its importance

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 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 become an entrepreneur.

### Further learning scope

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

## **Introduction to First-aid**

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

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

### **Introduction to 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 cause one to do wrong procedures. Hence be calm and focus on the given situation. 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 to do it. Hence moving a trauma victim, especially an unconscious one, needs very careful assessment. Removal 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 the 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?**

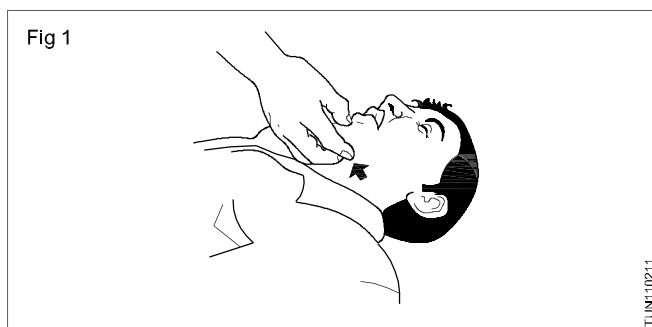
Reporting an emergency is one of those things that seems simple enough, until actually when put to use in emergency situations. A sense of shock prevail at the accident sites. Large crowd gather around only with inquisitive nature, but not to extend helping hands to the victims. This is common in road side injuries. No passer-by 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 multi-task 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 started 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 & 101 Fire, 108 for Ambulance.



### 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 (Diarrhoea & 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.**

### 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?

Fig 2



- 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



# Artificial respiration

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

- state the importance of respiration
- state occasions when artificial respiration becomes a necessity
- state the various methods of artificial respiration
- list the procedure to be followed in different methods of artificial respiration
- state the action to be taken to treat a victim with cardiac arrest
- state the important action to be taken when a patient recovers after undergoing artificial respiration.

## RESPIRATION

Respiration is an involuntary function of all living organisms. In human beings respiration involves breathing in and breathing out air. The air taken consists of oxygen which is made use of the lungs to purify the blood. If a person cannot breathe or stops breathing for any reason he will collapse in no time.

### Artificial respiration

There are occasions when breathing/respiration becomes difficult or feeble in a person due to sickness, shock or accident. When breathing becomes feeble the person becomes unconscious. At this stage it is possible to improve the respiration by artificial means. This is known as artificial respiration.

In artificial respiration, air containing oxygen is forced into the lungs of the unconscious person so as to maintain the supply of oxygen to the body till the time the victim reaches the hospital/clinic for further treatment.

There are several methods by which artificial respiration can be given. Some of the well known methods are,

- HOLGEN-NELSON method
- SCHAFER'S method
- Mouth-to-mouth method.

Basically all these methods serve the same purpose and are equally good. Therefore the person/volunteer can adopt any one of the above methods in which he is trained and is confident. However, Nelson's method and Schafer's method should be avoided while giving artificial respiration to those patients who are suspected to have injuries in the chest wall and abdomen.

Each of the above said methods has a systematic procedure to be followed. These procedures are given below. A person must practise this procedure thoroughly before giving artificial respiration to a sick person. Any short cuts in the procedure is dangerous and may worsen the condition of the sick person instead of improving it.

### NELSON's Method (Arm-lift back-pressure method)

#### PRECAUTION

**Nelson's arm-lift back pressure method must not be used in case of suspected injuries to the chest wall or abdomen of the victim.**

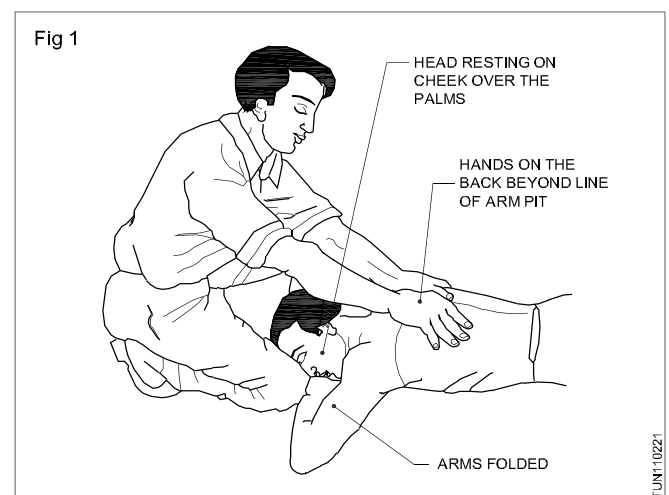
**Be brisk in carrying out this method but avoid violent operations which may cause injury to the internal parts of the victim.**

- 1 Loosen the clothing of the victim as tight clothing interferes with the victim's breathing.
- 2 Remove any foreign materials or false teeth from the victim's mouth, and keep the mouth open.

**NOTE:** Do not delay artificial respiration for loosening clothes or even if the mouth is closed tightly.

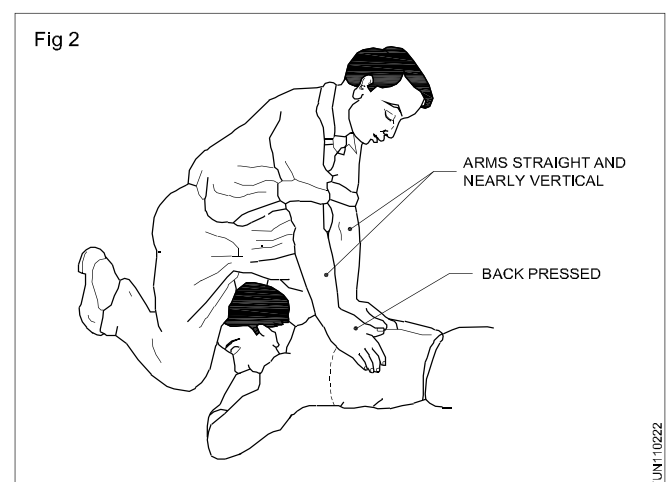
- 3 As shown in Fig 1, place the victim face down with his arms folded, palms one over the other and head resting on his cheek over the palms. Kneel on one or both knees at the victim's head. Place your hands on the victim's back beyond the line of the armpits. Spread your fingers outwards and downwards with the thumbs just touching each other.

Fig 1



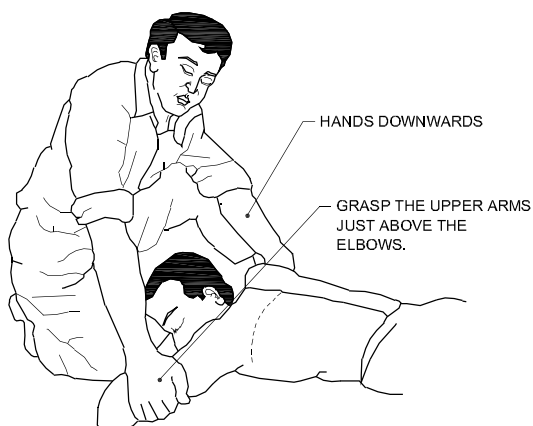
- 4 As shown in Fig 2, gently rock forward the arms keeping them straight until they are nearly vertical, and thus steadily pressing the victim's back as shown to force the air out of the victim's lungs.

Fig 2



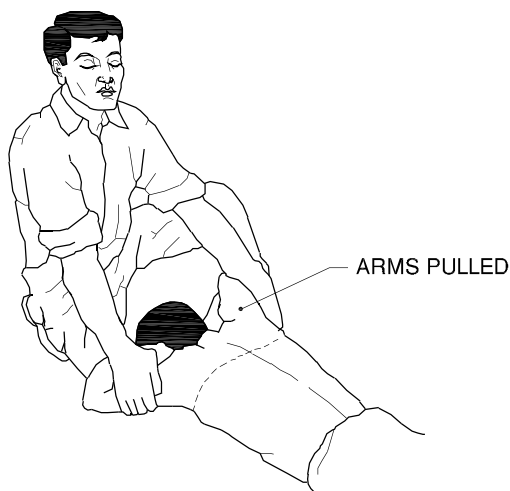
- As shown in Fig 3, synchronizing the above movement rock backwards sliding your hands downwards along the victim's arms. Grasp his upper arm just above the elbows as shown.

Fig 3



- Now rock backwards. As you rock backwards, gently raise and pull the victim's arms towards you as shown in Fig 4 until you feel tension in his shoulders. Remain in this position for a few seconds. To complete the cycle, lower the victim's arms and move your hands up to the initial position.

Fig 4



- Repeat the cycles a few more times by following steps 3 to 6.

#### SCHAFFER'S method

##### PRECAUTION

**Do not use this method of artificial respiration in case the victim has injuries on his chest or abdomen.**

**Be brisk in carrying out this method but avoid violent operations which may cause injury to the internal parts of the victim.**

- Loosen the clothing of the victim as tight clothing interferes with the victim's breathing.

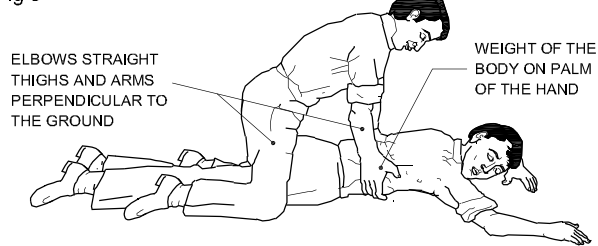
- Lay the victim on his abdomen. Extend one arm directly forward, and the other arm bent at the elbow as shown in Fig 5. Keep the face turned sideways and resting on the hand or forearm as shown in Fig 5.
- Kneel astride the victim as shown in Fig 5 such that his thighs are between your knees. Position your fingers and thumb as shown in Fig 5.

Fig 5



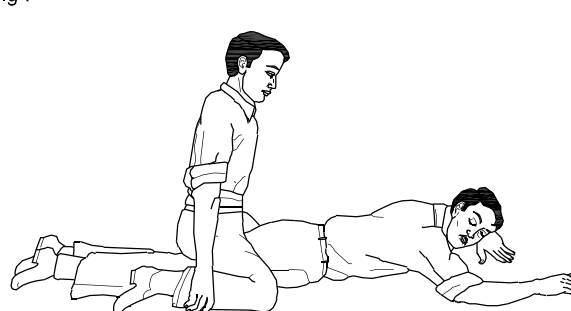
- With the arms held straight, swing forward slowly so that the weight of your body is gradually applied on the lower ribs of the victim as shown in Fig 6. This weight force the air out of the victim's lungs.

Fig 6



- Now swing backward immediately removing all pressure on the lower ribs as shown in Fig 7. This allows the lungs to get filled with air.

Fig 7



- After two to three seconds, swing forward again and repeat the cycle ( steps 4 and 5) twelve to fifteen times a minute.

#### Mouth-to-mouth method of artificial respiration

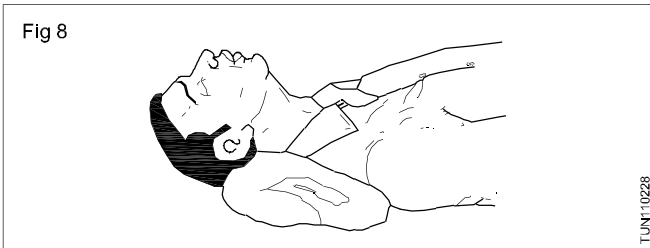
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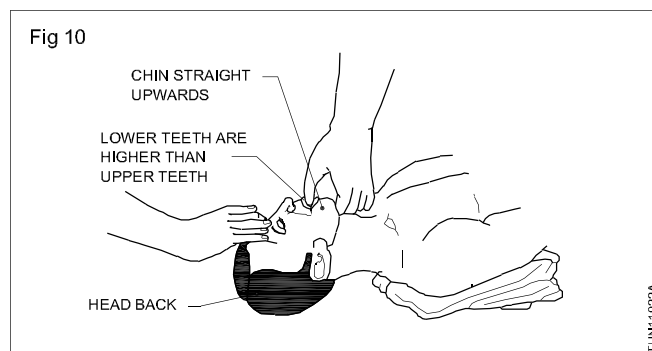
- 2 Remove loose dentures or other obstructions from the mouth. Make sure that the victim's nose and mouth are clear.
- 3 Lay the victim flat on his back. Place a roll of clothing under his shoulders such that his head is thrown well back as shown in Fig 8.



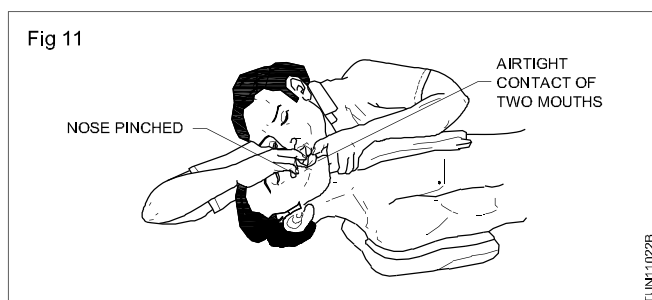
- 4 Tilt the victim's head back so that the chin points straight upward as shown in Fig 9.



- 5 Grasp the victim's jaw as shown in Fig 10, and raise it upward until the lower teeth are higher than the upper teeth. Maintain this position throughout the artificial respiration to prevent the tongue from blocking the air passage.



- 6 Take a deep breath and place your mouth over the victim's mouth as shown in Fig 11 making airtight contact. Hold the victim's nose shut with the thumb and forefinger. Blow into the victim's mouth (gently in the case of infants) until his chest rises. Remove your mouth and release the hold on the victim's nose.



NOTE 1: If you dislike direct contact, place a porous cloth between your mouth and the victim's.

NOTE 2: If air cannot be blown in, check the position of the victim's head and jaw. Check the mouth for obstructions. Then try again blowing air more forcefully. If the chest still does not rise, turn the victim's face down and strike his back sharply to dislodge obstructions.

- 7 Let the victim exhale. Hear the out rush of air from the victim's mouth and nose.

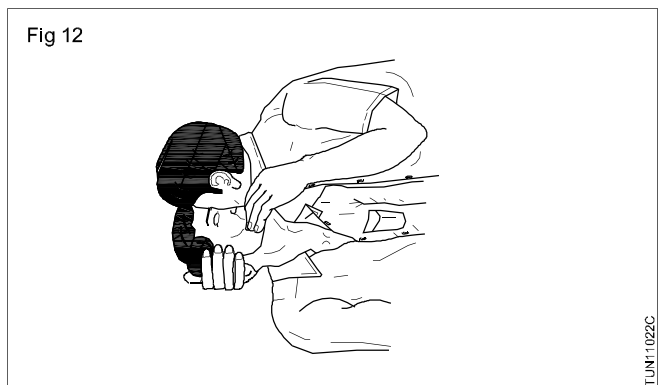
Sometimes air enters the victim's stomach as evidenced by a swelling stomach. Expel the air by gently pressing the stomach during the exhalation period.

- 8 Repeat steps 6 and 7, eight to ten times rapidly. Then slow down to 10-12 times a minute. (20 times for infant)

Sometimes it may take hours for the victim to breathe normally. Continue giving artificial respiration till he recovers.

### Mouth-to-nose method of artificial respiration

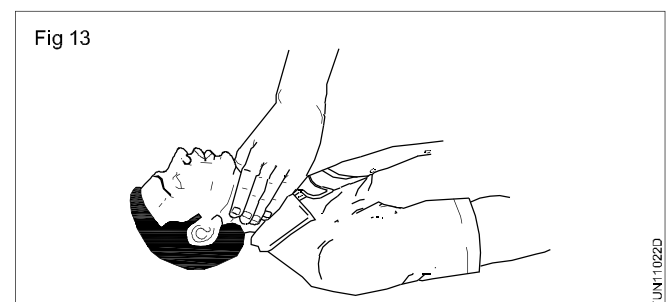
If the victim's mouth will not open, or has a blockage which you cannot clear then the mouth-to-nose method of providing artificial respiration should be followed. In this method use fingers of one hand to keep the victim's lips firmly shut. As shown in Fig 12 seal your lips around the victim's nostrils and blow air gently into his nose and suck back. Check if the victim's chest is rising and falling.



### Artificial respiration in case of cardiac arrest

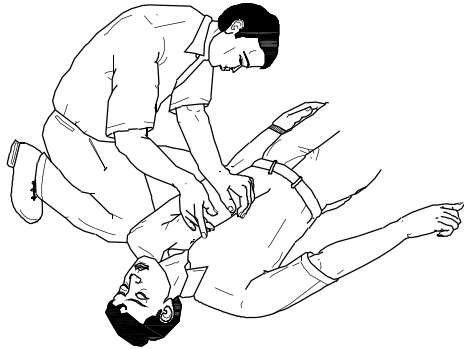
In the case of cardiac arrest where the heart has stopped beating, the following procedure has to be followed. One must act immediately as any delay will reduce the chances of the patient's recovery.

- 1 As shown in Fig 13, check if the carotid pulse in the neck can be felt. If the pulse is found feeble, go ahead with the following steps.



- 2 Lay the victim on his back on a firm surface. Kneel alongside as shown in Fig 14. Facing the chest, locate the lower part of the breastbone.

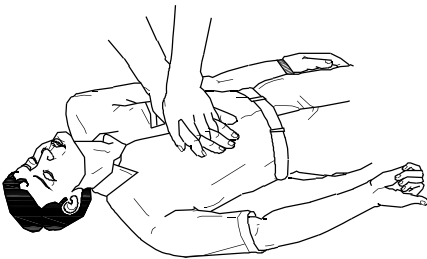
Fig 14



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- 3 Place the palm of one hand on the centre of the lower part of the breastbone, keeping your fingers off the ribs. As shown in Fig 15, cover the palm with your other hand and lock your fingers together as shown.

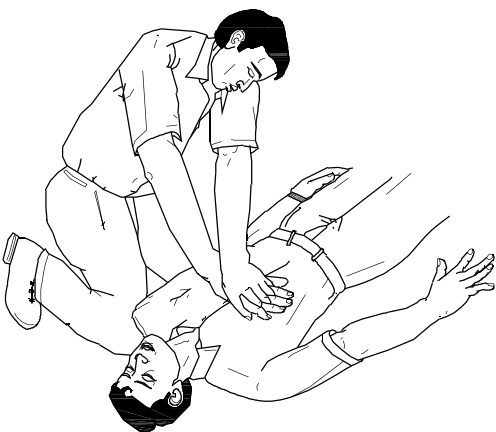
Fig 15



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- 4 Keeping your arms straight as shown in Fig 16, press sharply down on the lower part of the breastbone and release the pressure.

Fig 16



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- 5 Repeat step 6, fifteen times at a rate of approximately one per second.
- 6 Recheck the carotid pulse as done in step 1, Fig 13.

- 7 Give two cycles of mouth-to-mouth artificial respiration as shown in Fig 17.

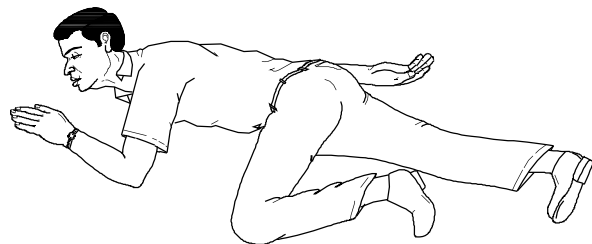
Fig 17



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- 8 Give 10-15 more compressions of heart as done in step 5, 7 and 6 follow it up with a further two cycles of mouth-to-mouth artificial respiration.
- 9 Checking for the carotid pulse. If the pulse is still feeble, repeat step 10 till the pulse improves.
- 10 As soon as the heartbeat returns, stop the compressions immediately and continue with mouth-to-mouth artificial respiration until natural breathing is fully restored.
- 11 Place the victim in the recovery position as shown in Fig 18. Keep him warm and get medical help quickly.

Fig 18



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#### IMPORTANT POINTS TO NOTE AFTER GIVING ARTIFICIAL RESPIRATION TO VICTIMS

- 1 Even if the victim's breathing and heartbeat have recovered, do not delay in calling a doctor for a check up and treatment.
- 2 After the victim has recovered, keep the victim warm with a blanket, wrapped up with hot water bags. Stimulate circulation by stroking the insides of the arms and legs towards the heart.
- 3 When the victim revives, make him lie down. Do not let him exert himself as this may lead to a deterioration in his condition.
- 4 Do not give the victim any stimulant such as coffee, tea etc. until he is fully conscious.

## **Introduction to 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 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 an 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 work 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's**

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

- 1 **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
- 2 **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.



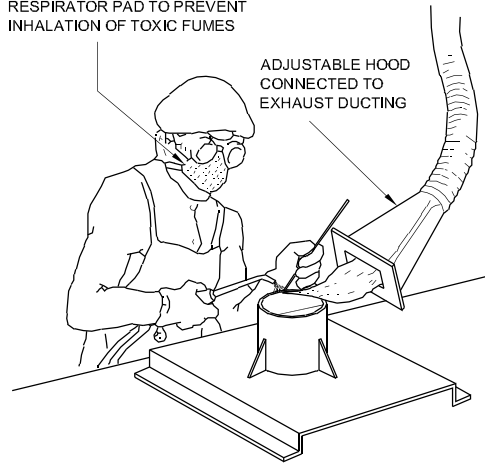
Fig 2



P.P.E. MUST BE WORN IN THIS AREA

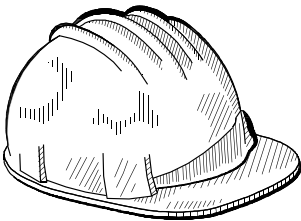
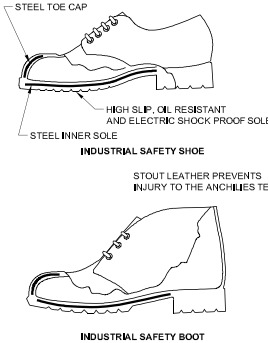
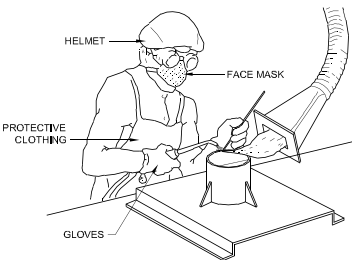
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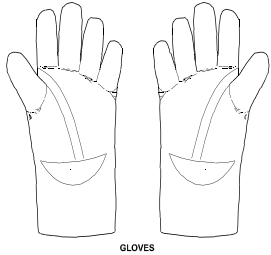
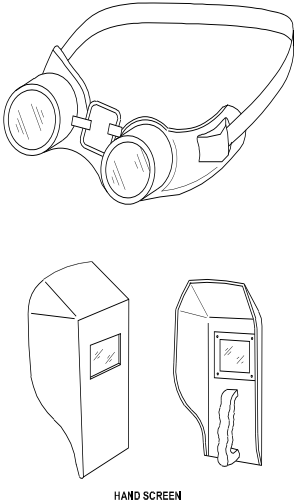
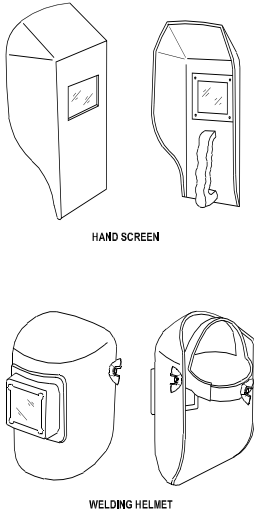
Fig 3

RESPIRATOR PAD TO PREVENT  
INHALATION OF TOXIC FUMESADJUSTABLE HOOD  
CONNECTED TO  
EXHAUST DUCTING

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Personal protective equipments and their uses and hazards are as follows

Types of protection	Hazards	PPE to be used
<p>Head Protection (Fig 1)</p>  <p>HELMET</p>	<ol style="list-style-type: none"> <li>1. Falling objects</li> <li>2. Striking against objects</li> <li>3. Spatter</li> </ol>	<p>Helmets</p>
<p>Foot protection (Fig 2)</p> 	<ol style="list-style-type: none"> <li>1. Hot spatter</li> <li>2. Falling objects</li> <li>3. Working wet area</li> </ol>	<p>Leather leg guards</p> <p>Safety shoes</p> <p>Gum boots</p>
<p>Nose (Fig 3)</p> 	<ol style="list-style-type: none"> <li>1. Dust particles</li> <li>2. Fumes/ gases/ vapours</li> </ol>	<p>Nose mask</p>

Types of protection	Hazards	PPE to be used
<p>Hand protection (Fig 4)</p>  <p>GLOVES</p>	<ol style="list-style-type: none"> <li>1. Heat burn due to direct contact</li> <li>2. Blows sparks moderate heat</li> <li>3. Electric shock</li> </ol>	<p>Hand gloves</p>
<p>Eye protection (Fig 5, Fig 6)</p>  <p>HAND SHIELD</p>	<ol style="list-style-type: none"> <li>1. Flying dust particles</li> <li>2. UV rays, IR rays heat and High amount of visible (UV - ultraviolet IR - Infra Red)</li> </ol>	<p>Goggles</p> <p>Face shield</p> <p>radiation</p> <p>Hand shield</p> <p>Head shield</p>
<p>Face Protection (Fig 6, Fig 7)</p>  <p>HAND SHIELD</p> <p>WELDING HELMET</p>	<ol style="list-style-type: none"> <li>1. Spark generated during Welding, grinding</li> <li>2. Welding spatter striking</li> <li>3. Face protection from UV rays</li> </ol>	<p>Face shield</p> <p>Head shield with or without ear muff</p> <p>Helmets with welders screen for welders</p>



### Quality of PPE's

PPE must meet the following criteria with regard to its quality-provide absolute and 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 limitations of PPE
- Ease 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.

## Importance of house keeping and good shop floor practice and introduction to '5s'

**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 .
- Reduced handling to get free flow of material.
- 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 is and where it is improved on time schedule performance.
- Decreased fire hazard.

### House-keeping

House -keeping is not just cleanliness it includes keeping work area neat and ordered, maintain floors free of slip, removing waste materials and other fire hazards in work area. It also requires paying attention to important details such as layout of work place, aisle marking, adequacy of storage and maintenance. It is the basic part of incident and fire prevention.

### 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).**

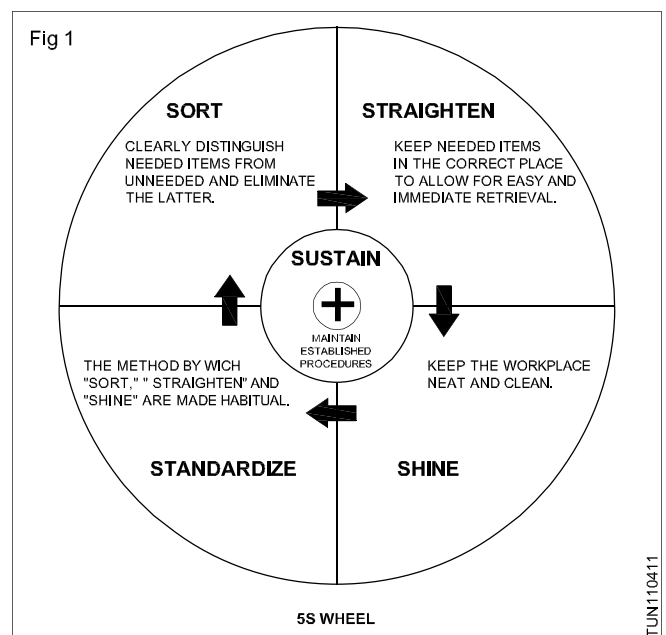
The list describes how to organize a work space for efficiency and effectiveness by identifying and storing the items used, maintaining the area and items, and sustaining the new order. The list describes how to organize a work space for efficiency and effectiveness by identifying and storing the items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

### 5S Wheel

#### The Benefits of the '5s' system

- Increases in productivity
- Increases in quality
- Reduction in cost
- Improves morale of the workers it reduces accident
- It gives satisfaction to customers.
- It enables overall improvement.

Better hygienic condition leading to improved health.



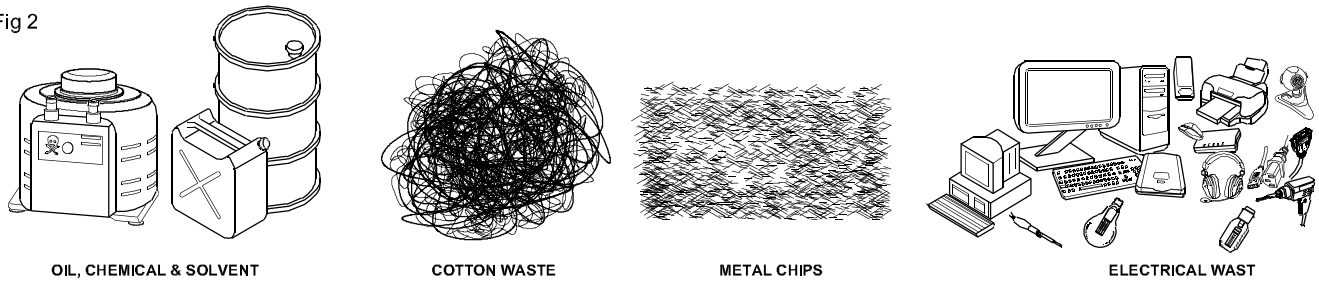
### Disposal of Waste material

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

#### List of waste material (Fig 1)

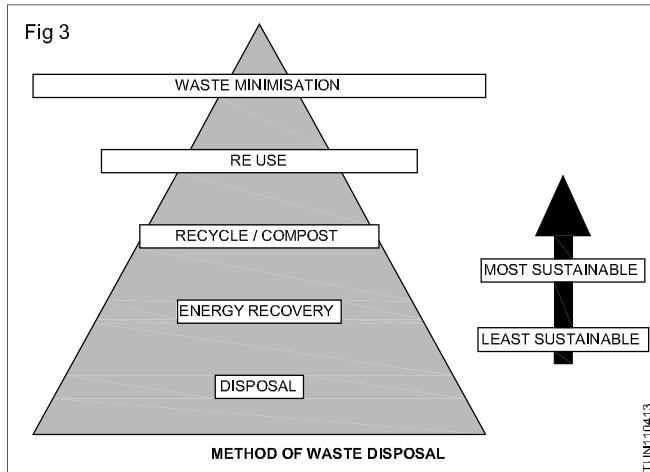
- Cotton waste
- Metal chips of different material.
- Oily waste such as lubricating oil, coolant etc.
- Other waste such as electrical, glass etc.

Fig 2



## Methods of waste disposal

Fig 3



## 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

## Colour code for bins for waste segregation

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

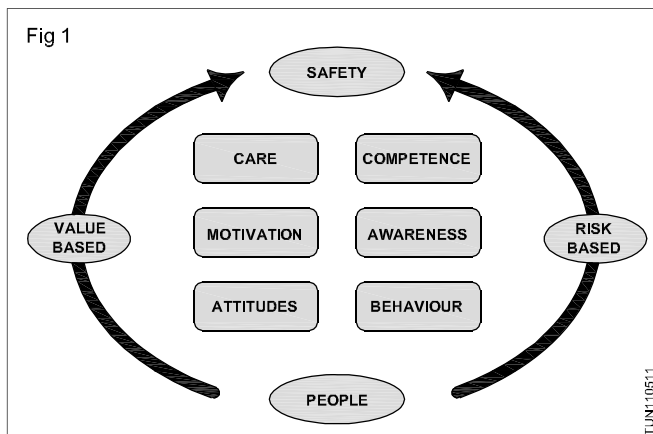
## Occupational Safety and Health

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

- define occupational safety and health
- state the importance of safety and health at workplace
- learn the advantage of waste disposal.
- get awareness on waste material.

**Occupational Safety and Health (OSH)** is an area concerned with protecting the safety, health and welfare of people engaged in co-workers, family members, employees, customers, and many others who might be affected by the workspace environment.

**Workspace safety :** Owner/Occupier of industries have to comply with legal directions to take care for the safety, health and welfare of their employees. Equally the workers have moral responsibilities to follow all safety norms and healthy on the shop-floor. (Fig 1)



**Occupational health :** Health at work is also called occupational health. It is concerned with enabling an individual to undertake their day to day work fully knowing the health hazards they are exposed to and preventing them at the workspace.

Good safety and health practices can also reduce employee injury and illness related costs, including medical care, sick leave and disability benefit costs. (Fig 2)



The joint ILO/WHO committee on occupational health (1995) main focus in occupational health is on three different objectives :

- (i) The maintenance and promotion of workers' health and working capacity.
- (ii) The improvement of working environment and work to become conducive to safety and health.
- (iii) Development of work organization and working cultures in a direction which supports health and safety at work and in doing so also promotes a positive social climate and smooth operation and may enhance productivity of the undertakings.

Employment and working conditions in the formal or informal economy embrace other important determinants, including working hours, salary, workspace policies concerning maternity leave, health promotion and protection provisions etc.

- 1 **Chemical hazards**, in which the body absorbs toxins.
- 2 **Ergonomic hazards**, in which the body is strained or injured, often over an extended period, because of the nature (design) of the task, its frequency, or intensity.
- 3 **Physical hazards**, in which the worker is exposed to harmful elements or physical dangers, such as heat or moving parts.

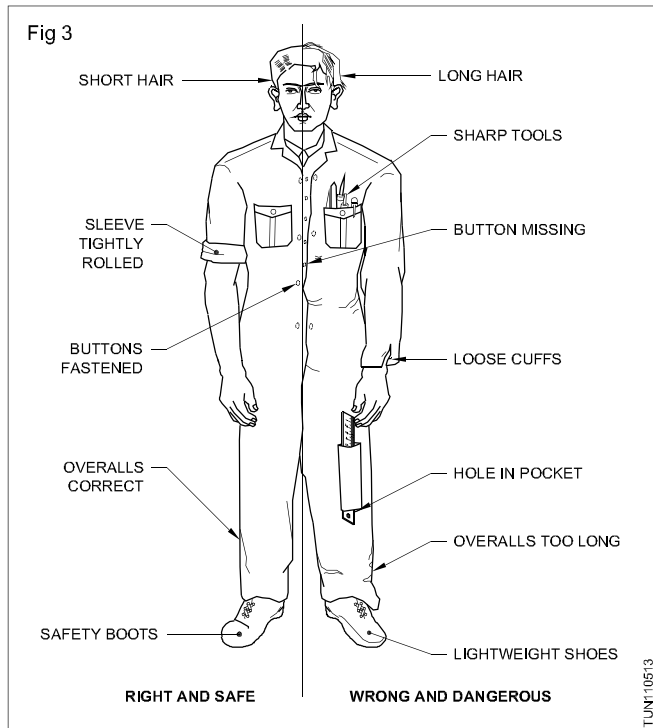
In the modern context, corporate management increasingly has viewed industrial safety measures as an investment - one that may save money in the long run by way of reducing disability pay, improving productivity and avoiding lawsuits.

### Occupational safety

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 damage. To achieve this, it is essential that every person should follow safety procedures. (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 spilt oil immediately.  
 Replace worn out or damaged tools immediately.  
 Never direct compressed air at yourself or at your co-worker.

## Occupational Safety

At the end of this lesson you shall be able to

- state what an accident is
- state the causes for accidents in general terms
- state what is safety attitude
- identify the four basic categories of safety signs.

### What is an accident?

Nobody deliberately has an accident; accidents occur due to causes which are not foreseen. Sometimes nothing can be done to prevent them from happening. For example, a part of a machine fails when nobody has any reason to think there is anything wrong with it, or the driver of a vehicle collapses at the wheel. Most accidents however occur as a result of human error of ignorance or neglect, forgetfulness or recklessness. These accidents can be prevented. If people had acted differently at some point, the event which we call an 'accident' would not have occurred.

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 and goggles.

Cut the hair short.

Don't wear a ring, watch or chain.

Never lean on the machine.

Don't clean your 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.

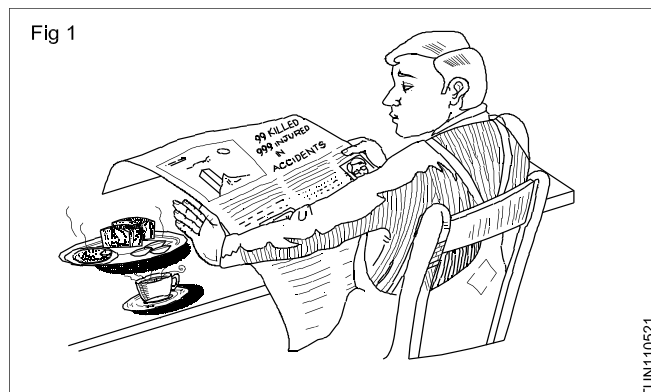
Have a calm attitude.

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.





Lots of accidents still happen every year killing a lot of people. Although most people are alarmed and horrified by this state of affairs, accidents continue to happen, costing the industry millions of rupees every year. Older workers who have come to terms with the dangers, young workers who may be reckless, employers who turn a blind eye to the possibility of things going wrong - because they want to get the job done, all these factors contribute to this senseless waste. Fortunately there are many who do not take this view. They have a different attitude to safety - and 'attitude' is an all-important factor in the chain of events which leads to someone causing, being involved in or becoming the victim of an 'accident'.

### Causes for accidents



**Normally accidents do not just happen. They are caused.**

Causes for accidents are many. Some of the important causes are listed below.

- Unawareness of danger
- Disregard for safety
- Negligence
- Lack of understanding of proper safety procedures
- Untidy condition of work place
- Inadequate light and ventilation
- Improper use of tools
- Unsafe conditions



### Safety attitudes

People's attitudes govern what they do or fail to do. In most cases where someone is working with unsafe equipment or in an unsafe situation, somebody has allowed that state of affairs to come about by something they have done or failed to do.



Most accidents don't just happen; they are caused by people who (for example) damage equipment or see it is faulty but don't report it, or leave tools and equipment lying about for other people to trip over. Anybody who sees a hazard and does nothing about it is contributing to the possibility of an accident. A worker doesn't necessarily need to do anything to help bring about an accident; just going mindlessly about his work may be enough to ensure a workmate being crippled for life. He didn't do it - but by proper and timely thinking and acting, he could have prevented it.

### 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, into training people, into 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 procedures 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 they 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; they contribute to the efficiency and safety of the job.

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
- mandatory signs
- warning signs
- information signs.

SHAPE Circular.

COLOUR Red border and cross-ba

Black symbol on white background.

MEANING Shows it must not be done

Example No smoking



### Prohibition signs

#### Mandatory signs

SHAPE Circular.

COLOUR White symbol on blue background.

MEANING Shows what must be done

Example Wear hand protection.



SHAPE Triangular.

COLOUR Yellow background with black border and symbol

MEANING Warns of hazard or dang

Example Caution, risk of electric shock.



### Warning signs

#### Information signs

SHAPE Square or oblong.

COLOUR White symbols on green background.

MEANING Indicates or gives information of safety provision.

Example First aid point.

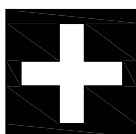
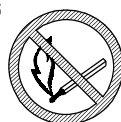


Fig 6



SMOKING AND NAKED  
FLAMES PROHIBITED



DO NOT EXTINGUISH  
WITH WATER



PEDESTRIANS  
PROHIBITED

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Fig 7



WEAR HEAD  
PROTECTION



WEAR EYE  
PROTECTION



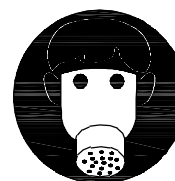
WEAR HEARING  
PROTECTION



WEAR FOOT  
PROTECTION



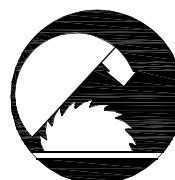
WEAR HAND  
PROTECTION



WEAR  
RESPIRATOR



WEAR SAFETY  
HARNES/BELT



USE ADJUSTABLE  
GUARD



WASH HANDS

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## Questions 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?

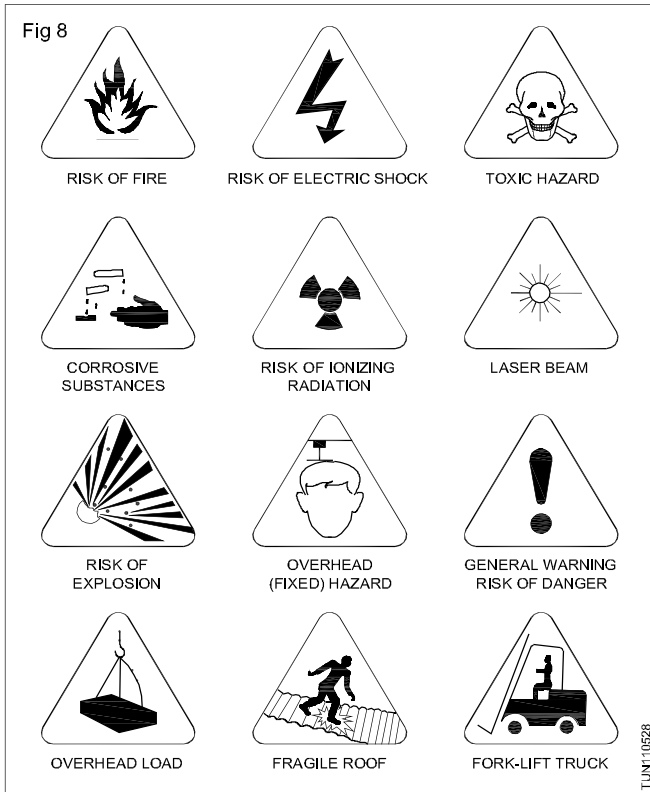
Are the plant, machinery and tools that you use really safe? Do you know how to use them safely and keep them in a safe condition?

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?

Fig 8



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

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

## Basic provisions for OSH

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

- state the basic provisions of safety, health, welfare under legislation of India.

India has legislation on occupational health and safety for over 50 years. A safe and health work environment is the basic right of every worker. The constitutional provision for occupational safety and health under the Article 24 - No child below the age of fourteen years shall be employed to work in any factory or mine or engaged in other hazardous employment.

Article 39 (e & f) - The state shall in particular direct its policy towards securing.

- That the health and strength of workers, men and women, and the tender age of children are not abused and that citizens are not forced by economic necessity to enter vocations unsuited to their age and strength.
- That children are given opportunities and facilities to develop in healthy manner and in conditions of freedom and dignity and that childhood and youth are protected against exploitation and against moral and material abandonment.

Article 42 - The state shall make provision for securing just and human conditions of work and maternity relief.

### National policy

Safety and health occupies a very significant position in India's constitution which prohibits employment of children under 14 in factories, mines and in hazardous occupations. Policy aims to protect the health and strength of all workers. It prevents employment in occupations unsuitable for the age and strength of the workers. It is the policy of the state to make provisions for securing just and humane

conditions of work. The constitution provides a broad framework under which policies and programmes for occupational health and safety could be established.

### National Legislation

Legislation provides an essential foundation for safety. To be meaningful and effective legislation should be reviewed and updated regularly as scientific knowledge develops.

The most important legislation cover occupational safety, health and welfare are :

- The Factories Act 1948. amended 1954, 1970, 1976, 1987.
- The Mines Act, 1952.
- The dock workers (safety, health and welfare) Act, 1986.
- The plantation labour Act, 1951.
- The Explosives Act, 1984.
- The Petroleum Act, 1934.
- The Insecticide Act, 1968.
- The Indian Boilers Act, 1923.
- The Indian Electricity Act, 1910.
- The Dangerous Machines (Regulations) Act, 1983.
- The Indian Atomic Energy Act, 1962.
- The Radiological Protection Rules, 1971.
- The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989.

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**Importance to be observed in the industry/ shop floor**

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

- **learn about the importance of safety**
  - **list precaution to follow while working fitting job.**
- 

**Importance of safety**

Safety is taking care of oneself as well as his belongings. In a factory personal safety is as important as Machine/ Factory safety.

Wherever safety norms are not followed accidents happen. Accidents do not happen but they are caused, due to lack of knowledge in safety, lack of discipline in implementing safety norms. Most accidents can be avoided if people strictly adhere to the safety procedures. This is common, irrespective of personal safety. Factory safety which covers general safety also safety rules/precautions are explained in details under occupational safety.

The safety procedures have to be evolved for each department, based on the operation involved, machineries used etc.,

**Precaution to be observed in a Fitting shop**

Fitting shop is involved with shaping of the material by sawing, filing, drilling etc and assembly of components. In the process many hand tools, processing method are standardised for all the fitting operations listed above. The following safety measures are generally to be followed in a fitting shop.

- 1 Files must have well fitted with handle.
- 2 See that work pieces is perfectly clamped or fixed in the vice.
- 3 Never use hammer with loose/mush room splint heads.
- 4 Select suitable weight of the hammer for the work.

- 5 Check the hammer head and handle whether any crack is there.
- 6 Ensure that the face of the hammer is free from oil or grease
- 7 Use the right tools for the operation performed.
- 8 Do not use a spanner as a hammer.
- 9 Do not use a steel rule as a screw driver.
- 10 Use the coolant at the time of hack shaving and drilling.
- 11 Keep the work place neat and clean after work.

The safety in a fitting shop included general safety. Such as keeping the floor and gangway neat, unnecessary running in the shop, careless in machine or tool handling not wearing personal protective equipments while entering the shop floor. Keeping away from electrical power lines, not touching the electrical switches with wet hands/base footed, keeping always alert in the shop floor etc are part of the general safety.

**Precautions to be followed while working in a fitting shop**

The chances of accidents are more in a fitting shop, using hammer, hacksaw, chipping with the chisel, grinding a punch or operating a machine. The accident can happen due to faulty tools, lack of safety knowledge, lack of cleanliness etc.,. The following table gives safety precaution to be followed for each tool used in fitting shop.

## **Power failure and system failure**

**Objectives:** On completion of this lesson you shall be able to

- **state prevention of electrical accidents**
- **state the meaning of electric shock**
- **state the severity of shock based on the voltage level**
- **rescue a person who is in contact with a live wire**
- **treat a person for electric shock/injury**
- **state the response to emergency during power failure.**

### **Prevention of electrical accidents**

- 1 Have only licensed electricians should install, repair and dismantle job site wiring.
- 2 Always plug in to a ground fault circuit interrupter protection.
- 3 Check each extension cord before use.
- 4 Do a through check for electrical wiring before cutting through any wall, floor or ceiling.
- 5 Inspect power tools on a regular basis.
- 6 Check insulated tools for damage before each use
- 7 Never modify electrical plugs.
- 8 Keep extension cords in a safe place where they won't be stepped on or driven over.
- 9 Ensure that all electrical components stay dry.
- 10 Use the right extension cord for the job.

### **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 at least 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 as shown in Fig 1.
- 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.

The severity of an electric shock will depend on the level current which passes through the body and the length of time of contact. Do not delay, act at once. Make sure that the electric current has been disconnected.

If the casualty is still in contact with the supply - break the contact either by switching off the power, removing the plug or wrenching the cable free. If not, stand on some insulating material such as dry wood, rubber or plastic, or using whatever is at hand to insulate yourself and break the contact by pushing or pulling the person free. (Figs 1 & 2)

Fig 1

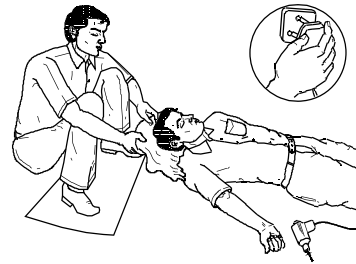


If you remain un-insulated, do not touch the victim with your bare hands until the circuit is made dead or he is moved away from the equipment.

If the victim is aloft, measures must be taken to prevent him from falling or at least make him fall safe.

Electric burns on the victim may not cover a big area but may be deep seated. All you can do is to cover the area with a clean, sterile dressing and treat for shock. Get expert help as quickly as possible.

Fig 2



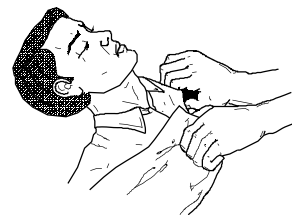
If the casualty is unconscious but is breathing, loosen the clothing about the neck, chest and waist and place the casualty in the recovery position. (Fig 3)

Fig 3



Keep a constant check on the breathing and pulse rate. keep the casualty warm and comfortable. (Fig 4)

Fig 4



Send for help.

**Do not give an unconscious person anything through the mouth.**

**Do not leave an unconscious person unattended.**

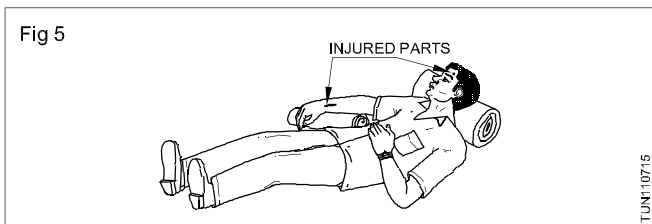
**A person having received electric shock may also have burn injuries. DO NOT waste time by applying first aid to the burns until breathing has been restored and the patient can breathe normally unaided.**

#### **Treatment to be given in case of burns, severe bleeding**

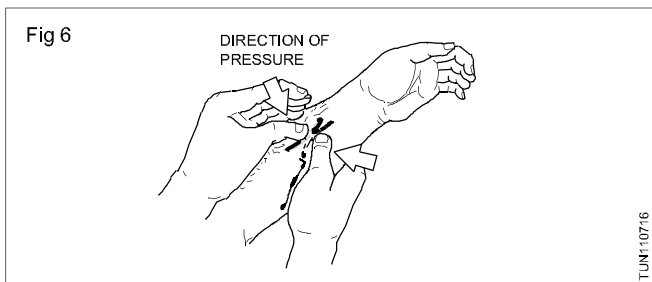
Burns caused due to electrical shock are very painful. If a large area of the body is burnt, clean the wound using clear water, or with clean paper, or a clean shirt. This treatment relieves the victim of pain. Do not give any other treatment on your own. Send for a doctor for further treatment.

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;

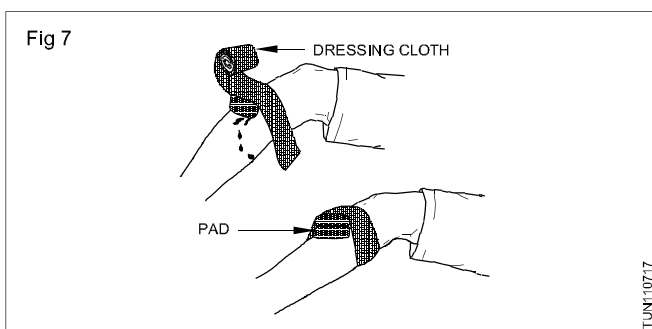
- make the patient lie down and rest
- if possible, raise the injured part above the level of the body as shown in Fig 5.



Squeeze together the sides of the wound as shown in Fig6. 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 7.



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 to Lesson/Exercise 1.1.01).

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.**

#### Response to emergency during power failure

Power failure may damage sensitive equipments or experiments. However sensitive electronic equipments, instruments and computer should be shut down before a planned outage.

In a power failure, equipment on emergency power will have power supplied to it by the emergency generator.

- Turn off lights and equipment that do not need power
- Check if your cold room is on emergency power if not, move temperature sensitive materials (or) arrange for a dry ice delivery.
- A disruption may damage computers, equipments or instruments with automatic resets or logic functions. Turn these off if it is not essential for continuous operation. Back up computers routinely.
- Designate an emergency contact for the Manager or coordinator. Services to contact you for your information in the event of an unexpected shutdown.
- Even when using a surge protector, make sure the electrical load is not too much for the circuit.
- Avoid over loading outlets with too many appliances.

## Fire and system failure

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

- explain various occupational hazard
- state occupational hygiene
- describe occupational disease disorders and its prevention.

All jobs, primarily provides many economic and other benefits, But equally there are a wide varieties of workplace dangers and hazards, which are risky to the health and safety of people at work.

### Basic hazards :

Employers have a responsibility to protect workers against health and safety hazards at work. Workers have the right to know about potential hazards and to refuse work that they believe is dangerous. Workers also have a responsibility to work safely with hazardous materials. Health and Safety hazards exist in every workplace. Some are easily identified and corrected, while others create extremely dangerous situations that could be a threat to your life or long-term health. The best way to protect oneself is to learn to recognize and prevent hazards in the workplaces.

**Physical hazards** are the most common hazards and are present in most workplace at some point of time. Examples include; live electrical cords, unguarded machinery, exposed moving parts, constant load noise, vibrations, working from ladders, scaffolding or heights, spills, tripping hazards. Physical hazards are a common source of injuries in many industries. Noise and vibration, Electricity, Heat, Ventilation, Illumination, Pressure, Radiation etc.

- **Ventilation** and air circulation have major say on the health and working comfort of the worker. There must be good ventilation, a supply of fresh, clean air drawn from outside is required. It must be uncontaminated and circulated around the workspace. Closed or confined spaces also present a work hazard, which has limited openings for entry and exit and unfavorable natural ventilation, and which is not intended for continuous employee occupancy.

Spaces of this kind can include storage tanks, ship compartments, sewers, and pipelines. Asphyxiation is another potential work hazard in certain situations. Confined spaces can pose a hazard not just to workers, but also to people who try to rescue them.

- **Noise and Vibration** : Noise and vibration are both fluctuations in the pressure of air (or other media) which affect the human body. Vibrations that are detected by the human ear are classified as sound. We use the term 'noise' to indicate unwanted sound. Noise and vibration can harm workers when they occur at high levels, or continue for a long time. (Fig 1)



- **Electricity** poses a danger to many workers. Electrical injuries caused by contact with electric energy can be divided into four types
  - fatal electrocution,
  - electric shock,
  - burns,
  - falls .



Wires and electrical equipment pose safety threats in the workspace. When employees mishandle electrical equipment and wires, they are taking risks. (Fig 2)

- **Temperature (Heat Stress)** : A reasonable working temperature, for strenuous work, local heating or cooling where a comfortable temperature is to be maintained which is safe and does not give off dangerous or offensive fumes, Thermal clothing and rest facilities where necessary (for example, for 'hot work' or work in cold storage areas). Sufficient space in workrooms etc. are under the legislation for implementation by the owner of the factories.
- **Illumination (lighting)** : Good lighting is essential for productivity Natural light is preferred where possible. Glare and flickering should be avoided.

## HEAT EXHAUSTION/HEAT STROKE & TREATMENT

- NORMAL BODY CORE TEMPERATURE MINUS 37 °C
- HEAT EXHAUSTION SIMILAR SUGGESTION MINUS 38 °C - 40 °C
- HEAT STROKE 41 °C AND HIGHER

### SIGNS AND SYMPTOMS

#### HEAT EXHAUSTION

- RESTLESS
- WEAK
- DIZZY
- RAPID PULSE
- LOW BLOOD PRESSURE
- NAUSEA
- VOMITTING
- MENTAL STATUS - NORMAL
- BEHAVIOR - NORMAL

#### HEAT STROKE

- REDUCED LEVEL OF CONSCIOUSNESS
- IRRITABLE
- MUSCULAR PAIN
- RAPID PULSE
- HIGH BLOOD PRESSURE
- NAUSEA
- VOMITTING
- MENTAL STATUS - CONFUSED
- BEHAVIOUR - ERRATIC
- HOT, DRY, RED SKIN
- DEATH

### TREATMENT

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• LAY PERSON DOWN &amp; ELEVATE LEGS</li> <li>• ENSURE NORMAL BREATHING</li> <li>• IF THIRSTY GIVE WATER TO DRINK</li> <li>• REPORT INCIDENT TO SUPERVISOR</li> </ul> | <ul style="list-style-type: none"> <li>• MOVE PERSON TO COOL VENTILATED AREA</li> <li>• CHECK FOR BREATHING, PULSE &amp; CIRCULATION</li> <li>• IF POSSIBLE COVER THE PERSON WITH ICE PACKS OR COLD WATER TO REDUCE THE BODY TEMPERATURE</li> <li>• GIVE WATER TO DRINK</li> <li>• MONITOR VITAL SIGNS</li> <li>• GET PERSON TO HOSPITAL</li> <li>• REPORT INCIDENT TO SUPERVISOR</li> </ul> |
|--|--|

**Chemical hazards** are present when you are exposed to any chemical preparation (solid, liquid or gas) in the workplace. Examples include: cleaning products and solvents, vapours and fumes, carbon monoxide or other gases, gasoline or other flammable materials. Chemicals hazards are the major causes of concern. Many chemicals are used not on generic names but on brands. The chemicals have biological effects on the human body if digested, inhaled or if direct skin contact with the chemicals, injuries occurs.

Accidents involving chemical spills, exposure and inhalation can lead to burns, blindness, rashes and other ailments. Most of them cause acute poisoning when taken orally, eye-skin irritation, Respiratory injuries etc. Long term effects of chemicals on blood, nerve, bones, kidneys, livers etc., may lead to serious diseases/disorders. The only way is to understand their chemical nature and handle them very carefully.

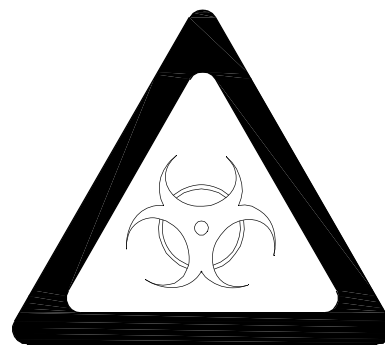
## CHEMICAL POISONING

**Poison** : An agent or substances which may cause structural damage or functional disorders when introduced into the body by :

- Ingestion
- Inhalation
- Absorption or
- Injection

**Biological hazards (Fig 3)** come for working with people, animals or infectious plant material. Examples include; blood or other bodily fluids, bacteria and viruses, insect bites, animal and bird droppings. Biological hazards are due agent like bacteria, virus, fungi, mold, blood-borne pathogens etc., are main agents to cause various illness. (Fig 4)

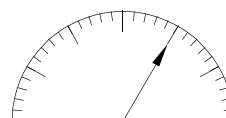
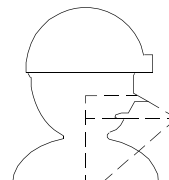
Fig 3



BIOLOGICAL HAZARD

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Fig 4

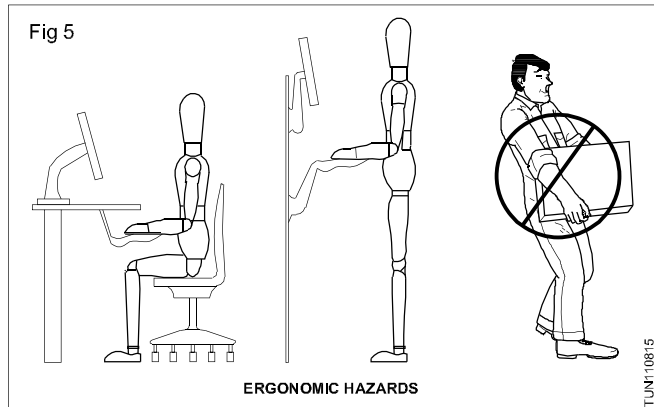


BIOLOGICAL HAZARD

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## Ergonomic hazards (Fig 5)

Ergonomic hazards occur when the type of work you do, your body position and/or your working conditions put a strain on your body. They are difficult to identify because you don't immediately recognize the harm they are doing to your health. Examples include : poor lighting, improperly adjusted workstations and chairs, frequent lifting, repetitive or awkward movements. Musculo Skeletal Disorders (MSDs) affect the muscles, nerves and tendons. Work related MSDs are one of the leading causes injury and illness.



Workers in many different industries and occupations can be exposed to risk factors at work, such as lifting heavy items, bending, reaching overhead, pushing and pulling heavy loads, working in awkward body postures and performing the same or similar tasks repetitively. Exposure to these known risk factors for MSDs increases a worker's risk of injury.

**Mechanical hazards** are factor arise out of varieties of machines in industries including manufacturing, mining, construction and agriculture. They are dangerous to the worker when operated without training and experience. Operating machines can be risky business, especially large, dangerous machines. When employees don't know how to properly use machinery or equipment, they risk such injuries as broken bones, amputated limbs and crushed fingers. Many machines involve moving parts, sharp edges, hot surfaces and other hazards with the potential to crush, burn, cut, shear, stab or otherwise strike or wound workers if used unsafely.

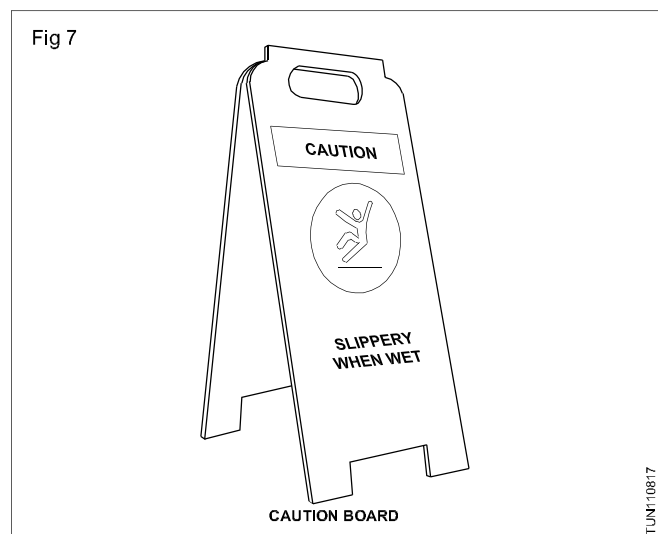
Various safety measures exists to minimize these hazards, lockout-tagout procedures for machine maintenance and roll over protection systems for vehicles. Machines are also often involved indirectly in worker deaths and injuries, such as in cases in which a worker slips and falls, possibly upon a sharp or pointed object. Safeguarding machinery decreases accidents and keeps employees who use the machine safer.

**Falls (Fig 6)** are a common cause of occupational injuries and fatalities, especially in construction, extraction, transportation, healthcare, and building cleaning and maintenance. Slips and falls to be the leading cause of workplace injuries and fatalities. From slippery surfaces to un-railed staircases, the possibility of slipping, tripping

or falling on the job is a workplace safety hazard. Broken bones, fractures, sprained wrists and twisted ankles constitute some of the physical injuries caused by falling accidents.



Falls in the workplace is effectively prevented by putting caution signs around slippery surfaces (Fig 7), having rails on every staircase and making sure that wires on the floor are covered to avoid tripping. They are perhaps unavoidable in certain industries, such as construction and mining, but over time people have developed safety methods and procedures to manage the risks of physical danger in the workplace. Employment of children may pose special problems.



**Psychosocial hazards** : psychosocial hazards are related to the way work is designed, organized and managed, as well as the economic and social contexts of work and are associated with psychiatric, psychological and/or physical injury or illness. Linked to psychosocial risks are issues such as occupational stress and workplace violence which are becoming a major challenge to occupational health and safety.

## Workplace inspections prevent hazards

Regular workplace inspections are another important factor in preventing injuries and illnesses. By critically examining all aspects of the workplace, inspections identify and record hazards that must be addressed and corrected.

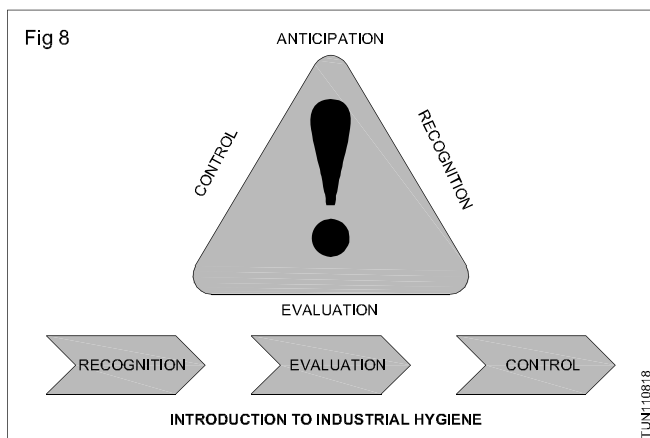


## A workplace inspection should include

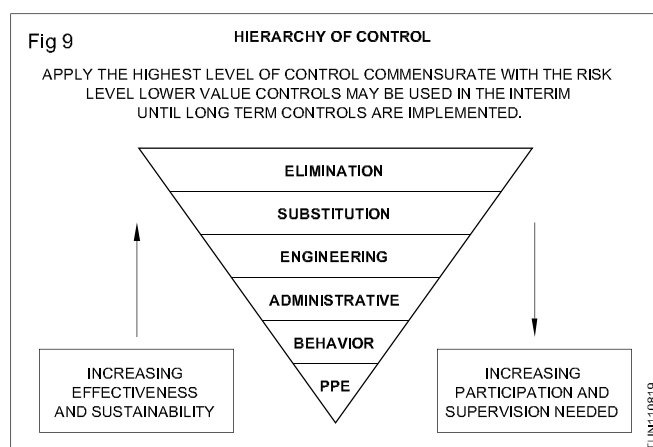
- Listening to the concerns of workers and supervisors.
- Gaining further understanding of jobs and tasks.
- Identifying existing and potential hazards.
- Determining underlying causes of hazards.
- Monitoring hazard controls (Personal protective equipment, engineering controls, policies, procedures)
- Recommending corrective action.

## Occupational hygiene

Occupational hygiene (Industrial hygiene) (Fig 8) is the discipline of anticipating, recognizing, evaluating and controlling health hazards in the working environment with the objective of protecting worker health and well-being and safeguarding the community at large.



Occupational hygiene uses science and engineering to prevent ill health caused by the environment in which people work. It helps employers and employees to understand the risks and improve working conditions and working practices. (Fig 9)



## Occupational disease/Disorders & its prevention

Occupational disease, illness incurred because of the conditions or environment of employment. Unlike with accidents, some time usually elapses between exposure to the cause and development of symptoms. In some instances, symptoms may not become evident for many years and hence the relationship between work and disease is ignored.

Among the environmental causes of occupational disease are subjection to extremes of temperature leading to heatstroke, air contaminants of dust, gas, fumes causing diseases of the respiratory tract, skin, or muscles and joints or changes in atmospheric pressure causing decompression sickness, excessive noise causing hearing loss, exposure to infrared or ultraviolet radiation or to radioactive substances. The widespread use of X rays, radium and materials essential to the production of nuclear power has led to an special awareness of the dangers of radiation sickness. Hence careful checking of equipment and the proper protection of all personnel are now mandatory.

In addition there are industries in which metal dusts, chemical substances, and unusual exposure to infective substances constitute occupational hazards. The most common of the dust and fiber inspired disorders are the lung diseases caused by silica, beryllium, bauxite and iron ore to which miners, granite workers and many others are exposed causing pneumoconiosis and those caused by asbestos is cancer - mesothelioma, Fumes, Smoke and Toxic liquids from a great number of chemicals are other occupational dangers. Carbon monoxide, Carbon tetrachloride, Chlorine, Creosote, Cyanides, Dinitrobenzene, Mercury, Lead Phosphorus and nitrous chloride are but a few of the substances that on entering through the skin, respiratory tract or digestive tract cause serious and often fatal illness.

Occupational hazards also are presented by infective sources. Persons who come into contact with infected animals in a living or deceased state are in danger of acquiring such diseases as anthrax. Doctors, Nurses and other hospital personnel are prime targets for the tuberculosis bacillus and for many other infectious organisms.

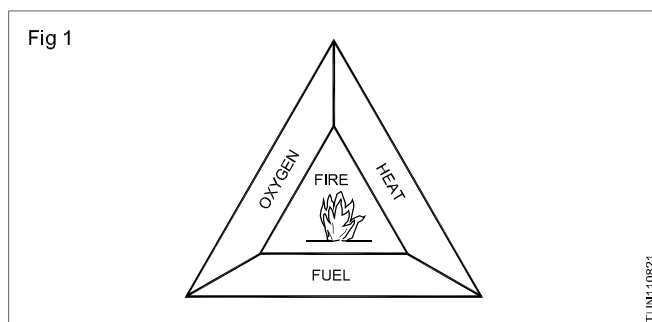
# Fire and Fire extinguishers

**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 anyone 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.

<b>Fuel</b>	Any substance, liquid, solid, or gas will burn if given oxygen and high enough temperature.
<b>Heat</b>	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.
<b>Oxygen</b>	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 common sense.

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 (Thinner, Adhesive solutions, Solvents, Kerosene, Spirit, LPG Gas etc.) should be stored in a separate 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.

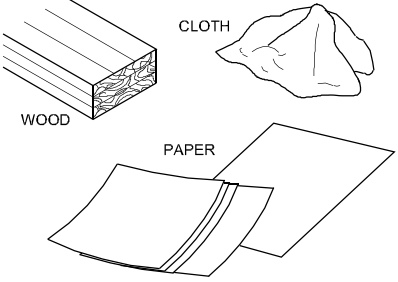
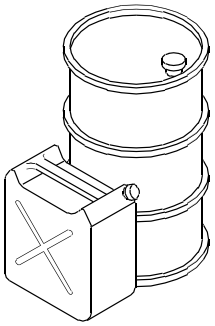
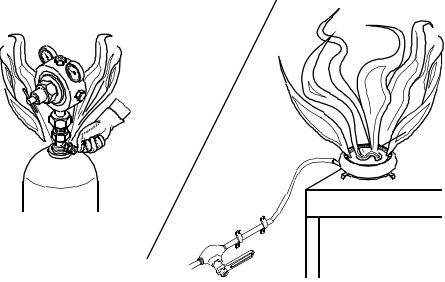

Fires are classified into four types in terms of the nature of fuel.

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>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 liquids &amp; liquifiable solids</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 used on burning liquids.</p> <p>Foam, dry powder or CO<sub>2</sub> may be used on this type of fire.</p>
<p>CLASS 'C' Fire      Gas and liquified gas</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 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) extinguishers must not be used on electrical equipment under any circumstances.</p>

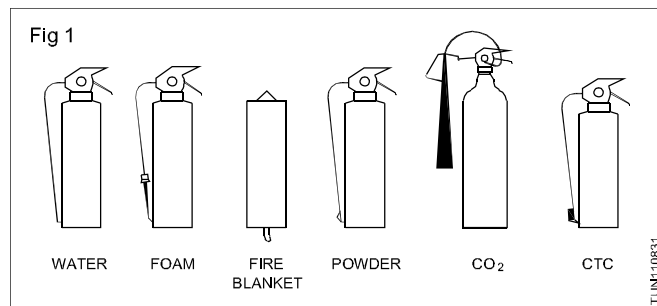
## Types of fire extinguishers

**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 an out of control fire.

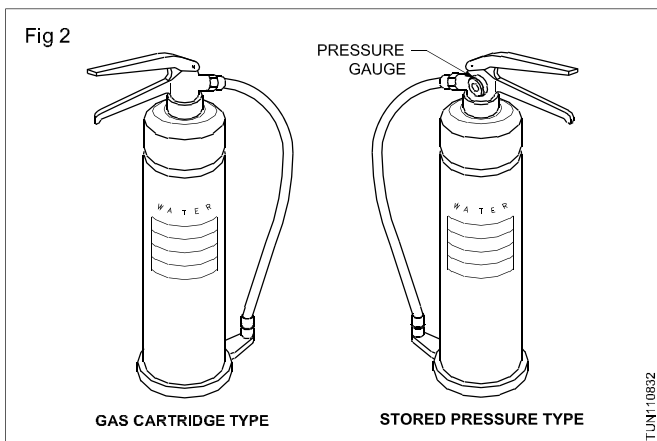
Many types of fire extinguishers are available with different extinguishing 'agents' to deal with different classes of fires. (Fig 1)



### 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)

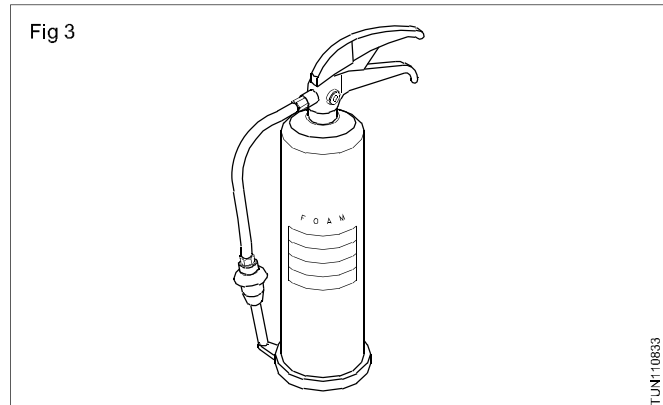
These may be of stored pressure or gas cartridge types.

Always check the operating instructions on the extinguisher before use.

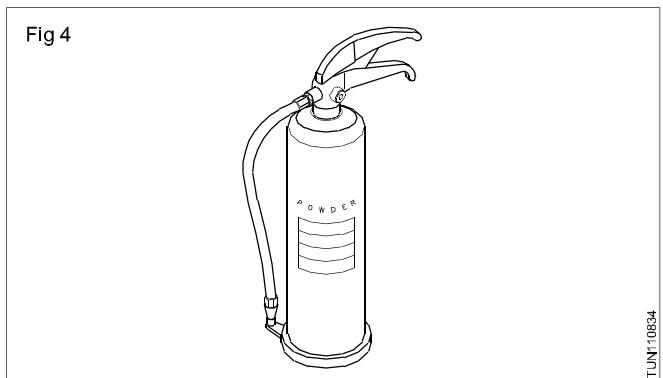
Foam extinguishers are most suitable for:

- 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 (CO<sub>2</sub>)

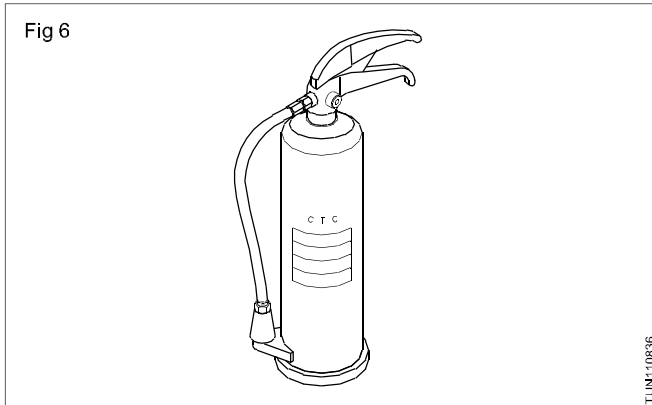
This type is easily distinguished by the distinctively shaped discharge horn. (Fig 5)



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 bromochlorodifluoromethane (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 risk getting 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.

### Response to emergency during Fire

- 1 Inform people in the immediate area to evacuate.
- 2 Activate the nearest building fire alarm.
- 3 Call if safe to do so. Otherwise evacuate the building and call from other side the building.
- 4 If the fire is small and you have been trained to use a fire extinguisher, you may attempt to extinguish the fire, make sure that you have a safe exit from the fire area and use the buddy system.

- 5 To use a fire extinguisher, remember the acronym pass
  - Pull the pin
  - Aim the extinguisher at the base of the fire
  - Squeeze the handle
  - Sweep the extinguisher from side to side.
- 6 Evacuate the building as soon as the alarm sounds and proceed to designated evacuation meeting point.
- 7 On your way out, warn others near by.
- 8 Move away from fire and smoke close doors and windows if time permits.
- 9 Don't touch and open /close doors if it is hot.
- 10 If doors are hot, place a wet cloth at the base to keep smoke from entering.
- 11 Use stairs only. Do not use elevators.
- 12 Move well away from the building and go to your designated meeting point.
- 13 Do not reenter the building or work area until you have been instructed to do by the emergency responders.

### Response to emergency during system failure:

Emergency guide outlines procedure and actions for managing major emergencies that may threaten the health and safety of the campus community or disrupt its programs and activities. The guide identified individuals that are responsible for emergency response and critical support services.

A work place emergency is an unforeseen situation that threatens employees or customers disrupt or shut down operations or causes physical or environmental damage.

The committee's main responsibility is to manage and deal with any emergency or disastrous situation. The committee consists of faculty and admin staff from different departments can form other sub committees or an emergency response team in case of necessities.

Each department should nominate a person or term to act / follow the guidelines framed with respect their areas.

Certain exercises like evacuation, security, safety, fire medical, transportation etc.

The exercise includes:

- Rescue persons who are in immediate danger.
- Pull the nearest fire alarm.
- Inform security personnel.
- Evacuate the building using the nearest exit.
- Account for all staff with service and security representative.
- Document the situation, what happened and the outcome.

The emergency team's main responsibility is to manage and deal with any critical situations.



## **Precautions to be followed while working in a fitting shop**

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

- **safe use of hand tools**
- **safe use of machinery & equipment.**

While working in a fitting shop, the chances of accidents are more in using hammer, handsaw, chipping with a chisel, grinding a punch or operating a machine. The

accident can happen due to use of faulty tools or lack of safety knowledge. The following table gives the safety precaution to be followed for each tool used in a fitting shop.

<b>Name of the tools</b>	<b>Safety</b>
Hammer	Select correct weight of hammer for particular work, check the handle defects. Do not use ashroomhead hammer. Select the suitable hammer (ball peen/cross/straight ) for the appropriate work.
Scriber	Do not use blunted point. Place a cork on the point when not in use to prevent accidents.
Hacksaw frame	Do not use without handle Tight the hack saw blades with correct tension.  While selecting blades, make sure atleast two teeth of the blades will be in contact with the work at all times.
Cutting plier	To use insulated cutting plier for electrical work.
Screw driver	Select the suitable screw driver to suit screw head.
Vernier Caliper	Do not place with other hand tools. After the work clean and apply film of oil. Check jaws butting and '0' of main scale and vernier scale matching.
Micro meter	Before measuring clean the measuring surface. Do not mix with other tools. Find and note the 'Zero' error before use.
Swage block	Do not give heavy blows on the edge or corners of the swage block without proper handle of swages and flatters should be fitted firmly for safe working.
Punch and drift	For retaining the hardness and original shape of punches and drifts, they should be frequently cooled in water. Handle must be secured rigidly so that the punches Do not come off while working.

Name of the tools	Safety
Machineries and Equipments	<p>Ensure that electrical connections are made by an authorised electrician only.</p> <p>Concentrate on your work.</p> <p>Have a calm attitude.</p> <p>Do things in a methodical way</p> <p>Don't engage yourself in conversation with others while concentrating on your job.</p> <p>Don't distract the attention of others.</p> <p>Don't try to stop a running machine with hands.</p> <p>Switch off the machine immediately if something goes wrong.</p> <p>Keep the machine clean.</p> <p>Replace any worn out or damaged accessories, holding devices, nuts, bolts etc as soon as possible.</p> <p>Do not attempt operating machine until you know how to operate it properly.</p> <p>Do not adjust the stroke, tool or the workpiece unless the power is off.</p> <p>Stop the machine before changing the speed.</p> <p>Disengage the automatic feeds before switching off.</p> <p>Check the oil level before starting the machine.</p> <p>Before starting the machine, move the ram by hand to ensure that the ram or tool-holder does not strike the workpiece or table.</p> <p>Never start a machine unless all the safety guards are in position.</p> <p>Take measurements only after stopping the machine.</p> <p>Use wooden planks over the bed while loading and unloading heavy jobs.</p> <p>Do not stop the machine before the finish of the cutting stroke.</p>