

Electrical Related Theory for Exercise 1.1.06 & 1.1.07

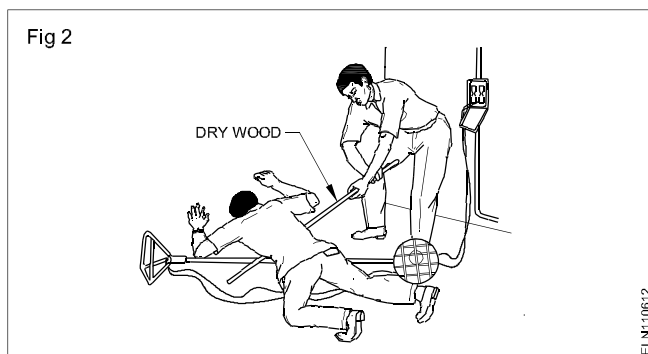
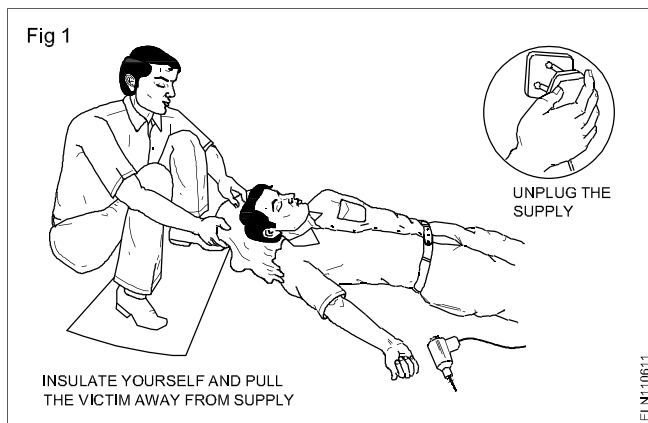
Electrician - Safety Practice and Hand Tools

Rescue operation - First aid treatment - Artificial respiration

- Objectives:** At the end of this lesson you shall be able to
- explain how to rescue a person who is in contact with a live wire.
 - state the first aid and its key aims.
 - explain ABC of the first aid.
 - brief how to give first aid treatment for a victim.
 - explain how to treat a person affected due to electric shock/injury.

The severity of an electric shock will depend on the level of 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 victim is still in contact with the supply - break the contact either by switching off or by removing the plug or pulling the cable free.

If not, stand on some insulating material such as dry wood, rubber or plastic or newspaper and then pull his shirt sleeves. However, you have to insulate yourself and break the contact by pushing or pulling the person free. (Figs 1 & 2)



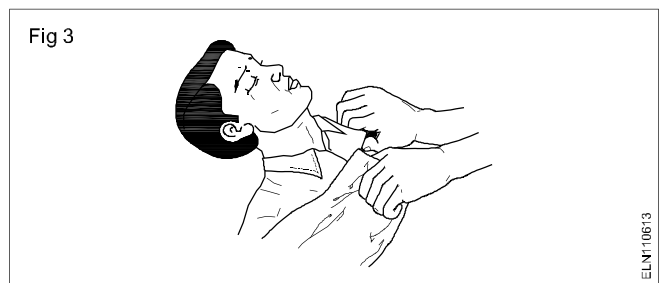
In any case avoid direct contact with the victim. Wrap your hands in dry material if rubber gloves are not available.

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 at a height, efforts must be taken to prevent him from falling or to make him fall safe.

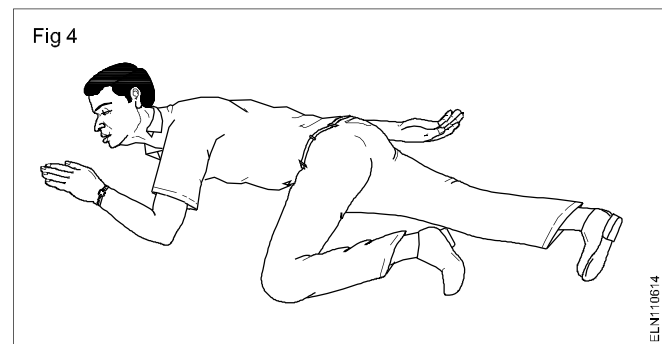
Electric burns on the victim may not cover a big area but may be deep seated. All you can do is to cover the area with a clean, sterile dressing and treat for shock. Get expert help as quickly as possible.

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



Keep a constant check on the breathing and pulse rate.

Keep the casualty warm and comfortable in the recover position. Send for help. (Fig 4)



- Do not give an unconscious person anything to eat or drink.**
- Do not leave an unconscious person unattended.**

If the casualty is not breathing - **Act at once to resuscitate the victim** - do not waste time.

There are four methods of artificial resuscitation is illustrated in Exercise 1.1.07 follow them.

Basic first-aid treatment

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 victim to safer place, 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 then 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 **Cardio Pulmonary 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 may cause 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 lead one to do wrong procedures. Hence be calm and focus on the given institution. Quick and confident approach can lessen the effect of injury.

Call medical emergencies

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

Surroundings play vital role

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

Do no harm

Most often over enthusiastically practiced first aid viz. administering water when the victim is unconscious, wiping clotted blood (which acts as plug to reduce bleeding), correcting fractures, mishandling injured parts etc., would leads to more complication.

Patients often die due to wrong FIRST AID methods, who may otherwise easily survive. Do not move the injured person unless the situation demands. It is best to make him lie wherever he is because if the patient has back, head or neck injury, moving him would causes more harm.

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 the hospital, they would have passed that critical period. First aid care come handy to save lives.

It helps to get to the nearest emergency room as quickly as possible through safe handling and transportation. The shorter that time, the more likely the best treatment applied.

Maintain the hygiene

Most important, the first aider need to wash hands and dry before giving any 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 gently 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 PR 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.

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 extent for such emergencies.

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 critical.

- 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 injures, vehicle's details and registration, number of people involved etc.

Call emergency service

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

Report your location

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

Give the dispatcher your phone number

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

Describe the nature of the emergency

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

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

How to do basic first aid?

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

Important guideline for first aiders

Evaluate the situation

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

Remember A-B-Cs

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

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

Avoid moving the victim

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

Call emergency services

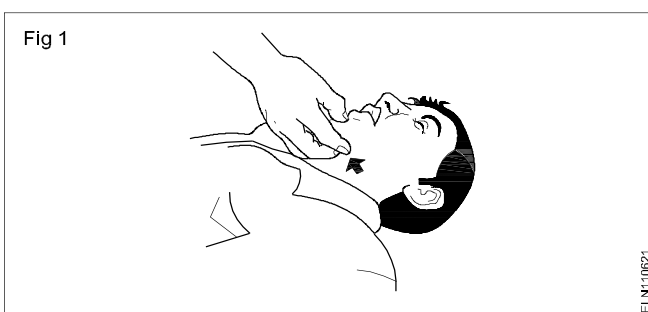
Call for help or tell someone else to call for help as soon as possible. If alone at the accident scene, try to establish breathing before calling for help, and do not leave the victim alone unattended.

Determine responsiveness

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

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

- Keep head and neck aligned.
- Carefully roll them onto their back while holding his head.



- Open the airway by lifting the chin (Fig 1).

Look, listen and feel for signs of breathing

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

If the victim is not breathing, see the section below

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

Check the victim's circulation

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

Treat bleeding, shock and other problems as needed

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

- **Stop bleeding:** Control of bleeding is one of the most important things to save a trauma victim. Use direct pressure on a wound before trying any other method of managing bleeding.
- **Treat shock:** Shock may cause 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.

Causes for COMA Stage

- 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:

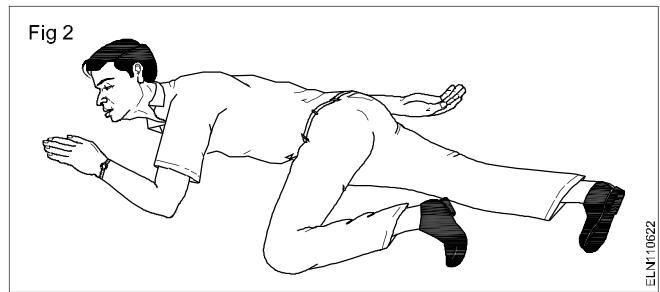
- Confusion
- Drowsiness
- Headache
- Inability to speak or move parts of his or her body (see stroke symptoms)
- Light headedness
- Loss of bowel or bladder control (incontinence)
- Rapid heartbeat (palpitation)
- Stupor

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 (Fig 2). 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 and 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 (Fig 2) with the neck extended. Never give any thing 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.
- **Think about drugs:** was there an overdose? Or might the person have under dosed - that is not taken enough of a prescribed medication?
- **Consider trauma:** is the person physically injured?
- **Look for signs of infection:** redness and/ or red streaks around a wound.
- **Look around for signs of Poison:** an empty bottle of

pills or a snakebite wound.

- **Consider the possibility of psychological trauma:** might the person have a psychological disorder of some sort?
- Consider stroke, particularly for elderly people.
- Treat according to what you diagnose.

Electric 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.

As blood flow slows, so does the amount of oxygen reaching the brain. The victim may appear to be confused, weak, and dizzy and may eventually deteriorate into unconsciousness. Try to compensate for this lack of oxygen, the heart and breathing rates both speed up, gradually becoming weaker, and may eventually cease.



Potential causes of shock include: sever internal or external bleeding; burns; severe vomiting and diarrhoea, especially in children and the elderly; problems with the heart.

Symptoms of shock

Victims appear pale, ice cold, pulse appear initially faster and gets slower, breathing becomes shallow. Weakness, dizziness, confusion continue. If unattended the patient may become unconscious and die.

First aid

Keep the patient warm and at mental rest. Assure of good air circulation and comfort. Call for help to shift the patient to safer place/ hospital.

- **Warmth:** Keep the victim warm but do not allow them to get overheated. If you are outside, try to get something underneath her if you can do easily. Wrap blankets and coats around her, paying particular attention to the head, through which much body heat is lost.
- **Air:** Maintain careful eye on the victim's airway and be prepared to turn them into the recovery position if necessary, or even to resuscitate if breathing stops. Try to keep back bystanders and loosen tight clothing to allow maximum air to victim.
- **Rest:** Keep the victim still and preferably sitting or lying down. If the victim is very giddy, lay them down with there legs raised to ensure that maximum blood and therefore maximum oxygen is sent to the brain.

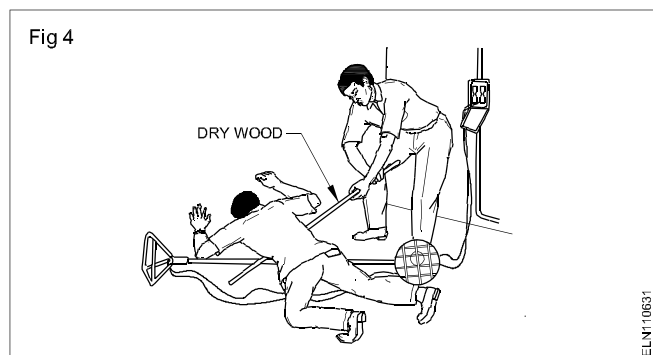
Treatment of electric shock

Prompt treatment is essential.

If assistance is close at hand, send for medical aid, then carry on with emergency treatment.

If you are alone, proceed with treatment at once.

Switch off the supply, if this can be done without undue delay. Otherwise, remove the victim from contact with the live conductor, using dry non-conducting materials 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, bakelised paper, tube etc. (Fig 4)



Avoid direct contact with the victim. Wrap your hands in dry material if rubber gloves are not available.

Electrical burns: A person receiving an electric shock may also sustain burns when the current passes through his body. Do not waste time by applying first aid to the burns until breathing has been restored and the patient can breathe normally - unaided.

Burns and scalds: Burns are very painful. If a large area of the body is burnt, give no treatment, except to exclude the air, eg. by covering with water, clean paper, or a clean shirt. This relieves the pain.

Artificial respiration methods to the electric shock victim

Artificial respiration methods already dealt in practical exercise 1.1.07 in detail. Refer practical book.

Disposal of waste material

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

- state about the waste material
- state the types of waste material and source of waste
- list out the waste material in workshop
- explain the methods of disposal of waste material.

Waste

Waste are unwanted or unusable materials. Waste is any substance which is discarded after primary use, or it is worthless, defective and of no use.

Waste is the by product of all the matter which is consumed by living organisms and is used in the industries as well as in agriculture and other fields. Usually this waste is thrown on areas outside the cities but this open disposal decreases the usable land into non-usable land and also polluting the environment.

Waste can be broadly classified as follows

- a) Rural waste
- b) Urban waste
 - i) Solid waste
 - ii) Liquid waste

a) Rural waste

Rural waste is the waste from agricultural and dairy forms. These can be reused by burning agricultural waste and composting. The waste produced by the man and animal is now used in the production of fuel by bio-gas plants.

b) Urban waste

It is the waste from house hold articles or from industries within municipal limit

It can be again classified into two types.

i) Solid waste

Solid waste is the material is hard (from industries) such as newspaper, cans, bottles, broken glass, plastics container, polythene bags etc.

ii) Liquid waste

It is the water based waste which is produced by the main activation sources of waste.

Sources of waste

i) Industrial waste

It contains solid as well as liquid waste and is formed by the processing of various materials and it contains harmful chemical and solid metal waste.

ii) Domestic waste

It includes all rubbish, garbage, dust, sewage waste etc. It contains combustible and non-combustible materials. When these waste disposal off openly cause various harmful effects.

iii) Agricultural waste

It includes the waste produced from the crops and cattle etc. Open disposal of thin waste create problems for health of man and other animals.

iv) Flu ash produced by interval power plants.

v) Hospital waste is most harmful waste off contains micro organisms which cause both communicable and non-communicable deseases.

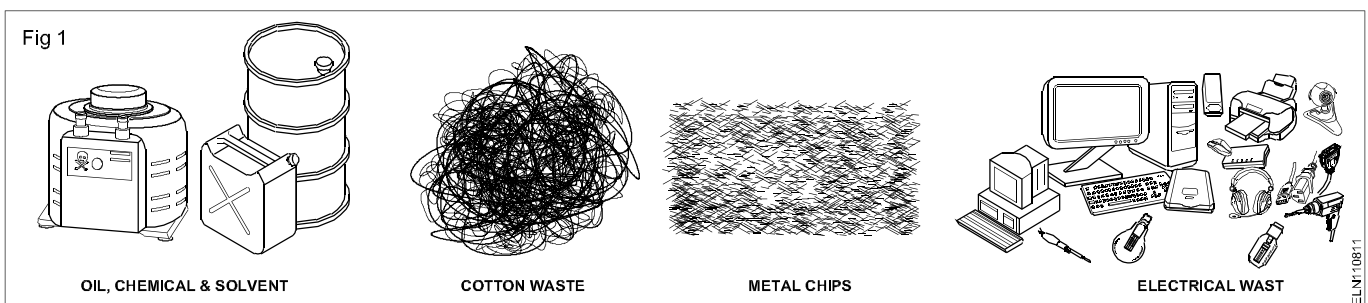
List out the waste material in workshop (Fig 1)

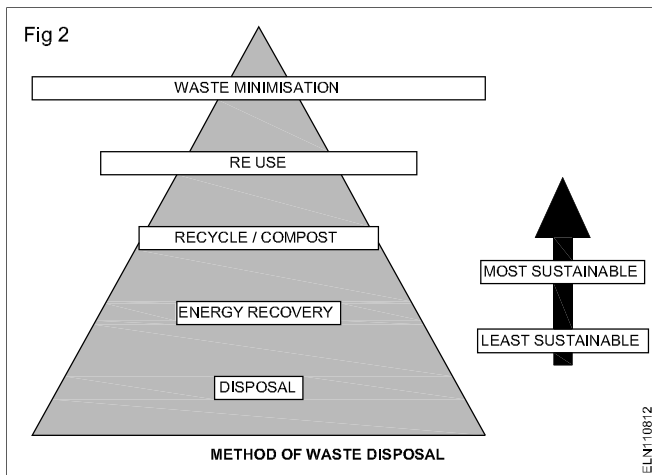
- Oily waste such as lubricating oil, coolant etc.
- Cotton waste.
- Metal chips of different materials.
- Electrical waste such as used and damaged accessories, wires, cables, pipes etc.

Methods of disposal of waste (Fig 2)

Disposal process : This is the final step of the waste management. From this disposal point or site the materials are selected steps as

- Recycling
- Composing





- Landfill
- Incineration
- Waste compaction
- Reuse
- Animal Feed
- Fire Wood

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 material into organic compounds that can be used as manure.

Landfill

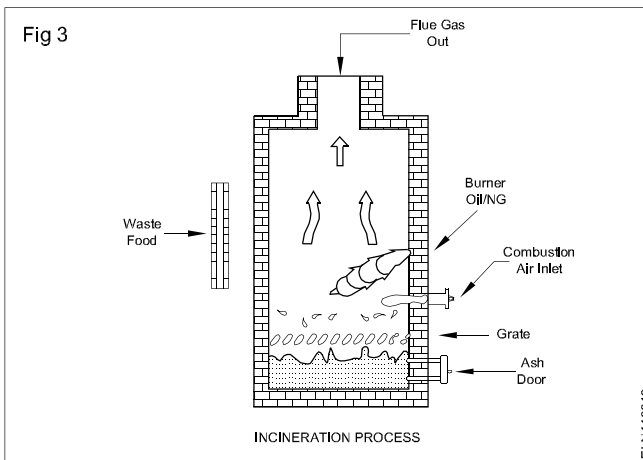
In this process, the waste cannot be reused or recycled separated out and spread as a thin layer in some low-lying areas across the city. A layer of soil added after each layer of garbage. Once this process is complete, this area declared unfit for building construction and is only used as a playground or a park.

Incineration (Fig 3)

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

Waste compaction

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



Reuse

The amount of waste disposal can be reduced by carefully considering the exact throwing away. Before discarding the item think for the possibility to wash and reuse them. Plastic tubs contents butter or icecream can become effective storage containers for a range of small item like nails or screws.

Animal Feed:

Vegetable peel and food scraps can be retained to feed small animals such as lamsters rabbit etc. Large meat bones will be greatly reused by feeding dog.

Fire Wood:

A small amount of waste disposal can be reused when it comes to refurbishing have or replacing furniture. before discarding the furniture, cut it into more meaningful process and use as fire wood.

Personal Protective Equipment (PPE)

- Objectives:** At the end of this lesson you shall be able to
- state about Personal Protective Equipment (PPE) and its purpose
 - explain the occupational health safety, hygien
 - explain occupational hazards
 - list the most common type of personal protective equipment for hazards

Personal Protective Equipment (PPE)

The Devices, equipment, 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 controlled by engineering methods rather than protecting the workmen through the use of personal protective equipment (PPE).

Engineering methods could include design change, substitution, ventilation, mechanical handling, automation, etc. In situations where it is not possible to introduce any effective engineering methods for controlling hazards, the workman shall use appropriate types of PPE.

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 equipment 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 PPEs

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

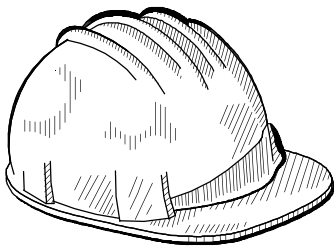
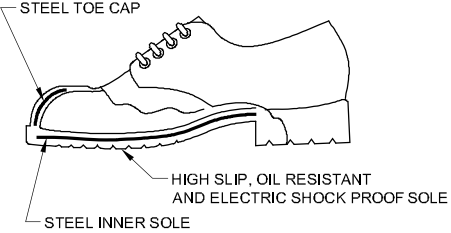
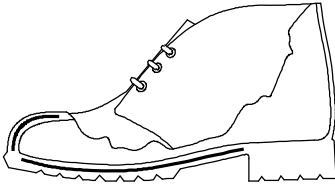
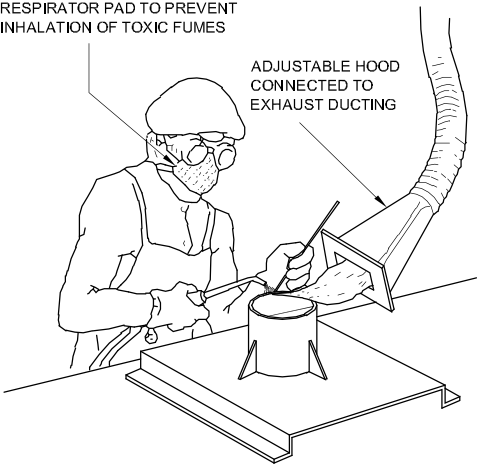
- 1 **Non-respiratory:** Those used for protection against injury from outside the body, i.e. for protecting the head, eye, face, hand, arm, foot, leg and other body parts
- 2 **Respiratory:** Those used for protection from harm due to inhalation of contaminated air.

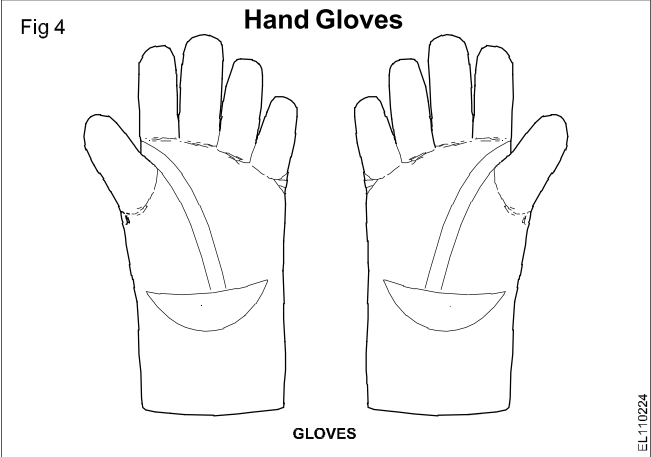
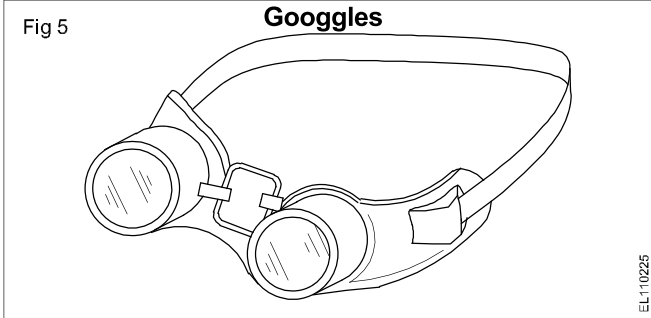
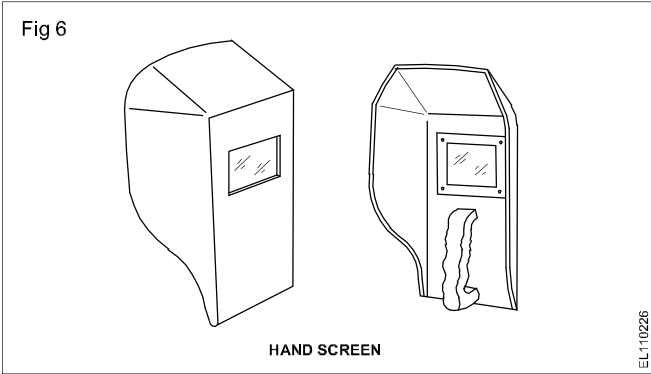
The guidelines on 'Personal Protective Equipment' is issued to facilitate the plant management in maintaining an effective programme with respect to protection of persons against hazards, which cannot be eliminated or controlled by engineering methods listed in table1.

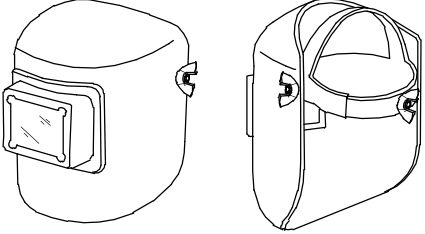
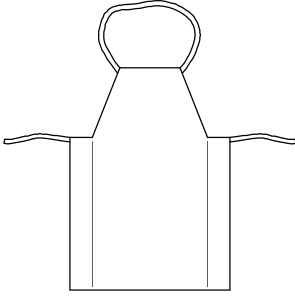
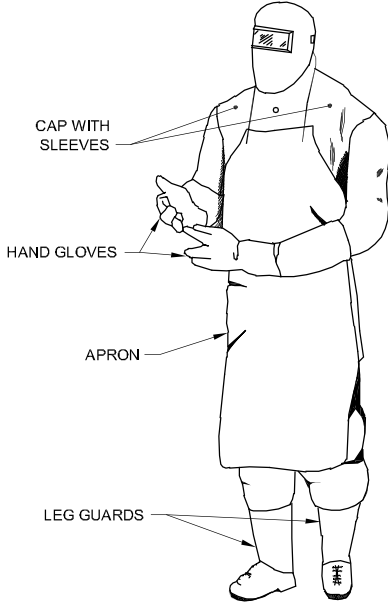
Table1

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

Personal protective equipments and their uses and hazards are as follows

Types of protection	Hazards	PPE to be used
Head Protection (Fig 1)	<ol style="list-style-type: none"> 1. Falling objects 2. Striking against objects 3. Spatter 	<p>Fig 1</p>  <p>HELMET</p> <p>EL110221</p>
Foot protection (Fig 2)	<ol style="list-style-type: none"> 1. Hot spatter 2. Falling objects 3. Working wet area 	<p>Fig 2</p>  <p>INDUSTRIAL SAFETY SHOE</p> <p>STOUT LEATHER PREVENTS INJURY TO THE ANCHILIES TENDON</p>  <p>INDUSTRIAL SAFETY BOOT</p> <p>EL110222</p>
Nose (Fig 3)	<ol style="list-style-type: none"> 1. Dust particles 2. Fumes/ gases/ vapours 	<p>Fig 3</p> <p>Nose Mask</p> <p>RESPIRATOR PAD TO PREVENT INHALATION OF TOXIC FUMES</p>  <p>ADJUSTABLE HOOD CONNECTED TO EXHAUST DUCTING</p> <p>EL110223</p>

Types of protection	Hazards	PPE to be used
<p>Hand protection (Fig 4)</p>	<ol style="list-style-type: none"> 1. Heat burn due to direct contact 2. Blows sparks moderate heat 3. Electric shock 	<p>Fig 4 Hand Gloves</p>  <p style="text-align: center;">GLOVES</p> <p style="text-align: right; font-size: small;">EL110224</p>
<p>Eye protection (Fig 5, Fig 6)</p>	<ol style="list-style-type: none"> 1. Flying dust particles 2. UV rays, IR rays heat and High amount of visible radiation 	<p>Fig 5 Goggles</p>  <p style="text-align: right; font-size: small;">EL110225</p> <p style="text-align: center;">and Face Shield Head Shield Hand Shield</p>
<p>Face Protection (Fig 6, Fig 7)</p>	<ol style="list-style-type: none"> 1. Spark generated during Welding, grinding 2. Welding spatter striking 3. Face protection from UV rays 	<p>Fig 6</p>  <p style="text-align: center;">HAND SCREEN</p> <p style="text-align: right; font-size: small;">EL110226</p> <p style="text-align: center;">and Face Shield Head Shield with or without Ear Muff Helmets with screen for welders</p>

Types of protection	Hazards	PPE to be used
Ear protection (Fig 7)	1. High noise level	<p data-bbox="760 289 813 323">Fig 7</p>  <p data-bbox="911 554 1240 583">Head shield with Ear muff</p> <p data-bbox="1019 611 1131 699">and Ear plug Ear Muff</p> <p data-bbox="1377 537 1393 600">EL110277</p>
Body protection (Fig 8, Fig 9)	1. Hot particles	<p data-bbox="760 800 813 833">Fig 8</p>  <p data-bbox="1040 1115 1101 1136">APRON</p> <p data-bbox="1377 1083 1393 1146">EL110228</p> <p data-bbox="760 1226 813 1260">Fig 9</p>  <p data-bbox="911 1352 997 1394">CAP WITH SLEEVES</p> <p data-bbox="878 1478 997 1499">HAND GLOVES</p> <p data-bbox="959 1583 1019 1604">APRON</p> <p data-bbox="911 1730 1029 1751">LEG GUARDS</p> <p data-bbox="1003 1856 1159 1885">Body Guard</p> <p data-bbox="1377 1824 1393 1887">EL110249</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
- Easy of maintenance and cleaning
- Conformity to Indian/ International standards and availability of test certificate.

Proper use of PPEs

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

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

Occupational health hazard and safety

Safety

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

Occupational health and safety

- Occupational health and safety is concerned with protecting the safety, health and welfare of people engaged in work or employment.
- The goal is to provide a safe work environment and to prevent hazards.
- It may also protect co-workers, family members, employers, customers, suppliers, nearby communities, and other members of the public who are affected by the workplace environment.

- It involves interactions among many related areas, including occupational medicine, occupational (or industrial) hygiene, public health, and safety engineering, chemistry, and health physics.

Need of occupational health and safety

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

Occupational (Industrial) hygiene

- Occupational hygiene is anticipation, recognition, evaluation and control of work place hazards (or) environmental factors (or) stresses
- This is arising in (or) from the workplace.
- Which may cause sickness, impaired health and well being (or) significant discomfort and inefficiency among workers.

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

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

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

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

Occupational hazards

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

Types of occupational health hazards

- Physical Hazards
- Chemical Hazards
- Biological Hazards
- Physiological Hazards

- Mechanical Hazards
- Electrical Hazards
- Ergonomic Hazards.

1 Physical hazards

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

2 Chemical hazards

- Inflammable
- Explosive
- Toxic
- Corrosive
- Radioactive

3 Biological hazards

- Bacteria
- Virus
- Fungi
- Plant pest
- Infection.

4 Physiological

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

5 Psychological

- Wrong attitude
- Smoking

- Alcoholism
- Unskilled
- Poor discipline
 - absentism
 - disobedience
 - aggressive behaviours
- Accident proneness etc,
- Emotional disturbances
 - violence
 - bullying
 - sexual harassment

6 Mechanical

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

7 Electrical

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

8 Ergonomic

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

Safety Slogan

A Safety rule breaker, is an accident maker

Guidelines for cleanliness of workshop and maintenance

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

- **state the necessity of cleaning of workshop**
- **list the benefits of shop floor cleaning and maintenance**
- **state the common cleaning procedure in workshop**
- **list the different methods of cleaning process**
- **state the concept of 5s techniques and their description**
- **list the benefits of 5s techniques.**

Cleaning process

Cleaning is the process of removal of unwanted matter, contaminants or pollutants from the environment or the prevention of soiling thus it should be - GREEN clean.

‘Green-cleaning’ means the need to clean up the cleaning process and protect themselves.

Cleaning is about removing pollution, not adding to it.

Necessity of cleaning of workshop

A clean workplace ensures safety and health of employees and injuries can be prevented by taking action to ensure a clean, safe work environment.

Reasons for cleaning the workplace

- Cleaning of dry floors essentially to prevent slips and falls in the workplace.
- Disinfectants prevents the spread germs and illness, because it will stop germs in their tracks.
- Proper air filtration reduces the exposures of hazardous substances like dust and vapors.
- Cleaning of light fixtures improve lighting efficiency.
- Using green cleaning products which is safer for both employees and the environment.
- Proper disposal of waste and recyclable materials keeps work areas clean.

Benefits of a shop floor maintenance

- Productive can be improved.
- Improves operator’s efficiencies.
- Improves the support operations such as replacement moves and finished goods.
- Reduction of scrap.
- Manufacturing process can be controlled effectively.
- Reduction of downtime due to better machine and tool manitoring.
- Better control of inventory process.

Common cleaning procedure

- Before starting to clean, read the product and equipment labels and usage instructions.
- Wear recommended Personal Potective Equipment (PPE) like rubber or surgical type gloves, goggles, dust mask or respirator, earplugs etc.
- Cleaning must be performed to prevent or remove soils, contaminants or pollutants.
- Select and use less toxic products and this system is known as “**Standard Operating Procedures**” (SOPs).
- SOPs is the part of the over all operation and maintenance plan for bending.

Other different methods of cleaning are

- Sprinkling
- Spraying
- Power wash process
- Boiling under pressure
- Carbon dioxide cleaning
- Pre cleaning
- Main cleaning
- Rinsing
- Drying etc,

For improving the standardising the way to clean **Standard Operating Procedures (SOPs)** as a set of written guidelines must be provided to the cleaners which includes

- 1 Cleaning procedures
- 2 Chemical handling and tracking requirements
- 3 Communication protocols
- 4 Training and inspection programs
- 5 Reporting and record keeping procedures.

The above guidelines should be made available to all cleaning personel and occupants.

Recommended activities for green cleaning

- Provide easily understood directions to cleaning staff in written with local languages.
- Use the appropriate technology (coarse spray, automatic chemical dispensers etc).
- Provide directory for the proper rinsing and disposal of expended or empty solution containers.
- Reduce, minimize or eliminate the need for using cleaning chemicals if possible.

5 Steps (5s) - Concept

5s is a people-oriented and practice-oriented approach. 5s expects every one to participate in it. It becomes a basic for continuous improvement in the organisation.

The terms (5s) 5 steps are

Step 1: SEIRI (Sorting out)

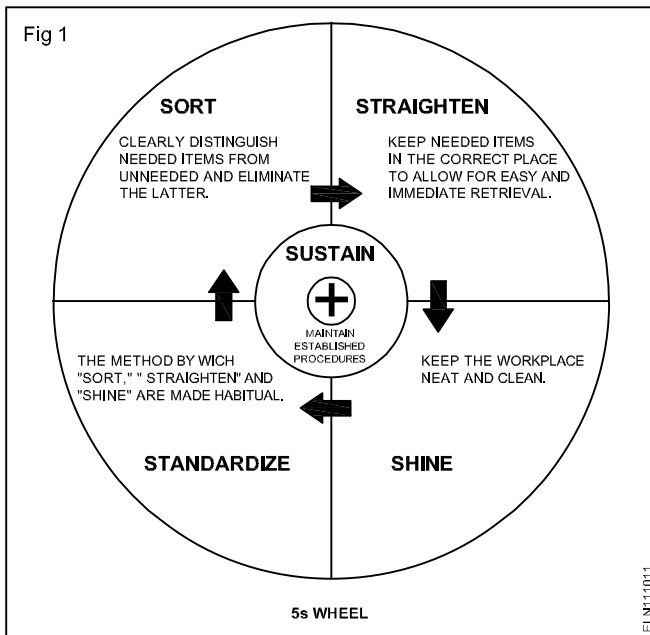
Step 2: SEITON (Systematic arrangement)

Step 3: SEISO (Shine cleanliness)

Step 4: SEIKTSU (Standardization)

Step 5: SHITSURE (Self discipline)

Fig 1 shows the 5s concept wheel.



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.

Benefits of 5s

- Work place becomes clearer and better organised.
- Working in working place becomes easier.
- Reduction in cost.
- People tend to be more disciplined.
- Delay is avoided.
- Less absenteeism.
- Better use of floor space.
- Less accidents.
- High productivity with quality etc.