

SAFETY

ACCIDENT

An accident is an unplanned and non-controlled event in which the action or reaction of an object, substance or person result in personal injury or probability thereof.

Result of Accident: Accidents result in any one of the following-

1. Complete loss of factory and equipment.
2. Partial loss of equipment or building.
3. Loss of production.
4. Loss of lives of employees.
5. Permanent disablement for the persons.
6. Loss of limbs, eye sight, hearing *etc.*
7. Disablement for the day or for a short period.

An accident is an unplanned and non-controlled event in which the action or Reaction of an object, substance or person results in personal injury or probability Thereof.

CAUSES OF WORKSHOP ACCIDENT

1. **Human Causes:** Carelessness and overcome and over-confidence cause accidents.
2. **Hand Tools:** Suitable tools must always be selected for the given particular work. Accidents may occur if faulty or improper tools are used.
3. **Working Condition:** Slipper floors, poor ventilation, poor lighting, and inadequate space are potential causes of accidents.
4. **Machines:** Unguarded machinery, poor maintenance, improper adjustments, etc. can causes accidents.
5. **Materials:** Storage of inflammable materials in unsecured places can lead to grave accidents. Sharp and pointed tools and jobs can also cause accidents.
6. **Person himself:** An improper position and/or uncomfortable dress as well as an improper position or posture can cause accident at workplace.

SAFETY

A good craftsman is one who is safety conscious. He knows and puts into practice safe accepted procedures. Learning to work safety is as important as learning the trade itself. Safety is an action which organizes and controlled all our acts in such a manner that we don't get involved; expose ourselves or others in an accident. Many accidents happen because people don't behave.

GENERAL SAFETY PRECAUTIONS

1. Learn safe way of doing the job before you actually start.
2. Think of safety and act safely at all times.
3. Follow all the safety rules and regulations – they are meant to protect you.
4. Put on proper and protective clothing.
5. Don't indulge in horseplay.
6. Concentrate on the work and avoid unnecessary talking.
7. Handle only the equipment you have been authorized to work on.
8. Check up and inspect the tools for safe working from time to time.
9. Don't attempt to oil, clean, adjust, or any machine when it is running.
10. Don't try to stop the machine with your hand or body.

PERSONAL SAFETY

1. Wear a close fitting and comfortable dress. Never wear a loose shirt.
2. Never enter a shop without shoes.
3. Don't wear rings, watches etc. that could get caught in the moving machinery.
4. Wear goggles whenever there is danger of flying matter.

SAFETY WITH HAND TOOLS

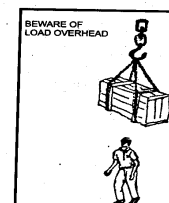
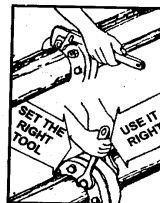
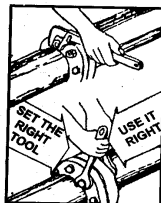
1. Avoid spilt, broken and loose handles of hammers. Heads of hammers must not be worn and they must be securely fastened to the handle.
2. Files must never be used as levers. They should always have a proper handle fitted to them.
3. Chisels with mushroom head are dangerous. When chipping always make sure that chips do not hit some body standing nearby.
4. Always hold the work firmly in a vice or other holding device. If the work shifts during operation a nasty injury may result.
5. Always use a correct size of spanner and avoid the use of packing or extension handle.

SAFETY WITH THE MACHINE

1. Do not try to operate any machine before you fully understand its mechanism.
2. Be sure how to stop a machine before you start it. Never operate a machine unless all safety guards are in position.
3. Always keep the shop floor free from oil, grease, tools and other cuttings.
4. Job must be clamped properly.
5. Cutter must be held properly.
6. Only recommended speeds and feeds should be used.
7. Use cleaning brush to clear off swarf from the machine.
8. Do not try to change gears when machine is in running position.
9. Do not try to stop the rotating tool / job by hand.
10. Only recommended lubricants and coolants should be used.
11. Grinding wheels should be checked for crack before fitting it.
12. Switch off power while mounting and dismounting a chuck removing job from the machine.
13. Chuck key must be removed before starting the machine.
14. A wooden plank should be used on bedways of lathe while mounting and dismounting the chuck.
15. Get first aid immediately for an injury.

Safety with workshop or work place

1. Keep shop floor clean and free from Grease, oil or other slippery material.
2. Clean the floor frequently.
3. Keep passages, gangways and pathways clean to avoid accidents.
4. Keep all the materials in their proper places. Put all unnecessary and rejected items and scrap in scrap box.
5. Store tools in their places when not in use.
6. Provide proper light, ventilation etc.



Safety with Drilling Machines

1. Remove chuck wrench from drill chucks, before starting machine.
2. Check frequently whether drill is running true or not.
3. Use only sharpened drills of correct size.
4. Ensure that proper speeds and feeds are used.
5. All the burrs from drilling holes should be removed by scraping or filing.
6. Change the belt or speed only after the power is put off.
7. If the work slips from a clamp, don't attempt to stop it, but stop the machine and then make necessary adjustment.

Safety with Grinding

1. Always use goggles or face shield while working on a grinder.
2. Check the various parts and controls before the grinder is set in motion.
3. Ensure that the wheel is flat and is free from depressions and grooves.
4. Use only correct and sound wheels for the work.
5. Ensure that tool rest in pedestal grinders is about 1/8" from the wheel. If the clearance is more it may cause the job to jam the wheel and break it.
6. Use the entire face of the wheel and not any particular portion to ensure uniform wear of the wheel.
7. Use only the face of the wheel and not the side of the wheel unless specified.
8. The wheel should be run at specified speed only.
9. Check frequently the balance of the wheel.
10. Use proper holding devices or clamps while grinding small pieces.
11. Check the holding power of chuck before starting the machine in the case of surface grinders.

Safety with Shapers

1. Check all parts and controls of the machine before power is turn on.
2. Check the tool head, work, table support, clamping devices, tool vice, ram etc. to see that they are properly secured in position.
3. See that the tool and tool head are clean of the job before starting the sharper.
4. Have a face shield or some protective screen to prevent chips flying out.
5. Frequently check that the adjusting nuts are tight often checking the stroke lengths and positions.
6. Remove all loose tools from the bed of the machine.
7. Stand in the correct position as far as possible parallel to the direction of stroke of machine when it is working.
8. Don't put your head across the ram.
9. Don't remove chips when ram is in motion.

Safety with Electrical Appliances

1. Any fault in working must be reported to competent authority.
2. Isolating switch must be switch off in case of emergency.
3. Live wires should not be pulled like rope since the insulation of the wires may be damaged and give shock.
4. Shock proof shoes and gloves must be used, while working on electrical points.

Safety with Lifting Loads

1. Before lifting loads, make sure route is clear of obstacles.
2. The place where the load is to be placed should not be obstructed.

3. The person who is carrying the load should be able to see over and around it.
4. The load should be lifted according to age, physique and health condition.
5. Do not lift a load which may cause strain in your body because twisting or jerking during lifting can put severe strain on muscles.
6. Lift the load properly. Approach the load squarely facing the direction of travel [Fig. 1.6(a)]. First straighten the legs to raise the load [Fig. 1.6(b)]. Look directly ahead while straightening up and keep the back straight [Fig. 1.6(c)]. Keep the load well into the body and it to the place where it is to be placed [Fig. 1.6(d)].
7. For lowering the load, bend at the knees to semi-squatting position and keep the back and head erect by looking straight ahead. Lower the load and place it at required place.

HOUSEKEEPING

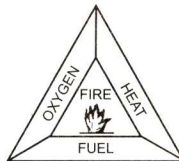
Good housekeeping means safe storage of tools, components, parts and all the items needed in the workshop. Important general rules for good housekeeping are-

1. Shop floor should be kept clean of grease, oil or any other liquid which may make the floor dirty and slippery.
2. Gangways should be kept clear of everything.
3. Tools etc. should not be left around on the table or on the bed of the machine.
4. Tools should be kept away in proper place when not required.
5. Scrap should be kept only on the scrape boxes.

FIRE AND FIRE ACCIDENT

Fire is a rapid oxidation process in which heat and light are produced. Three substances i.e. combustible material, heat and oxygen are essential for speed of fire.

By excluding any one of the three, the fire can be avoided or extinguished. When fire causes an accident, it is called *fire accident*.



TYPES OF FIRES

1. **Class A:** Fires in ordinary combustible materials such as wood, paper, textiles and rubbish.
2. **Class B:** Fires in flammable liquids such as gasoline, solvents, oil, grease, paint, varnish, lacquers.
3. **Class C:** Fires on electrical equipments such as motors generators and switch panels.
4. **Class D:** Class 'd' is the classification of fires involving combustible metals like magnesium, potassium, powdered aluminium, zinc, sodium, titanium and others.

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

An extinguishing agent is the material or substance used to put out the fire, and is usually contained in a fire extinguisher with a release mechanism for spraying into the fire.

It is important to know the right type of agent for extinguishing a particular type of fire; using a wrong agent can make things worse. There is no classification for 'electrical fires' as such, since there are only fires in materials where electricity is present.

METHODS OF EXTINGUISHING FIRE

1. **Starvation:** isolating the burning material from the neighborhood or removing the combustible material from the vicinity of fire.

2. **Blanketing:** Preventing the flow of air to the zone of fire.
3. **Cooling:** Lowering the hit of burning materials.

TYPES OF EXTINGUISHERS

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

Water-filled extinguishers: There are two methods of operation.

1. Gas cartridge type.
2. Stored pressure type.

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

Foam extinguishers: These may be of stored pressure or gas cartridge types. Always check the operating instructions on the extinguisher before use.

1. Flammable liquid fires.
2. Running liquid fires.

Must not be used on fires where electrical equipments is involved.

Dry powder extinguishers: 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 fire.

Carbon dioxide (CO₂): this type is easily distinguished by the distinctively shaped discharge horn.

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 plungers, lever, trigger etc.

Halon extinguishers: These extinguishers may be filled with carbon tetrachloride and bromochlorofluoro methane (BCF). They may be either gas cartridge or stored pressure type.

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

CAUSES OF FIRE

1. Naked flames coming in contact with inflammable materials.
2. Faulty storage of combustible materials.
3. Electric short circuits, electrical equipments improperly installed, poorly installed etc.
4. Faulty gas and oil burners.
5. Abnormally high process temperature due to faulty operations of processes.

PRECAUTION TO BE TAKEN TO AVOID FIRE

1. Fire buckets full of sand and water should be placed at different places in the workshop.
2. Inflammable materials should be placed separately.
3. Carbon dioxide gas should be made available in special containers at some required points.
4. All the electrical switches should be put off before closing the workshop.
5. Switches and other electrical fitting parts made of fire proof material should be used.

FIRST AID

It is immediate and temporary care given to a person who has met with an accident. It includes mental help to the victim as well as treatment of the injury.

1. Use proper first aid for the injury.
2. Ask someone to call a doctor and an ambulance, if required.
3. Don't move the victim unless he is in danger of further injury.
4. Don't leave the victim alone.
5. Reassure the victim that he will be all right because a good mental attitude is necessary in case of an accident.

MINIMUM FIRST AID FACILITIES

1. First aid cabinet should be kept ready with cotton wool, bandage, anti-septic liquid, ointment and powder, adhesive tape etc.
2. A trained first aid attendant should be available in the workshop.
3. Hospital facilities and services of a doctor should be available.

SAFETY SIGNS

Safety signs warn us for the possible danger and they must not be ignored. This signs can be recognized by there shape and colour. Generally the safety sign falls into the following four basic categories—

1. **Prohibition Signs:** These signs are circular in shape having red border and cross bar, black symbol on white background.

Examples:

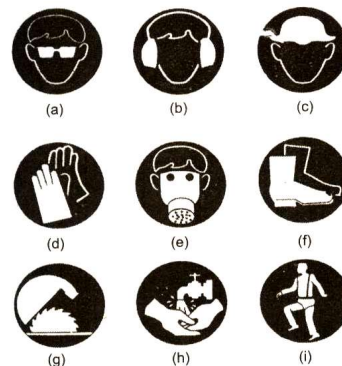
1. Pedestrians prohibited.
2. Smoking and maked flames prohibited.
3. Do not extinguish with water.



2. **Mandatory Signs:** This sign are circular in shape having white symbol on blue background.

Examples:

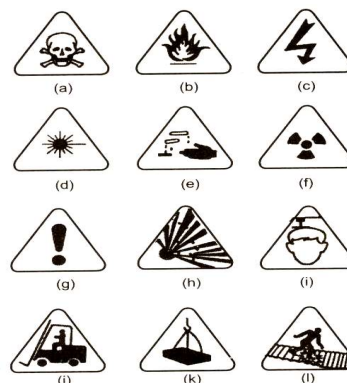
1. Wear eye protection.
2. Wear hearing protection.
3. Wear head protection.
4. Wear hand protection.
5. Wear respirator.
6. Wear food protection.
7. Use adjustable guard.
8. Wash hand.
9. Wear safety harness belt.



3. **Warning Signs:** These signs are triangular in shape having yellow background with black border and symbols.

Examples:

1. Toxic hazard.
2. Risk of fire.
3. Risk of electric shock.
4. Laser beam.
5. Corrosive substance.
6. Risk ironizing radiation.



7. General warning risk of danger.
8. Risk of explosion.
9. Overhead (fixed hazard)
10. Fork lifts truck.
11. Overhead load.
12. Fragile roof warning signs.

4. Information Signs: These signs are square in shape having white symbol on green background.

Examples:

1. First aid point.

TYPES OF INJURY AND THEIR PREVENTION

1. **Cuts and Abrasions:** These are generally caused by rough surfaces and jagged edges, by splinters and pointed projections. Leather gloves should be used for protection of cuts and abrasions.
2. **Crushing of Feet or Hand:** To prevent crushing of feet, safety shoes with steel toe can be used. Timber wedges can be used while raising and lowering heavy load to prevent crushing of hand.

NECESSARY TREATMENTS

1. **For burns and scalds:** If a large area of the body is burnt, try to exclude the air covering with water, clean paper etc. to relieve the pain.
2. **For severe Bleeding:** In case of severe bleeding the following immediate actions should be taken-
 1. Make the victim lie down and rest.
 2. If possible, injured part of the body should be raised above the level of the body.
 3. Pressure should be applied to the wound.
 4. Ask for assistance, if required.

When the bleeding has stopped, dress the wound and cover it with a pad of soft material.

3. **For Large Wound:** Use clean pad and bandage firmly in place. In case severe bleeding use more than one dressing.
4. **For Electrical Burns:** Do not waste the time for applying first aid to the burns until breathing has been restored and the victim can breathe normally unaided.