Unit 3

Electrical Wiring Components and Accessories

171177CH03

Introduction

Electricity requires an electric path to flow and there are many conducting materials used for this purpose. There are many semi conducting materials which are used to reduce the voltage and also drop the current flow. There are non-conducting materials which are used as insulation during working on live-lines. In this unit we will study how the household or industrial wiring is done and what materials are essential for household or industrial wiring. We will also study the different types of wiring and how they is done.

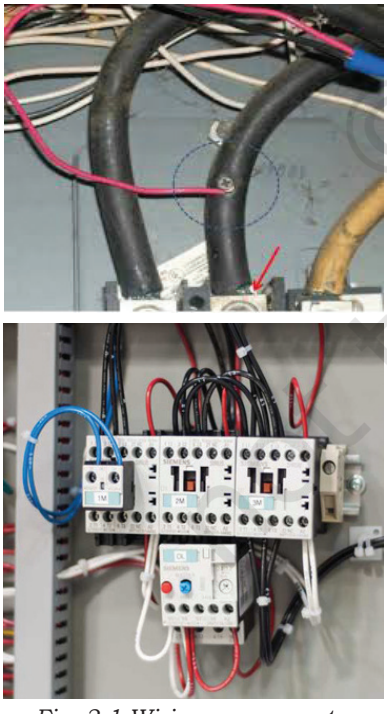


Fig. 3.1 Wiring components

Session 1: Identifying and Selecting the Wiring Materials and Components

Wiring materials

Electrical wire is made of materials like copper, aluminium and silver. As silver is expensive, mostly copper and aluminium are used in wiring.

Materials are classified into three types according to their properties:

1. Conducting materials
2. Insulating materials
3. Semiconductor materials

Conducting Material

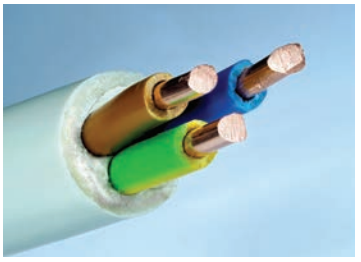


Fig. 3.2 Copper wire

(a) Copper

It is a good conductor of electricity. It is used in wiring materials in cables. Its has low resistance and is used for conduction of electricity at high, medium and low voltage (Fig. 3.2).

It is used in wiring and cable making.

(b) Aluminium

Fig. 3.3 Aluminium wire

It is light weight and cheaper in comparison to copper. Therefore, this type of conducting material is mostly used in electrical wiring. It is silvery–white in colour and it has a soft texture. It is often used in wiring and making cable (Fig. 3.3).

Insulating Materials

Insulating materials are used for insulating purpose. These types of materials are bad conductors of current. For example rubber, paper, mica, wood, glass and cotton.

Wiring Accessories

Wiring accessories are used for connecting appliances (Fig. 3.4).

Fig. 3.4 Sockets

(a) Switch

A switch is used to make or break an electrical circuit. It is used to switch 'on' or 'off' the supply of electricity to an appliance.

There are various switches such as

- surface switch
- flush switch
- ceiling switch
- pull switch
- push button switch
- bed switch

(i) *Surface switch:* It is mounted on wooden boards fixed on the surface of a wall. It is of three types

1. One-way switch
2. Two-way switch
3. Intermediate switch

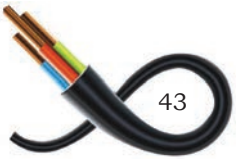


Fig. 3.5 One-way switch

Fig. 3.6 Two-way switch

Fig 3.7 Intermediate switch

Fig. 3.8 Flush Switch

Fig. 3.9 Bed switch

- **One-way switch:** It is used to control single circuits and lamp (Fig. 3.5).
- **Two-way switch:** It is used to divert the flow of current to either of two directions. The two-way switch can also be used to control one lamp from two different places as in the case of staircase wiring (Fig. 3.6).
- **Intermediate switch:** It is used to control a lamp from more than two locations (Fig. 3.7).

(i) *Flush switch:* It used for decorative purpose (Fig. 3.8).

(ii) *Bed switch:* As the name indicates, it is used to switch 'on' the light from any place, other than switch board or from near the bed. This switch is connected through a flexible wire (Fig. 3.9).

(b) Holders

A holder is of two types.

1. Pendant holder (Fig. 3.10)
2. Batten holder (Fig. 3.11)

Fig. 3.10 Pendant holder

(c) Ceiling rose

It is used to provide a tapping to the pendant lamp–holder through the flexible wire or a connection to a fluorescent tube (Fig. 3.12).

(d) Socket outlet/plug

The socket outlet has an insulated base with the moulded or socket base having three terminal sleeves (Fig. 3.13).

Fig. 3.13 Socket

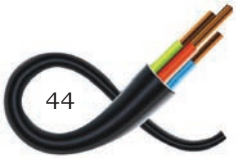
(e) Main switch

To control the electrical circuit a main switch is used. Through the main switch, the power in a building is controlled completely (Fig. 3.14).

Fig. 3.11 Batten holder

Fig. 3.12 Ceiling rose

Fig. 3.14 Main switch/ Main MCB



(f) PVC casing-capping wiring

PVC capping is done in order to cover the wires. It includes casing also. This casing-capping wiring is also known as open wiring, as it is done outside the wall.

Materials required for PVC casing-capping wiring (Figs. 3.15 and 3.16) include

1. wire
2. casing enclosures made up of plastic
3. capping made up of plastic
4. T. Joints VIR (Vulcanised Indian Rubber) or PVC (Polyvinyl chloride) insulated wire
5. junction box
6. elbow
7. casing and capping joints

Fig. 3.15 PVC casing-capping accessories

Fig. 3.16 PVC casing-capping bend

Wooden casing-capping wiring is old fashioned. Now PVC or VIR insulated wires are enclosed within the PVC casing enclosure and PVC capping is used to cover the casing.

Advantages of casing-capping wiring

- Easy to install
- Strong and durable wiring
- Customization can be done easily
- Safe from smoke, dust, rain and steam, etc.
- No risk of shock due to casing and capping,

Disadvantages of PVC casing-capping wiring

- Costly
- Not suitable for humid weather
- High risk of fire

Miniature Circuit Breaker (MCB)

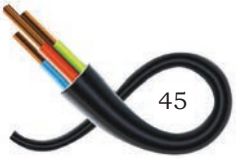
A MCB is used in new constructions instead of the older types of fuses. Circuit breakers are small devices used to control and protect the electrical panel and the other devices from overflowing of electrical power (Fig. 3.17).

Fig. 3.17 MCB Distribution Box

Uses of MCB

Home electrical panels

As with all breakers, the MCB is designed to protect the house from circuit overload. An MCB is much safer



than the typical fuse, because it can be reset manually and can handle larger amounts of power. The breaker can manage the flow of energy, distributing the voltage even when many devices run off the same power circuit.

Lights

MCBs are used in the lighting system of the house, because they can deal with the amount of power needed to lightening a house, especially if specific types of lamps, such as fluorescent lights are used. MCBs overcome the need of additional power required when switching on the lights, especially when lights are used extensively in the entire house.

Industrial applications

There are many small scale industrial buildings where MCBs are used instead of the old fuses. Miniature circuit breakers are largely used in restaurants, bakeries and commercial food stores.

Heaters

When heaters are used at home or in the office, the MCB can be beneficial. It is known in general that heaters can be problematic sometimes, especially with distribution of electrical power. The MCB prevents possible problems, cutting off electricity in the case of overload or fault. In this case, though, you need to choose a miniature circuit breaker of the proper capacity, enabling it to handle the load of power when needed.

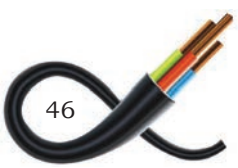
Conduit Wiring

Fig. 3.18 Conduit wiring

Electrical conduits are used to protect and provide the route of electrical wiring in an electrical system. Electrical conduits are made of metal, plastic, or fibre and can be rigid or flexible. Conduits (Fig. 3.18 and 3.19) must be installed by electricians as per standard regulations. For workshops and public buildings, conduit wiring is the best and most desirable system of wiring. It provides protection and safety against fire.

Types of Conduits

1. Class A conduit: Thin layered steel sheet of low gauge
2. Class B conduit: Thick steel sheet of high gauge



Materials used in Conduit Wiring

- GI (Galvanised Iron) wire
- Elbow
- Coupling
- VIR (Vulcanized Indian Rubber) or PVC (Poly Vinyl Chloride) insulated cables
- Lock nut
- Clip
- Junction Box

Advantages of conduit wiring

- Safe
- Better appearance
- No risk of fire
- No risk of damage of cable insulation
- Safe from humidity, smoke, steam, etc.
- No risk of shock
- Long lasting

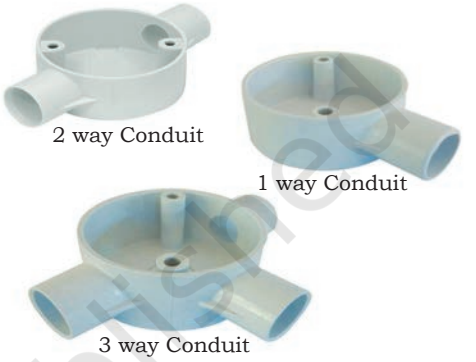


Fig. 3.19 Conduit wiring components

Disadvantages of conduit wiring

- Expensive
- Installation is not easy
- Not easily customisable for future use
- Hard to detect faults

Concealed Wiring

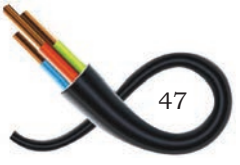
It is laborious to install this wiring. The layout of this wiring is done under the plaster of the wall of the building.

Advantages of concealed wiring

- Safe
- Better appearance
- No risk of fire
- No risk of damage of cable insulation
- Safe from humidity, smoke, steam, etc.
- No risk of shock
- Long lasting

Disadvantages of concealed wiring

- Expensive
- Installation not easy
- Not easily customisable for future use
- Hard to detect faults



Colour Code

Wiring for AC and DC circuit are colour coded for identification of individual wires (Table 3.1).

Table 3.1 AC power circuit wiring colour codes

Function	Label	New colour	Old colour
Protective ground	P G	Green or green-yellow	Green
Neutral	N	White	Gray
Line, single phase	L	Black or red	_
Line, three phase	L1	Black	Brown
Line, three phase	L2	Red	Orange
Line, three phase	L3	Blue	Yellow

Check Your Progress

A. Fill in the blanks

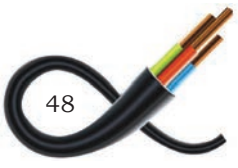
1. Wiring material is of three types _____, _____ and _____.
2. A switch is used to make or break _____.
3. Open wiring is also known as _____ wiring.
4. _____ are devices used to control and protect the electrical panel from overflowing electrical power.

B. State whether the following statements are True or False

1. Silver is a bad conductor of electricity.
2. Switches are made of conducting material.
3. PVC casing and capping are used for covering the wires.

C. Multiple choice questions

1. Concealed wiring is immune to_____
   (a) humidity
   (b) heat
   (c) light
   (d) dust



2. Pendant holder is used for_____
   (a) fixing the bulb
   (b) fixing the fan
   (c) for hanging the bulb
   (d) to hang the fan
3. A two-way switch is used for _____
   (a) control one bulb from 2 points
   (b) control two bulbs from 2 points
   (c) control multiple bulbs from 2 points
   (d) control one bulb from one point

D. Short answer questions

1. Why is PVC casing-capping preferred over wooden casing-capping wiring?
2. How does an MCB help in managing electrical power?
3. Why is conduit wiring used in homes?
4. Discuss the importance of colour codes in electrical wiring.

Session 2: ICTP Switch and Distribution Board

ICTP (Iron Clad Triple Pole) Switch

It is used alongwith the energy meter to isolate the supply of electricity automatically or manually (Fig. 3.20).

Fig. 3.20 ICTP switch

Distribution Board

A distribution board is a component of an electricity supply system that divides an electrical power feed into subsidiary circuits, while providing a protective fuse or circuit breaker for each circuit in a common enclosure. A distribution board is also known as panelboard, breaker panel, or electric panel (Fig. 3.21).

Fig. 3.21 MCB distribution board

Electrical Circuit

In an electric circuit the positive side of wire is connected to the negative side of a load, for example, bulb, TV, etc. and power supply is started by using a switch. The circuit is like an electrical house.

Types of Circuit

1. Open
3. Closed
4. Series
5. Parallel

- **Series circuit:** It is like a stair-case. In this type of circuit r1, r2, r3 are resistances connected in series. In this,

  R = r1+r2+r3

  where R is equivalent to resistance.

- **Parallel circuit:** When various resistances are connected in parallel, then it is called a parallel circuit. Like if r1, r2 and r3 are connected in parallel, then

  1/R = 1/r1+1/r2+1/r3

In this, all resistances having positive sides are connected on one end and all negative sides are connected on another end. In this, voltages are same in all the branches.

Fixing Wiring Accessories on Board

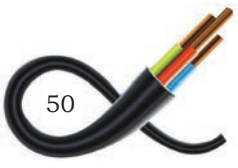
You should know the tools required for fixing the accessories on the board. You should also know the purpose of fixing the accessories.

In-house wiring of the switches, holders and sockets should be fixed on wooden/sunmica boards and blocks. Therefore, it is necessary to learn how to fix these accessories. The ways to fix these accessories have been discussed in the following practical activity.

Let's Practice 1

Adjust the electrical accessories like, switches, holders, sockets, etc. on the given board or round block. And then mark their positions by a pencil. Remove the covers of the accessories and loosen the screws of terminals. Make a powder of chalk and pour it in the holes of the terminal. Mark the point on them by the poker.

Now make the holes on the round block or board by the drilling machine where the points have been marked. Insert the wires in the terminal, after removing the insulation. Then fix all



the accessories on the board or round block by wooden screws after making holes on them by the poker. Then fix all covers on the accessories.

Tools and materials required

Tools

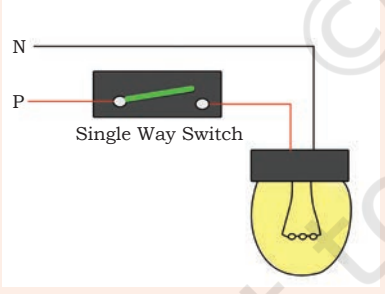
1. Hand drilling machine with a drift bit of 5 centimeter
2. Poker
3. Screwdriver
4. Connector screwdriver 8 cms
5. Combination plier 15 cm
6. Try square
7. Firmer chisel 20 mm
8. Electrician knife 10 cm

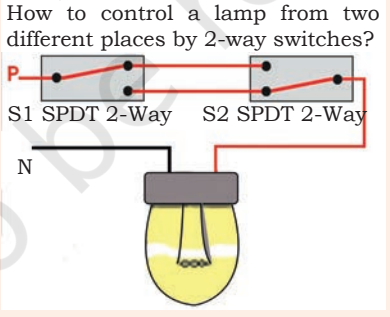
Material

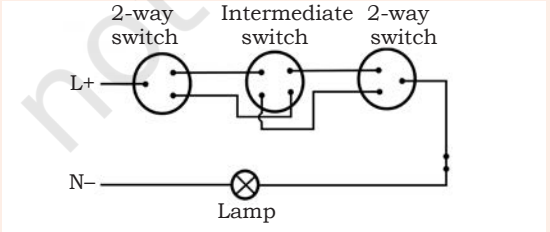
1. Wooden round block/ PVC Round Block
2. Wooden board/ Sun mica Board
3. Single pole one-way switch 5 A, 250V
4. PVC wire
5. Pencil
6. Chalk

Precautions

All the fittings (switch, holder) should be fitted well. No naked portion of the conductor should remain visible. The screws in the accessories fitted should be tight. The tools should be used carefully.







A lamp is switched ON and switched OFF from three different places.

Practical Exercise

Activity 1

Aim: Identify and draw the figure of various wiring materials

Procedure

See the different types of wiring materials as shown in the diagram as well as in classroom and draw the diagram.

Activity 2

Aim: Identify and connect the accessories with the wires

Tools and equipment required

1. Multimeter for measuring the current and voltage.
2. Tools like plier, screw driver will be required.

Procedure

Accessories will be connected with the help of wires.

Precautions

1. All connections should be tight.
2. Do not touch the terminals when supply is on.

Activity 3

Aim : To connect different types of components with wires in a junction box.

Tools and equipment required

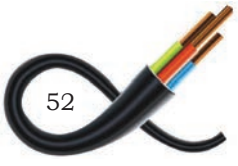
1. Multimeter
2. Tools like screw driver, plier.

Procedure

1. Different types of components will be connected with the help of wires in a junction box

Precautions

1. All connections should be tight.
2. Do not touch the terminals when supply is on.



Questions and Answers

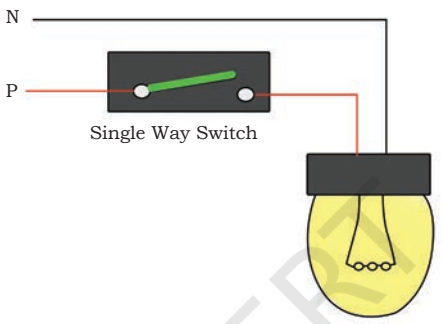
State whether the following are True or False

1. Conduit wiring is used in damp situations.
2. In wiring light point neutral is controlled by switch.
3. In three-pin plug maximum radius pin is used for phase.
4. In conduit wiring CTS wire is used.
5. Lead sheathed wiring age is more than conduit wiring.

Activity 4

Aim

- To familiarise the student with the electrical connection of a lamp to the supply mains.
- To select the proper size of connecting wires and switch for a given load.



Related information

In a lamp, the electrical energy is converted into light. The function of the switch is to turn the lamp "ON" or "OFF" by making and breaking the electrical circuit respectively. The switch should be connected to the phase wire of the supply. It should be connected in series with the lamp. The function of the fuse is to protect an electrical circuit against over current which may be caused by a fault or overloading.

Apparatus and material

1. Lamp
2. Switch
3. Fuse
4. Wooden batten/ PVC Batten
5. Link clips
6. Screws
7. Nails
8. Insulation tape
9. Connecting wires
10. Lamp holder
11. Electricians common hand tools

Precautions

1. Make all the connections tight.
2. Check the rating of the fuse.

Procedure

1. Fix the switch and lamp holder on the board.
2. Connect the switch and lamp.
3. Connect the circuit to the supply mains, while the main switch is "OFF".
4. Put "ON" the main switch.

Activity 5

Aim: To check the connection of the lamp by one switch (series)

Apparatus

Lamp 100W/220V, holder, one-way switch, PVC wire 1/18 SWG etc.

Tools and equipment

S. no.	Particular	Specification	Quantity
1.	Plier	Slide cutting plier Combination plier	1 1
2.	Screwdriver		1
3.	Phase tester	6"	1

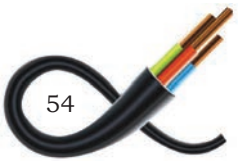
Procedure

Take a PVC 1/18 SWG wire about 1 meter in length and cut it in two pieces of equal length with side cutting plier. Remove the insulation of nearly 1 cm of both ends of each wire with the help of combination plier. Now take the holder and screw the nut with the help of screw driver. Fit each end of both the wire in the bolt and screw the nuts. Now cover the holder, connect one end of the wire to the top point of the switch. Take 1 foot of another wire and connect it to the bottom of the switch.

Connect the switch wire to phase and another wire to neutral. Switch it on. If the bulb glows then our connection is right.

Precautions

1. Phase is always controlled by the switch.
2. Part of the wire with removed insulation should not be open.



3. Twisted wire fitted in the holder should be put in such a way that the two wires should not touch each other.
4. Carefully remove the insulation part so that the wire should not cut.
5. Do not touch any naked electrical wire unless you are sure that there is no current in the wire

Activity 6

Aim: Check the connection of lamp by two switches (parallel)

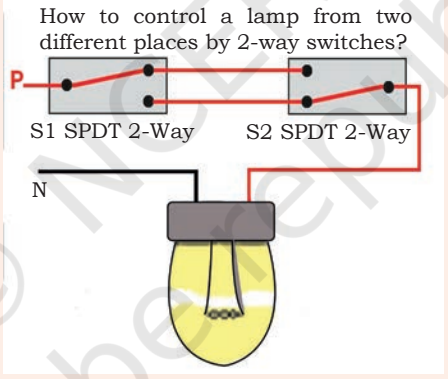
Related information

The circuit consists of one lamp and one pair of two way switches are connected.

The common points in switches S1 and S2 are C1 and C2 respectively. The common point C2 is connected to position 2 of the switch S2. Now if the common C1 is connected to position 1 in switch S1, then the path of the electric circuit is not complete and, hence, the lamp will not glow. However, if C1 is connected to position 1, then the path of the current is completed through S1, S2 and the lamp. The lamp will glow.

Apparatus

1. One lamp holder, (pendent) 5 A, 250V.
2. One lamp 40 Watts, 250V.
3. Two two-way switch, 5A, 250V.
4. Connecting wires
5. Insulated plier
6. Electricians knife
7. Screw driver



Procedure

1. Connect the lamp with the two switches S1and S2
2. Put the lamp in position in the holder
3. Make the positions 1 and 1' on S1 and 2 and 2' on s2
4. Operate switch S1 in position 1and 1'
5. For each position of S1 put switch S2 in position 2 and 2' respectively
6. Observe the results

Precautions

1. All connections should be firmly made
2. Switches S1 and S2 should be connected to the phase wire.

Check Your Progress

A. Fill in the blanks

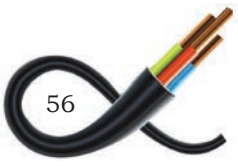
1. Distribution board is used for dividing an electrical power feed into _____.
2. In an electric circuit, the positive side is connected to the _____, and the switch is used to start the power supply.
3. Switches should be connected to the _____wire of supply.
4. The _____ protects an electric circuit.

B. Multiple choice questions

1. Switches, holder and socket are fixed on _____ boards.
   (a) sunmica (b) iron
   (c) steel (d) copper
2. In a lamp, electrical energy is converted into_____
   (a) electric (b) resistance
   (c) light (d) current
3. 3. All branch voltages are same in _____ circuit.
   (a) series (b) shunt
   (c) parallel (d) electrical
4. Distribution board is also known as a _____.
   (a) breaker panel (b) panel board
   (c) electrical panel (d) All of these

C. Short answer questions

1. Silver is a good conductor of electricity, but it is rarely used as a wiring material. Why?
2. Write down the properties of copper and aluminium and about their applications in electrical wiring.
3. Aluminium is the most commonly used metal for electrical wiring. Why?
4. List the different types of holders.
5. List the disadvantages of casing capping wiring.
6. Which material is used in conduit wiring?
7. List the advantages of conduit wiring.
8. Write the colour codes of AC power circuit for single phase circuit.



Session 3: Workplace Health and Safety Measures

Workplace hazardous systems are designed to protect the health and safety of workers. Information must be provided about the safe handling, usage, storage and disposal of hazardous systems. Workplace hazard is something that can have potential to harm the technician. There are hazards in every type of job and every type of workplace. Everyone at the workplace shares the responsibility to identify and control the hazards. The technician must first recognise the hazards at the workplace. When the technician installs or assembles the components, she/he may have to face hazards which are related to the workplace. For instance, these hazards can be associated with the installation and assembly process of a water purifier. The technician should be aware of the hazards associated with the installation of a water purifier. Majority of the hazards can be avoided by being aware and taking appropriate precautions.

Electrical Hazard

An electrical hazard defines a dangerous condition. This dangerous condition is related to energised equipment or a conductor at workplace. If a technician comes in contact with the energised equipment, then the equipment may cause injury to the technician. There is a possibility of being electrocuted or getting an arc flash burn, thermal burn or blast injury while assembling the components in a unit. Many of the hazards can be avoided by being aware and taking appropriate precautions. This will ensure safety at workplace (Fig. 3.22).

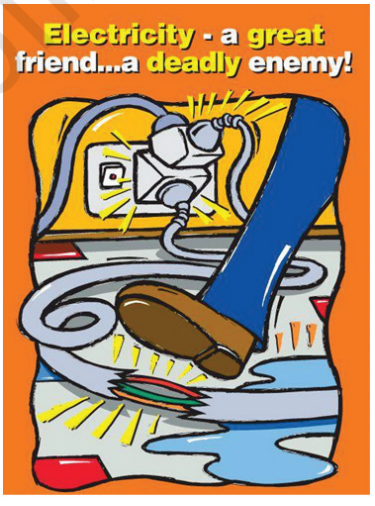


Fig. 3.22 Safe work in an electrical system

Points that need to be remembered for working safely around electrical panel and cabinet are as follows.

1. Watch out for loose cords and wires. Loose cords and wires can cause physical hazards and even electrical hazards. Hazard Tape should be placed if a cord or wire is placed on a pathway.

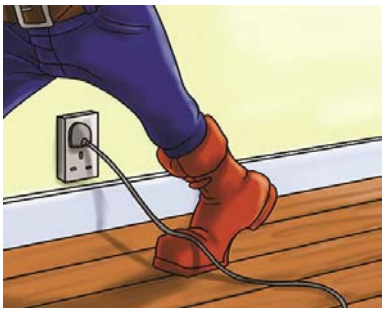


Fig. 3.23 Loose cord which can be hazardous

Fig. 3.24 Hazard tape

2. Wear proper personal protective equipment. The kind of personal protective equipment (PPE) required around a machine will depend upon the type of machine and task the employee is performing. Nevertheless gloves, hardhats, safety glasses, earplugs and other gears are important to use where necessary. For safety, signs can be posted near panels reminding employees to wear PPE (Figs. 3.23 and 3.24).
3. Use caution around heat sources. Some panel and equipment get hot while operating. Everyone should be aware of these areas and use caution when nearby. PPE like gloves or flame-resistant clothing may be required in these areas.
4. Be careful when cleaning: When cleaning around a panel or equipment, one should note other possible hazards too (Fig. 3.24):
   - Fire and explosion hazards
   - Need for PPE during cleaning
   - Risk of electric shock

Follow visual and written instructions panel, equipment has signs and labels on them alerting employees to hazards (Fig. 3.25).

Fig. 3.25 Personal protection equipment

5. Be cautious while testing, replacing the components in the panel. All levels of voltage should be considered equally dangerous. Even the voltage levels which cannot produce electrical shock should also not be ignored. We should check and confirm that the circuit is dead before touching it for repairing maintenance or any other work.
6. Avoid water at all times when working with electricity. Never touch or try repairing any electrical equipment or circuits with wet hands. It increases the conductivity of electric current (Fig. 3.26).
7. Never use equipment with damaged insulation or broken plugs.
8. If you are repairing an electrical device always turn off the mains supply.

9. Always use insulated tools while working.
10. Always use appropriate insulated rubber gloves and goggles while working on any branch circuit or any other electrical circuit.
11. Never try repairing energised equipment. Always check that is de-energised first by using a tester.

Fig.3.26 Avoid water while working with electricity

Chemical hazards are caused due to

1. improper storage of chemicals causing a chemical leakage
2. mishandling of chemicals due to inadequate training or negligence.

Fire Extinguisher

A fire extinguisher (Fig. 3.27) is a protection device used to cease fire. It is the basic first aid equipment which can be effectively used for controlling fire. A fire extinguisher is a cylindrical pressure vessel containing an agent which can be discharged to cease a fire. A fire extinguisher should always be available in areas where persons work with electrical equipment.
Different parts of a fire extinguisher are shown in Fig. 3.27.

The following steps demonstrate the operation of a fire extinguisher in case of a fire emergency.

Step 1: Identify the safety pin of the fire extinguisher which is generally present in its handle

Step 2: Break the seal and pull the safety pin from the handle

Step 3: Use the fire extinguisher by squeezing the lever

Step 4: Sweep it from side to side

Fig. 3.27 Parts of fire extinguisher

First Aid for Electrical Emergencies

Electrical accidents cause countless injuries. Injury could be minimised and many lives saved if proper rescue techniques and treatments are used. Electrical accidents may occur at any time or place. Timely response and treatment of victims is a major concern. When an electrical accident occurs, due to the effect of

muscle clamping, a victim is often incapable of moving or releasing the electrical conductor. Caution should be a primary consideration during any electrical accident or emergency. There should always be an emergency response plan for scheduled electrical maintenance or work.

Electrical Rescue Techniques

(a) Approaching the accident

- Never rush into an accident situation
- Call 108 as soon as possible
- Approach the accident place cautiously

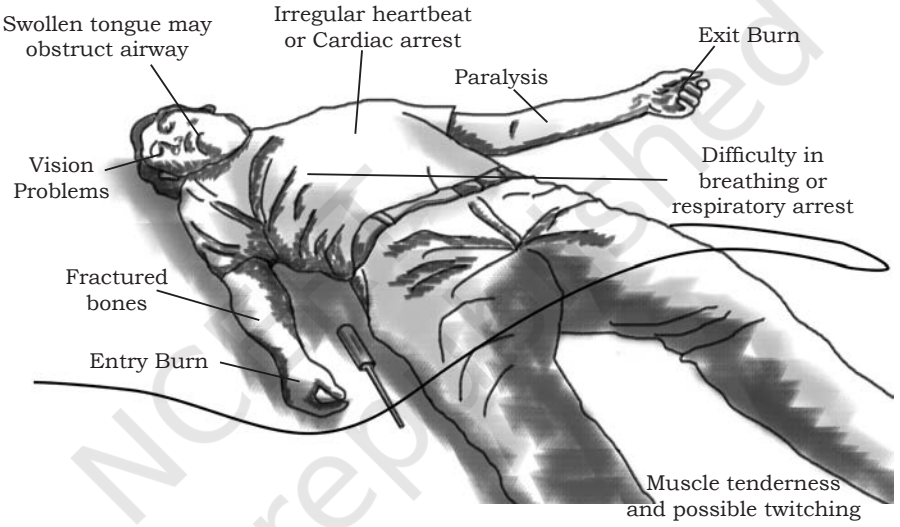


Fig. 3.28 Wireman in an unconscious state because of an electrical shock

(b) Examining the scene

- Visually examine victims to determine if they are in contact with energised conductors (Fig. 3.28).
- Metal surfaces, objects near the victim may also be energised (Figs. 3.29 and 3.30).

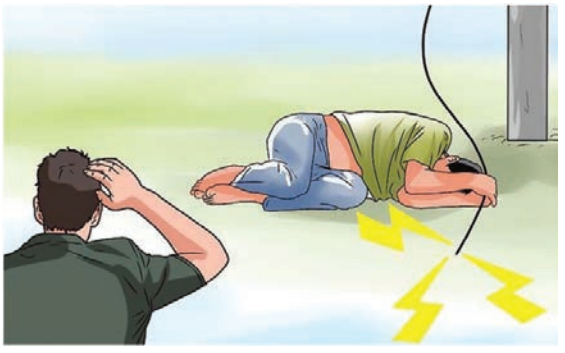


Fig. 3.29 Victim in contact with energised conductor

- You may become a victim if you touch an energised victim or conductive surface. Do not touch the victim or conductive surfaces while they are energised.
- Switch off the electrical circuits if possible.

(c) Hazards and solutions

- Be alert for hazards, such as heated surfaces and fire etc.
- In case you cannot switch off the power source, take extreme care
- Ensure that your hands and feet are dry
- Wear protective equipment, such as gloves and shoes. Stand on a clean dry surface
- Use non-conductive material to remove a victim from the conductor (Fig. 3.30)

Fig. 3.30 Use of non-conductive material to rescue the victim

(d) High voltage rescue

- Special training is required for rescues if high voltage is present
- Protective equipment, such as gloves and shoes must be worn

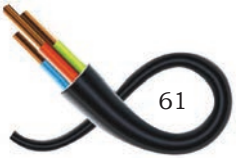
(e) First aid

- A victim may require Cardio-Pulmonary Resuscitation (CPR). Steps to perform in CPR are shown in the Figs. 3.31, 3.32 and 3.33.
- If the victim is breathing and has a heartbeat, give first aid for injuries and treat for shock.
- Ensure the victim gets medical care as soon as possible.
- Physician attending the victim must have detailed information to properly diagnose and care for the victim. The physician must determine whether the victim should be sent to a Trauma or Burn Centre.

Fig. 3.31 Chest compression

Fig. 3.32 Open the mouth for airway

Fig. 3.33 Rescue breathing



Check Your Progress

A. Fill in the blanks

1. While working with electricity, the technician must wear _____ gloves and shoes.
2. Defective or inadequate insulation may result in _____.
3. CPR stands for _____.

B. Multiple choice questions

1. What are the steps to operate fire extinguisher?
   (a) Identify the safety pin of the fire extinguisher which is generally present in its handle
   (b) Break the seal and pull the safety pin from the handle
   (c) Use the fire extinguisher by squeezing the lever
   (d) All of the above
2. When do we use a fire extinguisher?
   (a) In case of flood
   (b) In case of electric shock
   (c) In case of fire
   (d) In case of burn injury
3. Which of the following is a safety item that a wireman must not have while working?
   (a) Safety boots
   (b) Gloves
   (c) Helmet
   (d) Belt
4. Which of the following steps are required to perform CPR?
   (a) Chest compression
   (b) Open airway
   (c) Rescue breathing
   (d) All of the above