

Domestic Wiring

Introduction:

A network of wires drawn connecting the meter board to the various energy consuming loads (lamps, fans, motors etc) through control and protective devices for efficient distribution of power is known as electrical wiring.

Electrical wiring done in residential and commercial buildings to provide power for lights, fans, pumps and other domestic appliances is known as domestic wiring. There are several wiring systems in practice. They can be classified into:

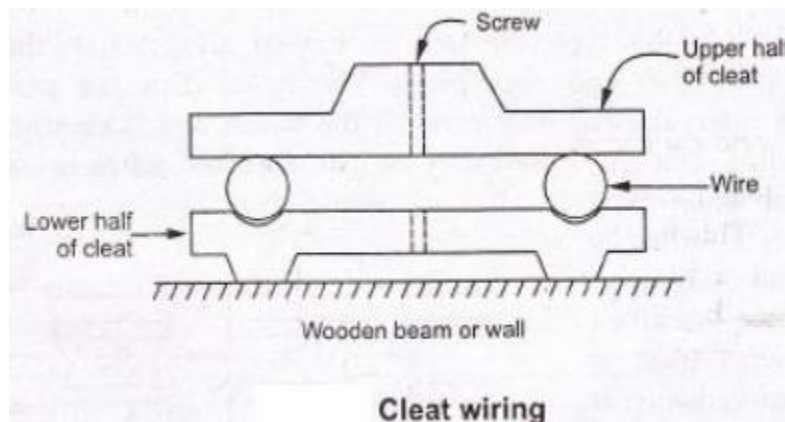
Types of wiring: Depending upon the above factors various types of wiring used in practice are:

1. Cleat wiring
2. Casing wiring
3. Surface wiring
4. Conduit wiring

i) Cleat wiring:

In this type V.I.R or P.V.C wires are clamped between porcelain cleats.

The cleats are made up of two halves. One half is grooved through which wire passes while the other fits over the first. The whole assembly is then mounted on the wall or wooden beam with the help of screws.



Advantages:

- This method is one of the cheapest method and most suitable for temporary work.
- It can be very quickly installed and can be recovered without any damage of material.
- Inspection and changes can be made very easily.

Disadvantages:

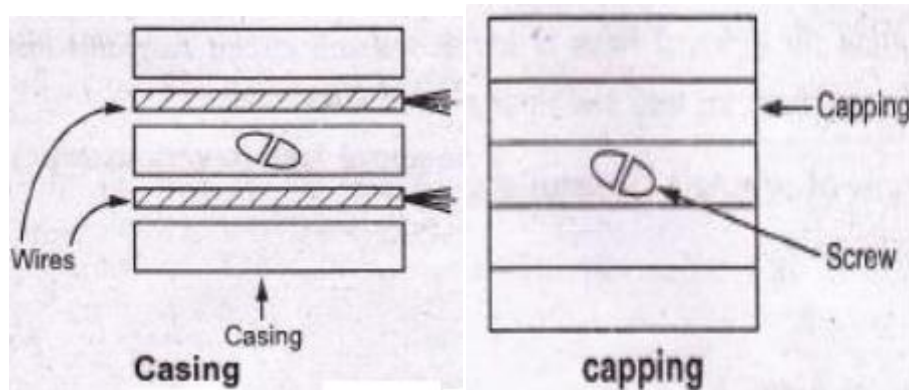
- This method does not give attractive appearance.
- After some time due to sagging at some places, it looks shabby.
- Dust and dirt collects on the cleats.

- The wires are directly exposed to atmospheric conditions like moisture, chemical fumes etc. maintenance cost is very high.
- Due to these disadvantages this type is not suitable for permanent jobs.

ii) Casing capping:

This is very popularly used for residential buildings.

In this method, casing is a rectangular strip made from teak wood or modern days PVC. It has 2 grooves into which the wires are laid. Then casing is covered with a rectangular strip of wood or P.V.C. of the same width, called capping. The capping is screwed into casing and is fixed to the walls with the help of porcelain discs or cleats.



Advantages:

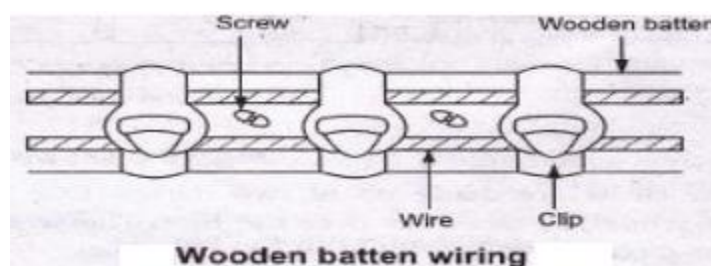
- Good protection to the conductors from dangerous atmospheric conditions
- neat and clean appearance

Disadvantages:

- In case of wooden casing capping, there is high risk of fire
- Requirement of skilled labor.
- The method is costly.

(iii) Surface wiring:

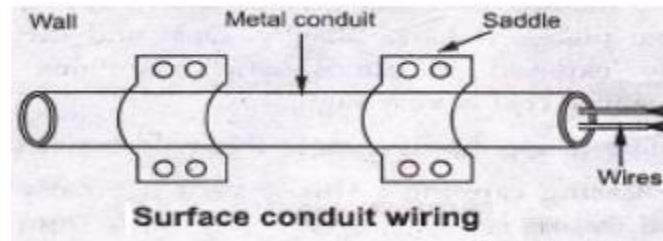
In this type, the wooden battens are fixed on the surface of the wall, by means of screws and rawl plugs. The metal clips are provided with the battens at regular intervals. The wire runs on the batten and is clamped on the batten using the metal clips. The wires used may be lead sheathed wires or can tyre sheathed wires. Depending upon type of wire used surface wiring is also called lead sheathed wiring or can tyre sheathed wiring. If the wire used is though rubber Sheathed then it is called T.R.S. wiring while if the wire used is can tyre Sheathed then it is called C.T.S wiring.



(iv) Conduit wiring:

In this method, metallic tubes called as conduits are used to run the wires. This is the best system of wiring as it gives full mechanical protection to the wires. This is most desirable for workshops and public Buildings. Depending on whether the conduits are laid inside the walls or supported on the walls, there are two types of conduit wiring which are :

i) Surface conduit wiring: in this method conduits are mounted or supported on the walls with the help of pipe books or saddles. In damp situations, the conduits are spaced apart from the wall by means of wooden blocks.



ii) Concealed conduit wiring: In this method, the conduit are buried under the wall at the some of plastering. This is also called recessed conduit wiring.

Advantages:

- The beauty of the premises is maintained due to conduit wiring.
- It is durable and has long life.
- It protects the wires from mechanical shocks and fire hazards.
- Proper earthing of conduits makes the method electrical shock proof.
- It requires very less maintenance.

Disadvantages:

- The repairs are very difficult in case of concealed conduit wiring.
- This method is most costly and erection requires highly skilled labour.
- In concealed conduit wiring, keeping conduit at earth potential is must.

FACTORS AFFECTING THE CHOICE OF WIRING SYSTEM:

The choice of wiring system for a particular installation depends on technical factors and economic viability.

- 1. Durability:** Type of wiring selected should conform to standard specifications, so that it is durable i.e. without being affected by the weather conditions, fumes etc.
- 2. Safety:** The wiring must provide safety against leakage, shock and fire hazards for the operating personnel.
- 3. Appearance:** Electrical wiring should give an aesthetic appeal to the interiors.
- 4. Cost:** It should not be prohibitively expensive.
- 5. Accessibility:** The switches and plug points provided should be easily accessible. There must be provision for further extension of the wiring system, if necessary.
- 6 Maintenance Cost:** The maintenance cost should be a minimum
- 7. Mechanical safety:** The wiring must be protected against any mechanical damage

Specification of Wires:

The conductor material, insulation, size and the number of cores, specifies the electrical wires. These are important parameters as they determine the current and voltage handling capability of the wires. The conductors are usually of either copper or aluminum. Various insulating materials like PVC, TRS, and VIR are used. The wires may be of single strand or multi strand. Wires with combination of different diameters and the number of cores or strands are available.

Ex: 1/20 or 3/22

The numerator indicates the number of strands while the denominator corresponds to the diameter of the wire in SWG (Standard Wire Gauge). SWG 20 corresponds to a wire of diameter 0.914mm, while SWG 22 corresponds to a wire of diameter 0.737 mm.

A 7/0 wire means, it is a 7-cored wire of diameter 12.7mm (0.5 inch). The selection of the wire is made depending on the requirement considering factors like current and voltage ratings, cost and application.

Example: Application: domestic wiring

1. Lighting - 3/20 copper wire
2. Heating - 7/20 copper wire

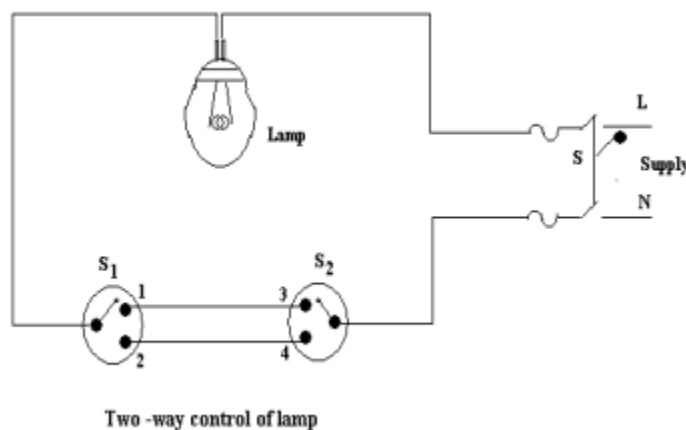
The enamel coating (on the individual strands) mutually insulates the strands and the wire on the whole is provided with PVC insulation. The current carrying capacity depends on the total area of the wire. If cost is the criteria then aluminum conductors are preferred. In that case, for the same current rating much larger diameter of wire is to be used.

Two- way and Three- way Control of Lamps:

The domestic lighting circuits are quite simple and they are usually controlled from one point. But in certain cases it might be necessary to control a single lamp from more than one point (Two or Three different points). For example: staircases, long corridors, large halls etc.

(i)Two-way Control of lamp:

Two-way control is usually used for staircase lighting. The lamp can be controlled from two different points: one at the top and the other at the bottom - using two- way switches which strap wires interconnect. They are also used in bedrooms, big halls and large corridors. The circuit is shown in the following figure.



- Switches **S₁** and **S₂** are two-way switches with a pair of terminals 1&2, and 3&4 respectively.
- When the switch **S₁** is in position **1** and switch **S₂** is in position **4**, the circuit does not form a closed loop and there is no path for the current to flow and hence the lamp will be **OFF**.
- When **S₁** is changed to position **2** the circuit gets completed and hence the lamp glows or is **ON**. N

- Now if **S₂** is changed to position **3** with **S₁** at position **2** the circuit continuity is broken and the lamp is off.
- Thus the lamp can be controlled from two different points.

Position of S ₁	Position of S ₂	Condition of lamp
1	3	ON
1	4	OFF
2	3	OFF
2	4	ON

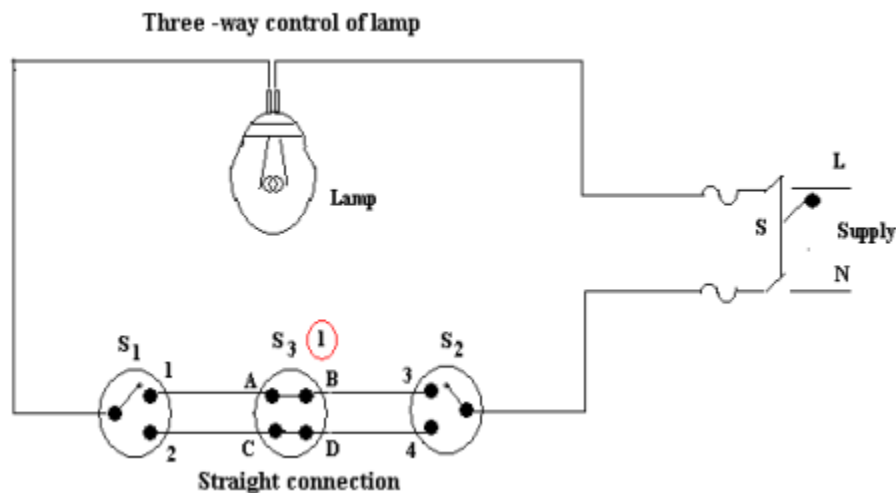
(ii) Three- way Control of lamp:

In case of very long corridors it may be necessary to control the lamp from 3 different points. In such cases, the circuit connection requires two; two-way switches **S₁** and **S₂** and an intermediate switch **S₃**. An intermediate switch is a combination of two, two way switches coupled together. It has 4 terminals ABCD. It can be connected in two ways:

- Straight connection
- Cross connection

In case of straight connection, the terminals or points AB and CD are connected as shown in figure 1(a) while in case of cross connection, the terminals AB and CD is connected as shown in figure 1(b).

As explained in two ways control the lamp is ON if the circuit is complete and is OFF if the circuit does not form a closed loop.



The condition of the lamp depends on the positions of the switches **S₁**, **S₂**, and **S₃**.

