

Extension board (Fig 2)

Extension boards are used to operate portable electrical appliances/ machines. It is also used where more number of sockets are required at a time.

Extension boards are available in different shapes with PVC (or) plastic boxes provided with 2 core (or) 3 core cables and moulded plugs. Extension boards are available in 6A and 16A ratings.

Fig 2



Conduit wiring - types of conduits - non-metallic conduits (PVC)

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

- distinguish between the different types of conduits used in wiring
- compare metal and PVC conduit wiring
- state the different types of accessories used in non-metallic conduits wiring.

In general, conduit is defined as a tube or channel, which is the most commonly used in electrical installations. When cables are drawn through the conduit and terminated at the outlet or switch points, the system of wiring is called conduit wiring.

Types of conduits

There are four types of conduits used for wiring.

- Rigid steel conduits
- Rigid non-metallic conduits
- Flexible conduits
- Flexible non-metallic conduits.

Non-metallic conduits

These are made of fibres, asbestos, polyvinyl chloride (PVC), high density polyethylene (HDP) or poly vinyl (PV). Of the above, PVC conduits are popular owing to their high resistance to moisture and chemical atmosphere, high dielectric strength, low weight and low cost. These conduits may be buried in lime, concrete or plaster without harmful effects.

However, light gauge (lower than 1.5 mm wall thickness) PVC pipes are not as strong as metal conduits against mechanical impact. Special PVC pipes which are heavy gauge and high impact resistance are available in the market which can withstand heavy mechanical impact as the thickness of the pipe is more than 2 mm.

There are some PVC heavy gauge conduits having special base material made to withstand temperatures up to 85°C. These PVC conduits are available in 3 m length.

Flexible conduits

Apart from rigid conduits, flexible conduits are also used for protecting cable ends connected to a vibrating machine inter connection between switchgear and distribution boards. In the case of metal flexible conduits, steel strips are spirally wound to form a tube. However, these flexible conduits of any type cannot be relied on as the sole means of earthing due to the manufacturing method as well as material. Hence, earthing conductors should run either externally or internally to the flexible conduit to form the earth connection. Flexible conduit accessories should be of threaded type.

Variation in conduit wiring systems

There are two types of conduit wiring systems as stated below, for either metallic or non-metallic types.

- Surface conduit wiring system done on wall surfaces.
- Concealed (recessed) conduit wiring system done inside the concrete, plaster or wall.

Selection of the type of conduit

Metallic or PVC conduits are equally popular in electrical installations. Selection of the type of conduit depends upon the following criteria.

- Type of location, outdoor or indoor
- Type of atmosphere, dry or damp or explosive or corrosive
- Expected working temperature
- Exposure to physical damage due to mechanical impact
- Allowable weight of conduit runs
- Estimated cost.

A comparison between metal and PVC conduit wirings given in Table 1 will help in choosing the right type of conduit for a specific installation.

Table 1

Comparison between metal and PVC wirings

Metal conduit	PVC conduit
1 Provides good physical protection to cables.	Comparatively poor.
2 Weighs more for a given length.	Lighter.
3 Needs skill and time for installation.	Needs less skill and time.
4 Risk of electric shock due to leakage.	No risk as PVC is an insulator.
5 Good earth continuity available through the pipe itself.	Not possible. Separate earth wire required.
6 Can be used in gas-light and explosive-proof installations.	Not suitable.
7 Not resistant to corrosion, needs protective coating.	Resistant to corrosion.
8 Large ambient temperature range	Suitable for limited temperature range. At temperature above 60°C, the conduit starts melting. At very low temperature the conduit cracks.
9 Fire resistant.	Non-fire-resistant.
10 More costly.	Less costly.

Special precautions with non-metallic conduits

- 1 If the conduits are liable to mechanical damages they should be adequately protected.
- 2 Non-metallic conduits shall not be used for the following applications.

- In concealed/inaccessible places of combustible construction where the ambient temperature exceeds 60°C.
- In places where the ambient temperature is less than 5°C.
- For suspension of fluorescent fittings and other fixtures
- In areas exposed to sunlight.

Non-metallic conduit accessories

Non-metallic conduit fittings and accessories shall be fabricated or moulded to the required shape. They shall be so designed and constructed so that they can be fitted with the corresponding conduit sizes without any adjustment, ensuring ready mechanical protection to the cables.

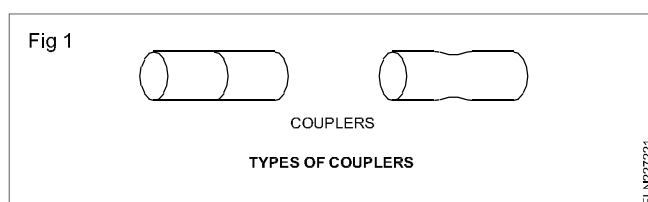
These fittings and accessories are used for conduit extension, and tappings or to assist pulling conductors. Rigid conduit accessories are normally of grip type only.

Inspection type, non-metallic fittings and accessories are permitted to be used only with surface mounting type wiring. Inspection fittings shall be so constructed that the screws used for fixing the cover do not deform the conduits or damage the insulation of the cables enclosed.

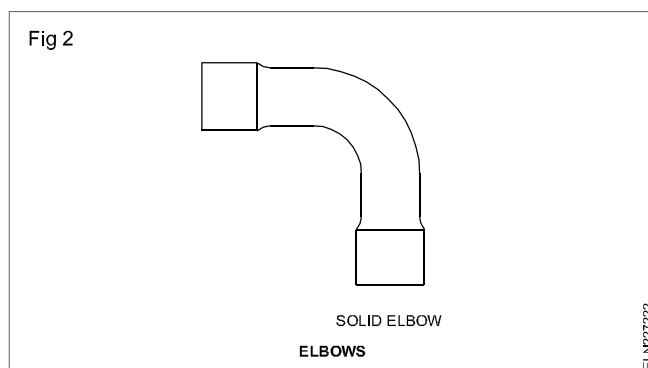
PVC fittings and accessories

Couplers (Fig 1)

Normally push type couplers are used and the conduit shall be pushed right through to the interior of the fittings. Inspection type couplers are used in straight conduit runs to assist in the inspection of the cables.

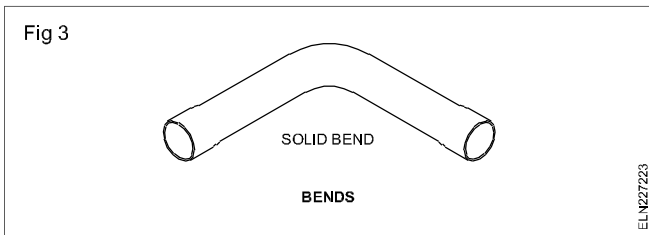


Elbow (Fig 2)



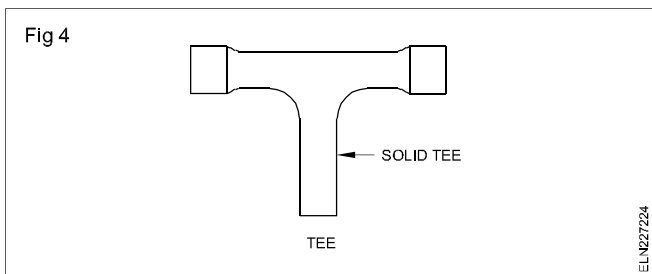
The axis of any elbow shall be a quadrant of a circle plus a straight portion of each end. Elbows are used at sharp ends of nearby walls or roof and wall.

Bends (Fig 3)



A bend gives a diversion of 90°C in the turn of a conduit, and a normal bend shall be a large sweep. Inspection type bends are used to assist in the inspection at the corners and for drawing cables.

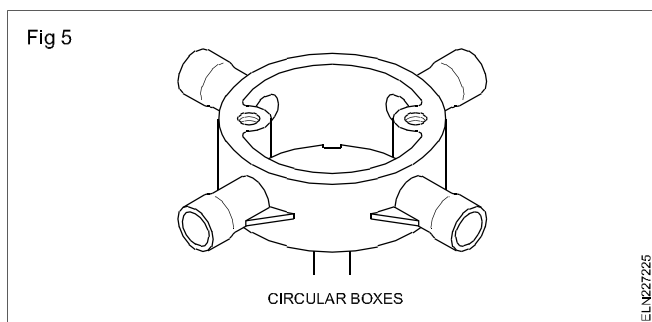
Tees (Fig 4)



Tees are used to take diversion from the main line either to the switch points or the light points. It may be either an ordinary type or an inspection type. Inspection type tees are used to assist in the inspection in case there is a need.

Boxes

Circular boxes (Fig 5)



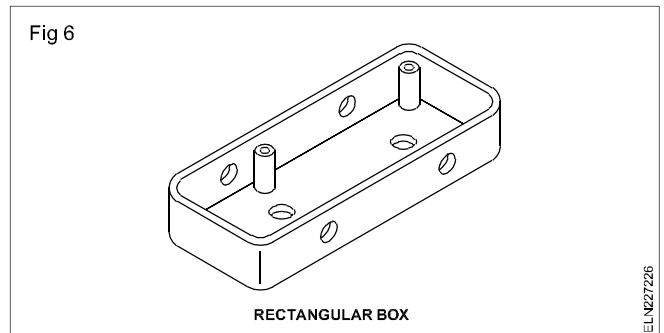
Small circular boxes shall be provided with two machine screws of a diameter not less than 2.8 mm for fixing the covers. Large circular boxes have four machine screws of not less than 4 mm diameter having not less than 10mm threaded portion for fixing the cover.

They are available in a single-way, two-way, three-way and four-way as well as back outlet types which can be used as per necessity in wiring. The minimum depth of junction boxes used in roof slabs shall be 65 mm. The cover of the circular box shall be made of the same material as that of the the box, and have a minimum thickness of 1.6 mm.

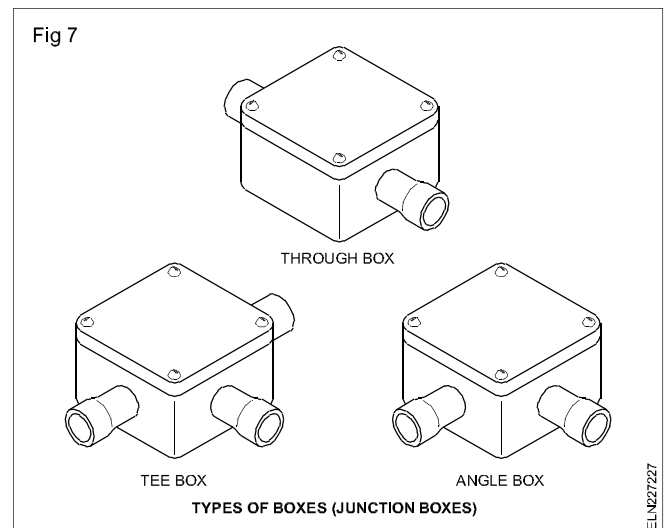
Rectangular boxes (Fig 6)

These boxes shall be provided with two machine screws of a diameter not less than 2.8 mm for fixing the cover. They

can be used as a junction box or switch box, for fixing flush type switches. These boxes shall be free from burrs, fins and internal roughness. The minimum thickness of the wall and base of the PVC box should be 2 mm and clear depth of 60 mm.



Apart from the above types, various other types are used as junction boxes (Fig 7).



Method of cutting, joining and bending PVC conduit pipes

While doing the conduit wiring, it becomes essential, that the length has to be increased or decreased. Further the conduit is to be bent according to the required situation.

Cutting PVC conduit

A PVC conduit is easily cut by holding at the corner of a bench and using a hacksaw. Any roughness of cut and burrs should be removed with the aid of a knife blade/emery sheet, or sometimes by using a reamer. Before installing the PVC conduit pipe great care should be taken to remove the burrs inside the pipes to avoid damage to the cables during the cable drawing process.

Joining conduit with fittings

The most common jointing procedure uses a PVC solvent adhesive. Before applying the adhesive the inner surface of the accessory and the outer surface of the PVC pipe shall be cleaned with emery sheet to have a better grip. The adhesive should be applied to the receiving portion of the

conduit fitting, and the conduit twisted into it to ensure a total coverage.

Generally, the joint is solid enough for use after two minutes although complete adhesion takes several hours. In order to ensure a sound joint, the tube and fittings must be clean and free from dust and oil.

Where expansion is likely and adjustments become necessary a mastic adhesive should be used. This is a flexible adhesive which makes a weatherproof joint, ideal for surface installations and in conditions of wide temperature variation. It is also advisable to use the mastic adhesive where there are straight runs on the surface exceeding 8 metres in length.

Conduit fittings should be best avoided, as far as possible, on outdoor systems.

Bends in conduit

All bends in the non-metallic system shall be formed either by bending the pipes by proper heating or by inserting suitable accessories such as bends elbows or similar fittings. Solid type fittings shall be used for recessed wiring. Solid type/inspection type of fittings shall be used for surface conduit wiring.

The minimum bending radius of conduits shall be 7.5 cm. Care should be taken while bending the pipes to ensure that conduit pipes are not damaged or cracked and the internal diameter is not effectively reduced.

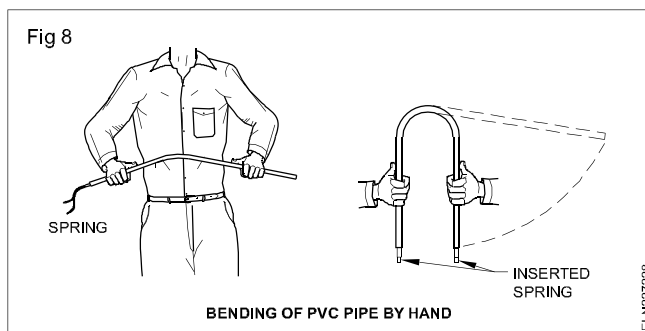
In recessed conduit wiring, conduit bending, other than at the ends, shall be made by bending the pipes to the required angle and clamping at short intervals. In the case of conduits laid in the roof slab, it can be clamped or tied to steel reinforcement bars with suitable metallic clamps.

In the case of conduits recessed on walls, the chasis shall be made in the required shape and conduit fixed in the groove with suitable clamps. In the case of bending for surface conduit system, bending can be done either at cold state or by proper heating.

Cold bending PVC conduit pipes

PVC conduits not exceeding 25 mm diameter can be bent cold by using a spring. The bend is then made either with the hands or across the knee (Fig 8). In order to achieve the angle required the original bend should be made at twice the angle required and the tube allowed to return to the correct angle.

Under no circumstances should an attempt be made to force the bend back with the spring if it is twisted in an anticlockwise direction. This reduces the diameter of the spring, making it for easy withdrawal.

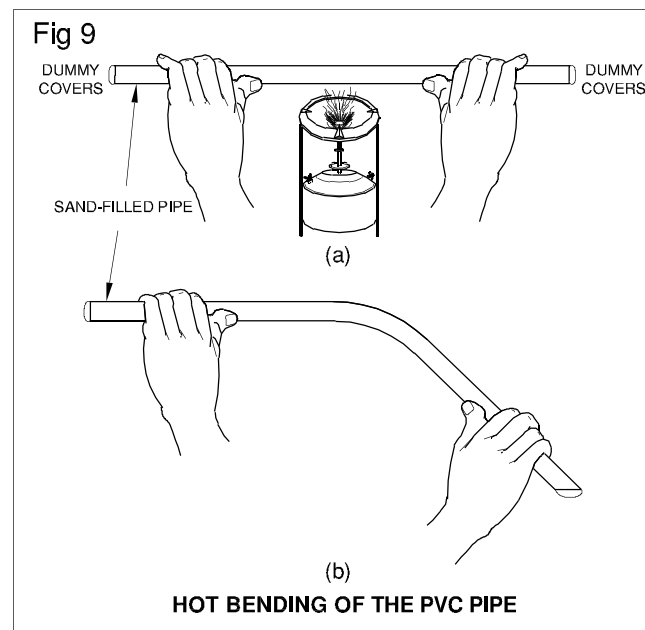


Bending PVC conduit in cold weather

In cold weather it may become necessary to warm the conduit slightly at the point where the bend is required. One of the simplest ways to do this is to rub the conduit with the hand or a cloth. The PVC will retain the heat created long enough for the bend to be made. In order that the bend is maintained at the correct angle, the conduit should be saddled as quickly as possible.

Bending of conduit by heating

The piece of conduit to be bent is first cut and inspected for any sharp edges or burrs left out. In such cases it shall be made smooth by using suitable emery sheet. The conduit is then filled with river sand. The ends are sealed with suitable dummy covers. The portion where the bend is to be made shall be heated uniformly (Fig 9a) to a temperature below its melting point.



Then bend the required angle is made by holding both sides, with sufficient gap from the heated portion to avoid burning of hands, and applying uniform pressure (Fig 9b). Care shall be taken to avoid kinks on the conduits while bending.

Selection of conduit sizes and general regulations

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

- state the method of selection of a suitable size of conduit for a specific number and size of cables.

In PVC conduit wiring the first step is to select the correct size of conduit. The conduit size is determined by the size of cables and the number of cables to be drawn in a particular section. This information can be obtained from the wiring layout and the wiring diagram.

Selection of conduit size

A non-metallic conduit pipe, used in wiring, should have a minimum size of 20 mm in diameter. Where a large number of conductors are to be drawn, the size of the diameter depends on the size of the conductor and the number of conductors. Table 1 gives details of the numbers and the sizes of conductors that can be drawn in each size of a non-metallic conduit.

Example

For selection of a PVC conduit

When 2.5 sq mm 650 V grade single core cables of six numbers are to be drawn in a single run, we can use 25 mm non-metallic conduit as per the table.

When 6 sq mm. 650 V single core 6 cables are to be drawn in a single pipe we can use 32 mm PVC pipe. The following are the maximum permissible number of 650/1100V volts grade single core cables that may be drawn into rigid non-metallic conduits (Table 1).

TABLE 1

Maximum number of PVC insulated 650 V/1100 V grade aluminium/copper conductor cable drawing through conduits conforming to IS: 694-1990.												
Nominal Cross- sectional area of condutor in sq.mm	20 mm		25 mm		32 mm		38 mm		51 mm		70 mm	
	S*	B*	S	B	S	B	S	B	S	B	S	B
1.50	5	4	10	8	18	12	—	—	—	—	—	—
2.50	5	3	8	6	12	10	—	—	—	—	—	—
4	3	2	6	5	10	8	—	—	—	—	—	—
6	2	—	5	4	8	7	—	—	—	—	—	—
10	2	—	4	3	6	5	8	6	—	—	—	—
16	—	—	2	2	3	3	6	5	10	7	12	8
25	—	—	—	—	3	2	5	3	8	6	9	7
35	—	—	—	—	—	—	3	2	6	5	8	6
50	—	—	—	—	—	—	—	—	5	3	6	5
70	—	—	—	—	—	—	—	—	4	3	5	4
<p>* The above table shows the maximum capacity of conduits for a simultaneous drawing in of cables.</p> <p>* The columns headed ‘S’ apply to runs of conduits which have a distance not exceeding 4.25 m between draw in boxes and which do not deflect from the straight by an angle of more than 15 degrees. The columns headed ‘B’ apply to runs of conduit which deflect from the straight by an angle of more than 15 degrees.</p> <p>* Conduit sizes are the nominal external diameters.</p>												

PVC Channel (casing and capping) wiring

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

- state the use limitation and rules of channel wiring system
- select the channel size according to size and number of cables from the chart
- explain the method of fabricating neutral, bend, and junction in PVC channel .

Introduction : Channel (Casing and Capping) wiring is a system of wiring in which PVC/metallic channels with covers are used for drawing wires. This system of wiring is suitable for indoor surface wiring works. This system is adopted to give a good appearance and for extension of existing wiring installation. PVC insulated cables are generally used for wiring in casing and capping system. This is otherwise called 'wireways'.

The channel and top cover shall be of the same material either PVC or anodised aluminium. The casing is square or rectangular in shape. The capping shall be slide in type with double grooving in the case of PVC wire ways. Plain type capping are used for metallic wireways.

The only disadvantage in a channel wiring is that it is inflammable and risk of fire.

Channel (casing & capping) wireways should not be used.

In residential buildings or such buildings where there is a risk of tampering where ambient temperature exceeds 60°C or less than 5°C in areas exposed to sunlight.

Dimensions : The sizes of channel, the maximum number of wires which can be drawn in each size are given in the table 1 below.

The thickness of channel should be 1.2mm ± 0.1mm.

TABLE 1

Nominal cross sectional area of conductor in sq.mm	10/15mm x 10mm size channel	20mm x 10mm size channel	25mm x 10mm size channel	30mm x 10mm size channel	40mm x 20mm size channel	50mm x 20mm size channel
	No. of wires	No. of wires	No. of wires	No. of wires	No. of wires	No. of wires
1.5	3	5	6	8	12	18
2.5	2	4	5	6	9	15
4	2	3	4	5	8	12
6	-	2	3	4	6	9
10	-	1	2	3	5	8
16	-	-	1	2	4	6
25	-	-	-	1	3	5
35	-	-	-	-	2	4
50	-	-	-	-	1	3
70	-	-	-	-	1	2

Precautions

- 1 Neutral (Negative) cables should be carried in top channel and phase (Positive) in the bottom channel.
- 2 Crossing of cables between phase (Positive) and neutral (Negative) should be avoided.
- 3 Porcelain or PVC pipe should be used for crossing the cables through the walls.

Installation of PVC channel : The channel should be fixed to wall/ceiling with flat headed screws and rawplugs. These screws shall be fixed at an interval of 60cm. On either side of joints this distance shall not exceed 15cm from the end point. Channel under steel joints shall be fixed with MS clips of not less than 1.2mm (18SWG) thickness and width not less than 19mm.

Floor/Wall crossings : When conductor pass through floors/wall the same should be carried in a steel conduit/ PVC conduits properly bushed at both ends. The conduits shall be carried 20cm above floor level and 2.5cm below ceiling level and properly terminated into the channel.

Joints in PVC/Metal channel : As far as possible wireways in straight runs should be single piece. All joints shall be scarfed or cut diagonally in longitudinal section. The section ends shall be filed smoothly but joined without any gap. Care shall be taken to see that the joints in PVC cover does not overlap those channel.

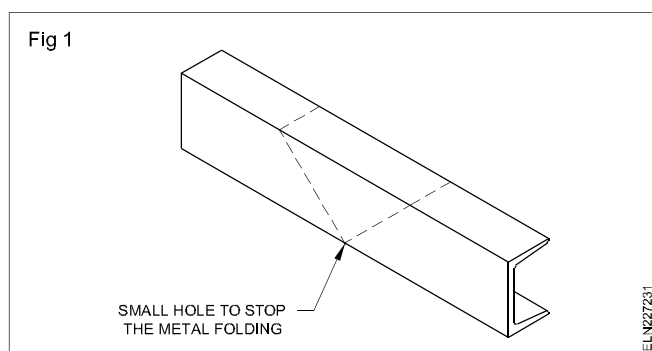
Joints shall also be done using standard accessories like elbows, tees, 3 ways/4 ways junction box etc of high grade PVC/Aluminium alloy. In PVC channel separate channel

cover for joint, elbows, tees, cross etc are available. These can be fixed after fixing the channel to give a good appearance. The radius of curvature of the cables inside a bend should be more than 6 times its over all diameter.

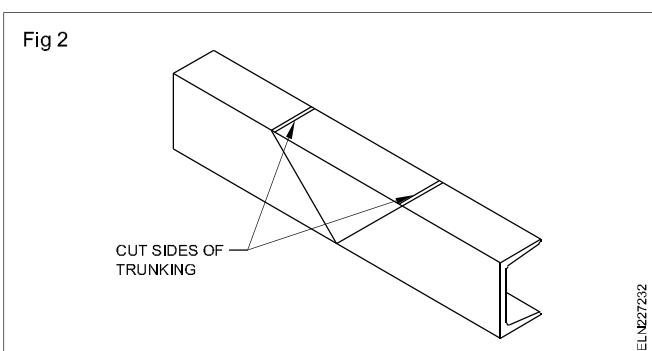
In the case of PVC channel, making joints is comparatively easy. Mark the joints by placing the two pieces in required angle. Identify the position to be cut and remove on each pieces. Cut through the lines and file the edges to get gapless joint.

Fabricating a right-angled vertical bend

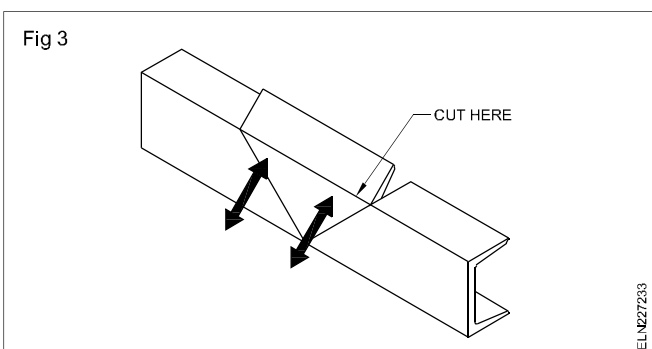
- 1 Mark out the position of bend of all sides as shown in Fig 1. the width 'Y' must be made equal to the diagonal length 'Y' to be cut.
- 2 Drill small holes in corners at point of bend to stop channel folding (Fig 1).



- 3 Place wood blocks inside trunking for support. Cut sides of trunking (Fig 2).

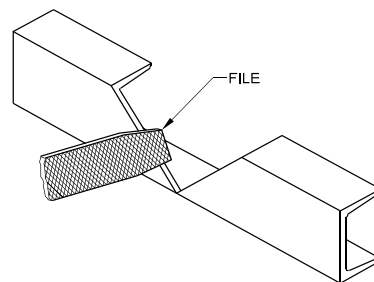


- 4 Cut, file and break-off waste (Fig 3).



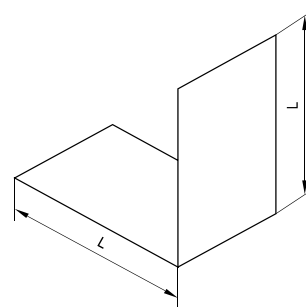
- 5 File all the edges smooth in order to bend to shape (Fig 4).

Fig 4



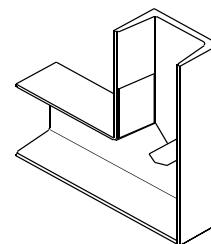
- 6 Make 'L' plates out of PVC scrap (Fig 5).

Fig 5



- 7 Make and secure assembly with 'L' plates and paste it with suitable adhesive (Fig 6).

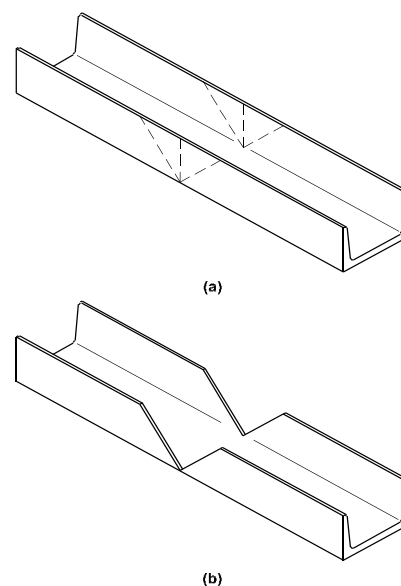
Fig 6



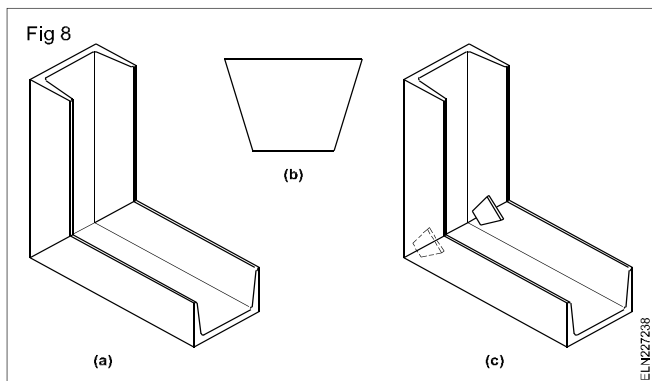
Fabricating 90° bend

- 1 Mark out the position of bend (Fig 7a & b).

Fig 7

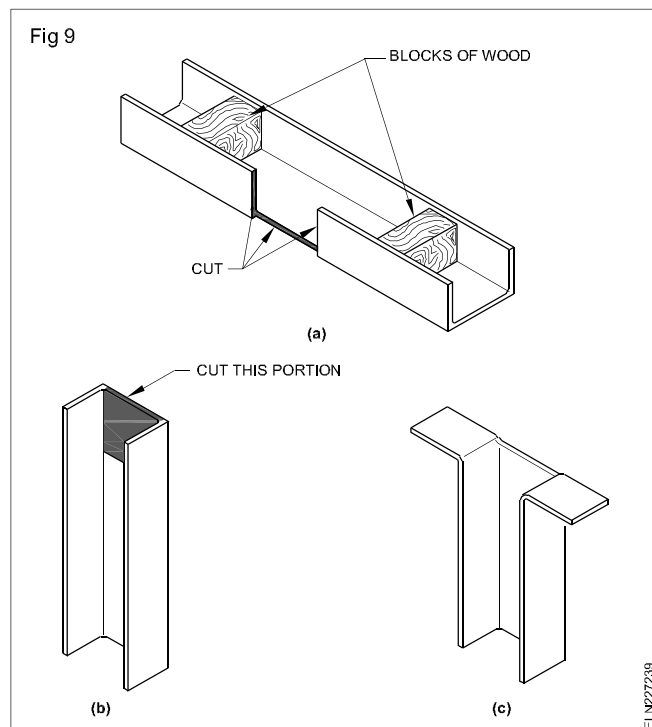


- Place wood blocks in trunking for support and make cuts with hacksaw.
- Remove sections and file smoothly.
- Bend shape and adjust the fit as required (Fig 8a, b & c).
- Make fish plates from PVC scrap (Fig 8b).
- Make and secure the assembly with fish plate (Fig 8).

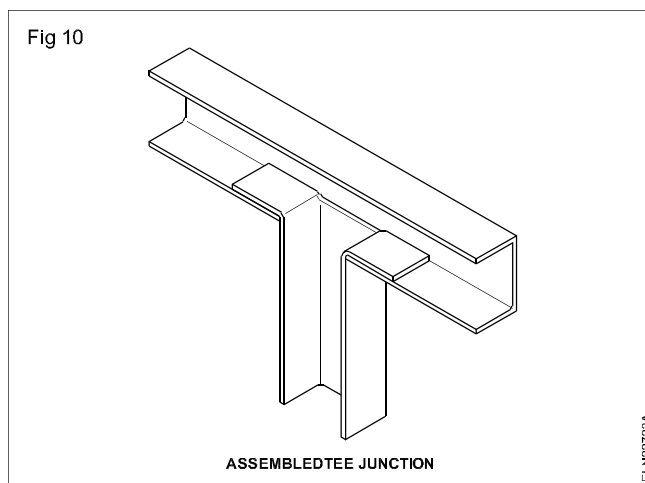


Fabricating a Tee junction

- Mark out the position of tee using another piece of trunking to gauge width
- Cut out the space for the tee (Fig 9a). Blocks of wood should be used to support section being cut.
- In another piece cut away the section (Fig 9b) to form two legs (Fig 9c).

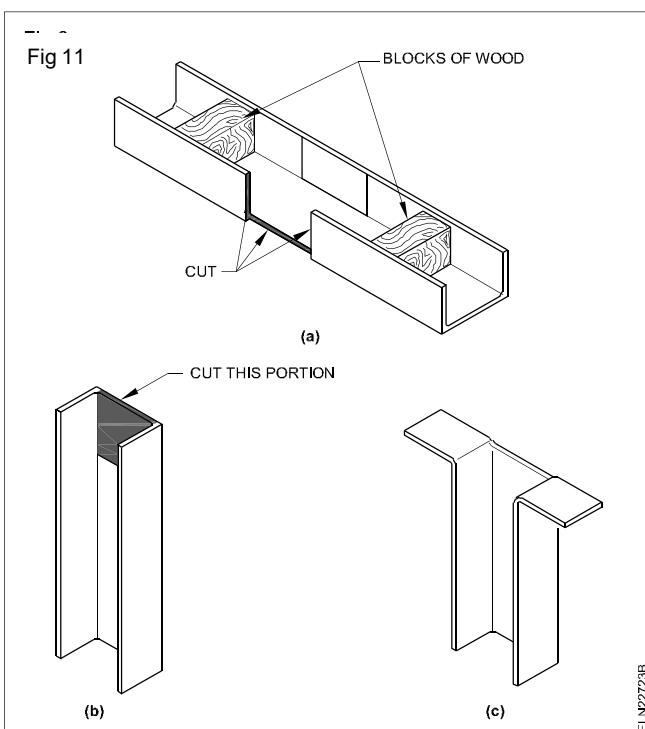


- File edges smooth and remove burrs. Check fit and adjust as necessary.
- Make, assemble and secure the Tee junction using suitable adhesive (Fig 10).



Fabricating a cross junction

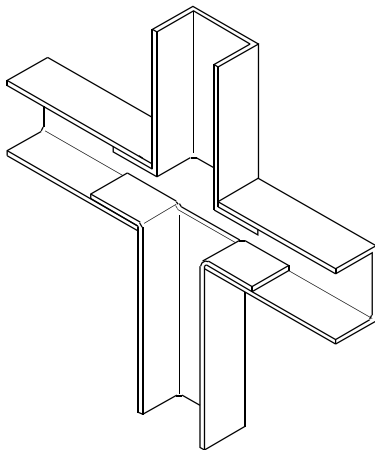
- Mark the position of first set (Fig 11a).
- Place blocks of wood in trunking for support and make cuts with hacksaw.
- Remove section of trunking and file the edges.
- Take another two pieces and cut away the section (Fig 11b) to form two legs (11c).



- Make, assemble and secure the cross junction using suitable adhesive (Fig 12).

Installation of cables : Cables carrying the direct current or alternate current shall always be bunched separately so that the outgoing and return cables are drawn in the same channel. Clamps shall be provided to hold the wires inside the channel at suitable intervals, so at the time of opening of the cover of channel, the wires do not fall out.

Fig 12



ASSEMBLED CROSS JUNCTION

ELN2723C

Attachment of cover : Cover should be attached to channel in individual sections after drawing all wires inside. No screws or nails shall be used for fixing PVC capping (cover) to the casing (channel). The capping (cover) should be slid in through the grooves. Metallic capping (cover) shall be fixed by using cadmium plated screws in a staggered manner with axial spacing not exceeding 30cm.

Earth continuity conductor : Earth continuity conductor shall be drawn inside the casing and capping (channel) for earthing of all metallic boxes of the installation as well as for connecting to earthpin of the socket.

In case of metallic casing and capping channel, there shall be a metallic link between adjacent casing with screw connections, and also connections from end channel (casing) to earth terminal of metallic boxes/outlets.

Power wiring

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

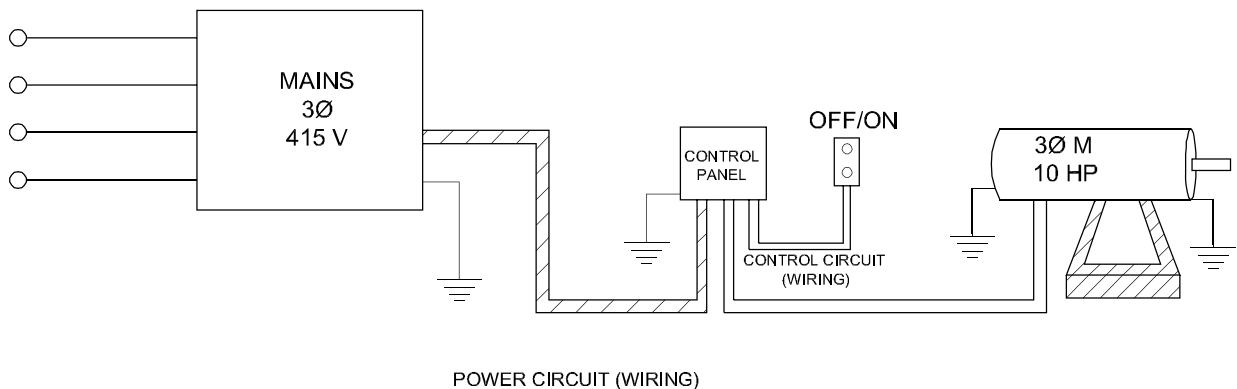
- state the power, control, communication and entertainment wiring
- state the necessity of various wiring.

A panel wiring diagram usually gives information about the relative position and arrangement of devices and terminals of the devices to help in installing or servicing the device.

Generally all the control panel / commercial / industrial wiring invariably consists of two sections viz control wiring and power wiring.

Fig 1 shows the typical layout diagram of a motor wiring. The control panel consisting of all the control and protective devices installed near to the power source and the load like, furnace, compressor etc, are installed away from the power source / panel boards.

Fig 1



POWER CIRCUIT (WIRING)

ELN27241

Power wiring is a high current carrying circuit which is wired to connect / disconnect the load like motors/ furnace through the protective devices like OLR and fuses etc..

Power wiring has to be done as per the guideline and rules specified in IE rules. The cable size depends on the load current and it varies according to the load.

The power and control cable should not be run into single conduit. As the current radiation influences the control cable, a separate conduit to be provided for control and power cables.

Control wiring

Control wiring is a circuit which is wired to communicate the commands and other information between control devices and lighting.

Control wiring enables the control circuit for various control purpose. In a motor control unit the control circuit is wired and kept near to motor. In other system such as fire alarm, fire detector etc. The control circuit is wired separately with low current carrying conductors and drawn separately for easy maintenance.

Fire alarm

The purpose of fire alarm system is to provide an immediate alarm in case of any fire and to prevent loss of life, also to secure the immediate attention of fire fighting staff.

Fire detectors

The three principal fire detection method involve sensing the heat, presence of flame or smoke. The third method identifies the pre - fire condition that is a flammable gas detector, which is technically not a fire detector and its use is limited to places where flammable gases are likely to be present.

I Heat detector

The three basic operating principles for heat detection are:

- a Fusion detector (melting of a metal)
- b Thermal expansion detector
- c Electrical sensing

II Smoke detectors

There are three types of smoke detectors namely

- 1 Ionisation detector
- 2 Light - scattering smoke detector
- 3 Obscuration smoke detector.

III Flammable gas detector

A flammable gas detector is designed to measure the amount of flammable gas in the atmosphere. The gas mixture is drawn over a catalytic surface where oxidation i.e. combustion takes place. The combustion causes a rise in temperature of the surface which is measured by a decrease in its electrical resistance. The instruments are calibrated by considering pentane or heptane as reference gas. The readings are displayed in terms of percentage of lower explosive limit.

Control panel for fire alarm system

The control panel is the heart of the system through which the fire alarm system is monitored and alarm is initiated if any indication/signal is conveyed to the panel.

The working of the fire alarm system should be checked once in a month regularly.

The features of the control panel are the power supply, battery charging unit and control card.

Communication wiring

It is type of wiring which is used to transmit the voice, data, images and video etc to the desired places.

Some of examples are

- Telephone wiring
- Internet / LAN network wiring
- Cable TV and other entertainment wiring
- Data and security services wiring
- Telex/ Fax machines wiring

Faster and more reliable than ordinary phone wiring, low-cost, high-tech copper wiring should serve every room in the modern home. Its is required to carry voice, data and other services from where they enter the house to every room, and from any one room to any other.

Necessity of communication wiring

Unshielded twisted pair (UTP) copper information wiring often called structured wiring is used today for offices, schools and factories to provide local area networks (LANs), which allow computers to talk to one another and to receive and send Internet and high-speed computer data outside the facility.

Educated homebuyers-and homebuilders realize it is better to use the most advanced wiring technology up front, when installation is economical.

It's better to anticipate the homeowner's future needs by wiring the house with a state-of-the-art system while it is being built, and at the same time equip yourself with a powerful marketing tool.

The phone wiring of the past, often referred to as quad wiring because it has four copper wires, is now obsolete. Cat 5 or higher speed wiring has four twisted wire pairs, or eight wires.

Copper UTP Wiring

Copper UTP wiring contains eight color-coded conductors (four twisted pairs of copper wires). It offers greatly increased bandwidth compared with old-fashioned quad wiring.

The cable is small (roughly 3/16 inch in diameter), inexpensive and easy to pull, although it must be handled with care.

Advantages

Modern copper UTP wiring offers the following advantages:

Diversity

The Internet and computer communications, as well as ordinary phone signals, can be carried throughout the home on modern, inexpensive, high-speed, UTP cables. (To service a large number of TV channels, it is recommended to also run high-quality coaxial cable, such as quad-shielded RG-6.)

More phone numbers

Several phone numbers can be made available throughout the house. Actually, voice service requires very little bandwidth, and the addition of separate numbers is almost trivial.

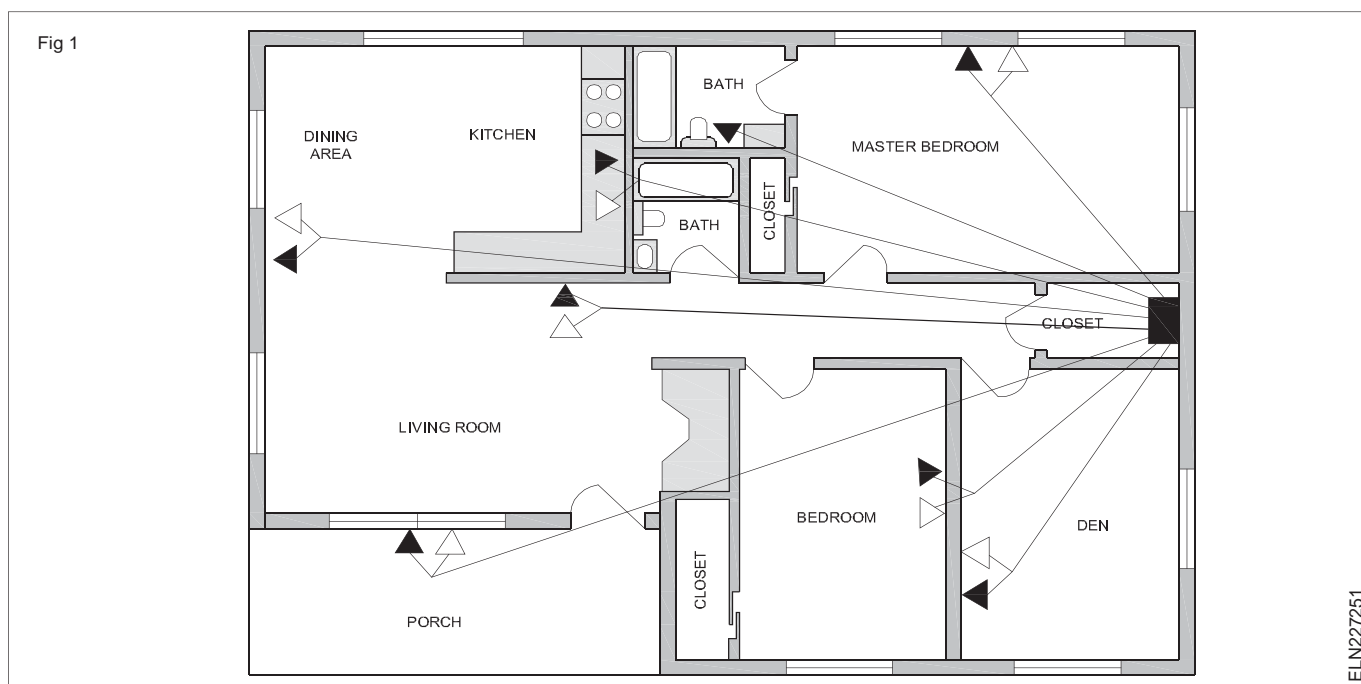
Bandwidth

Bandwidth correlates with speed, and these bandwidths are many orders of magnitude greater than the bandwidth required for a "modern" 56 kbps (kilobits per second) modem.

New Services

The Internet is now available at high speed to many homes, but homebuyers are not able to take full advantage of it, if their wiring is inadequate. One high-capacity technology now being offered by local phone companies is DSL (digital subscriber line). And cable modems are being offered by cable TV companies that bring in the Internet on the same coaxial cable carrying the TV signals.

Fig 1 is a simplified plan of a small, two-bedroom, single-story house. Note that all the wiring radiates from a single distribution device the star pattern and there are multiple outlets in each major room, including the kitchen and the porch.



Use 8-Pin Modular (RJ-45) Jacks (Fig 2)

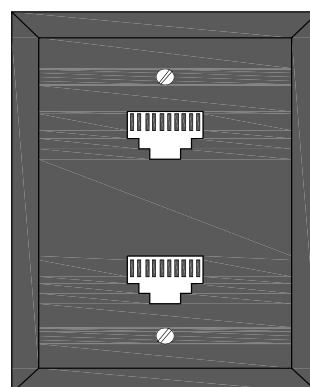
These devices provide connection points for all eight of the wires contained in the four twisted pairs.

Fig 2 (below) shows a wall outlet with two such jacks.

All connecting devices, central distribution device, plugs on the ends of cables, outlets, etc.-should be rated for the cable used.

Finally, the finished installation should be thoroughly tested.

Fig 2



Video Cables

Although the industry is working toward an all-UTP solution for wiring residences, at this time it is prudent to also include conventional coaxial cable for video distribution, particularly cable TV. This is because it is difficult to predict whether many channels well over 100, for example-may become a reality in the near future, some channels of which will be the more bandwidth-consuming high-definition television (HDTV).

If coax is installed, quad-shielded RG-6 coax, with an all-copper center conductor, should be used for superior performance. (Copper-plated steel center conductors are also available, providing additional stiffness, but are unable to handle low-frequency currents used to power some devices.) A lesser grade, RG-59, should not be used.

Entertainment wiring

It is a type of wiring which is mainly used for entertainment or relaxation purpose. Example Home theatre wiring.

The nature and quality of wiring will not only determine the level of safety in home theatre room, but equally important, will have a noticeable impact on the video and sound quality of your system components.

Home Theatre Wiring Basics: Safety, planning, budgeting

When it comes to home theatre wiring, the guiding principle is...

- Do it safe
- Do it once
- Do it right

Safety: This is a most important aspect in any installation. Do not save on the wiring by using sub-standard cables.

With in-wall installations, Specially certified wires (UL-rated CL3 wires) should be used that comply with national standards for resistance to fire, chemicals, abrasion, and temperature extremes.

Planning: Planning is the key to future proofing the installation while avoiding costly alterations later on.

AV (Audio Video) equipment and speaker placement the room lighting requirements, networking, possible future additions, etc. are to be taken care of these will determine the quantity and placement of the various audio/video points in the room as well as the electrical needs for home theatre installation.

Finally, when it comes to estimating the required cable lengths, do not just calculate the linear lengths to complete your cable runs; allow for at least 20% extra to cover for possible errors and slack for terminations.

Budgeting: The wiring requirements during planning stage will determine the budget necessary for your home theater wiring project.

Home Theatre Speaker Wiring

Many fail to realize that home theatre wiring can have a noticeable impact on speaker performance. The greatest speakers will not sound their best with the use of inappropriate speaker wires or an incorrect wiring installation. In particular, selecting the correct speaker wire thickness is essential for the best speaker performance.

At the same time, keep in mind that some speaker manufacturers use non-standard connectors with their speakers; in these circumstances, use of optional third-party speaker wire and connectors may not always be an option unless you take the extreme route of splice your wiring.

Speaker Wire Size

Selecting the correct thickness for your home theater wiring is important as it affects the speakers' performance; it will impact the speakers' ability to deliver the explosive effects in home theatre sound.

The thickness of a wire conductive copper part is identified by its Wire Gauge, normally expressed either in AWG (American Wire Gauge) or SWG (British Standard Wire Gauge)

Single Room Installation

The thicker wire will help bring out fine musical detail in quality music systems, as well as deliver the explosive effects of surround sound.

In those situations where long speaker wire runs cannot be avoided, thicker wire helps reduce the overall resistance, and therefore amplifier load - leading to lower operating temperatures. This will result in improved sound quality and long-term stability.

After setting up a modestly priced home-theatre-in-a-box package, do not go for the more expensive thicker wire unless you plan an upgrade sometime in the future; using of gauge 16 speaker wire should suffice in this case.

Multi-Room Wiring

In a multi-room installation, long home theatre wire runs are inevitable; The suggested wire gauge to use in home theatre wiring is given below:

Distance between speaker and amplifier	Speaker Wire Gauge
Less than 50 feet	16
50 to 100 feet	14
100 to 150 feet	12
more than 150 feet	10

The 'length factor' is not the only issue to consider when determining the wire gauge to use. The speaker impedance should also be taken into account.

Connection Basics

Speakers and amplifiers/receivers normally come equipped with one of two types of connectors - spring terminals or binding post connectors.

Each speaker connection have two such terminals marked (+) and (-) to help you distinguish the two leads. Maintaining correct polarity all along your home theater wiring is important. For this reason, speaker wire and terminals are normally color coded black for the -ve terminal and red for +ve side.

Spring terminals will only accept pin connectors or tinned base wire ends. Instead, binding posts accept many types of connection, including pin, banana plug or spade.

Guidelines for Home theatre wiring & installation

- Do not run home theatre cables in close proximity or parallel to other electrical lines, nor run your wiring around power supplies as these can lead to interference issues with both your audio and video system components.
- Avoid splicing wiring at all cost, as it leads to a lowering in performance. In addition, always use direct speaker wire runs straight from amplifier to each speaker. This is the normal way of wiring the sound in the home theatre but in the case of a multi-room audio installation, some may simply skip on this and splice the speaker cable along the way. Doing so, may not only lead to a detrimental effect but equally important, makes fault tracing even more difficult later should problems arise.
- Leave extra length at each end of the cable runs. And if home theatre wiring is part of a renovation project, it is also advisable to cover the extra cable lengths and termination/junction boxes. The plastering/painting process that follows can be really messy..