Trunking Systems

10.1 AN OVERVIEW OF TRUNKING INSTALLATION

A number of reputable manufacturers can supply trunking ranging from 25mm × 25mm to 300mm × 300mm or even larger, with two or more compartments. They also provide all necessary accessories such as bends, tees, crossovers and bridges to segregate cables of different systems at junctions.

Trunking systems are more flexible than conduit systems. Extensions can readily be made during the life of the installation by making a new hole in the trunking and running a conduit to a new point. Naturally, care is needed with the design of such an alteration as grouping of additional circuits may require the de-rating of cables to be re-assessed. However, it may be possible to implement the alteration without disturbing the existing wiring.

Trunking can be easily and quickly erected, and can be fitted to walls or suspended across trusses; where it should be supported at each joint. As with conduit, guidance on the spacing of supports for conduit is given in the IEE On-site Guide. IEE Table 4D covers both steel and plastic trunking types.

Where there are vertical runs of trunking, pin racks should be fitted inside the trunking to support the weight of the cables and to enable the cables to be secured during installation. These pin racks consist of steel pins, sheathed by an insulating material, mounted on a backplate; they should be fitted at intervals of 5m.

Where vertical trunking passes through floors it must be provided with internal fire barriers, which must consist of non-flammable materials, cut away to enable cables to pass through and made good after the installation of the cables.

When large cables are installed in trunking, care must be taken to ensure that all bends are of sufficient radius to avoid damaging the cable (IEE Regulation 522.8.3). The IEE On-site Guide gives useful advice on this subject. This states, for example, that non-armoured PVC-insulated cables of an overall diameter greater than 25mm shall not be so bent that the radius of the inside of the bend is less than six times the diameter of the cable. Trunking manufacturers provide bends and tees that enable this requirement to be satisfied.

Trunking can be used to accommodate PVC insulated cables that are too large to be drawn into conduit. Unless there are special reasons for using conduit, it will generally be found more economical to use trunking rather than conduit larger than 32mm diameter.
Regulations

The regulations governing wiring in conduit also apply to wiring in trunking, as far as applicable. All sections of trunking, bends, and other accessories must be effectively earthed in order to ensure that the conductivity of the trunking is such as to enable earth-fault current to flow to operate the fuse or earth-leakage circuit breaker protecting the circuit.

Trunking is usually supplied in 3 m lengths, although in some cases longer lengths are obtainable. If copper links are fitted these will generally ensure satisfactory earth continuity, but if tests prove otherwise an insulated protective conductor should be installed inside the trunking. It is in any case common practice to provide separate circuit protective conductors to ensure earth continuity throughout the life of the installation. As with conduit the cable capacities of trunking can be calculated. To ensure that cables can be readily installed, a space factor of 45% should be used.

When a large number of cables are installed in trunking, due regard must be paid to temperature rise due to grouping of cables. IEE Tables 4C1–4C5 give details of the factors to be taken into account when cables are bunched in trunking or conduits, and in some circumstances this could result in a very considerable reduction in the current ratings of the cables installed in the trunking.

For example, if eight circuits are enclosed in trunking the correction factor, according to IEE Table 4C1, could be as much as 0.52 to the rating values for 16 single-core cables.

The ratings of cables installed in trunking are also affected by ambient temperatures, and a de-rating of PVC insulated cables will be necessary if the ambient temperature exceeds 30 °C, as will be seen by referring to the rating factors in IEE Tables 4B1–4B3.

Details of the application of correction factors for grouping and ambient temperature are given in Chapter 4.

10.2 METALLIC TRUNKING

Metallic trunking for industrial and commercial installations is often used in place of the larger sizes of conduit. It can be used with advantage in conjunction with 16mm–32mm conduits, the trunking forming the background of framework of the system with conduits running from the trunking to lighting or socket outlet points. For example, in a large office building, trunking can be run above the suspended ceiling along the corridors to feed corridor points, and rooms on either side can be fed from this trunking by conduits.

In multi-storey buildings trunking of suitable capacity, and with the necessary number of compartments, can be provided and run vertically in the riser ducts and connected to distribution boards; it can also accommodate circuit wiring, control wiring, also cables feeding fire alarms, telephones, emergency lighting and other services associated with buildings.
(a) 100 × 100mm steel trunking and lids laid out ready for erection. (b) Components for vertical and horizontal bends are available pre-formed and ready for assembly. The short straight length is cut to suit and is drilled with clearance holes for the fixing screws.

(c) Fitting the components of the offset together using set screws inserted into the pre-tapped holes in the angle pieces. (d) Having fitted the long runs of 100×100mm conduit to the wall, the offset is assembled in position.

(e) Using a magnetic spirit level to check the alignment of the vertical section before tightening the fixing screws. Note the washers used under the heads of the fixing screws to spread the load. (f) The completed trunking assembly, with the offset, ready for wiring. Following which the lids will be fitted.

FIGURE 10.1 Steel trunking.
As explained in Chapter 8, cables feeding fire alarms and emergency circuits need to be segregated by fire-resisting barriers from those feeding low-voltage circuits (i.e. 50V–1000V). It is usual for telecommunications companies to insist that their cables are completely segregated from all other wiring systems. It may therefore be necessary to install three- or four-compartment trunking to ensure that IEE Regulation 528.1 and the requirements for data and telecommunications circuits are complied with. Cables feeding emergency lighting and fire alarms must also be segregated so as to comply with the requirements of BS 5266 and 5389. Additionally, segregation may be required to achieve electromagnetic compatibility requirements.

**Lighting Trunking System**

Steel or alloy lighting trunking was originally designed to span trusses or other supports in order to provide an easy and economical method of supporting luminaires in industrial premises at high levels.

The first types of such trunking consisted of extruded aluminium alloys, the sections of which were designed to support the weight of luminaires between spans of up to 5m. More recently sheet-steel trunking has become available, made in sections which achieve the same purpose.

The advantage of this type of trunking is that it can be very easily installed across trusses, will accommodate all wiring to feed the lighting points, and can also accommodate power wiring and, if fitted with more than one compartment, fire alarm and extra low-voltage circuits.

**FIGURE 10.2** Shallow sockets can be obtained for fitting to the lid of skirting trunking and trunking manufacturers will punch suitable apertures for the reception of sockets.
When installed at high levels it can be very usefully employed to accommodate wiring for high-level unit heaters, roof fans and similar equipment. Its main purpose of course is to support luminaires, and when suspended between trusses, which have a maximum spacing of 5 m, it should be able to support the weight of the required number of luminaires without intermediate supports.

It is therefore necessary that trunking suspended in this manner is of sufficient size to take the necessary weight without undue deflection. Manufacturers of trunking provide the relevant data and should be consulted about this.

Lighting trunking is also manufactured in lighter and smaller sections which can be fixed directly to soffits, either on the surface or mounted flush with the finished ceiling; as this does not have to support heavy weights between spans it is similar to ordinary cable trunking.

Like all other trunking, it must be provided with suitable copper links between sections to ensure adequate earth continuity, but as already explained, if the earth continuity is found to be unsatisfactory, an insulated protective conductor should be installed in the trunking.

Some types of lighting trunking are of sufficient dimensions to accommodate the fluorescent lamps and control gear within the trunking. Others have the control gear in the trunking and the lamp fittings fixed beneath.

**Steel Floor Trunking**

Underfloor trunking made of steel is used extensively in commercial and similar buildings, and it can be obtained in very shallow sections with depth of only 22mm, which is very useful where the thickness of the floor screed is limited.

![Office lighting fitted in integral trunking which houses the control units as well as the light fittings, the whole being suspended from the roof structure.](image)
It is supplied with one or more compartments, and with junction boxes that have cover plates fitted flush with the level of the finished floor surface. Where there are two or more compartments these boxes are fitted with flyovers to enable Band I and Band II circuits to be kept segregated as required by IEE Regulation 528.1.

When floor ducts are covered by floor screed it is necessary to ensure that there is a sufficient thickness of screed above the top of the ducts to prevent the screed cracking as a result of the expected traffic on the floors. Another method is to use floor trunking, the top cover of which is fitted flush with the finished floor surface. In this case the top cover plate has to be of sufficient thickness to form a load-bearing surface.

Outlets for sockets and other points can be fitted on top of the cover plates, and it is usual to fit pedestals to accommodate the sockets.

Trunking is available which has sufficient depth to accommodate the socket and plugs, together with the necessary wiring. The minimum depth for this type of trunking is 50mm. Separate short sections of cover plate are provided in all positions where sockets may be required; these sections are easily removable and are provided with bushed holes to enable flexible cords to emerge. It is necessary to provide suitable holes in linoleum or carpets for the flexible cords to pass through.

Whatever type of floor trunking is employed, it can be connected to distribution board positions, and also to skirting trunking. Special right-angle bends are available to facilitate connection between floor trunking and skirting trunking.

If there is any doubt as to the continuity between sections of floor trunking it is advisable to run an insulated protective conductor in the trunking. Protective conductors must connect from the trunking to earthing terminals of socket outlets and other accessories. Where socket outlets are required in positions where there is no floor or skirting trunking, such points can be wired in conduit connected to the side of the trunking.

Another type of metal floor trunking is the ‘In-slab’ installation method. This consists of enclosed rectangular steel ducts (usually 75mm × 35mm), together with junction and outlet boxes. A separate duct is provided for each wiring system, i.e. for low-voltage circuits, fire alarms, telephone lines, etc.

The separate ducts are spaced apart to give a stronger floor slab. The depth of the trunking and outlet boxes together with their supporting brackets equals that of the floor structure, so there is no need for a finishing screed, thus affording a considerable saving in construction costs. The outlet boxes can be fixed in any position, but a distance of 1.5 m between boxes will usually provide facilities for most office needs.

10.3 NON-METALLIC TRUNKING

A number of versatile plastic trunking systems have been developed in recent years and these are often suitable for installation work in domestic or
commercial premises, particularly where rewiring of existing buildings is required. The trunking can be surface mounted and if care is taken in the installation, it can be arranged to blend unobtrusively into the decor. Skirting-mounted trunking is probably the most appropriate for use in domestic dwellings, but shallow multi-compartment trunking can also be run at higher levels in, for example, school classrooms or kitchens. Industrial non-metallic trunking is also available in a range of sizes up to 150mm × 150mm. The manufacturers of plastic trunking generally supply a full range of fittings and accessories for their systems, and in some cases these are compatible between one make and another. Generally, however, once one system is chosen, it will be necessary to stay with it to achieve a neat appearance and the ability to interchange fittings.

The IEE Regulations which apply to metal trunking also generally apply to non-metallic types. Low-voltage insulated or sheathed cables may be installed in plastic trunking. In any area where there is a risk of mechanical damage occurring, the trunking must be suitably protected. Being non-conductive, it will be necessary to run protective conductors for circuits requiring them inside the trunking, and the size of these protective conductors must be calculated so as to satisfy the IEE Wiring Regulations.

The advantages of non-metallic trunking are that it is easier to install, is corrosion resistant and is maintenance free. In addition the flexibility is such that it is often possible to reposition outlets or make other alterations without any major disturbance. For those circumstances where it is required, plastic trunking can be obtained with metal screening between the different compartments used for low voltage, communication or other cables. There are limits to the ambient temperature in which the system can be installed.

**FIGURE 10.4** Multi-compartment skirting trunking allows the segregation of different types of circuit. In this example 13 A ring main socket outlets and telecommunications circuits are provided (W.T. Parker Ltd).
Installation of Non-Metallic Trunking

Care and good workmanship are needed to ensure a successful installation, and the use of good quality materials is necessary. The installation layout must be planned before commencing work. If the installation is in a new or altered building, all internal structural and wall finishes should have been completed.

As with plastic conduit, it is necessary to allow for expansion of the trunking. This is done by leaving gaps between trunking sections as they are installed. A gap of 4–6mm per 3m length is recommended if high ambient temperature variations are likely to occur. The gaps are generally covered by pieces designed for the purpose. The detail will vary according to the particular system being used and the manufacturer will be able to advise on the recommended method.

The trunking should be cut using a fine tooth saw. Clean off any burrs and swarf after making the cut. Appearance will be spoiled if the cut angles do not match exactly so it is advisable to use a mitre box to make the cuts.

The main component of the trunking is generally fitted to the surface of the wall using dome-headed screws. It is essential to use washers under the screw heads, and to cater for expansion of the plastic components, oversize holes should be drilled in the trunking. Trunking should be fixed at intervals of not more than 500mm, and there should also be fixings within about 100mm of the end or of any joint. If it is intended to fit any load-bearing components such as light fittings, extra fixings should be provided. It is best to first drill the clearance holes in the trunking, and then use the prepared length as a template to mark the wall for drilling. It is possible to use shot-fired masonry pins to

FIGURE 10.5  A typical office installation where data, telecommunication and power circuits are required (W.T. Parker Ltd).
(a) Three-compartment dado trunking ready for fitting. The compartments and one of the lid sections can be clearly seen. (b) The end caps are screwed into position.

(c) Having checked the length required, cut the trunking using a fine-tooth hacksaw, the complete section is screwed in position on the wall. In this case the battery powered electric screwdriver is fitted with a light to aid the work. (d) The flat twin and cpc cable is prepared for use by running it out to avoid twists and kinks.

(e) After the cable has been placed into the centre compartment, the socket boxes are clipped in position. (f) The cable feeding the socket outlets is installed behind the outlet boxes.

**FIGURE 10.6** Installing multi-compartment dado trunking.
secure the trunking if desired. In this case it is essential to use cushioning washers under the heads of the pins.

In general, the various components of trunking systems clip together, but it may be necessary with some systems to employ glued joints. Special solvent adhesives are available for this purpose and should be applied in the same way as described in the section on installation of plastic conduit.

Once the trunking has been fixed, the cables can be run. Some makers supply special cable retaining clips which make it easier to retain cables prior to fitting the lids. Alternatively, it is a good idea to use short offcut sections of trunking lid for this purpose. Cable capacities are calculated in the same way as for conduit using a ‘unit system’. The manufacturer of the trunking should be consulted for factors for other shapes.

When fitting the trunking compartment lids, increased stability and improved appearance will be achieved if the lid joints are arranged not to coincide with the joints in the main carrier.

(g) The lids are cut to length and fitted and butted up to the socket boxes. (h) In a similar way, the top and bottom lids are cut and fitted. These compartments will be used for data and communications circuits. The power cabling is complete and ready for the sockets to be wired.

(i) After work is complete, the site is left tidy, removing all rubbish and vacuum cleaning the floor (all M.W. Cripwell Ltd).

FIGURE 10.6 cont’d. Installing multi-compartment dado trunking.
(a) The mini-trunking is offered up on site and marked to indicate the location of the bend. (b) Using a fine-tooth hacksaw, the conduit is cut at the back and on one side to suit the angle of bend required.

(c) The bend is tested on the ground prior to being offered up on the wall. (d) After marking and cutting to length, rough edges and burrs are removed using a file.

(e) Fixing holes are required and these are next drilled at suitable positions. (f) After drilling the conduit, the wall is correspondingly marked out and drilled for wall plugs.

FIGURE 10.7 Installing plastic mini-trunking.
Skirting and Dado Trunking

Skirting and dado trunking is used extensively in commercial buildings, laboratories, hospitals and similar installations. It usually consists of a shallow PVC trunking, approximately 50mm deep with two or more compartments. One compartment is used for socket or lighting wiring, one for communications or telephone wiring, and very often a third compartment is reserved for data cabling to computers, as these cables must be separated from all other wiring systems.

Trunking can be shaped to form the skirting, and is frequently fitted around the outer walls of a building where sockets, telephones, etc., are likely to be required. It is often also fitted on internal walls. In order to cross the thresholds of doorways, and to interconnect isolated lengths of skirting trunking, conduits or floor trunking can be installed in the floor screed. Suitable bends and adaptors are made to connect between skirting and floor trunking.

Shallow flush-type socket-outlets can be obtained for fitting to the lid of skirting trunking and trunking manufacturers will punch suitable apertures for the reception of sockets.

FIGURE 10.7 cont’d. Installing plastic mini-trunking.

(g) The trunking lid is marked out for cutting. (h) After screwing the trunking in position, the lid is cut to suit. In this case a notch needs to be removed to clear an existing trunking run. The lid is notched using a saw and pliers used to remove the notch.

(i) The lid is fitted, the completed trunking gives a neat and workmanlike appearance (all M.W. Cripwell Ltd).
It is often an advantage to fit the sockets, data or telephone outlets on short lengths of lid, which need not be disturbed when the remainder of the lid is removed for extensions.

Another form of trunking in use is dado trunking incorporating busbars. These allow socket outlets and spur boxes to be simply plugged in, effecting an economy in installation times.

Where trunking passes through partitions, short lengths of lids should be fitted as this enables the remainder of the lid to be removed without difficulty.

Plastic Underfloor Trunking

As with many other types of wiring system available such as conduit or trunking, plastic materials are often used instead of their metal counterparts for the enclosures of underfloor systems.

Underfloor trunking systems made with this material can be divided into two main types, raised floor systems and underfloor ducted systems.

The raised floor installation has the advantage of extreme flexibility as the load-bearing floor is structurally supported such that there is an unobstructed space underneath. The wiring ducts can thus be run under the floor in any desired position. The outlet positions which are incorporated in floor panel sections are connected to the ducted wiring using flexible conduit and in this way outlet positions can be rearranged at will by exchanging the floor panel sections. This type of layout is especially useful in computer rooms where due to the rapid advance of technology it is necessary to replace obsolete equipment at intervals.

The other system supplied in plastic materials is the underfloor ducted system. With this, shallow ducts are installed prior to the final floor surface being laid. The ducting is subsequently buried in the concrete screed. A variety of outlet positions can be used. Concealed and raised socket outlets are

**FIGURE 10.8** (a) Underfloor three-compartment trunking installed in a commercial office installation. With the growth of data processing, flexible office wiring systems are a necessity, and a raised floor provides a viable method of achieving this. This outlet box is fitted with power sockets and data sockets will be fitted later. (b) The outlet box with the lid in position, providing a flat floor.
available, and as previously mentioned, ‘power poles’ can also be fitted. Some manufacturers supply fittings whereby connection can readily be made to skirting trunking.

10.4 CABLE DUCTS

Cable ducting is defined in the IEE Regulations as ‘an enclosure of metal or insulating material, other than conduit or cable trunking, intended for the protection of cables which are drawn in after erection of the ducting’.

Cable ducts usually consist of corrugated PVC, sometimes placed inside earthenware or concrete pipes buried in the slab or ground, with suitable access chambers to enable cables to be drawn in. IEE Regulation 522.8.3 requires that every bend formed shall be such that cables will not suffer damage. Cables installed in underground ducts should have a sheath or armour to resist any mechanical damage. Unsheathed cables must not therefore be installed in these ducts. Mineral insulated copper sheathed cables which are installed in ducts must have an overall covering of PVC sheath.

The space factor of ducts must not exceed 35%, whereas the space factor for trunking is 45%, and that for conduit is 40%. All of these space factors depend upon not more than two 90° bends (or the equivalent) being installed between draw-in points. IEE Regulation 528.1 makes it clear that Band I and Band II cables must not be installed in the same duct.

One method of forming concrete ducts is by means of a flexible rubber or plastic tubing of the required diameter. This is inflated and placed in position before the concrete slab is poured. After the concrete has set, the tube is deflated and withdrawn, and can be reused to form other ducts. Bends in ducts can be formed by this method provided the inner radius is not less than four times the diameter of the duct.

10.5 UNDERFLOOR TRUNKING SYSTEMS

Open plan office and other types of commercial buildings may well need power and data wiring to outlets at various points in the floor area. The most appropriate way of providing this is by one of the underfloor wiring systems available. Both steel and plastic construction trunkings can be obtained, and if required ‘power poles’ can be inserted at appropriate locations to bring the socket outlets to a convenient hand height. With the increasing use being made of computers and other electronic data transmission systems, the flexibility of the underfloor wiring can be used to good advantage.