After completing this chapter, you will be able to:

- List the wiring methods available for commercial installation and the rules regarding each method of wiring.
- Size wireways to satisfy Code requirements.
- Identify fittings, connectors, supports, and other integral hardware unique to a particular wiring method.
- Select the correct wiring method based on Code requirements.
- Calculate wireway size.

This chapter is an introduction to conduits, raceways, busways, wireways, junction boxes, gutters, busbars, pull boxes, device boxes, and a host of other wiring methods and related components. These items compose the system through which electricity is routed.

The Code recognizes many wiring methods for use in buildings. These wiring methods fall into several main categories:

- Raceways
- Conductors

### Technical Terms

- Armored cable (BX)
- Auxiliary gutters
- Busways
- Cable tray
- Electrical metallic tubing (EMT)
- Electrical nonmetallic tubing (ENT)
- Flexible metal conduit (Greenfield)
- Intermediate metal conduit (IMC)

- Liquidtight flexible conduit
- Metal-clad cable
- Multi-conductor cable
- Nonmetallic-sheathed cable (Romex)
- Rigid metal conduit
- Rigid nonmetallic conduit
- Service-entrance cable
- Surface raceway

### Wiring Methods in the Code

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<th>Code Article</th>
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<td>Electrical Metallic Tubing</td>
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<td>Electrical Nonmetallic Tubing</td>
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<td>Flexible Metal Conduit</td>
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</tr>
<tr>
<td>Wireways</td>
<td>376, 378</td>
</tr>
</tbody>
</table>

Figure 5-1. Code sections for common wiring methods.
General Rules and Requirements

The Code, under Article 300—Wiring Methods, addresses the acceptable methods of installing conductors. Choosing the right method for a wiring job depends on the environment where the wiring is to be installed. Certain wiring methods are only permitted in a limited range of conditions. Others are acceptable in a broad variety of situations.

Regardless of the specific wiring method, there are some general rules common to many of the methods. These provisions should be understood before beginning any wiring installation. A brief look at these general provisions follows:

- Whether in cable or as single individual units, conductors should be used within the voltage and temperature range for which they are designed.

Rules for Buried Conductors

Conduit, cables, and other raceways that are buried must meet specific criteria. The conductors must be protected so that damage does not occur. Table 300.5 of the Code lists the minimum burial depth for conductors 600 volts nominal or less. The table in Figure 5-3 is a condensed version of Table 300.5. Deeper burial is not uncommon due to soil conditions, interferences with other utilities, and structural footings.

Cables under buildings must be installed in raceway and the raceway must extend past the exterior walls of the building. Further, where buried conductors and cables emerge from the ground, protection must be provided by raceways that extend from the minimum cover distance to at least 8” above grade or to the point of entry into a building. See Figure 5-4. At the point where underground conductors emerge from a raceway, the raceway should be fitted with a bushing or sealed.

Regardless of the method of wiring used, all underground installations must be grounded and bonded as required by the Code. Refer to Chapter 10 of this text and Article 250—Grounding of the Code.

Splices and taps are permitted in buried conductors and cables. Be sure to use materials that are suitable for underground use. All splicing materials must be suitable for the conditions and environment in which they are installed.

NEC NOTE 300.3(B)

All conductors of the same circuit and, where used, the grounded conductor and all equipment grounding conductors shall be contained within the same raceway, cable tray, trench, cable, or cord. See exceptions in Code.

NEC NOTE 300.5(D)(4)

Where the enclosure or raceway is subject to physical damage, the conductors shall be installed in rigid metal conduit, intermediate metal conduit, or Schedule 80 PVC, or equivalent.

WARNING

Conductors placed in service where the voltage or temperature may exceed their specific rating will represent a serious hazard to the electrical system, equipment, structure, and personnel.

- Normally, single conductors may only be installed as part of a wiring method recognized by the Code. Thus, routing individual conductors without the protection or support of an approved wiring method is strictly prohibited.

For a circuit, the current-carrying conductors, neutral conductor (where used), and equipment grounding conductor must all be run within the same conduit, cable, duct, tray, or enclosure. Failure to comply with this requirement could lead to inductance problems.

Table 300.5

<table>
<thead>
<tr>
<th>Minimum Burial Depths (600V or less)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below streets, alleys, and parking lots</td>
</tr>
<tr>
<td>------------------------------------</td>
</tr>
<tr>
<td>24”</td>
</tr>
<tr>
<td>Below building slab or foundation (in raceway)</td>
</tr>
<tr>
<td>In trench below 2” thick concrete or equivalent</td>
</tr>
<tr>
<td>Under one- or two-family dwelling driveway</td>
</tr>
</tbody>
</table>

Figure 5-3. Condensed version of Table 300.5 from the Code.
Securing and Supporting Wiring Systems

All wiring must be secured to and supported by structural members. Normally, wiring systems are not used to support other wiring systems or nonelectric equipment. However, Section 300.11(B) of the Code specifies some conditions under which one raceway can be supported by another raceway.

Mechanical and electrical continuity is required. Metal conduit, cable sheaths, cable armor, and nonmetallic raceway must be continuous between boxes, enclosures, fittings, and cabinets. All connections between the components must be secure prior to pulling conductors. The equipment grounding conductor should be independent of the device connection, so if the device is removed the continuity is not interrupted.

Conductor support in vertical raceway

In buildings where raceways are run vertically, the conductors must be supported at assigned intervals. One cable support at the top of the raceway run and at intervals indicated in the table in Figure 5-5 are required. This table is a condensed version of Table 300.19(A) from the Code.

Support of vertical conductors can be accomplished in several ways, including the following:
- Placing insulated wedges between the cable and the inside wall of the raceway or using insulated clamps within an enclosure.
- Installing junction boxes with supports installed and attached to the cable, Figure 5-6.
- Installing junction boxes and offsetting the cable at least 90° and using tie wires within the box.

NEC NOTE 300.19(C)(3)

When the cable is supported by bending it at least 90° in a junction box and securing with tie wires, support intervals cannot exceed 20% of the normal maximum support distance. The bend in the conductor must extend horizontally at least twice the diameter of the cable.

Wiring within Air-Handling Spaces

No wiring is permitted within air-handling ducts used for the purpose of transporting dust, flammable vapors, or cooking equipment ventilation. In plenums used for environmental air only, wiring methods employing type MI or MC cable are permitted. Flexible metal conduit and liquidtight flexible metal conduit are also permitted in short lengths (not more than 4′) to connect sensors, louvers, and other devices permitted in these plenums.

For other types of air-handling ducts, refer to Code Section 500.22(C) and the local inspection authority, which may have special requirements applicable to the specific conditions.

Temporary Installations

The provisions of Article 590 of the Code are specifically tailored to apply to temporary electrical wiring methods, which may be less exacting than a permanent wiring system. Temporary wiring installations are allowed for the purpose of providing power and lighting to facilities during construction. Temporary wiring can also be used for testing, experimental, and developmental purposes. Upon completion of the activity, the temporary lighting must be removed.

Bear in mind that Article 590 simply modifies Code requirements, and that except for those specifically modified under that article, all other requirements of the Code apply. Some of the modifications and specific requirements for temporary wiring are as follows:
- All lamps for general lighting will be protected from breakage by a guard over or around the lampholder.
- Splices in conductors do not require junction or splice boxes if the conductors are part of a multi-conductor cable or open conductors.
- Ground-fault circuit-interrupters are required for all 125-volt, single-phase, 15- and 20-amp receptacles that are not fed from permanent wiring circuits.
- Regularly scheduled maintenance checks will be performed on equipment grounding conductors. The checks will be performed at not more than three month intervals and will verify continuity, any damaged condition, and proper polarity relative to the grounding electrode conductor.

Figure 5-6. Cable must be supported vertically within the maximum support distance. Clamping the conductors to the junction box is one method of vertical support.

Figure 5-4. Conduit must be installed to protect cables and conductors emerging from underground.

Wiring Methods

There are three broad classes of wiring methods: cable, raceways, and cable trays. All of the methods are used to connect the power supply, devices, and switches in an electrical circuit.

Cable consists of several conductors wrapped by a flexible outer covering. Raceways are enclosures installed between equipment or devices that are to be connected by conductors. The conductors or cables are placed inside the raceway, which protects and supports the wiring. Unlike raceways, cable trays are not enclosed; they are simply trays on which cables are laid.

Multiconductor Cable

Multiconductor cables are flexible assemblies of conductors having an overall protective covering. There are essentially four major types of multiconductor cable assemblies:
- Service-entrance cable
- Armored cable
- Nonmetallic-sheathed cable
- Metal-clad cable

Service-entrance cable (SE, USE, and ASE)

Service-entrance cable has conductors that can be used not only for service-entrance wiring, but also for indoor applications. Type SE, as shown in Figure 5-7, is unarmored, moisture resistant, and flame retardant. It can be composed of two or three insulated conductors and an additional bare conductor. It is readily available in AWG sizes 12 AWG through 4/0 AWG.
Armed cable (AC and ACL)

Type AC or ACL (often called “BX” cable) is used in both dry and wet locations, but is not permitted to be buried, see Figure 5-8. This type of cable, once commonly used in many applications, has some limitations for commercial use. It may not be used in places of assembly, studios, movie theaters, hazardous locations, commercial garages, areas with vapors and corrosive agents, lifts, cranes, hoists, elevators, or battery rooms.

Armed cable can be used in the following situations:
- As flexible connections to motors or vibrating equipment (up to 24″ length).
- As fixture whips (up to 6′ length).
- In dry locations.
- Concealed behind walls (may be fished behind walls in old work).
- Exposed along wall surfaces.
- Where exposed to weather or moisture (type ACL only).

Armed cable must be properly supported at intervals of 4′ - 6″ and within 12″ of terminal boxes or fittings. When routing BX cable through wall, floor, or ceiling members, the member must be drilled through the center or notched and covered with a metal plate to protect the cable from nails. The cable can be run along the sides of studs, joists, or rafters without further protection. Guard strips made of 1 × 1 or 1 × 2 stock are used to protect BX or AC cable when it is run along attic floor joists.

**CAUTION**

Antishort insulating bushing must be placed between conductors and the outer armor wherever the cable is cut. The bushings protect the conductor insulation from any sharp edges on the cut armor.

Nonmetallic-sheathed cable (NM, NMC, and UF)

Often referred to as Romex, nonmetallic-sheathed cable is frequently used as the preferred wiring method in small commercial establishments, as well as in residential structures. This cable is made up of two to four insulated conductors plus a green insulated or bare grounding conductor with an overall nonmetallic sheath. See Figure 5-9.

![Figure 5-9](image)

Type USE is basically the same as type SE except the outer jacketing is better suited for direct burial. It is highly moisture and corrosion resistant. Type ASE has an armored jacket, which provides additional protection.

As already noted, service-entrance cable can be used for interior wiring or for service-entrance cable between the utility supply and main service disconnect. It can be used in many applications, has some limitations for commercial use. It may not be used in places of assembly, studios, movie theaters, hazardous locations, commercial garages, areas with vapors and corrosive agents, lifts, cranes, hoists, elevators, or battery rooms.

**NEC NOTE 344.30(B)(3)**

For vertical rigid metal conduit risers from machinery with threaded coupling, the distance between supports can be increased to 20′, provided that both ends of the risers are securely fastened and no means of intermediate support is readily available.

Type NM is used strictly indoors while types NMC and UF are suitable for either indoor or outdoor applications. Further, type UF can be directly buried in the ground.

Nonmetallic cable must be supported every 4′ - 6″ and within 12″ of a terminal box, junction box, outlet, or fitting. It may be installed alongside or through studs, joists, rafters, and other building members with the same protection requirements and restrictions as with armored cable. This type of cable may also be installed in unfinished basements, attics, and crawl spaces, and may be terminated in metal or nonmetallic boxes.

Metal-clad cable (MC)

This type of cable is a heavy-duty commercial and industrial assembly consisting of one or more conductors individually insulated and enclosed in an interlocked metallic armor that consists of corrugated tubing or interlocking tape. This type of cable looks similar to armored cable (BX). MC cable is available in sizes 14 AWG up to 1000 kcmil. It is permitted in a wide range of applications:
- Indoors or outdoors.
- Exposed or concealed.
- For direct burial.
- As open run cable, or in a raceway or a conduit tray.
- As aerial cable on a messenger wire.
- In hazardous locations.
- In wet and dry locations.
- For feeders, branch circuits, and service conductors.
- For power, control, lighting, and other circuit applications.

Type MC cable cannot be used in destructive corrosive environments, such as buried in concrete or earth that exposes the cable to harmful chemicals and contaminants.

Raceways

A wiring method using raceways is more secure and safe than a method using only cables. This is a result of the added protection provided by the raceway. Unfortunately, a method using raceways is also more expensive.

There are many different types of raceway. The selection of a particular type depends on the specific application.
Modern Commercial Wiring

Chapter 5  Wiring Methods

Conduit Properties

<table>
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<tr>
<th>Trade Size</th>
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<th>Wall Thickness</th>
<th>Weight (lb/1000')</th>
<th>OD</th>
<th>ID</th>
<th>Wall Thickness</th>
<th>Weight (lb/1000')</th>
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<tbody>
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<td>4.334</td>
<td>0.083</td>
<td>4000</td>
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Conduit Fittings

Rigid and Intermediate Metal Conduit Fittings

- Locknut
- Bushing
- Compression Connector
- Coupling
- Set Screw Connector
- Short Elbow
- Long Elbow
- Three Piece Coupling
- One Hole Strap
- Two Hole Strap
- Nail-Up Strap
- Conduit Clamp Hanger

Conduit Support Fittings

- 10' Maximum between supports
- 3' Maximum between box and support
- Total bends = 90° x 4 = 360° (maximum)

Intermediate metal conduit (IMC)

IMC has a thinner wall than rigid metal conduit, but is nearly as strong. It is approximately 25% lighter than rigid conduit and is less costly. IMC can be threaded and reamed in the field.

Just like rigid metal conduit, IMC must be supported every 10' and within 3' of every outlet and fitting. The total number of bends in each run must be less than 360°.

Electrical metallic tubing (EMT)

EMT, or thinwall conduit, is about half as heavy as rigid metal conduit. This is due to the fact that EMT has a much thinner wall (about 60% less) than rigid metal conduit, although their outer diameters are about the same. See Figure 5-12. IMC is also thicker than EMT.

This advantage of lighter weight is offset by the loss in ability to withstand physical damage. EMT does not enjoy as wide a variety of permitted usage as does rigid metal or intermediate metal conduit. Still, EMT may be used in most locations.

EMT is not threaded. Its couplings and connectors can be set screw, compression, or indenter types. See Figure 5-13. It is supported at intervals of no more than 10'.
Flexible metal conduit (FMC)

Flexible metal conduit is very similar in appearance to armored cable. The primary differences are that FMC does not come with conductors and the armor is more closely interlocked. This type of conduit may be installed in dry or wet locations (provided the conductors are “W” rated and the flex is liquidtight), hoistways, hazardous areas (Class I, Division 2), and oil and gasoline areas if the conductor insulation is suitable for the purpose. FMC is manufactured in sizes 3/8" to 4" diameter, the 3/8" size being permitted for use in connections not over 6’ in length for fixture whips, motor connections, under plaster extensions, and manufactured wiring systems. In such lengths or less, the FMC may serve as the equipment grounding conductor. Flexible metal conduit fittings are shown in Figure 5-14.

Flexible metal conduit must be supported at intervals less than 4’-6” and within 12” of each end. It should also be firmly supported at every bend. Lengths of FMC less than 3’ do not need to be supported, Figure 5-15. As with other forms of conduit, the total bends between termination points must not exceed 360°.

The maximum number of conductors permitted in 1/2” to 4” FMC is determined by using the tables in Chapter 9 of the Code. For 3/8” FMC, the number of conductors is indicated in Table 348.22 of the Code.

NOTE
Conduit sizing is discussed in Chapter 6 of this text.

Liquidtight flexible metal conduit (LFMC)

Liquidtight flexible metal conduit is identical to flexible metal conduit except it has an outer plastic jacket that makes it impervious to liquids. It is manufactured in sizes from 3/8” to 4” in diameter. The connectors are watertight as well. Requirements for number of conductors, bends permitted, and supporting liquidtight metal flex are the same as for standard flexible metal conduit. As with standard metal flex, lengths of 3’ and less need not be supported.

Uses of liquidtight flexible metal conduit include direct burial, concrete embedment, exposed surfaces, and through walls (concealed). Sizes of 3/8” to 1 1/4” liquidtight flexible metal conduit are suitable for equipment grounding in lengths not exceeding 6’, longer lengths and sizes 2” or larger require a separate equipment grounding conductor to be run inside the conduit.

Liquidtight flexible nonmetallic conduit (LFNC) shares all the same rules as its metallic counterpart except for the following:

- The maximum permitted size is 2”.
- Lengths of more than 6’ are prohibited.
- The grounding electrode conductor, where required, is run inside or outside the flex.

Rigid polyvinyl chloride conduit (PVC)

There are several types of rigid nonmetallic conduit on the market today, but rigid polyvinyl chloride conduit (PVC) is the most popular. The combination of low cost, ease of installation, strength, and availability makes PVC a good choice when a metallic conduit is not required.

Article 352 of the Code addresses the rules regarding the installation of PVC. You will find in this article that PVC is permitted to be used in wet locations. This feature makes PVC an excellent choice for underground, farm, and outdoor installations. Make sure to use the stronger schedule 80 PVC for exposed areas of physical damage. Some of the other considerations when deciding to use PVC are the following:

- PVC conduit can be used in concealed areas such as walls, floors, and ceilings.
- Do not use PVC conduit to support any fixtures or luminaires.
- Do not use PVC conduit in areas with an ambient temperature in excess of 122º F.
- Use expansion fittings when the length of the conduit may expand or contract by 1/4” or more. This can be determined by using Table 352.44 of the NEC.
- Use bushings when connecting PVC conduit to a box unless the box, fitting, or enclosure design provides similar protection.

Electrical nonmetallic tubing (ENT)

ENT is a very versatile wiring method. The tubing is composed of a corrugated nonmetallic material (typically plastic). The tubing can be bent by hand, making it very easy to install, Figure 5-16. ENT is available in 1/2” to 2” sizes.

Support for ENT must be provided within 3’ of each box and every 3’ along the length of tubing. Compared to other wiring methods, ENT requires more support due to its flexibility.

Surface raceway

In many situations there arises a need to add new circuits in an area where the existing wiring is not accessible. The wiring could be embedded in concrete or in conduit behind walls.

In such conditions, the needed changes can be made using surface raceway, Figure 5-17. Surface raceway consists of one- or two-piece channels and are easily installed. These raceways are used not only for power outlets and lighting, but are also permitted, when provided with internal barriers, to route communication wiring and fire protection cable.

The number of conductors permitted in surface raceway is not defined by the Code but is provided by the manufacturer. As with wireway and auxiliary gutters, splices and taps are permitted (in those raceways having removable covers) so long as they do not occupy more than 75% of the cross-sectional area. The one-piece unit must be installed and secured prior to pulling conductors. There are numerous types of fittings, switches, receptacles, elbows, and adapters available for surface raceway.
Wireways

Wireways are rectangular sheet metal enclosures with removable covers. Fittings, such as elbows, clips, and end pieces, enable the sections to be joined to form an overall wiring system. Concentric knockout slots are provided in each side and at the ends.

When installed vertically, wireways are supported every 15′. Each wireway system must be complete prior to installing the conductors. Entry into a wireway can be made using other wiring methods, such as mineral-insulated metal-sheathed cable (MI), metal-clad cable (MC), rigid conduit, intermediate conduit, electrical metallic tubing, and rigid nonmetallic conduit.

The total cross-sectional area of all conductors in a wireway must be less than 20% of the cross-sectional area of the wireway. Splices and taps are permitted in the wireway, but must take up less than 75% of the cross-sectional area. See Figure 5-18.

Sample Problem 5-1

Problem: What is the minimum cross-sectional area for a wireway that will accommodate four 2/0 AWG THW, ten 6 AWG THWN, and ten 10 AWG THWN insulated copper conductors?

Solution: First, determine the cross-sectional area of all of the conductors. Cross-sectional areas of conductors are found in Chapter 9, Table 5 in the Code.

<table>
<thead>
<tr>
<th>Size (AWG or kcmil)</th>
<th>Approximate Diameter</th>
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<tr>
<td>2/0</td>
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<td>12.900</td>
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</tbody>
</table>

The wireway size must be large enough that 1.77 in² is less than 20% of the total area. If 1.77 in² is 20%, dividing 1.77 in² by 0.20 will equal the area equivalent to 100%. This is the minimum wireway cross section:

1.77 in² / 0.20 = 8.85 in²

Therefore, the wireway must have a cross section of 8.85 in² or larger.

Auxiliary gutters

Essentially identical in construction and appearance to wireways, auxiliary gutters are primarily used to extend or supplement wiring spaces at load centers, transformers, and metering cabinets. Auxiliary gutters cannot extend beyond 30′ from the equipment they supplement. The same rules regarding fill (20%) and splices or taps (75%) apply as with wireways.

Busways

Busways are sheet metal enclosures into which conductors are installed at the factory. These conductors, which are actually copper or aluminum busbars, are supported by insulating material. Busways commonly come in up to 10′ sections that are bolted together. When installed horizontally, busways require supports every 5′ unless otherwise designated. Busway systems are often used in commercial buildings as the primary wiring method.

There are three types of busways available:

- Feeder busways
- Plug-in busways
- Trolley busways

A plug-in busway is illustrated in Figure 5-19. Although the initial cost of busway material is higher than other wiring methods, the installation labor costs are much lower. This often makes it a more cost-effective system.

There are numerous wiring methods that are permitted for use with busways as taps or branch circuits:

- Rigid nonmetallic conduit (PVC)
- Electrical nonmetallic tubing (ENT)
- Intermediate metal conduit (IMC)
- Electrical metallic tubing (EMT)
- Flexible metal conduit
- Rigid metal conduit
- Armored cable (AC)
- Surface metal raceway

Additional information and requirements concerning the design and use of wireways can be found under Article 376 and Article 378 of the Code. Some key points within this article include the following:

- Wireways are not to be installed where subject to damage.
- Wireways are not to be placed in corrosive environments.
- Wireways are not to be concealed.
- Wireways are normally restricted to no more than thirty current-carrying conductors. More than thirty current-carrying conductors can be contained in a wireway if their ampacity rating is derated per Section 310.15(B)(3)(a) of the Code.

NEC NOTE 376.22(B), 378.22

Conductors for signaling circuits or controller conductors between a motor and its starter and used only for starting duty shall not be considered as current-carrying conductors.

Additional Conductors for subsidiary service feeders (load centers) and modern installations, where clarity is desired, see Article 410.
Cable Trays

Cable trays are open cable-supporting assemblies used in a variety of commercial and industrial buildings. Cable trays are not enclosed, so they do not fit the description of raceways, but they have the same function. Tray systems are fully recognized as an approved method for wiring. Cable trays resemble troughs, open at the top (although covers are often used), with ventilated bottom sections. Figure 5-20. There are two main types of cable trays: trough and ladder. There are many specific rules regarding the types of wire and cable that can be used in a tray system, and how those wires and cables must be arranged within the tray. Article 392 of the Code permits trays to be used as a support system for wiring methods that can be used without a tray. Uses permitted and not permitted are as follows:

- Where single conductor building wire is used in a tray, only size 1/0 AWG or larger is permitted and must be marked as suitable for tray installation. Further, this only applies to industrial installations; only multiconductor cable is permitted in a tray within commercial premises.
- A metallic cable tray is acceptable as the equipment grounding conductor for the circuits within the tray.
- Nonmetallic cable trays are permitted in areas where there are corrosive conditions.
- Multiconductor cables rated 600 volts or less may be placed in the same cable tray. Tray cable rated over 600 volts can be placed in the same tray with cables rated under 600 volts if a noncombustible barrier is installed to separate the high and low voltage cables.
- Cables within a single tray can be spliced. Single-conductor cable can be used only if multiconductor cable is not available.

Multicore Assemblies

The Code addresses multicore assemblies in Article 380. Essentially, these are two-piece assemblies. The top piece (cover) is prepunched to accept receptacles at close (6") and up) intervals. The receptacles can be factory installed.

This method of wiring is particularly useful and commonly found in laboratories, workshops, stores, schools, and offices. It is installed exposed on the surface like other surface raceway. It may pass through walls provided there is no receptacle within the partition and the covers on either side can be easily removed.

Review Questions

Answer the following questions. Do not write in this book.

1. What is the maximum ambient temperature for PVC conduit?
2. What is the maximum interval for vertical support of a 4 AWG copper conductor?
3. Regarding cable trays, what is allowed in industrial applications that is not allowed in commercial applications?
4. Describe surface raceway.
5. Which Code article contains the requirements for underground feeder cable?
6. What is normally the maximum number of conductors that can be placed in a single wireway?
7. Can the conductors for a single circuit be located in different conduit runs?
8. Which conduit has thicker walls: IMC or EMT?
9. Compare the support requirements of ENT with other wiring methods. What is the reason for the difference?
10. Under what conditions can conductors with different voltage ratings be located within the same conduit?
11. What are the four main types of cable?
12. What are the requirements for protecting conduit running through wall studs?
13. What percentage of wireway area can be filled by conductor splices?
14. What type of cable is called Romex?
15. What is the minimum burial depth of rigid metal conduit below a residential driveway?
16. In what situations is service-entrance cable used?
17. Is direct burial of type USE cable allowed?
18. When underground wiring is used, how far above ground level must the raceway extend at the point where the conductors exit the ground?
19. What methods can be used to support vertical conductors?
20. Which type of cable does FMC resemble?
21. What is the maximum total cross-sectional area of conductors that can be placed in a 4" x 4" rectangular wireway?
22. A cable splice that will occupy 8.8 in² is proposed to be located in a 3" x 4" wireway. Will this splice satisfy wireway space limitation requirements?
Although residential and commercial installations are similar in theory, commercial electrical work involves larger equipment, conduit, and conductors. This fixture, located in the Von Braun Civic Center in Huntsville, Alabama, is much larger than any fixtures encountered in residential work. (Armstrong World Industries, Inc.)