

**STATION WIRE AND CABLE
INSTALLATION AND ROUTE SELECTION**

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1. GENERAL

- 1.01 This practice provides recommended guidelines for routing and installing station wiring and cable.
- 1.02 This practice is reissued to add precautions and bring practice into compliance with the 1999 NEC (National Electrical Code).
- 1.03 The NEC requires all permanently placed equipment and material to be Listed. Listed refers to a published list of materials, equipment, and services meeting identified standards or tested and found suitable for a specified purpose by an approved organization. Some organizations do not recognize equipment as being Listed unless it also labeled. The Authority Having Jurisdiction (local inspection body) has authority to identify Listed products based on the system used by the listing organization. See Note.

Note: Underwriters Laboratories (UL) has been, historically, the only listing organization. However, in recent years, other organizations have been granted permission to list products. The term UL Listed is no longer used. The industry has adopted the term Listed to replace the old UL Listed language.

- 1.04 All installations shall be made in accordance with the NEC and local building codes. If the local codes are more restrictive, use the more restrictive code. If local codes are less restrictive, use the NEC. The installation of optical fiber cables is covered in the NEC, Article 770, and metallic communications circuits are covered in the NEC, Article 800.
- 1.05 The 1999 National Electric Code is divided into an introduction and 9 chapters. Chapter 8 covers communications systems and is independent of the rest of the Code unless it is specifically referenced in Chapter 8.
- 1.06 The National Electric Code is intended to be suitable for the mandatory application of governmental bodies to ensure public safety. The Authority Having Jurisdiction (AHJ) will have the responsibility of interpreting the Code and for giving approval on equipment and materials. The AHJ has the latitude to waive specific Code requirements or to permit alternate methods when it can be assured that public safety will not be compromised.
- 1.07 Installations under the exclusive control of communications utilities located outdoors or in building spaces used exclusively for such installations are not governed by the NEC. This exemption generally applies to the Central Office.

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2. PRECAUTIONS

- 2.01 Use of unapproved building cable can create a fire hazard. Refer to "Fire Safety Considerations of Cable in Building," Practice 620-100-001.
- 2.02 Suitable protective clothing such as gloves and safety glasses should be worn when installing cable.
- 2.03 Exercise caution when installing riser cable to prevent sheath damage (kinks, cuts, and abrasions). The metallic reels should be blocked so that they cannot roll accidentally.
- 2.04 All communication cables shall be listed (classification will not be adequate) as meeting the requirements of the 1999 NEC, Article 800, Table 800-53. See Table 2.01.

TABLE 2.01

National Electric Code Table 800-53 Cable Uses and Permitted Substitutions			
CABLE TYPE	USE	NEC REFERENCE	PERMITTED SUBSTITUTIONS
CMP	Communications plenum cable	800-53(a)	MPP
CMR	Communications riser cable	800-53(b)	MPP, CMP, MPR
CMG, CM	Communications general-purpose cable	800-53(c)	MPP, CMP, MPR, CMR, MPG, MP
CMX	Communications cable, limited use	800-53(d)	MPP, CMP, MPR, CMR, MPG, MP, CMG, CM

- 2.05 Non-plenum rated cables may be used in plenums or risers where they are installed in metallic raceways.
- 2.06 Only Listed cables will be permitted to be used in buildings except for outside plant cable which will be limited to 50 feet beyond the point of entry (within 50 feet of the building entrance). Where practical, outside plant cable and protectors should be placed as close to the service entry point as possible.
- 2.07 All equipment permanently installed must be Listed.
- 2.08 Permanently placed equipment should be installed according to the manufacturers' labeling.

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2.09 All cable placed inside a building must be fire rated and must have the fire rating designation on the cable sheath.

1. Types of markings you will find on fire rated cable.

- MPP (Multipurpose plenum cable)
- CMP (Communications plenum cable)
- MPR (Multipurpose riser cable) For use in vertical riser shafts and all other areas, except plenums.
- CMR (Communications riser cable) For use in vertical riser shafts and all other areas, except plenums.
- MP (Multipurpose cable) No fire protection of any type. Must NOT be used in plenums and risers.
- MPG (Multipurpose general-purpose cable) No fire protection of any type. Must NOT be used in plenums and risers.
- CMG (Communications general-purpose cable) No fire protection of any type. Must NOT be used in plenums and risers.
- CM (Communications cable) No fire protection of any type. Must NOT be used in plenums and risers.
- CMX (Communications cable-Limited use) Limited use for dwellings and raceways.

Note: Plenum fire rated wire (CMP) can be identified by “CSCH” in the description portion of the Procurement Catalog.

2.10 Cables that combine voice and data transmission must be listed as communication cables.

3. FIRE SAFETY

3.01 The fire safety requirements of this practice meet or exceed the requirements of the NFPA (National Fire Protection Association Standards NFPA 90A-1999) "Standard for the Installation of Air Conditioning and Ventilating Systems" and the 1999 "National Electrical Code." In addition to the conditions outlined in this practice, certain local electrical and building codes may add further restrictions to the placement of cables in buildings. Know the requirements of local electrical and building codes. These codes and the national and regional codes are revised periodically. If you have any questions, contact your local building industry consulting service.

3.02 A fire wall is defined in National Fire Protection Association Standards (NFPA 90A-1999) as “a wall subdividing a building to restrict the spread of fire and having fire resistance and structural stability.”

3.03 The 1999 NEC requires that all wire and cable penetrations through fire-resistant rated walls, partitions, floors, or ceilings shall be fire-stopped using approved methods. Most approved

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methods are classified as systems and not Listed by a Nationally Recognized Testing Laboratory. These systems may require multiple components. The proper use of such systems vary according to the type of penetration and the type of fire-rated assembly. Refer to BSP 800-005-200MP, "Common Systems Through-Penetration Fire-Stopping Requirements" or the manufacturer's instructions for approved fire-stopping methods.

Note: Penetration and sealing of existing firewalls or fire stops permitting the passage of wire and cable shall be the responsibility of the building owner or the subscriber at their expense.

- 3.04 Penetrating firewalls should be avoided when possible, but if this becomes necessary, the hole must be completely sealed around the cables with a fire rated material. Generally firewalls enclose a means of egress. Hallway walls, masonry walls, and walls that separate tenants in the same office building are considered firewalls. Most communications or electrical closets enclosed in 1 or 2 hour firewalls require fire blocking at the exit points.
- 3.05 In buildings, use a UL Classified fire stop. A list of UL Classified fire stop assemblies is published in the 1999 Underwriters Laboratories Building Materials Directory. If the penetration and fire stop are part of an outlet box assembly, use an Underwriters Laboratories approved outlet box assembly. A list of classified outlet box assemblies is published in the Underwriters Laboratories Fire-Resistance Directory under "Outlet Boxes and Fittings Classified for Fire Resistant. Refer to BSP 800-005-200MP, "Common Systems Through-Penetration Fire-Stopping Requirements," for approved fire-stopping methods.
- 3.06 The 1999 NEC requires that riser cables have a fire-resistant covering capable of preventing the carrying of fire from floor to floor. Riser cables must be Listed as CMR or CMP.
- 3.07 The air-conditioning code (NFPA 90A-1999) and the 1999 NEC require that cables run in plenums without conduit must be listed as type CMP having adequate fire-resistant and low smoke-producing characteristics.
- 3.08 All cables placed in plenum ceilings or other spaces used for environmental air must be fire rated and have low-smoke producing characteristics. The National Electric Code defines a plenum as "a compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system". Generally, air spaces being accessed by vents and not fed by ducts are considered plenums. The typical plenum air area is identified by treated air (heat/air conditioning) being introduced to the living area in a duct. The return air uses no ducts but is returned via the open area above the ceiling.
- 3.09 Communications wires and cables shall have a voltage rating of not less than 300 volts and shall be listed in accordance with (a) through (i). Conductors in communications cables, other than in a coaxial cable, shall be copper.
 - (a) Type CMP. Type CMP communications plenum cable shall be listed as being suitable for use in ducts, plenums, and other spaces used for environmental air and shall also be listed as having adequate fire-resistant and low smoke-producing characteristics.

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- (b) Type CMR. Type CMR communications riser cable shall be listed as being suitable for use in a vertical run in a shaft or from floor to floor and shall also be listed as having fire-resistant characteristics capable of preventing the carrying of fire from floor to floor.
- (c) Type CMG. Type CMG general-purpose communications cable shall be listed as being suitable for general-purpose communications use, with the exception of risers and plenums, and shall also be listed as being resistant to the spread of fire.
- (d) Type CM. Type CM communications cable shall be listed as being suitable for general-purpose communications use, with the exception of risers and plenums, and shall also be listed as being resistant to the spread of fire.
- (e) Type CMX. Type CMX limited use communications cable shall be listed as being suitable for use in dwellings and for use in raceway and shall also be listed as being resistant to flame spread.
- (f) Type CMUC Under-Carpet Wire and Cable. Type CMUC under-carpet communications wire and cable shall be listed as being suitable for under-carpet use and shall also be listed as being resistant to flame spread.
- (g) Multipurpose (MP) Cables. Cables that meet the requirements for Types CMP, CMR, CMG, and CM and also satisfy the requirements of Section 760-71(b) of the 1999 NEC for multi-conductor cables and Section 760-71(h) for coaxial cables shall be permitted to be listed and marked as multipurpose cable Types MPP, MPR, MPG, and MP, respectively.
- (h) Communications Wires. Communications wires, such as distributing frame wire and jumper wire, shall be listed as being resistant to the spread of fire.
- (i) Hybrid Power and Communications Cable. Listed hybrid power and communications cable shall be permitted where the power cable is a listed Type NM or NM-B conforming to the provisions of Article 336 of the 1999 NEC, and the communications cable is a listed Type CM, and the jackets on the listed NM or NM-B and listed CM cables are rated for 600 volts minimum, and the hybrid cable is listed as being resistant to the spread of fire.

Note: Plenum fire rated wire (CMP) can be identified by “CSCH” in the description portion of the Procurement Catalog.

- 3.10 Do not subject cables to continuous high temperature (above 60 degrees C or 140 degrees F).
- 3.11 Refer to BSP 800-005-200MP, “Common Systems Through-Penetration Fire-Stopping Requirements,” for approved fire-stopping methods.

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4. INSTALLATION REQUIREMENTS

A. General

- 4.01 Many of the general notes pertaining to communication facilities will apply to business and residence installations.
- 4.02 General notes pertaining to communication facilities are given in paragraphs 4.03 through 4.14.
- 4.03 Where practical, the point of entry for underground wire and cable should be within 20' of the electrical service entry point. Where this cannot be achieved, a separate electrode and bonding wire is required. Refer to Practice 876-300-100MP, "Electrical Protection at Customer Locations," for grounding information.
- 4.04 Seal all conduit ducts at each end between underground terminals or utility poles and the customer premises. A weather-head may be used if the conduit terminates above ground.
- 4.05 Any conduit, sleeve, cable or inside wire passing through a firewall must be fire-stopped on both sides of the penetration. Refer to Practice 800-005-200MP, "Common Systems Through-Penetration Fire-Stopping Requirements," for approved fire-stop methods.
- 4.06 Use existing telecommunications conduit where practical.
- (a) Use conduit where inside wire runs have turns or terminate through a plastered-ceiling, such as in a garage.
 - (b) Pull wires in existing telecommunications conduit may be used instead of placing new conduit where a run is short and is vertical to an unfinished readily accessible area, such as a basement, garage, etc.
 - (c) Because of unsafe conditions, attic runs should be avoided wherever possible.
 - (d) Local ordinances may require fire rated sleeves be placed when penetrating firewalls. Consult local inspecting authority.
- 4.07 Advance wiring may be provided when service orders have been issued in advance, pending the availability of facilities to connect service.
- 4.08 The facilities to look for are existing conduits or raceways and existing wiring or cable. Use only empty conduits or conduits used exclusively for telecommunications cables.
- 4.09 The placement of wiring or cable is as follows:
- (a) Wiring or cable should be placed in a neat and workmanlike manner.

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- (b) Wiring or cable should be placed in such a manner as to eliminate the possibility of its being damaged.
 - (c) All cable is to be installed, when practical, so that it runs parallel or perpendicular to the building's superstructure. Run wire or cable horizontally or vertically in a straight line.
 - (d) Use baseboards or other trim where conduit is not provided.
 - (e) Make use of wooden surfaces in preference to others where possible.
 - (f) Keep runs as short as possible.
- 4.10 After location of first attachment has been determined, consider the following factors:
- (a) Locate the drop or block wire run on the building with a view to permanency and accessibility.
 - (b) On building wall, finished with stucco, rigid composition shingles, brick veneer, and similar materials, locate attachments on wood trim where practicable.
 - (c) Locate preferably on the rear and side walls of a building.
 - (d) Place horizontal run above the reach of the public.
 - (e) Do not run wires in front of signs, doors, windows, fire escapes, awnings, etc,
 - (f) Do not place wire runs on walls that are likely to be built against.
 - (g) Avoid locating on intermediate structures of a deteriorated or temporary construction. Select alternate route.
 - (h) When making a wire run on a building wall near cable, proceed in one of the following ways.
 - Use rings installed with cable clamps.
 - Remove nails or screws that hold cable clamps and replace with drive rings (locate drive rings at least 6 feet above floor or ground).
 - Install separate wire run paralleling cable.
- 4.11 Avoid the following locations when placing wire or cable:
- (a) Damp locations
 - (b) Locked storerooms, etc.

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- (c) Temporary structures
 - (d) Runs that provide support for foreign objects
 - (e) Excessively hot locations, steam pipes, etc.
 - (f) Locations where wires and cables will be subjected to abrasions.
 - (g) Avoid hazardous locations.
- 4.12 In Hazardous (Classified) Locations, locate and install wiring as covered by specific instructions in accordance with the equipment being installed. Installations in such areas require special wiring methods and equipment unless the equipment is "intrinsically safe". See Articles 500 and 504 in the 1999 NEC for more information.
- 4.13 Grounding conductors must be insulated and listed, solid or stranded, and sized according to its application, not smaller than #12.
- 4.14 The requirements for ground wire runs are as follows:
- (a) Grounding conductors should be run in a straight line where possible.
 - (b) Make runs as short as possible.
 - (c) Locate wire where it is least likely to be disturbed and guarded from damage.
 - (d) Run protector ground wire exposed, except where conduit has been provided.
 - (e) Do not place protector ground wire in ring runs.
 - (f) Signal ground wire may be placed in rings.
 - (g) When an existing protector ground wire has become enclosed by a ceiling or partition, the protector may be reused only if continuity can be checked and ground clamp is accessible.
 - (h) Refer to Practice 876-300-100MP, "Electrical Protection at Customer Locations," for grounding information.

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B. Unusual Building Entrances

- 4.15 Entrance requirements for station wire and cable at metal frame windows and doors are as follows:
- (a) The point of entry for station wire and cable must be within 20 ft. of the electrical service entry point.
 - (b) Do not make entrance through metal doorframes.
 - (c) When metal window frame is set in masonry or bricks, enter through mortar as near as possible to windowsill.
 - (d) Cut slot in seam of mortar between bricks. Be sure slot is deep enough so wire is cleared when shutter or screen is operated.

The 1999 NEC requires that communication wires or cables shall not be placed in conduits or raceways which contain power or Class I remote control, signaling, or power-limited electric wires not properly separated by partitions from the space provided for communication wires or cables. Electrical service raceways may not be used to support other systems such as telecommunications.

C. Selection of Exposed Wiring Routes

- 4.16 In general, an exposed wire route should be used only where no concealing facilities are available.
- 4.17 The wiring in finished rooms and offices is as follows:
- (a) Run wires along baseboards or on door or window casings so they will be as inconspicuous as possible.
 - (b) Where trim cannot be followed, run wire horizontally or vertically but not diagonally.
- 4.18 The wiring in cellars, factories, storerooms, etc., is as follows:
- (a) Place wire and cable where they will be least likely to be broken or detached. Provide mechanical protection if necessary.
 - (b) Consider the shortest, most direct right-angle route unless otherwise specified.
 - (c) Select a wire route that will be safe and accessible.

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- (d) Follow the ceiling line rather than baseboard in heavily traveled passageways.
- (e) If necessary to follow chair rails, use the underside.
- (f) When possible, follow joists.
- (g) If necessary to span joists, run wiring not more than 3 inches from wall.

5. BUSINESS PREMISE WIRING

A. Making Use of Wire Distributing Systems

5.01 Distribution systems in office buildings are as follows:

- (a) Office buildings are generally provided with an exchange cable terminated in a main terminal on the ground floor and distributed to each floor through a building or house cable, or the exchange cable may be distributed directly to each floor.
- (b) For information regarding the building conduit system, consult the plan at the main terminal or contact the building superintendent or your local building industry consulting service.

5.02 Distribution systems in apartment houses, hotels, and hospitals are as follows:

- (a) Generally, these buildings provide a main terminal location in the basement or ground floor and a wall conduit system to each apartment or room.
- (b) In large buildings, there may be house cable from the main terminal to each floor with a terminal on each floor and conduits to the various apartments or rooms from the floor terminal.

B. Wire Placement

5.03 The 1999 National Electric Code cites the following as accepted industry standards for telecommunications wiring:

- Commercial Buildings Telecommunications Cabling Standard, ANSI/EIA/TIA 568-A-1995
- Commercial Buildings Standard for Telecommunications Pathways and Spaces, ANSI/TIA/EIA 569-A-1997

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- Residential and Light Commercial Telecommunications Wiring Standard, ANSI/EIA/TIA 570-1991
- Or other ANSI approved installation standards

While these references may be used as a resource, they are not enforceable as part of the 1999 NEC. This practice has been written to reflect the 1999 NEC. All installations shall be made in accordance with the NEC and local building codes. If the local codes are more restrictive, use the more restrictive code. If local codes are less restrictive, use the NEC.

- 5.04 All cable must be supported to or by the building superstructure.
- 5.05 Most common types of support hardware:
- Beam clamp with bridal ring/j-hook
 - Wire strand with tie-wraps
 - Bridal ring/j-supports and threaded anchors (used when ceiling is concrete)
 - Inside the “V” of the superstructure
 - Cable tray
 - Caddy clips
- 5.06 An excessive amount of cable may not be placed on suspended ceilings tiles or grids unless permitted by local ordinance.
- 5.07 Excessive amounts of cable may not be placed on suspended ceiling supports unless permitted by local ordinance.
- 5.08 Placement standards require cable to be placed at least 3” above ceiling tile with 6” clearance if space allows.
- 5.09 Cable installed in a ceiling must be supported at a minimum every 4.5 feet.
- 5.10 Cables shall not be attached by any means to the exterior of any raceway, conduit, or pipe as a means of support.
- 5.11 Cables should be separated at least 2” from conductors of any electric light or power circuits.
- 5.12 Cables should not share entry holes with conductors or conduit of any type except telecommunications cable.
- 5.13 Cable installed prior to the wall being closed must be supported every 16 inches to the inside face of the stud.
- 5.14 Where cables pass through a metal stud, conduit or electrical box, a plastic grommet must be installed in the hole.

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5.15 Cables installed externally in areas subject to traffic (i.e.: from a wall to a cubicle) must be within a protective raceway. The most common types of protective raceways are as follows:

- (a) Rigid Metal Conduit or Intermediate Metal Conduit
- (b) Surface Metal or Nonmetallic Raceway.
- (c) Liquid-tight Flexible Metal Conduit or Liquid-tight Flexible Nonmetallic Conduit(Sealtight)
- (d) Power/Communication Pole (Utility Columns)
- (e) Electrical Metallic Tubing (EMT)
- (f) Flexible Metal Conduit (Greenfield or Flex)
- (g) Rigid Nonmetallic Conduit (PVC)

C. Using Concealed and Overfloor Conduits

5.16 Consider the following factors when using conduits:

- (a) Whenever conduit is provided for communication wires and it meets the prescribed specifications, it should be used.
- (b) Verify conduit contains only communication circuits. Follow local instructions concerning sharing conduit with the following:
 - Class 2 or 3 remote central signaling and power-limited circuits
 - Fire alarm circuits
 - Community antenna television and radio circuits.
 - Conduit shall not be shared with power or Class I remote control, signaling, and power-limited circuits.
- (c) Consult the building maintenance personnel before extending wiring beyond the provided system.
- (d) When necessary to provide wiring through concrete floors or similar construction from floor to floor and conduit is not provided, inspect premises for pipe sleeves through floor, which may be provided for such use.

5.17 Conduit types are:

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- Electrical metallic and nonmetallic tubing
 - Nonmetallic flexible conduit and nonmetallic flexible tubing
 - Rigid metal conduit
 - Rigid nonmetallic conduit
 - Other
- 5.18 Appropriate electrical codes should be used to determine the type of conduit to be used for the application.
- 5.19 Only metallic conduit may be used in plenum environments.
- 5.20 Conduits should be reamed to eliminate sharp edges. Metallic conduit must be terminated with an insulated bushing.
- 5.21 Pull strings should be placed when pulling wire within conduits or when placing conduits.
- 5.22 Wires placed within conduits should not exceed fill requirements for the size of the conduit. See Table 5.01

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- 5.23 Conduits should not have more than four 90 degree bends (or its equivalent) in each section. If more than two 90 degree bends are required, an additional pull box is required.

1999 NEC

Table 5.01

MAXIMUM NUMBER OF CABLES BASED UPON ALLOWABLE FILL

CONDUIT TRADE SIZE	Cable outside diameter, mm (inches)									
	3.3 (0.13)	4.6 (0.18)	5.6 (0.22)	6.1 (0.24)	7.4 (0.29)	7.9 (0.31)	9.4 (0.37)	13.5 (0.53)	15.8 (0.62)	17.8 (0.70)
16 (1/2)	1	1	0	0	0	0	0	0	0	0
21 (3/4)	6	5	4	3	2	2	1	0	0	0
27 (1)	8	8	7	6	3	3	2	1	0	0
35 (1 1/4)	16	14	12	10	6	4	3	1	1	1
41 (1 1/2)	20	18	16	15	7	6	4	2	1	1
53 (2)	30	26	22	20	14	12	7	4	3	2
63 (2 1/2)	45	40	36	30	17	14	12	6	3	3
78 (3)	70	60	50	40	20	20	17	7	6	6
91 (3 1/2)	-	-	-	-	-	-	22	12	7	6
103 (4)	-	-	-	-	-	-	30	14	12	7

- 5.24 The National Electric Code outlines specific conduit depths and coverage under a variety of conditions. Consult **Table 5.02** for specific requirements.

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TABLE 5.02

NATIONAL ELECTRIC CODE 1999

Table 300-5. Minimum Cover Requirements, 0 to 600 volts, Nominal, Burial in Inches.

(Cover is defined as the shortest distance in inches between a point on the top surface of any direct-buried Conductor, conduit, or other raceway and the top surface of any finished grade, concrete, or similar cover.)

Location of Wiring Method or Circuit	Types of Wiring Method or Circuit				
	Column 1 Direct Burial Cables or Conductors	Column 2 Rigid Metal Conduit or Intermediate Metal Conduit	Column 3 Nonmetallic Raceways Listed for Direct Burial Without Concrete Encasement or Other Approved Raceways	Column 4 Residential Branch Circuits Rated 120 Volts or Less with GFCI Protection and Maximum Overcurrent Protection of 20 Amperes	Column 5 Circuits for Control of Irrigation and Landscape Lighting Limited to Not More than 30 Volts and Installed with Type UF or in Other Identified Cable or Raceway
All locations not specified below	24	6	18	12	6
In trench below 2-in. thick concrete or equivalent	18	6	12	6	6
Under a building	0 (in raceway only)	0	0	0 (in raceway only)	0 (in raceway only)
Under minimum of 4-in. thick concrete exterior slab with no vehicular traffic and the slab extending not less than 6-in. beyond the underground installation	18	4	4	6 (direct burial) 4 (in raceway)	6 (direct burial) 4 (in raceway)
Under streets, highways, roads, alleys, driveways and parking lots	24	24	24	24	24
One- and two- family dwelling driveways and outdoor parking areas, and used only for dwelling -related purposes	18	18	18	12	18
In or under airport runways, including adjacent areas where trespassing is prohibited	18	18	18	18	18

Notes:

1. For metric conversion, 1 in. = 25.4 mm.
2. Raceways approved for burial only where concrete encased shall require concrete envelope not less than 2 in. thick.
3. Lesser depths shall be required where cables and conductors rise for terminations or splices or where access is otherwise required.
4. Where one of the wiring method types listed in Columns 1-3 is used for one of the circuit types in Columns 4 and 5, the Shallower depth of burial shall be permitted.
5. Where solid rock prevents compliance with the cover depths specified in this table, the wiring shall be installed in metallic or nonmetallic raceway permitted for direct burial. The raceways shall be covered by a minimum of 2 in. of concrete Extending down to rock.

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D. Description of Building Riser Shafts

5.25 Building riser shafts are generally of the following two types:

- (a) Closed riser shafts consist of a series of closets, aligned vertically one above the other, usually beginning in the basement and extending throughout the height of the building. The closets are interconnected by UL cable slot or pipe sleeves through the floors.
- (b) Open riser shafts usually extend from the basement to the roof of the building with no floor separations. They are similar in construction to elevator shafts.

5.26 To conform to the 1999 NEC, observe the following when placing wire and cable in building riser shafts.

5.27 The closed riser shafts, under the 1999 NEC, require the following:

- (a) CMP or CMR rated wiring may be placed with no restrictions.
- (b) Cables rated less than CMP or CMR may be used if encased in metallic conduit.
- (c) Fire stops are required.
- (d) See Practice 620-100-001, "Fire Safety Considerations of Cable in Building," for additional fire safety considerations.

5.28 The open riser shafts, under the 1999 NEC, require the following:

- (a) Listed Cables rated less than CMP or CMR are restricted unless enclosed in a non-combustible metal conduit.
- (b) CMP or CMR rated wiring may be placed with no restrictions.

E. The Use of Area Above Suspended Ceilings

5.29 It is not recommended to use the area above a suspended ceiling for concealing communication plant. Avoid it whenever possible because of the following disadvantages:

- (a) The necessity of working on ladders over desks or other objects creates a safety hazard.
- (b) Expenses are incurred by the owner or the tenant when opening and closing ceilings for access by communication employees.

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- (c) It is difficult to avoid low beams, air ducts, power conduits, etc., when placing communication plant after the ceiling has been installed.
 - (d) There is a possibility of damaging or soiling ceilings.
 - (e) There is a possibility of communication cables picking up interference from induction and causing noise in working circuits.
 - (f) There is a possibility of having to rearrange communication cables due to the addition or re-arrangement of air conditioning ducts or other services.
- 5.30 A ceiling distribution system is considered a last choice. An adequate under-floor raceway or conduit system is preferable. When it cannot be avoided, use the area above the suspended ceiling if the communications company and builder/owner agree to the following conditions:
- (a) The area above a suspended ceiling is to be used only for communication service on the same floor so the occupants of one floor are not disturbed by communication work for the occupants of another floor.
 - (b) Whenever access is required, the ceiling shall be opened and closed by the building owner or subscriber.
 - (c) Groups of wires require conduit.
 - (d) Areas with solid or interlocking suspended ceilings require conduit.
 - (e) Clear working space for placing wires and cables must be available and not blocked by vent ducts, pipes, supports, or other equipment.
 - (f) Opening of firewalls to permit the passage of communication wire and cable shall be completed and fire-stopped by the building owner or the subscriber.
 - (g) Communication terminals properly sized and spaced to keep wire or cable runs to a maximum of 150 feet are recommended.
 - (h) Whenever possible, avoid disturbing other tenants on the same floor where communication service is being installed.
- 5.31 Because of the high smoke and high flame spread characteristics of non-plenum rated cable, the 1999 NEC prohibits their use above suspended ceilings used as air plenums unless they are contained in metallic conduit.
- 5.32 In environments where telecommunications cables are allowed to be placed within a ceiling, adequate open-top cable supports must be used.

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- 5.33 Special supports must be provided to support congested areas in the ceiling where larger quantities of cable are found (i.e., telecommunications closets, etc.). Special supports should be designed to carry the additional weight.
- 5.34 When the number of pairs being supported exceeds 500 pairs, a new wire run should be placed.
- 5.35 A suspended ceiling support rod or wire may be used with cable fasteners to support cable where local jurisdictions allow.
- (a) Cable fasteners must be designed to hold the weight and should not interfere with removing or inserting of ceiling tiles.
- (b) The T-bar rail of a suspended ceiling may be used to support wires with appropriate fasteners.
1. Fasteners should not be loaded with cable exceeding a total weight of .45 lbs./ft. and should not interfere with the inserting or removing of tiles.

F. Supporting Structures Above False Ceilings

- 5.36 Make every attempt to secure the following type(s) of supporting structure(s) when placing inside wires or station cables above suspended ceilings.
- B Support Clip
 - Conduit
 - Cable trays
 - J-hooks
 - Wire loops
- 5.37 If none of these types of supporting structures can be obtained, inside wires or station cables can be placed directly on the main runners and/or cross runners (T-bars) of the false ceiling hardware, provided the conditions in paragraphs 5.30 through 5.36 are adhered to and is permitted by the local jurisdiction.
- 5.38 Inside wires and station cables that do not exceed a total of 500 pairs within a 4-foot section of the ceiling may be placed directly on the ceiling runners if the supporting structure(s) outlined in paragraph 5.34 cannot be obtained and local jurisdictions allow. Cable runs supported on the ceiling hardware should be placed as close as possible to the hangar wires.
- 5.39 Major runs of inside wires and station cables should be placed in the type(s) of supporting structures mentioned in paragraph 5.36 in new buildings or sections of existing buildings that have been completely renovated.

Note: A major run is a run that could ultimately exceed any combination of 500 total pairs.

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- 5.40 In existing buildings, additional cables should not be added to any run supported on the ceiling runners if the combination of new and existing wires and cables will exceed 500 pairs within a 4-foot section of the ceiling. If the combination of new and existing wires and cables exceeds this limit, a route along another row of hangar wires should be selected.
- 5.41 Exercise care when working in false ceiling spaces to avoid distorting or damaging the ceiling.
- 5.42 Do NOT block access tile in limited access type ceiling. A minimum of 3" clearance is required. Also avoid placing cables on or against any light fixtures.
- 5.43 Some local ordinances prohibit the placement of wire on T-rails and ceiling tile runners. In those cases, follow local ordinances.

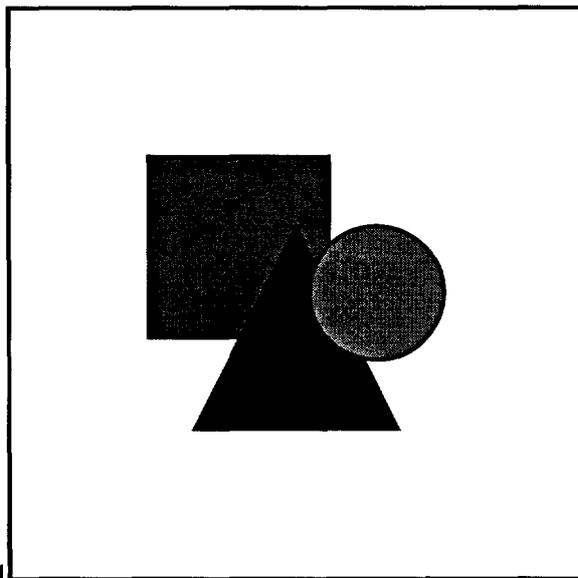
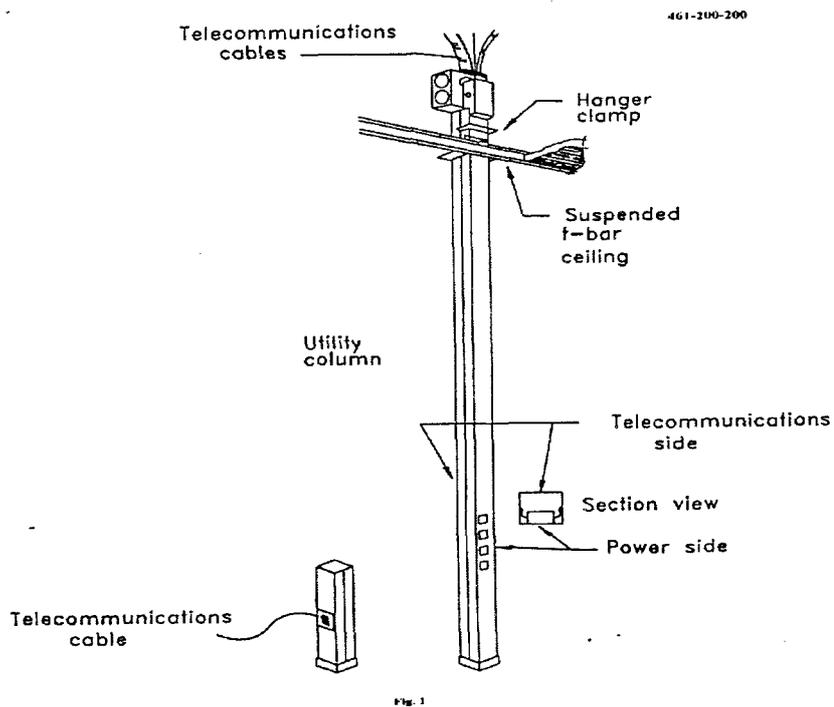
6. WIRING METHOD CEILING-TO-DESK LOCATION

A. Utility Column

- 6.01 A utility column is a post placed between the ceiling and floor in conjunction with the ceiling distribution system as shown in Fig. 1. It is used for the concealment of communications wiring from the ceiling to the desk. It can also be used as an extension of electrical outlets for the same purpose.

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- 6.02 The utility column is a commercial product, and if used, must be supplied and installed by the customer.
- 6.03 Interconnection with customer-owned wiring in utility columns is not permitted.
- 6.04 The utility columns should be attached, or supported, by the main T-rails in the ceiling as shown in Fig. 1. It is not recommended that these columns are attached to the transverse or cross rails unless these rails are rigidly anchored to the main T-rails.
- 6.05 Usually when the utility columns are being placed or have been placed, they are subjected to being slightly shifted. Such movement invariably causes the T-rail to become warped, marred, or bent. Excessive bending of rails may cause tile to fall down.

7. USE OF WALLS OR PARTITIONS

- 7.01 The following conditions apply if hollow core walls or partitions are used for concealing communication wire and cables.
 - (a) The hollow core walls or partitions must be clear and unobstructed.
 - (b) Opening of walls and partitions and the installation of outlet boxes are the responsibility of the building owner or subscriber.
 - (c) A pull wire is required from all outlet boxes to the approved supporting structure above the suspended ceiling.
 - (d) Use only vertical pull wire runs. If bends or horizontal runs are necessary, conduit is required.
- 7.02 If fire blocks, sound deadening materials, or insulation is used in the construction of walls or partitions, conduit must be run from the outlet to the approved supporting structures above the suspended ceiling.

8. RESIDENTIAL PREMISE WIRING

A. Outside Wiring

- 8.01 Plan station installations so the protector/network interface device is mounted on the outside of the residence wherever possible.

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- 8.02 Place the protector/network interface device within 20' of the power service entry point, where practical.
- 8.03 Locate the drop wire attachment and protector as close as possible to the protector ground source so the ground wire can be as short as possible. Refer to Practice 462-005-100, "Station Protection and Grounds-Identification, Selection, and Installation," for protector ground information.
- 8.04 When making drop wire attachments and running wire on the outside of the residence, make use of wooden surfaces in preference to other harder surfaces.
- 8.05 Run wire under the eaves and overhang making the wire run inconspicuous and neat.
- 8.06 Do not make attachments or wire runs on the front of residences except as a last resort.
- 8.07 Telecommunications drops should maintain a minimum separation of 12" from power supply drops at any point in the span, including the point of their attachment at the building. A 40" separation is required at the pole.

B. Inside Wiring

- 8.08 When making building entrances, drill holes at an upward angle from the outside to prevent water from leaking into the premises. Use drip loops and caulking compound to seal holes to prevent leaks.
- 8.09 Use conduit if it is available.
- 8.10 Use the shortest, most direct route for the inside wire route.
- 8.11 Run inside wire on floor joists and baseboards wherever possible.
- 8.12 Run inside wire parallel with the floor joists to prevent the hanging or lying of objects on the wire.
- 8.13 Avoid inside wire runs where the possibility of physical damage to the wire may exist.
- 8.14 Do not use attic space to run inside wire unless they are easily accessed and provide safe working conditions, such as completed floors and ample headroom.

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9. ISSUING ORGANIZATION

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