

Pathway Separation Between Telecommunication Cables and Power Cables

Communications cables are, by design or necessity, often installed in close proximity and/or in the same pathway as power service cables. The electrical energy of the power cables can have significant effect on the performance and safety of the communications plant. Cable design and placement are very important to ensure that electromagnetic interference (EMI), or dangerous levels of electrical energy are not induced into telecommunication cables. When installing communication cables near power service cables, proper separation must be maintained. Safety and signal integrity can be maintained by following the separation guidelines for the most common telecommunication pathway designs.

Aerial Cable Installation Pathway Separation

When placing, installing, or rearranging communication cables and service drops, including optical fiber, copper and coax, the proper clearance requirements must be maintained. This safety zone also mitigates most EMI, and power induction issues, provided that the proper bonding and grounding of the communications cable and power service cables have been maintained.

TABLE 1: SEPARATION DISTANCE PER OSHA 1910.268(B)(7) APPROACH DISTANCES TO EXPOSED OVERHEAD POWER LINES AND PARTS

Voltage Range (phase to phase, RMS)	Approach Distance	
	Inches	Millimeters
300V and less	Avoid contact	Avoid contact
Over 300V, not over 750V	12	304
Over 750V not over 2 kV	18	457
Over 2 kV, not over 15 kV	24	609
Over 15 kV, not over 37 kV	36	914
Over 37 kV, not over 87.5 kV	42	1,066
Over 87.5 kV, not over 121 kV	48	1,219
Over 121 kV, not over 140 kV	54	1,371

Strict enforcement to the guidelines list above must be followed to be compliant with OSHA regulations for safety.

Additional safety rules and clearances can be found in NESC Rule 238.

Buried Cable Installation Pathway Separation

While there is no specific guideline defined for the installation of communication cables with power supply cables in regards to a mandatory separation, state and local regulations do apply and must be maintained. Please see your state or province requirements for the specific rules in your geographic location. Generally a 12 inch to 24 inch soil separation is recommended as a safety barrier and for locating purposes.

When collocating facilities the following NESC guidelines should be considered:

- NESC 352 (e) Supply cables shall not be installed in the same duct with communication cables unless all of the cables are operated and maintained by the same utility; and
- NESC 352 (f) Communication cables may be installed together in the same duct provided all utilities involved are in agreement.

When burying communication cables with power supply cables, the following depth requirements should be maintained.

TABLE 2: SUPPLY CABLE OR CONDUCTOR BURIAL DEPTH (RULE 352D)

Voltage (phase to phase)	Depth of Burial	
	Inches	Millimeters
0 to 600	24	600
601 to 50,000	30	750
50,001 and above	42	1,070

Exception: Where conflicts with other underground facilities exist, street and lighting cables operating at not more than 150V to ground may not be buried at a depth less than 18 in (450 mm)

NESC Rule 353

Deliberate separations and rule 354 - Random separation - specify that radial separation of supply and communication cables or conductors from steam lines, gas, and other lines that transport flammable material shall not be less than 12 in (300 mm) and shall meet Rule 353 of the NESC.

Pathway Installation and Planning Recommendations for Inside Buildings

Special planning should be considered for the installation of communication cabling inside buildings to avoid EMI and coupling from power, electric motors and transformers. Installing cabling with no consideration of potential sources of EMI can be harmful to a network system and result in poor data transmission quality. Proper routing, shielding, barriers, and the use of optical fiber cable can also reduce separation requirements. Since fiber optic cable is immune to EMI, it is often the preferred choice in high EMI environments. Shielded cables such as shielded twisted-pair (U/FTP or STP) and screened twisted-pair (F/UTP or ScTP) can also be utilized to protect against EMI. The use of divider trays also helps provide the proper separation and cable management needed to install cabling within building environments. Superior Essex provides a full line of cabling products to meet the demands of your complex wiring needs.

Additional reference for the reduction of noise coupling is as follows:

ANSI/TIA/EIA-569-A STANDARD: 10.3.3 Reducing Noise Coupling

In order to further reduce noise coupling from sources such as electrical power wiring, radio frequency (RF) sources, large motors and generators, induction heaters, and arc welders, the following additional precautions should be considered:

- Increased physical separation.

Electrical branch circuit line, neutral, and grounding conductors should be maintained close together (e.g., twisted, sheathed, taped, or bundled together) for minimizing inductive coupling into telecommunications cabling.

- Use of surge protectors in branch circuits that can further limit the propagation of electrical surges. Follow guidelines in section 9.11.2 of ANSI/IEEE 1100.
- Use of fully enclosed, grounded metallic raceway of grounded conduit or use of cable installed close to a grounded metallic surface that will also limit inductive noise coupling. Refer to clause 5.5.2.7 of ANSI/TIA/EIA - 607 and section 9 of ANSI/IEEE 1100.

TABLE 3: MINIMUM SEPARATION DISTANCES PER ANSI/TIA/EIA-569 BETWEEN POWER AND DATA CABLES (POSSIBLE SOURCES OF EMI)

Condition	Minimum Separation Distance		
	< 2 kVA in (mm)	2 - 5 kVA in (mm)	> 5 kVA in (mm)
Unshielded power lines or electrical equipment in proximity to open or nonmetal pathways	5 (127)	12 (305)	24 (610)
Unshielded power lines or electrical equipment in proximity to a grounded metal conduit pathway	2.5 (64)	6 (152)	12 (305)
Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal conduit pathway	-	3 (76)	6 (152)
Electrical motors and transformers	-	-	48 (1,220)

NFPA 70 (National Electric Code)

800.133 Installation of Communication Wires, Cables and Equipment

Communications wires and cables shall be separated at least 50 mm (2 in.) from conductors of any electric light, power, Class 1, non-power-limited fire alarm, or medium-power network-powered broadband communications.

EN 50174-2

Use of cable trays for wire management is most commonly used in ceiling and below floor applications. When using trays with or without dividers, the following cable separation rules from EN 50174-2 should be utilized.

TABLE 4: MINIMUM SEPARATION DISTANCES PER EN 50174-2 BETWEEN POWER AND DATA CABLES (POSSIBLE SOURCES OF EMI)

Cable Type	Distance		
	Without Divider or Non-metallic Divider in (mm)	Aluminum Divider in (mm)	Steel Divider in (mm)
Unscreened power and unscreened IT cables	7.87 (200)	4.00 (100)	2.00 (50)
Unscreened power and screened IT cables	2.00 (50)	0.78 (20)	0.19 (5)
Screened power and unscreened IT cables	1.18 (30)	0.39 (10)	0.07 (2)

Note: EN 50174 permits no separation for the final 15 meters of the horizontal cable run.

When routing cabling in the vicinity of fluorescent lighting, a minimum separation distance of 2 in (50 mm) should always be maintained.

Additional resources for specialized installations not listed above can be found in the NESC, NEC, EN, ANSI/TIA/EIA standards, OSHA regulations and other publications.

For personal safety, please follow all local codes, safety guidelines and practices when installing telecommunications cables in or around the vicinity of power supply cables.