

Cable Lore

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PLENUM CABLE

Plenum Cables are power limited and communication cables designed for installation without metal conduit in the air handling spaces of buildings. The primary advantage of plenum cables is that the installed cost is typically 30% less than for a conventional cable-in-conduit system. While cable costs are higher than with conventional cable, the total cost is less because there is no conduit or conduit installation expense.

Plenums Defined

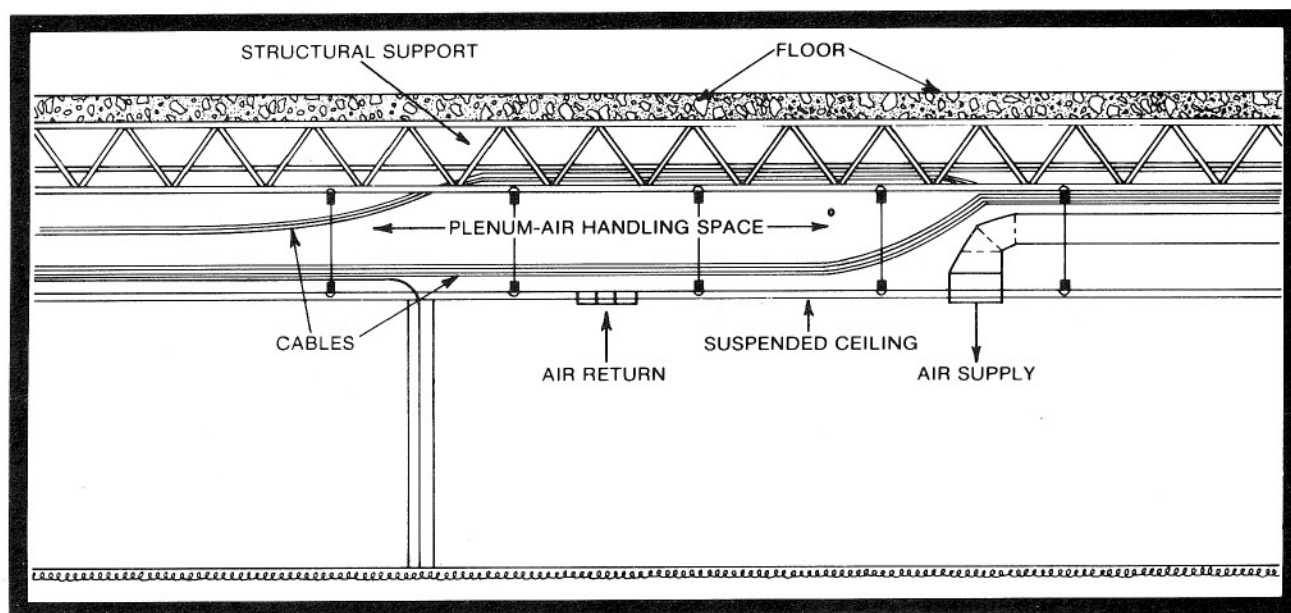
Plenums are enclosed spaces in buildings used as air returns for heating and cooling systems. A common type of plenum is the area above a suspended ceiling in an office building as shown in the diagram. Another common plenum is the area below the raised floor of a computer room. Plenums can be used as a place to install power limited and communication cables without metal conduit if they meet stringent fire safety requirements.

Safety Considerations

Although useful in simplifying construction and reducing building costs, plenums can create a hazard to life and property in the event of a fire. Once flames have reached a plenum, there are often no barriers to contain the fire and smoke. Driven by the forced draft of return air, fire and its associated smoke and other by-products of combustion can spread quickly throughout an entire floor of a building, feeding on any flammable material inside the plenum.

The National Fire Protection Association (NFPA) recognized the increased fire hazard created by the use of combustible cable insulations in plenums and, as a result, severely restricted their use beginning with the 1975 edition of the National Electrical Code (NEC).

Plenum cables fall into three general categories under the Code:



- Communication Wire and cable (article 800-3(d))
- Remote Control Signaling and Power Limited cable (article 725-2(b))
- Fire Alarm cable (article 760-4(d))

The 1984 NEC reasserts the strict safety requirements begun in 1975 and stipulates that all electric cables must comply with these criteria when installed in a plenum area:

1. Cables with "ordinary" insulating materials, PVC, polyethylene, etc. must be metal sheathed or installed in metal conduit.
2. Cables which are "classified as having adequate fire-resistant and low smoke-producing characteristics" can be installed **without conduit**.

In 1978, the NFPA recognized fluoropolymer insulated cables classified by Underwriter's Laboratory (UL) as permissible for installation in air handling plenums without conduit.

Insulation and Jacket Materials

Several high performance fluoropolymer materials with low smoke generation and low flame spread characteristics have shown themselves to be ideally suited for use as the insulation or jacketing of plenum wire and cables:

- FEP fluorinated ethylene propylene (DuPont's tradename is Teflon FEP)
- ECTFE ethylene chlorotrifluoroethylene (Allied Chemical's tradename is Halar)
- ETFE ethylene tetrafluoroethylene (DuPont's tradename is Tefzel)
- PVDF polyvinylidene fluoride (Pennwalt's tradename is Kynar for the homopolymer version; Soltex's tradename is Solef for the copolymer version)
- PFA perfluoroalkoxy (DuPont's tradename is Teflon PFA)

These materials all exhibit low flame and smoke characteristics when tested according to UL Standard 910 "Test Method for Fire and Smoke Characteristics of Cables." (This test is a modification of a test method

described in ASTM E-84 and UL #723 and is often referred to as the Modified Steiner Tunnel Test.) UL 910 has become the industry standard for evaluating the flame-spread and smoke-producing properties of cables installed in plenums.

In addition to low flame and smoke characteristics, the electrical properties of plenum cables must be considered. Several materials such as FEP and PFA, exhibit excellent electrical properties which make them ideal for use in high speed digital and high frequency analog cables as well as in cables intended for slower speed, lower frequency applications.

A wide range of communication, fire alarm, remote control and coaxial plenum cables utilizing these fluoropolymer materials are available. These cables meet all applicable NEC and UL requirements for applications including:

- Telephone Systems
- Computer Networks
- Intercoms
- Thermostat Controls
- Fire Alarm Systems
- Entertainment Systems
- Smoke Detectors
- Business Machines
- Point of Sale Cash Registers
- Sound Systems
- Environmental Control
- Office Network Systems
- Remote Control Signaling Systems

In summary, plenum cables are cables designed for use in plenum air spaces without metal conduit and which meet applicable sections of the National Electrical Code. The NEC requires strict flame resistance for plenum cables as measured by a UL test often referred to as the Modified Steiner Tunnel Test. These strict flame requirements require the use of sophisticated cable insulation and jacket materials. However, on an installed cost basis, the use of plenum cables can reduce costs 30% or more when compared with conventional cable-in-conduit. ≡