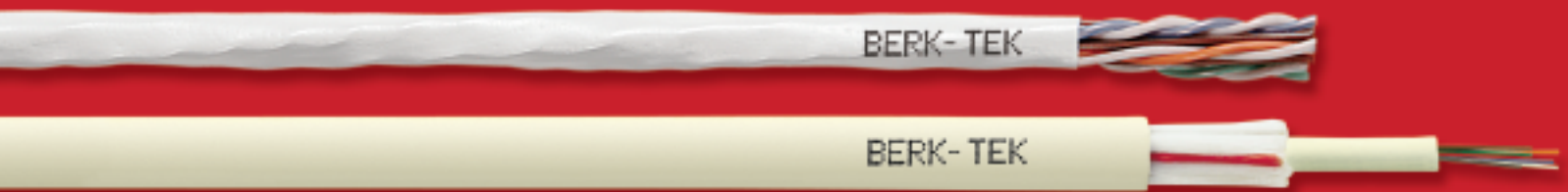


Tekbrief

data
center

limited
combustible:
the **NEW**
standard for
FIRE SAFETY



Berk-Tek[®]
A NEXANS COMPANY

Limited Combustible: The New Standard for Fire Safety

*Written by Daniel Kennefick
Limited Combustible Product Business Manager
Berk-Tek, A Nexans Company*

Since the advent of client server computing in the early 1980's, Building Codes officials have been concerned about the buildup of cables in air return plenum spaces. The development of Local Area Network (LAN) cables to support the rapid increase in the use of personal computers, plus the unacceptable practice of leaving these cables "abandoned in place" has forced codes officials and the National Fire Protection Association (NFPA) to take a hard look at the fire safety level of LAN cables and other low voltage cables. Fortunately, new low voltage cables have been developed that have dramatically improved fire safety properties. The new fire safety level that these cables offer is called **Limited Combustible** and it is "The New Standard for Fire Safety."

Cable Fire Safety History

Until 1975, low voltage cable included communications, signal and control, fiber optic, fire alarm and CATV/Broadband. These cables were not required to be installed in conduit. Building power cables however have long been required to be installed in conduit to both protect people from electrical shock and deliver a cable fault to ground. In addition, the NFPA required the use of conduit for building power circuits to prevent the spread of fire in the event of a catastrophic cable failure. With respect to low voltage circuits, the NFPA and National Code officials felt that the energy developed in a low voltage circuit was not enough to create a spark, and hence a fire, and the volume of low voltage cables in a typical building were not substantial enough to warrant any unique fire safety precautions be taken, such as the use of conduit.

The first major change to cable fire safety came in 1975 when the National Electrical Code (NEC) mandated that all low voltage circuits be installed in metal conduit. This change was brought about by a number of devastating fires, the most influential of which was the MGM Grand Hotel/Casino fire in Las Vegas. In this fire, combustible materials, including cables in concealed spaces, burned with such speed and intensity that a "flashover" situation developed in the casino and 84 people lost their lives.

About the time this change was implemented, DuPont, AT&T, and UL developed and introduced a cable that had similar fire safety properties as cable in conduit. The test, developed at UL, was a variant of the Steiner Tunnel test used to list building materials such as ceiling tile and wallboard. The pass/fail criteria for the test were calibrated to the cable in conduit performance, and this new cable and test was introduced to the NEC during the 1978 code cycle. This cable option was approved and adopted by the NEC in 1978. This “exception” test is what we know today as the “plenum cable test.” Despite the high cost of this new cable vs. the non-plenum cable used at the time, the use of this “exception cable” quickly became the norm across the country. Users quickly found that because they no longer had to use conduit, the installed cost of low voltage cabling dropped by at least 50% when they used plenum cable.

The Development of Limited Combustible Cable

As noted, client server computing quickly took off in the 1980's, and the volume of low voltage cables installed in buildings began to rise exponentially. Many of these cables were left abandoned in place as network technologies and the cables used to support them rapidly evolved. By the early 1990's, this increase of cable density in building air return plenums caught the attention of codes officials, and work was initiated to both eliminate the abandoned cables and to develop a cable that was more flame retardant than plenum cable. Ideally, codes officials wanted a cable that was as flame retardant as the building materials used to construct air return plenums.

This development was completed in 2001 with the announcement of the first **Limited Combustible (LC)** cable design. This cable was burned in the same test as ceiling tile and wallboard and passed the same smoke emission and flame spread criteria. This new fire safe cable design offered two particular attributes that codes officials were looking for:

- Up to 20 times lower smoke emissions than plenum rated cable
- 3-5 times lower fuel load than plenum rated cable

Lower smoke emissions and lower fuel load are two attributes that will help reduce the effect cable will have on building fire safety now and in the future.

The Differences Between Limited Combustible Cable and Plenum Cable

To significantly improve the fire safety of LAN copper cable, material changes needed to be made. As an example, the individual conductors in Category 5e and Category 6 plenum rated cables are insulated with FEP (Fluorinated

Ethylene Propylene). This material is more familiar to some by the DuPont trade name Teflon®. The FEP cable core is then jacketed with a flame retarded, smoke suppressed grade of PVC. (See Figure 1.)

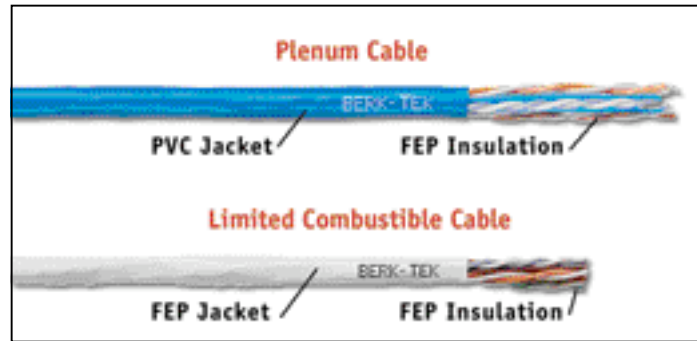


Figure 1

To create a limited combustible cable, the PVC jacket is replaced with a specially formulated FEP jacket. (See Figure 1.) The FEP compound used by Berk-Tek in copper and fiber optic limited combustible cables is an exciting new development from Alpha Gary and DuPont that offers the low smoke emission and flame spread of FEP but is flexible and can be pigmented like PVC. By using these materials in combination, the cables become **“DuPont® Certified”** and are being marketed by Berk-Tek as *DuPont® Certified Limited Combustible Cable*. As an all-FEP design, Berk-Tek’s DuPont® Certified Limited Combustible cable offers many attributes that are superior to plenum cable:

- Lower in smoke emissions and flame spread
- Better low temperature and high temperature UL ratings
- Better electrical performance at elevated temperatures
- Contains no lead
- Easier to pull—low coefficient of friction
- More flexible than a natural FEP jacketed LC Cable
- Smaller than plenum cable—greater tray and pathway fill
- 100% recyclable

Who Is Interested in Limited Combustible Cable

Since its development, Limited Combustible Cable has been of interest to two primary groups of end users: Those who need to create more “time to exit” for large numbers of potentially slow moving people and those protecting mission critical facilities.

Two Primary Concerns Driving LC Cable Interest

- Protecting Large Numbers of People
 - ▶ Hospitals
 - ▶ Elderly Care Facilities
 - ▶ Schools
 - ▶ High Rise Buildings
- Protecting Mission Critical Facilities (MCF's)
 - ▶ Data Centers/Storage Area Networks
 - ▶ Co-Located Facilities
 - ▶ Military and Government

Figure 2

Numerous end users in both of these categories are considering specifying limited combustible cable or have already installed limited combustible cable to improve building fire safety.

Expected Code Evolution of Limited Combustible Cable

Listing programs for limited combustible cables exist at both major independent test labs in the United States, UL and ITS/ETL Semko. Berk-Tek has DuPont® Certified Limited Combustible LAN copper cable listings for Category 3 through LANmark-2000 enhanced Category 6. Berk-Tek is also the first to launch a limited combustible fiber optic cable: *Adventum LC*. These cables can be installed today in any fire safety classification environment, including a plenum environment. Limited combustible cable is considered “best practice” and has fire safety performance above and beyond plenum cable. For limited combustible cable to achieve “mainstream” use, it must be listed in the industry’s primary fire safety documents. Figure 3 shows the fire safety codes and standards under the NFPA, which influence the wire and cable industry:

Key Wire and Cable Fire Safety Codes

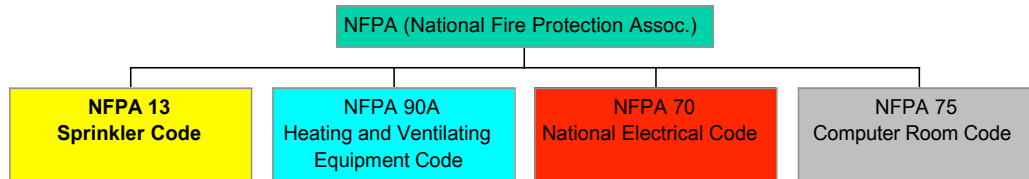


Figure 3

Electrical inspectors have historically used NFPA 70, the NEC, as a reference document to certify cable installations. Over the years, the NFPA has done a pretty good job of making sure codes and standards that have common areas of interest are harmonized. With the addition of Limited Combustible Cable to the code development process we are at the initial stage of a major change that will take a number of years to harmonize throughout the affected codes and standards.

The NFPA 90A Heating and Ventilating Equipment Code is a very important code for the wire and cable industry because this group acts as the “landlord” for the air return plenum space. This group was the first group to allow plenum cable in their space. The NEC followed NFPA 90A in 1978 to harmonize the two groups. The 90A group is currently in the middle of their 2006 code cycle and is considering the addition of limited combustible cable to their code because of special clause in the NFPA 13 Sprinkler Code. In the Sprinkler Code it states:

8.14.1.5 Localized Protection of Exposed Combustible Construction or Exposed Combustibles...concealed spaces having exposed combustible construction, or containing exposed combustibles...
The combustibles shall be protected as follows:

- (2) If the exposed combustibles are in the horizontal plane the area of the combustibles shall be permitted to be protected with sprinklers...

If limited combustible cable is used in these sprinklered buildings in a concealed space such as an air return plenum then the following applies from NFPA 13:

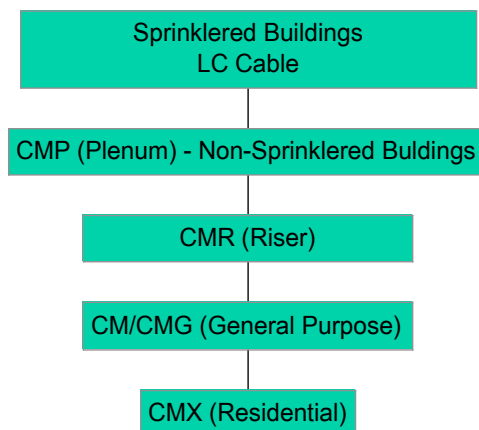
8.14.1.2 Concealed Spaces Not Requiring Sprinkler Protection

8.14.1.2.1 Non-combustible and limited combustible concealed spaces with no combustible loading...The space shall be considered a concealed space even with small openings such as those used as return air for a plenum.

Thus, in sprinklered buildings, if combustible materials (plenum cables are considered combustible because they are not limited combustible) are installed in concealed spaces such as air return plenums then the space must be sprinklered. If limited combustible cable is used, then the space does not need to be sprinklered. NFPA 90A is trying to harmonize with the Sprinkler Code regarding this issue. Thus far, this recommendation has passed through committee and will be voted on in the NFPA National Meeting in May of 2005. If it passes the national vote, it will become part of the 2006 90A Code.

To complete the harmonization process, the inclusion of this Sprinkler Code clause will be recommended for the 2008 NEC in the fall of 2005. This recommended addition will go through the balloting and comment process for the next two and a half years. If the cycle is completed, then the sprinkler clause will be added to the 2008 NEC. If the sprinkler clause for limited combustible cable is included in the 2008 NEC, then intense lobbying will happen with codes officials, such as electrical and fire inspectors, to adopt this version of the code at their respective local levels. The NFPA 90A and NEC Fire Safety Hierarchy would then appear as shown below.

NEC Fire Safety Hierarchy for Communications Cable



Recommendations

Plenum cable has served the industry well but is a thirty year old technology that is no longer the best available. Limited combustible cable provides users with an improved level of fire safety that will allow them to more effectively protect people dense buildings and mission critical facilities such as data centers. Berk-Tek's DuPont® Certified Limited Combustible cables offer additional benefits such as improved flexibility and strip ability, and an easier to read print legend. As the codes evolve to this more fire safe technology, users will use this cable in concert with other building fire safety improvements to create safer structures and more time to exit for their occupants.

For more information about Berk-Tek's DuPont® Certified Limited Combustible cables, visit www.berktek.com or call 1-800-BERK-TEK.

—end