

# **Guidance Document on Listing Requirements Associated with Cables as it Pertains to Fire Protection [3/26/2010]**

## **Introduction:**

This document is to assist design engineers with the flammability requirements of cable and wire installed at Jefferson Lab.

Cable and wire covered by this guidance shall conform to the requirements of the applicable standards for the types specified herein. Compliance in regard to fire and casualty hazards, as discussed within this guidance document, does not absolve the cable or wire from complete compliance with other technical and installation requirements.

## **Jefferson Lab Commitment:**

As stated in 10CFR851.23, "Contractors must comply with the following safety and health standards that are applicable to the hazards at their covered workplace". Included in this list of standards is the National Fire Protection Association (NFPA) 70, "National Electrical Code (NEC 2005 version)". It is this referenced code that mandates the listing requirements for various cable types. The NEC has four different tests to measure the tendency of a cable to spread smoke and flames when exposed to a fire: Plenum, Riser, General-Purpose, and Residential (Residential type cable is not to be used at Jefferson Lab; it is not equivalent from a fire resistance standpoint since it is only "Flame Retardant", not "Flame Resistant").

**Note:** All other existing cables, installed under earlier codes of record, will remain as is or replaced as deemed necessary.

## **Definitions:**

Plenum (P)- rated cable is intended for use in any air space between walls, under structural floors, above dropped ceilings, or any other spaces used for environmental air distribution. Plenum rated cable can be used where Riser rated or General Purpose rated cable is required.

Riser (R) – rated cable is intended for use within commercial buildings in vertical runs and penetrating more than one floor, or cables in vertical runs in a shaft. Riser rated cable can be used where General Purpose rated cable is required.

General Purpose – rated cable is intended for general use within nonresidential type buildings; typically these are cables installed within a location which does not fall within the Plenum or Riser cable classifications. These cables can be installed in vertical runs not penetrating more than one floor.

**Fire Resistant** - The term fire resistant is relative to the degree to which various cables will burn when subjected to a controlled set of fire test procedures. All cables will burn, the intensity and severity depends on the type, quantity, and configuration of the cables involved. In all cases engineering judgment should be used when comparing cables and determining the need for cable installation fire protection.

**Listed** – Equipment, materials, or services included in a list published by a Nationally Recognized Testing Laboratory (NRTL) that is concerned with the evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that the equipment, material, or services either meets appropriate designated standard or has been tested and found suitable for a specified purpose.

- The NRTL determines that specific equipment and materials ("products") meet consensus-based standards of safety to provide the assurance, required by OSHA, that these products are safe for use in the U.S. workplace. See <http://www.osha.gov/dts/otpc/nrtl/nrtllist.html> for a list of organizations recognized by OSHA (Occupational Safety & Health Administration) as NRTLs.

### **Jefferson Lab Designation of Various Locations**

The majority of locations within buildings that house Accelerator Operations equipment and the Physics Halls equipment are designated as General Purpose cable areas; in other words the cables installed within these buildings do not fall within the Plenum or Riser cable classifications. These areas are classified for general use because the space is not being used for environmental air distribution and/or the vertical cable runs are not penetrating more than one floor or installed in a shaft. The vertical penetrations between the tunnel and the service buildings are not considered risers.

#### **Examples of some spaces that require a higher fire resistance rating than general purpose:**

1. The vertical cable shafts for Hall A, B, and C are riser spaces.
2. The location under the access floor in the Hall A, B, and C Counting Rooms are a plenum space.
3. The location under the Hall D Counting Room Rack Area is a plenum space.

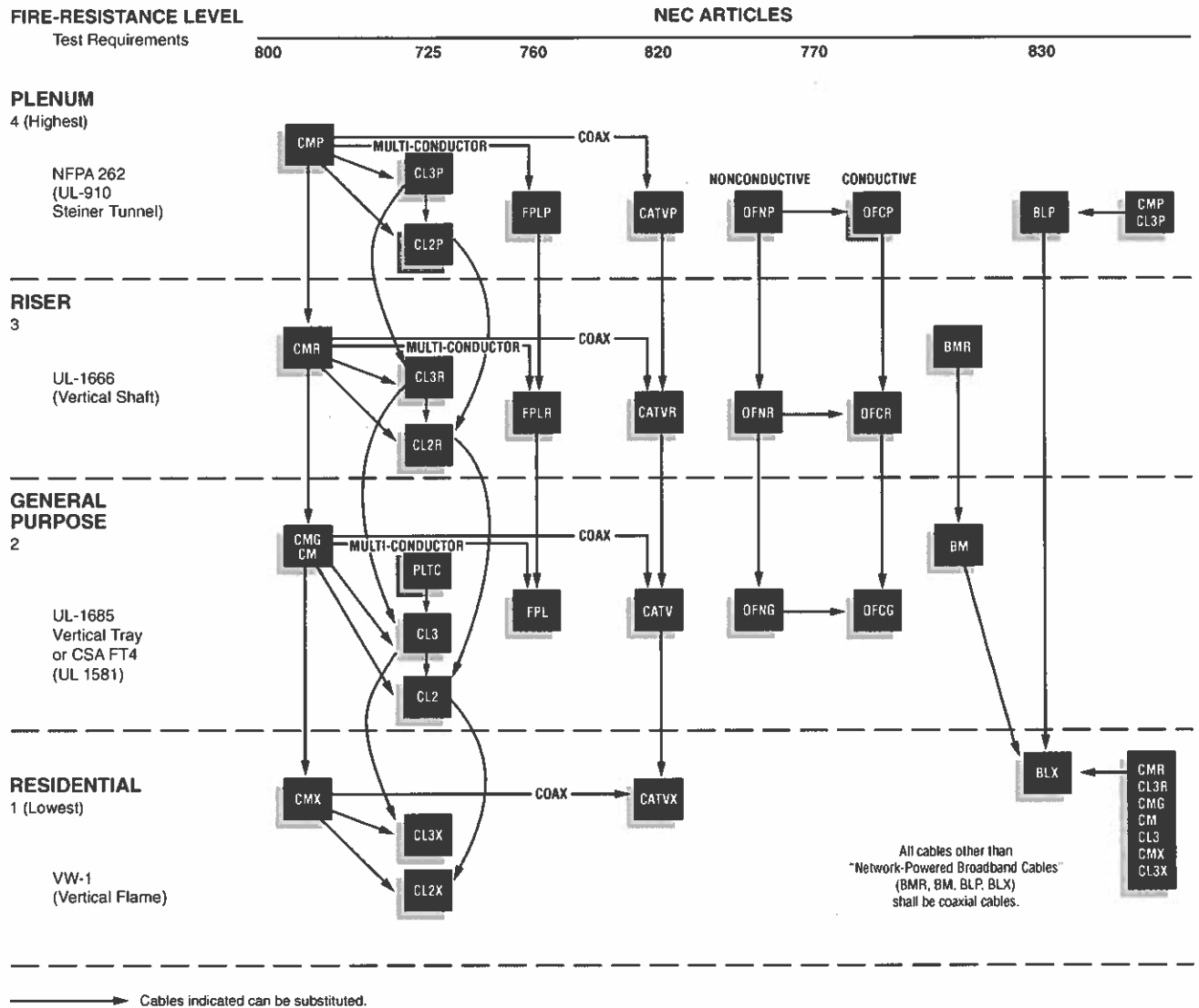
**Note:** If unsure of an areas classification, then contact Dave Kausch (Fire Protection Engineer) of Facility Management at x7674 for further evaluation.

### **Cable Substitution Chart (per NEC 2005):**

The following chart represents the accepted type of cable for installation in various spaces (Plenum, Riser, General Purpose, or Residential) along with the corresponding fire resistant test requirements and the corresponding NEC articles pertaining to the referenced cables.

# Cable Substitution Chart

Per 2005 NEC®



NEC Type	Definition
CMP, CMR, CMG, CM, CMX	Communications Cables
CL3P, CL3R, CL3, CL3X, CL2P, CL2R, CL2, CL2X	Class 2 and Class 3 Remote-Control, Signaling and Power Limited Cables
FPLP, FPLR, FPL	Power Limited Fire Alarm Cables
CATVP, CATVR, CATV, CATVX	Community Antenna Television and Radio Distribution Cables
OFNP, OFNR, OFNG, OFN	Nonconductive Optical Fiber Cables
OFCP, OFCR, OFCG, OFC	Conductive Optical Fiber Cables
PLTC	Power Limited Tray Cables
BMR, BM, BLP, BLX	Network-powered Broadband Communications Cable

### **Other Relevant NEC Requirements for Cable Practices:**

**NEC Article 300.21** – “Spread of Fire or Products of Combustion”. Electrical installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be made so that the possible spread of fire or products of combustion will not be substantially increased. Openings around electrical penetrations through fire-resistant-rated walls, partitions, floors, or ceilings shall be fire stopped using approved methods to maintain the fire resistance rating.

- The vertical penetrations between the tunnel and the service buildings which are sealed at the tunnel ceiling are considered an approved method to maintaining the fire separation.
- The accessible portion of abandoned cables shall be removed so as not to unnecessarily increase fire loading. Cable is considered abandoned when it is not connected to equipment and not identified for future use with a tag.

**Electrical Tape** – UL listed tape is certified to not catch fire and burn when over heated, meanwhile non-UL listed tape may contribute to a fire and burn like a petroleum product. The UL510 standard covers thermoplastic and rubber tapes for use as electrical insulation at not more than 600 V and at 80°C (176°F) and lower temperatures on joints and splices in wires and cables in accordance with the National Electrical Code (ANSI/NFPA 70).

**Cable Technical Requirements** – Cables are also characterized by usage and electrical power limitations. The Cable Substitution Chart should be used as a reference for the specific NEC article corresponding to these requirements for each type of cable. For example Class 1 circuit’s power limitations can be found in article 725.21; where as Class 2 and Class 3 circuit’s power limitations can be found in article 725.41 which ultimately references tables 11A and 11B of chapter nine of the NEC.

### **Variances / Exceptions to this Guidance Document:**

This Guidance Document is for the installation of cables from this day forward. All other existing cables, installed under earlier codes of record, will remain as is or replaced as deemed necessary.

If a desired cable to be installed cannot achieve the flammability test requirements and no other cable is available that will meet the technical aspects of the intended design, then the Engineer-In-Charge shall first investigate other acceptable means of installing the desired cable. If no practical method of installing the desired cable can be achieved, the Engineer-in-charge can request an equivalency or exemption from the code requirements from the Electrical Safety Committee. This request shall follow the format (click on the AHJ plug-in) presented in chapter 6200 of the ES&H manual and sent to [kujawa@ilab.org](mailto:kujawa@ilab.org). An exemption from the code requirements will always require mitigation measures to provide an equivalent level of safety that the NEC requirements achieve. When considering a request for equivalency or exemption from the code requirements, be prepared to facilitate an equivalent level of protection means.

If a desired cable to be installed cannot achieve the flammability test requirements but other cable that meets both the technical need and the flammability requirements is available, then the alternate cable shall be used.