

## Cable Ratings and Materials and Counterfeiters! Oh My!

Have you ever started a cable project in your home or office and took a moment to wonder if your cable was rated for the task or (holding breath) your usage of it was properly up to building codes? It is easy to get lost in this sea of acronyms, part numbers and other markings that are meant to differentiate two seemingly identical cables. In this article, we hope to clear up some of this confusion so that you can make a more educated decision about your next cable purchase no matter whether you are a consumer or professional installer.

“ It is easy to get lost in this sea of acronyms, part numbers and other markings... ”

The basic standards and codes (Factoid: a standard is a suggestion for usage while a code must be abided by law.) for cable and its usage in the United States are set by the National Fire Protection Association (NFPA) through a document of theirs called the NFPA 70: National Electrical Code. This collection of rules is the starting point for safeguarding all cable, wiring and electrical devices in the US from causing fire or electrocution. While many of the mandates are federal and even state, local building codes have the final word on what is or is not acceptable or legal, so check with your local municipal first if you have any questions. Commonly though, cities will align their building codes to the most current version of the NEC for streamlining and in order to avoid lawsuits.

### Basic Cable Applications Home vs Commercial Usage

The majority of home cable installations will compromise of either CL or CM rated wiring. The CL rating indicates that the cable is intended for wiring typical of audio and video signal types such as speaker wire or HDMI cable. CL with either a 2 or 3 suffix designates that the cable is intended for class-2 or class-3 circuits and can be run within walls of buildings or dwellings. Another common cable rating is CM, which denotes communications cable such as Cat 5e or Cat 6 networking cable. Often, this type of cable meant for home usage will carry an X suffix signifying that it is intended for use in buildings where the cable is enclosed in a non-combustible conduit. Additionally, CMX cable can be used for outdoor runs (always check to make sure the PVC jacketed is UV resistant though.).

Commercial buildings often have physical features not found in houses such as drop ceilings, sophisticated air-circulation systems and more than two floors. For use in these specialized regions, further cable ratings have been developed to denote a cable's fire load and/or toxicity should it burn. Cables that are low in both of these categories carry an R or P rating standing for riser or plenum rated respectively.

The tables below designate: the basic cable classes as stated by National Electrical Code (NEC), an indication of the fire resistance per cable family type and lastly, which cable rating types can safely be substituted for one another without causing a fire hazard.

#### Type Use

CM Communications  
CL2 Class 2: remote-control, signaling, and power-limited cables  
CL3 Class 3: remote-control, signaling, and power-limited cables  
FPL Power-limited fire protective signaling cables

MP Multipurpose cable  
PLTC Power-limited tray cable

#### NEC Cable Classes

Application	Cable Family						Fire Resistance
	MP	CM	CL2	CL3	FPL	PLTC	
Plenum	MPP	CMP	CL2P	CL3P	FPLP	--	Most
Riser	MPR	CMR	CL2R	CL3R	FPLR	--	



General PurposeMP, MPGCM, CMGCL2 CL# FPL PLTC  
 Dwelling -- CMX CL2XCL3X-- -- Least  
 NEC Cable Marking Application Categories

Permitted Substitution

Cable Type	MPP	CMP	PCL3	PCL2	PFPL	MPR	CMR	CL3R	CL2R	RFPL	RMP	GPC	MG	CM	PLTC	CL3	CL2	FPL	CMX	CL3X	CL2X
MPP	X																				
CMP	X	X																			
CL3P	X	X	X																		
CL2P	X	X	X	X																	
FPLP	X	X	X																		
MPR	X	X																			
CMR	X	X																			
CL3R	X	X	X																		
CL2R	X	X	X	X																	
FPLR	X	X	X																		
MPG	X																				
MP	X																				
CMG	X	X																			
CM	X	X																			
PLTC																					
CL3	X	X	X																		
CL2	X	X	X	X																	
FPL	X	X	X																		
CMX	X	X																			
CL3X	X	X	X																		
CL2X	X	X	X	X																	

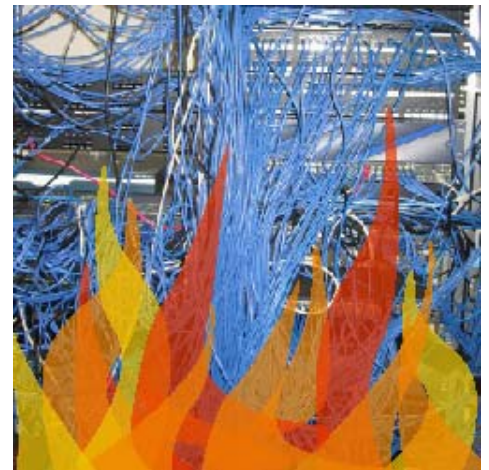
Legend: Plenum Cable Riser Cable General Purpose Cable Dwelling Cable  
 NEC Cable Substitution Table

## Fire Safety Some History

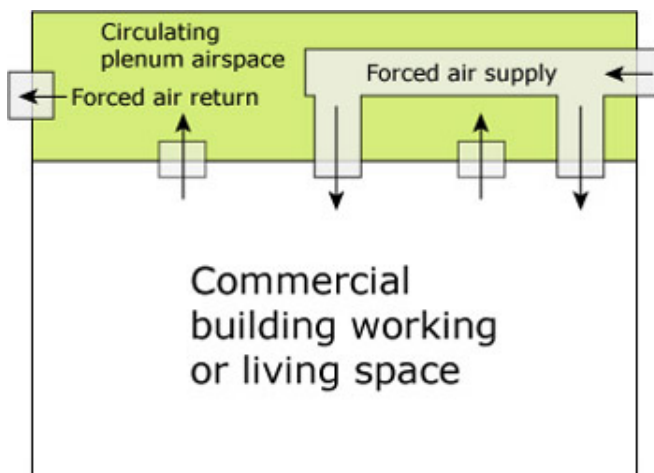
“Among the many things that contributed to the rapid spread of the toxic smoke were the combustible plastics (PVC) used in the building wiring.”

On the morning of November 21, 1980, a fire started in the MGM Grand Hotel and Casino (now Bally's) in Las Vegas. 87 people were killed, mostly due to smoke and toxic fume inhalation. It remains the 2nd worst hotel disaster in US history, and helped usher in many building code changes and safety measures.

Among the many things that contributed to the rapid spread of the toxic smoke were the combustible plastics (PVC) used in the building wiring. The cables burned easily, allowing the fire to spread, and gave off toxic smoke that spread through the air conditioning systems. Although the fire itself was contained within the casino and restaurant, most people died from smoke inhalation on the upper floors of the hotel.



## What is a Plenum?



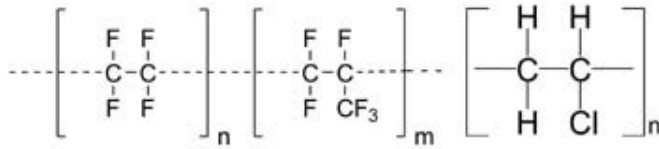
A plenum is an area used as a return for air conditioning and air circulation systems within buildings. Typically, a plenum airspace is the area directly above the drop ceiling. In addition to air conditioning equipment, plenums are also used for thru fares of cable and wiring. Should a fire enter the plenum area, fumes from burning cable would be easily transferred through the building via the air circulation equipment.

## Plenum Cable

This type of cable is specifically designed for use in plenum spaces. A plenum cable has a very low fire load meaning that they can endure very high temperatures and if they do burn, the smoke emitted will contain little toxicity. The jacket, and inner jackets such as on Cat 5e/6, on plenum cable is primarily responsible for it being fire retardant and is made of either a Teflon type or high temperature PVC.

## A Plenum Airspace

such as between floors in a building. These cables are also fire retardant to a degree but the specifications by the NEC for their fire load levels are not as strict as those for plenum. Plenum cables can always replace riser cables in buildings but not vice versa.



FEP (Teflon) and PVC Chemical Symbols

forms of Teflon, has the useful properties of having a low friction coefficient, non-reactivity and high temperature tolerance (it melts at 500° F). Fluorinated ethylene propylene is also highly transparent and resistant to sunlight unlike most forms of PVC.

PVC (polyvinyl chloride) is one of the most common plastics used today and is by far the most common material of cable jacketing. It is cheap, durable and easy to produce all of which have led to its prevalence in the cable industry. While typical PVC such as that found in sewage piping is rather flame resistant due to its high chlorine (Cl) content, the PVC used for cable jacketing is not. The addition of plasticizers needed to make it softer and more flexible also contribute to its high toxicity while burning. However, in recent years, low smoke, fire retardant PVC has been developed by adding additional compounds to the PVC such as antimony trioxide (Sb<sub>2</sub>O<sub>3</sub>). These low smoke, high temperature PVC variants are indeed applicable, like Teflon, for riser and plenum rated cable jacketing.

## Halogen's, Europe and LSZH

Halogens are a group of highly reactive, nonmetal elements which include fluorine (F), chlorine (Cl), bromine (Br) and iodine (I). Due to their reactivity, these elements are found only in nature as compounds and ions. Additionally, these elements form highly toxic and corrosive gasses when heated and burned. Popular cable jacketing materials such as PVC, FEP and even PTFE (Teflon) compromise of considerable amounts of halogens. The danger here lies when these cable jackets are burned in the presence of moisture as would be present when fire extinguishing equipment such as emergency sprinklers have been activated. The addition of water to fluorine or chlorine gases produces: hydrofluoric (HF) and hydrochloric acids (HCl) respectively. Each of these acids is quite corrosive and will easily cause damage to eyes and lungs as well as equipment.

In Europe, all plenum cable must adhere to Low-Smoke Zero Halogen (LSZH) tolerances the cable jacketing is composed of thermoplastic or thermoset compounds that emit limited smoke and no halogens when exposed to high heat. LSZH jacketing is becoming popular in applications where ventilation is extremely poor such as rail cars and aircraft.

## Cutting Corners Cheap but at What Price?

It seems that every year brings more and more low cost, cheaply made cables to the market. As a company, CableWholesale exists on the very notion that cables are by a whole, overpriced by national brands. However, we only sell quality cabling unlike many others out there who skimp on the essentials that a good cable must have. While a cheaply made cable might work fine in certain applications, the user will get what they pay for in others. Take Cat 5e/6 cable for instance. Inferior Cat type cable will not allow a network to achieve its maximum bandwidth and its speed will suffer. Shielding too is another element skimmed on with shoddy cabling. A/V cables of lengths exceeding 35 feet or so can experience noise and/or feedback issues due to a lack of proper shielding. Sometimes, the result is an audible hiss in the audio. Other times, long HDMI cables simply will not work due to interference.

## Counterfeit Cabling

Another disturbing trend in the cable industry today is companies selling fraudulent cable even with UL labels on them. These perpetrators will get a quality cable made for them and tested by UL or CSA for the tester's product number. They will then contract a manufacturer to reproduce a lesser quality or completely different spec'd version of this cable and mark it with the same UL or CSA verification number. While this effort may save vendors thousands of dollars, it ultimately is the consumer who gets burned in the long run. With false testing facility markings, how is a buyer really supposed to know what they are buying and if it will adhere to the spec's they need? Suppose one installs a large quantity of suspect network cable and after the installation, the consumer learns that their network is just too slow because the cable was not built with an adequate amount of copper but rather copper coated aluminum. Now the consumer will have to pay again and again to have the installation removed as well as new quality cable bought and installed.



Counterfeit Cat 6 Cable Box Label

## Fake Plenum & Riser Rated Cables

In the cable industry, the selling of falsely labeled cable represents perhaps the largest safety risk to consumers and corporations. While it is one thing for a cable to not hold up to its specification ratings for passing audio, video or data, it is of grave concern when

the same cable does not live up to its fire and/or current rating. The materials used to construct a cable with a riser or plenum rated jacket cost much more than their in-wall equivalent. As a result, cheap cables are being sold with in-wall rated jackets and labeled as riser rated. Even worse is cables that would only pass a riser rating test but are sold as plenum just to save a few dollars. Any installer using such cable is gambling with the lives of others should a fire break out in a building wired with incorrectly labeled cable.

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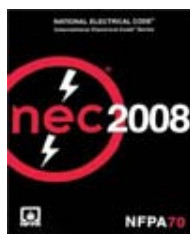
### **Protecting Yourself The Testers & Rule Makers**

The agencies and companies listed below benefit consumers through testing, developing safety standards and certifications. The verification marks of any of these agencies on a product are meant to ensure the consumer that what they are buying will not present an electrical or fire risk under normal and sometimes even extreme usage. While there are many testing and certification companies, those below represent the most recognized globally.

#### **National Fire Protection Association, NFPA**



Established in 1896, this international nonprofit advocate's aim is to reduce the effect of fire and other hazards through developing standards and codes, training, research and education. The NFPA is the largest authority on fire prevention and develops, publishes, and disseminates more than 300 codes and standards to minimize the possibility and effects of fire and other risks.



#### **National Electrical Code, NEC**

The National Electrical Code (NEC), also called the NFPA 70, is the standard in the United States for safe installation of electrical wiring, cabling and equipment. Created by the NFPA, it is part of their national fire codes. While the NEC is not US law, it is commonly used as the basis for the majority of state and local building codes due to it being thorough and widespread in its use.

#### **Underwriters Laboratories, UL**



Underwriters Laboratories® is an independent product safety certification organization that tests products and writes safety standards for over 98 countries. Each year, UL tests and evaluates over 19,000 products, systems and materials. In fact, in its century of existence, Underwriters Laboratories has certified and marked over 20 million devices with its famous UL symbol.

#### **Intertek, ETL**



Like UL, Intertek also specializes in product safety testing as well as EMC and benchmark performance testing. ETL is a global leader in product accreditations and operates on over six continents with over 70 offices and laboratories.

#### **Canadian Standards Association, CSA International**

The CSA is another worldwide recognized product tester although its focus is on products sold within Canada. It is responsible for testing and providing certification for electrical as well as mechanical, plumbing, gas and a





multitude of other devices. The CSA mark currently can be found on billions of products around the globe.

## Know Your Product

When purchasing for your next wiring project or job always keep in mind that cheap, inferior cable is present in the marketplace. A buyer should ask questions and even request a cable's data spec sheet to know what they are getting. It is not too much to ask a seller for a cable's UL, ETL or CSA marking number. These numbers can typically be verified upon the respective testing agency's website.



1. Cable type and rated bandwidth
  2. Wire gauge and conductor type (solid core wire) with plenum jacketed
  3. UL, CSA and ETL certification marks
  4. Length of cable in feet
  5. Color of jacket
  6. UL cable listed type/fire rating
  7. Certification ID numbers
  8. ROHS compliance certification
  9. Cat 5e cable markings
- CableWholesale Cat 5e Cable Label Decoded

At CableWholesale, we are committed to not only selling tested and verified cable products, but also educating the public to make the right purchase for their next wiring project. While cost is always a factor in purchasing a product, it should never come at the expense of safety.