



## General Cable's 17 FREE™ Solutions

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### An Overview of Halogenated PVC and General Cable's 17 FREE™ Offering

Written by: Jason Draime, Rob Gould and Alice Albrinck

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## An Overview of Halogenated PVC and General Cable's 17 FREE™ Offering

### OVERVIEW

In 1926, Waldo Semon and the B.F. Goodrich Company developed Polyvinyl Chloride, or PVC, in a form that was flexible and durable enough for commercial use. PVC is lightweight, strong, and chemically- and biologically-resistant, making it an ideal material for use in pipes, wiring, signs, clothing, and even those classic vinyl records.

Up until the early 1950s, cables were manufactured using rubber, cloth, a woven jacket, and usually tar to protect from moisture. This material, when in contact with oxygen, becomes brittle over time and can break down, thereby reducing life expectancy. PVC, however, will not corrode or become brittle under normal conditions and provides excellent physical characteristics, so it became an obvious successor to these cables.

### WHAT ARE HALOGENS AND WHY DO THEY MATTER?

PVC consists of Hydrogen (H), Carbon (C), and Chlorine (Cl halogen), with other elements added to act as fire retardants (typically Bromine (Br) halogen), smoke suppressants and various other additives. These additives alter the characteristics of the PVC to meet specific requirements by the end users. Chlorine and Bromine reside in the 17<sup>th</sup> column of the periodic table of elements, within the group of elements known as the halogens.

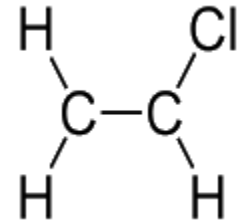


Fig. 1 PVC Molecular Structure CH<sub>2</sub>-CHCl

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
Fr	Ra																
		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	
		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	

Fig 2: The Periodic Table of Elements Referencing the Halogens: Fluorine, Chlorine, Bromine, Iodine, and Astatine



When PVC is ignited, the Chlorine and Bromine react with free radicals produced by fire. The heat breaks the Chlorine and Hydrogen bonds, allowing them to combine with the other additives that may be present. While this reaction greatly reduces the ability for the fire to burn, it also releases HCl (Hydrogen Chloride) and HBr (Hydrogen Bromide) fumes that turn into hazardous acids when combined with water from sprinkler systems or moisture in the mucous membranes (eyes and lungs if inhaled).

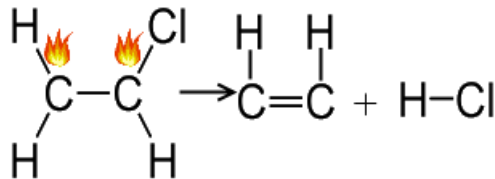


Fig. 3: When PVC burns, it reacts to form CH=CH+HCl  
(Hydrogen Chloride)  
This does not depict PVC with additives

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## RESULTS

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Typically, 50 million feet of Category 5e cable contains approximately 332,600 pounds of PVC. This includes 89,800 pounds of Chlorine, and 6,650 pounds of Bromine. Higher end Category 5e products such as General Cable's GenSPEED<sup>®</sup> 5500 has additional material causing the amount of Chlorine and Bromine to reach 118,900 and 8,810 pounds respectively. General Cable's cable design is not unique among the industry, in that nearly all U.S. manufacturers use PVC in their cable construction. What does make us distinctive is General Cable's halogen-free cable line, 17 FREE<sup>™</sup>. The halogen group on the periodic table (Fig. 2) can be found in the 17th column. General Cable's 17 FREE product family has eliminated all halogens from the cable while maintaining the same flame requirements, electrical performance and longevity.

General Cable's patent pending 17 FREE cable line eliminates halogens, resulting in a less hazardous cable construction as compared to traditional PVC based cables.



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## **CONCLUSION**

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### **Why Choose a 17 FREE™ Solution?**

When designing a building for LEED certification, the use of General Cable's 17 FREE line of products may qualify for LEED credits. Buildings that are LEED certified use resources more efficiently compared to the standard building code and can provide a healthier working environment for people. There are four levels of certifications—baseline, gold, silver and platinum—that offer a reduction in operations costs and possible increased tax incentives.

Incorporating General Cable's 17 FREE line of cables into a building significantly reduces the health hazard of halogen-based fumes in a fire scenario, while still meeting industry standards.

