



## DATACOM CABLE SOLUTIONS

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### 17 FREE™: A New Class of Halogen-Free Cables

Written by: Alice Albrinck, Chemical Applications Engineer,  
General Cable

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## A New Class of Halogen-Free Cables

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### ***INTRODUCTION***

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“What defines a green cable?” This question has been a topic of significant debate in the wire and cable industry. No direct standard has been set forth to completely define what makes cable green. Recycled packaging, material reduction, scrap reduction, and even RoHS (European Standard for Restriction of Hazardous Substances) have all been environmentally responsible ways to address the topic of green. However, none substantiate green properties for the cable itself. The United States Green Building Council (USGBC) was the first U.S.-based organization to address this with the introduction of a pilot credit that requires the removal of halogens from wire and cable jacketing. This move has taken the topic of green cable to a new level.

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### ***WHAT IS A HALOGEN?***

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Halogens, which are group 17 on the periodic table, are comprised of Chlorine, Fluorine, Bromine, Iodine and Astatine. With the exception of Astatine, halogens are abundant in supply. They can be found in seawater, minerals, and are even present as natural products in living organisms. Halogens are highly reactive and easily form compounds that have found diverse uses in our modern lives. Medicines, salts, disinfectants, polymers and flame retardants are just a few of the many applications where halogens are used on a daily basis.

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### ***WHY ARE HALOGENS USED IN WIRE AND CABLE?***

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Halogenated polymers, such as PVC, CPE, Neoprene and FEP have been used in the wire and cable industry for the last 50 years, replacing flammable materials such as paper insulation. They are exceptionally durable, inherently resistant to fire, have good electrical characteristics, and most are relatively inexpensive. In addition, both PVC and CPE can be modified through the use of additives to impart a variety of properties, including increased flexibility, impact resistance, UV stability, additional flame retardancy, and increased smoke suppression. Ultimately, the use of these materials can be attributed to the necessity of meeting increasingly stringent building codes in the United States.

U.S. National Electrical building codes require that wire and cable meet certain flame and smoke suppression standards. Specifically, cable must be either UL CMR or CMP rated. CMR (Riser) cable has to meet the fire rating requirements of UL 1666. CMP (Plenum) cable must meet both the fire and smoke requirements of NFPA 262. These requirements have necessitated the use of halogenated materials.



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## **WHY THE CONCERN FOR HALOGENS IN WIRE AND CABLE?**

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Halogens used in wire and cable can create issues both from the environmentally detrimental byproducts formed during the manufacturing process as well as the gases that can be released during combustion.

The manufacture of Polyvinyl Chloride (PVC) can potentially release byproducts such as chlorinated dioxins, chlorinated furans, PCBs, hexachlorobenzene (HCB) and octachlorostyrene (OCS). According to the U.S. Environmental Protection Agency, both dioxins and furans are part of a class of chemicals known as PBTs (Persistent, bioaccumulative and toxic pollutants).

Bioaccumulation refers to the accumulation of chemicals in an organism, resulting in a higher concentration than what is present in the environment around them. If in the case of PVC, dioxins and furans were released into the environment, soil and waterways could be contaminated. Plants and small organisms may then absorb the chemical. Fish and small animals eat the plants and could obtain even higher amounts of the PBTs. This cycle is repeated up the food chain, perhaps leading to ingestion by humans.

High concentrations of PBTs in animals and humans have been linked to detrimental effects on the nervous system, reproductive and developmental problems, immune-response suppression, cancer and endocrine disruption.

PBTs may also be released during the combustion of products containing PVC, either through accidental fire or incineration of solid waste. In addition, PVC combustion may also release carbon dioxide, carbon monoxide, hydrogen chloride and water. Hydrogen chloride gas may cause skin burns and when inhaled, lead to respiratory changes. Exposure to hydrogen chloride may adversely affect a person's ability to escape from a burning building, or in extreme exposure cases, cause respiratory failure and even death.

Although less important in scale, it has been reported that hydrogen chloride gas generated by a fire may destroy fragile computer and electronic equipment, resulting in a larger amount of damage to property than would have been caused by just the fire alone.

Another commonly used polymer in the wire and cable industry is FEP (fluorinated ethylene propylene), a type of Teflon. Although FEP is extremely hard to ignite, during an intense fire, temperatures sufficient to cause FEP to decompose may be reached. Decomposition products of FEP include hydrogen fluoride, perfluoroisobutene (PFIB), and oxygen difluoride. All three of these chemicals are known respiratory irritants, and potentially lethal to both humans and animals at high enough concentrations.

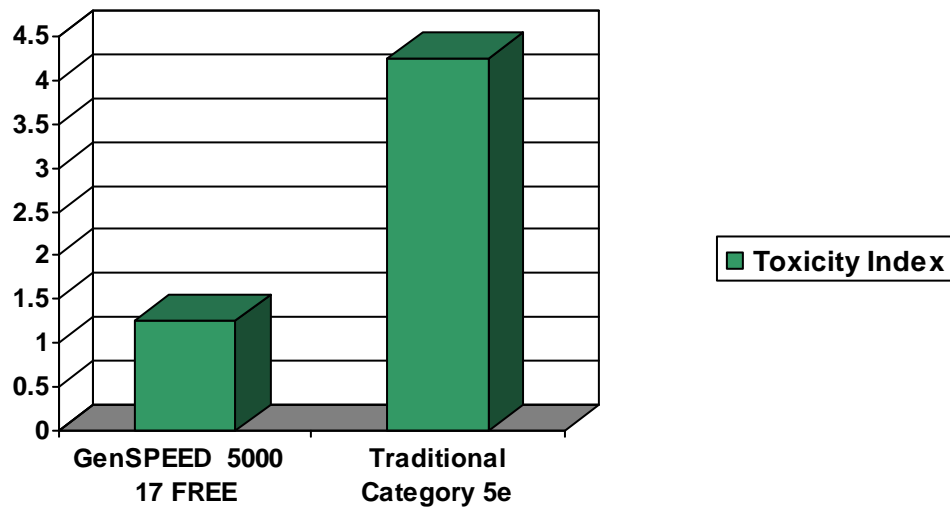
While halogenated compounds have been instrumental in enabling wire and cable to meet certain flame and smoke requirements, General Cable has developed a product line that is halogen free while meeting the necessary UL rating.



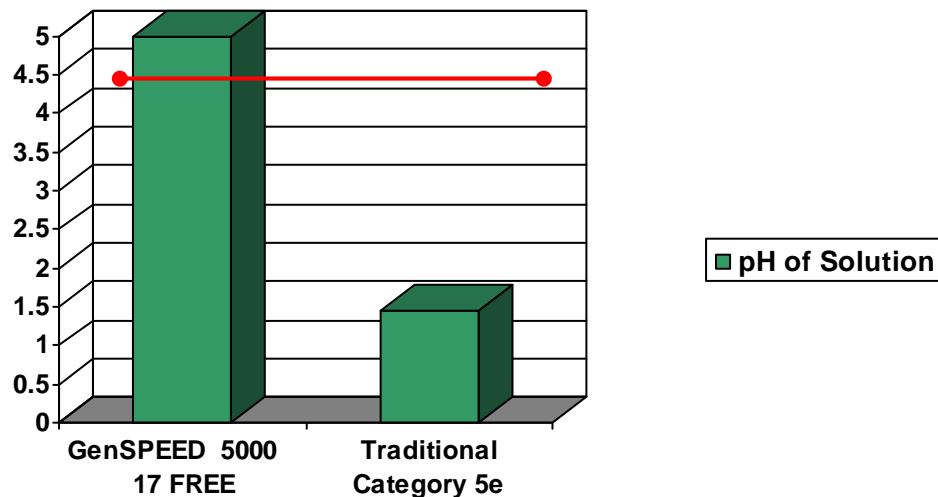
### INTRODUCING A NEW CLASS OF HALOGEN-FREE CABLE

General Cable has developed a line of halogen-free cables, called 17 FREE™. All halogenated polymers and flame retardants have been eliminated and replaced with more environmentally friendly choices, which were internally developed and manufactured by General Cable. 17 FREE cables meet or exceed the necessary electrical and physical properties for the respective application standard.

To measure the toxicity index of these cables, we used the MIL-PRF-85045 Paragraph 4.8.28 military specification. It quantitatively measures the release of potentially toxic gases including hydrogen fluoride, hydrogen chloride, hydrogen bromide, ammonia, carbon dioxide, carbon monoxide, formaldehyde and phosgene, among others, and assigns them an index. GenSPEED® 17 FREE Category 5e and a traditional Category 5e cable were both tested to this specification and the results can be compared in Figure 1. The 17 FREE cable reduced the quantity of such gases generated by a factor of 3.



In addition, both the 17 FREE and traditional jacketing materials were tested to IEC 60754-2, which measures the pH of halogen acid gas evolution. IEC has no requirement, but recommends a value greater than 4.3. These results can be viewed in Figure 2.





Unlike other Low-Smoke, Zero-Halogens (LSZH) cables on the market, this revolutionary product has a UL 1666 CMR rating, required in many U.S. building applications and data centers. The 17 FREE products are more flexible, with the look and feel of a traditional category cable, and are easier to install than traditional LSZH cables. An additional benefit of 17 FREE is that the cable has superior cold temperature handling properties as compared to a standard CMR cable.

General Cable's 17 FREE products do not contain any chemicals known to be PBT's, making the manufacture and eventual disposal of this product potentially less hazardous. The result is a halogen-free product line that is designed to be environmentally friendly, without degrading the electrical performance of the cable.

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**CONCLUSION**

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The United States Green Building Council's LEED Pilot Credit 2 was proposed to encourage architects and developers to specify more environmentally friendly wire and cable products. This pilot credit requires the use of materials without added halogenated organic compounds for at least 75% (by cost) of the material totals in a minimum of three of the four following groups: exterior components, interior finishes, piping, conduit and electrical boxes and building-installed electrical cable and wire jacketing. (Source: U.S. Green Building Council, LEED Pilot credit 2).

Whether you are building a LEED certified building or just looking for more ways to safeguard people and protect the environment, General Cable's 17 FREE products offer an alternative that provides a truly "green" cable.