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Fire Alarm Systems: Fighting Fire With Technology

BY ALBEN ROLAND, MANAGER, PRODUCT ENGINEERING, CAROL BRAND ELECTRONIC PRODUCTS–GENERAL CABLE

"Safety" is a buzzword that affects every aspect of our lives. From the seat belt you wear during your daily commute to the "caution" notice on the bag of popcorn you make for a midnight snack, safety dominates our modern culture. Few industries are more safety-focused than that of fire alarm system manufacturers, who are constantly improving their products using advanced technologies and state-of-the-art components to ensure the well-being of their customers and the general public. Let's take this opportunity to review the essentials that will guarantee a good cable selection.

The main purpose of a fire alarm cable — be it part of a central-station or a non-central-station system — is to interconnect the fire alarm control panel to the alarm zones. One set of cables receives the signals from the flame/smoke detection device, while another set activates the alarm system (annunciates an alarm condition). Sprinklers, however, are not connected to the system — they are heat-sensitive and respond to the increase in temperature that accompanies a fire. Obviously, an alarm system is only as reliable as the cable with which it is wired, so selecting the right cable for the job is vital.

Begin the cable selection process by addressing the essentials. First, identify which cable rating is appropriate for the installation. Is plenum-rated cable required? Riser-rated? Or can you use a general purpose cable for the job? It is important to understand the restrictions and applications for each rating in relation to your project. A red jacket indicates that a cable is part of a fire alarm system. While it is not required by UL, a majority of jurisdictions — 75% or more — call for a red jacket in all fire alarm installations and further mandate that no other cable system may use a red-jacketed cable.

Correct gauge size must also be considered for the application. Cable gauge affects voltage drop, which determines the maximum length of the cable run, so larger conductors (lower AWG number) have a lower voltage drop and can typically be used for longer runs. Finally, have the installation reviewed and approved under engineering supervision or by a trained electrical professional prior to beginning the project.

There are several systems of codes and standards that can help identify the correct cable for your individual fire alarm system. The National Electric Code (NEC) catalogs the requirements for safe electrical installations and represents the primary document for guidance in the United States. The type of fire alarm cable selected and its specific application will dictate which section of the NEC you should follow. With that being said, it is extremely important for installers to make certain the wires selected for their specific application meet all local and national building codes required for their jurisdiction.

Understanding the two primary classifications of fire alarm system cables — non-power-limited and power-limited — will also impact your ability to select the appropriate wire for the project. Non-power-limited cables are permitted for use at voltages of 150 volts or less. These cables are used when power must be supplied through a circuit not connected to your normal power grid (an individual branch circuit). This may come off a battery back-up system or generator (NEC section 760.41). The intent is to supply a fire alarm system that is not subject to interruption, which is important in the instance of a power outage. For further information about non-power-limited cables and their use, check NEC Article 760 section II.

Power-limited cables carry a voltage rating of no less than 300 volts. As with non-power-limited installations, power-limited systems are also used when an individual branch circuit is required. For further information about power-limited cables and their use, see NEC Article 760 section III.

As mentioned earlier, it is crucial to understand the restrictions and applications for each cable flame rating — plenum vs. riser vs. general purpose — in relation to your project. Plenum-rated cables can be used in air return spaces, as well as in floor-to-floor applications (in the riser tray) and within walls (general purpose). Plenum cables have a higher flame rating than do riser and general purpose cables. Additionally, plenum cables have a limited smoke output, whereas riser and general purpose cables do not. Plenum cables come in two types, NFPLP — plenum rating for non-power-limited fire alarm cable, and FPLP — plenum rating for power-limited fire alarm cable.

Riser-rated cables can be used floor-to-floor (in the riser tray) and within walls on the same floor. Riser cables cannot be used in an air return space (plenum). Riser cables are also available in two types, NFPLR — riser rating for non-power-limited fire alarm cable, and FPLR — riser rating for power-limited fire alarm cable. General purpose-rated cables can only run within walls on the same floor. These cables cannot be run from floor-to-floor or in the air return space and thus have a more limited application. Again, general purpose cables come in two types, NFPL — general purpose rating for non-power-limited fire alarm cable, and FPL — general purpose rating for power-limited fire alarm cable.

In certain limited applications, as outlined in NEC Article 760, Circuit Integrity (CI) rated cables may be used in fire alarm system installations. CI cables retain vital electrical performance for an extended period of time (up to two hours).

Additional fire alarm cable options are available that offer installers specialized environmental advantages. For example, while unshielded cables are the most commonly used cable construction for alarm system projects, shielded cables are used when extra RFI (radio frequency interference) or EMI (electromagnetic interference) protection is required. These shielded cables typically provide superior noise isolation. PVDF (a type of fluoropolymer) jacketed cables offer superior chemical, abrasion and water resistance than standard plenum-grade PVC jackets.

Because fire alarm systems are an ever-evolving technology, so too must be your knowledge of them. Understanding cable types, constructions and ratings is essential to safe, reliable alarm system installations. When making your project selections, keep three core concepts in mind — first determine which cable type is required for your application, then identify the appropriate flame rating for the codes and standards of your jurisdiction, and finally, consider the unique conditions of the job and decide if any specialized cable options are necessary to provide superior performance or protection from the environment. By doing so, you'll ensure the safety of your customers and the people they serve.

Still need help? Carol's Wire Wizards are ready with first-class customer support, printed catalog materials and detailed product specifications. Please give us a call at 1.888.295.5896, send us an e-mail at info@generalcable.com or visit www.generalcable.com.