

## **Low-Power Radio (Wireless) Fire Alarm Systems**

by Dean K. Wilson, P.E.

**I work as a design engineer in the electrical department of an architectural firm devoted to serving the college and university market. Recently, we received a *Request for Proposal* for the renovation of a classroom building originally built in 1870 that the university wants to convert to a graduate student housing facility, while retaining some of the historical features of the building. One of my colleagues working on the computer infrastructure for this facility has just chosen to use a wireless networking scheme to avoid some of the difficulty we expect to have in running wiring throughout the facility. Another colleague has suggested that we consider using a low-power wireless fire alarm system to avoid having to install fire alarm wiring in this difficult renovation project. Can we do this and still meet the requirements of the various codes and standards?**

NFPA 72-2002, *National Fire Alarm Code*, does make provision for a low-power radio (wireless) fire alarm system. You will find the specific requirements in Chapter 6, Section 6.16.

Probably the most important requirement of all of those stated in this Section resides in section 6.16.1. This Section states: “compliance with Section 6.16 shall require the use of low-power radio equipment specifically listed for this purpose.” In other words, the low-power radio equipment must have received a listing—from either Underwriters Laboratories Inc. or FM Approvals—specifically for fire alarm system use. This requirement coincides with the requirement

found in Section 4.3.1: “Equipment constructed and installed in conformity with this Code shall be listed for the purpose for which it is used. Fire alarm system components shall be installed in accordance with the manufacturers’ installation instructions.” Fire alarm system components of all types must have received a very “use specific” listing from either UL or FM.

This requirement narrows the field of suppliers considerably. Over the years a number of manufacturers have proposed to introduce low-power wireless fire alarm systems, but only a very select few have ever successfully received listing for their products. The particular test standards employed by the testing laboratories put the equipment through a very appropriately severe set of test criteria.

Therefore, first and foremost, in selecting a low-power wireless fire alarm system, you will want to choose one that has received specific listing as a commercial or industrial fire alarm system.

Most of the rest of the requirements in Section 6.16 provide detailed criteria for various key features of a low-power wireless fire alarm system.

Section 6.16.2 deals with power supplies and contains requirements for those low-power wireless fire alarm systems that use primary batteries, such as a 9 volt battery. The Section considers length of service, depletion signals, catastrophic failure, and impact on other transmitters of a power failure on one transmitter.

Section 6.16.3 covers alarm signals. This section deals with requirements for repetition of alarm signals, priority of alarm signals over other signals, maximum allowable signal delay, and alarm signal latching at the fire alarm system receivers.

Section 6.16.4 provides requirements for all aspects of monitoring for integrity. These requirements assure that key aspects of the low-power wireless system architecture has provision to oversee the integrity of the transmission pathway, whether that pathway consists of the wireless portion of the system, or some portion of the system that uses wiring. This Section, by its very nature, must reference certain requirements of the Federal Communications Commission, since the FCC has jurisdiction over federal law that regulates radio transmission in the United States. This Section covers requirements for initiation and repetition of trouble signals resulting from loss of integrity of the transmission pathway, removal of a transmitter from its intended location, or receipt of unwanted and interfering radio frequency signals that might block the operation of the low-power wireless fire alarm system.

The final Section of this portion of NFPA 72-2002, *National Fire Alarm Code*, covers the requirements for output signals from the low-power radio (wireless) receiver/control unit. Section 6.16.5 includes requirements that ensure the integrity of the actuation of various appliances by the low-power wireless receiver/control unit.

When a fire alarm system designer encounters a venue where installing a conventional fire alarm system might prove difficult because the installation of necessary wiring offers too great a challenge, a low-power radio (wireless) fire alarm system offers an ideal alternative. But, use of

these low-power wireless systems need not remain limited to locations where the installation of a conventional system seems particularly challenging. Low-power radio (wireless) fire alarm systems that have received listing by UL or FM as a commercial or industrial fire alarm system offer the full range of features of a conventional system and can provide a very cost-effective method of providing a fire alarm system for virtually any location needing such a system.

Contrary to the claims of some individuals who may not have become fully familiar with this technology, these low-power radio fire alarm systems are not “toys.” Nor are they a “fancy version of a garage door opener.” Rather, these listed low-power wireless fire alarm systems offer a very sophisticated technology that can easily provide a code-complying fire alarm system that should serve the system users very well.

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