Solving the System
Integrated Fire Alarm Monitoring

When the University of Maryland needed a high-performance, campus-wide, code-compliant, integrated fire alarm monitoring system, they took the time to research the options and plan for the best solution.

Whether your fire alarm system is giving a supervisory signal for a fire pump problem, a trouble signal for a dirty smoke detector, or an alarm signal for an activated manual station or sprinkler head, you need to be able to respond promptly with the right equipment and personnel. Although codes do not require the monitoring of every campus fire alarm system, many campuses as a matter of practice do, and use various methods to accomplish this. Several years ago, we began the process to install a code-compliant, proprietary fire alarm monitoring system on our campus of nearly 200 fire alarm systems. The system is nearing completion, but there are several lessons that we learned that are worth sharing with the readers of this magazine.

How a Monitoring System Works (Simplified)

Fire alarm monitoring systems all have four basic components.

First, there is a fire alarm communicator, usually called a DACT (digital alarm communications transmitter), connected to your fire alarm control panel. These typically have four to eight dry contact inputs. On older panels, there will be dry contact outputs for "alarm," "trouble," and "supervisory" signals. Some panels may have more. Newer DACTs may also have the ability to send serial information from the printer port commonly found on addressable fire alarm systems. All communicators will also have some means to transmit the information received from the fire alarm panel. This could be a telephone dialer, an Ethernet card, or a radio transmitter.

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The second component is the means of transmitting information. For many years, this has been done by telephone autodialers. More recently, with the advent of the World Wide Web, via data lines. Transmission can also take place via radio frequency transmitters that use mesh technology to relay information through a spider web of communication links to the receiver site. RF communications have the advantage of no monthly line fees that you would incur if you use data or telephone communication lines, which over the lifetime of the system can be significant.

The third element is the fire alarm receiver, a digital alarm communications receiver (DACR). Like the transmitter, the receiver can receive information in several different forms, and some can receive information in multiple formats at the same time. We will be able to receive telephone communications from our residence halls as well as dry contact and serial information via RF transmitters on the same fire alarm systems.

The final element of the monitoring system is the software and hardware that manages the system. This software sets up accounts for different buildings and sets up the routing of the signals. In our case, alarm signals will be sent to our Public Safety Department. Non-alarm signals will go to Facilities Management.

Code Requirements for Monitoring

NFPA 72 (2010), the National Fire Alarm Code, Chapters 23 and 26, has the code requirements for fire alarm monitoring systems. ANSI/UL 864 (the most recent edition was released in December of 2008), the Standard for Control Units and Accessories for Fire Alarm Systems, establishes the testing standard for DACTs, DACRs, and other accessories for the monitoring system.

One of the most stringent parts of these standards is the self-testing of the systems components to assure communications reliability.

Our History and Problems of Growth

Since the late 1970s, this large campus has been monitoring many (not all) fire alarm systems through our environmental management (HVAC) system. While this allowed us to receive information about our fire alarm systems at our work management center, there were several shortcomings in the system.

This environmental management system was not installed in all buildings with fire alarm systems. At its peak, we were monitoring only 60 percent of nearly 200 fire alarm systems. Although this included more than 80 percent of the 13,000,000 sq. ft. of building space on the campus, we still had to rely on individuals from many buildings to make a telephone call whenever the fire alarm system sounded.

The hardware and software of the environmental management system was not designed to monitor fire alarm systems, particularly the myriad of manufacturers and models that we have. So we were limited to monitoring dry contact outputs from alarm, trouble, and supervisory circuits. In a few buildings, we were able to receive reports from sprinkler valve tamper switches and water flow switches. It didn't matter if the building had one or 100 manual stations; we only knew that the system was in "alarm" when a manual station was pulled. This limited the amount of information required of us to have the fire department dispatched for any alarm signal and to send maintenance technicians to investigate trouble and supervisory signals, all with very limited information. Once they arrived at the building, they had to go to the main control panel or to a remote annunciator to determine what they needed to do next.

This system printed messages on a dot-matrix printer in our work control center. There was no audible alarm or other method to distinguish between an alarm signal being received from a fire alarm or a "too hot/too cold" message from an HVAC system. Unless the work control operators monitored the printer frequently, it was very possible to miss fire alarm messages, particularly during busy periods.

Environmental management systems are not required to meet the same standards that a code-compliant fire alarm monitoring system must have. One of the major shortcomings of our environmental monitoring system is the lack of supervision of the communications path. When components would fail or be taken out of service for maintenance, this left gaps in the communications, and signals from the fire alarm systems were not sent to the work control center where our systems were monitored.

When the Facilities Management unit that manages this system began several years ago to implement an equipment upgrade, our residence hall maintenance department, citing the cost of this new equipment, decided to install digital alarm communication transmitters (DACTs), connecting our 68 residential buildings to our department of Public Safety by telephone lines. This added another dimension in our monitoring of fire alarm systems.

As the sophistication of these systems has improved from the low-voltage conventional fire alarm systems of the '70s and '80s to the microprocessor-based addressable systems that have become the industry standard, the amount of self diagnosing and information available allows technicians and firefighters to pinpoint the location of alarms and problems. We believed that if we could have this specific information transmitted to our monitoring site, we could provide better information to firefighters responding to alarms and to our technicians who handle other non-alarm signals, saving valuable time — a critical issue for first responders.

The Process

Key personnel from both Environmental Safety and Facilities Management had

been looking at this issue when Residential Facilities decided to install the DACTs, and had gathered a significant amount of information at that time. Funding did not exist to convert all campus fire alarm systems to a new monitoring system. Three other major stakeholders were pulled together to form a committee to come up with a solution: Residential Facilities (they manage the buildings with the highest risk of injury and death if a fire occurs), the office of Information Technology (they manage our campus-wide voice and data network), and the Department of Public Safety (they operate our 911 and Security Operations Center, the location where alarm signals from the new system would be routed).

Each stakeholder had specific ideas of what they wanted the system to do. The University Fire Marshal wanted a code-compliant system that would send alarm signals to Public Safety. Public Safety wanted to receive alarm signals only — no trouble or supervisory signals — and they preferred to use telephone communicators to their existing receiver. Information Technology preferred that telephone or data lines be used since they receive monthly fees for these. Facilities Management wanted a system that could work with multiple makes and models of fire alarm systems; was able to receive dry contact information from older systems and serial (digital) information from addressable systems, as well as receive information from the telephone dialers in use in the residence halls; able to distribute information to multiple locations (Public Safety, Work Control, and our maintenance shop); simple to operate and maintain by one department; and above all… reliable.

An internal study of fire alarm monitoring systems was conducted to identify manufacturers that could meet all of the requirements and to estimate the costs of both installation and long-term operation costs. This revealed that the lowest installation costs were associated with systems that use copper or fiber telephone and Ethernet lines for information transmission, but the long-term costs were lower using radio transmitters — no jack installation charges and a monthly savings of several thousand dollars, but avoiding the line charges required by the other systems. This study was repeated by an outside engineering firm, which confirmed the internal study and provided more accurate cost estimates.

The funding request was made in a manner that would split the cost of the system on a pro-rated basis among the state-supported and self-supporting facilities. After establishing the project budget, a request for proposals was posted on our electronic procurement system. Surprisingly, of the several potential systems that we had identified in our studies, only two vendors responded to the RFP, and only one of these met the stringent requirements of UL 864.

Lessons Learned

This process took time — a lot of it — to bring together all of the stakeholders and to procure a system that will work best for this University. But, considering that this is a major investment that will need to operate reliably for many years, it shouldn't be rushed.

A fire alarm monitoring system needs to be looked at as a system, with the least number of organizations involved in its operation and maintenance as possible and, more importantly, a system of hardware and software components that have been designed and tested to work together.

Your request for proposals needs to be very well written. There are many components in a fire alarm monitoring system that can and are being used to monitor security systems. However, the UL standard for these components is not as stringent as UL 864.

You must review every proposal very carefully. It is possible to put together a monitoring system using pieces of hardware and software from various third parties.

While these may work in the beginning, you may run into problems in the future when you try to get service. It's also possible to receive equipment sheets in the proposal that clearly state "UL Listed" without specifying what standard they are listed to. If it's not UL 864 listed, you don't want it.

The components of the monitoring system, from the fire alarm control panel through the transmitters and communications to the receivers and the management software, should be under the control of one organization. In our case, this will be the Facilities Management unit that maintains all 200 of our fire alarm systems. The only components that will be outside their direct control will be the monitoring equipment within the Public Safety dispatch center. This will be hard-wired to the system and will be supervised for problems.

The system needs to be expandable. Although our system is not yet fully installed, our environmental monitoring unit has asked if this system can be used to monitor critical components in buildings where their system doesn't reach, and our electrical shop would like to monitor some emergency generators. We will be looking into this in the near future.

Conclusion

Monitoring of your fire alarm systems is important to reducing the response time to actual alarms as well as important maintenance needs. Your monitoring system will impact the operations of many departments on your campus, and each of the stakeholders needs to have a voice in the system and buy-in into the final decision. In order to get the best system to meet your needs and budget, it takes time and effort on your part… but in the end, it will be worth the effort. CPM

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