

Building to Building

by Dean K. Wilson, P.E.

Question: My fire alarm installation company has just received drawings from an architect regarding a new set of industrial buildings scheduled for construction in one of the local industrial parks. The specifications call for a single fire alarm system covering all four buildings in the complex. Each building houses just under 100,000 square feet. How do we interface each building with a single fire alarm system and maintain compliance with NFPA 72-2007, *National Fire Alarm Code*?

Answer: While installing a single fire alarm system for a multiple building facility offers certain challenges, with careful planning and execution, you will not have a problem complying with the *Code*. Here's what I would suggest you do:

First of all, make a detailed list of each fire alarm initiating device for each of the four buildings. Include all manual fire alarm boxes, heat detectors, smoke detectors, radiant energy-sensing fire detectors (flame detectors), automatic sprinkler system waterflow alarm initiating devices, fire suppression system alarm initiating devices, and any other fire alarm initiating devices.

Then, make a detailed list of each supervisory initiating device for each of the four buildings. Include every automatic sprinkler system valve tamper switch, dry pipe valve high/low air pressure supervisory switch, low building temperature supervisory switch, low city water pressure supervisory switch, fire pump running supervisory connection, fire pump trouble supervisory connections—depending on whether the complex has a fire pump and on the type of

driver: electric motor or diesel engine—water tank level supervisory switch, water tank temperature supervisory switch, and so forth. Naturally, if the locale of the facility does not present freezing temperatures, you do not need to provide low temperature supervisory switches.

Next, make a detailed list of each fire alarm notification appliance for each the four buildings. Include all audible and visible notification appliances. Coordinate with the Authorities Having Jurisdiction, especially the responding public fire department, on where they want the exterior annunciator located. You may discover that they want a single annunciator—to cover all four buildings—located at the building closest to the main entrance to the facility. This will assure that you comply with the requirements of NFPA 72-2007, *National Fire Alarm Code*, section 4.4.6.3, as follows:

4.4.6.3* All required annunciation means shall be readily accessible to responding personnel and shall be located as required by the authority having jurisdiction to facilitate an efficient response to the fire situation.

A.4.4.6.3 The primary purpose of fire alarm system annunciation is to enable responding personnel to identify the location of a fire quickly and accurately and to indicate the status of emergency equipment or fire safety functions that might affect the safety of occupants in a fire situation.

Then, make a detailed list of each building fire safety function with which you must interface the fire alarm system for each of the four buildings. Include all elevator recall; elevator shutdown; heating, ventilating, and air conditioning (HVAC) system control or shutdown; door release; door unlocking; fire or smoke damper operations; or exit marking systems actuation.

Next, based on the detailed input and output information you have developed in the first four steps above, plan to install a fire alarm control unit in each of the four buildings. Designate one of these four fire alarm control units—typically the one located in the principal or main building

and the building closest to the point of entry to the facility—as the “master” fire alarm control unit. You will interface the other three building fire alarm control units with that “master” fire alarm control unit. In so doing, refer to NFPA 72-2007, *National Fire Alarm Code*, section 6.8.2, as follows:

6.8.2* Fire Alarm Control Units.

A.6.8.2 This Code addresses field installations that interconnect two or more listed control units, possibly from different manufacturers, that together fulfill the requirements of this Code.

Such an arrangement should preserve the reliability, adequacy, and integrity of all alarm, supervisory, and trouble signals and interconnecting circuits intended to be in accordance with the provisions of this Code.

Where interconnected control units are in separate buildings, consideration should be given to protecting the interconnecting wiring from electrical and radio frequency interference.

6.8.2.1 Fire alarm systems shall be permitted to be either integrated systems combining all detection, notification, and auxiliary functions in a single system or a combination of component subsystems. Fire alarm system components shall be permitted to share control equipment or shall be able to operate as stand-alone subsystems, but, in any case, they shall be arranged to function as a single system. Exception: Where the building is not served by a building fire alarm system, independent dedicated function fire alarm systems and/or releasing fire alarm systems shall not be required to be interconnected to function as a single system.

6.8.2.2 All component subsystems shall be capable of simultaneous, full-load operation without degradation of the required overall system performance.

6.8.2.3 The method of interconnection of fire alarm control units shall meet the monitoring requirements of 4.4.7 and NFPA 70, *National Electrical Code*, Article 760, and shall be achieved by the following recognized means:

- (1) Electrical contacts listed for the connected load
- (2) Data communications over signaling line circuit(s) dedicated to the fire alarm or shared with other premises operating systems
- (3) Other listed methods

6.8.2.4 Where the signaling line circuit is shared by other premises operating systems, operation shall be in accordance with 6.8.4.

6.8.2.4.1 All signal control and transport equipment (such as routers, servers) located in a critical fire alarm or fire safety function signaling path shall be listed for fire alarm service unless the following conditions are met:

- (1) The equipment meets the performance requirements of 4.4.4.1.

- (2) The equipment is provided with primary and secondary power and monitored for integrity as required in Section 4.4.
- (3) All programming and configuration ensure a fire alarm system actuation time as required in 6.8.1.1.
- (4) System bandwidth is monitored to confirm that all communications between equipment that is critical to the operation of the fire alarm system or fire safety functions take place within 10 seconds; failure shall be indicated within 200 seconds.
- (5) Failure of any equipment that is critical to the operation of the fire alarm system or fire safety functions is indicated at the master fire alarm control unit within 200 seconds.

6.8.2.4.2 A listed barrier gateway, integral with or attached to each control unit or group of control units, as appropriate, shall be provided to prevent the other systems from interfering with or controlling the fire alarm system.

6.8.2.5 Each interconnected fire alarm control unit shall be separately monitored for alarm, supervisory, and trouble conditions.

6.8.2.6 Interconnected fire alarm control unit alarm signals shall be permitted to be monitored by zone or by combined common signals.

6.8.2.7 Protected premises fire alarm control units shall be capable of being reset or silenced only from the fire alarm control unit at the protected premises unless otherwise permitted by 6.8.2.8.

6.8.2.8 Remote resetting and silencing of a fire alarm control unit from other than the protected premises shall be permitted with the approval of the authority having jurisdiction.

As you plan your connection to a remote fire alarm system monitoring location—central station or remote station—make certain that the transmission system allows the identification of the specific building that has initiated the signal. This will greatly assist the emergency responders, in the case of a fire alarm signal, and greatly assist the responding maintenance personnel, in the case of a supervisory or trouble signal.

Your next task: choosing the method of interconnection between buildings. To do this, you must pay particular attention to NFPA 72-2007, sections 4.4.4.3 and 4.4.4.4, as follows:

4.4.4.3 Transient Protection. To reduce the possibility of damage by induced transients, circuits and equipment shall be properly protected in accordance with the requirements of NFPA 70, *National Electrical Code*, Article 800.

4.4.4.4* Wiring. The installation of all wiring, cable, and equipment shall be in accordance with NFPA 70, *National Electrical Code*, and specifically with Articles 760, 770, and 800, where applicable. Optical fiber cables shall be protected against mechanical injury in accordance with Article 760.

A.4.4.4.4 The installation of all fire alarm system wiring should take into account the fire alarm system manufacturer's published installation instructions and the limitations of the applicable product listings or approvals.

So, as you can see in the requirements stated above, you must also refer to NFPA 70-2008, *National Electrical Code*, in order to determine the proper means of interconnecting the four buildings. In Article 760, you will find the following requirements:

760.32 Fire Alarm Circuits Extending Beyond One Building.

Power-limited fire alarm circuits that extend beyond one building and run outdoors either shall meet the installation requirements of Parts II, III, and IV of Article 800 or shall meet the installation requirements of Part I of Article 300. Non-power-limited fire alarm circuits that extend beyond one building and run outdoors shall meet the installation requirements of Part I of Article 300 and the applicable sections of Part I of Article 225.

Notice that you have several options. You may comply with Article 800, Parts II, III, and IV. Or, you may comply with the installation requirements of Article 300, Part I. Or, if your circuits must follow the requirements for non-power-limited fire alarm circuits, you must meet the requirements of Article 300, Part I, and the applicable requirements of Article 225, Part I. Obviously, you will need to study these requirements in some detail in order to choose the most appropriate method to connect each building to the building that houses the “master” fire alarm control unit.

If you follow these guidelines, and if you submit detailed plans to the Authorities Having Jurisdiction for their approvals, in advance of your beginning the installation, you will provide the owner of these large industrial buildings with a code-complying fire alarm system that will meet the owner's fire protection goals and objectives.

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