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LifeAlarm® Lines

NEWS AND UPDATES IN LIFE SAFETY

Elevator and Fire Alarm System Interaction – Part III

Bruce Fraser

In previous articles, we discussed the historical background regarding elevator recall and main line elevator power shutdown (shunt trip). This issue will take a look at some of the issues related to sprinklers and power removal requirements.

Differing Views

The requirements to recall elevators have not run into too much controversy, however, the same cannot be said of the power disconnect or "shunt trip" requirements. There has, indeed, been much controversy revolving around this issue.

Means of disconnecting elevator main line power can be accomplished several different ways, but, by far the most commonly used method today is the shunt trip, which is the term we'll use hereafter.

From 1999 to 2001 time frame, an Ad Hoc Committee on Sprinklers in Elevator Machine Rooms was formed with the charter to perform a risk/hazard analysis addressing the concerns relating to sprinklers, the shunt trip requirement, and the associated hazards.

To understand the issue, one must understand that the intent of the shunt trip requirement is to take the elevators out of service because of the danger that water from sprinklers poses to safe elevator operation. In particular, water on elevator electrical components can cause shorting or "bridging" between circuits leading to uncontrolled and dangerous elevator operation and water on braking systems of traction elevators can cause uncontrolled stopping. In order to minimize the danger caused by water on elevator components, the requirement to remove elevator mainline power became code. It is important to note that it is the mainline power to the elevator drive mechanism that is removed and not the power for lights and communications within the car.

Scenario for the intended shunt trip operation:

- A fire starts in the elevator machine room
- A smoke detector in the elevator machine room actuates, initiating elevator recall
- Elevators immediately return to the recall floor and the car doors open … passengers exit on the safe floor
- Heat buildup eventually causes a heat detector to actuate which then initiates the shunt trip
- The shunt trip operates, removing mainline power from the elevator
- The sprinkler closest to the fire operates

There is not an issue as long as everything follows that timing sequence; however, in the instance of a rapidly developing fire that actuates the smoke detector (which initiates recall) and quickly following actuates the heat detector to cause shunt trip, the potential exists to trap passengers in the hoistway if the elevator has not yet reached the recall floor.

The Ad Hoc Committee was made up of individuals with varying complementary backgrounds from fire protection engineering, the active fire service, and other experienced elevator and fire protection industry experts including representatives from NFPA (National Fire Protection Association) and NEII (National Elevator Industry, Inc.).

The risk assessment findings resulted in, among other things, two significant recommendations:

1.) Recommendation to exempt elevator machine room and hoistways from the current sprinkler requirement. Additionally this recommendation would also effectively eliminate the necessity for a shunt trip and the associated initiating devices.

2.) Where sprinklers are installed in elevator machine rooms or hoistways, the recommendation is to require a means of delaying both the shunt trip and the release of water from sprinklers until the elevators complete recall. The purpose of the delay would be to prevent passenger entrapment by allowing the cars to complete recall prior to the release of water from sprinklers and prior to shunt trip.

The determination of the task group was that the risk of allowing fire growth in order to provide time to allow completion of recall was less than the risk of activating sprinklers resulting in passenger entrapment.

Opposing views on this issue remain, so stay tuned to see the outcome of these recommendations in the future code making process.

Elevator Pit Sprinklers

The elevator pit is considered part of the hoistway. Effectively, for passenger elevators installed in accordance with A17.1, there is no reason to have shunt trip initiated from any device in the hoistway. Because sprinklers are not required at the top of elevator hoistways of passenger elevators that are installed in accordance with A17.1 Elevator and Escalator Safety Code (meeting the required fire resistance ratings), and sprinklers installed in the pit are installed at no more than 24 inches from the bottom of the pit as required by NFPA 13, Standard for the Installation of Sprinkler Systems. Everything seemed to be coordinated and working well until the A17.1S-2005 Edition was issued. Effectively, the requirements changed from exempting the shunt trip requirement for sprinklers installed in the pit at 24 inches or less to requirements which are subjective and, unless the responsible design engineer makes a determination to the contrary, shunt trip will be required. In this latest edition of A17.1, Section 2.8.3.3.2 states that "where elevator equipment is located or its enclosure is configured such that application of water from a

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sprinkler could cause unsafe elevator operation, means shall be provided to automatically disconnect the main line power supply to the affected elevator upon or prior to the application of water."

Design engineers, contractors, and authorities having jurisdiction (AHJs) would be well advised to work this issue out prior to the start of the bidding process. Proposals have been submitted to A17.1 to return to the previous wording, but until there is a change, it is anticipated this issue will stir more controversy in an already controversial area.

NFPA 72, 2007 Changes Part 1

Gary Girouard

It has been five years since the last revised edition of NPFA 72 Fire Alarm Code. Due to the elimination of the annual fall meeting, the previous three year change cycle was extended to five years in order to balance the needs of the revision process across all the major NFPA codes. With over 1300 proposals submitted, there are numerous changes implemented in the new National Fire Alarm Code. There are important changes affecting all sections of the CODE, but this article will highlight some of the major items affecting the standard for how systems are installed, tested and maintained. This is the first installment in a multi-part series on the latest edition of NPFA 72.

NFPA 72 Fire Alarm Code has become more than the standard for just fire alarm systems. New language has been added to include emergency warning systems for other life safety purposes, including Mass Notification Systems (MNS) and Carbon Monoxide (CO) Detection equipment. This is reflected in the use of the words "emergency warning equipment" added to the system types described in the scope of Chapter 1. In addition, Mass Notification Systems and Wide Area Signaling were both added to the definitions in Chapter 3 to define their inclusion as part of a combination emergency signaling system. The remainder of this overview will focus on the key items in Chapter 6 Protected Premises Fire alarm Systems and Chapter 7 Notification Appliances.

Protected Premises Fire Alarm Systems

Where system operation for protected premises fire alarm systems previously required fire to be the highest priority in a combination system, the language now permits MNS signals to take precedence over fire alarm signals. This is a significant change over previous Code requirements that had always placed fire alarm events as the highest priority above other non-fire emergencies in a combination system. In addition, where live voice instructions are used, they are required to override all previously generated signals and take precedence over any automatically initiated signals or remotely generated mass notification messages.

Designers will need to clearly identify the system operation of these more complex systems to meet the needs of the owner. As noted in the related annex section, "designers should detail the operation of the system to include how the system should respond after the mass notification message has completed." Where there is the potential for multiple or simultaneous emergency events in a combination system, it may be required to toggle between MNS and fire alarm events. In these more complex systems, the operation needs to be carefully evaluated, planned and documented.

Survivability requirements in Chapter 6 have added language to expand acceptable methods of survivable designs. Acceptable methods previously required 2-hour rated Circuit Integrity (CI) cable, a 2-hour fire rated cable system, and a 2-hour rated enclosure or other performance alternatives acceptable to the AHJ. The Code now includes that a building fully protected by an automatic sprinkler system complying with NFPA 13 could be another acceptable method for a survivable design. There are two areas which dictate these requirements Emergency/Alarm communication systems and two-way telephone communication service. Where emergency/alarm communication systems are typically associated with hi-rise building applications, any system that provides partial evacuation or relocation of occupants requires a survivable design for its notification appliance circuits. Notification circuits that pass through one signaling zone to another must be protected from fire long enough to assure evacuation of occupants in the affected areas. That includes any supporting circuits for remote fire alarm control units, network communications, audio riser circuits and control circuits which turn notification appliance circuits on and off! Survivability requirements are also extended to equipment that is remotely located such as command centers. The requirements for survivable firefighter telephone circuits are new and require the same protection methods as written for notification appliance circuits mentioned earlier.

The performance tables that defined classes and styles of notification, initiation and signaling line circuits in Chapter 6 were simplified. Initiating Device Circuits and Notification Appliance Circuits are now defined as either Class A or Class B. The references to the many variations in circuit Styles have been reduced to better represent the types and styles of circuits commonly used today. Where Signaling Line Circuits (SLC) still maintains the use of Classes and Styles of circuits, the change allows the designer to choose between two Class A circuits Styles 6 or 7. The major difference between the operation of a Class A style 6, and Class A style 7 SLC is having alarm receipt capability during a wire-to-wire short under abnormal conditions.

Notification Appliances for Fire Alarm Systems

Chapter 7 - The maximum sound pressure level for notification appliances was lowered from 120dBA to 110dBA to be more in line with other laws, codes and standards. This change aligns with the current Americans with Disabilities Accessibility Guidelines (ADAAG) while addressing the protection of occupant hearing as defined by OSHA standards.

Where notification appliances are used for signaling on combination systems with more than one type of emergency, the word FIRE or related symbols must be omitted from the appliance. The change implemented in Chapter 7 was intended to make these appliances more generic when used in combination systems. Where there could be more than one type of emergencies activating the same notification appliance, it is important that these appliances not give an incorrect message to occupants.

Another important new addition to Chapter 7 for notification appliances is requirements for application of directional sounder notification appliances. This new technology provides an added element of safety to audibly direct occupants to exits when visibility is impaired by smoke during a fire. The application of these appliances requires designers to follow specific application criteria such as location and audibility requirements to assure these devices can be heard over both ambient noise and fire alarm signals.

Synchronization of visual alarm signals has received much attention since the Americans with Disabilities Act (ADA) was enacted into law in 1990. Starting with the 1996 edition, NFPA 72 has required synchronization of visual appliances in rooms where more than 2 appliances are used. Where there has been much debate over where synchronized strobes are required, further clarification of these requirements in the CODE included synchronization of

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strobes in corridors where there are more than two strobe notification appliances. The latest 2007 CODE clarifies another common interpretation issue of how strobes are viewed by building occupants. Strobe appliances being viewed from multiple areas other than rooms, including those viewed from outside the building through large windows were being interpreted as requiring synchronization. Chapter 7 for visual appliances now states that synchronization requirements "do not apply where the visible notification appliances inside the building are viewed from outside of the building." In addition, multiple strobes that are synchronized in a room are not required to be synchronized to strobes outside of the room. Where the possibility exists that doors may be open during normal occupancy or during an emergency evacuation, the combined effect of two independently synchronized groups of strobes still falls within the acceptable flash rates set by ADAAG and UL1971, the Standard for Safety Signaling Devices for the Hearing Impaired.

Although the prescriptive coverage requirements of strobes has not changed, more research was done on the effectiveness of visual notification in large spaces such as warehouses, distribution centers and superstores and was summarized in the annex section A.7.5.3. Although not a firm answer to the challenges of visual signaling in areas with rack storage, shelving and high ceilings, the question on the effectiveness of strobe signaling was analyzed. This section describes the results of testing and what variables were experienced with direct and indirect viewing against high ambient light levels and other factors. Where this topic needs more conclusive data to require strobe coverage specific to these applications, the information provides a good foundation for determining what considerations a designer may use to support an application.

In the next issue of Life Alarm Lines newsletter, we'll highlight more of the changes to the National Fire Alarm CODE, 2007 edition!

For more in-depth information on all the changes to this CODE, NFPA offers one day seminars that provide comprehensive details. Go to: www.nfpa.org for more information.

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Quell™, Nothing Ordinary About This Fire Protection System

Frank Monikowski

Performance Based Design

Even though performance based design has been a buzz term for years, there has been very little deviation from the standards in regards to fire sprinkler installations. While the current NFPA standards to which fire sprinkler systems are designed have proven to be successful, some systems can be tailored to a specific application when testing and/or modeling can confirm their effectiveness. The definition of performance based design for fire protection is essentially "the use of engineering tools to develop solutions that take into account the unique aspects of a facility or operation in the development of an overall fire protection strategy within the context of a specific performance objective." The key is that the performance based design must provide a level of safety and dependability that meets or exceeds the results that can be expected from designing a system to current standards. The other key is to have enough documentation that the insurers and authorities having jurisdiction will accept this deviation, and the owner of a facility recognizes an obvious benefit.

NFPA 13 2002 edition, Installation of Sprinkler Systems, has two sections that addresses the use of performance based design.

1. Section 1.5 – Equivalency, nothing in the standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard. Technical documents shall be submitted to the authority having jurisdiction to demonstrate equivalency. The system method or device shall be approved for the intended purpose by the AHJ.

2. Section 1.6 – New Technology nothing in this standard shall be intended to restrict new technologies or alternate arrangements provided the level of safety prescribed by the standard is not lowered.

The Creation of the Quell™ Method of Sprinkler System Design

Listening to the "Voice of the Customer," important for any business, played an important role in the development of this technology. For years there has been a need to protect cold storage facilities, especially freezers, allowing for greater heights of storage and eliminating the requirements for sprinklers located within the storage racks. Sprinklers and piping in storage racks are always subject to damage by fork lift trucks. This is especially devastating for cold storage facilities where water, when introduced into the fire protection piping, freezes almost instantly. The cost associated with removal of sections of frozen piping is very high and leaves the freezer unprotected for a considerable amount of time.

Tyco Fire & Building Products (TFBP) has conducted a series of fire tests for class two and class three commodities (typical commodities stored in freezers) at Underwriters Laboratories, to various storage heights in racks.These tests verified the TFBP solution that cold storage companies were seeking.

Quell Technology

The Quell™ method of sprinkler system design (Quell™ Design Method) utilizes innovative products and software made available by TFBP, e.g., the SprinkFDT™ (Fluid Delivery Time) software, which calculates the time it takes for water to be discharged to open sprinklers, and the QRS electronic dry pipe valve accelerator.The SprinkFDT program is listed by Underwriters Laboratories and approved by Factory Mutual on a specific installation basis, and has been used for predicting dry pipe system water delivery time since 2003. It has also become an alternate method to help determine the allowable capacity of dry pipe systems based on an anticipated number of sprinklers operating for the severity on the hazard being protected (as prescribed by NFPA 13). This change is now written in to the current NFPA standards as an alternate to actual witnessing of water delivery times.

Although mechanical accelerators have been around for years, they are unable to trip the valve at a desired delay time with substantial accuracy. With the QRS electronic dry pipe valve accelerator (quick opening device), operation of the dry pipe valve reliably occurs within the desired 4 seconds. This device utilizes a unique system air-monitoring device that constantly samples air pressure twice per second. When the air pressure has demon-

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strated a sustained drop exceeding a rate of .1 psi per second as verified by three consecutive samplings, a signal is sent to a releasing panel allowing the solenoid to activate the dry pipe valve.

Other System Features
As previously stated, the system is a dry type system that uses sophisticated equipment and hydraulics to accomplish the protection of high piled storage in freezers and coolers. Up to 40 ft. high storage is permitted in a 45 ft. high building without requiring sprinklers in racks. The Ultra K-17 sprinkler (by Tyco Fire & Building Products) is the only approved sprinkler to be installed, and, as in other special storage application sprinklers, the starting required calculated pressure and number of sprinklers are based on the commodity classification and height of building.

Unlike previous dry pipe systems, the Quell™ system actually delays the water delivery slightly, permitting more overhead sprinklers to open. The idea is to "surround and drown" the fire as opposed to just operating heads directly above the fire and as opposed to “chasing” the fire as with standard systems.

For freezer applications, a double interlock pre-action system is recommended. The preferred detection systems is linear cable, and the control panel must sense both low air pressure (sprinkler operation) and heat in the cable before allowing the valve to open and flow water.

Benefits
The following benefits of the Quell™ Design Method and resulting Quell™ Systems are listed on the Tyco Fire & Building Products’ Website (at www.tyco-fire.com):

1. Does not require expensive antifreeze, which can leak and damage storage.

2. Ceiling-only coverage eliminates costly in-rack sprinklers and increase storage array flexibility.

3. Provides fire protection Class I, Class II and Class III commodities.

4. Provides the lowest installation and maintenance costs.

5. Backed by the industry’s best 10-year warranty.

Conclusion
The Quell™ Design Method and the resulting Quell™ Systems are revolutionary in that the performance of a “wet” system is now possible with a “dry” sprinkler system without the design penalties traditionally associated with such systems. Since the Quell™ Design Method is rooted in performance based design, the user must take into account specific limitations and requirements to enable the technology. System sizes can be limited by the maximum time required for water delivery, large volumes of water at high pressure are required to satisfy the system demand, and the system risers must be located near the protection area to minimize the water delivery time.

Only contractors with considerable experience and in house design expertise that are licensed by TFBP to employ the Quell™ Design Method may design and install Quell™ Systems. For additional information visit the Tyco Fire and Building Products website at www.tyco-fire.com.

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