



# Effective Planning for Fire/Life Safety Upgrades

Facility executives have two choices for upgrading fire/life safety systems. One is to wait until the entire system is so old that it has to be replaced. The other alternative is to modernize the system in smaller, regular steps. This phased modernization enables facility executives to budget more effectively for upgrades while accelerating the adoption of new technology. Phased modernization also reduces the cost and difficulties of maintaining aging fire/life safety systems.

**This white paper addresses crucial fire/life safety issues that facility executives should consider when planning upgrades including:**

- Advances in fire/life safety system technology
- Problems with aging fire/life safety systems
- Why most facility executives use phased modernization
- Budgeting for fire/life safety system upgrades
- Minimizing disruptions with upgrades

building  
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White paper

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Whether it's alarms, detectors, control panels or monitoring and reporting systems, today's fire/life safety systems are far more advanced than systems that are 10 years old or older. New systems are addressable and often offer Internet connectivity and emergency announcement capabilities. They have networking capabilities and may use management station/computer-based annunciation and control.

Upgrades to new technology can bring significant benefits. Fire/life safety upgrades "get people out of the building to a safe place before conditions in the building become untenable," says Chris Jelenewicz, engineering program executive for the Society of Fire Protection Engineers. "Fire alarms and smoke detectors catch the fire's development as soon as possible, resulting in faster notification of building management and the fire department. The smoke management removal system reroutes smoke and gases so conditions do not become untenable too quickly. And all of these help protect property as well."

Property loss due to fire amounts to more than \$2 billion annually, according to National Fire Protection Association statistics. A major fire's impact can stretch across years. Studies show that 50 to 70 percent of companies that experience a major fire go out of business within three years. Business interruption insurance will compensate for some losses while repairs are made, but during that period, valuable customers may move their business permanently to the competition.

Those facts help explain why, even in a weak economy, investment in fire/life safety systems is a priority for many organizations. Among facility executives who responded to a fire safety survey by Siemens Industry, Inc., 58 percent have upgraded or installed a new fire/life safety system in the past five years, and 46 percent anticipate upgrading or installing a new system in the next five years. (See Figures 1 and 2.) More than 1,100 respondents whose firms own or manage commercial offices, educational facilities, government buildings and health care centers completed the email survey.

"Among our clients, fire/life safety is not a luxury," says Raymond A. Grill, principal in charge of fire engineering practice for the Americas at Arup.

New and upgraded fire/life safety systems aren't limited to items mandated by code. Of respondents who installed new or upgraded systems, 51 percent reported making an investment in measures not required by code. (Figure 3 shows additional functionality most often specified in those projects.)

### Phased Modernization is Industry Standard

When facility executives set out to upgrade their fire/life safety systems, they have two basic choices: either use a form of phased modernization or do a wholesale replacement of the aging system.

Phased modernization is the upgrade method preferred by a large majority of survey respondents: 78 percent called phased modernization their most common approach to fire/life safety upgrades. (See Figure 4.)

A good approach to phased modernization is to make the new

**FIGURE 1: Most companies have recently upgraded or installed new fire safety systems**

Yes 58%  
No 42%

**Question:** Have you upgraded or installed a new fire safety system in the past five years?



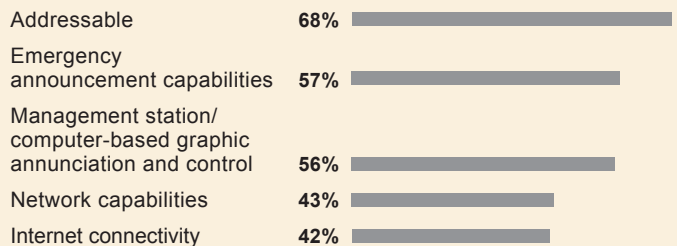
**FIGURE 2: Many companies are planning fire/life safety system upgrades**

Yes 46%  
No 54%

**Question:** Do you anticipate a fire/life safety system upgrade in the next 5 years?



**Figure 3. Companies are specifying fire/life safety functionality beyond code requirements**



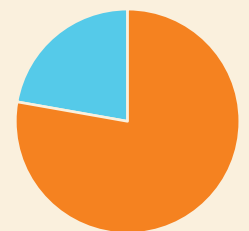
**Question:** What additional functionality, beyond code requirements, were you looking for?

(Adds up to more than 100 percent because multiple selections were allowed.)

**FIGURE 4: Phased modernization is most common upgrade strategy**

Modernization: phased-in approach to smoothly upgrade existing system to new technology 78%  
Wholesale replacement of an old system 22%

**Question:** Which of the following best describes your organization's most common approach to fire safety system upgrades?



control panel the first priority. One reason the modernization might begin at the panel is that the phased modernization will be adding more alarm/detector lines in subsequent years. The panel is connected to the existing periphery units, which then can be replaced line-by-line as necessary.

Advantages to starting with the control panel include integration of security and building automation systems. Facility personnel benefit immediately from the control panel's ease of use, as compared to older panels. And the periphery fire/life safety alarm/detection system can be replaced as the investment plan permits.

The alternative to phased modernization is wholesale replacement. Wholesale replacement often begins by installing a new control panel that is integrated with the existing one. Then the alarm/detector lines are individually replaced and connected to the new control panel. Once all alarm/detector lines are connected to the new control panel, the old control panel is removed. With this approach, a completely new state-of-the-art system is put in place with no interruption in fire/life safety coverage.

### Taking Advantage of Newer Technology

Facility executives report a variety of advantages of phased modernization. (See Figure 5.) Number one on the list is the desire to keep the system up to date.

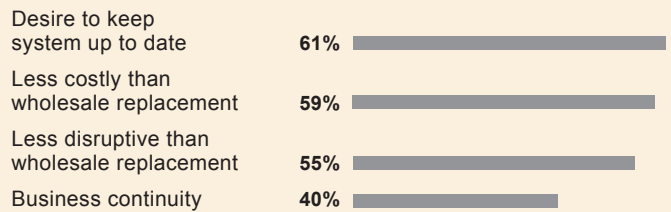
Planned modernization allows facility executives to take immediate advantage of today's advanced technologies. Current systems can identify precisely where a fire originates, helping in the evacuation of building occupants by fire personnel. They offer digital readouts, some diagnostics and programming capabilities. They can also provide insight into hazards or other special considerations that might exist in the affected area. A modern smoke detector outside a restaurant area can be set to expect a larger amount of false phenomena, resulting in a higher tolerance, while another smoke detector in, say, the telephone switching room can detect smoke with much greater sensitivity.

New technology brings real benefits, according to facility executives. For example, Paul Mendel, senior vice president of facilities for RB Management Services, explains that RB does long-term life cycle studies of its clients' fire/life safety systems. "We tell them the status of their fire alarms, their sprinkler systems and when they will need to be replaced, along with a current budget figure," says Mendel. "In some cases, we might say this portion of the fire/life safety system can be nursed along, but two years from now it has to be replaced, so you need to be budgeting for it. Most building owners are receptive to this approach because they understand the importance of fire/life safety."

Kidder Mathews just finished a phased modernization in part of a 50,000-square-foot building. "We were putting in a new tenant who would occupy most of the third floor, so we upgraded the fire/life safety system in that space," says Tom Sante, vice president of Kidder Mathews. "As we get tenant turnover, we will tie in the balance of the building to the new upgrades."

Sante appreciates that newer fire/life safety systems are addressable, far more dependable and can be expanded as needs arise. Tenants also appreciate fire/life safety improvements and regular

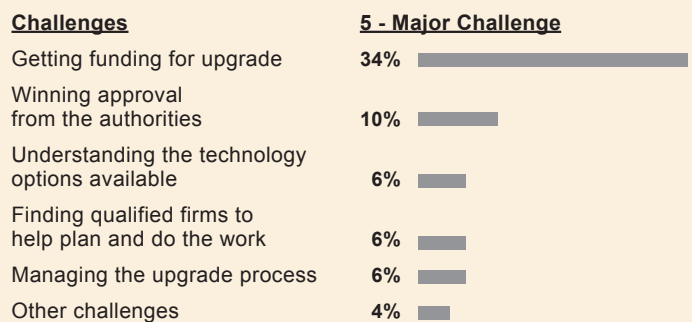
**Figure 5. Benefits of phased modernization**



**Question:** Why does your organization use phased modernization?

(Adds up to more than 100 percent because multiple selections were allowed.)

**Figure 6. Funding is major upgrade challenge**



**Question:** How would you rank the following challenges with respect to fire/life safety upgrades on a scale of 1 to 5 (1 = No challenge and 5 = Major challenge)

inspections. "When our tenants see us doing these things, they feel more comfortable with their safety," Sante says.

Newer systems are easier to operate, have remote monitoring capabilities and offer ease of operation, according to Chuck Butterfield, director of safety/security, Rapides Regional Medical Center. What's more, he says, they can be integrated with other systems.

### Phased Modernization Simplifies Budgeting for Upgrades

Getting funding was the fire/life safety upgrade issue most frequently ranked as a top challenge by survey respondents, with 34 percent identifying that as a major challenge. (See Figure 6.)

Another important benefit of phased modernization is that it avoids the one-time cost of a wholesale replacement and allows budgeting and planning for a staged migration to new technology. "Our more sophisticated building owners have capital budget programs that are planned 10 years out," says Carl F. Baldassarra, executive vice president, The RJA Group. "Fire/life safety system upgrades are planned and part of the budget process."

For the 20 buildings on the campus of Grand Rapids Community College, Tom Smith, executive director of facilities, has used phased modernization because of the costs involved in wholesale modernization. "When you upgrade everything at once, the cost can be astronomical," he says.

“Available capital dollars” drives phased modernization of the fire/life safety system at Rapides Regional Medical Center, says Butterfield. Fire/life safety modernization is “always in competition for the same monies that are used to replace CT scanners, lab equipment and the newest surgical device,” he says. But he finds funding is “no more difficult than funding any other worthwhile project.”

### **Phased Modernization Reduces Disruption**

The survey showed another important reason for phased modernization of fire/life safety systems: Individual steps in a phased modernization of the fire/life safety system are also less disruptive to building occupants and take less time. Of survey respondents, 55 percent cited that as a reason they rely on phased modernization.

One reason Smith uses phased modernization is that some buildings on campus need to be running and occupied 365 days a year. For example, the five-story science building can temporarily relocate some classes, but the labs need to function. Smith cannot shut down the entire science building for a wholesale modernization.

Planned modernization allows building management to schedule fire/life safety upgrades during the building’s slow periods. In hotel applications, fire/life safety modernization can be done at the same time as planned renovations of common areas, new restaurant accommodations, or a suite of guest rooms, or during off-peak travel times. For higher education, that may be when school is not in session. For commercial properties, the modernization may be scheduled to take place concurrently with tenant rollovers or other building upgrades. “Wherever construction is open, the fire/life safety modernization takes place,” says Baldassarra.

### **Aging Fire/Life Safety Systems Face Code Issues**

One reason for the popularity of fire/life safety system upgrades is that aging systems suffer from a variety of shortcomings. One issue is compliance with local fire/life safety codes.

“Because the fire code changes every three years, there is always the possibility that the aging equipment no longer meets current code and Underwriters Laboratories (UL) standards,” says Wayne D. Moore, P.E., principal with Hughes Associates, Inc. Existing equipment may be grandfathered, he says, “but it is still an issue.”

“From a code standpoint, the primary problem with aging fire alarm systems is making sure they are still performing as intended,” says Lee Richardson, National Fire Protection Association (NFPA) staff liaison for NFPA 72, National Fire Alarm and Signaling Code. NFPA 72 requires periodic inspection, testing and maintenance of fire alarms/detectors and signalers. “Building owners may not realize that they are responsible to ensure these required periodic inspections and testing be performed,” says Richardson.

### **Older Systems Not as Effective**

Jelenewicz points out that building occupants may not recognize older fire alarms as signaling possible fire conditions. When a bell or loud horn alarm sounds in a commercial building, people may fail to recognize it as a fire alarm. To correct that confusion, fire alarms incorporated a Code 3 signal — three beeps and a pause, three beeps and a pause. “But research showed that people still failed to recognize the signal,” says Jelenewicz. “People want information and they want help in knowing how to react. They

want to know, ‘What is the problem? What am I to do? How do I do it?’ Newer fire alarms answer these questions.”

As fire/life safety systems age, facility executives will encounter more false, or nuisance, alarms. Nuisance alarms require personnel go to the alarm and investigate what may have tripped it. “You must check each one out because there is the potential of trouble,” says Grill.

Nuisance alarms also can be caused by lack of maintenance, says Jelenewicz. When they are frequent, building occupants tend to ignore them, with potentially disastrous consequences.

Getting building occupants to respond quickly in the event of a fire is essential. In a January 19, 2000, fire at Seton Hall University, for example, many students did not evacuate immediately, says Jelenewicz. Three students died in that fire.

A worse situation than nuisance alarms occurs when occupants fail to hear the signal. Maybe walls were modified at some point, blocking the sound. Or maybe the environment is noisier than was accounted for in the initial design, making older voice message systems inaudible or unintelligible. “Newer fire/life safety voice messages are audio engineered with the right amount of speakers and sounds so that they are understandable,” says Jelenewicz.

### **Maintenance, Support Issues with Older Systems**

With aging fire/life safety systems, maintenance costs are higher because they need more repairs. Facility executives also may find it’s more difficult, if not impossible, to get necessary repair parts. “Hopefully, building management bought an inventory of spare parts when the system was newer, because the manufacturer may no longer support it,” says Baldassarra. “But even if those spare parts exist, there’s the possibility that with staff changes over the years, the new engineering director doesn’t know where those parts are now stored.”

Older systems are also difficult to retrofit. Even if parts are still available, they use “proprietary systems so you cannot get them using competitive pricing strategies,” says Sante. Sante cited a fire recall feature on an elevator that went out recently. “Finding a replacement module for the elevator was challenging,” says Sante. “And then we needed to find a vendor that could get it to work.”

Aging fire/life safety systems cause headaches when it comes to repairs. “It’s hard to find trained personnel who can service aging equipment,” says Smith.

“Newer technicians do not know the older equipment,” says Moore. “Even if they are good troubleshooters, they will take longer to find problems to initiate repairs.”

### **Choosing an Upgrade Strategy**

Facility executives seeking the benefits of new technology have to decide between phased modernization and wholesale replacement. Although most facility executives use phased modernization, there are times when wholesale replacement makes sense — for example, if use of the building is changing. In that case, replacement may be required by code. Facility executives also use this method when a building is undergoing major renovations.

When such projects span several phases, the contractor installing the system ends up coming back to the site multiple times. "Pricing strung out in this manner will end up costing the building owner more," says Baldassarra, "as compared to mobilizing the fire/life safety installers once on the site and getting it over with." But phased modernization makes sense in most cases. Simply waiting until capital funds are available to do a wholesale replacement on an aging system can be risky. While building management waits to upgrade an aging fire/life safety system, a catastrophic equipment failure could occur, resulting in "crisis replacement, which is always more expensive," says Moore. Catastrophic failures can mean the fire/life safety system is not adequately protecting the building and its occupants. "If a fire alarm fails, the building owner is faced with emergency replacement, and the local code authorities probably will require a manned fire watch during that replacement," says Grill.

A phased modernization can make it less likely that a catastrophic failure will occur. Phased modernization enables a facility executive to replace elements of the system before they become unreliable.

The mindset of the facility executive should be that fire/life safety modernization is an annual issue, says Jelenewicz. "That's best in terms of building occupant safety and probably easier on the budget," he says.

### Planning for a Phased Modernization

Any work involving the fire/life safety system must be carefully planned. Phased modernization is no exception. "You must make sure the older system that is still operating is compatible with the new fire/life safety system," says Baldassarra. Phased modernization needs the approval of local authorities before a permit will be issued. And those authorities will want to review implementation.

"Some local authorities do not understand how phased modernization can be done in a manner that maintains the continuity of protection," says Grill. "By putting in parallel infrastructure or head-end redundancy, however, the fire/life safety system can be transitioned over time to the new system."

Facility executives have to allow for longer lead times for planning and obtaining elements that are compatible today, but have the additional capabilities that will allow them to work well with the next element modernized. "Smoke detectors need to work with the HVAC so dampers are activated and so on," Smith says. "The fire/life safety components have to be compatible, and they have to integrate with the building automation system."

A well-designed fire/life safety system is essential to protecting the lives of building occupants. The system also helps to prevent prop-

erty losses and reduces or eliminates business interruption costs. Today's fire/life safety systems offer long-term investment protection as the technology grows to meet the building's changing needs. Maintenance costs are lower and spare parts, when needed, are available. Fire protection components also are flexible and generally can be adapted as the building's occupancy changes. More reliable detection ensures protection against false alarms. Best of all, they can adapt to the enterprise's investment plan.

## Methodology

The Siemens Industry, Inc. Fire/Life Safety Survey was sent via email to a random sample of 13,000 Building Operating Management subscribers on July 7, 2011. Reminders were sent to non-respondents on July 12 and July 26, 2011. A total of 618 subscribers chose to opt out of the survey or failed to respond due to an invalid email address, yielding a final sample of 12,382.

The survey was closed for responses on July 27, 2011. With 1,144 qualified responses returned and with a net sample of 12,382, the rate of response for the email survey was computed to be 9.2 percent. The overall estimated margin of error for this study is +/- 2.87 percent at the 95 percent confidence level.

### Demographics of Survey Sample

- 36% Commercial Office
- 33% Educational: K-12/Colleges/Universities
- 23% Health care
- 12% Government
- 12% Industrial/Manufacturing
- 11% Retail
- 5% Hospitality
- 3% Other

(Total exceeds 100 percent because multiple mentions were allowed.)

**Question:** Please indicate the types of facilities you/your firm own or manage. Responses = 1,140

- 
- 44% 100,000 to 499,999 sq. ft.
  - 21% 500,000 to 999,999 sq. ft.
  - 22% 1 million to 4,999,999 sq. ft.
  - 7% 5 million to 9,999,999 sq. ft.
  - 6% 10 million or more sq. ft.

**Question:** Please indicate the total square feet of buildings you/your firm own or manage. Responses = 1,128

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