



Planning That Saves Lives

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It is important to incorporate fire protection design into school renovations.

The United States Fire Administration (USFA) reported an estimated annual average of 14,700 fires occurred on school properties in the United States between the years 2003 to 2005.

Any fire that occurs on school grounds presents an extremely dangerous situation for faculty and students. School officials need to evaluate their school's current fire protection systems to determine if changes are necessary. This process may seem tedious and complicated, but it can actually be conveniently done when the school un-

dergoes a renovation, no matter how minor or serious the project.

The information below illustrates the basic implementation process of a fire protection system during a school renovation. I hope that the material will not only be educational, but also encourages officials to consider incorporating such a system during their school's next renovation.

Project Overview & Budgeting

Once you have decided to incorporate fire protection during your school's renovation, you should determine a



budget. Local fire safety codes will specify the minimum requirements for your system — but moral considerations will play a role in determining the ultimate capabilities of the fire protection. Cost shouldn't be a huge factor, as the peace of mind gained from having a state-of-the-art system is worth the capital investment.

The cost is usually determined by the type of facility being renovated (for example, classroom vs. cafeteria or assembly space), size, geographic location, type of system being implemented, and project schedule. A general estimate is that the system cost will range from \$3.00 to \$6.00 per sq. ft. of the building area.

In terms of scheduling, a minimum of six months to a year is typically required to complete the design, and then another six months to a year for implementation. Renovations almost always take place during school vacations, since even something as simple as replacing a sprinkler system requires dismantling ceilings and drilling through walls.

There are four different components of a fire protection system. Depending on each individual project, renovation may include any or all of the elements.

- **Fire Alarm**

The Fire Alarm components include electronic devices such as the smoke detectors, alarms, strobe lights, public address systems, door controls, and hold-open devices.

- **Fire Suppression**

Fire Suppression includes the mechanical aspects of the systems, such as sprinklers, piping, and hose valves.

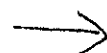
- **Egress/People Management Systems**

This aspect includes the devices that manage the flow of people out of a building to a safe area. Current life safety code (NFPA 101) increases stair width and requires photoluminescent strips to outline the egress paths in fire stairs. The strips have proven extremely effective in New York City, where they have been required since 2006 for high-rise buildings.

- **Containment/Compartmentalization**

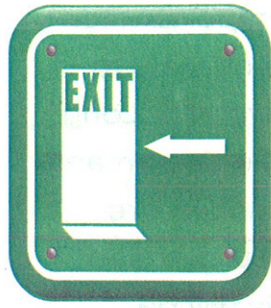
This refers to the building's structure and includes any materials that would contain a fire and protect the school from heat damage. For example, if the school's walls are constructed of concrete or other fire rated material, a fire that starts in a classroom can be contained (at least for a while) by closing the classroom door.

As you plan your renovation project, always keep in mind that the potential for unexpected problems is enormous. To avoid this as best as



possible, the facility needs to be surveyed to determine the full scope of the project. For example, opening up the ceiling may reveal that the existing pipes are corroded or that there is not enough space in the ceiling to support the new system. Another common problem when expanding existing systems is that the existing fire alarm or public address systems may be too outdated to be compatible with a new system's technology.

It may also be a good idea to incorporate life safety "commissioning" into the project plan. Commissioning is the systematic process of verifying that a building's systems are designed, installed, and tested to perform according to the design intent and operational needs. Commissioning is especially important in a renovation project where old and new systems are being joined together. The commissioning process will ensure that



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the systems will operate together as designed when you need to rely on them. Moreover, if the old system was not commissioned after the original installation, this is a good opportunity to test it.

How to Choose an Engineering Firm

Your renovation project will require the design services of a fire protection engineer and code consultant.

Depending on the local requirements, one consultant may provide both services. There are many qualified firms with skilled professionals; how do you choose the right one for your project?

The primary consideration is to check a firm's licensing. The consultant that you select needs to be licensed to practice engineering in the state where the project is located. You may verify the information with the state's licensing board, which can also divulge if there are complaints against a prospective firm.

Practical experience is also important. A firm without any experience working on schools may have a steep learning curve during the renovation. In contrast, a firm with practical experience will anticipate challenges, help the project run more efficiently, and have an understanding of the dynamics of egress and people movement in schools. Also, there is an important distinction between designing for colleges and universities than K-12 schools because the younger students will react differently than adults.

Also, keep in mind that the science of fire protection design has changed extensively over the years. Unfortunately, many of those changes have been a result of tragedies, such as the Our Lady of Angels fire in Chicago in 1958, in which 92 children and three nuns died after being trapped in the

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school. The fire protection engineer you select needs to be knowledgeable with the current codes and all of the changes that have resulted from events like this one.

Sprinkler codes vary by state and even by local jurisdiction. Twenty years ago, the national sprinkler codes were 30 pages. Today the codes are very



detailed and average about 1,000 pages for the sprinkler systems alone! Because of the complexities and the rapid evolution of the codes, the firm you select needs to have a command of the most current codes.

Working Together

Once you have hired a design firm, the project team will have to understand the overall project goals and the school's existing systems. It will need to visit the building to survey the existing systems to review not only the fire protection system, but also the structural, electrical, and plumbing design to determine the building's existing capabilities. Your design firm will prepare your contract documentation and help you select a contractor. They will also work with the contractor to build your project.

It is important for school officials to stay involved. Long after the design and construction are completed, these officials will be responsible for using the system. Their participation throughout the design process will help them become familiar with utilizing the system. Administrators should involve themselves in such processes as selecting where intercoms and fire panels are located and what materials are used.

Planning Life Safety

The final step of the design process is to develop a Life Safety Plan. The fire protection engineer will collaborate with you and the local fire department in preparing your plan. The life safety plan will include key information and procedures to follow in case of an emergency, such as:

- emergency contact list — a list of people who will be contacted in case of a fire;
- schematic diagrams — floor layouts and site plan, including locations

- for egress and assembly areas;
- audit of building resources — brief list for first responders (e.g. fire alarm with P/A);
- responsibilities of staff;
- persons requiring assistance;
- fire drill procedures;
- occupant procedure signage — pictures of emergency procedure signs;
- control of fire hazards — fire safety and prevention measures and isolation and identification of hazardous materials;
- maintenance requirements of the building fire and life safety systems;
- procedures to shutdown fire equipment in case of accidental discharge or alarm; and
- out-of-service signage and documents posted during building system shutdowns.

The life safety plan should be kept

at the fire command center. Your local fire department can tell you or your engineer what information or other resources they will need at the fire command center and guide you in locating the center to suit their requirements. Copies of the plan should be distributed to all persons who are part of the emergency response team.

Regardless of how comprehensive a life safety plan is, human behavior is unpredictable in an emergency situation. The best way to prepare staff and students is to discuss emergency plans openly and practice them regularly. ☐

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