Pathway Marking Can Speed Evacuation

Signage and markings can play crucial role if a building loses power

It is essential for facility executives to realize how poor conditions can be during an emergency, and how important it is that every reasonable effort be made to ensure that occupants can move through passageways and stairs as rapidly as possible. Walking in darkness is not something that many people do with confidence. Even at home, movement is slower in the middle of the night; how can rapid movement through darkness be expected in an unfamiliar environment during an emergency? The answer, of course, is that it cannot.

During the evacuation of the World Trade Center as a result of the 1993 bombing, the loss of normal and emergency power left the stairways in total darkness, a darkness that far exceeded what will typically be encountered at night in a home. A survey by the National Fire Protection Association after the attack revealed that, for those who made the decision to exit, more than 60 percent needed more than an hour to get out.

As a result of those problems, the Port Authority of New York installed a photoluminescent pathway marking system to highlight the locations of treads, landings, handrails and exits. Photoluminescent safety markings glow in the dark after being charged by normal ambient lighting. They are non-electrical and non-radioactive, and the glow is very bright in the first 90 minutes but can be visible for several days.

Although it has been widely reported that the lights remained on during the attacks on Sept. 11, there have been some reports of lights having been off in parts of some stairways. At least one survivor of the South Tower relied on the pathway marking system to descend from the 84th Floor, using it to navigate past a darkened, smoke-filled section of the stair in the impact zone. Further investigation should reveal what role the photoluminescent pathway marking played in egress.

One thing is clear: Had circumstances been the same as in 1993, with no light in the stairways and no pathway marking, egress would have been significantly slower on Sept. 11, and many more people would have died.

Another case in point was the MGM Grand fire in Las Vegas in 1980, which resulted in 85 deaths. With overhead lighting and exit signs obscured by smoke, many occupants were left in the dark without direction. Egress was slowed or stopped altogether.

In 1989, California adopted a law requiring pathway marking and low-level exit signage in new assembly, educational, health care and hospitality facilities. In 1993, following a cruise ship fire that killed 158 people, the International Maritime Organization (IMO) passed a similar requirement.

Beating a Path to the Door

Pathway marking systems are not meant to be obtrusive or noticeable under normal conditions, but should power be lost during a fire, earthquake, terrorist attack or blackout, or should overhead lighting and exit signage be obscured by smoke, these systems should identify the egress path with a continuous stream of information. Numerous studies, most notably the 1999 study by Canada's National Research Council, support this stream-of-information approach.

Exit signs are the last piece of information an occupant needs during egress. Without a continuous stream of information from their point of origin, occupants may never reach that exit sign.

ASTM Standard 2030-99, "Guide for Recommended Uses of Photoluminescent Safety Markings," shows a system that provides a continuous stream of information for occupants, a stream that mimics the appearance of the systems required by California and the IMO. In Europe, where it is already a recognized part of the egress system design, pathway marking is required in many types of occupancies. In this country, the Federal Aviation Administration started requiring aisleway marking on airliners in the mid-1980s. The American Passenger Transit Association (APTA) passed a requirement for pathway marking on all new commuter trains as of 2001 and existing commuter trains by 2006.

These changes are welcome, but they leave a door open that is best closed; failure is still possible. Every requirement adopted to date has allowed the use of either photoluminescent or electrically powered systems. While electrically powered systems can be designed to be brighter than photoluminescent materials, they can never be as reliable, given their dependence on power. Several cruise lines came to this conclusion after fitting what they found to be high-maintenance electrical systems in passenger areas and low-maintenance photoluminescent systems in crew areas.

Interior designers on cruise ships tend to opt for electrically powered systems, which they find more attractive. In fact, designers sometimes want the pathway marking systems to be left powered at all times to serve as a design element in the space. That's a mistake. Pathway marking systems should not to be treated as a decorative addition to the environment. Weekly testing of pathway marking systems is already required, and continuous use only serves to age the system prematurely and increase the incidence of failure.

What's more, if occupants notice a pathway marking system under normal conditions, it may not stand out during an emergency. This does not mean that occupants should not be informed of the presence of a pathway marking system. Passengers on commercial flights and cruise ships are informed that the system is there to help them find an exit.

It's also important to keep in mind that electrically powered pathway marking systems, known as low-location lighting on cruise ships, are not 100 percent reliable, even with the most rigorous maintenance routine. A 1998 cruise ship fire revealed this. The control panel for the low-location lighting system sounded a trouble alarm five minutes after the fire started. Because there was no switch to silence the alarm, the chief electrician shut down power to the entire system, which turned off all low-location lighting throughout the ship. Fortunately, no one died as a result of shutting off the low-location lighting, but two crewmen trapped in a restroom near the fire were unable to find their way out through the smoke because the passageway was "totally black." The two were found by firefighting teams checking the area 30 minutes after the fire started.

What Lies Ahead

Photoluminescent products can be used in most every case to provide the continuous stream of information that occupants need to egress. There will be exceptions, such as where there is no ambient light to charge the photoluminescent material, but they will be few and far between. It seems likely that photoluminescent systems will be the rule in the future. One reason is code changes. For example, in New York City, code changes proposed as a result of the attacks on the World Trade Center would mandate photoluminescent pathway marking systems. Another factor that seems likely to drive adoption of photoluminescent pathway marking systems is tenant interest: A 1.4-million - square-foot building is putting in a photoluminescent system in response to tenant demand for that type of system. Finally, there are operational issues. The electrically powered pathway marking systems used in ships and airliners are less reliable and also more costly to maintain than photoluminescent systems.

Pathway marking is also capable of replacing overhead emergency lighting. It does not matter how bright emergency lighting was designed to be if it is not operating or cannot penetrate the smoke. The National Research Council of Canada has stated that photoluminescent pathway marking "appears to be a cost-effective addition or even a potential replacement for traditional electrical emergency lighting, since it does not consume energy, requires no wiring, needs minimum maintenance and is totally reliable, provided it is installed in locations where permanent full lighting is provided."

Sept. 11 marked the onset of a new era in which previously unthinkable attacks are possible. Buildings should be designed accordingly. Photoluminescent pathway marking systems are an important element of an effective life safety system. Although it will take some years for the fire protection industry to require the use of photoluminescent pathway marking systems, these systems will improve the level of safety for occupants wherever they are used.

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