



Securing the Building Enclosure

Provisions for Forced-Entry Prevention

By Steven R. Marshall, RRC, CDT, LEED® AP

Recent tragedies have led to a growing demand for increased safety measures in building design, especially in schools. A large number of schools in the United States were built before 1985, when security design was not emphasized. In addition to implementing training for emergency response, many modern-day school administrators have initiated such preventive measures as controlling building access and providing additional means for emergency egress. In fact, since the late 1990s, building and school ground access control measures during school hours have increased more than 17 percent and 12 percent, respectively. Many schools also are implementing faculty identification badges, video monitoring and telephones in classrooms.

Although fenestrations (e.g., windows, doors, louvers, vents, etc.) are the most vulnerable components of a building enclosure (and, thus, highly susceptible to unauthorized access), school designs are incorporating increasing amounts of glass and windows due to the positive benefits of natural light. Although vulnerable, certain design concepts can be implemented to help secure fenestrations, either as new construction or renovation programs. These provisions will improve students' ability to enjoy the benefits of natural light, without compromising building security.

What Is Your Building's Risk?

The most basic, and least visually/physically obtrusive, solution is to use specific types of glazing that can provide security to the fenestrations. For renovations, this can be accomplished by replacing the existing glass or modifying the glass in place. These options will vary with regard to performance and cost. Selection of the most appropriate measure or measures should consider three key concepts:

1. *Hazard Identification.* When assessing a potential shooting or explosion, evaluate probability and magnitude.
2. *Vulnerability Assessment.* Identify which assets are at risk. Human life is, of course, at the top of the list, but facilities professionals and school administrators also should consider the protection of property, systems, equipment and operations.
3. *Impact Analysis.* This step is worst case, as the preferred amount of casualties and injuries is obviously zero. However, it is important to have a good understanding of impact to ensure the proper attention and consideration are instituted.

Glazing Provisions

Various glazing compositions can provide a deterrent to unauthorized access, as follow.

Laminated Glass

Comprised of an interlayer sandwiched between two glass layers, laminated glass (see “Figure 1,” right) is often the most feasible strategy from both a practical and economic standpoint. The interlayer thickness can vary, depending on the desired level of performance, but will not prevent breakage; rather, displacement of the glazing out of the frame is averted upon breakage. This form of glazing has both safety and security uses, and also enhances sound attenuation and ultraviolet (UV) protection. Similar to other glass types, laminated glass also is available in an almost infinite number of coating, color, tint and texture combinations.

The major negative is that emergency responders may oppose the use of laminated units due to complications relating to egress or ingress during an emergency. Unfortunately, the interlayer makes the glass difficult to break, remove and sufficiently clear from the frame. This is a valid concern, and one that should be carefully reviewed as part of a project’s design phase.

Applied Window Films

Applied window films (see “Figure 2,” below) consist of micro-thin layers of polyester, which are bonded to the glass surface with adhesive or mechanically anchored into the window frame at the perimeters. Films are largely used in renovation or retrofit applications, where existing fenestrations and glass are already in place. Films are commonly used for solar heat control, as they can be provided in a number of tint configurations to reduce solar heat gain. However, many manufacturers also are offering film products that provide security and safety benefits.

Similar to laminated glass, films do not prevent breakage of the glass. Instead, they hold the glass fragments together upon breakage, thus reducing the potential for injury or forced entry.

Typically, films are installed on the interior, and are cut around the perimeter of the glass up to the edge of the frame or muntin. As an added security benefit for additional anchorage capacity of the film, some manufacturers offer a perimeter profile that is installed onto the window frame and glass surface.

Glass-Clad Polycarbonate

Glass-clad polycarbonate is similar to laminated glazing. Sheet polycarbonate and polyurethane interlayers are used in conjunction with glass cladding to provide added durability and resistance to penetration. This type of glazing is most commonly used in extreme impact-resistant applications, such as detention facilities, jewelry stores, museums and courthouses. However, it certainly can provide the forced-entry function in other (less extreme) cases.

The polycarbonate layers are the main source of strength and impact resistance for glass-clad polycarbonates. The polyurethane interlayers accommodate the expansion differentials between the polycarbonate and glass layers, thereby creating a firm elastic bond for increased durability.

Security Screens

In addition to, or in lieu of, providing “security” glass, other design provisions can be implemented. One option is the installation of security screens over the fenestration opening. Security screens (see “Figure 3,” page 28) are not directly associated with the glazing itself, but are



Figure 1: Laminated glass has both safety and security uses, and also enhances sound attenuation and ultraviolet protection.

a practical solution for adding building security in both new construction and retrofit applications.

Security screens typically consist of an integral frame assembly surrounding either a stainless steel wire cloth or perforated panel. They can be mounted directly to the window assembly or the surrounding wall substrates, and are more commonly used at punched windows (as opposed to larger curtain wall-type openings or entrances). Common complaints associated with security screens include the difficulty to see through and negative aesthetics on the building façade.

Provisions for egress from the interior or maintenance access (for cleaning) from the exterior may include operating hardware and external locks. An added benefit to the open area of the screens is natural air flow and ventilation

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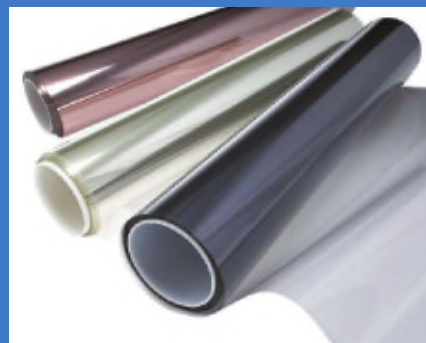


Figure 2: Many security films—always a practical solution for existing windows—also offer solar heat control.

while building security is maintained. However, as with laminated glass, emergency responders may not allow these types of screens since they greatly restrict access.

Emergency Egress

The glazing provisions already discussed can help deter entry through a building's fenestrations. While keeping unauthorized persons from entering a facility is the first line of defense, it is not always preventable. As such, emergency egress measures also must be considered when creating a secure facility.

Building Codes

Although the National Fire Protection Agency's *NFPA 101 Life Safety Code* is not a legal code requirement with statutory authority, this document is a widely adopted standard with some very important recommendations. Per Chapter 15, *NFPA 101* recommends "that every room or space greater than 25 square feet used for classroom or

other educational purposes, or normally subject to student occupancy, shall have not less than one outside window for emergency rescue."

Ideally, emergency egress windows must be easily accessed by building occupants and should be a casement-type configuration. However, other operation types also will work as long as adequate opening areas are maintained. Each rescue window should be clearly marked as an emergency exit location, and all screens or devices (if present) should not interfere with rescue requirements.

Building Access Control

Building access control may be considered one of the more important

topics of discussion pertaining to building security. Keeping intruders out of the building starts at the entrances. Ideally, all exterior doors throughout a school should be locked from the exterior at all times, including the main entrance. Appropriate hardware should be specified to accommodate this while also providing code-compliant egress from the interior. There is a necessary balance between access control, emergency response and emergency egress. The most effective building security programs include all three.



Figure 3: A security screen over an existing window reduces the potential for forced entry.

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Security Measures

For other building security measures, consider working surveillance cameras, intercoms and call stations at entrances; card reader access at entrances; and various site improvements, including perimeter fencing or gates, visitor parking controls and a landscape layout that minimizes hiding capabilities. In addition, roof hatches and other miscellaneous building access points should remain locked from the exterior at all times.

Building Entrances

When possible, try to limit the amount of glass in and around the building entrances. Where glass is desired, implement one, or a combination, of the glazing provisions previously discussed. Consider using hollow metal or fiber reinforced polyester (FRP) doors with laminated glass vision lites in lieu of standard storefront doors with full glass lites. Although metal or FRP doors reduce the open feel of an entrance, they are an acceptable trade-off to improve

security. Another option during design is to include an additional vestibule, inside the main entrance, to provide yet another layer of visitor clearance and control.

Close Connection to Emergency Response

In all cases, school administrators and faculties should nurture a close connection to their municipalities' emergency response departments. Many facilities now include phones throughout the building with direct connection to the police and fire departments. Some administrators and facility professionals also have set up anonymous emergency hotlines for added response.

Each Building and Situation Is Unique

The security considerations discussed here should not be treated as boilerplate, as the needs of each building vary with respect to its distinct parameters. Therefore, it is up to the professional consultant, in conjunction with

the school administrators and first responders, to establish the most effective system for each application.

It is also critical to institute an emergency response plan in conjunction with the physical modifications to a building enclosure. Lessons learned from past tragedies have identified both as key components of any effective security program.

Finally, successful security strategies against forced entry should be developed as a team, including building personnel, maintenance personnel and emergency responders. Such collaboration, combined with a variety of simple solutions, can maintain the appearance of any building while making it more secure. **INIBS**

ABOUT THE AUTHOR: Steven R. Marshall, RRC, CDT, LEED® AP is a senior project manager for Gale Associates, Inc. (www.galeassociates.com). He specializes in site investigations, design, administration and coordination of roof, wall and window projects. Marshall has extensive experience in the evaluation, repair or replacement of roof, window, curtain wall, storefront, door and masonry wall projects. He has been responsible for managing close to 100 window projects.

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The manufacturing process for ArmorCore® Bullet Resistant Fiberglass Panels includes layering woven fiberglass and resin that absorbs the energy of the impact. When shot, the panels actually capture the bullets instead of ricocheting. The material also serves as protection against flying debris in violent storms and forced entry. ArmorCore® ballistic technology has been implemented in numerous military operations, including humvees and housing. Now the same technology is starting to find employment closer to home as a school armoring solution. "Many school districts and parents do not want their children in a distracting, prison-like setting. This is why they are using our product in the walls of the entrances, cafeterias, libraries or around the reception areas. The first goal is to isolate the perceived threat from accessing possible victims," said Breeland.

ArmorCore® is currently being incorporated into a non-profit initiative in California whose goal is to provide ballistic protection in class room doors free of charge to public schools.



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