



Designing Safer Schools

Environmental design makes the grade

by Randall I. Atlas, PhD, AIA, CPP

When it comes to the issue of safety in schools, it is important to remember that long before the students walk the halls, a design team creates the building and its grounds, envisioning the subsequent relationships with its occupants.¹ Consequently, the success or failure of a school is in many ways predisposed to the quality of its design and budget limitations.

Since the threat of unwanted intruders and inappropriate/illegal student behavior are major concerns for school boards, new ways of designing security features have come to the forefront. One is crime prevention through environmental design (CPTED), which refers to reducing

the opportunity and fear of crime through the effective use and design of the built environment.

Understanding CPTED

CPTED is a powerful concept that can improve the productive use of space and help make schools safer. Architectural features, structural enhancements, and spatial definition can deter, detect, and delay potential criminals from entering school campuses and buildings. Predicting and determining the types of users to enter the space and their intended purposes is critical to designing a school with CPTED features.

A Quick Lesson on Designing Safer Schools

The following are design and management tips for a safer school:

- conduct an assessment for each school's security needs with a uniform survey instrument;
- have a district-wide crisis response plan and establish practices annually;
- integrate school security systems and have them remotely monitored;
- consider use of both natural and mechanical access control;
- eliminate design features providing access to rooftop or upper levels;
- develop a safe corridor program;
- communicate security policy to faculty and students;
- place lighting on grounds that operate from dusk to dawn;
- use motion sensors on exterior and common areas after hours to notify staff and police of inappropriate or unlawful activity;
- use schools after hours as adult education facilities to minimize the time the building is empty;
- install self-engaging locking mechanisms on windows and doors;
- provide landscape buffers (e.g. thick shrubs or ground cover) to reduce access to walls vulnerable to graffiti vandalism;
- provide piano hinges on vulnerable external doors to reduce access to intruders;
- secure and lock any pull-down ladders used to gain access to the roof (or place them inside the building);
- be wary of placing utility boxes on walls if they can provide climbing access to the roofs or balconies;
- consider removing nets and hoops at end of day if athletic spaces attract nuisance behavior after hours;
- be sensitive to placements of internal space protection devices near air-conditioning vents or exhaust grills as the vibration of the compressor can trigger false alarms;
- doors and frames must be institutional-grade to withstand heavy use and abuse and faceplates should be specified over locks to prevent jimmying;
- school boundaries and exercise areas should be fenced with vandal-resistant picket-type fencing (e.g. a structure strong enough to resist bending easily);
- limit the number of buildings to as few as possible—preferably one—to better control access of illegitimate users;
- allow for a security person to be positioned at a single entrance onto the school campus, challenging each vehicle for identification of all occupants (buses and school employees would have their own separate and controlled entrance);
- minimize the number of driveways or parking lots students have to walk across to get to the school entrance;
- allow for the ability to lock off the rest of campus from the gym after hours or during sporting events;
- provide conduit or empty piping for present and future communication and security systems in classrooms and common areas; and
- reconsider the use of student lockers—the current trend is to not have them at all (athletic lockers are only used during gym class, with overnight storage prohibited). ♥

School administrators and architects cannot select appropriate countermeasures unless clear objectives are identified. To be comprehensive and effective, integrated school security strategies should look at prevention, control, detection, and intervention. Threats to a school are either external (*i.e.* from outside influences and persons) or internal (*i.e.* from students, faculty, or staff, or workplace violence that can be primarily deterred through policy and procedure strategies, and management techniques).²

CPTED can make a direct impact on reducing external threats through the use of natural access control, surveillance,

territoriality boundary definition, management, and maintenance strategies.

Safe school design involves four key areas that should include security layering/defensible space planning practices. These are:

- site design (*e.g.* landscape architecture, exterior pedestrian routes, recreational areas, and vehicular routes and parking);
- building design (*e.g.* building organization, exterior covered corridors, points of entry, enclosed exterior spaces, ancillary buildings, walls, windows, doors, roofs, and lighting);

- interior spaces (e.g. lobby and reception areas, corridors, restrooms, stairs and stairwells, cafeterias, and administrative areas); and
- systems and equipment (e.g. alarms and surveillance systems, fire control, HVAC and mechanical equipment, and telephone/information systems).

Evolution in school design

Although today's architects incorporate security innovations into their designs, this was not always the case. The vast majority of schools were designed and built in less dangerous times. For example, schools built in the 1940s had a look and feel of civic authority, typically comprising a two-story façade with classical columns and arches to convey a sense of presence.

In the 1950s, a new era of practicality entered school design, as opposed to grandeur. Air-conditioning was uncommon, which meant schools were designed with low-profile 'fingers' that divided the facility into several long, skinny buildings. This configuration allowed classroom windows on opposing walls to naturally allow for cross-ventilation.

The 1960s saw the use of open design. Educational experts believed traditional classrooms were too confining and

instead envisioned larger rooms that could hold several classes at once. They also felt windowless schools improved students' attention and prevented them from daydreaming. The reality was these open rooms were loud and difficult to manage, and lacked wall space for display and blackboards. Additionally, they began to take on an industrial and detention-like look and feel. While removing the windows led to a drop in utilities and vandalism, ventilation became a concern, necessitating the specification of air-conditioning.³

In the 1970s and 1980s, state laws required natural light and ventilation for every classroom. As such, architects began favoring one-story buildings and laying out schools in an open-campus plan and using courtyards surrounded by classrooms. As school crime and violence started to escalate in the 1990s, designers turned to a 'circling the wagons' plan, which relied on tightly controlled access through a well-defined main entrance.

Today's schools are usually rectangular in shape with an interior courtyard. Other features can include detention-grade polished stainless steel in bathrooms rather than glass mirrors (to reduce the likelihood of vandalism), and the removal of double doors from restrooms in favor of an open

Improve IAQ Design Green & Cut Costs



THE ORIGINAL
BIG FANS
Since 1995

Design A More Natural Environment

- ✓ A Consistent Breeze Improves Comfort, Health & Productivity
- ✓ Variable Speed Control Creates the Perfect Breeze
- ✓ Diameters Up to 24 Feet Add WOW Factor to Any Space
- ✓ Design Beautiful Form & Function with Custom Colors & Textures

More Selections From the Inventors of HVLS™ Fans

- ✓ NEW SIX Blade Series
- ✓ Choose from the Airvolution™ or MaxAir Series™
- ✓ Original TEN Blade Series
- ✓ Special Purpose and Custom Fans

Save Energy and Cut Costs Forever

- ✓ Big Fans Operate for Pennies an Hour
- ✓ Extend Cycle Times to Leverage Heat & Air Conditioning Systems
- ✓ Most Logical Alternative to Expensive HVAC Systems
- ✓ *Rebates Are Available for Our Energy Efficient Fans

1-866-668-3247

MacroAir
TECHNOLOGIES

SIZED 8 TO 24 FEET IN DIAMETER
CUSTOM FANS ARE AVAILABLE

www.macro-air.com

*Energy Efficient Equipment Rebates Vary by State
All rights reserved. © MacroAir Technologies LLC 2007



Accessibility can be restricted through exterior improvements like fencing, which prevents unwanted entrance, but still allows observation of surrounding areas.

'lazy S' design (to reduce the concealment of inappropriate behavior). Metal louvers are also added over windows to protect against vandalism and burglary.

Many school buildings in the United States are designed to achieve an inviting and open-campus style with multiple buildings, numerous entrances and exits, big windows, and certain opportunities for privacy. However, these design configurations are not inherently conducive to current security requirements. Unless there is an intensive program of safe management practices and a cohesive and collaborative school culture focused on safety, it is difficult to deter opportunities and fears of crime. Even with these necessary social and management programs, attention to basic CPTED design considerations is always advisable.

In addition to design strategies, involvement by parents, faculty, and students is critical to maintaining a safe environment. School officials hope to boost safety by encouraging parental involvement or by keeping facilities open past regular hours for theater groups, community meetings, adult education, sports, and other programs. This puts more adults on school property after hours, which can deter loitering and vandalism while instilling a sense of community ownership.

Site design

Since landscaping denotes school boundaries, accessibility can be restricted through edge conditions, along with established and naturally observed areas that are clearly defined in their use. Examples include territoriality/boundaries (e.g. perimeter fencing) and landscaping barriers (e.g. gates and fences), which restrict unwanted entrance and access.

The goal is to use these methods to permit observation of surrounding areas. Appropriate landscape trees and flowers can improve the aesthetics of these barriers. Trees should have a canopy taller than 2.4 m (8 ft) to allow unobstructed visibility below and permit pedestrian-level lighting. Bushes and ground cover should not exceed 0.8 m (2.5 ft) in height to prevent a person from hiding.

Planting choices vary greatly throughout the United States due to vast climate changes. For example, in south Florida, palm trees are used, whereas scrub brushes are common in the southwestern United States and oak and elm trees are common in the northeast. This author recommends consulting a landscape architect to specify flora best suited to a particular locale. It is critical design professionals understand planting solutions should not become future problems by providing places for an intruder to hide.

Likewise, a school's principal, supervisors, and/or administrative staff should have clear lines of sight to critical areas, such as the playground, places where students gather, and the parking lot. The ability to observe the exterior (e.g. parking and circulation areas) from classrooms is also





Adjustable vertical track straightens old or new wall surfaces

2" to 6" insulation optional

Built-in 1" rain screen allows ventilation

No separate foundation or brick sill is required

Corner returns optional

Featuring the patented Stofix® curtainwall leveling system designed for building re-cladding, ideal for new construction. The system allows for addition of up to 6" of insulation and has a built-in rain screen. Façade materials include the patented Stonel 'real' brick panel, granite, marble, limestone, sandstone, slate, metal panels, plaster or many additional façade materials being researched. One of the fastest curtainwall façades to install. Cuts time off of your construction schedule. The system can also be installed in severe weather conditions. The Stonel Systems is lightweight and Dry for a Lifetime.

Rain Screen Solutions

Stonel Inc.
www.stonelsystems.com
 Toll free: (866) 487-0953



an important design feature. When correctly laid out, these considerations may discourage intruders from trespassing or engaging in other illegal behavior due to the increased risk of detection, identification, and intervention.

Observing vehicular traffic and pedestrians is also central to the CPTED concept. As such, administrative spaces should have clear sightlines to entry roads and parking lots. Additionally, anyone entering a school area should never go undetected and vulnerable entries should be secured. Providing surveillance points to view potential problem areas (e.g. a common use stairwell) can increase safety and ensures several people can observe the space at any given time.

Another concept central to CPTED is preventing students from using exterior paths as informal gathering places. The areas beyond school or campus property are often not under the direct control or supervision of school personnel. These areas invite and attract unwanted or illegal behavior by students and most often, outsiders who loiter and/or trespass, and commit more serious offenses.

Bicycle racks should be placed in high visibility areas, such as the school's main entrance. Landscaping can be designed so that bicycles are screened, but views remain unrestricted (i.e. bushes and ground cover plantings should be maintained to less than 0.8 m [2.5 ft] in height so as not to obstruct visibility).

Traffic-calming considerations are also a factor when designing a school with CPTED features. Speeding can be deadly and parking lots should be designed with few or no 'long runs.' Straightaways should not exceed 46 m (150 ft) before the road curves or speed controls (e.g. humps or stipples) are located. Speed limits for school areas can range from 24 to 32 km/h (15 to 20 mph). However, the lack of straight paths prevents drivers from accelerating. Other traffic-calming methods include chicaning the road, narrowing the street width, and specifying roundabouts, road ripples, stop signs, speed bumps, flashing lights, and crosswalk signage.

Proper speed and stop signage must be installed and maintained, and bus pick up/drop off areas should not interfere with other traffic. Signs should announce intended and prohibited uses and must be clear, reasonably sized, and placed so they are easily viewed. Signage must comply with *Americans with Disabilities Act Accessibility Guidelines (ADAAG)* and be correctly mounted, rather than simply taped on.

Building design and interior spaces

Covered circulation ways must be designed with care. For example, blind spots and points of entrapment can be



Closed circuit television (CCTV) does not stop crime; it only records it. Still, cameras are a deterrent at school entrances.

minimized by specifying doors with a visual panel (e.g. glass lite), thereby eliminating 'door-in-the-face' incidents. Covered corridors should be designed to eliminate access to a structure's upper floors. This may require a roof with steep slope, security screening, or razors to prevent intruders or vandals from climbing the structures and gaining access.

CPTED's goal is to channel people through the designated main entry door. For example, devices such as weapons

Struggling With Roofing Specs?

Try GAF's SpecWizard™
and see how easy your next
roofing project can be.

Write complete, CSI-formatted
roofing specifications in just minutes!

Includes:

- Built-up roofing
- Modified bitumen roofing
- Single-ply roofing
- Roof restoration systems
- Shingle roofing



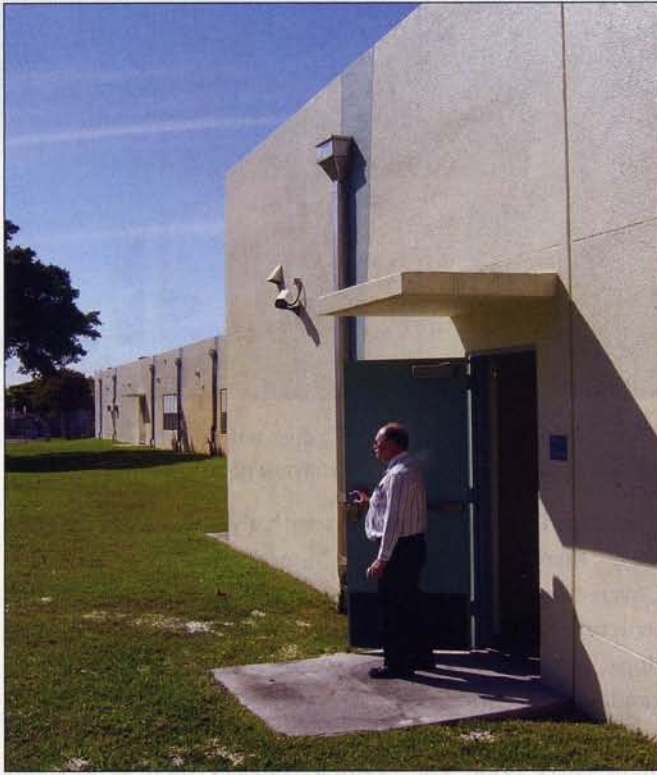
Exclusively at SpecCentral on
www.gaf.com

©2006 GAF Materials Corporation

CPTED 101

Successful school security begins with:

- effectiveness of security design and programs;
- affordability of security programs and features;
- acceptability of security technology and practices;
- identification of assets worthy of being protected;
- definition of areas or property vulnerable to attack and loss; and
- characterization of the environment and balancing needs to threats. ♥



When designing for safer schools, it is not enough to simply specify state-of-the-art equipment. Practical thinking is crucial in ensuring systems operate as intended. In the above scenario, the security camera is being blocked by the door.

detectors can be used to increase security to a school's main entrance. Access to other areas from these entryways should be carefully planned, directing visitors past a supervised space. The potential for visitors to get confused and lost should be limited by having color-coded hallways or good signage to direct people to offices or classrooms.

Many schools have intersecting hallways with insufficient wayfinding graphics and multiple entryways, which can cause confusion. Additionally, the latter can provide ambush points or areas where an intruder may lie in wait. In any case, all exits should be alarmed with position switches, alerting security or administrators to an open secondary or fire exit door.⁴

Special access areas (e.g. roofs) require careful attention to detail to be secure, while also allowing quick and effortless access for maintenance staff. Other areas, such as electrical or mechanical rooms, should be located so they are not in danger of being compromised.

Blind spots

Recessed entries or blind spots should be avoided. When they are demanded by the configuration of a building, corners can

be tapered by 45 degrees to allow the eye to see around a corner and avoid an ambush situation. Mirrors can also be used, although they are not as effective since most people do not pay enough attention to use them.

The characteristics of a wall directly influence the potential for crime. Walls enclosing utilities, dumpsters, and unusual architectural elements must be carefully designed to minimize blind spots and hiding areas. Where unavoidable, these higher risk areas should be well lit and have ample space around them so as to not attract people. In exterior situations, landscaping and plantings along walls should reduce hiding areas, rather than produce them. Use of thorny vines and brush can deter vandals from tagging a wall or painting graffiti. Walls located in high vandalism areas (e.g. gymnasiums, storage areas, or any surface without windows or opportunity for natural surveillance) should be constructed of durable material resistant to graffiti.

Restrooms

Restrooms should have recessed entries or blocked lines of sight to the toilet areas. However, having an opening that allows sound and smell of smoke to be transmitted to the hallway deters many illegal or inappropriate behaviors. One such opening is a 'lazy S,' which uses no doors or hardware and provides required visual shielding of restrooms, while allowing auditory monitoring.

Doors

Doorway and corridor design should safely coexist, not create hazards. Recessed doorways can create dangerous blind spots if poorly designed. To alert a user to a person on the other side of a door and prevent accidents, openings should be flush to the hallway, swing 180 degrees, and not require an alcove.

Any door is a critical point of access, making lighting, signage, hardware, and observation key elements to their placement and design. Doors are typically checked by school

resource officers or campus police/security staff on their daily rounds. These openings are usually hollow metal doors with an Underwriters Laboratories (UL) rating for fire resistance. Additionally, they should have fire-rated vision panels, door closers, and bumpers, which prevent slamming or scratching of walls when opened. Lighting at entrances should comply with Illumination Engineering Society of North America (IESNA) guidelines and standards.

Courtyards

A poorly designed courtyard is out of the view of faculty and staff and/or has tall bushes, which can provide shielding for inappropriate activities. In contrast, a well-designed area has good natural surveillance and takes students and users off the main circulation path where they can sit and relax. There should be no doubt where people should gather while on school grounds. The placement of benches and seating areas draws users to these intended areas.

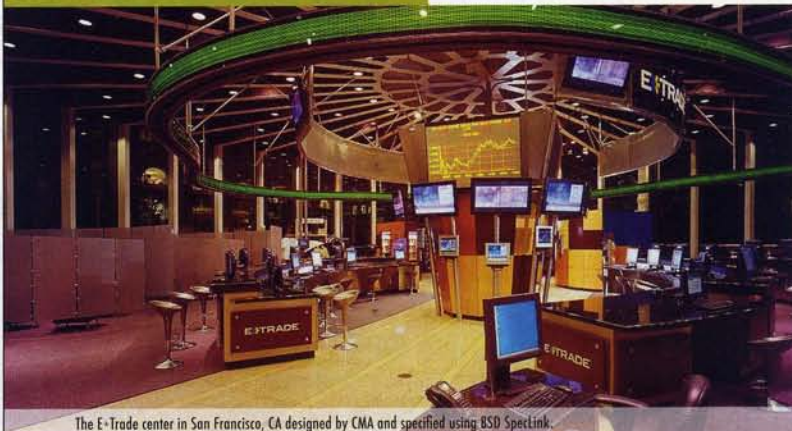
Screens and windows

Screens provide physical access barriers to windows and walls, and offers privacy where needed. It is critical design professionals ensure these barriers do not negatively affect ventilation. Screening for windows should be sturdy enough to resist easy cutting, while the mesh should be small enough to resist climbing. Any kind of grilling placed over windows should also comply with life safety codes that require emergency egress in the event of a fire. Therefore, release latches on the inside of the screening should allow for fire escape, yet remain burglar-resistant from the outside. Decorative materials can be used for aesthetic purposes, but walls must be designed in a way to make climbing impossible.

Rather than specifying a large glazed opening, groupings of smaller windows can provide similar ventilation and natural lighting, while increasing security. Their smaller size makes it

difficult for intruders to crawl through or remove school property. Clerestory windows provide multiple functions with high security benefits. The goal is to allow light, ventilation, and protect privacy, while preventing easy entry. When combined with clerestory windows, glass blocks minimize wall penetrations while providing good security, ventilation, and natural lighting. However, while this type of opening affords greater privacy, it comes at the cost of

**BSD SpecLink Significantly
Reduces Spec Production
Time at CMA**



The E-Trade center in San Francisco, CA designed by CMA and specified using BSD SpecLink.

**Setting Higher
Standards for
Master Guide
Specification
Software**

**Call Us Today at
1-888-BSD-SOFT
1-888-273-7638**

**or visit our website at
www.bssoftlink.com**

"As a result of using SpecLink, we have reduced our RFIs by 60-70% and our spec production time by 50-70% depending on the project type."

Sam Austin, AIA, Senior Project Manager, CMA

Call today to learn how
BSD SpecLink can help you:

- Dramatically speed-up editing tasks
- Reduce specification production time while minimizing errors and omissions
- Update automatically without disruption each quarter

BSD
Building Systems Design, Inc.

A Strategic Partner of 

functional observation when the blocks are not transparent. If windows have steel or metal jalousies that close, these products must engage in the window frame so as not to be pried open, exposing the glass to breakage and interior spaces to vandalism and theft.

Systems and equipment

Closed circuit television (CCTV) recording time-lapsed digital images should operate continuously and be placed strategically at entrances, exits, and hallways. It is critical videotapes are regularly analyzed and archived in case they are required at a later date should a crime take place within their line of sight. However, there can be an over-reliance on technology. Security and school resource officers are typically understaffed and institutions may depend on cameras to make up for the lack of sufficient personnel.

Cameras do not stop crime, they merely record it. CPTED is about trying to design the environment in such a way that it signals illegal or inappropriate behavior. These design considerations may prevent a crime by making the risk of being observed, identified, challenged,

and caught too high for the gain. At the same time though, some kids committing school crimes are trying to have their moment of fame on video and unfortunately, CCTV provides them with their perceived chance at immortality. Thus, cameras should be low-profile (e.g. small, hidden, or unobtrusive), concealed from view in exit signs, placed in domes with smoked or darkened glass, or built into devices or finishes that make them almost invisible to the casual observer.

Duress alarms (or panic buttons) provide security in isolated areas (e.g. restrooms and locker areas) and should be integrated with other security systems, such as fire alarms and CCTV. Additionally, periphery observation and security checkpoints should have a clear and secure line of communication to main administrative areas.

While management plays a key role in CPTED, it is the designer's responsibility to ensure an area or space can be properly and sensibly managed. Once an efficient design is constructed, it is up to management to maintain a secure atmosphere. Several codes exist to help effectively manage and integrate security into school design. Florida's *Safe School*

Additional Information

Author

Randall I. Atlas, PhD, AIA, CPP, is vice president of Atlas Safety & Security Design and president of Counter Terror Design Inc. He is a registered architect, National Council of Architectural Registration Boards (NCARB)-certified, has a doctorate of criminology, and practices criminal justice architecture and environmental security design.

Atlas is a Certified Protection Professional (CPP) with the American Society of Industrial Security (ASIS) and is an educator for the Institute of Community Security and Public Safety (ICSPS) and the American Institute of Architects (AIA). He can be contacted via e-mail at ratlas@ix.netcom.com.

MasterFormat No.

08 10 00—Doors and Frames
08 50 00—Windows
08 70 00—Automatic Door Operators
26 56 00—Exterior Lighting
28 23 00—Video Surveillance
32 31 00—Fences and Gates
32 90 00—Planting

UniFormat No.

B2020—Exterior Windows
B2030—Exterior Doors
D5020—Exterior Building Lighting
D5030—Security Access and Surveillance
G2040—Fences and Gates
G2050—Landscaping

Key Words

Divisions 08, 26, 28, 32
Crime prevention through environmental design
Closed circuit television
Schools

Abstract

Crime prevention through environmental design (CPTED) is a powerful concept that may improve the productive use of space. For school projects, the related

architectural features, structural enhancements, and spatial definition can deter, detect, and delay potential violent offenders from entering campuses and buildings.

Act uses CPTED guidelines and security features in the architectural planning process of its facilities.⁵ Regardless of the jurisdiction, CPTED-trained architects working on new capital construction and renovation of existing buildings should be involved in building and site selection, along with plans and specification reviews.

Conclusion

Many school buildings in the United States have been constructed to achieve an inviting and open style. However, these design configurations are not always conducive to current security needs. In the past, deterring broken windows, burglary, and vandalism meant designing schools as fortresses, which resulted in buildings with almost no windows and prison-like enclaves.

Incorporating the principles and practices of CPTED in the design and remodeling of schools can contribute to the safety of these facilities, while reducing the citadel-like effects of a bunker mentality. Security technologies (e.g. cameras, sensors, weapons screening) can contribute to overall security, but not in all situations. It is critical designers do not undervalue the importance of good maintenance, construction, and design, along with a fair and equal management style of school operation. ♥

Notes

¹ This article is updated and adapted from a feature that appeared in *Campus Security Journal* in December 2002.

² See Mary W. Green's *The Appropriate and Effective Use of Security Technologies in U.S. Schools, A Guide for Practical School Security Applications*, Washington, D.C.: National Institute of Justice, U.S. Department of Justice (DOJ) (September).

³ See Del Stover's "High Schools or High-Tech Prisons?," *Education Digest*, vol. 60 (1994).

⁴ See this author's "The ABCs of CPTED," from the August 2002 issue of *Campus Safety Journal* and "Barry University Security: A CPTED Case Study," from the June 2002 *Campus Law Enforcement Journal*.

⁵ Safe School Design principles were incorporated into Section 423.8.8 of the 2001 *Florida Building Code (FBC)*. The 1993 CPTED guidelines were referenced in that provision and their availability was promoted through Florida Department of Education (DOE) sources, including its Internet site. Pursuant to Chapter 120, Florida Statutes, in January 2001, the State Requirement for Educational Facilities (SREF), which contained the Safe School Design provisions, was incorporated into the state's *Uniform Building Code for Public Educational Facilities Construction (UBC)*.

CSI AudioCast

Construction Specifications Institute Podcast



CSI AudioCasts

Hear fresh construction industry news, best practice from experienced professionals, and the latest about CSI's construction document standards and formats.

Listen now!
audio.csinet.org

Attention students & educators!

CSI AudioCast's are perfect for a peek into real-life practice!

The Construction Specifications Institute • 99 Canal Center Plaza, Suite 300 • Alexandria, VA 22314
800-689-2900 • Fax 703-684-0465 • csi@csinet.org