

# CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN AND SECURITY TECHNOLOGY FOR SCHOOLS <sup>1</sup>

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## Introduction

The physical structure of a school should be both safe and inviting. Children who feel safe are both psychologically and physiologically more receptive to learning. Most schools will never experience a shooting, but they will very likely have to deal with bullying, custody battles, drug dealing, gang activity, theft or extreme weather. Often, changes to the physical structure can help mitigate these types of problems, but determining what changes to make can be complicated. A comprehensive examination of site weaknesses must occur before an effective solution can be put in place. Such a broad examination falls under the field known as Crime Prevention through Environmental Design (CPTED). CPTED is the broad study and design of environments to encourage desirable behavior, heighten functionality and decrease antisocial behavior. Fundamental CPTED emphasizes physical design, while advanced, or “second generation” CPTED, addresses the affective, psychological and sociological environment. This guide emphasizes CPTED fundamentals.

## Basic Concepts

Fundamental CPTED is built on natural surveillance, natural access control and territoriality. Natural surveillance is the capacity to see what's occurring without having to take special measures. Natural access control is the capacity to limit who can gain entry to a facility, and how. Territoriality is the capacity to establish authority over an environment, clarifying who is in charge, who belongs, and who is trespassing.

## CPTED Planning: Key Questions

Although the fine details of safe school planning can become overwhelmingly complex, an excellent framework to start with can draw on the following eight questions:

1. What risks and opportunities do students encounter between home and school?
2. What risks and opportunities are posed in areas directly adjoining school property?
3. Can office staff observe approaching visitors before they reach the school entry?
4. Do staff members have the physical ability to stop visitors from entering?
5. How well can people see what's going on inside the school?
6. Do staff members have immediate lockdown capability in classrooms and other locations?
7. Is the overall school climate pro-social?
8. Are there identifiable or predictable trouble spots or high risk locations?

These questions are addressed in greater detail below:

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1. What risks and opportunities do students encounter between home and school? Regardless of school climate and architecture, if students traverse war zones to reach school, they are in danger. Even after reaching safe schools, high states of anxiety can compromise students' ability to learn.

*Solutions*

Provide students with safe routes to school. Arrange for trustworthy neighbors, volunteers, parents or police officers to provide a presence along the way, and to extend themselves to children in distress. Businesses and residents can work with police in establishing safe havens along the route into which children can retreat when they feel threatened, and where help is readily available.

2. What risks and opportunities are posed in areas directly adjoining school property? An offender looking for child victims can predict accessibility at these locations. Drug or alcohol outlets anywhere near a school increase the likelihood of substance-abuse fueled antisocial behavior.

*Solutions*

Build partnerships with neighbors. Neighbors are positioned to serve as critical eyes and ears for a school. Open up areas hidden from view. No security service can compete in terms of providing a continual presence, as well as in commitment to the neighborhood. Attend to conflicts. Ignoring a problem because it is technically off campus is short-sighted.

3. Can office staff observe approaching visitors before they reach the school entry? The office is the screening tool for most schools, expected to evaluate and direct visitors, bar undesirables, placate the disgruntled and generally solve problems. Most offices are poorly-sited to fulfill these roles.

*Solutions*

The office and window locations, reception desk and counter layout should give the receptionist wide views of the entry area, inside and outside.

4. Do staff members have the physical ability to stop visitors from entering? Even if staff can see intruders approaching, can they really do anything about it? Are the doors already locked as a matter of course once school starts? How quickly and easily can staff lock all entries? Can staff protect themselves as well as the student body, or are they simply set up to be the first victims?

*Solutions*

Strengthen the receptionist's ability to detect and stop potential offenders as follows:

- Secure all secondary entries making them alarmed emergency exits. This obliges all visitors to use the main entry. Electronic controls governing the front door empower the receptionist to immediately lock doors against a threat. Communication devices should make it possible to alert the entire school that a lockdown is in place.
- An entry vestibule could be added, adjacent to the main office. When visitors enter an entry vestibule, they physically cannot proceed further until cleared by the receptionist who controls all adjacent doors electronically.

5. How well can people see what's going on inside? Blind corners, alcoves and stairwells provide "cover," or hidden areas, for misbehavior.

*Solutions*

Provide direct, natural surveillance. Staff should be able to look up and see the source of a noise directly through openings or windows, or, indirectly, through mirrors or cameras.

6. Do staff members have immediate lockdown capability in classrooms and other locations? For every indoor location, how do people call for help, make themselves safe, or protect students? Any room might have to serve as a haven during a crisis. Unfortunately, most would be very difficult to lock down, and

only some have reliable communication devices. Most rooms will have outward opening doors. If the door is standing open during an emergency, a teacher will have to reach out into the hallway – which could be a dangerous location, with bullets flying – to pull the door closed. Even worse, she may have to insert a key on the outer, hallway side in order to lock the door. That means she will have to step into the hallway, extract a key ring, find the correct key and insert it into the lock – possibly while shots are being fired.

Entrapment is also a risk. If an intruder blocks the classroom door, students will need a secondary escape route.

### *Solutions*

- Every room should be evaluated as a potential safe haven. It should be possible to easily lock the door during a crisis without entering a danger zone.
- Each room should contain a reliable communication device. The office needs the ability to tell everyone, immediately, to lock down, relocate or evacuate.
- Each location in the school will provide unique opportunities and challenges as safe havens. Hallways are sometimes too vulnerable to internal threats, in which case students will be better off retreating to a more enclosable space. Libraries can serve well only if securable, with thick furniture and piles of books offering protection. Gymnasiums rarely have communication devices in them or quick means by which to secure doors. Panic-bars are usually secured with hex keys, and only one or two staff members usually carry these keys. Solutions include wider distribution of the key (and practice using it) or retrofitting the panic-bars with conventional keys on the inside. Each room should be examined to determine where best to "take cover," or hide from flying bullets.
- Escape routes also have to be considered, using emergency doors or windows.

7. Is the overall school climate pro-social? The dangers of an anti-social school climate far outweigh the benefits of a pro-social physical environment. In the extreme, a highly secure but affectively toxic school resembles nothing more than a prison.

### *Solutions*

Establish an overall pro-social behavior management plan for the school. Have a clear flow chart of preventive actions, crisis intervention and remediation that staff can easily follow. If the same concepts are taught to all staff and students, they are more likely to be accepted and followed. If staff all know their responsibilities when misbehavior arises, problems are less likely to fall through the cracks or escalate into larger crises.

8. Are there identifiable or predictable trouble spots or high risk locations? Students often identify the entrance, any hallway or stairs, parts of the cafeteria and restrooms as hotspots. Each of these locations merits individual attention.

### **Parking Lots and Bus Stops**

Conflicts often erupt in parking lots and at bus stops. Cars provide convenient, hidden areas for illicit behavior. Closed car doors muffle sound, and activity in one car can be camouflaged in a sea of other vehicles. Students anxious to escape after school jostle with each other for limited space at bus pickup areas. Normal traffic-related conflict between buses, cars, bicycles and pedestrians compounds the potential for violence or accidents. Crime on buses, including hijacking, can be a concern as well.

As the demand for parking exceeds available space, new parking areas surface, officially or unofficially. When this occurs, the pedestrian flow may shift to a secondary entrance. If the administration ignores this new reality, the office can become dysfunctional as a gate keeper. If, on the other hand, the secondary entrance remains locked and students are forced to walk a

considerable distance to the main entrance, they may be at risk of victimization along the way.

#### *Solutions*

Contain parking within a compact, easy-to-patrol area. Investigate vehicles that circumvent this restriction. Require registration stickers for all students' vehicles, and keep records of license plate numbers and vehicle descriptions, to make identification easier. Enclose parking lots with fencing, to restrict access by offenders. At the same time, leave escape routes for pedestrians, to avoid entrapment.

Another possibility is to assign parking spots. This makes a trespasser's vehicle stand out. CPTED principles call for avoiding the use of "dead" walls adjacent to parking lots, using windows or openings to improve visibility. In addition, the alignment of rows of parked cars can be designed to enhance natural surveillance.

If parking shifts to a new location, and students start using the most convenient entry point, supply adequate controls and supervision at that point. This can replace the original office, or augment it during peak hours. Another option is to place another type of service at that location, such as the library, using the librarian as a gate keeper.

When all else fails, video surveillance and human patrolling can be added. For immense parking lots, emergency call buttons may be wise investments too.

### **Hallways**

Hallways suffer from a population explosion every forty five minutes. Hallway locker doors and locker owners create obstacles for pedestrian traffic, as do clusters of students. Staff members generally avoid hallways during these brief rush hours, and when they are present lack natural surveillance beyond the students closest at hand. A commotion at the far end of the hall is camouflaged by the chaos blocking the view. Overcrowding, combined with petty conflicts, can lead to violence.

#### *Solutions*

Wider spaces and otherwise unoccupied niches often act as social gathering spots. By selectively building these spaces out of the traffic flow, some of the congestion can be reduced. Lockers can be spread out, reducing conflict between neighboring locker users. Lockers can be moved to separate bays, but as with any isolated spot, if there is no natural surveillance over this area it is at risk. Where second stories exist, use them to provide natural surveillance for staff. Place staff break-rooms at appropriate locations to at least give the impression of surveillance – mirrored windows can leave students guessing as to whether or not they can be seen. Convex mirrors placed high improve surveillance over crowds and around corners. Where the architecture fails to enhance surveillance, cameras or human patrolling may be considered. Avoid allowing the line of sight to be blocked by vending machines or other obstacles. In many schools, classroom doors swing outward, due to fire codes. If doors remain ajar, jutting into the hallway, they may block natural surveillance along the length of the hall. Classrooms are more secure if doors are kept locked and shut. While they are open they should be opened fully, flush to the wall.

### **Stairwells**

Stairwells, like hallways, may suffer from intermittent congestion, alternating with periods of disuse. Stairwells are often hidden from view; fire doors may seal them off entirely. In between rush hours, stairwells can provide hidden areas, and fire doors can muffle sound. Stairs may be "travel predictors," which offenders can rely on to place victims in their paths

at certain times.

#### *Solutions*

The more open the stairway design, the better. Wherever solid walls are blocking surveillance, look for ways to install openings or windows. Exterior, isolated fire stairwells can be made safer by the extensive use of glass or wrought iron grates for exterior walls. Mirrors, cameras and patrolling are additional options.

### **Grounds**

Outdoor areas are extremely difficult to control. Especially if designed for multi-purpose use, territoriality is often vague – anyone who wants to is welcome to treat school grounds as open public space. Unfortunately, this can lead to visits from undesirables who put students at risk. If schools serve double duty as community centers and unofficial skateboard parks, nobody really knows who is in charge anymore. Landscaping and outbuildings can hide illicit activity, while outdoor shelters can become magnets for people with no better place to go. Playing field bathrooms are frequently problematic serving as illicit meeting places or predictable locations for cornering prey.

#### *Solutions*

Wrought-iron fencing is the territorial-marker and access control device of choice. It is extremely vandal resistant, and lacks enough surface space to attract graffiti. Although it's relatively expensive, it is a good long-term investment that enhances school image and climate, and leaves natural surveillance intact, while defining and controlling official entry points.

Heighten area definition to enhance territoriality. Invite students, service clubs and area residents to develop paths, swing sets, gardens, sandboxes, slides, wetlands, natural meadows, tennis courts, and amphitheaters, as well as traditional athletic fields. Student, neighbor or service group participation can give them a sense of ownership. If they subsequently see problems occurring on the site, they will be more likely to call authorities.

Amenities should be factored into grounds development. Driveways and service roads will be needed, but can attract unwelcome users if not controlled with gates, barricades and/or speed bumps. Large crowds for soccer tournaments generate parking overflow, litter and sanitation problems. They will need bathrooms, drinking water, and shelter. Benches or bleachers should also be considered. Boost natural surveillance of vulnerable amenities with non-glare lighting and clear sight-lines for neighbors.

Consider arranging for a resident caretaker – trade mobile home housing for an overnight presence. Video cameras and paid security represent two further possibilities.

### **Entry areas**

Entry areas are travel predictors and gathering spots. If security measures focus on visitors only after they enter the building, violence is more likely to occur before entering the school's locus of control, so internal security can, by default, push violence outside. Pedestrian traffic jams while waiting to clear a security checkpoint create a mass of unprotected potential victims, lingering outdoors. Student conflicts initiated inside school may erupt after parties exit the front doors. Snipers and drive-by shooters can anticipate easy prey before or after school, when crowds provide targets outside the main doors.

#### *Solutions*

Upgrade front office design to provide surveillance over the exterior entry area as well as the interior foyer and hallway. Reconsider any security measures that create vulnerable gathering

spots. If tight security at the entry point is required, consider staggering attendance times for each grade, thinning the crowd. Provide an adult presence wherever students congregate, and provide communication devices. Provide shelter for students waiting for rides or entry, with low walls or stanchions that can be used for protection, either from bullets or out of control vehicles. At the same time, take care to maintain natural lines of sight – don't build walls that block surveillance.

### **Breezeways**

Sprawling campuses often connect buildings with breezeways, which are cheaper than enclosed hallways, avoid violating code restrictions on building sizes, and may be viewed as aesthetic features. Regardless of motive, breezeways are unprotected travel predictors. They may be under-lit as well, and can lack natural surveillance. Even during rush hours, particularly in bad weather, staff members don't linger there. If surveillance cameras are used, bright daylight outside tunnel-like breezeways may backlight subjects, undermining picture quality.

#### *Solutions*

Enclose breezeways and connect buildings, shifting from a sprawling campus to more of a fortress design. At the same time, keep natural surveillance as strong as possible by using windows rather than solid walls. Seal off secondary entry points, such as breezeway entries, with fire doors. The doors should close and lock automatically. Staff should have keys or proximity cards. Doors should be staffed while open between classes.

### **Bathrooms**

Many students avoid using school bathrooms altogether for fear of bullying or other antisocial behavior. Bathrooms are frequently located in isolated corners of buildings, out of view. Occasionally they are also near secondary entries, providing opportunities for unobserved trespassers and easy exits. Double door entries muffle typical bathroom noises, but they also muffle cries for help, sounds of assaults or vandalism, and the drift of cigarette smoke. Toilet stalls provide even greater privacy.

#### *Solutions*

Install bathrooms adjacent to supervised areas, within line of sight of school staff. Maze entries should replace double door entries, for many reasons: alarming sounds are more apt to be noticed from outside; escaping from predators is much easier; offenders cannot count on the sound of the outer door opening to warn them when an authority figure is entering; cigarette smoke is no longer masked; and as an added benefit, fewer un-sanitized hands have to share the same door knob or plate. Regular maintenance is essential. Take back ownership of toilet stalls by painting over graffiti.

Many schools have had problems with several students gathering in one stall to sell or use drugs. When officials approach the area, students typically flush any evidence. Using magnetic latches on stall doors can make it harder for students to delay entry by officials. In addition, some schools avoid the use of drop ceilings, which can be used to hide contraband. Vandalism-resistant materials can be used for stall partitions. Most important, regular patrolling of school bathrooms is always required, no matter how thoughtful the design.

### **Cafeterias**

Cafeterias are predictable gathering spots. As a result, they can serve as attractive destination points for intruders bent on destruction.

#### *Solutions*

The greater the accessibility, the more vigilance is required. Escape routes are critical, as are

communication devices to call for help. If screening occurs at some distance from the cafeteria, there is less likelihood of an offender reaching this destination undetected.

### **School Size, Renovation and Rebuilding**

The larger the school, the more of a challenge it is to secure. Multiple entry points will require an equivalent number of guardians, or will compromise access control. A labyrinth of add-ons often incorporates numerous blind corners, creating hidden areas attractive for delinquent behavior, thus compromising natural surveillance.

Research makes a strong case for small schools in order to promote intimate learning communities, boost academic performance, improve the likelihood of personal connections, reduce isolation and achievement gaps, build group cohesion, and make staff coordination easier, as well as to improve school safety.

Many schools do not or cannot accommodate these limitations. In those cases, a number of options can be considered. Converting excess doors into alarmed emergency exits, sealing off under-utilized school wings with accordion-style grates, recruiting volunteer hall monitors and installing surveillance cameras are some possibilities. Schedules can be staggered to reduce congestion in the hallways. Large schools can be divided into a number of smaller, specialized wings, houses, families, or schools-within-schools, focusing on arts, sciences, languages, trades, career exploration or other subjects. From a CPTED perspective, any arrangement that makes it easier for students to know each other and build bonds while enhancing staff surveillance and access control is a positive step.

## **Security Technology Overview**

Ideally, a school's physical structure should inherently provide adequate natural surveillance, access control and territoriality to minimize the need for technological fixes. Unfortunately, this ideal structure rarely exists; enhancements are usually necessary. These may take the form of short-term fixes, major remodeling, extra staffing, or electronic technology.

New technology has a lot to offer, but identifying which specific make, model or system to use requires very up-to-date research. Installers and system integrators who can provide solid references, and who are currently active in the field, may be the best sources of up-to-date information on state-of-the-art equipment.

### **Communication Devices**

Telephones, radios, cell phones, intercoms, public address systems and pagers are sensible, technological fixes. Trouble can occur anywhere on or near campus. If staff can immediately call for help, damage can be contained.

Annunciators are lights or buzzers indicating open doors. They can alert staff at a central console when a secondary or emergency door has been opened. Augmented with cameras, these allow staff to remotely observe behavior, and to quickly respond.

Alarms triggered by smoke or flame, or set off by manually operated pull stations, are required by fire code. More sophisticated systems can also send messages to a central receiving station, pinpointing the location of a problem. Panic button alarms can be built into intercoms or worn as pendants. Combination identification/location alarms identify, locate and track people using them. "Smart" cameras (discussed shortly) can recognize specific shapes or movements, such as a person falling down, and trigger alarms.

Emergency Notification products are quickly becoming commonplace. A number of companies offer mass communication services and technology for schools and communities.

Personal Digital Assistants (PDAs) can be used for tracking data, sending messages, and in some cases pulling up live video images from cameras linked to a school network or an internet protocol (IP) address.

### Access Control Technology

The access control field has been evolving at a break-neck pace over the past decade, and shows no sign of letting up. Reliance on conventional keys is likely to fade – but by no means disappear – as more sophisticated options become more affordable. Conventional keys can be lost, copied or stolen, at which point there is no access control. They will still be needed for emergency use in the foreseeable future, but may become backup devices rather than primary access methods. Electronic devices such as swipe cards, proximity cards, coded entries, fingerprint scanners or facial recognition technology offer far better control.

### Weapons Detectors

Metal detectors, wands, portals, and X-ray machines have drawn some media attention as potential solutions, particularly for high crime schools, but are unpopular with most schools across the country.

### Surveillance Technology

Surveillance cameras have come a long way over the past few years, with the biggest change being a shift from analog to networked high definition cameras. The latter offer vastly superior picture quality, even when captured images are enlarged. Smart technology allows the cameras to be programmed to watch for certain behaviors, such as climbing a fence, and to then send an alert. Power-over-ethernet capability eliminates the need to run power cables, saving costs. Wireless technology similarly saves costs and enhances flexibility.

### Integrated Security Management Systems (ISMS)

The most dramatic school security changes evolving over recent years have involved an exponential growth in complexity and options for security technology. Those schools that invested in cameras, alarms and other devices, have served well as testing grounds, learning valuable lessons. Take advantage of their wealth of information about what has worked and what has not, especially in your area. Before investing in new gear, carefully diagnose your schools concerns, including: (1) what are common problems needing to be addressed, (i.e. bullying or snow storms) and (2) what are uncommon problems that you want to preemptively address (i.e. school shootings or levees breaking). For all of these,

- Brainstorm solutions. These could be structural or technological, or could involve staffing or behavioral changes.
- Research what others have done to alleviate these concerns.
- Always come back to examining how your proposed solutions would mitigate the specific problems on your list. Sample school problems and possible responses are presented in Table 1 (next page).

Table 1. Illustrations of concerns, objectives, and possible solutions

Concerns and Objectives	Possible Solutions
There have been a number of fights in the cafeteria. How can we address that?	<ul style="list-style-type: none"> <li>Reduce congestion at doors – mark doors as entrances or exits.</li> <li>Improve ambience of cafeteria. Use tablecloths and lower lighting levels.</li> <li>Hang curtains to absorb sound. Play calming, classical music.</li> <li>Establish a culinary institute, run partly by students. Let them run one part of the cafeteria like a restaurant, accessible only to students who behave.</li> <li>Serve meals at tables, rather than having students competing for space in line.</li> <li>Provide secondary dining locations, in order to form smaller groups that eat together.</li> <li>Assign students to seating areas.</li> <li>Have staff eat with students in small groups.</li> <li>Have conflicting groups eat at separate times.</li> <li>Install surveillance cameras.</li> <li>Post and enforce rules.</li> <li>Increase supervision.</li> </ul>
Tornados wreaked havoc in a neighboring district last year. How can we prepare for extreme weather events?	<ul style="list-style-type: none"> <li>Prepare to serve as an emergency shelter.</li> <li>Attach shelves to walls in all rooms.</li> <li>Build shutters for windows facing bay.</li> <li>Mark emergency shelter locations.</li> <li>Practice emergency evacuation.</li> <li>Clear out basement so it can be used for shelter in an emergency.</li> <li>Install back-up generator and lights.</li> <li>Store emergency supplies.</li> <li>Prepare emergency communication system. (see next item.)</li> </ul>
After a serious car wreck last year, we weren't able to alert students, staff, parents or the media as rapidly as we would have liked. How can we rapidly communicate emergency messages to staff, students, parents, media, police, or district administration?	<ul style="list-style-type: none"> <li>Repair existing PA system.</li> <li>Install intercoms in rooms.</li> <li>Install phones in rooms.</li> <li>Provide PDAs for all staff.</li> <li>Provide cell phones for all staff.</li> <li>Provide radios for all staff.</li> <li>Provide electronic displays at key locations.</li> <li>Automate media releases.</li> <li>Pre-program fax machine for mass distribution.</li> <li>Investigate emergency mass transmission software and services.</li> <li>Install wireless routers throughout campus.</li> <li>Create group email and text message lists.</li> <li>Create pre-recorded emergency messages, triggered by alarms.</li> <li>Identify zones in school and community where electronic communications won't work.</li> </ul>

Sometimes, problems can be addressed piecemeal. If a school is unlikely to install anything beyond a basic four camera security system, that's relatively simple and can be installed as a stand-alone device. However, problems frequently result when the solutions accumulate in a patchwork manner over time – especially technological solutions. There comes a point when a school is much better off integrating technological solutions into a cohesive system. For example, if your school wants smoke detector alarms, open-door annunciators, video surveillance over multiple locations, emergency lock down buttons, proximity card access control devices on particular doors and emergency call boxes in the parking lot, then an integrated system will

serve you best, maximizing efficiency and reliability. Integration assures software and hardware compatibility for all the involved technology, and keeps a lid on maintenance costs.

One obstacle to creating a good, integrated system is confusion about where to begin. Some of the biggest errors in this respect include the following:

- Starting with a solution (i.e. “let’s get some cameras”) before you’ve clearly identified the problem you’re trying to address.
- Emphasizing low bids (i.e. “great price on these cameras!”) rather than performance standards (i.e. the quality of the pictures or competence of the installers.)
- Being unclear about what hardware and software to use. A bid that requires a specific camera “or equivalent” risks ending up with something far from adequate.
- Providing sub-standard equipment for all schools, rather than quality equipment at fewer schools. In the long run, substandard equipment will be less reliable, harder to maintain and ultimately more expensive than the higher quality alternative. Gradually adding high quality equipment, rather than immediately adding low quality equipment, will be a better investment in the long run.

### **Safety Audits and Security Surveys**

Approaches to School Safety Audits can range from basic, in-house overviews to extensive projects drawing on grants and consultants. To find CPTED specialists, contact the author (<http://www.transcendingviolence.com>). Local police and security agencies may be able to help as well. A variety of checklists and surveys are available nationally. One of the most extensive is available for free download from the National Clearinghouse for Educational Facilities (<http://www.edfacilities.org>).

### **Conclusion**

CPTED is a key component of school safety planning. A well-protected site will require less staff time and energy to defend. This leaves instructors more time for teaching, and students more time for learning.