Creating a Safe Campus: The Power of Environmental Design

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The Power of Environmental Design

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At McMillan Pazdan Smith, we care deeply about how we shape our world and how we affect those living in it. An individual school is not the world; but it is the microcosm of it where our youngest and most vulnerable family, neighbors, and future citizens begin their journey. In this fragile and formative environment, generations are shaped in the mold we help create. And yet, the complexity of this issue requires a deft hand — potential pitfalls abound, from underestimating threats to overcompensating fortifications, from dismissing technological evolution to rejecting flexibility in favor of stability.

The path to a secure and enriching educational campus requires design solutions that find balance between robust security and individual freedom, that refuse to sacrifice the physical and emotional environment most conducive to learning, and that are rooted in the notion that this is truly something worth doing. **There are few issues more precious to us, or more enduring, than establishing true safety and security for our children.**

The growing unease over school security must be faced squarely, immediately, and comprehensively. This present, nationwide concern is unlike any experienced by previous generations. It demands specific, thoughtful, and integrated responses for personal safety measures. Educational facility design plays a significant role in meeting the challenges of safety and security. However, a designer's approach to safety and security must recognize that psychology, technology, and policy decisions must be integrated into any safety solution.

With over 55,900,000 students in approximately 132,800 schools [1] across the U.S., today's unique challenges and opportunities require a proactive and sensitive approach. To facilitate an overarching strategy for a safe campus that is both realistic and efficacious, an integrated approach must address three fundamental layers of security.

A LAYERED STRATEGY

- **DESIGN:** sensitive to functional and psychological needs

- **DESIGN + SYSTEMS:** appropriate product and systems integration

- **DESIGN + POLICIES:** reaching and exceeding educational performance objectives

Societally, education enables the next generation to contribute by preparing them for a future full of possibilities. Understanding that each student learns differently and is unique in terms of personality and talent, fundamentally underlays the design of an educational facility. The goal, then, of schools is to allow the most optimal environment to facilitate learning. By stepping back and considering how we plan facilities to meet this goal, and in so doing re-examining the very quality and character of school life, our resulting design must consider safety, security, and positive morale across the entire campus population as a functional and psychological programmatic need for positive educational outcomes.

Maslow's Pyramid:
If lower, more basic needs such as food, shelter and personal security are being met, a student won't particularly notice them. But, if they're not being met, anxiety and stress take over and can easily derail the most dedicated learner. **(2)**

"We have also found that a significant part of feeling safe at school is actually the absence of overt security measures, which signify that there is reason to be afraid."

self actualization
achieving individual potential

esteems needs:
feeling accomplishment

belonging needs:
finding affiliation, acceptance, affection

safety needs:
creating security, physiological safety

physiological needs:
having food, water, warmth, rest

(3)

Understanding how design impacts educational outcomes begins at the fabric of the school campus: the function of each space within a building taken together with the social networks that connect students to one another and to adults. **(4)** Creating a positive school culture encourages thoughtful behaviors beyond the hours of the school day. Ultimately, this drives the development of the physical school environment. It is this type of community-based architecture — the highest good for the greatest number — that provides the key to achieving success in shaping safer campuses.

There is clear evidence of a distinct relationship between a positive school culture that embraces these social networks and a higher natural level of school safety. A supportive learning environment creates a feeling of safety. This in turn allows students to advance beyond "basic needs" and progress towards satisfaction, fulfillment, and self-worth.

We have also found that a significant part of feeling safe at school is actually the absence of overt security measures, which signify that there is reason to be afraid. Schools are active centers of the communities they serve. For schools to continue to play this role, it is necessary to make the school environment safe without making it look like a walled-in fortification. When the entire design of a building supports the social networks in place, the students will have a positive sense of attachment and engagement with the school itself, and ultimately, a path toward higher achievements.

Design: How can design respond sensitively to both functional and psychological needs?

As we begin to examine how the built environment can positively impact the psychological landscape of a student population, the national building design standard CPTED (Crime Prevention Through Environmental Design) provides us with one framework — "a multidisciplinary approach to deterring criminal behavior that focuses on changing how places are laid out, and how they look and feel." [5]

CPTED goes well beyond traditional approaches to protecting the school environment by engaging covert surveillance, strict access control, and territorial reinforcement in a way that presents a psychological deterrent to those who either should not be on the school site or plan to engage in criminal activity of some sort. Simply stated, these principles can be addressed at three distinct levels of environmental design: Site, Layout, and Materials.

CPTED PRINCIPLES 1 – 4

CPTED Principle 1: Natural Surveillance

"'See and be seen' is the overall goal when it comes to Crime Prevention Through Environmental Design, or CPTED, and natural surveillance. A person is less likely to commit a crime if they think someone will see them do it. Lighting and landscaping play important roles in Crime Prevention Through Environmental Design."

CPTED Principle 2: Natural Access Control

"Natural Access Control is more than a high block wall topped with barbed wire. CPTED utilizes the use of walkways, fences, lighting, signage, and landscape to clearly guide people and vehicles to and from the proper entrances. The goal with this CPTED principle is not necessarily to keep intruders out, but to direct the flow of people while decreasing the opportunity for crime."

CPTED Principle 3: Territorial Reinforcement

"Creating or extending a 'sphere of influence' by utilizing physical designs such as pavement treatments, landscaping, and signage that enable users of an area to develop a sense of proprietorship over it is the goal of this CPTED principle. Public areas are clearly distinguished from private ones. Potential trespassers perceive this control and are thereby discouraged."
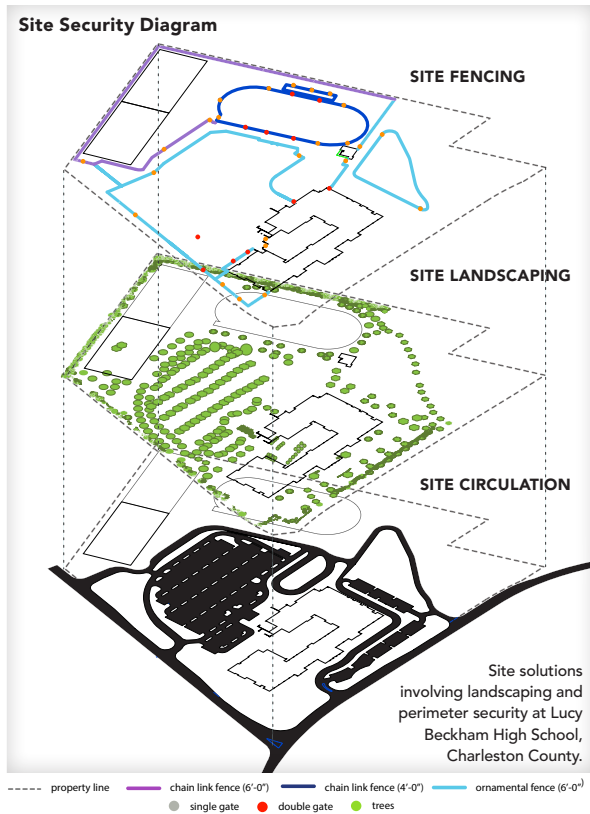
CPTED Principle 4: Maintenance

"CPTED and the 'Broken Window Theory' suggests that one "broken window" or nuisance, if allowed to exist, will lead to others and ultimately to the decline of an entire neighborhood. Neglected and poorly maintained properties are breeding grounds for criminal activity."

SITE DESIGN / CONTEXT

CPTED's concept of Territorial Reinforcement promotes social control through a variety of measures that support the clear definition of the boundary between the public and private spaces. The physical attributes of the building and grounds express the ownership of the property and provide reassurance to the school community. These strategies also allow staff members to recognize an outsider more quickly, by providing ample opportunities for legitimate users engaged in their day-to-day activities to observe the space around them.

In considering how the site can best support these distinctions, we begin with the site in its broadest context. Here, five key issues must be understood and integrated skillfully: landform, landscape, exterior lighting, sightlines, and glazing.

Site Security Diagram

SITE FENCING

SITE LANDSCAPING

SITE CIRCULATION

Site solutions involving landscaping and perimeter security at Lucy Beckham High School, Charleston County.

----- property line   —— chain link fence (6'-0")   —— chain link fence (4'-0")   —— ornamental fence (6'-0")
● single gate   ● double gate   ● trees

Lighting at Christ Church Episcopal School.

1) LANDFORM: When considered properly, the landform itself can offer a sense of comfort for school campus populations. Site grading should be straightforward without hills or valleys. A buffer between the building and the street, such as a curbed entry drive and parking lots, provides natural territorial elements that discourage entry by outsiders.

2) LANDSCAPE: Creative landscape design is attractive, but more importantly it is psychologically necessary to provide a sense of calm — it grounds the building as a part of that land by tying it to the site.

The site landscaping should be designed in a way that does not block sightlines or create hiding places behind or between plants. Maintain a certain distance between the building and landscape elements, limit trees to those that maintain slim trunks as they grow, and trim low branches to avoid blocking security cameras.

3) LIGHTING: Exterior building lighting should be adequate and consistent. Lighting entry plazas with a general glow provides safety to those entering or exiting the building. Spot or direct lighting onto the building face should be avoided, as it creates high-contrast "hot spots" that cast the areas between fixtures into relative darkness. All nooks and recesses should be well lit, as well as covered areas such as drop-off canopies and outdoor dining or play areas.

4) SIGHTLINES: Clear sightlines are essential for the design of the school, making everyone who comes onto school property immediately visible to the school staff. The building should present a simple architectural face to the community without large accessible nooks or recesses, facilitating oversight of everyone arriving on campus. The idea of the building set within the fabric of the community connects it to the whole, offering a further sense of belonging and protection. This is, in part, what we mean by community-based design.

5) GLAZING: Ample glazing in the building façade allows those inside to see outside and take advantage of the thoughtful and essential site elements already described. Though significant glazing may seem counterintuitive to security, it provides the critical transparency needed for the staff to maintain visual control, thwarting the ability of strangers to approach the school unobserved. The distinct advantages of daylight must also be weighed. Natural light is known to have a calming effect on the brain and negates the risks of deterioration of the academic, behavioral, social, and emotional health of the students.

Tinted glazing or window film can be used to restrict views into the building while allowing views out. Sliding whiteboards or blinds can provide quick and easy covering if ever necessary. "This strategy has been used successfully at schools such as the new Sandy Hook Elementary School, which is notable as much for what it is — a response to a terrible tragedy — as for what it isn't — a complete rethinking of school design." [6]

Clear Sightlines at Berkeley County, Philip Simmons High School.

Clear Sightlines at Berkeley County, Philip Simmons High School.

Glazing at Cooper School in Charleston, SC.

SITE DESIGN / TERRITORIAL REINFORCEMENT

Once we've considered the full extent of the site's context, we turn to the sequence of exterior spaces leading to access into the interior of the school. As a primary layer of defense, a progression of passive and active measures cohesively contributes to the idea of "Territorial Reinforcement." Four major design elements that determine how the facility can be approached include: fencing, parking illumination, pathways, and entry signs.
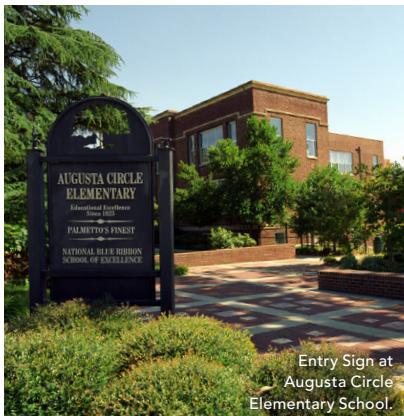

Fencing at Pine Street Elementary School.

Illuminated Parking at Sterling School.

Pathway at SC Governor's School for the Arts.

Entry Sign at Augusta Circle Elementary School.

1) FENCING: Property fencing should be high enough to prevent anyone from climbing it, yet it must also be very porous to avoid blocking views. Detention ponds can serve dual purposes by providing a layer of separation as well.

2) PARKING ILLUMINATION: Effective parking illumination goes beyond just adequate quantity and placement. Post-mounted LED parking lot lighting with solar power and hard-wired back up should be provided in each parking lot. The fixtures should focus the light down rather than out or up, to avoid excess light pollution and to focus the light where it is needed. All exterior lighting should be controlled by a timer with a sensor to provide lighting appropriately and avoid dependence on humans to control it.

3) PATHWAYS: Every pathway to the entrances and around the building should be lit with solar-powered, LED, bollard-style fixtures with hard-wired backup power. The only exception is in play yards, where these style of lights become tripping hazards for children. Landscaping again plays a role in secure design, as borders of native grasses and plants can be used to define the paths and direct pedestrians to the entrance. [7]

4) ENTRY SIGNS: Clear entry signage communicates how to appropriately navigate the site. Best practices include locating an internally lit monument sign near the main entry for vehicular traffic. In middle and high schools, there are typically multiple entrances for access to gymnasiums, theaters, and ball fields, and each entry should have appropriate signage. Additional signage on the building at the main entry will assist in clearly defining the entrance.

SCHOOL LAYOUT

As districts pay closer attention to how they secure their facilities, the physical layout is proving to be a vital part of the solution. Some of the key changes we see most directly affecting a campus' security include:

- **REMOVING PORTABLE CLASSROOMS** from the campus, ensuring students are within a properly secured facility at all times

- **SEPARATING PUBLIC ACCESS FACILITIES** like auditoriums or gymnasiums from academic wings either physically or via access control

- **RE-LOCATING PLAYGROUNDS** away from the street moves them further from potential access. Additional changes to how teachers monitor the perimeter further secures an outdoor, less secure space
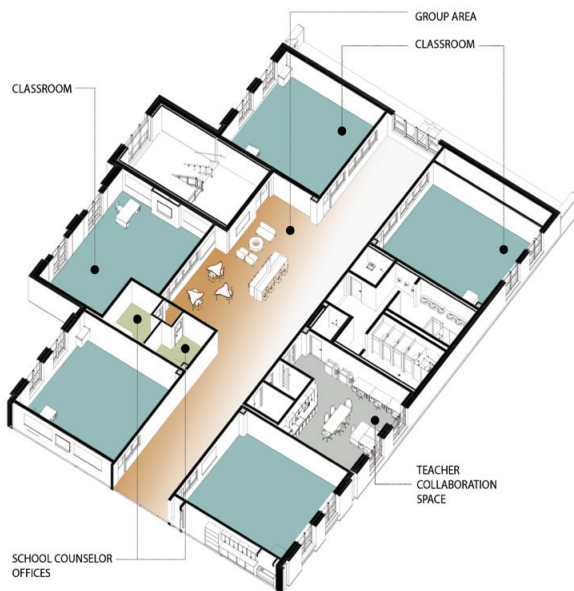
Security through teacher oversight

In designing a 21st century educational facility, spaces are expected to adapt to needs and offer maximum flexibility of use. New school designs offer clean layouts and open areas — no hiding places. They're planned to facilitate emergency procedures with control points and compartmentalized safe zones. Key aspects of this approach include: offices, sightlines, congregation spaces, and egress.

▶ **DECENTRALIZED STAFF OFFICES + WORKROOMS** located at corridor intersections provide much higher levels of adult oversight in hallways. Placing guidance counselors and mental health professionals in close proximity to students further increases their efficacy. Ultimately, this strategy promotes greater positive interactions between adults and students.

▶ **CLEAR SIGHTLINES THROUGHOUT THE BUILDING** allow teachers to spot threats quickly. While a worst-case intruder scenario is statistically unlikely, this greater visibility also reveals student bullying, a much more common threat.

▶ **IN AREAS WHERE STUDENTS CONGREGATE,** providing greater levels of adult presence leads to better security. Beyond the obvious hallways, cafeterias, auditoriums, and gymnasiums, other spaces this tactic can positively affect include enclosed areas like locker rooms and restrooms.

▶ **AMPLE AND OBVIOUS EGRESS** from the building is just as important as access into the building. In large group spaces, multiple exits facilitate better egress without incident. Wide hallways and proper alignment of interior and exterior windows offer easier visibility for managing evacuation. Secure courtyards provide alternative access to natural light and outdoor spaces without compromising security.

BUILDING MATERIALS

CPTED's 'Broken Window Theory' suggests that maintenance is a vital part of creating a secure and safe environment. A campus can be readily well-maintained due, in large part, to smart material selections.
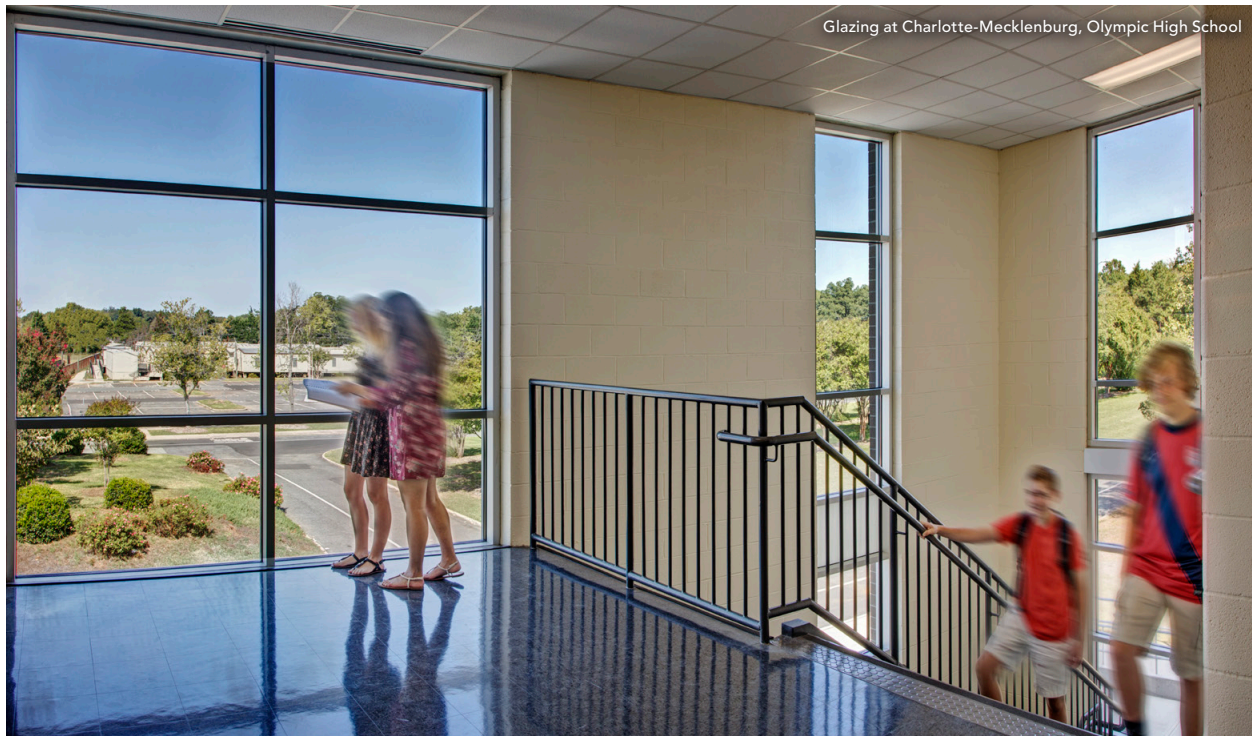
An experienced architectural firm will be adept at specifying durable materials proven to withstand the wear and tear by hundreds of students passing through the building for most months during the year. However, design teams today are paying attention not just to wear-resistant materials, but to threat-resistant materials.

In addition to materials that are generally considered for fire protection, occupant safety and health, and protection from natural hazards, special attention is required for materials resistant to "threats", as adversary actions are referred to by law enforcement. For example, choices for interior and exterior glazing, locksets,

and security systems require extensive research and coordination with local fire and police departments. [9]

Glazing is the most vulnerable material used in schools today, and yet, daylighting has well-documented physical and mental health benefits, and educational transparency has been proven to spark cross-curriculum learning inciting a more a well-rounded education. So, while we strongly advocate for an abundance of glass in all or most areas of the facility (entry sequence, classrooms, courtyards, etc.), we also recommend that specific performance criteria be met.

The term "bulletproof" is a misnomer; nothing is truly bulletproof. In reality, there are several grades of glazing options to be considered based on placement and intended use: bullet resistant, forced-entry rated, and blast resistant.

Glazing at Charlotte-Mecklenburg, Olympic High School

Glazing allows a variety of sightlines at Dr. Phinnize J. Fisher Middle School.

The capabilities of these materials vary widely. Some bullet resistant materials are also forced-entry rated, and some forced-entry rated materials are also blast resistant. But security glazing can be counterintuitive; a blast is a more powerful force, but a bullet will go right through most blast resistant windows. [8] Regardless of which grade of glazing is selected, the gypsum board surrounding it may prove to be less resistant than any of the options.

▶ **BULLET RESISTANT:** Bullet Resistant acrylic, laminated glass, and other bullet resistant materials such as window frames and doors, are meant to give the occupants time to evacuate the room via adequate escape paths. UL 752 is the testing standard for "bullet resisting equipment," resulting in a material with a specific UL rating that indicates the number of a specific caliber of bullets it is expected to stop. We caution the use of after-market "security film," as many of the available products don't live up to their claims. [8]

▶ **FORCED-ENTRY:** Forced-Entry rated glass meets UL 972 Standards. This glass is meant to slow, if not stop, attempted break-ins. The most common applications of this material are showroom and display windows, as well as the exterior windows of government offices and financial institutions. Some ballistic materials, especially laminated products,

also carry a forced-entry rating. However, it is not likely that a forced-entry rated material will also stop bullets or a blast. [8]

▶ **BLAST RESISTANT:** "Blast Resistant" glass is the most difficult to specify, partly because there are so many types of blasts and partly because blast rating standards are constantly evolving. The most reliable standard for blast resistant materials is the GSA/ISC Blast Resistance Criteria document, which is the only standard recognized by the US GSA (US General Services Administration.) [8]

There are instances in which considerations for one aspect of safety or sustainability may conflict with others. For example, bullet or blast resistant glazing may impede emergency egress in a fire, hence the need for an operable panel in exterior windows. LEED requirements for reducing light pollution may contradict the level of lighting considered necessary to make exterior spaces safe for users.

Conversely, site design and security can go hand in hand, as when the design of storm water management doubles as a vehicle barrier. Achieving the correct balance of materials and strategies to provide acceptable results requires a savvy architectural and consultant team. [9]

Design + Systems: How do the appropriate products and systems support the design?

In the quest to create a safer school campus, the environmental design is merely the foundation for a successful plan. Beyond the intelligent selection of site, layout and materials, the next critical layer is the application of security systems onto that environment, both physically and functionally.

To date, the most prevalent school safety systems are simply exterior door hardware and some level of security cameras. As the sophistication of these systems expands, the way they are integrated into a well-designed physical facility will determine their efficacy. They should be made mostly covert. They also require a careful balance between operational, technical, and physical resources.

- **Operational safety** = School Resource Officers

- **Technical safety** = system-wide camera surveillance

- **Physical safety** = locked doors and vehicle barriers

In many new and existing schools alike, the layout and procedures must hope for the best but anticipate the worst. This anticipation begins at the threshold — entrance to the site and to the building.

SAFETY SYSTEMS

A SECURE ENTRY VESTIBULE at the main entrance has become the expected processional into both existing and new facilities. This secure entrance alone can prevent unauthorized entry by presenting a positive security image as a deterrent, but if that is unsuccessful, the physical design will come into play.

SCREENING is an important operational entrance barrier. A multi-step check-in process with an intercom and video call box located outside the school ensures the main office can screen guests while they are still outside bullet resistant windows.

Visitors granted access then pass through the primary entrance into a similarly glazed vestibule which remains locked. There is a direct connection from this vestibule to only the administration suite. **PROOF OF IDENTIFICATION** is scanned for the issuance of a color-coded visitor badge, then the visitor is chaperoned through the building. Security cameras are in sight in the lobby to make visitors aware that safety precautions are being taken.

SECURITY CAMERAS in every part of campus allow video surveillance throughout and around the building. Monitoring of the cameras should be done by both the building administration and police in patrol cars. All exterior doors should have directional cameras and each corner of the building requires a camera. Exterior doors can be wired to send an alarm if they're propped open. Keyless doors with electronic locks allow first responders to rush in with an access card, as well as let administrators know who is in the building. **(10)**

PANIC BUTTONS should be located at the front desk and at other locations in the school such as in remote administrators' offices. Telephones should be provided in classrooms, offices and in any location where occupants will gather in an emergency. Then, an effective communication plan, coordinated with local emergency and first responder systems, can be applied across the facility.

In the event of a real or potential threat to the safety of the campus, all staff members and students should know their predetermined **SAFE LOCATION**. Typically, these would be spaces such as a small group room, office, or conference room, taking cover in either a corner of the room or up against a wall away from exterior windows. The doors in all these rooms, including classrooms, should be able to be locked from the inside. Operable windows should be provided for egress from every classroom as a precaution in case of emergency.

Design + Strategies: How do school policies affect whether the building will meet or exceed educational performance objectives?

We've seen that environmental design is more than just the physical building; it also addresses both the social and psychological interactions and implications of a space. In today's school culture, many of the greatest security concerns trace back to the issue of bullying. In 12 of 15 school shooting cases from the 1990's,[11] the shooters had a history of being bullied. There is ever-increasing research surrounding the very small number of bullied children who might retaliate through extremely violent measures.

Consider how the physical design of our schools together with the administrative policies of the school can help address bullying. **Clear sightlines** throughout the building allow teachers to oversee student interactions. A formal **Anti-Bullying Plan** that prohibits physical or psychological threats or actions against any student or teacher has also proven effective.

However, the strategic layer of this process must address more than just bullying. Every school should have a robust, comprehensive safety strategy that includes training, drills, preventative policies, and intervention procedures. It must embrace the social networks that are at the heart of excellence in education and work hand-in-glove with the physical architecture, security systems, and community partners to foster peace.

SAFETY STRATEGIES

▶ **LOCAL POLICE AND FIREFIGHTERS** are critical to the success of this layer. By scheduling regular meetings with local law enforcement, emergency preparedness is kept at the forefront of everyone's mind as an on-going effort. Periodically, have the school leadership team walk the building with the police and firefighters to review plans and go over the steps in the campus' emergency playbook.

▶ **LOCALIZE YOUR APPROACH.** Adopt training approaches only after your neighborhood police and firefighters have had the chance to vet them. Ensure that your teachers and staff have had appropriate training. Always review new strategies with local professionals, as training advice found on the internet may not be appropriate for your community, physical configuration, or specific situation.

▶ **LOCKDOWN AND EMERGENCY TRAINING** should be included in the on-boarding process for all new hires and anyone frequently in and around the building, such as volunteers, maintenance staff, and district administrators. This training should be accompanied by alternating drills for fire and active shooter on a regular schedule.

▶ **ENSURE TWO-WAY COMMUNICATION** with all teachers to let them know what's going on. "School districts yearn to learn about swifter evacuation tactics that involve reuniting students with their families much quicker in a crisis." **(10)**

▶ **MAINTAIN AND PROTECT RELATIONSHIPS** as thriving members of a nurturing school community. By providing comfortable social spaces that engage individuals according to their preferences and personal comfort levels, the built environment can facilitate a sense of belonging. This positive contribution to the school's social fabric ultimately reduces feelings of anxiety or alienation and creates a more peaceful environment.

▶ **ENCOURAGE MENTAL HEALTH AND WELLNESS.** School nurses and psychologists have been the traditional frontline team to address mental health issues. While they continue to play a critical role in this increasingly complicated area, many campuses and districts may begin considering a more robust approach. In some cases, a partnership with a local hospital for these services could significantly supplement the district's capabilities. Many times, local non-profit organizations also stand ready to contribute to the overall health of their community.

Across every aspect of this strategic layer, the application of technology is a growing theme. Each traditional element of a campus-wide safety plan can be augmented and enhanced today through data-driven "smart" capabilities. Intelligent, real-time tracking of students provides operational cost controls and behavioral insights. Spaces that conform to individual learning styles offer better outcomes. Bullying, often cyber-based as much as on-campus in nature, can be better anticipated, intercepted, and curtailed. **As these resources evolve at the pace of technology, our design approach must respond in kind.**

Conclusion

For years, American citizens with a deep and abiding concern for the future of education in our country have been on high alert in the wake of constant threats to school safety. We recognize that comprehensive, integrated, and systematic solutions must be sought after to address the multi-faceted set of problems that continue to lead to violent attacks on innocent people. By combining the promise of environmental design with the careful application of active security systems, all within an overarching umbrella of strategic measures, we can work together to achieve a culture of safety on campus.

As community-based architects, this problem demands our attention. We see very clearly our obligation to face this question squarely and thoughtfully while proposing an integrated approach to its solution. This is not an issue we can put off to another generation of architects, but rather a statement of what we value today as a society, and how we will protect the most vulnerable among us — our children. ■

CONTINUING THE CONVERSATION ABOUT SAFER SCHOOLS

Through a series of ongoing initiatives, McMillan Pazdan Smith Architecture continues to address this escalating crisis. Currently, our firm is actively engaged in:

- Hosting regular **Safety Dialogues** within the firm's **dedicated K-12 Studio** and with **external partners,** including landscape architects, product designers, engineers, and a variety of law enforcement and first responders to encourage deeper connections around campus safety topics

- Creating **roundtable discussions** and hosting **forums** among academic **leaders** and design professionals to foster conversation between our **clients,** our **peers,** and our **neighbors**

- Encouraging **collaboration** between the firm's Healthcare Studios and K-12 Studios to connect the latest **behavioral health research** to the K-12 campus plan

- Pursuing **data-driven results** that validate a cycle of **continuous improvement** within our K-12 portfolio

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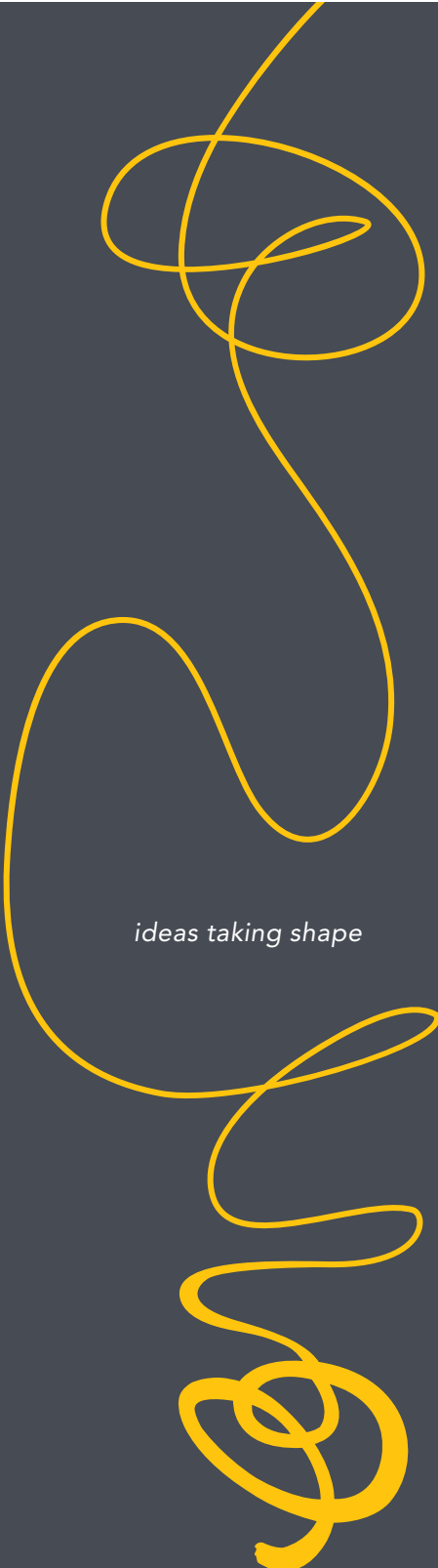
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