

CASE STUDY

Metal Detector Implementation in K-12 Educational Facilities



Introduction

The fact that you are reading a case study on school security is a good indicator that you already understand how important this topic is in today's society. The shock-grief-apathy cycle that has characterized our collective response to school shootings since the 1990s has broken down. Parents, thought leaders, and now students, are no longer willing to revert to the status quo soon after each new school tragedy. These increasingly vocal constituents are asking for change and putting pressure on school administrators and school boards to find solutions.

Furthermore, parents with school-aged children are tuning in to a difficult-to-defend inconsistency. When they attend a major sporting event or a concert, they participate in a simple yet effective screening process that involves bag checks and walk-through metal detectors in order to ensure the venue is secure and weapon-free. This makes sense given our collective experience with terrorism and other types of violence. When their kids walk into a school building, however, security seems to be an afterthought, or, even worse, nonexistent. This begs the question, "Is the safety of our students less important than the safety of our fans?" Of course not. And parents are noting the illogical nature of this discrepancy and are asking for change.

What can and should be done? First, it is important to note that a school is not the same as a stadium from a security standpoint. A stadium needs only manage perimeter and physical security to be safe and to fulfill its function. A school environment, however, is more complex from the standpoint of layout, and its physical security is highly correlated with the emotional and psy-

chological health of its students. It must concern itself with issues such as depression and bullying, and must provide resources to help shepherd students to healthy adulthood. Many of these functions and activities have an important role to play in creating a safe school environment, and significant resources can and should be devoted to them. On the occasions when these efforts fail, however, there must be a last line of defense that is sufficient to protect the school from violence. That's where improved perimeter security comes into play.

Background

The subject of this case study is a real school district (the "District") which became convinced that it had to quickly expand security at its school facilities. It also faced real limitations on the amount of time, money, and resources that were available to make those improvements. The reason for their sense of urgency was the fact that a school in the District had suffered a mass casualty shooting. At the time of the event, the District had a comprehensive security plan in place which included layers of security, adherence to state school safety protocols, training, drills, audits, and other useful features.

The teachers and administrators at this school district knew the students and cared for their emotional and physical needs. They did not overlook "red flags"



or warning signs. They weren't indifferent to security. In this case, the assailant, who was a student in the District, "flew under the radar", avoiding detection until the attack occurred.

Once the shock of the incident subsided, administrators, educators, and local officials began to work together to analyze their existing security protocols, make refinements to those measures that were already in place, and to plan to add a new layer of security, the hardening of the perimeter of the District's school facilities to provide a last line of defense against dangerous weapons.

Strategy and Objectives

In the aftermath of the school shooting, the District approached the issue of improving security from the perspective that it would do all that it could to prevent such an attack from ever happening again in one of its schools. This standard, which is actually the hope and expectation of every parent in every school district, had implications for what types of objectives related to perimeter security were needed.

First, every school in the District would need to be included, not just the high school. Second, screening would need to be done for all open entrances all day, every day while school is in session and open for extracurricular activities. Third, technologies, equipment, and screening procedures would be needed to quickly and effectively scan visitors and students to verify with certainty that no weapons were brought into a school.



If these three objectives could be met, school officials would have an elevated level of assurance that their "last line of defense" would be effective. In addition, a very important side benefit of ensuring a weapon-free environment for all schools in the District would be the emotional comfort afforded to returning students who had been traumatized by the violent events of the prior school year.

Facilities Planning

Fortified with clear objectives, leadership in the District and the community began working with administrators, faculty, and local law enforcement to plan the necessary improvements. State government, private companies, and concerned citizens also provided encouragement, funding, and expertise to assist in the effort. The resulting plan for seamless and efficient perimeter security included these elements:

- Reducing monitored building access to a small number of "open access" entrances on each campus (three entrances at the high school, two entrances at the middle school, and one entrance at each of the elementary schools)
- Monitoring the "closed access" entrances which were controlled using remotely-activated locks. This was done while taking fire safety building codes and regulations into account
- Adding audible alarms to each of the closed access entrances
- Monitoring all entrances continuously in real-time with security cameras and security personnel
- Making facilities modifications to some entrances which would be open access during school hours (These facilities projects were needed to accommodate new security equipment and procedures. Three of the eight open access entrances across the District required modifications; five were deemed sufficient to accommodate the new screening equipment and procedures.)
- Installing walk-through metal detectors at all open-access entrances
- Adding full-time security screeners to each campus in the district

- Increasing the number of law enforcement officers on campus during school hours
- Implementing screening procedures in consultation with security experts
- Clarifying dress code and ID badge guidelines for ease of identification and screening

A comprehensive plan to improve school perimeter security requires resources, changes in habits, and the willingness of groups and individuals to work together in ways they previously had not. The scope and scale of these changes may cause some school districts to be inclined towards delay or inaction. This is very unfortunate. It is noteworthy that school districts which experience incidents of violence often place a strong emphasis on upgrading their perimeter security in the aftermath. How much better would it be for all education leaders to proactively implement proven solutions to keep their schools weapon-free?

Equipment and Capacity Planning

Once their initial planning was complete, the District began consulting with a technology company which manufactures walk-through metal detectors (the “Manufacturer”). This began in early June, leading to discussions regarding ways walk-through metal detectors could help achieve the District’s objective of securing each school facility in the District.

Modern walk-through metal detectors are extremely well-suited to the needs of school perimeter security. They have high capacities, processing well over 500 students per detector per hour at the time of installation. In the days after installation, throughput increases to well over 500 students per hour as screeners learn how to screen more efficiently, and those being screened learn what not to pack and what not to wear in order to minimize the probability of causing an alarm due to bringing innocuous metal objects through the detector.

High quality metal detectors have features and accessories that are essential for use in K12 school environments. They have lockable casters for mobility, and are light enough to be easily moved in and out of position as the daily schedule requires. They can be operated on standard 120V power using power cords or

on battery power. The best batteries offer up to 10 hours of operating time and can be easily recharged overnight. If operated on 120V, batteries can be used as an uninterrupted power supply, keeping the equipment running in the case of a power disruption. These units may also be operated indoors or outdoors in all types of weather, and offer adjustable levels of sensitivity.

Selecting the right equipment involves choosing a manufacturer with excellent service and support who builds detectors under an ISO-certified quality system. Care should be taken to avoid counterfeit products or low-quality “knockoffs” as those products often lack the features that a school needs and the reliability that is necessary to make screening operations run efficiently.

An essential step of the planning for a successful school implementation is the site survey. Once the District’s plan was in place, a site assessment was done by the Manufacturer to identify the type and number of metal detectors that would be needed, and to give advice regarding procedures and implementation. The site assessment for four campuses took less than a day. The District provided the number of students to be served at each school facility, and an approximate break-out of how many of those students would typically enter each of the open access entrances during the morning arrival period. That data, along with the morning schedule, was all that was needed to estimate the number of metal detectors that would be needed at each entrance in order to use the available floor space efficiently while avoiding any “bottlenecks” at entrances to the buildings. No school administration can afford to institute security measures that create long lines and delays for students as they arrive to school. Fortunately, walk-through metal detectors have sufficient capacity to enable perimeter security to be “right-sized” to accommodate the arrival times and the numbers of students that must be processed.

The Manufacturer also gave guidance on the layout of the metal detectors at each open access entrance, as well as the number and layout of associated equipment such as hand-held scanners and screening tables. School administrators made adjustments to the recommendations as they saw fit to tailor the plans for each of their facilities.



In addition, the need to prevent a security gap at the closed access entrances had to be addressed. Screening would only be conducted at the open access entrances, but the possibility that a student would open a closed access entrance from the inside in order to accept a weapon that is staged or passed through from the outside could not be ignored. The solution to this problem is to implement video monitoring of those entrances and loud audible door alarms so that any such breach is immediately identified and investigated by trained security personnel.

With strong collaboration between the District and the Manufacturer, planning the equipment configuration and layout to ensure seamless security and efficient daily operations was both easy and effective.

Cost

Effective perimeter security for school facilities is affordable. High quality metal detector equipment and the related furniture and accessories typically cost between \$3,500 and \$4,000 per detector. The high school at the District required nine detectors to screen approximately 1,500 students at three open access entrances. The four campuses in the District required a total of 19 detectors.

A larger component of the total cost of perimeter security is the ongoing expense of personnel needed for screening and for law enforcement oversight. Those costs are driven by the number of detectors needed, the availability of school faculty to participate as screeners, the availability of qualified volunteers, and the prevailing wage rates in the district. It is worth noting that effective screening requires some training, but it does not require specialized skills that are expensive to acquire, and the bulk of the screening each day is done for less than an hour during the morning arrival period. After the morning bell rings, most open access entrances can be closed for the rest of the school day, and any additional traffic into the facility can be directed through a smaller number of open access entrances. In the case of the District, each facility decided to staff only one security checkpoint for the full school day, helping to control the cost of staffing.

The District was able to staff the security checkpoints with a combination of faculty and hired security screeners. In all, the District added five law enforcement officers and ten security screeners. The total annual cost of the additional personnel was approximately \$500,000.

Each metal detector required two screeners, and each open access entrance also required a “pacer” who was responsible to help regulate the flow of students into the walk-through area, and an armed law enforcement officer to monitor the screening area from behind the metal detectors. The law enforcement position is critical for dealing with any difficult situations, and to deal with any weapons or illegal items that might be found during the screening.

Modifications to open access entrance vestibules which are intended to facilitate perimeter security are usually optional, at least in the near term. Changing the size or orientation of an entrance may make the design and operation of the checkpoints easier, but most modifications for this purpose may be delayed until funding is available. The short-term solution to an inability to make extensive facility modifications is to spread the required metal detectors out over a larger number of open access entrances for the morning arrival period.

The number of open access entrances can be reduced in the future once the facility modifications have been

completed. At that time, metal detector equipment can be easily redeployed to the open access entrances where the modifications have been made. Nothing from the initial deployment need be wasted.

Installation and Training

Proper installation and training was needed to ensure the screening would be effective at maintaining a weapon-free school environment at each facility and to achieve a trouble-free launch of the new program. The District devoted resources alongside those of the Manufacturer to achieve this goal.

Installation was done two weeks before the first day of school in the new academic year. It took approximately one day to install nineteen metal detectors at four school facilities. At the same time, the equipment manufacturer trained law enforcement and building operations personnel on the setup and operation of the metal detectors. Administrators were also trained on the basics of the metal detection technology and on proper screening techniques.

Around the same time, the District began communicating with parents and students to describe the new security procedures and explain how they would impact students in terms of delays and arrival times the first week of school. Advice was also given to students regarding the actions they could take to help ensure smooth operations from the beginning. Information on the “Ideal Backpack™” was also communicated to parents to help them purchase the kinds of school supplies that would make screening operations more efficient. In hindsight, the Ideal Backpack™ concept could have been more fully leveraged by starting the communication earlier in the summer and by working with local retailers to promote the stocking of optimal school supply items. The communication campaign culminated with back-to-school meetings at the high school with students and parents that included a review of new procedures and a metal detector demonstration by the Manufacturer.

The final training of screeners and faculty was held a few days before the start of school. At this time, some students with backpacks were present to help demonstrate the procedures.

Screening Methods

The straightforward operation and high throughput of a walk-through metal detector makes scanning people very quick and easy. The part of the process that is time consuming is the screening of the bags that accompany the people. This is certainly true of a school environment, where virtually every student carries a bag of some type.

The District had two very important objectives which had implications for the type of screening procedures that would be needed for the inspection of bags:

- 1) Zero weapons missed, and
- 2) Minimal wait times at open access entrances

It is easy to see how these two objectives might work at counter-purposes. Achieving a “zero weapons missed” goal through a very thorough manual search of each bag could be time consuming, creating long lines. On the other hand, screening quickly or sampling some bags and not others could result in missing dangerous items. Fortunately there are options when it comes to screening procedures.

There are three methods of bag screening as it pertains to security checkpoints involving metal detectors in school environments:

1. Manual
2. Clear/mesh Bags
3. Ideal Backpack™

The manual method can be done with no prior communication or coordination with students. Simply stated, the manual method requires every bag to be checked by hand every time. The screeners are relied upon to find any and all weapons and to identify any false bottoms or hidden pockets which might conceal a weapon. After inspection, the checked bags are passed around the metal detector and thus are not screened by the metal detector equipment.

While this method can be effective, it has three significant drawbacks. 1) the amount of labor required to do 100% checks is higher than the other methods; 2) bag checkers must be skilled and very vigilant in order

to avoid missing items that have been intentionally or unintentionally hidden, and 3) the time required for each bag to be checked can be high, causing long lines in front of the security checkpoints.

Some venues including sporting arenas have tried to address the downside of performing manual bag checks by mandating clear/mesh bag policies. This method requires good communication with the entrants in advance of the event so that the right bags are brought (perhaps not a problem in a K12 school environment for students, but a more significant issue for visitors) and it also requires a “plan B” option such as a bag check facility for entrants who are unaware of the security procedure and bring bags that are not clear/mesh.

The value of clear/mesh bags is threefold: 1) they can be limited in size, 2) in most cases they can be screened visually without having to open them, and 3) they negate some common methods of concealment such as false bottoms or hidden pockets. As in the manual method, the clear/mesh bags are passed around the metal detectors and so do not get screened by the equipment. Clear/mesh bag policies can work well in K12 environments and would be helpful to speed inspections and reduce the number of labor hours per day that are needed to staff the security checkpoints. The drawbacks of a clear/mesh bag policy in K12 school environments are: 1) they inhibit the personal expression of the students, 2) they limit the amount of stuff a student can bring into the school (perhaps this is not a bad thing), and 3) they can expose personal items to public view. In general, clear/mesh bag policies are not popular with students or fans.

The method developed and recommended by the Manufacturer for K12 schools is the Ideal Backpack™ method. In K12 school environments this method requires up-front communication and coordination with students and their parents, but the initial investment in effort has a large payoff in terms of required labor and screening effectiveness. The basis for this method is the fact that most school supplies are available in forms that are completely or mostly non-metallic. For instance, a



These are examples of low-metal school supplies which can pass through a metal detector without alarming when the detector is properly calibrated to standard school settings.

metal three ring binder will cause a walk-through metal detector to alarm, but a similar, mostly-plastic binder will not.¹

With this awareness and a small amount of effort it is possible to select widely available school supplies (including scientific calculators and backpacks with metal zippers) that can pass through walk-through metal detectors without alarming. If the Ideal Backpack method is selected, students are encouraged to bring non-metallic school supplies in their non-alarming backpacks. When they arrive at the security checkpoint, they pull out any items that are known to contain detectable levels of metal for a visual inspection and to be passed around the detector. The student then carries his or her backpack, which contains the rest of their possessions inside it, through the walk-through metal detector. This greatly reduces the inspection burden while maximizing the effectiveness of the inspection. It also avoids an unnecessary limitation of student personal expression and privacy.

¹ Small amounts of metal such as jewelry or a set of keys can pass through a walk-through metal detector without alarming while using a program which is sensitive enough to alarm on simulated weapon test pieces and actual weapons including small handguns and knives.

The District chose the Ideal Backpack method and began communicating the policy and purchasing advice to parents and students during the back-to-school period.

Post-Alarm Screening

Once a person triggers an alarm on the walk-through, he or she must enter a secondary, post-alarm screening in order to identify the source of the alarm. There are two methods for performing the post-alarm screening:

- 1) Ask the individual to remove any metallic items in their possession and to walk back through the walk-through for a second try. The exit lights on the walk-through can be used by the screener to give the person an indication of where on their body the metal will be found. If the secondary screening fails, the person is asked to step aside for screening with a hand-held scanner. In a school environment, it is suggested that non-contact methods of manual screening be utilized for the secondary screening. In the unlikely even that these methods fail to identify an innocuous cause of the alarm, the situation should be passed off to the law enforcement officer for final disposition.
- 2) Skip the second pass through the walk-through metal detector and waive the person off to the hand-held screening area where the cause of the alarm is investigated using the procedure outlined above.

Which of these methods is best? That depends on the situation. If the demand at the security checkpoint is light, it is usually easier to ask the person to pass through the walk-through a second time (method 1 above). If demand is heavy, overall flow through the checkpoint may be improved by keeping the line moving through the walk-through and addressing the alarm in the hand-held screening area (method 2 above). A practical concern that should be addressed procedurally is to allow the individual who is moving to the hand-held screening area to retrieve his/her personal items to avoid the possibility of theft while they are distracted by the manual screening.



Staffing

There are four basic staffing roles that are needed for a well-functioning security checkpoint:

- 1) *Pacer*—one per checkpoint. This person is positioned at the entrance to the checkpoint upstream from the screening area. The purpose of this position is to encourage the orderly flow of students into the metal detector lines and to instruct/remind the students what to do to prepare to be screened. These instructions would include reminders to remove metal objects from pockets and from bags. In the case of the Ideal Backpack method, the pacer would also remind students to carry their bags through the metal detector after removing metal objects for inspection and pass-around. It is optimal to select a high-energy individual who knows the students to perform this function. Often coaches do well in this role, as they are used to motivating and instructing students to do physical tasks.

- 2) *Bag Check*—one per walk-through metal detector. This person performs the bag checks according to the bag check method that has been selected. In the case of the Ideal Backpack method, the bag checker is tasked with ensuring that the items that



are pulled out of each student's bag are safe for the school environment and are passed around the metal detector and retrieved without loss.

3) *Screener*—one per walk-through metal detector. This person tells each student when to enter the walk-through metal detector and monitors the detector for alarms. If the student does not alarm, the screener waives the student on to the item retrieval area to be reunited with their belongings. If the student alarms, the screener instructs them on how to participate in the post-alarm screening. An alert screener will use the alarm lights on the metal detector to advise the student of where on their body the metal object should be found. Once the secondary screening procedure has been performed in a satisfactory manner resulting in a clear identification of the reason for the alarm, the student is free to enter the school.

4) *Law Enforcement Officer*—one per checkpoint. The Manufacturer recommends that each security checkpoint have at least one licensed law enforcement officer to be present to handle uncooperative students and to deal with any weapons or illegal items that might be found during screening. This position is critical, as the other personnel at the security checkpoint may not be trained or equipped to handle security situations that are complicated or possibly tense.

At the District, the main entrance to the high school was outfitted with four walk-through metal detectors. This checkpoint was staffed with one pacer, one law enforcement officer, and a bag check/screener pair for each of the metal detectors, for a total of ten staff members. Security checkpoints at the middle school were staffed in the same way. The District chose not to screen students at the elementary schools but would instead screen all adult visitors. This resulted in a need for just one or two staff members at the elementary school facilities.

First Day Operations – What to Expect

A very important part of implementation is first day support. The Manufacturer recommends on-site first day support by skilled and experienced personnel for all K12 implementations. If first day mishaps and delays are minimized, the program will be judged to be successful and will retain community support. Take heart, the first day is the hardest. Program results normally improve each day for the first week or two. These improvements take the form of steady decreases in delays and disruptions.

In the case of the District, the three levels of school facilities (high school, middle school, and elementary school) implemented their new security procedures on three consecutive days. The Manufacturer sent a team to assist for the first three days of school, supporting the high school on day 1 at each of the three security checkpoints in the facility. On day 2, the same staff supported first day operations at the middle school while

also assisting at the high school on their second day of operations. On day 3, the staff supported the first day operations at the two elementary schools while also monitoring operations at the high school and the middle school.

On the first day, implementation staff should arrive at least thirty minutes before the doors open. The implementation staff should perform these duties:

- Review security checkpoint layout. This is needed to address any discrepancies to the implementation plan before the program goes live. This includes associated furniture and equipment such as bins, screening tables, floor mats, lane dividers, and hand-held metal detectors. All should be checked for functionality and placement in the security checkpoint area. Any items that are out of place can be relocated as necessary. Fortunately, walk-through metal detector equipment can be outfitted with casters so that it can be quickly and easily relocated.
- Review walk-through metal detector settings. This includes confirming the security program that is selected, sensitivity, counter settings, etc. Assume nothing. Check each setting.
- Review staffing. Make sure the required staffing is in place when the doors open. Ask the staff if they have any questions. Issue reminders or training tips as needed.
- Review equipment operation. Check the hand-held scanners to make sure they contain good batteries. Power up the walk-through metal detectors and check for unexpected interference and proper operation.

In the case of the District, the first day support received much attention from both school administration and the Manufacturer. A number of minor issues were found and addressed before the doors opened. At two of the three security checkpoints at the

high school, detectors were found to be interfering with one another, which was an indication that the detectors had been physically moved to a different sequence after they were initially installed. The solution for this problem is to simply move the units back into the correct order/position that they were in when they were initially calibrated. Once this was done, the equipment performed as expected. If this check had not been done before the doors opened, the arrival period would have been thrown into chaos.

In general, school administrators should anticipate the first day of operation to have some difficulty and they should prepare their faculty and the broader community for this likelihood. It is good practice to relax the beginning and the ending times of the arrival period and first academic period for the first week of operations. In addition to allowing 15-30 extra minutes for arrivals, the penalties for tardiness should also be suspended the first week of school.

This relaxation is helpful to both students and faculty as everyone learns their new roles. The District adopted this approach and it was effective at keeping frustrations in check during implementation. Be patient. Performance will improve day-by-day.

Learning Curve – Week One Efficiency Improvements

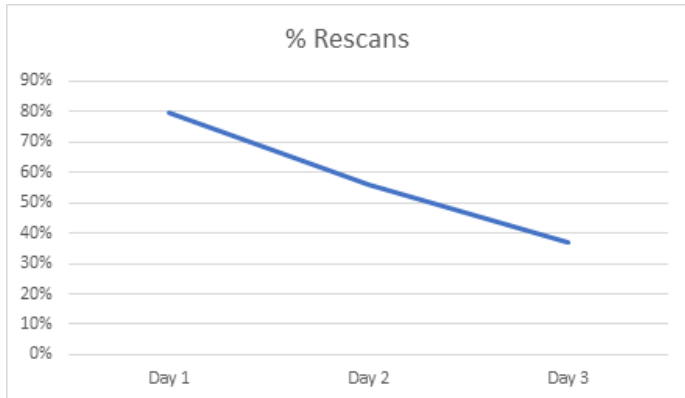
During the first week of school at the District, data was collected to measure the performance of the program for the first few days. This real-world data is indicative of the performance that should be expected for a well-



designed, well-implemented program. The following observations were made at the high school:

| | <u>Day 1</u> | <u>Day 2</u> | <u>Day 3</u> |
|-----------|--------------|--------------|--------------|
| % Rescans | 80% | 56% | 37% |

- On Day 1, 4 out of 5 students had to undergo secondary screening.
- By Day 3, the secondary screening rate was down to 1 out of 3 students.



| | <u>Day 1</u> | <u>Day 2</u> | <u>Day 3</u> |
|-----------------------------|--------------|--------------|--------------|
| Worst Entrance Time Cleared | 7:40am | 7:20am | 7:07am |
| Best Entrance Time Cleared | 7:11am | 7:09am | 7:05am |

Several weeks into the new school year, the District reported that rescan rates continued to decrease after the first week, and that all entrances continued to clear quickly enough so that only late arrivals failed to progress through the security checkpoints in time to arrive at their first class before the morning bell. Students and parents also overwhelmingly report that the program makes them feel safer, which is a key benefit of such security programs.

Conclusions

This case study was written to convey leading-edge thinking and a real-life example of implementing effective perimeter security for K12 school facilities. The hope in publishing this information is to inform and to encourage school administrators, school board members, state officials, and parents to consider and then adopt efficient and effective security measures to protect students from the threat of school violence. Walk-through metal detection technology is mature and affordable and can be used to create an effective last line of defense for our schools. The time to take action is now—before the protection is needed.