



FUNDAMENTAL ASPECTS OF PERIMETER SECURITY BARRIERS

A guide to common perimeter security

terminology, threat vectors, preventative

measures and performance criteria for

perimeter security systems



INTRODUCTION

The purpose of this document is to establish a security industry common knowledge base, thus allowing customers, practitioners, designers and other interested parties to better describe the products they need for perimeter security systems, particularly fence products. This document also seeks to increase awareness of performance criteria and encourage industry professionals to clearly market and install these products from a technical perspective to meet the expectations of an end user.

For example, the term “antichimb” has become a common reference used within the fencing industry within its product specifications and marketing material. All fencing is antichimb to some extent, as noted by its prefix “anti-,” which means “opposed to, or against.” Under this definition a 4-foot-high residential-grade pool fence is only truly antichimb to a toddler. The term antichimb has evolved into a statement of higher security, which it is not. No fence is truly antichimb!

It is the characteristics, therefore, that define how well a fence can prevent a breach. Adding height or toppers (razor/barbwire/spikes) or curving the top can make the breach increasingly difficult for the unprepared assailant; however, a planned attack through introducing simple tools like a screwdriver stuck in the small opening of a micromesh, wire-wall fence can aid in a breach.

End users need to understand fencing characteristics and appropriately define the functional requirements for perimeter security products.

The following definitions represent the barriers and vulnerabilities that need to be considered in your assessment of attractiveness, actor presence and capability of the actor.

WHAT ARE PERIMETER SECURITY BARRIERS?

A perimeter security barrier (PSB) is a fence, wall, railing, planting or other strategically placed items intended to mark a boundary, control access or prevent escape.



Produced by the Security Industry Association (SIA) Perimeter Security Subcommittee

The SIA Perimeter Security Subcommittee guides the Security Industry Association’s (SIA’s) support for nationwide and international efforts to prevent hostile vehicle attacks. From crowded public spaces or critical infrastructure sites to government facilities, the subcommittee works to identify best practices, assess current threats and solutions and provide stakeholders with the latest on safety and security standards from governments and industry.

THREAT VECTORS TO CONSIDER FOR PERIMETER SECURITY

Threat vector is a term used to describe the various methods or pathways through which a malicious actor can gain access to a system, network or physical asset. This could include physical access, cyberattacks, social engineering or any other means by which an attacker can gain entry.

The following are elements that need to be considered in analysis of threat vectors.

Human capability: The Centers for Disease Control and Prevention define human strength and the term “strength” and explain the concept of strength measurement. Strength is defined as the capacity to produce force or torque with voluntary muscle contraction. The definition of strength also involves force or torque.

- **Scaling/climbing:** The ability of a person to breach the PSB physically by propelling their body over said PSB.
- **Fingerhold:** The ability of an individual to grasp a protrusion or insert a finger through any component of the PSB.
- **Foothold:** The ability of an individual to place one foot or toe upon a protrusion or insert through any component of the PSB.
- **Tool assist:** Using a tool or material of any sort to help climb or scaling.
- **Scaling/vaulting/rappelling:** Using a tool or equipment to breach the height of the fence.
- **Perch point:** Any point on the PSB that allows an individual to stop climbing and rest, possibly for surveilling or attack.
- **Knowledge/experience:** Sophisticated attackers with exceptional knowledge of the site or products being used or those with experience in breaching a certain product type should also be a consideration when choosing perimeter security solutions.

Boundary: Marking a boundary is a physical security measure that involves setting up a physical barrier such as a fence or wall to clearly define the perimeter of an area. This is done to prevent unauthorized access and to provide a visual deterrent.

Cutting: Using mechanical, chemical, flame or natural means to degrade, destroy or remove any part or parts of the PSB to obtain entry to site.

Functional value (cost value analysis): An approach to physical security that considers the cost of implementing a security measure in relation to the perceived value of the protection it provides. This approach allows security professionals to identify the most cost-effective security measures to implement based on the level of protection they offer.

Tunneling: Removing earth or other substrate from beneath the PSB to obtain entry to site.

Prevent nuisance critters: A physical security measure that involves blocking access to areas of a building or property that may be attractive to animals or pests. This can include sealing off entry points, such as cracks and crevices, and installing barriers, such as screens, fences and netting, to prevent animals or pests from entering or leaving the area.

When considering **threat vectors** and barrier options, security professionals must also consider the **functional value** of the target.





Traffic

- **Intentional or forced entry** is a physical security measure designed to make it difficult for an unauthorized person to gain access to a property or facility. It may include the use of locks, alarms, surveillance cameras and other security measures to deter and detect any attempts at forced entry.
- **Passive or casual entry** is a term used in physical security to refer to measures taken to reduce the likelihood of unauthorized access to a facility or area through means that are not actively guarded or monitored. This includes measures such as strong locks, fences and barriers, as well as lighting, signage and other deterrents.
- **Opportunity of attack** is a term used to describe the potential for physical security breaches, such as unauthorized access to a facility or the theft of assets. It is the result of inadequate security measures and/or inadequate security awareness. This can include weak locks, lack of surveillance cameras, or inadequate security personnel.
- **Vehicular or pedestrian traffic** is a physical security measure used to regulate the flow of vehicles and pedestrians in and around a facility. This measure typically involves the use of physical barriers, such as fences, bollards, gates and guard posts, to control the movement of people and vehicles on the premises. It also includes the use of signage and traffic control devices, such as stop signs and speed bumps, to ensure that people and vehicles are following the rules of the road.

External pressure or force: Having an external factor that affects the integrity of the product and its ability to withstand said factor.

- **Environmental permeability** refers to the general effect of time and the elements. Extended exposure to sunlight, heat, cold, moisture and other environmental elements may affect performance or even affect the allowance of waterflow/airflow

or other factors that may be necessary for maintenance of adjacent measures. (For example, plantings on one side of an opaque wall may not get enough sunlight for proper growth or development.)

- **Wind load:** Product height and opacity will always be affected by wind load. Wind, whether normal or routine or catastrophic due to weather anomaly, should always be considered. Product engineering needs to incorporate potential extremes based on the geography the product is being installed within.
- **Water,** whether rainfall, humidity, floodplain or secondary exposure from adjacent water masses, can quickly change the dynamic of security or safety these perimeter security products are providing. Additional consideration should be given to make sure there are no adverse effects.
- **Vehicle ramming:** The use of vehicles to breach security and gain unauthorized access or inflict damage.
- **Platform for Hostile Vehicle Mitigation (HVM):** A system designed to detect, identify and mitigate the threat of vehicles being used as weapons against people or property. It is typically composed of physical barriers, sensors and other security measures that can detect, stop and redirect a vehicle before it reaches its target.
- **Ballistics resistance:** A term used to describe the ability of a physical security barrier to withstand penetration from small arms fire, such as handguns, rifles and shotguns. Ballistic resistance is measured by a rating system that indicates the level of protection a barrier provides, such as UL 752 or NIJ 0108.01.
- **Blast/explosive resistance:** A term used to describe a structure or system's ability to withstand the effects of an explosive blast, such as shock waves, pressure and flying debris. Blast resistance is an important consideration in physical security as it can help protect people and property from the devastating effects of a blast.

PERIMETER SECURITY BARRIER (PSB) CHARACTERISTICS

The following are defined characteristics that help in defeating the threats in various ways.

Breaking Force: Breaking force on PSBs should be considered as well when looking at overall performance. Every system and configuration have a breaking moment where the kilonewton of force applied to it causes it to bend or break. When reviewing individual components or blending different systems, be sure to review how easily a product may break. For example, adding wood boards to an aluminum track slide gate may add some degree of climb resistance and opacity, but a thin board can easily be broken with a small hammer or other simple tool.

Rigidity: PSBs can be considered a rigid or flexible platform to provide yet another layer of security. Most products are installed as a rigid platform. Structurally, they are going to support the infill and provide long-lasting robust security. At times the desire may be to provide a flexible platform, one that bends when trying to climb or breach, thus making it more difficult to attain or maintain a fingerhold, foothold or even grasp the product.

Finish height: The distance measured from finish grade to the top of the finished installed product (including any outriggers).

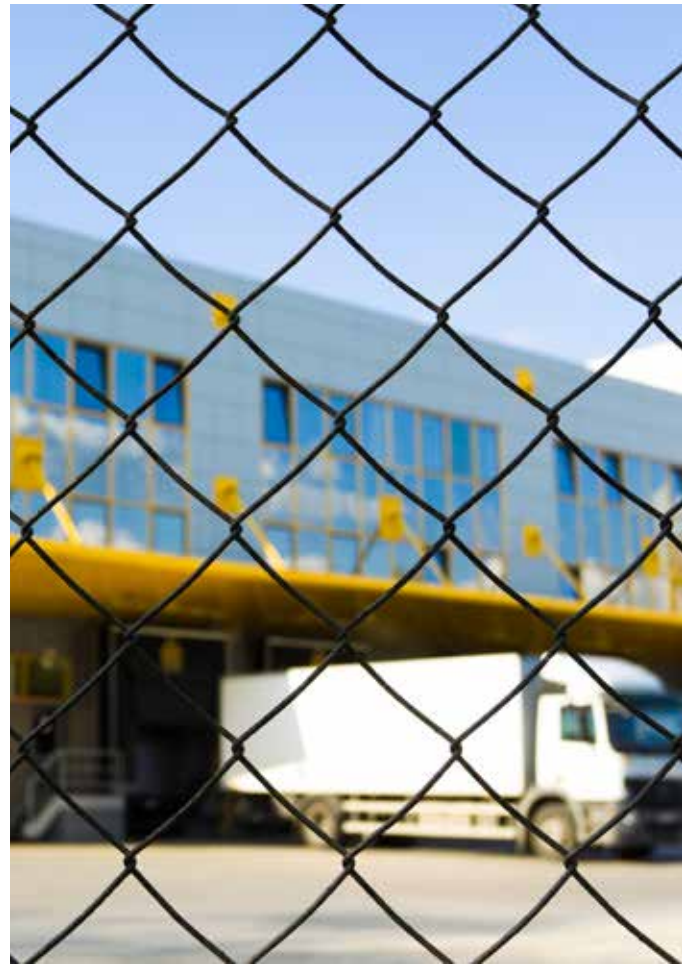
- The finished height can be compromised of various parts – for instance, a fence may be 7-foot chain link fabric buried 1 foot in the ground with 1 foot of barbed wire on top. The height for the sake of the security professional and end user is 7 feet, as that is the effective above-grade resistance that product is providing.
- Why is this important? The higher the barrier/fence, the more challenging it is to climb.

Posts: The vertical structural supports of the fence/barrier system.

- Why is this important? Spacing of posts is critical to manufacture, design and integrity.

Rails: The horizontal structural supports of the fence/ barrier system and provides rigidity.

- Added rails may provide additional rigidity, but also may assist in climbing ability.
- Spacing and placement of rails is critical to final function, design and integrity.



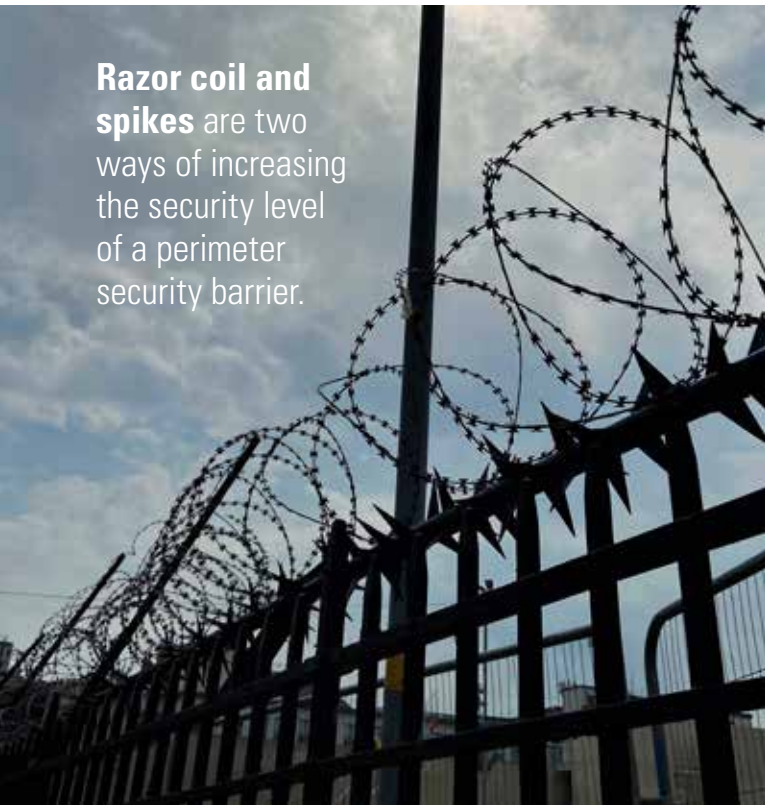
Infills: The balance of the PSB comprising of an array or composition of product to achieve the end goal.

- **Chain link fence:** A series of individual wire strands woven in a helical fashion to create a wire mesh. Its characteristics are defined by:
 - Gauge and type of wire
 - Size of the opening created by the wire
 - Protective finish coat
 - Selvage – which is how the ends of wire are affixed to prevent unraveling, either knuckled or twisted to create a barb finish
- **Slats:** Slats are additional inserts for chain-link fence to provide added privacy and climb resistance, often made of plastic or metal.
- **Pickets/pales:** Pickets/pales are metal shapes used as a vertical infill. Their characteristics are defined by:
 - Dimension and shape of profile
 - Gauge of metal used
 - Spacing and opening widths

- **Expanded metal sheet:** A type of sheet metal which has been cut and stretched to form a regular pattern (often diamond-shaped) of metal mesh-like material. It is defined by:
 - Width of slit cut for expansion
 - Gauge or thickness of metal sheet
 - Finished surfacing either standard or flattened (pressure rolled to provide a smooth, flat surface)
- **Wooden boards:** Boards may be of various species and finish dimensions.
 - Be aware of nominal dimensioning for wood products.
- **Plastic/composite/engineered infills:** These infills can be many variant base products from polyvinyl chloride shapes to plastic composite to engineered systems provided variant levels of longevity and performance.

Passive fence system: The parts of the fence that have little or no moving parts. Some spinners (rotating spikes/rota spikes) are moving parts, but function only within an immediate plane or field.

Razor coil and spikes are two ways of increasing the security level of a perimeter security barrier.



Active fence system: Any part of the fence that moves significantly, out of plane or function.

- Generally identifiable as a point of entry or exit of the secured area.
- Most often accommodated by a sliding, swinging or lifting gate mechanism.
- Exposure created by moving parts.

Material composition: The type and grade of the material used for manufacture and construction of the fence/barrier system. Properties of those products relative to:

- Cutting with mechanical methods such as saws, shears or likewise
- Bending moments with or without leverage
- Chemothermal resistance, either heat or freezing
- Ballistic resistance
- Blast or high-pressure resistance
- Environmental resistance (sunlight, wind, rain, cold, heat)

Foundation requirements: All PSB require foundation for structural support. Foundations could consist of any of the following:

- Concrete foundation excavated into existing earth
- Supported via post driven or submerged earth
- Attachment to existing structure via chemical or mechanical anchors
- Opportunity for installation on specialty surfaces such as water, rock, ice or other surfaces
- Mow strips are a foundation option that allows for a spread foundation beneath the fence either of concrete or other aggregated material, that will help prohibit tunneling, prevent vegetation from growing into area immediate upon the PSB, as well as provide a line along the fence to allow for easier maintenance and site cleanup.

Prohibit conductive electricity: The prohibition of electrical conductivity is a physical security measure that prevents the unauthorized transfer of electricity through a system. This is usually done by using insulation, such as rubber, plastic or metal, to separate the electrical components of the system from each other and prevent any accidental or deliberate contact between them.



Perimeter security barrier design often requires many different considerations, from physical and vehicle entry obstructions to engineered foundations and climb-resistant elements.

Opacity: The level of visibility through the product allowed. This is measured by a percentage of the light or views passing through a PSB.

Allow airflow: A physical security measure that ensures that air can freely circulate to reduce the risk of fire and other safety hazards. It involves maintaining proper ventilation, ensuring that all openings are not blocked and that all air ducts are clear and unobstructed.

Obstacles and accoutrements: Additional products placed on the PSB to bolster the security level. They may include:

- Barbed wire
- Razor coil or razor ribbon
- Climb resistant spinners
- Spikes (both stationery and moveable)
- Signage
- **Access control:** A physical security measure that restricts entrance to a property, building, or room to authorized persons. It involves the use of locks, keys, access cards, biometric scans or other security measures to ensure that only those with the proper credentials can enter.
- **Lighting/illumination:** Platform for lighting is a physical security system that uses lighting to identify and monitor areas of interest. It can be used to detect intruders, monitor movement and provide illumination in dark areas. Platforms for lighting can include motion-activated lights, CCTV cameras and other lighting technology.

- **Cameras:** Platform for cameras is a physical security system that consists of a combination of hardware and software components that allow for the installation and management of cameras for the purpose of monitoring and recording activity in a given area. This system typically includes a network of cameras, a recording device, a viewing station and a software platform for managing the cameras and recording the footage.
- **Electronic intrusion detection systems:** Platform for intrusion detection is a system that monitors and detects unauthorized access to a physical space or facility. It typically includes sensors, cameras and other security devices that are connected to a central control system, which then sends out alerts to personnel when an intrusion is detected.

Appearance: Aesthetic value in physical security refers to the visual appeal of a security system, such as CCTV cameras, lighting fixtures and other security equipment. It is important to consider the aesthetic value of a security system when designing a security plan, as it can influence the effectiveness of the system, as well as the overall look of the premises.

Visual privacy: Visual privacy is a physical security measure that prevents individuals from being observed or recorded without their permission. It is achieved by using physical barriers such as walls, fences or curtains to block the view of people or cameras. Visual privacy also includes the use of security cameras and other surveillance technology to ensure that only authorized personnel have access to sensitive areas.

CONCLUSION

This guide to select aspects of perimeter security barriers provides descriptions and selections of security products, evaluated various materials and designs and identifies potential vulnerabilities and threats such as human scaling, cutting and vehicular attacks. By addressing the aspects presented in this guide, security professionals can ensure that the chosen perimeter security solutions meet the specific functional and protective needs of their environments, from residential areas to critical infrastructure.

Although this guide was written as a primer and knowledge base for perimeter security and is not presented as an official standard, SIA encourages and welcomes proposals to advance related initiatives for perimeter security barriers.

More information on how to participate in and propose standards activities can be found here: securityindustry.org/standards



securityindustry.org

