BETAFENCE

PERIMETER
SECURITY
FOR PRISONS

Contents

Introduction

Perimeter security, containment, and stability are critical functions for correctional institutions and require the integration of security systems into one manageable platform that provides real-time control.

Today, security buyers can choose from a wide range of perimeter security technologies that allow them to maintain full control and visibility of inmates. Be it to delay an intrusion, to detect and intervene, or to efficiently control access, correctional facilities need technologies they can rely on.
This whitepaper offers an overview of these different available technologies.

Challenges facing correctional facilities today

Security technology today is becoming increasingly effective in:

1. deterring,
2. delaying and
3. detecting

possible security incidents in prison facilities. Worldwide, prisoner escapes have dwindled in the past two decades. The reason for this is a higher level of modern prison construction and the development of increasingly sophisticated security technology. Although they still occur, prison escapes – especially from maximum security prisons – have become rather rare.

And yet, the increased number of strikes held by prison guards worldwide points to another pressing issue: **overpopulation**. In 2017, prison occupancy levels in 79 countries (40 per cent of the world's states) were above 120 per cent capacity and as many as 51 countries (26 per cent) had a problem of extreme overcrowding, with occupancy levels above 150 per cent. The United States is the world's leader in incarceration with 2.2 million people currently in the nation's prisons and jails — **a 500% increase over the last forty years.**

The constant rise in prison population is generating enormous pressure on correctional authorities and makes it increasingly difficult to provide secure facilities for the public, prison staff and inmates. While prison population is increasing, the number of prison officers is decreasing, which in many cases has left a severely understaffed prison estate.

At the same time, prisons have become more and more open to the outside world. They bring in an increasing number of people and vehicles to the prison gates, which makes prison security and organization a complex process.

IN SUMMARY

- **Deterring, delaying and detecting possible security incidents in prison facilities is a key objective in security technology.**
- **The main issue in prison facilities is overpopulation.**
- **Prison security and organization is a complex process.**

Technology mix

Prison authorities have the difficult task to maintain a high level of security, and prevent escapes and other incidents. At the same time, security efficiency needs to be coupled with humane treatment that is aimed at rehabilitation into society.

In addition to meeting these challenges, prisons also have to be capable of reacting rapidly to internal emergency situations, and restoring order within a short timeframe once incidents have been brought under control

Security technology is only part of the solution, but nonetheless a very important part. The right technology mix can help prison authorities improve security levels for all stakeholders and tackle the complex security issues correctional facilities are facing today. Perimeter security, containment, and stability are critical functions for correctional institutions and require the application and integration of an efficient technology mix, specifically configured to the facility's needs. Prison perimeter security simply has no one-size-fits-all solution, but needs to carefully combine the most suitable equipment, services and technologies to create an optimal integrated perimeter security solution.

Perimeter security for correctional facilities

A prison's security plan greatly depends on the security of the external perimeter. The perimeter security system needs to detect unauthorized entry or exit into defined areas and deter inmates from violating the fence. The system must be highly reliable, difficult to bypass and not activate unnecessary alarms, even in adverse conditions.

The increasing need for prison security and protection results in a higher demand for efficient perimeter security solutions. Although the silver bullet solution does not exist, the best approach to perimeter security is a mix of technologies, including:

- **High-quality mesh fences**
- **A wide range of gates, barriers and turnstiles**
- **Electronic components for access control, intrusion detection, identity control and registration**

When discussing perimeter security for prisons, a number of things need to be considered:

2.1 Reverse concept

In most cases, perimeter security systems are designed to keep people out of the premises. Obviously, for prisons, it's designed to keep people in and prevent them from getting out, all of which will be reflected in the system's design.

However, security from outside intrusions needs to be considered as well. Contraband thrown over the fence or smuggled into prison yards increasingly finds its way into the hands of prisoners. Sometimes, even drones are used to bring contraband inside the prison walls. Tobacco, narcotics, weapons or phones are commonly smuggled in. Cell phones especially are a serious issue, because they can be used to organize escapes, commit crimes on the outside, and even to order hits on prison guards and personnel. The most striking example of breaching the prison perimeter from the outside are cases of gangs breaking into the prison walls with the intention of kidnapping inmates.

2.2 Security levels are defined by national and international standards

The prison system greatly differs across countries and continents. Prison security standards often reflect national or regional trends.

In many countries, prisons are places of violence, where assaults by staff and by fellow prisoners are commonplace. Gang related violence is a particular problem in Latin America. Some former Soviet Union countries still struggle with a division between the 'red' prisons, run by prison authorities, and the 'black', de facto administered by inmates.

In some countries, technology has been exploited to increase prisoners' contact with the outside world. Since 2008 families in Russia have been able to email with prisoners and the system is being expanded with the introduction of a Smartphone app. In the Philippines women prisoners can apply to have a skype or video call with family and friends. Scanners are being used in Jordan to check the food brought in by families.

But technology also helps correctional authorities and has even resulted in the reduction of staff involved in security duties. Close Circuit Television (CCTV) and sophisticated alarm systems for example are reducing the need for manned perimeter patrolling and watchtowers. Another striking example of the use of technology are the Ohio state prisons, who are believed to be the first in the USA who are testing security drones in the hope of reducing illegal activity at the penitentiaries.

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2.3 Different types of prisons

In terms of security levels, prisons can be roughly divided into three categories: minimum, medium and maximum security. Most prisons are strictly limited to one level of security in order to keep the operation and design of the facility simple. The availability of these different security levels depends on the country. For example, some countries only offer minimum and medium security prisons.

- **Minimum security prisons** often resemble camps or college campuses. They are reserved for non-violent offenders with relatively clean criminal records, or prisoners who have served most of their term in a higher-security facility and displayed exemplary behavior.

- A **medium security prison** restricts the daily movements of the inmates to a greater extent, but instead of cells they usually have dormitories, and the prison is usually enclosed by a razor-wire fence.

- **Maximum security prisons** limit the movement of inmates strictly, only allowing them out of the cell for a limited amount of time. These facilities are reserved for violent offenders, those who have escaped (or tried to escape) or inmates who could cause problems in lower security prisons. Maximum security prisons are usually surrounded by high walls topped with razor wire, and monitored by armed guards.

This white paper is focused on maximum security prisons.

3 Different security layers with different goals

Perimeter security has to be as tight as possible, to prevent detainees from evading surveillance and escaping, and to ensure that third parties cannot enter the prison without authorization.

The most direct way to ensure perimeter security is the installation of fences. The wide variation of fence types can be explained according to the several different security zones in which a correctional facility can be broken down. Each of these zones has its own special purpose and security level.

Delay

Fences in the 'delay' category hinder entry and for that reason are considered as 'security fencing'. The delay perimeter's objective is to slow down an active intrusion enough to force the intruder to give up, or allow the security team to respond. The caused delay must be longer than the time needed for intervention.

Detect & intervene

Fences with integrated detection systems must trace any form of unwanted breach of the fence. Additional electronic components such as an acoustic alarm, security lighting and camera surveillance also have a deterrent effect. Upon detection, prison personnel can be alerted in time to intervene in the incident.

Access control

Access onto the site can be controlled by using turnstiles, barriers and gates.

The strength of the security layer will depend on the level of dissuasion, the delay that the physical barrier can cause, the accuracy of the detection system and the speed of the intervention.
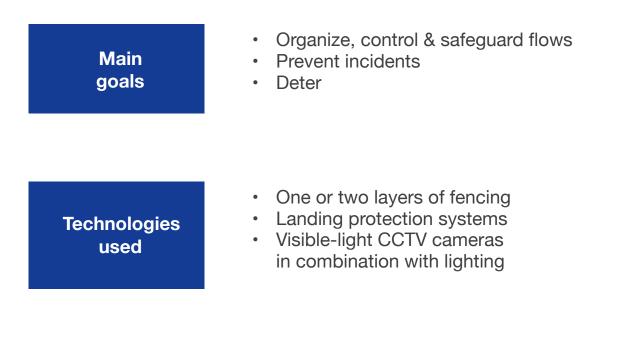
Prison security layers

A typical maximum security prison layout will have different security layers, all with their own goals and related technologies. In this section, we describe the typical layers, the most appropriate technologies and the typical technology challenges.

4.1 Internal compartments

The internal security layer will typically include the inmates' housing area, but also leisure areas, i.e. where inmates can walk, play or exercise. All of these locations do not provide access to public areas.

Typical security measures include the installation of rigid and deterrent barriers or gates to organize, control and safeguard the flow of the residents. Sometimes, these areas are also protected with landing protection mesh in order to prevent helicopters or drones from entering the area.

Main goals	• Organize, control & safeguard flows • Prevent incidents • Deter

Technologies used	• One or two layers of fencing • Landing protection systems • Visible-light CCTV cameras in combination with lighting

Challenges

In order to deal with possible riots, escape attempts or other incidents, fences in this security layer need to be highly resistant and must be able to withstand pressure from vandalism or cutting attempts. The mesh aperture, resistance of the welds and the steel wire diameter are all critical features that should make it hard to cut and climb the fence. Razor barbed wire topping can provide an additional degree of security. Fence material should also be able to withstand harsh weather conditions.

Efficient fencing needs to strike a balance between preventing inmates from climbing it and providing adequate visibility for prisoner officers or security cameras. The tighter the mesh has been made, the more difficult it is to climb, but also the more the visibility is hindered. For the same reason of visibility, fences need to have light colors, so they will form a better contrast with human shapes.

Fences are often completed with lighting and CCTV security cameras. Although CCTV technology requires a certain investment, they can also be very instrumental in reducing the required manpower and the frequency of manned perimeter patrols.

IN SUMMARY

- **Fences in prison facilities need to be highly resistant and must be able to withstand pressure from vandalism or cutting attempts.**
- **Fences are often completed with lighting and CCTV security cameras.**

4.2 Interior perimeter

The internal compartments are mostly secluded from the outside world by two security layers, with a neutral open zone or 'no man's land' in between them. The interior perimeter will either be a concrete wall or a conventional fence structure, while the exterior perimeter will usually be a higher concrete wall. The objective of the interior perimeter will be to delay or slow down an active intrusion enough to force the intruder to give up, or give the security team sufficient time to respond.

Main goals	• Deter • Delay • Monitor, detect & intervene

Technologies used	• Delaying layer with fence, razor rail, barbed wire, taut wire • Neutral zone: Fixed surveillance cameras, automatic detection with PTZ cameras, microwave beams, IR beams

A wide variety of technologies are available to enhance a fence structure with detection capabilities:

- A **taut wire system** consists of a series of wires under tension that are connected to sensors. The wires are installed in such a way that an intruder or an escapee must move them in order to escape. When the wires are moved, the sensors are triggered, which in turn alerts the guards.

- An **electret** *(coming from electric + magnet)* **cable system** uses microphonic cables to detect noise generated along the fence. This way, it is possible to detect any attempt to cut, climb or otherwise break through the fence. The system consists of a sensitized cable attached to a fence that must be taut in order for this system to work most effectively.

- **Electromagnetic cables** essentially operate as vibration sensors and can be installed on the fence structure. They detect any movement of the fence and send signals that trigger alarms. As with the electret cable system, the fence must be taut for proper operation.

Technologies

If an inmate can make an escape to the neutral zone, the goal is to detect their location and make an intervention possible in the shortest time frame. No man's land is usually a large area that has excellent visibility features that make it easy for CCTV or the human eye to spot the intrusion incident and for security teams to carry out an effective intervention. Today's fixed and PTZ **surveillance camera** technology makes it possible to accurately detect intrusions from large distances and to zoom in on the area where intrusion was detected. But CCTV is not the only technology to make quick detection in an open field possible.

- **Electromagnetic sensors** can also be buried in the terrain to provide an invisible perimeter intrusion detection. Just like electromagnetic cables attached to the fence, they can make a detection based on changes in an electromagnetic field.

- **Microwave systems** (also known as radar or Doppler) provide detection by changes in radio frequency across a prescribed field. These systems can detect walking, running or crawling human targets in an outdoor environment. Microwave sensors generate an electromagnetic (RF) field between transmitter and receiver, creating an invisible volumetric detection zone. When an intruder enters the detection zone, changes to the field are registered and an alarm occurs.

- **Infrared sensors** detect infrared signals and measure their variation from an established norm. The detection is measured from a transmitter to a receiver, both of which are often post mounted.

- **Video analytics** can enhance the performance of surveillance cameras with intrusion detection capabilities. Today's smart video analytics are able to detect people or vehicle intrusions based on intelligent algorithms that analyze the video image.

Challenges

False alarms

Motion sensors and surveillance cameras used for detection can generate a high number of unwanted alarms caused by environmental conditions like precipitation, wind, shadows and reflected light, or by small animals or uncontrolled vegetation. Cameras enhanced with intrusion analytics for example need to strike a difficult balance between detecting every possible intrusion incident as fast as possible and generating too many unwanted alarms. In a security situation where every alarm must be investigated, a system that generates a high amount of nuisance alerts will end up not being used at all.

Harsh weather conditions

The lifetime and maintenance cost of fencing systems and their related detection technologies can be influenced by adverse weather conditions.

Visual verification

Fence detection systems can be effective in detecting irregularities, but they lack the possibility of visual verification. Bearing in mind that unwanted alarms are always possible, security personnel needs to be able to quickly assess the severity of the incident. That's why it is a good idea to pair fence detection systems with surveillance cameras.

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4.3 Exterior perimeter

The exterior perimeter usually is a high-security fence system that prevents residents from leaving the premises and that keeps the general public from entering the site. It consists of a combination of fences and concrete walls with a high level of dissuasion, delay and detection. An exterior perimeter fence needs to prevent anyone from climbing over it, digging under it, or cutting through it.

The exterior perimeter can be interrupted by building structures, such as public spaces, administrative areas or employee service buildings. The gatehouse is also a vital checkpoint which allows all individuals entering or leaving a facility to be monitored at a single location. As prisons become more and more open to the outside world, bringing increasing numbers of individuals and vehicles to the prison gates, gatehouse security and organization are critical. Secure access points between different zones need to prevent people (including security staff) from moving freely around the facility without security checks.

Main goals	• Demarcate • Deter • Delay • Detection & Intervention • Access control

Technologies

An exterior perimeter can consist of one or more fences or concrete walls, up to 6 meters high, combined with cameras and lighting. Security at the exterior perimeter is a matter of combined manpower and technology.

- **Manpower:** Security guards will typically occupy strategic positions at manned security gates, access points or at manned watchtowers.

- **Access control technology** can be biometric or card-based. Mechanical keys and swipe cards may be appropriate in some circumstances, and photo ID cards can be used when security staff are employed. Technologies such as fingerprint recognition or iris recognition offer a higher level of security. These technologies are often complemented with surveillance cameras to provide visual verification.

- **Surveillance cameras** along the exterior perimeter also have a deterrent effect. Cameras with overt, large enclosures make it obvious to all approaching the perimeter that they are under surveillance.

- **Other detection technologies**, like microwave radar, underground electromagnetic detection or any type of fence-mounted detection systems (see 4.2 Interior perimeter) more and more replace manned security patrols.

Challenges

In order to maximize the delay effect, the distance between the exterior perimeter large as possible. Typical fence distances are 60 to 90 m (200 to 300 ft) from the exterior of the buildings in suburban or rural areas. The minimum distance from the correctional facility exterior should be kept below 8 m (25 ft).

Correctional facilities often cover large areas, which makes it, in practice, difficult to ensure all-round visibility. Manned patrols can prove costly. Smart CCTV can provide a solution. Smart cameras can provide surveillance 24/7, either with a combination of visible-light cameras and lighting poles, or by means of thermal cameras that generate alarms based on the detection of body heat.

IN SUMMARY

- **Typical fence distances are 60 to 90 m (200 to 300 ft) from the exterior of the buildings in suburban or rural areas. The minimum distance from the correctional facility exterior should be kept below 8 m (25 ft).**

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4.4 External compartments

Especially in rural areas, correctional facilities can have an extra security layer, demarcating the boundary of a larger territory. These areas can contain several external facilities, such as parking lots, water basins or low-security compounds. This external perimeter has an additional deterring effect and needs to be able to efficiently deny the access of people and vehicles, even from hostile attacks.

| **Main goals** | • Dissuasion
• Access control |

Technologies used

In this security layer, a wide range of gates, barriers and blockers can be used. So-called **Hostile Vehicle Mitigation** (HVM) systems can be installed in order to specifically withstand attacks from vehicles. Threats from vehicles can range from vandalism to sophisticated or aggressive attack by determined criminals or terrorists. The mobility and payload capacity of a vehicle offers a convenient delivery mechanism for a large explosive device, although the vehicle itself may also be used as a weapon.

5 Choosing the right technology mix

A risk assessment or security audit for each facility should be the first step in rolling out a perimeter security project. A risk assessment identifies the possible threats as well as the possible consequences of any security breach.

A thorough risk assessment allows for the right selection of the technology mix. But even then, the selected installations and technologies need to be re-evaluated periodically based on their performance. If the technologies do not provide the required security levels, then additional measures might be needed.

When selecting a perimeter security solution provider, the following points need to be considered.

- **The technology mix for perimeter security** should allow correctional facilities to maintain full control and visibility of its inmates. The security solution should reduce the need for human interaction during an incident as much as possible.
- **There is no silver bullet security solution.** Different technologies should operate in a complementary fashion and should keep each other in check.
- **A technology mix** will consist of a combination of traditional construction works (walls, fencing) and innovative access control and detection technologies. Typically, fencing and construction works take up more than 50% of the perimeter security budget.
- **100% security is hard to achieve.** The security situation should only be improved to a level where the applied security measures are no longer practical or are hindering the facility's operations.
- **A higher level of perimeter security** and associated risk reduction should be weighed against the cost of installation.
- **In order to guarantee a future-proof security solution,** it is important to select a solution provider that is able to offer maintenance services.

6 Perimeter security solutions from Betafence

Betafence offers perimeter security solutions specifically configured to the needs of correctional facilities. Solutions from Betafence have been installed for perimeter protection at some of the world's most challenging facilities. Betafence's strength lies in its ability to carefully combine the most suitable equipment, services and technologies for the creation of an optimal integrated perimeter security solution.

Betafence solutions include:

- Fencing systems
- High-security deployment barriers
- Crash-rated anti-ram barriers
- Access control
- Truck stoppers
- Bollards
- Lighting
- Gates and turnstiles
- Intruder detection
- Fibre and radar
- CCTV surveillance
- Video analytics
- Remote monitoring
- Non-intrusive inspection
- Bullet-resistant fences

7 Sources

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