ProSPeReS

Recommendations for equipment monitoring / detection / protection

Appendix 2

of GUIDEBOOK on security measures
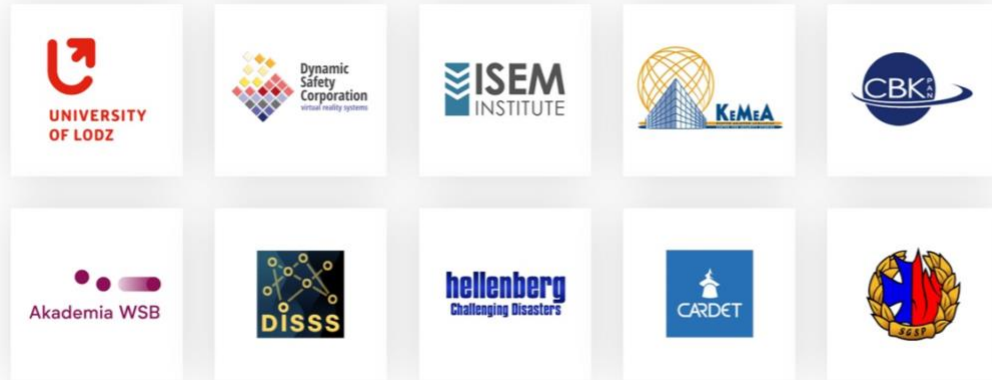for religious sites & communities
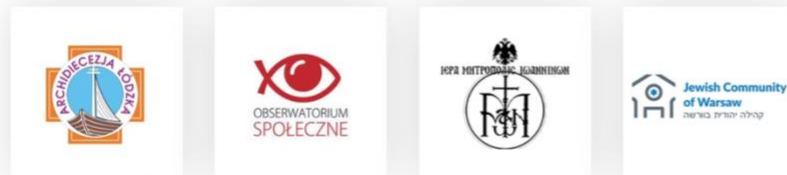
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ProSPeReS consortium

Security experts, security research and academic institutions, providers of technical solutions and services

Law enforcement agencies (LEAs)

Faith-based organizations

Recommendations for equipment monitoring / detection / protection

Appendix 2
of GUIDEBOOK on security measures
for religious sites & communities

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1. Introduction to equipment recommendation

Protecting religious facilities, their staff, and the worshippers is a great challenge. It must combine all the elements necessary for its proper functioning and not be an inconvenience to the congregants visiting the temple.

A proper and comprehensive approach to the subject often represents a substantial financial investment. This study is a guideline for solutions used in public buildings as a suggestion for existing applications. Not all of these solutions can be applied to every place, but they can be a guideline in which the equipment applications should be directed.

Malfunctions or improper preparation of the building security can expose the facility to many different hazards and risks, ranging from theft to the worst-case scenario of a successful terrorist attack. A poorly designed access control system makes it much easier to launch.

One of the critical goals of the multi-level protection concept is a comprehensive implementation of security measures integrating physical, technological, and operational standards.

From the technical point of view, a crucial point should be covered to ensure the safety of congregates arriving at the worship places.

The facility should be divided into a few areas of interest to approach this problem comprehensively.

The adaptation of technical protection systems should be tailored individually to the specific facility's needs, preceded by a specialized security audit.

The first source of information regarding enhancing security at a facility should be the local Law Enforcement Agencies (LEAs) responsible for conducting operations in the particular area in which the facility is located. Cooperation with the police is particularly important with regard to updating the threat level, cooperation on a daily basis and during the preparation as well as protection of an ongoing event, expert advice on procedures, and especially equipment recommendations. Due to its broad, specialized expertise in countering terrorist threats, it is a source of valuable information and support during the organization of events that gather large numbers of people.

2. Types and level of threat

Recommendations are a guide to identifying solutions that should be used to eliminate gaps in a facility's security system for a given type and threat level. These are divided into those for the facility, including its infrastructure and personnel. Any effort to equip the facility and personnel with appropriate technical measures should be preceded by a professional assessment of the facility's security safety measures and expert advice in adapting it to the current level and type of threats.

For the purposes of equipment recommendations, due to the complexity of the problem, they have been divided into 3 types of threats:

1. General terrorist acts (GENERAL).

This group includes other terrorist attacks unrelated to the IED and CBRN types of threats. These include but are not limited to:

- Sharp object attack,
- Firearms attack,
- Hand grenades/projectiles attack,
- Vehicle attack,
- Incendiary,
- Hostage-taking,
- Kidnapping.

2. Improvised explosive device (IED).

IED threats include one or more incidents involving improvised explosive devices, such as:

- IED detonation,
- Explosion,
- Find,
- Hoax,
- False,
- Turned-In.

3. CBRN.

Incidents include all threats involving the use of CBR agents regardless of whether they were triggered intentionally or unintentionally.

Intentional - CBRN incidents that involve the intentional release by states, non-state armed groups, terrorists, or criminals, with the intent to cause injury and death, cause fear and panic in individuals or a specific group of the local population.

Non-intentional - events related to industrial accidents, accidents in military research centers, related to accidents during the transportation of hazardous goods, natural sources of infection with bacteria or viruses, natural disasters leading to the destruction of industrial or military installations, and remnants of war.

However, this does not mean that every terrorist attack uses only one type of threat. Current trends indicate that terrorists are aiming for complex attacks, using each of the available weapons (firearms, bladed weapons, hand grenades, IEDs to CBR agents). Therefore, in the comprehensive preparation of a facility for terrorist attacks, all types of threats should be considered and implemented in security plans, technical upgrades, and individual equipment.

For the purposes of equipment recommendations for PW, the risk level for a given threat is determined based on the VAT light (Vulnerability Assessment Tool light), resulting from the assessed probabilities and consequences of threats.

Table 1 – Risk Matrix Levels

Very Low/Low: is not considered a vulnerability. e.g., the attack can be mitigated by existing security measures.

Medium: is considered a vulnerability. e.g., the attack cannot be mitigated by existing security measures and should be mitigated by the managing body and its partners.

High/Very High: is considered a critical vulnerability. e.g., the risk cannot be mitigated by measures that the municipality and its partners can manage themselves.

3. Equipment recommendation matrix

The table is a pre-set tool designed to indicate minimum equipment recommendations based on the identified type of threat and its level. There is a specific equipment recommendation at the intersection of the identified threat level, the given area and the type of threat.

Suppose the threat for a given area is identified at the VERY LOW/LOW level. In that case, the recommendation also applies to the MEDIUM and HIGH/VERY HIGH levels (and on a similar basis, if a MEDIUM level is identified, it also applies to the HIGH/VERY HIGH threat level recommendation), as shown in the table below. On the right side of the table is a box with links to a brief description of existing solutions for the type and level of threat from different project resources.

Table 2 – Equipment recommendation table

			Threat	RISK LEVEL			Link to description
			GENERAL/IED/CBR	VERY LOW LOW	MEDIUM	HIGH VERY HIGH	
Object							
	Structure	Fencing	GENERAL /IED/CBR	X	X	X	LINK
		Land scaping	GENERAL /IED/CBR		X	X	LINK
		Reinforced landscape objects	GENERAL /IED/CBR			X	LINK
		Blast protection	IED			X	LINK
		Blast door protection	IED			X	LINK
		Ballistic door protection	GENERAL			X	LINK

For example: Based on the VAT tool, a security analysis determined the threat level for a given facility as the MEDIUM for the IED threat.

Table 3 – Equipment recommendation table

			Threat	RISK LEVEL			Link to description
			GENERAL/IED/CBR	VERY LOW LOW	MEDIUM	HIGH VERY HIGH	
Object							
	Structure	Fencing	GENERAL /IED/CBR	X	X	X	LINK
		Land scaping	GENERAL /IED/CBR		X	X	LINK
		Reinforced landscape objects	GENERAL /IED/CBR			X	LINK
		Blast protection	IED			X	LINK
		Blast door protection	IED			X	LINK
		Ballistic door protection	GENERAL			X	LINK
		Blast window protection	IED			X	LINK
		Anti-fragmentation window films	IED	X	X	X	LINK

According to the matrix, the person responsible for the facility's security checks the minimum recommended requirements that should be met to ensure an adequate security level. If there is an "X" mark in a particular area, it means that the solution is recommended for use.

After identifying a recommended security measure (e.g., anti-fragmentation window film), the person responsible for the security of a given facility moves to the "Link to description" tab leading to a description of existing solutions by clicking on the link.

Table 4 – Equipment recommendation table

Blast window protection			X	Link
Anti-fragmentation window films	X	X	X	Link

Table 5 – Equipment recommendation

Antifragmentation window film.
The substitute of the detonation blast resistant windows is the use of a protective film installed on the window glass. This solution can reduce the danger from an explosion by keeping glass shards together. Furthermore, the mechanical attachment of the film to the window frame further reduces the risk of the glass being pulled out of the frame during an explosion.
An added benefit is protection from thrown objects. It effectively stops even heavy, low-speed objects from falling into the object and protects against glass fragments. This solution is inexpensive, effective against thrown objects and to some extent reduces the effects of detonation of the explosive charge.

Safety and Security Window Films

In this way, he can identify whether the recommended solutions are installed at a given facility and, if so, whether they meet the relevant requirements for a given threat. The tool also indicates in which areas to seek specialized advice for technical modernization/equipment of the facility to improve its safety.

Any interference with a facility's security systems should be preceded by expert advice.

			Threat	RISK LEVEL			Link to description
			GENERAL/IED/CBR	VERY LOW/ LOW	MEDIUM	HIGH/ VERY HIGH	
Object							
	Structure	Fencing	GENERAL /IED/CBR	X	X	X	LINK
		Land scaping	GENERAL /IED/CBR		X	X	LINK
		Reinforced landscape objects	GENERAL /IED/CBR			X	LINK
		Blast protection	IED			X	LINK
		Blast door protection	IED			X	LINK
		Ballistic door protection	GENERAL			X	LINK
		Blast window protection	IED			X	LINK
		Anti-fragmentation window films	IED	X	X	X	LINK
		Safe room	GENERAL /IED/CBR			X	LINK
		Safe shelter	GENERAL /IED/CBR	X	X	X	LINK
		Mail room	CBR			X	LINK
		Control room	GENERAL /IED/CBR	X	X	X	LINK
	infrastructure	Antiintrusion barriers	GENERAL /IED/CBR	X	X	X	LINK
		Gates	GENERAL /IED/CBR	X	X	X	LINK
		Security post	GENERAL /IED/CBR		X	X	LINK
		CCTV	GENERAL /IED/CBR	X	X	X	LINK

		CCTV face/behaviour recognition software	GENERAL /IED/CBR			X	LINK
		CCTV left item detection software	GENERAL /IED/CBR		X	X	LINK
		PA System	GENERAL /IED/CBR	X	X	X	LINK
		Ventilation protection	CBR	X	X	X	LINK
		Bollards	GENERAL /IED/CBR		X	X	LINK
		The anti-terrorism vehicle barriers	GENERAL /IED/CBR			X	LINK
		Portable temporary roadblocks	GENERAL /IED/CBR		X	X	LINK
		Access control	GENERAL /IED/CBR	X	X	X	LINK
		Unauthorized opening door and windows alarm system	GENERAL /IED/CBR	X	X	X	LINK
		Turnstile gates	GENERAL /IED/CBR			X	LINK
		Interlocking door systems	GENERAL /IED/CBR			X	LINK
	detection	Walk-through metal detectors	GENERAL /IED/CBR		X	X	LINK
		CBR detection	CBR			X	LINK
		X-Ray scanners	GENERAL /IED/CBR		X	X	LINK
		Drone support	GENERAL /IED/CBR			X	LINK
		Anti-drone system	GENERAL /IED/CBR			X	LINK

Personel

Security				RISK LEVEL			
			Threat	LOW	MEDIUM	HIGH	
Security	detection	Handheld Metal detectors	GENERAL /IED/CBR	X	X	X	LINK
		Explosives detectors	IED/CBR		X	X	LINK
		Portable X-Ray scanners	GENERAL /IED/CBR		X	X	LINK
		CBR detection	CBR			X	LINK
		Inspection accessories	GENERAL /IED/CBR	X	X	X	LINK
	protection	CBRN PPE		FFP2 mask	Mask FFP3	Full face CBR mask	LINK
				gloves	gloves	gloves	LINK
				googles	googles		LINK
				personal decon. kit	personal decon. kit	personal decon. kit	LINK
						CBRN suite	LINK
				emergency kit	emergency kit	emergency kit	LINK
		C-IED PPE		CAT	CAT	CAT	LINK
				burn dressing	burn dressing	burn dressing	LINK
				H&L set	H&L set	H&L set	LINK
					bulletproof vest	bulletproof vest	LINK
					ballistic blanket	ballistic blanket	LINK
					ballistic helmet	ballistic helmet	LINK
						haemostatics dressing	LINK

						non-flammable uniforms	LINK
		Armed attack PPE			Coercive measures	Coercive measures	Coercive measures	LINK
						bullet/knife proof vest	bullet/knife proof vest	LINK
						ballistic helmet	ballistic helmet	LINK
						ballistic blanket	ballistic blanket	LINK
VIP/religious leaders/admin	protection	CBRN PPE			FFP2 mask	Mask FFP3	escape respiratory protection	LINK
					gloves	gloves	gloves	LINK
					googles	googles		LINK
					Initial decon set	Initial decon set	Initial decon set	
		C-IED PPE				bullet proof vest	bullet proof vest	
						ballistic helmet	ballistic helmet	
		Armed attack PPE				bullet/knife proof vest	bullet/knife proof vest	
						ballistic helmet	ballistic helmet	

4. Facility security measures

Due to the diversity of the facility and its varying size, construction, and design, the facility has been divided into three areas of interest for equipment recommendations.

Area 1 – External premises of the facility.

This chapter is intended to provide a basic understanding of circuit design. It covers the location of the premises within the perimeter of the plot and the protective elements between the exterior building walls and the property boundary line. Some technical solutions also reach beyond this defined line.

Area 2 – Facility entry points/facade.

This chapter describes solutions and protection elements applicable to the building envelope

including facades, entry points, and other openings and access points.

Area 3 – Internal zone.

This zone includes the internal space of the building after crossing its entry points and the security and technical infrastructure

4.1. Area 1 – External premises of the facility

4.1.1. Anti-intrusion barriers

Anti-intrusion barriers are designed to prevent unauthorized persons from entering the premises. These barriers are designed to slow down an intruder in passing an obstacle, which may result in a change of tactics in terms of gaining access and additional time for detection and response.

This role will also be fulfilled by masonry fences high enough or finished with additional features that make it difficult to get to the other side, including spikes, barbed wire, etc.

Picture 1 – Wall spikes WSF-02

Source: Shandong Xingying Environmental Energy Technology Co. LTD.,
https://www.wall-spikes.com/wallspikes/wallspikefence.html [access: 16.12.2022]

It can also be combined with detection devices, significantly increasing its effectiveness. These solutions mainly protect the facility in this area against theft, active shooter, and planting small IEDs.

Picture 2 & 2a – RFID perimeter protection system

Source: RCS Engineering Sp. z o.o., https://rcse.pl/en/perimeter-protection-system/
[access: 16.12.2022]

In order to detect unauthorized intrusion into an area protected by a fence, intrusion detectors with vibration sensors (accelerometers) are mounted directly on the fence span in configuration with a CCTV system and combined with perimetric protection of gates and gateways. Fiber optic technologies and microwave barriers are also used.

4.1.2. Landscaping

As an alternative to road barriers, the external perimeters of the facility could be planted with natural plantings in the form of trees that can stop vehicles from unauthorized entry. This solution is environmentally friendly, provides a natural look, and does not require a significant investment. The disadvantage of this solution is the time it takes for the tree to settle down and grow to the appropriate size. An added advantage is that it also provides an excellent screen from view of the property, limiting the possibility of hostile reconnaissance and remote weapon attacks. Ditches, bunds, and berms also fulfil this type of purpose.

4.1.3. Anti-ramming barriers

For the protection of pedestrians and the possibility of bringing in explosives in large quantities, it is necessary to secure external perimeters of the facility, pedestrian traffic routes, gathering places of the worshippers, and the possibility of entering the inner area of the facility by the vehicle.

The line of protection should be continuous and completely enclose the site. There should be no unprotected places where vehicles can approach or enter the site, including from adjacent plots, roads, and open areas.

For this purpose, various types of technical protections are used, which act not only as a physical barrier but also as a preventive measure and deterrent to potential attackers.

Bollards

A bollard is a small pillar used to create protective or architectural barriers. Bollards primarily serve as a visual guide, directing traffic and establishing perimeters. As landscaping features, they are available in various shapes or visually distinctive designs.

Bollards can be made from almost any material, including but not limited to the most common are metal, stone, plastic, and cement. Bollards may also be structurally constructed to physically block vehicle entry or protect individuals and assets.

There are also solutions, such as automatic retractable hydraulic bollards, which function as anti-terrorist vehicle barriers, with the possibility of hiding them entirely in the ground in order to allow the passage of vehicles at entry points and in the event of danger raising them in a short time blocking the route. This solution also makes it possible to maintain pedestrian traffic.

Picture 3 & 3a & 3b – SP 40, M50–1000 DFES bollards

Source: DFE Security Sp. z o. o., https://www.dfes.pl/kategoria-produktu/oferta/rozbaz/blokady-drogowe-bollards/ [access: 16.12.2022]

The anti-terrorism vehicle barriers

This type of protection is divided into several types depending on the method of operation. Mounted on vehicle entry points to the inner area. They can be manually, automatically, pneumatically, electromechanically, or hydraulically controlled. Its primary task is to stop a terrorist attack with the use of a vehicle traveling at high speed from entering the premises, protecting against ramming the congregants and bringing into the area explosives or other dangerous substances in large quantities.

Picture 4 – Roadblocker M50

Source: DFE Security Sp. z o. o, https://www.dfes.pl/produkt/zapora-drogowa-roadblocker-m50-dfes/ [access: 16.12.2022]

Reinforced landscape objects

Heavy objects can also be an effective barrier and complement the landscaping. These are various heavy, mostly concrete, architectural landscape objects, including benches, sculptures, and plant pots.

Picture 5 & 5a – Bollards Furniture Urban

Source: SVC Products Pty Lt., https://svc.com.au/products/civil/concrete-pits/ [access: 16.12.2022]

Portable temporary roadblocks

These installations are not necessarily a permanent part of the facility's infrastructure but can be used as additional security measures for specific events or during high-risk periods. The advantage of this solution is the lack of significant financial outlays on the modernization of existing infrastructure and the limitation of the designated area only for a limited period. By design, these elements must meet the requirements of anti-terrorism protection.

Picture 6 & 6a – F11, F18 mobile roadblock

Source: DFE Security Sp. z o. o., https://www.dfes.pl/kategoria-produktu/oferta/rozbaz/blokady-drogowe-bollards/bariery-tymczasowe/ [access: 16.12.2022]

Some mobile vehicle barriers that allow authorized vehicles and emergency services to pass through also meet legal requirements for escape routes and accessibility.

Picture 7 – Mobile Road Blocker

Source: Mobile Gate Security A part of Security Holding Denmark,
https://mobilegatesecurity.com/products/mobile-roadblock/ [access: 16.12.2022]

Gates

A reliable means of access control is the entrance gate. Self-supporting sliding gates operate regardless of the characteristics of the road and its slope. Swing gates can reliably and economically secure access to the protected area. A swing gate can be used whenever a sliding gate's space is insufficient for proper operation. Some anti-terrorism gate solutions meet the appropriate security requirements and required standards.

Picture 8 – The Delta Cantilever Sliding Gate
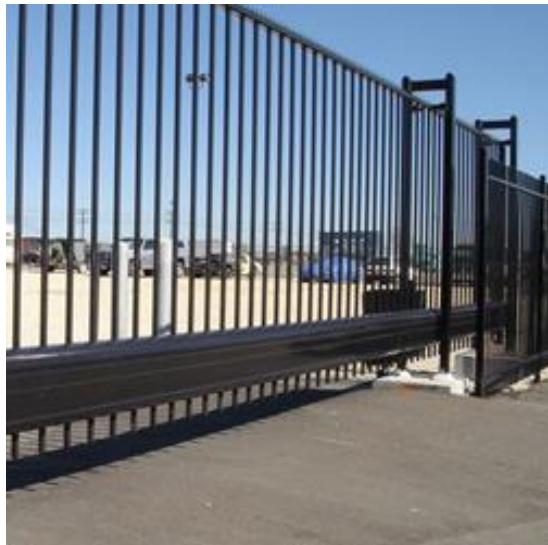
Source: Wallace Perimeter Security., https://www.wallaceperimetersecurity.com/gates/slide-gates/delta [access: 16.12.2022]

4.1.4. Security post

Permanent or temporary security guard posts are constructed when there is a need to ensure the safety of a fixed location on the perimeter of a building or at vulnerable points. Security posts are designed to enhance a security guard's ability to perform their duties 24/7. The security post should also provide shelter in adverse weather conditions, provide adequate lighting, be equipped with appropriate technical support, and be protected against vehicle ramming.

Picture 9 – Colored Security Post

Source: AB Sea Container Private Ltd., https://www.indiamart.com/proddetail/colored-security-post-17623595791.html [access: 16.12.2022]

4.1.5. CCTV system

The primary function of the CCTV (Closed Circuit Television) system is to support and protect the facility and manage it properly. It must cover all sensitive points. In many cases, it also serves as evidence in criminal or terrorist cases and allows for accurate reconstruction of the event. Further features of this system are deterrence and prevention capabilities, where we reduce the likelihood of attack. A well-functioning security system supported by appropriate technology can detect hostile reconnaissance and prevent existing hostile activities. The system must be operated by qualified personnel, and all critical points must be well illuminated and free of so-called blind spots. The system should be designed and installed by professionals preceded by a security audit, which will guarantee its correct functioning.

Picture 10 & 10a – CCTV system

Source: Geotechnology IT Group Sp. z o.o., https://www.geotechnology.pl/systemy-cctv/
[access: 16.12.2022]

Face/behavior recognition system

Additional features of this system can be equipped with appropriate software and a database for face recognition. In many European countries, such a function is highly effective but limited by law.

Picture 11 – Screen capture from the Skylark system

Source: Skylarklabs, Inc. https://skylarklabs.ai/public-safety#/ [access: 16.12.2022]

Left item detection

The left-behind baggage recognition system identifies potentially dangerous objects in public spaces where terrorist threats pose a real danger. It performs its role very well in finding objects that may contain improvised explosive devices (IEDs) and CBR agents. In case of detection of the object left in the supervised area, the software automatically informs the system operator about the situation, who decides on further steps. There are also solutions for detecting unusual behavior that can detect the behavior of a potential assassin.

Picture 12 – Abandoned Luggage Detection
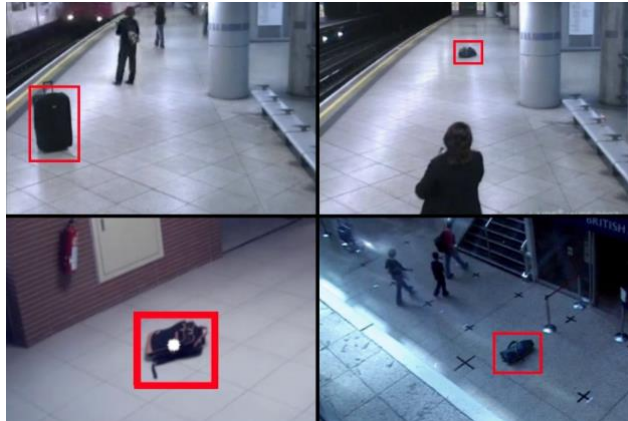
Source: viso.ai., https://viso.ai/application/abandoned-luggage-detection/ [access: 16.12.2022]

Body Worn Camera

They are becoming standard equipment for security services. They affect the safety of those using them, record video and audio from incidents. They also act preventively during hostile reconnaissance. Designed to operate regardless of the existence of a permanent CCTV system.

Its use is conducive to reducing complaints about the actions of security. They have a significant impact on reducing violent incidents. Properly used, show the event and the situation from the security point of view. Together with the radio communication system, it creates an extensive surveillance system with direct preview by CCTV operators (just like drones). The recordings can provide evidence in proceedings and often constitute essential evidence in a case. It is required to prepare a number of procedures for handling recordings, including who and when can have access to recordings, to whom and on what terms copies are made available. It is also necessary to handle copies following General Data Protection Regulation.

Picture 13 – Body worn cameras

Source: Caught In The Act Video Surveillance Pty Ltd., https://www.citact.com.au/product/body-worn-cameras/ [access: 16.12.2022]

4.1.6. Waste containers

An essential element in security system is the proper supervision, placement, and design of trash garbage cans. These are places that are naturally suited for leaving a variety of items, including dangerous objects. Therefore, they should receive special attention from security supervisors in this matter.

4.1.7. Drones solutions

Drones are increasingly supporting public services in providing security and are also exploited by criminals or terrorists. Therefore, drone support and protection against them must meet appropriate requirements.

Drones support

Flying drones are equipped with high-resolution cameras that provide real-time data of the circumscribed area of interest. The algorithms allow mapping the area by building, street, vehicle, or person. This allows for planning the event's details to ensure the participants' safety.

Picture 14 – DJI Mavic 2 Enterprise Advanced, DJI Matrice 300 RTK drones

Source: TPI Sp. z o.o., https://tpi.com.pl/pl/katalog-produktow [access: 16.12.2022]

Thanks to the technology, such devices ensure control over the crowd gathered at the event. It is possible to zoom in on the area of interest and take appropriate security protocols. The technology also enables integrating police databases with facial recognition algorithms. This solution allows for the detection of criminals or terrorists at an early stage of their planned activities.

Picture 15 – Drone recognition system screen capture from the Skylark system

Source: Skylarklabs, Inc., https://skylarklabs.ai/public-safety#/ [access: 16.12.2022]

It is also possible to equip the drones with accessories useful during crowd control. These include megaphones, searchlights, drop systems, and communication systems.

Picture 16 – Drones accessories

Source: TPI Sp. z o.o., https://tpi.com.pl/pl/katalog-produktowPic [access: 16.12.2022]

To operate drones, proper qualifications are required, and drone aviation is regulated by the European Union Aviation Safety Agency (EASA), which has standardized rules among its member states - (EU) 2021/1166 of July 15, 2021.

Anti-drone systems

Antidoron systems are primarily entrusted to law enforcement agencies. Appropriate national approvals must be obtained for the purchase and operation of the relevant system. By design, they are not dedicated to individual consumers because of the damage that can be done to people and property.

We can divide these devices into 3 groups:

- for military applications - laser sets, guided missiles, etc.,

- kinetic devices - net launchers (hand-held) mounted on interceptor drones,

- non-kinetic devices - mainly based on radio frequency solutions (jamming/interceptor).

Kinetic devices

Hand-held interceptor net launchers are designed to intercept flying drones at low altitudes and speeds. They fire a net that weaves into the rotors of the drone. The disadvantage of this solution is that the drone falls inertly from its height, and therefore, it has significant limitations on its application.

Picture 17 – Antidrone net muncher Sky Wall 100

Source: My Drone Services Inc., https://mydroneservices.com/drone-mitigation-deterrent-solutions/ [access: 16.12.2022]

Another kinetic solution is anti-drone systems launched from another drone. Depending on the solution, it can autonomously track a passing device or be controlled by an operator. This is a safe solution due to the fact that the intercepted drone remains hooked up to the capturing device.

Picture 18 – Drone Catcher - Delft Dynamics BV

Source: Delft Dynamics., https://www.forcesoperations.com/amp/laid-a-la-recherche-dun-drone-intercepteur-de-drone/ [access: 16.12.2022]

Non-kinetic devices

Non-kinetic antidoron systems are based on electronic hardware and software. They work on the principle of detecting a flying device with the help of various types of radar, appropriate qualification, and neutralization.

Various types of radars and sensors are used for detection purposes. These include but are not limited to radars, acoustic detectors, and detection cameras, which can give a device's location with a high degree of accuracy.

Picture 19 & 19a & 19b & 19c – Anti-drone system SkyCtrl
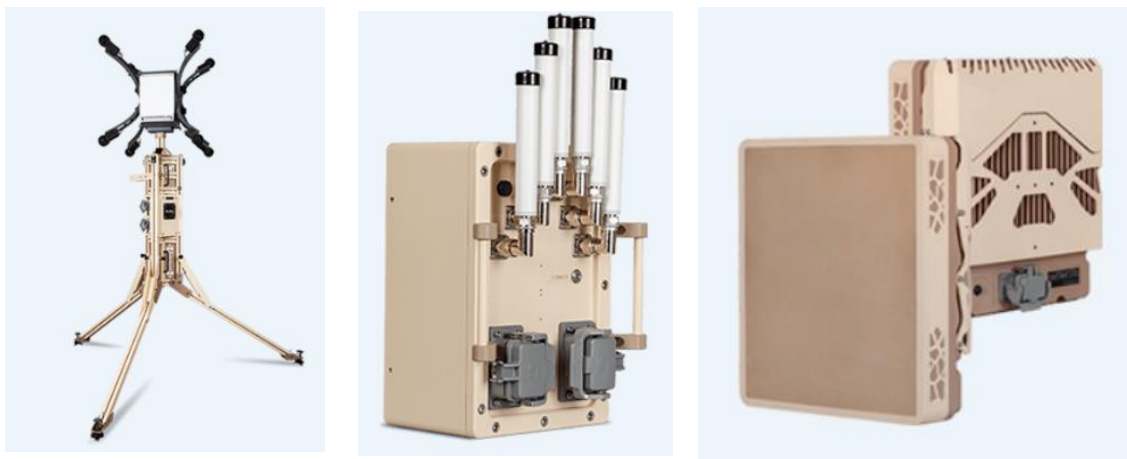
Source: Advanced Protection Systems SA., https://apsystems.tech/produkty/sky-ctrl/
[access: 16.12.2022]

Then, the drone is classified and assigned to the appropriate group using artificial intelligence. If the collected data determines that the flying object is unauthorized, it displays the pertinent information to the operator, who decides on further action. Once the decision is made, the operator activates neutralizing devices consisting mainly of jamming radio bands or giving appropriate commands to the device to bring it to the ground and immobilize it. Radio frequency jamming is strictly regulated by the relevant country's internal authorities.

There are also hand-held solutions, where the operator aims the interceptor at a flying object and, thanks to the installed directional antennas, sends a jamming beam in the direction of the device. When the jamming beam reaches the drone, it is possible to bring the device to the ground or command it to return to "home" or the remote-control device location.

Picture 20 – Drone interceptor gun DroneGun Tactical

Source: DroneShield LLC. https://www.droneshield.com/dronegun-tactical [access: 16.12.2022]

4.2. Area 2 - Facility entry points

Deterrence and detection are vital to eliminating a threat inside a building. Therefore, proper screening procedures for persons entering the building should be used. There are many technical features to streamline the inspection process. Unfortunately, they bring a number of inconveniences, such as financial outlay, uncomfortable conditions for the worshipers/visitors, additional equipment space, and technical infrastructure. Additionally, for these outlays to fulfil their role, these posts should be physically separated from the facility's interior. This should be arranged so that a potential attacker cannot get from the control zone to the location of the planned attack.

4.2.1. Entry/exit

Access control

By design, it is an electronic system for verifying and assigning access authorization to selected personnel. Several key points must be followed for the system to perform its function, and all entry points must be equipped with it. It is crucial to minimize the number of entry points, and doors equipped with it should be fitted with a self-closing system and emergency locking system in case of need. An additional advantage of this system is the possibility to designate internal zones ensuring the segregation of persons moving in a given area.

Picture 21 & 21a – Access Control Systems

Source: Standard Telephones and Cables., https://telephonesandcables.com/access-control-security/ [access: 16.12.2022]

Turnstile gates

Turnstiles are installed in areas particularly prone to attack or unauthorized entry and where high throughput is a requirement. They are often integrated into an access control system or installed after a personal screening, where they can be interlocked and prevent an attacker from entering.

Picture 22 – Turnstile gate REXON ERA 3
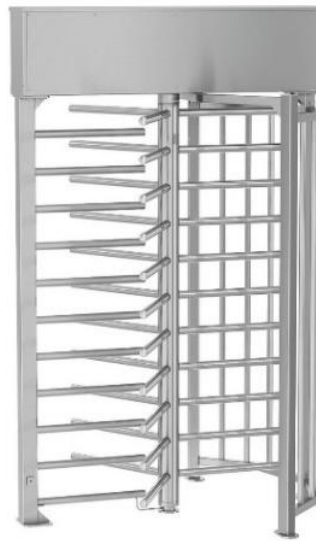
Source: DFE Security Sp. z o. o., https://www.dfes.pl/kategoria-produktu/oferta/rozbaz/bramki-i-furty/wysokie-furty-obrotowe/ [access: 16.12.2022]

Alternatively, smaller versions of this device are available but do not prevent access to the designated area. It is possible to pass a tripod twister over.

Picture 23 – Tripod twister Bar BA

Source: DFE Security Sp. z o. o., https://www.dfes.pl/kategoria-produktu/oferta/rozbaz/bramki-i-furty/obrotowe-bramki-kolowrotkowe/ [access: 16.12.2022]

4.2.2. Screening and detection equipment

Handheld Metal Detectors

Hand-held metal detectors are designed to detect metal objects brought in by people on the premises. This device makes it possible to search a person without violating his/her personal rights. This device can detect metal knives, IEDs, and inspect small suitcases, packages, letters, firearms, and other objects brought into the protected area. These devices are not expensive, easy to use, and generally available.

Picture 24 – Handheld metal detector Super Scanner®V

Source: Garrett Electronics Inc., https://garrett.com/security/hand-held/super-scanner-v-hand-held-metal-detector [access: 16.12.2022]

Walk-through metal detectors

This is a larger version of the metal detector in the form of a gate. These devices are characterized by a highthrer throughput than hand-held metal detectors but are associated with more significant expense, designation of the appropriate place, power supply, and additional lightning. They can be mounted for the duration of the event and quickly and easily dismantled. Often, this post is equipped with another hand-held detector to precisely locate the metal object.

Picture 25 – Garret Walk-thrue metal detector

Source: Garrett Electronics Inc., https://garrett.com/security/walk-through [access: 16.12.2022]

Both solutions are associated with using an additional table for searching things brought into the area of the object and a workplace for security personnel.

X-Ray scanners

Stationary X-ray scanners are used primarily where there is an increased risk of a terrorist attack. These devices generate X-rays that travel from a source to a receiver, analyzing differences in the density of objects placed between them. These devices are expensive, and the operation requires specialized training. It also requires considerable space and adequate infrastructure to be considered during its installation. The advantage of this system is the possibility to precisely inspect the contents of objects without opening them, even placed inside solid objects, electronic equipment, closed boxes, and items sealed in factory packaging. In some devices, installed software supports the operator's ability to identify prohibited items and devices such as weapons or IEDs. Thanks to the applied technical solutions, they also distinguish between organic and inorganic compounds, significantly affecting the detection capabilities of explosives and some chemical and biological agents.

Picture 26 – X-ray scanner

Source: Safeway Inspection System Ltd., https://www.safeway-system.com/What-should-be-paid-attention-to-when-using-x-ray-baggage-scanner-id3375671.html [access: 16.12.2022]

Modern solutions also make it possible to manually scan suspected items. During the scanning process, thanks to the technology used, the scanner is slowly moving scanned object without contact, and generates two-dimensional image in real-time on a high-resolution color display.

Picture 27 – Handheld X-ray scanner NIGHTHAWK

Source: Z&Z Biztonságtechnika Kft., https://znz.hu/termek/viken-hbi-hordozhato-visszaszorasos-kezirontgen-backscatter/ [access: 16.12.2022]

Explosives detectors

Explosive detectors can be divided into several groups depending on the amount of material to be sampled, the technology used, the physical state of the sample, and its mobility. They are used to detect homemade, commercial as well as military explosives. Depending on the technology used, some devices take vapours samples from the air or directly from the tested surface with swabs. Some solutions combine both technologies. Various colorimetric tests are also based on the reaction of corresponding solutions with explosives and are expressed by a colour change on the corresponding paper. These devices are relatively cheap and easy to use. The disadvantage is that the sample must be taken directly from the test substance or swabbed. Electronic devices are expensive and trigger the appropriate safety procedures more often. The advantages of these devices include detection capabilities to detect even trace amounts of explosives, even after a considerable period following exposure to the explosive. A wide range of available devices allows you to tailor solutions to the conditions and requirements of the facility.

Picture 28 – ENTRYSCAN® 4 - high-sensitivity high explosives walk-through detection system

Source: Rapiscan Systems., https://www.rapiscansystems.com/en/products/entryscan
[access: 16.12.2022]

Picture 29 – Smiths Detection SABRE 5000 chemical trace detector

Source: Federal Resources, https://www.federalresources.com/product/sabre-5000/
[access: 16.12.2022]

Picture 30 – IONSCAN™ 500DT - simultaneous explosives and narcotics trace detector

Source: Smiths Detection Group Ltd., https://www.smithsdetection.com/products/ionscan-500dt-2/ [access: 16.12.2022]

Picture 31 – Ultra™ Multi-Target Explosives & Precursors Test Kit

Source: Ideal Blasting Supply Inc., https://idealblasting.com/ultra-multi-target-explosives-precursors-test-kits-box-of-10/ [access: 16.12.2022]

CBR detectors

The detection of CBR substances involves specialized knowledge and high-quality equipment dedicated exclusively to this hazard group. Detecting substances expose the operator to hazards and exposure. Testing without additional personal protection equipment is a lethal risk, which is why the equipment is dedicated mainly to specialized services. Despite this, a number of detection devices are available on the market without special permission, regulated by the internal regulations of a particular country or by internal company policy. These devices very often have additional explosives detection capabilities. A relatively less expensive alternative to expensive and customer-restricted devices are toxic industry chemicals detectors which are limited to chemicals detection abilities. It does not change the fact that testing a sample requires exposure to a hazardous agent.

Chemical detectors

As with explosives detection, several types of devices are divided into groups depending on the technology used, the amount of material to be sampled, the physical state of the sample, and its mobility. In facilities producing or using toxic industrial substances in the production process, dedicated detectors for specific contaminants are installed. Chemical hazards can also be identified using a chemical detection method. In this case, the chemical compounds react with the corresponding reagents, which results in a change of color.

Picture 32 – Gemini™ Combining Raman and FTIR technology Chemical Analyzer

Source: Delta Science., https://www.deltasciencemm.com/category/portable-analytical-instruments/ [access: 16.12.2022]

Picture 33 – RAID-M100 Plus - Ion Mobility Spectrometry (IMS) hand-held Chemical Agent detector

Source: Bruker Corporation., https://www.bruker.com/en/products-and-solutions/cbrne-detectors/ims/raid-m-100.html [access: 16.12.2022]

Picture 34 – Drager Detection Tubes

Source: Drägerwerk AG & Co., https://www.draeger.com/en_uk/Products/Sampling-Tubes-and-Systems [access: 16.12.2022]

Biological detectors

Rapid detection is critical in minimizing the effects of biological weapons use. In many cases, the first symptoms occur a considerable time after exposure to the threat. Detection and identification of this type of hazard should take place in specialized labs and be performed by appropriately trained and protected personnel. Nevertheless, rapid and accurate detection is the key to minimizing the effects of biological agents in terrorist acts.

Picture 35 – BioCheck™ Powder Screening Test Kit

Source: 20/20 Gene Systems. https://2020gene.com/home-page/ [access: 16.12.2022]

Picture 36 – Qubit™ 3 Fluorometer

Source: Fisher Scientific AG., https://www.fishersci.ch/shop/products/qubit-3-0-quantitation-starter-kit/15397463 [access: 16.12.2022]

Radiation detectors

Detection of ionizing radiation and radioactive materials is impossible without appropriate equipment that detects its presence, type of radiation, its intensity, which allows estimating the level of risk for humans. Basic detectors for detecting ionizing radiation and dose meters are relatively inexpensive and widely available. False alarms are rare with this type of device and are mainly caused by human maintenance errors. These solutions can be installed at entry points to facilities, used as hand-held detectors, or as personal equipment for employees as dosimeters that measure the received radiation dose.

Picture 37 – NeutronRAE-II - personal radiation detector

Source: Gastech Australia Pty Ltd (Gastech)., https://gastech.com/products/radiation-monitoring/neutronrae-ii [access: 16.12.2022]

Picture 38 – X-Ray and Gamma Personal Dosimeters PM1610A

Source: Polimaster Europe UAB., https://polimaster.com/eu/product/x-ray-and-gamma-radiation-dosimeters/personal-dosimeters/personal-dosimeter-pm1610/ [access: 16.12.2022]

4.2.3. Unauthorized opening door and windows alarm system

Detectors and devices that indicate an unauthorized entry attempt by rule are part of the anti-intrusion system. These devices should operate in a 24-hour system in places that should be permanently closed (such as emergency exit doors, back rooms, and key technical rooms of the facility). Additionally, such a system should have a possibility of temporary authorization for entering and leaving so that it does not cause false alarms during the operating hours of a given zone. Such sensors are mounted on any door or window that can be used as an entry point to a facility. They are usually magnetic or mechanical switches connected to the alarm system. These are low-cost alarm systems and do not represent a significant investment at the construction stage. In the case of already existing buildings, there is a need to connect sensors by wire (which should be prospected), which can be a technical problem. The disadvantage of this solution is that the sensor can be bypassed, for example, by breaking and going through the glass of a window. Therefore, the design and installation should be commissioned to a professional company that provides for such a possibility by installing additional technical protection. Wireless versions are also available, but they involve changing the battery and using a wireless network.

Picture 39 – Open/Close Alarm Sensor for SCW Shield - 74WOS

Source: Security Camera Warehouse., https://www.getscw.com/window-alarm-sensor [access: 16.12.2022]

4.2.4. Interlocking door systems

This system is installed at access points to critical and sensitive places. It can be installed in small rooms or as a security booth, consisting of two doors with monitored and controlled locks. It is not possible to open two doors at the same time. The doors are controlled in two ways, one is by an operator who authorizes the person by visual inspection, and the second is automated using a cay card or pine code. In this type of solution, there is a possibility of stopping a suspect inside the room.

Picture 40 – Man Trap Doors - Standard Telephones and Cables

Source: Standard Telephones and Cables., https://telephonesandcables.com/access-control-security/ [access: 16.12.2022]

4.2.5. Signage

Proper signage indicating specific evacuation routes, assembly points, safe havens, etc., will increase the effectiveness of the emergency response. Appropriate signage on access roads guarantees smooth traffic flow and indicates places or areas designated for emergency services, e.g., fire roads, hydrant locations, assembly points, etc. On the other hand, avoid designating security-sensitive locations such as command posts, CCTV rooms, critical objects, and infrastructure. An adequately marked facility is a great help to people unfamiliar with its topography, and often in emergency situations, it is the only indicator of safety procedures to be followed. Signage also has the additional benefit of sending clear and strong deterring signals to potential attackers that the facility is appropriately manned and secured. It can also protect against hostile reconnaissance, where the person gathering information about the facility is aware that he/she is being recorded. The recording can be used in the investigative process.

Picture 41 – Surveillance Cameras In Use Signe

Source: Discount Safety Signs Australia, https://www.discountsafetysignsaustralia.com.au/
products/security-signs/surveillance-cameras-in-use/ [access: 16.12.2022]

4.2.6. Facade

The façade of a building is a barrier that separates the outside from the inside with numerous entry points, windows, columns, and other functional elements of the structure. In places of worship, it is also, in many cases, a decorative element of the building itself, which can amplify its effects during an attack with high explosives.

To ensure that a structure is adequately resilient to the effects associated with the detonation of a high explosive charge, it must be considered at the building design stage following applicable safety standards (appendix. No. 1).

To ensure the safety of buildings not designed for this type of hazard, create a buffer zone to provide a stand-off distance. The stand-off distance is defined as the distance between the detonation and the protecting building (the bigger, the better).

Mostly related to large IEDs (mostly VBIEDs) that may create primary and secondary fragmentation from the blast. When the blast accrues shatters the glass in windows (glass walls), causing the large fragments to fall, creating structural damages and fragmentation. This is why this consideration should be taken for buildings facades for the mass event congregation. This can be done using the measures described above to prevent the vehicle from entering directly under the facility facade.

4.2.7. Doors, glazing, and windows

Door

In addition to their standard purpose, doors in buildings can perform many additional functions, such as anti-burglary, ballistic, fire, weather protection, etc. However, they must maintain their primary function.

The doors of the facility should be appropriate to the potential hazard. Other than in the case of the building structure itself, they can be modernized in existing door openings in most cases.

In the context of security, they function as the first barrier an assassin may encounter in his path during a forcible entry. Therefore, it is a good solution to consider installing a burglar-proof door or changing the locks and door bolts to burglar-proof. This allows to slow down or prevent force entry, even using tools or firearms.

In addition to entry points into the facility, these doors should also be provided for special purpose rooms (safe houses, control rooms, vaults, etc.). Doors and locks shall be certified and meet the latest security standards depending on their resistance class (see appendix no. 1). Also, they should be installed by qualified personnel who install them based on a detailed design using proven and certified test methods, following other safety regulations. Only such installation guarantees their correct functioning at an adequate resistance level.

These solutions do not represent a significant financial outlay but significantly reduce the vulnerability to potential aggressors.

In the case of increased risk of explosives or firearms use, there are solutions to protect also in this aspect. Due to appropriate technical parameters of door openings, the installation of such doors must be preceded by a proper specialist analysis of the possibility of their application.

Picture 42 & 42a – Burglar resistance door and lock

Source: Shield 100 Ltd., https://www.shield-security-doors.co.uk/ [access: 16.12.2022]

Glazing and windows

Windows, glazing, and stained glass are important functional and architectural elements of each building. Damage caused by accidents, natural weather phenomena, or terrorist attacks can produce significant amounts of glass fragments. Such incidents can cause numerous injuries and deaths to the worshippers both inside and outside the building. Therefore, they should remain under special supervision and adapted to the existing risks.

Detonation blast-resistant windows

Explosion-proof windows are installed to eliminate or reduce casualties from the explosive charge detonation and the resulting high-velocity glass shards. The greater the hazard and other circumstances that increase the risk level (e.g., a small stand-off distance from the street), the higher the level of blast protection the window should be provided. Due to the standards that must be met by the window and its installation (see Appendix no.1), the application of such a solution should be assigned to specialized companies that will adapt protection requirements to the threat and technical capabilities of the object. Installation of this type of protection is expensive and will not always be possible, but it provides adequate protection against explosion hazards.

Picture 43 – Blast Resistant Windows

Source: Window Gard B.V., https://windowgard-security.com/index.php/blast/15-blast-resistant-windows [access: 16.12.2022]

Antifragmentation film

The substitute of the detonation blast-resistant windows is the use of a protective film installed on the window glass. This solution can reduce the danger from explosion by keeping glass shards together. Furthermore, the mechanical film attachment to the window frame reduces the risk of the glass being pulled out of the frame during the negative pressure.

An added benefit is protection from thrown objects. It effectively stops even heavy, low-speed objects from falling inside and protects against glass fragments. This solution is inexpensive, effective against thrown objects, and somewhat reduces the effects of the detonation of the explosive charge.

Picture 44 – Safety and Security Window Films

Source: EUROLAB., https://www.laboratuvar.org/pl/testler/otomotiv-testleri/ece-r-43-motorlu-tasitlarin-guvenlik-cami-onayi/ [access: 16.12.2022]

Forced entry resistant/anti-burglary windows

Security windows should be used primarily where they are easily accessible from the outside, especially from a level directly accessible from the ground or structural or terrain elevations.

Similar to the door, they should be certified and meet the latest security standards depending on their resistance class (see appendix no. 1). In addition, they should be installed by qualified personnel who install them based on a detailed design using proven and certified test methods, following other safety regulations. Only such installation guarantees their correct functioning at an adequate resistance level. Installations of this safety measure make it difficult or impossible to overcome even using tools, and this significantly reduces the risk of an attacker getting through this entry point. They are characterized by a reinforced frame, built-in anti-ramming mechanisms, locks in the handles, and laminated or polycarbonate glass. This solution is relatively cheap and can be installed in most existing facilities.

Picture 45 – Anti-burglary window

Source: Oknoplast Sp. z o.o., https://oknoplast.com.pl/dawka-wiedzy/okna-bariera-dla-zlodzieja/ [access: 16.12.2022]

Bars

Bars are an effective solution against forcible entry through the windows. They are installed in window openings or other facility access points. Correctly installed, they are a significant obstacle that an attacker needs tools and time to break through. High efficiency, adaptability to existing window openings, and low costs are the advantages of this solution. Unfortunately, they also have limitations in the application, mainly due to fire and evacuation regulations.

4.3. Area 3 - Internal zone

4.3.1. Safe room

A safe room is a designed or adopted room that serves as a shelter in an emergency. Provides shelter to its occupants from such threats as armed aggressors, the detonation of explosives, firearms, chemical threats, fire, and natural disasters. They can be divided into designed/adopted facilities (safe rooms) or temporary shelters that provide temporary short-term protection (shelter-in-place). Shelter-in-place is a low-cost solution for rooms that are not permanent occupancy facilities but only shelter until a safe evacuation can be possible.

In addition to standard protection, there are dedicated solutions for CBR threats. Mainly by using appropriate filtration in the ventilation system or by switching it off. It is possible to equip a standard shelter with proper PPE to give the possibility of surviving an attack. To meet the best of its requirements, the room should start at the building design stage. Adapting an existing room is possible but can be complicated and expensive (especially for CBRN threats). Such rooms can also protect against armed attack or hijacking, but this solution requires the facility to be equipped with walls, doors, and windows ballistic protection.

Shelter location and capacity are crucial in the space design process. Another critical element to consider are escape routes. They should be easily accessible and properly marked. The time and the distance to travel to reach the shelter should also be considered. Such shelters should also meet requirements for people with disabilities. Such a room should be equipped appropriately depending on the expected time to ensure its independence from external factors. Most importantly, it should be equipped with water, food, sanitation, medical supplies, communications equipment, and additional survival gear.

All these elements should be properly selected by a qualified company.

4.3.2. Mailroom

To counter the dangers of shipments containing hazardous substances and devices, there is a separate room for their inspection. There are two types of threats identified. These are explosive and CBR threats. Every facility should provide temporary or permanent dedicated mail room, especially when preparing for a mass event. An alternative solution is redirecting mail to a specialized company for verification and security checks. The receiving and screening room should be in a location with minimal risk to few. The best solution is to locate this facility outside critical areas, away from the main entry point and other vital assets. In the event of a bomb threat, such a room should be designed to allow positive pressure to escape outside the building. In addition, with this type of hazard, it is important to equip it with explosive-resistant containers. The structure itself should provide sufficient safety in the adjacent rooms. In the case of increased hazards, the room should also be equipped with detection equipment for the anticipated risks. It should additionally be equipped with personal protective equipment appropriate to the anticipated hazard.

Picture 46 – Mailsafe Bomb Box

Source: bombrieven.nl., https://www.bombrieven.nl/product/mailsafe-bomb-box/ [access: 16.12.2022]

4.3.3. Control room

The monitoring room (control room) is critical in ensuring facility security's efficient and effective management. It is where information is gathered and flows between security officers and other employees. From this place, evacuation and rescue operations should be coordinated. There are control panels for all security systems (CCTV, intrusion, fire protection, access control, BSM (building management system), PA (public address system). It is also a surveillance point for vehicle traffic in all zones and for people entering the site. In order to manage the security, the room must be properly equipped and protected against unauthorized access.

For this room to meet its requirements, it must be designed, located, and equipped by a professional company and meet current quality standards according to the following principles:

- the room cannot serve a dual function, e.g., detention room, mail reception, record storage,

- should be located away from traffic routes accessible to the public,

- should be isolated from installations that may affect its operation,

- should be able to manage critical building control systems,

- should ensure ergonomics and efficiency for the CCTV monitoring operator,

- should additionally be equipped with personal protective equipment (PPE) appropriate to the anticipated hazard and suitable for managing any type of incident,

- should be equipped with a separate communication line with a direct connection to the critical points of the facility,

- should have a backup power supply to keep essential systems running at full capacity,

- equipped with extinguishing agents that do not damage or interfere with the operation of the equipment,

- arming doors with appropriate resistance depending on the anticipated threat, access control system, two-way videophone system,

- equipping the room with a surveillance camera.

4.3.4. Public address/voice alarm system

During an emergency, clear and precise voice messages are essential to effective safety management. Public address/voice alarm system delivers pre-recording voice warming messages. It also provides an effective method of communicating critical information and emergency instructions. It enables the effective, calm, and controlled management of staff and other people on the premises. The system can be divided into several zones, which makes it possible to inform and instruct the relevant groups of people in given areas, which is an important part of security management. It also does not cause unnecessary panic.

It consists of an integrated IP network, input controllers, and a speaker network system. It may also combine the microphone for announcements and message recordings.

Picture 47 – Public Address, Bosch Security and Safety Systems

Source: DSI sp. z o.o., http://www.dsintegracje.pl/aktualnosci/nowosc-paviro-bosch.html [access: 16.12.2022]

The detailed scope of its deployment and uploaded or prepared commands depends on the facility's risk analysis and response plan. As this technology underpinning the incident detection and signaling infrastructure continues to evolve, the standards for how this system should operate are increasing. Commands and instructions may vary depending on the emergency and need. The public address system may emit specific or default tones, broadcast priority voice commands according to established codes, or hazard-specific commands. Compared to traditional alarm methods such as alarm bells or voice commands, the response time to a threat is significantly improved.

4.3.5. Panic button

Panic buttons are devices used to signal a robbery or other event related to a security threat to people or property. There are loud and silent alarms depending on the procedure adopted in the safety documentation and the situation. Such pushbuttons may be either stationary (placed in high-risk rooms/places such as security posts, main entrance points, reception area, church pulpit, etc.) or mobile, the equipment of persons responsible for the security of the facility. Such devices are usually connected to the facility's primary alarm system and activate the structure of notification and alarming according to the established safety chain.

They can be installed in wired or wireless versions. The remote control is very convenient and easy to use. The standard range in the open space is about 200 m (differs indoors, dependent on building structure), but there are also models with a much longer range. The remote control is available as a

one or multi-channel model. In the multi-channel version, the radio channel can be used to trigger a panic alarm (loud or silent), and the remaining channels can be used for such purposes as a garage door, a parking barrier, or other safety features. They can be paired with almost any alarm system and utility automation. They require little investment and are easy to apply to alarm installations.

Picture 48 & 48a – Panic button

Source: Security Alarm Corp., https://www.securityalarm.com/blog/does-your-bank-need-a-panic-button/ [access: 16.12.2022]

4.3.6. Integration systems - Physical Security Information Management (PSIM)

As part of the interconnection of various independent systems related to facility management and security, integration systems are installed. Depending on the version used, these solutions enable integration with any number of security or building automation systems through dedicated interfaces. In advanced versions, it is possible to connect any number of sensors and define any number of procedures and situational plans.

Mobile versions are also installed on mobile devices, extending the system's functionality by managing resources such as mobile patrols, services, emergency services, etc. This is a particularly useful feature during terrorist events where a major command post or management point is rendered inoperable (in case of a full evacuation, command post takeover, use of CBR agents, etc.).

Picture 49 – Physical Security Information Management sysyem - GEMOS MOBILE

Source: Ela-compil sp. z o.o., https://ela.pl/2016/12/07/aplikacja-gemos-mobile/ [access: 16.12.2022]

The main benefits of its use are:

- quick and easy assignment of tasks to mobile devices,

- efficient management of resources (patrols, technical services, emergency services, etc.),

- position tracking in open terrain and inside buildings,

- immediate information on the violation or exceeding the designated zones,

- reporting with the possibility of attaching multimedia documentation.

4.3.7. Integrated Mass Notification System

Integrated Mass Notyfication System enables public safety and enterprice operators to quickly and effectively alerts and notifications across multiple channels from a single unified command and control interface to help keep employees and individuals safe.

The system can assist with:

- zone creation - preplanning to create specified zones and routes for evacuation,

- evacuation and planning - build zone-based evacuation plans including population, structure, traffic, and other data (past events, local knowledge, and known potential local hazards),

- fire protection - incident occurs and all communities/zones are alerted on where to go,

- operator - receives alerts and warnings on easy-to-use dashboard and activates notifications,

- mobile alerts - send geotargeted SMS, Text, Cell Broadcast, Email, and Social Media,

- voice notifications - broadcast audible sirens and clearly understood voice messages over local or large areas.

Picture 50 – Genasys Integrated Mass Notification System
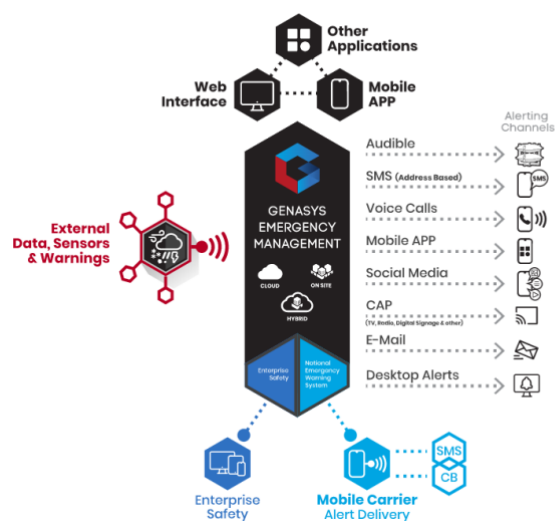
Source: Genasys™, https://eu.genasys.com/es/gestion-de-emergencias-genasys/
[access: 16.12.2022]

4.3.8. Critical utility infrastructure

Some technical installations are critical infrastructure for the facility's daily operation but may also be critical during an evacuation. Such installations should also be designed in locations less vulnerable to attack.

To protect the facility's technical infrastructure, keep signage at these locations to a minimum. They should be protected with fencing, access control, detection devices, and vegetation to conceal above-ground systems.

Ventilation system

A mechanical ventilation system provides a constant supply of fresh air to indoor areas and removes used air, regardless of atmospheric conditions. Depending on the object's size, it may operate as a single system or a network of independent centers.

The most vulnerable components are air intakes, handling units, and ducts.

A system potentially exposed to the hazards of spraying chemicals, biological agents, or suspensions that emit ionizing radiation. Properly securing access to the technical space ensures that equipment and the transmission network are protected from the immediate risk of contamination.

In many existing buildings, air intakes are located below or a ground level. Locating the intake at the highest practical level of the building is desirable. To protect against the hostile activity, air intakes should be shielded, monitored, and inaccessible to the public.

A proper filtration system is also used to protect against accidents or terrorist attacks. Air containing hazardous gases, vapours, and aerosols must be appropriately filtered to meet its requirements. This is mainly achieved by passing the air through various types of filters and absorbers. The most common way to purify the air from aerosols are mechanical filters and chemical/mechanical absorbents for vapours and gases.

Due to the high investment and maintenance costs, this solution is mainly used in safe rooms.

Detectors for chemical and biological agents in ventilation systems are also used to improve safety. Detection devices for biological hazards are less common, expensive, and the detection time is extended. These devices also require specialized operation and specialized personnel. Due to a large number of potentially hazardous chemicals, it is recommended to install equipment capable of detecting the most probable ones (e.g., in case of hazards caused by industrial installations of nearby plants).

Water supply

Water infrastructure, along with the technology necessary to operate it on a daily basis, is considered one of the most critical components of technical infrastructure. Thus, it can be contaminated by introducing poisons, pathogens, or chemicals into the distribution systems.

Access to points in the system where chemical or biological agents can be introduced sufficiently to cause health risks should be limited and accessible only to facility maintenance personnel. In addition, where water treatment is used, the range of chemical and biological contamination should be periodically controlled.

Emergency power supply

Emergency power, lighting, and backups for all critical systems allow security systems continue to operate during emergency situations (e.g., when the security control room is damaged or during a power failure). The emergency power system should be designed in such a way as to provide electricity only to the most critical elements of the building's safety equipment.

This can be accomplished in several ways by installing battery backup power, UPC systems, and emergency power generators. These systems are often interconnected to increase reliability and continuity of power supply.

5. First response equipment

In order to ensure an efficient, safe, and effective response to emergency situations and awareness of implemented procedures, it is necessary to provide additional emergency equipment for the personnel managing the facility's security. A well-designed, equipped, and properly located package will significantly increase the effectiveness of emergency response actions. Personnel responsible for coordinating emergency actions should be familiar with its contents, location and trained in its use.

5.1. PPE

Personal protective equipment (PPE) is worn to minimize exposure to hazards that cause injury and illness.

5.1.1. CBRN PPE

PPE is individual, specialized equipment and clothing for employees to ensure protection from hazardous conditions (such as chemical agents, biology agents, and toxins). General work clothing (such as suits, pants, and shirts) is not considered PPE. While using the specific PPE required is determined by a risk assessment. To prevent the effects of a terrorist attack using CBR agents, the goal should be to protect as effectively as possible against all hypothetical scenarios. When selecting appropriate PPE, size is a crucial criterion, and choosing the right size of equipment ensures that its properties are maintained. Further considerations affecting the effectiveness of the protection are the use of compatible PPE (masks, goggles, overalls, gloves), proper sealing of joints so that they form a tight unit, proper training in dressing and undressing.

CBRN PPE Levels

Vapours, gases, and particulates from hazardous substance response activities place response personnel at risk. For this reason, response personnel must wear appropriate personal protective clothing and equipment whenever they are near the site. The more that is known about the hazards at a release site, the easier it becomes to select personal protective equipment. There are four levels of personal protective equipment.

Level A protection is required when the greatest potential for exposure to hazards exists, and when the greatest level of skin, respiratory, and eye protection is required. Examples of Level A clothing and equipment include:

- positive pressure, full face-piece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA,

- totally encapsulated chemical and vapor-protective suit,

- inner and outer chemical-resistant gloves.

Level B protection is required under circumstances requiring the highest level of respiratory protection, with lesser level of skin protection. At most abandoned outdoor hazardous waste sites, ambient atmospheric vapours or gas levels have not approached sufficiently high concentrations to warrant level A protection. Examples of Level B protection include:

- positive pressure, full face-piece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA,

- inner and outer chemical-resistant gloves,

- face shield,

- hooded chemical resistant clothing (impermeable),

- coveralls,

- outer chemical-resistant boots.

Level C protection is required when the concentration and type of airborne substances is known and the criteria for using air purifying respirators is met. Typical Level C equipment includes:

- full-face air purifying respirators,

- inner and outer chemical-resistant gloves,

- hard hat,

- escape mask,

- disposable chemical-resistant outer boots.

Level D protection is the minimum protection required. Level D protection may be sufficient when no contaminants are present or work operations preclude splashes, immersion, or the potential for unexpected inhalation or contact with hazardous levels of chemicals. Appropriate Level D protective equipment may include:

- gloves,

- coveralls,

- safety glasses,

- face shield,

- chemical-resistant, steel-toe boots or shoes.

While these are general guidelines for typical equipment to be used in certain circumstances, other combinations of protective equipment may be more appropriate, depending upon specific site characteristics.

Eye protection

These should provide eye protection from chemical and biological splashes and protect against dust. By design, goggles and safety glasses should have protective shields on the sides to prevent these substances from entering the eye in angled splash situations. Prescription goggles are also available in specialized stores.

Eye protection is often integrated with face masks, which provide the best protection.

Protective glasses do not provide full protection against dust, vapours, and aerosols entering the eye, therefor suitable protective goggles are recommended. The best goggles are made of soft components that ensure a tight fit with a properly curved surface that fits the face.

Picture 51 & 51a – Dräger X-pect® 8100 Cover Spectacles,Dräger X-pect ® 8500 protective goggles

Source: Dräger Polska Sp. z o.o., https://www.draeger.com/pl_pl/Productselector/Head-and-Eye-Protection/Protective-Eyewear?page=1 [access: 16.12.2022]

Respiratory Protection

Respiratory protection protects personnel from inhaling airborne hazardous substances in various forms (aerosols, liquid/solid particles, gases, or vapors).

There are many possible hazards associated with improper use of respiratory protection. To avoid these, it is important to remember:

- improper fitting and wearing of a respirator mask - a mask cannot fully protect if it does not properly fit the face,

- touching the inside of a respirator mask can result in the transfer of contamination and eventually lead to substances entering the mouth and nose,

- taking unnecessary risks of exposure by users as a result of a false sense of protection - it is always better to maintain an appropriate stand-off distance.

There are three types of respiratory protection:

- air purifying masks,

- self-contained breathing equipment,

- rescue and Escape Apparatuses.

Air purifying masks - filtering half-masks, full-face masks, filtering masks with forced circulation.

These solutions depend on the air in the given environment and filter it of hazardous substances. Depending on the environment, they can be used if the oxygen content is at the appropriate level (a minimum of 17%) and the type of hazardous substance is known (only a suitable filter can ensure proper functioning). Therefore, it is recommended to use masks with filters of the broadest possible spectrum:

- single-use half-masks - recommended filtration class FFP3/P3/N99/N100 - they do not protect against most chemical substances and are mainly used in case of biological risks, they protect against harmful dust and aerosols, including carcinogenic and radioactive substances and pathogenic substances such as viruses, bacteria, and fungal spores,

Picture 52 – Dräger X-plore® 1900 dust mask

Source: Dräger Polska Sp. z o.o., https://www.draeger.com/pl_pl/Products/X-plore-1900 [access: 16.12.2022]

- reusable respirators half-masks with replaceable filters - depending on the type and filters used, can be a good solution for respiratory protection in some cases of CBRN hazards,

Picture 53 – MSA Comfo Classic® Half-Mask Respirator

Source: MSA Safety Incorporated, https://us.msasafety.com/Air-Purifying-Respirators-%28APR%29/Elastomeric-Half-Masks/Comfo-Classic%C2%AE-Half-Mask-Respirator/p/000100000200001030 [access: 16.12.2022]

- full-face masks - provide respiratory and eye protection at the same time. They are available in one- or two-filter versions.

Picture 54 – Dräger CDR 4500 full-face mask

Source: Dräger Polska Sp. z o.o., https://www.draeger.com/pl_pl/Products/CDR4500 [access: 16.12.2022]

Self-contained breathing equipment - used mainly in places with oxygen content below 17% or where there is a dangerous concentration of hazardous substances. This solution provides a constant supply of air or oxygen and is an independent breathing apparatus. When used correctly, it gives complete protection against the effects of CBR agents. These devices require periodic technical inspections, and the personnel using them must undergo appropriate medical examinations and training.

Picture 55 – G1 SCBA Self-contained breathing apparatus

Source: MSA Safety Incorporated, https://pl.msasafety.com/Aparaty-oddechowe-na-spr%C4%99%C5%BCone-powietrze/Aparaty-oddechowe-na-spr%C4%99%C5%BCone-powietrze/G1-zintegrowany-aparat-powietrzny/p/00 [access: 16.12.2022]

Rescue and Escape Apparatuses

These are used in emergency situations to provide immediate protection from harmful agents for a limited period.

There are:

- devices dependent on atmospheric air - these are fire and industrial escape hoods with installed efficient filter absorbers designed to protect against toxic gases, vapours, and industrial and fire particles, providing adequate filtration for a minimum period of 15 minutes; these devices are dependent on atmospheric oxygen.

Picture 56 & 56a – Dräger PARAT® 4700 escape hoods

Source: Dräger Polska Sp. z o.o., https://www.draeger.com/pl_pl/Products/PARAT-4700 [access: 16.12.2022]

- equipment independent of ambient air:
  - o compressed air apparatus - these are systems that provide a continuous supply of air for a minimum of 15 minutes from a compressed air cylinder and come in the form of a full-face positive-pressure mask or escape hood,
  - o regenerative oxygen devices - ensuring access to oxygen in conditions of toxic gases and lack of oxygen in a given environment; depending on the version, they provide air supply for up to 60 minutes.

Picture 57 – Dräger Saver PP Emergency Escape Breathing Apparatus

Source: Dräger Polska Sp. z o.o., https://www.draeger.com/pl_pl/Products/Saver-PP
[access: 16.12.2022]

Picture 58 & 58a – Dräger Oxy K 30 H escape devices

Source: Dräger Slovenija d.o.o., https://www.draeger.com/en_seeur/Products/Oxy-K-30-S-HW-HS
[access: 16.12.2022]

Safety Gloves

Provide an additional element of protection for overall safety management personnel. It should be used whenever a CBRN incident is suspected. They must meet a number of requirements, should be resistant to chemical and biological substances, abrasion-resistant and other damage, and thin enough not to hinder manual activities. Therefore, their proper selection is crucial to ensure adequate protection for the employee. In principle, double-dressed pairs of gloves should be used during CBRN incidents. This primarily protects against secondary contamination when undressing after decontamination and provides extra protection against damage to the top protective layer.

The most universal and ensuring adequate protection are nitrile protective gloves 0.2 - 0.4 mm thick, characterized by appropriate chemical and biological resistance, mechanical resistance, antistatic properties, and do not significantly interfere with manual activities.

Picture 59 – Safety gloves table

„Latex" Gloves	Nitrile Gloves	Vinyl Gloves
Latex gloves are natural material, made from natural rubber – rubber tree. They are a popular choice of protective glove for medical or industrial use. The primary reason people would choose an alternative to latex is because many people suffer from latex allergies. When allergy is not a concern, latex does have a slight advantage with comfort and dexterity over nitrile gloves.	Nitrile gloves are made out of a synthetic rubber, and are an ideal alternative when latex allergies are of concern. Nitrile gloves are the superior glove when it comes to puncture resistance. Nitrile gloves are often referred to as "medical grade." Before gloves can be marketed to hospitals and medical institutions, they must undergo a series of tests conducted by the Food and Drug Administration (FDA) to ensure their durability.	Vinyl gloves are a popular choice for the food industry and situations where high levels of durability and protection are less of a priority. While they may be less durable, they are the less expensive option.
Fit like a second skin Have a high level of touch sensitivity Are good for wearing for an extended amount of time Work well for high-risk situations involving infectious material Are cost-effective Are lightly powdered, making it easier to put on Are very elastic and strong Are biodegradable	Latex-free Are most puncture resistant Have a high level of sensitivity Mold to your hand for a great fit Are good for wearing an extended amount of time Work well for high-risk situations involving infectious material Resist many chemicals Have a long shelf life Are available in blue or black to help identify if the glove has been punctured	Latex-free Have a looser fit Are good for short-term, low-risk tasks Are the most economic option Have anti-static properties Are best for use with non-hazardous materials Are lightly powdered to make it easier to put on"

Source: ISEMI – International Security and Emergency Management Institute

Protective clothing

Protective clothing is a barrier between harmful external factors and human skin. Depending on application and danger, it is divided into categories:

- Category I - providing protection against minimal danger,

- Category II - provides protection against specific factors that do not threaten life and health,

- Category III - protection against external factors dangerous to life and health.

The suits of the highest protection category are divided into subcategories (type 1-6). They are made of materials ensuring an adequate chemical and biological protection and are light and comfortable.

Picture 60 – Protective clothing table

Type	Description	Relevant standard
1a-B, 1b-B, 1c-B	Gas tight	EN 943-1:2002, EN 943-2:2002
2-B	Non gas tight	EN 943-1:2002, EN 943-2:2002
3-B*	Protection against pressurised liquid chemicals	EN 14605:2005 + A1:2009
4-B	Protection against liquid aerosols (spray tight)	EN 14605:2005 + A1:2009
5-B	Protection against airborne solid particulates	EN ISO 13982-1:2004+ A1:2010
6-B	Limited protection against liquid chemicals (light spray)	EN 13034:2005 + A1:2009

Source: ISEMI – International Security and Emergency Management Institute

The most universal suits for non-professionals are suits meeting requirements for Type 4B clothing (protection against pressurized liquid jets and biological agents). Additional equipment includes shoe protectors and an integrated protective hood. Proper sizing, training in dressing and undressing are essential to ensure adequate protection.

Picture 61 – Protective suit 3M 4570

Source: 3M Marketplace, https://www.3m.com/3M/en_US/p/d/b00046817/ [access: 16.12.2022]

Initial decontamination

Decontamination removes the hazardous substances from the victims, the responders and their PPE, and the equipment and vehicles at the chemical incident site.

The aim of decontamination is to prevent the movement of hazardous substances from contaminated into clean areas and to protect the public and downstream responders from

exposure by secondary contamination, and to protect emergency responders by decreasing the stress on their PPE.

There is a very useful rule to remember regarding decontamination: the so-called 'rule of tens. This rule states that the rapid and effective completion of each decontamination stage (disrobe, dry, and wet decontamination) leads to a ten-fold reduction in the level of casualty contamination. So, each stage reduces the amount of contamination and the risk to the casualty and first and second responders. Dry decontamination are any available dry, absorbent materials that can be used, for example: kitchen towels, toilet rolls, or paper tissues, such as 'blue roll' towels and clean rags, strips of blanket, or sheeting. Other absorbent materials like dry soil or cat litter can also be used. Wet decontamination using water should only be used for decontamination where the chemicals are confirmed as being caustic or corrosive or if the individual is displaying signs and symptoms consistent with exposure to caustic substances. It requires minimal equipment and training in the Rinse-WipeRinse procedure.

Picture 62 – CBRN response stages
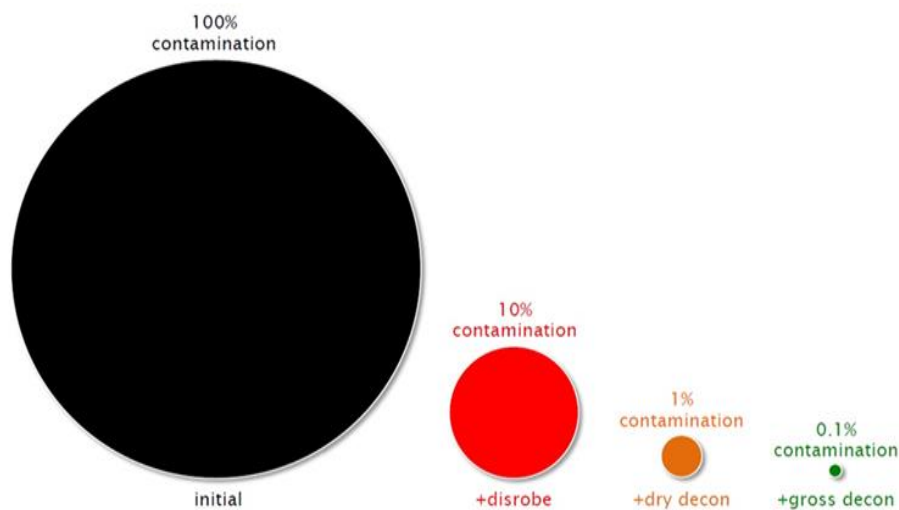
... *rapid and effective completion of each stage of the incident response procedure yields a ten-fold reduction in the level of casualty contamination*

Source: ISEMI – International Security and Emergency Management Institute

Technic decontamination is the planned and systematic process of reducing contamination to A level that is as low as reasonably achievable (ALARA).

- Technical DECON is a multi-step process in which contaminated individuals are cleansed with the assistance of trained personnel,

- technical DECON is similar to a car wash

- there is an entry point and an exit point (I.E., the DECON line).

Picture 63 & 63a – Decontamination process

Source: ISEMI – International Security and Emergency Management Institute

There are many technical solutions providing decontamination of personal, equipment or vehicles as well as internal and external subphases. One of them is made by the company Cristanini which provides the full set of decontamination solutions, jet generators, decontamination vacuum cleaners, or personal decontamination tents.

Picture 64 – Decontamination equipment

Source: ISEMI – International Security and Emergency Management Institute

Initial decontamination kits (PDKITs) are ready-to-use lightweight sets for removing or neutralizing CBR agents from people or equipment. It is not a replacement for complete decontamination but only a first response to the threat to minimize the exposure to hazardous agents until the arrival of professional emergency services. It is recommended to use this solution where the CBRN risk is increased. The most important in such a case is the time of contact of the hazardous substance with the skin. Immediate application of such a kit reduces the risk of severe burns and prevents the number of dangerous substances from being absorbed into the body.

Regardless of the type of hazard (chemical, biological, radiological), the personnel conducting decontamination should be familiar with and trained in its use. The decontamination kits were designed for soldiers involved in warfare to maintain their combat capability. Some of the kits intended for military use are also designed and dedicated to the civilian community. The kits are usually packed in a

hermetically sealed package and consist mainly of decontaminating mitts, solutions, and lotions used to remove, absorb, or neutralize the agent. The more extensive kits contain a number of additional items to assist and enhance the decontamination process:

- poncho with hood,

- cotton briefs (panties),

- elastic knitted socks,

- plastic shoes such as beach sandals,

- protective half-mask,

- moist non-woven towel,

- moist hygienic glove for washing exposed parts of the body,

- identification bands marked with an individual number,

- plastic bag for contaminated clothing and waste,

- plastic bag for personal items,

- disposable nitrile gloves.

Picture 65 – RSDL® Reactive Skin Decontamination Lotion Kit

Source: Emergent BioSolutions Inc., https://www.rsdl.com/about-rsdl/ [access: 16.12.2022]

Picture 66 – Skin decontamination by RSDL sponge

Source: https://www.researchgate.net/figure/Skin-decontamination-by-RSDL-sponge_fig3_294424232 [access: 16.12.2022]

5.1.2. C-IED/Armed attack PPEC-IED/Armed attack PPE

In order to protect key personnel, including those responsible for security and evacuation operations, it is recommended to equip them with measures that provide adequate protection against the IEDs detonation effects, gunfire, or stabbings. Ballistic vests are used for this purpose.

Anti-stabbing vest

A stab vest is a protective element worn under or over outer clothing to protect against stabs and other sharp objects to a person's chest, back, and sides. They are made of high-density and strength synthetic fibers such as Kevlar. Puncture resistance is defined in, but not limited to, NIJ 0115.00 and is expressed on a three-grade scale depending on the ability to protect against a knife or spike measured in joules.

- Level 1- 24 joules,
- Level 2- 33 joules,
- Level 3-43 joules.

In most cases, Level 1 protection is sufficient against most knife attacks. Some solutions give resistance to needle and spikes attacks.

Picture 67 – Hercules Covert Stab, Spike and Needle Resistant Vest

Source: Body Armour Canada Ltd., https://www.bodyarmourcanada.com/shop-bullet-resistant-or-stab-resistant/covert-stab-spike-and-needle-resistant-vest [access: 16.12.2022]

Bullet and fragmentation-resistant vests

The protective vest, also known as a ballistic vest or a bullet/fragmentation-resistant vest has become the essential equipment of every law enforcement officer. It is increasingly being used by security guards and facility security staff.

The ballistic and fragmentation resistant vest protects not only from small arms projectiles and fragmentation but also from knives and spikes.

The vest absorbs the impact and reduces the penetration of bullets or fragments from detonation.

It is made of high-density and strength multilayer fabric woven of synthetic fibers such as Kevlar. Such inserts are sewn or inserted into a cover sewn into the shape of a vest. To increase the resistance of certain parts of the vest, they are equipped with additional reinforcement in the form of ballistic plates. They are made of various materials resistant to high-energy bullets such as metal, ceramics, and resistant plastics such as polyethylene, placed in pockets to protect the body's main organs.

Are available in many resistance classes as defined by the appropriate standards. The most common standard is NIJ standard 0101.06.

Additional constructional features of the vest increasing its protection area are collars and crotch or shoulder protectors. They are also made of elastic ballistic inserts, mainly Kevlar.

Picture 68 – Ace Link Armor MSOV Modular

Source: ACE Link Industrial Inc. https://acelinkarmor.com/m-s-o-v-modular-special-operations-vest-flexcore/ [access: 16.12.2022]

Picture 69 – DFNDR Armor Lightweight Level III+ armour plate

Source: DFNDR ARMOR a Division Of Engense Inc. https://dfndrarmor.com/products/level-iiipp-rifle-rated-body-armor [access: 16.12.2022]

Ballistic blanket

These blankets are made of high-quality soft ballistic material such as Kevlar and are similar to bulletproof vests, providing shrapnel protection following relevant standards. They are highly maneuverable due to foldability and flexibility, so they can be used in various tactical situations, such as in vehicles, to cover walls, doors, people, etc. Because they are collapsible, they do not take up much space and can be, to some extent, effective protection against firearms or the effects of an IED detonation.

Picture 70 & 70a – Ballistic blanket

Source: BSST GmbH, https://www.bsst.de/en/de02.html [access: 16.12.2022]

Head protection

Head protection systems include ballistic helmets, hybrid solutions, and helmets, along with complementary modules that, when properly selected, create a total solution to protect people's heads from a wide range of threats. Ballistic helmets are most commonly used for head protection against firearms hazards and IED detonation effects. Other versions do not provide adequate protection. They are most often made of compressed Kevlar and high-resistance synthetic materials such as reinforced ballistic polyethylene. Such structures must meet stringent protective standards depending on the resistance required. The most common standard for helmets is NIJ 0106.01. The helmet can be equipped with additional accessories to ensure easy installation of the various modules, which include side mounting rails (for mounting flashlights and other accessories) with flexible cables with a hook to stabilize the night vision googles, a front mount with a socket for night vision, garda and an optional selection of accessories kit designed for specific needs. The whole thing is supported on the head with the help of a fascia.

Picture 71 & 71a – Galvion helmet VIPER P4

Source: Ha3o, https://sprzetspecjalny.pl/produkt/helm-viper-p4/ [access: 16.12.2022]

Flame-resistance clothing

Flame-resistance clothing is used where there is a risk of fire or explosion. It does not provide long-lasting protection against open flames or high temperatures, and its use is intended to minimize the effects created during a fire or IED detonation. Thanks to the use of suitable fibers, the flame is not sustained and extinguishes itself. Notably, the fibers do not melt but glow, which does not cause the melted fibers to stick to the skin, significantly reducing the depth of burns and shortening the recovery period. Additional flame-resistant equipment completing the overall protection are gloves and non-flammable balaclavas. They come in many versions, and they appear like ordinary outerwear from the outside.

Picture 72 & 72a – QS24 - Nomex® Comfort – Dupont Flame-resistance clothing

Source: uPont de Nemours, Inc., https://www.dupont.com/products/dupont-nomex-bulwark-qs24.html [access: 16.12.2022]

Combat application tourniquet

It is a disposable compact system for temporarily stopping severe bleeding from body extremities.

It is a fabric band placed on the limb and twisted until the bleeding stops. It is used for dressing wounds after gunshots, amputations, and wounds sustained after an IED explosion. A correct application does not require extensive training and can be limited to reading the manual. It contributes significantly to reducing fatalities and the deterioration of the condition of the injured until professional assistance is provided at the hospital.

The advantage of this solution is the possibility of self-application with one hand.

Picture 73 – C-A-T® GEN7 - CAT Resources combat application tourniquet

Source: TacMed Australia, https://tacmedaustralia.com.au/collections/workplace-response/products/cat-tourniquet [access: 16.12.2022]

Burn dressing

Pre-hospital cooling therapy is a well-established first aid treatment for burns. Effective use of cooling can reduce the extent and depth of tissue damage and pain. Most commercially available burn kits are based on water therapy. The water gel dressing principle of operation is based on the flow of heat from the wound to the gel, which is more effective than cooling the wound with water (it is aseptic, stays on the skin, gives a surface protection, does not lead to excessive tissue cooling or hypothermia, easy to open, easy to remove without pain for the victim, available in multiple sizes and shapes).

Depending on the chosen solution, it can be used in 1st, 2nd, and 3rd-degree burns. It should be a component of first-aid kits for hazards related to detonation of IEDs or fire.

Picture 74 – Burn dressing Water-Jel Technologies

Source: CVN Medical Solution, https://www.cvn.fi/en/osasto/burn-injuries/ [access: 16.12.2022]

Hemostatic dressing

Hemostatic dressings are designed to inhibit hemorrhage in arterial injuries of various origins. These include firearm wounds, post-blast wounds, cuts, traffic accidents, and many others. It works by blood coagulation and expands the gel inside the dressing to form a gel "plug". This ensures the seal of the wound and inhibits the flow of blood. Such dressings are germicidal, thus protecting the wound from infection. The disadvantage of such a dressing is the knowledge of providing the first aid for this type of wound. To stop bleeding it is necessary to find the bleeding location in the wound, dry it and apply the dressing, often deep inside the wound. Therefore, it is recommended to apply it only after proper training.

Picture 75 – Hemostatic dressing CELOX RAPID

Source: Medtrade Products Limited, https://medtrade.co.uk/mtproducts/celox-rapid/
[access: 16.12.2022]

Accessories – Inspection mirror/cameras

Cameras and inspection mirrors are integral attributes of security personnel. As the inspection mirrors are dedicated mainly to controlling entering vehicles, and in smaller versions to check hard-to-reach places in buildings, the inspection camera allows viewing objects being brought into the premises. Inspection cameras can be used to inspect incoming packages, items, and hard-to-reach objects without damaging or opening them. It is often possible to drill a small inspection hole to gain access to the inspection camera. The device consists of an integrated camera on a flexible probe connected to a digital display. These devices have a built-in camera, LED light, high-resolution color display, and sometimes an infrared light source. It is possible to record video and take high-resolution images for further analysis.

Picture 76 – Inspection cameras RIDGID CA-350X

Source: Emerson Electric Co., https://www.ridgid.eu/pl/pl/kamera-inspekcyjna-micro-ca350x [access: 16.12.2022]

Picture 77 – TSS Under Vehicle Search Mirror, Range: 4 Inspection mirror

Source: ANGEL GIL LEMOS, https://espiando.es/detectores/detector-explosivos/espejo-de-inspeccion-convexo-anti-explosivos-vision-bajo-vehiculo-linterna-led-y-bolsa-de-transporte/ [access: 16.12.2022]

Accessories – Hook and line set

This kit is a basic set of simple tools for remote displacement or opening various types of objects in case of suspected hazardous content. It is useful mainly in places where there is no possibility to support law enforcement agents or when there is no time to call for support. The most basic version consists of a line and a hook, but it can be extended with a number of other valuable accessories (wood screws, duct tape, climbing loops, self-grip pliers, blocks, snatch blocks, etc.). Using this set significantly increases the safety of the person manipulating the object. It increases the stand-off distance and, with the use of blocks, can be operated from a safe place. Such a basic kit requires training in hazard recognition and tactics, techniques and procedures for its use.

Picture 78 & 78a – Hook and line kit

Source: own photos. Author: Dominik Klimas

Emergency kit

Emergency equipment should include all necessary means to support operations during emergency situations. The best solution is to collect all the necessary accessories into one bag and place them in the facility in designated areas accessible to security personnel. Such packages may include, but are not limited to:

- emergency instructions,
- individual flashlight,
- multitool,
- chemical lights - to mark zones (safe/dangerous - green/red),
- emergency communication kit,
- reflective vests with emergency instructions,
- first aid kit,
- CBRN PPE,
- PDKITs,
- warning tapes,
- reinforced duct tape,
- thermal blankets,
- biological waste bags or CBR waste bags.

6. Conclusions

Religious sites are considered to be especially vulnerable to attacks due to their accessibility and the fact that there are usually limited security measures applied. The equipment recommendations in the document are only part of the measures and solutions that affect the improvement of the security level, particularly deterrence, detection, prevention, and response to potential attack attempts, personal protection, and CBR threats. As part of the technological evolution, it is essential to maintain a constant ability to monitor the market and technological innovations that can significantly increase the effectiveness of prevention or protection while reducing costs for the user.

The technical sophistication of some solutions in this document raises several challenges for the end user in effectively exploiting the potential of the selected equipment.

Firstly, the complicated handling and the method of preparing the equipment for operation require comprehensive training for those dedicated to working with such specialized tools.

Secondly, the operation of some equipment requires appropriate permits. It enforces constant supervision of adherence to operating conditions, including storing in proper conditions (often in rooms dedicated to the equipment), maintaining adequate charge levels of power sources, and supplementing necessary accessories.

Finally, and thirdly, maintaining constant service supervision of these tools/devices, as is dictated by manufacturers' recommendations and inherently related to this, scheduling additional budgeting to provide funds for these purposes.

Using devices and their application in local conditions has a distinct role in the security of religious sites.

All this means that to fully secure against the entire spectrum of terrorist threats, a place of worship would have to transform itself into a specialized security unit, which would be associated with substantial financial and personnel expenses.

Therefore, it is crucial that, as part of the considerations before selecting appropriate equipment options, consultations should be held with representatives of local LEAs, for a proper assessment of the site's vulnerability to particular forms of terrorist attacks. Consultation and later equipment selection decisions are also important regarding the time of response to situations by emergency services. Knowing how a site can protect itself speeds up response to incidents and eliminates mistakes in assessing the situation at early stages by local services.

A proper relationship with local services also brings additional benefits. With good cooperation with LEAs, municipalities and others, worship places can significantly improve their security, especially in the context of organized mass events.

It should be emphasized that the key element of our efforts under the PROSPERES project is the protection of people who are in such places. The presented solutions, despite their universal nature, do not focus, for example, on the protection of property, but on the safety of people.
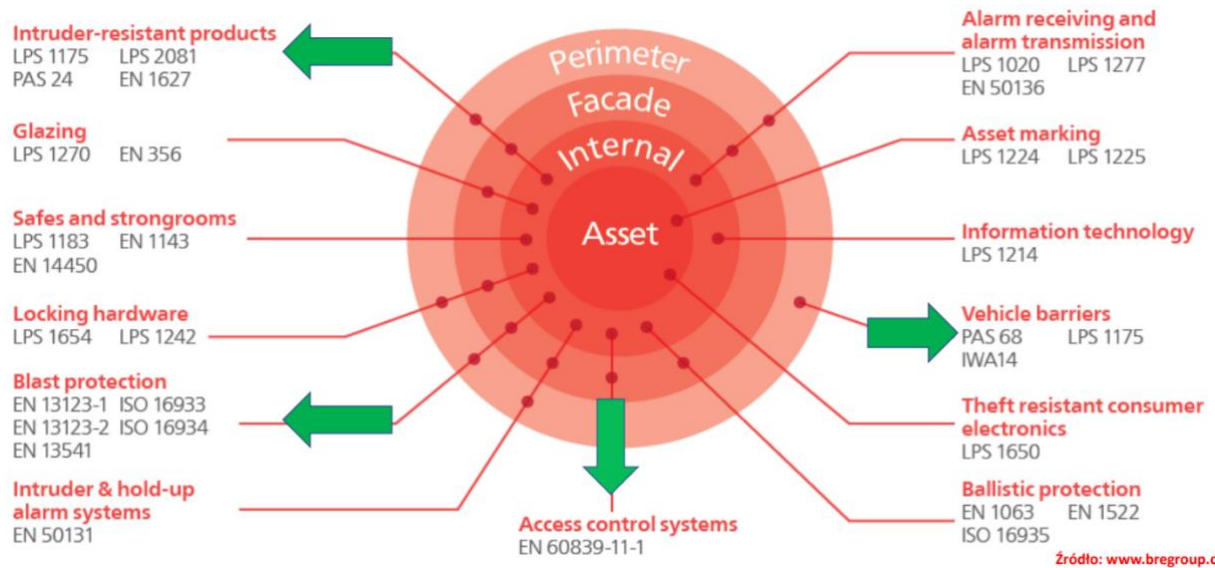
List of References

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- CBRNPol "Students Handbook"

- SECURE "CBRN security manager handbook", Łódź 2018

- Risk Management Series "Safe Rooms and Shelters Protecting People Against Terrorist Attacks" FEMA 453, May 2006,

- Beyond Concrete Barriers Innovation in Urban Furniture and Security in Public Space, January 2018

- Explosives Trace Detectors (ETDs) Market Survey Report November 2021, US Department of Homeland Security

- Personal Decontamination Kits Market Survey Report SAVER T MSR 14 APPROVED FOR PUBLIC RELEASE, US Department of Homeland Security, February 2017

- Buildings and Infrastructure Protection Series, Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings, US Department of Homeland Security, October 2011

- Guidelines for Enhancing Building Security In Singapore, Joint Operations Group - Ministry of Home Affairs,

- Weapons Technical Intelligence (WTI) Improvised Explosive Device (IED) Lexicon - 4th Edition, Joint IED Defeat Organization, J5 Division, October 2012

Appendix A

Intruder-resistant products
LPS 1175   LPS 2081
PAS 24   EN 1627

Glazing
LPS 1270   EN 356

Safes and strongrooms
LPS 1183   EN 1143
EN 14450

Locking hardware
LPS 1654   LPS 1242

Blast protection
EN 13123-1 ISO 16933
EN 13123-2 ISO 16934
EN 13541

Intruder & hold-up alarm systems
EN 50131

Alarm receiving and alarm transmission
LPS 1020   LPS 1277
EN 50136

Asset marking
LPS 1224   LPS 1225

Information technology
LPS 1214

Vehicle barriers
PAS 68   LPS 1175
IWA14

Theft resistant consumer electronics
LPS 1650

Ballistic protection
EN 1063   EN 1522
ISO 16935

Perimeter
Facade
Internal
Asset

Access control systems
EN 60839-11-1

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