



The Effects of Built Environment Landscaping on Site Security: Reviews on Selected Shopping Centers in İstanbul

* Dr. Gökçen Firdevs Yücel Caymaz ¹ 

¹Department of Industrial Product Design, Faculty of Architecture and Design, İstanbul, Turkey

ARTICLE INFO:

Article history:

Received 15 July 2018

Accepted 23 September 2018

Available online 28 September 2018

Keywords:

Site Security,
Safety,
Built environment,
Urban Open Space,
Shopping Mall

ABSTRACT

In recent years, the global increase in security concerns made it inevitable to develop new action plans in planning processes. Security concerns come with the necessity of considering building architecture processes together with environmental and landscape design processes. This study aims identification of which measures can be taken into account safely built environment design. It was made a safety checklist which can be adapted for every open spaces. Five shopping malls around the İstanbul were evaluated and some result have been achieved for their site security.

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JOURNAL OF CONTEMPORARY URBAN AFFAIRS (2019), 3(1), 191-201.

<https://doi.org/10.25034/ijcua.2018.4730>

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1. Introduction

The security issue plays an important role in making urban design decisions and determining quality of life criteria. Security is ranked after physiological and biological needs in the hierarchy of vital needs of human beings (Maslow, 1943). Presence of other people makes one feel safer (the concept of "eyes on the street": the more people, the safer the environment is) (Jacobs, 1961), and people living in the city need safe environments in their daily life cycle. Project for Public Space, and the studies carried out by Lang, Gehl and Turkoglu, which emphasize the importance of safety and trust for the space quality and healthy cities, are important (Lang, 1994; URL 1, Gehl, 2002; URL 2).

Positive security perception enhances the urban senses of belonging and ownership. Improvement of social, economic and cultural living conditions besides the improvement of the design conditions of the physical environments influences the perception of positive security (Bal, 2012). Using durable materials such as steel and concrete in urban furniture, expanding the coverage of pedestrian zones, providing dense afforestation, constructing barriers, distributing

*Corresponding Author:

Faculty of Architecture and Design, Department of Industrial Product Design, İstanbul Aydın University, İstanbul, Turkey
E-mail address: gokcenfyucel@gmail.com

transfer points of public transportation to multiple locations, and limiting vehicle access to the city center are important actions within the scope of the mentioned action plans (URL 3). In urban outdoor designing, safe physical planning is important for being able to provide people with psychological comfort. Security planning requires considering the building's location in the city, its position on the land, its form, landscape design, car park and infrastructure facilities as well as the pedestrian and vehicle access as a whole. In addition to planning studies, security design of the building perimeter also includes the efforts to restrain the sources of unwanted external threats by means of artificial or natural restrictive means such as walls and fences. This kind of security restrictions are intended for keeping potential threat elements away from buildings. Despite all precautions, there may still be a risk of danger due to physical factors as well as budget and personnel restrictions (Hopper and Droge, 2005). Today, building perimeter security is an issue that concerns all buildings. This study examines the security of shopping centers and their perimeters, as environments with intensive human use that city-dwellers use to carry out their social, cultural and economic activities. According to the definition of the International Council of Shopping Centers (ICSC); "shopping centers are public commercial buildings covering a minimum gross leasable area (GLA) of 5,000 square meters and at least 15 independent departments, which are managed as a single entity. The terrorism threat in commercial shopping centers is an important source of concern due to the fact that 21 countries have had more than 60 terrorist attacks since 1998. According to the analysis results of the statistical data about these attacks, 17 of the terrorist attacks were carried out around and outside the shopping centers; and therefore, security planning is needed for the outdoor spaces of such public buildings (Figure 1) (LaTourrette et al., 2006, URL-2). The same concerns are shared in Turkey as well, regarding the modern shopping center buildings taking the place of traditional shopping centers, the number of which reached 299 in consequence of the increase in their number, experienced especially after the 1980s.

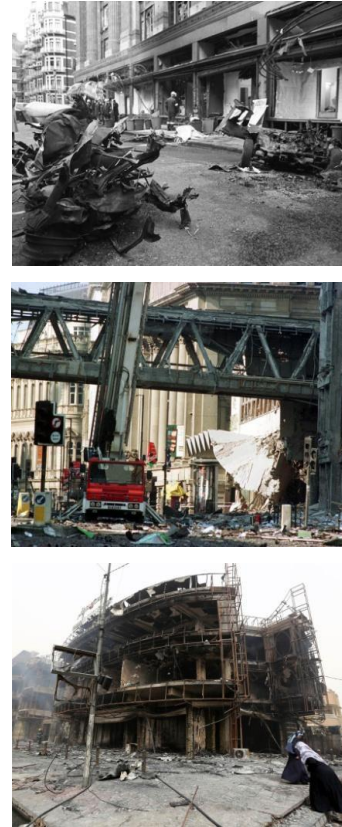


Figure 1. Images of damaged shopping center surroundings: Harrods; Corporation Street; Manchester; Karrada; Bagdad (URL 4)

The result of the investigation made within the scope of this study, on the laws and regulations applicable for building construction processes in our country, showed that no application provision and design criteria for site or urban security has been included in legislations, apart from several laws and regulations such as Construction Zoning Law No.194 enacted in 1985, the Regulation on Occupational Health and Safety in Constructional Works enacted in 2012, the Regulation on Making Spatial Plans enacted in 2014, and the Regulation on Shopping Centers enacted in 2014 (URL 5).

At this point, it is important to define site security of shopping centers besides security of all urban buildings, and establish their legal regulations as well as their planning and design standards. In this study, it is intended to define appropriate site planning principles by establishing standards for site security design.

2. Method Of The Study

In this study, an effort is made to form a checklist intended for measuring the security design processes of building perimeters. The checklist titles were taken by the American Society of Landscape Architects (ASLA) from the "Security Design and Landscape Architecture" titled study of the Landscape Architecture Technical

Information Series/LATIS, and the “Risk Management Series” titled study of the Federal Emergency Management Agency/FEMA (LATIS, 2016; FEMA, 2003, 2007). This checklist created basically for building perimeters was applied to five shopping centers in Istanbul. The measurement values of the control list were determined based on the results of a literature review. Afterwards, data were collected for each shopping center by carrying out field studies including on-site monitoring, observations and project analyses. Among the indicators considered to be potentially have an effect on the site security process, those considered to have a positive contribution were scored 1, whereas those considered to have a negative contribution were scored 0 during the formation of the checklist. In consequence of the study, the buildings thought to be relatively well protected were described.

3. Concepts About Building Perimeter Security

In security planning, minimizing the losses of life as much as possible will be the main objective that can be achieved by creating a detailed and integrative security program during the early stages of the site selection and/or design process. Proximity to risky buildings will require additional precautions in site planning. Other issues such as site selection, orientation of buildings, retraction distance, entrance control, activity areas and infrastructure deployment should be considered in the early stage of the design development process. A building structure deployed in a dispersed formation can protect the building from getting damaged completely during an attack. If the elevation of a building is higher than that of the street, it will enhance its security. Proximity to important transportation routes such as railroads, watercourses, highways etc. as well as the existing infrastructure elements such as tunnels should be evaluated because buildings may be subjected to terrorist attacks through these (LATIS, 2016; Russ, 2002, s.320).

Standoff Distance in Risk Analysis

Standoff distance can be defined as the distance between the building and the nearest point, where there may be an unauthorized vehicle access. A longer standoff distance will provide better protection (Figure 2) (National Capital Authority, 2003, p.7).

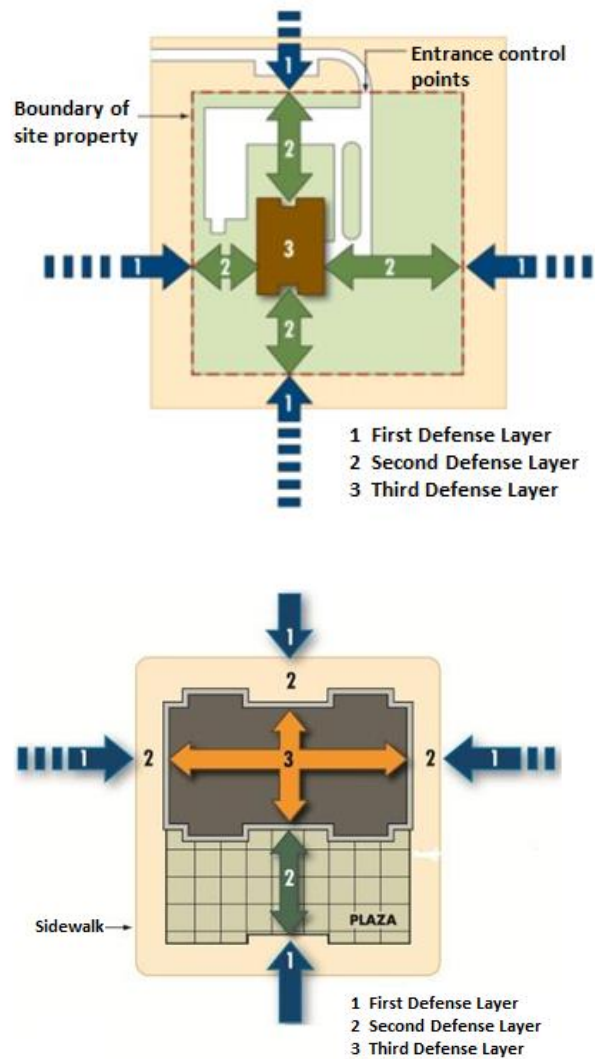


Figure 2. Defense layers; Up: Single building perimeter, Down: Plaza. Perimeter boundary (Site property boundary) determines the security distance around the building that can be uncontrollable for the owner of the building and the people living there (FEMA, 2003)

Security zones in risk analysis

Security zones between the building and streets can be defined as building perimeter, border/pedestrian path, border and parking zones (Figure 3). Measures are usually taken in the building perimeter and the border/pedestrian zones.

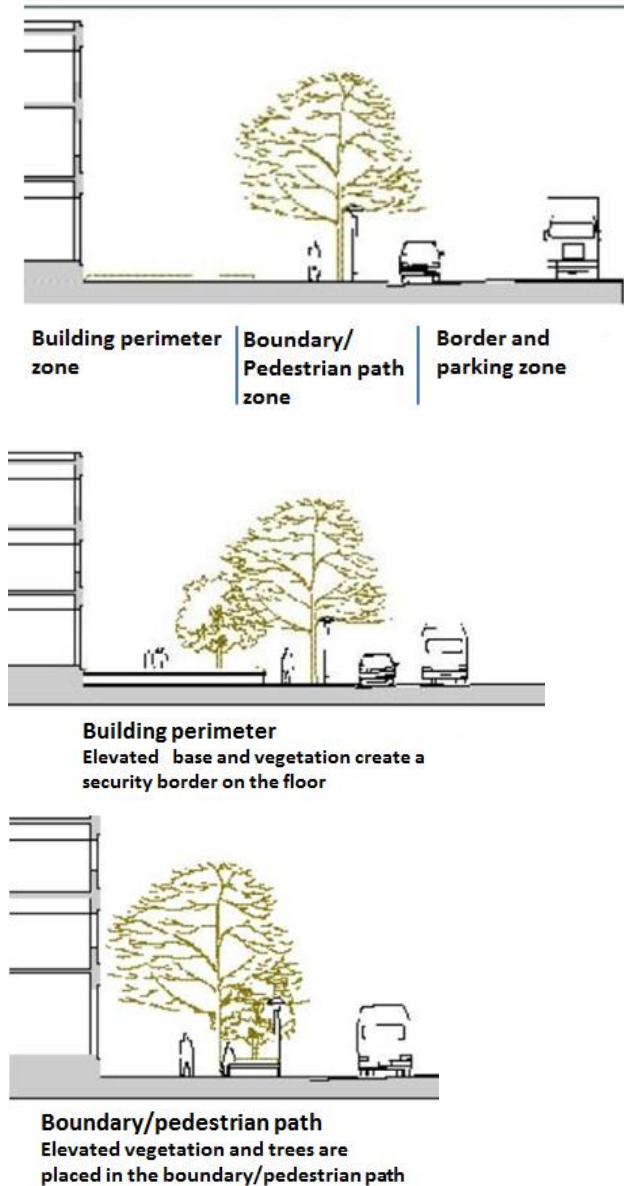


Figure 3. Up: security zones (National Capital Authority, 2003, p.7); middle: building perimeter zone; down: border/pedestrian zone (National Capital Authority, 2003, p.9).

Security analysis includes the situation assessment of the site perimeter and outside the site. Topography, vegetation, adjacent land uses, fields of vision, storage areas, locations of the infrastructure facilities, existing lighting elements, service vehicles, entrance points for the personnel, and access and circulation system for visitors are the issues important in planning (The American Institute of Architects and Demkin, 2003, p.44).

Topography

The presence of natural physical barriers such as water elements, dense vegetation, and uneven terrain can be helpful for providing access control and consequently for ensuring the security of the site (Figure 4, 5).



Figure 4. Security protection has been designed in harmony with the architectural identity of the building. The Federal Complex containing the three iconic buildings of Mies van der Rohe and the statue of Alexander Calder (Chicago, Illinois) (Photo General services administration by teng and associates, Chicago) (FEMA, 2007).



Figure 5. The Minneapolis courthouse plaza. Small lawn hills and logs prevent possible vehicle attacks along the facade of the building (FEMA, 2007)

Vehicle and pedestrian access

The number of vehicle entrance points should be low as much as possible. The size of the adjacent streets and the traffic will determine the vehicle entrance points. Ensuring an adequate retraction distance along the entrance of the building will be effective particularly in controlling the access for vehicles. (LATIS, 2016; FEMA 2003).

Car park

Parking spaces should be away from the building, and should be controllable by the security staff (Russ, 2002, p.321). Underground car parks are highly risky in terms of potential bomb attacks, and they require high security control. Where possible, they should be designed to remain outside the building (LATIS, 2016).

Seating Elements

Open spaces with seating elements should be formed around the building (FEMA, 2007). Benches planned together with plant pots, bollards and other urban furniture can be used in security control in intensively use areas around the building. If the benches will be placed on the sidewalk zone, they should be positioned in such a way as to ensure that they face the street and the building, and if they will be placed in the building zone, they should face the street. The presence of benches can provide control against unwanted activities, by providing opportunities for natural monitoring of the environment (Phifer, 2005; American Planning Association, Steiner, Butler, 2006; Russ, 2002, p.319).

Landscape Design

Land forms, water features, vegetation, inclination differences in floor areas, boundaries, urban furniture series, bollards, benches, flagpoles, and sales units can play a role in limiting the access to the site and controlling the pedestrian and traffic flows. They should be placed in such a way not to hinder emergency vehicle entrances, pedestrian flow and pedestrian access. The use of thorny and sharp-leaved plants (Scarlet Firethorn-Pyracantha, Chandelier, Spanish dagger-Yucca gloriosa, Pampas grass-Cortaderia selloana, etc.) around the building can create a natural barrier (FEMA, 2007).

Physical Protective Borders

Physical protective boundaries can create permanent boundaries around the site, by helping in limiting, directing or blocking the access. In addition to their physical effectiveness, protective boundaries also provide a psychological deterrence against those who plan an unauthorized access attempt. Water elements, changes in the topography, vegetation, and outdoor furniture such as fences, walls, bollards, and fountains can provide protection by creating borders (FEMA, 2003). Crash-proof vehicle barriers prevent vehicle access for pedestrian

protection and building security. Walls, berms, plant pots, bollards, heavy elements, reinforced urban furniture and trees, water barriers, fences, and sculptural restrictive elements can prevent vehicles from posing a threat to the building (Figure 7) (FEMA, 2007).



Figure 6. Up: sculptural forms, furniture and bollards serving as restrictive elements. San Francisco Federal Building (FEMA, 2007); middle: Times Square Tower, down: Wall Street, New York City, Rogers Marvel Architects (Phifer, 2005; FEMA, 2007)

Signing

Signing required to be designed correctly and adequately so as to avoid disorders at the transportation, car parks and entrance points should be located outside the site and in the entrances, and should not be used in sensitive areas as unless it is required (FEMA, 2003.)

Lighting

43 lux (= 4horizontal foot-candles) on average will be adequate to provide proper lighting at the entrance control points (FEMA, 2003). Security lighting that enhances natural surveillance for security staff and users is intended to ensure regular lighting in vehicular and pedestrian roads, and to protect people and the building perimeter. Security lighting

provides physical and psychological deterrence. Lighting elements with high poles provides a wider and more natural light distribution. They are aesthetically preferred over standard lighting elements (American Planning Association, Steiner, Butler, 2006, p. 275; Hopper, 2007, p.80, Bulla, 2004).

Infrastructure Systems

Infrastructure systems may be significantly damaged after an explosion. Besides constituting physical damages in the building, they may also prevent the evacuation of wounded people. Therefore, the landscape architect should be careful when working on the infrastructure facility. Where possible, substructure facilities such as telephone,





















electricity, gas and water installations etc. should be placed under ground. The fire safety lines should be well defined, and the water distribution system as well as the fire hydrants should be in a visible place (FEMA, 2007). Care should be taken to abstain from signing critical infrastructure elements as long as it is not necessary. When hazardous materials such as oil, gas and other chemicals are required to be stored, they should be placed downwards on the slope, at least 30.5 m away from the buildings. Garbage cans should be designed to be located 9.14 m meters away from the building, and car parks and vehicle roads should be designed to be at least 15.24 m away from the critical infrastructure systems.




















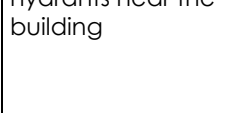
4. Analyses of Sample Sites

4.1 Analyses of Building Perimeters: See the Table 1.

Table 1. Analyses of Building Perimeters

	NUMBER 1	NUMBER 2	NUMBER 3	NUMBER 4	NUMBER 5
RISK ANALYSIS	Standoff distance (Figure 7)				
	Adequate 	Inadequate 	Inadequate 	Adequate 	Adequate 
	Figure 7. 1,2,3,4,5				
	Security zone (Figure 8)				
	Adequate 	Security zone with retaining walls consisting of curbs and slopes, and with seaward terraces. 	No physical security measure is available at its entrance points. 	Adequate 	Adequate 
TOPOGRAPHY	The presence of natural physical barriers at the entrances (Figure 9)				
	Statue 	Statues and water features are not available 	Water feature 	Statues and water features are not available 	Statue 
	Figure 9. 1,2,3,4,5				
	Dense vegetation	Dense vegetation	Dense vegetation is unavailable	Dense vegetation	Dense vegetation
	Stairs are available	Stairs are unavailable	Stairs are unavailable	Stairs are available	Stairs are unavailable
	Land Inclination (Figure 10)				
	Sloping terrain 	Rugged terrain 	Flat terrain 	Sloping terrain 	Sloping terrain 
	Figure 10. 1,2,3,4,5				

VEHICULAR AND PEDESTRIAN ACCESS	<p>The presence of traffic signs and lights, and the drivers reducing the speeds of their vehicles by paying attention to the warnings.</p> 	<p>The chaos caused by the pedestrians and vehicles while accessing the main place from the coastal road. The traffic density at the main entrance caused by the valets providing VIP service for visitors.</p> 	<p>Unavailability of an arrangement in front of the main entrance gate of the building, and the hindered pedestrian access experienced especially during rush hours due to vehicles parked in front of the building.</p> 	<p>Ease of access from all directions</p> 	<p>Four different access points for pedestrians, and eight for vehicles</p> 
	Figure 11. 1,2,3,4,5				
CAR PARK	<p>A parking garage and a parking lot at the back of the building.</p> 	<p>Parking garage</p> 	<p>A parking garage and an uncontrolled parking lot</p> 	<p>A parking garage with three different entrances and exits, and a parking lot for LPG vehicles</p> 	<p>One is a parking lot for service and warehouse vehicles, and the other is for general use</p> 
	Figure 12. 1,2,3,4,5				
SEATING ELEMENTS	<p>Around the secondary entrance of the building and in the cafeterias located in the vicinity of the main entrance.</p> 	<p>Around the building and in the cafeterias</p> 	<p>No seating element is available</p> 	<p>Seating elements facing inside the courtyard in the main entrance square</p> 	<p>Sitting areas on the right and left of the main entrance, located in parallel to the sidewalks; designed together with cafes, shops and parking spaces</p> 
	Figure 13. 1,2,4,5				
VEGETATION	<p>Vegetation that does not close the building perimeter</p> 	<p>Terrace landscape application extending from the seaside</p> 	<p>Green band at the right and left of the road heading only from the main entrance gate to the parking lot.</p> 	<p>Inadequate vegetation with plant pots</p> 	<p>Plantation distributed around the building</p> 
	Figure 14. 1,2,3,4,5				

PHYSICAL PROTECTIVE BORDERS	Urban furniture and plant walls formed with the land slope at the main entrance. A separative wall and fence at the entrance of the parking garage that constitutes the boundary between the house and the shopping center	Seaward terraces with plants, heavy plant pots placed along the perimeter of the entrance, and a fence determining the boundaries of the property.	There is no physical protector or restrictive element apart from the split road formed for valets at the main entrance, and the green band between the main road and the shopping center at the side facing the airport.	Restriction with vegetation, concrete blocks, stairs and ramps	Sidewalks, design elements on the sidewalks, and the walls intended for security and restriction.
					
Figure 15. 1,2,3,4,5					
SIGNING	Direction sign (for transportation and parking)	Simple portable traffic cones and signs placed in the direction of the parking lot entrance.	Signing only for the car park area	Symbols and signs intended for only emergency situations	No direction signs for vehicles' access to the parking lot, signs for access to the building entrance.
					
Figure 16. 1,2,3,4,5					
SIGNING	Adequate lighting except for the lighting on the road to the car park. The light on the building, cafeteria and outside wall that comes from the street.	Inadequate lighting and dark areas in the front entrance. Stronger lighting systems on the sea side.	The facade parallel to the motor way is lighter.	Additional lighting coming from the street, and lighting elements placed at certain intervals in the landscaping areas outside the building.	Lighting and lighting poles at the main entrance, and small lighting elements intended for landscaping.
					
Figure 17. 1,2,3,4,5					
INFRASTRUCTURE FACILITIES	Placed under ground	Fire hydrant around the building	Placed under ground	Fire hydrant around the building	Water distribution mechanism and fire hydrants near the building
					
Figure 18. 2, 4,5					

4.2. Checklist Evaluations

While forming the checklist about building perimeter security, we first investigated certain subjects such as closeness to the risky areas related to the building layout plan, building's form, building's location and retraction distance, security zones around the building, entrance control points, and building's closeness to important motorways; then

analyzed the topography covering the subject of BUILDING PERIMETER LANDSCAPING, vehicular and pedestrian use, car park, seating elements, vegetation, lighting, garbage cans, as well as the indicators of the infrastructure systems subjected to a detailed examination in Table 1, and ultimately obtained the results shown in Table 2.

Table 2. Score Analysis of Shopping Centers (LATIS, 2016; FEMA, 2007; FEMA, 2003)

	1	2	3	4	5
General Subjects					
Closeness to risky areas. close 0, not close 1	1	1	0	0	1
Is the building form in a dispersed formation? yes 1, no 0	1	1	1	1	1
Has the building a retraction distance? yes 1, no 0	1	1	1	1	1
Has it security zones? yes 1, no 0	1	1	0	1	1
Is the access control adequate? adequate 1, inadequate 0	1	0	0	1	1
Is the building positioned higher than the street elevation? yes 1, no 0	1	0	0	1	0
Is it close to the railroad? not close 1, close 0	1	1	1	0	1
Is it close to the highway? not close 1, close 0	1	0	0	1	1
Is there a substructure facility? yes 0, no 1	1	1	1	1	1
Topography					
presence of natural physical barriers (water, dense vegetation, rough terrain etc.)					
stairs are available 1, unavailable 0	1	0	0	1	0
dense vegetation is available 1, unavailable 0	1	1	0	1	1
rough terrain is available 1, unavailable 0	1	1	0	1	1
Vehicular and Pedestrian Access is adequate 1, inadequate 0	1	0	1	1	1
The number of vehicle entries is limited 1, excessively high 0	1	1	1	0	0
Car park					
Security staff is available 1, unavailable 0	1	1	0	1	1
Underground car park is available 0, unavailable 1	0	0	0	0	0
Available outside the building 1, unavailable 0	1	1	1	1	1
Seating Elements					
Seating elements facing the street are available 1, unavailable 0	1	1	0	0	1
Seating elements facing the building are available 1, unavailable 0	0	1	0	1	1
Planting Design					
Vegetation that does not eliminate the visibility of the building perimeter is available 1, unavailable 0	1	1	1	1	1
Physical Protective Borders					
Water features are available around the building available 1, unavailable 0	1	0	1	0	1
Physical restriction (wall) is available 1, unavailable 0	1	1	0	1	1
Bollards are available 1, unavailable 0	1	1	1	1	1
Vehicle barriers are available 1, unavailable 0	1	1	1	1	1
Surface mounted plant pots are available 1, unavailable 0	0	1	0	1	0
Signing is adequate 1, inadequate 0	1	1	0	0	0
Is the parking space obvious? obvious 1, not obvious 0	1	1	0	1	1
Is the entrance point obvious? obvious 1, not obvious 0	1	1	1	1	1
Lighting					
Adequate entrance-control lighting is available 1, unavailable 0	1	0	0	1	1
Adequate car park lighting is available 1, unavailable 0	0	0	0	1	1
Adequate pedestrian path lighting is available 1, unavailable 0	0	1	0	1	1
High lighting is available 1, unavailable 0	0	0	0	1	1
Are the garbage cans away from the building? yes 1, no 0	0	0	0	0	0
Infrastructure Systems					
Are the fire hydrants apparent? yes 1, no 0	0	1	0	1	1
Total	26	22	12	26	27

5. Conclusion

A good security design involving technology, operational activities and operational processes is intended for protecting the building against existing and potential hazards (Hopper, Droge,

2005). In order to ensure an adequate level of protection, precautions should begin to be taken before the construction stage of the building, when taking design decisions related to the building. Particularly the terrain

topography should be well analyzed and the zones that will protect the building and the surrounding area should be formed during the site planning process. Ensuring an effective security protection requires arrangements and precautions related to the vehicular and pedestrian roads, car park locations, seating elements, vegetation, restrictions, signing, lighting, and infrastructure facilities. Well-maintained and well-illuminated areas protected by an adequate number of security personnel can play a role in preventing unwanted activities. An effective control can also be ensured through natural surveillance of people around the building. In the evaluation of the checklist created in accordance with these criteria; it was concluded that the site security qualities of the shopping centers 5, 1, 4, and 2 (respectively) were higher than that of the shopping center 3. Although the research results are not definite, they have a nature that can give information about outdoor security, including the subjects of constructional and vegetal landscape design of building perimeters. At this point, this study will have the nature of being a source that paves the way for analyzing the site security qualities of other building perimeters and the existing shopping centers, and for carrying out precautionary and revisionary studies intended for the future.

Acknowledgements

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interests

The author declares no conflict of interest.

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