International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies

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SECURITY PRINCIPLES IN THE BUILT ENVIRONMENT FOR CUSTOM CHECKPOINTS

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ARTICLEINFO

Article history:
Received 15 January 2018
Received in revised form 10 April 2018
Accepted 19 April 2018
Available online
11 May 2018

Keywords:
Built Environment; Secure Residential Environment; Architectural design; Facility Layout; Spatial layout; Crime Prevention

ABSTRACT

This study identifies building typologies which are suitable to be adapted in a development when security is paramount. The study reviews books related to security in the built environment and then applies these principles into custom buildings in Malaysia. Newman (1977) stated that a building should have clear distinction of areas which are influenced by the inhabitants, to have opportunity to survey the surrounding. Healy (1983) argued that having a proper site layout of facility and his principle of Three Line of Defenses would ensure security in a building. Finally, Crouch et al (1999) stated that having communal areas and proper lighting would avoid crime. These total five principles can be implemented in institutional buildings to warrant security. First is to have a clear distinction of public and private spaces. Second is to give the opportunity to survey the surroundings. Third is to have a proper site layout. Fourth is to implement the Three Line of Defenses as proposed by Healy (1983) and finally to ensure a facility to have adequate lighting. It can be concluded that these approaches are derived from three elements: eradicating the fear in people, lessening the opportunities for offenders to act on a crime and an understanding of human psychology to create a boundary.

1. INTRODUCTION

In this paper, we explore the way design influences behaviors of people especially in criminal behavior. Around 1980s, new building typology was introduced (high rises) and it has caused certain buildings to record a higher case of crime. This sparked the minds of writers such as Jane Jacobs (1961) and Oscar Newman (1977) to identify the root of the problem. We will discover typologies which can improve security in a building compound without relying heavily on electronic solutions like CCTV surveillance and manpower. Jeffery (1976) stated "no means have

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been found to change individual behavior without first changing the environment within which the behavior occurs."

2. LITERATURE REVIEW

2.1 DEFENSIBLE SPACE

Newman (1972) examined the ways environment affects behavior of people. He noticed that some building types have negative effects on their occupants. He focused on the effects of residential design on crime rates. He explained that *a* defensible space *is a living residential environment which can be employed by inhabitants for the enhancement of their lives, while providing security for their families, neighbors, and friends.* He argued that to achieve a secure environment, there are 4 elements of physical design to follow which are:

- A clear distinction of area which are influenced by the inhabitants.
- Having windows looking out so that inhabitants can naturally survey their surroundings
- To adopt a building outlook that blends into the surrounding to that the house does not stand out and becomes a target. Peculiar houses are perceived as a form of vulnerability and isolation making it an obvious target
- To locate residential area adjacent to activities that do not impose threat

Newman emphasized that the hierarchy of spaces in an apartment complex is paramount to achieving safety in a neighborhood. Buffer zones such as public seating areas or parks in front of an apartment complex can create a safe zone. He also believed that heavy pedestrian footpath creates a sense of security by providing "eyes on street" which conforms with the new urbanist theories. He agrees with Jane Jacobs theory (1961) that tied together the relation between crime loss and the physical layout of a neighborhood.

2.2 DESIGN FOR SECURITY

Healy (1983) set up general guidelines to follow when designing with security in mind. He argues that the physical factor (activities and nature of environment), sociopolitical (ethnic, economic, and political character), loss history (scale of loss experienced in the vicinity of area) and criminal activities in the area are to be considered during site selection. The site layout of a facility is important to design a secure compound rather to add manpower when the facility is complete because of its high operation cost. The reduction of entry points into a facility and by having all the building blocks closely together can contribute to a more secure compound as do introducing barriers in areas of the building layout to avoid unwanted pedestrian movement and theft. Alternatively, having an isolated secondary circulation (such as in underground interconnecting link between blocks) can also be implemented for the same reason.

Healy (1983) introduced what he called, The Three Lines of Defense, when designing for physical security. The first line of defense is the perimeter barriers and security towers. These barriers will create a psychological barrier for those who would innocently wonder in and at the

same time discourage those who have the intention of breaking in. The second line of defense is the building exterior. Large openings should be located above ground level and properly secured. Potential entrances on all sides of the building, including the roof and underground access like sewerage system, should be identified. The final line of defense is interior control. This includes alarms, locks, lights, doors, patrols and etc.

2.3 DESIGN FOR SECURE RESIDENTIAL ENVIRONMENTS

Crouch et al. (1999) looked at how design has the potential to reduce crime and improve community safety. They highlighted that when designing with security in mind, a building should be comfortable for occupants instead of relying heavily on *hardware manufacturers or simplistic concepts of fortification*. To create a physically secure space, the easiest way to achieve this could be by designing a vault; thick walls, small windows, and few entry points but it would not be comfortable for occupants because of the lack of natural lighting and the feeling of claustrophobia. There are three categories that design elements can increase security which are external and communal areas, lighting, and entrances and windows.

2.3.1 EXTERNAL AND COMMUNAL AREAS

Crouch et al. (1999) pointed that a clear indication of *who is allowed where* is important. This means that a distinct segregation of users in a space will contribute to overall safety. These borders are typically defined by barriers like fences or hedges between a public and private area. However, grey areas exist in shared spaces or spaces that are not defined. Back lanes, alleys or left-over corners are examples of such spaces where it is unclear of who is allowed and not allowed to wander in. Design flaws such as left-over spaces when reduced can contribute to overall community safety.

2.3.2 LIGHTING

As lighting is important in crime prevention, crimes that happen at night are committed when an opportunity is identified and done in the heat of the moment when the offenders are certain they can escape in the dark (Crouch et al., 1999). Good lightings, when applied together with other measures have an important role to reduce crimes and fear in people. There are three aspects of light which are studied by the authors which are the intensity of light, brightness of light and colour rendition.

2.3.3 ENTRANCES AND WINDOW

There are three factors affecting the vulnerability of a door. They are, the location of the door, type and its components and the security device used. Doors located at secluded areas such as at the back of the house or the side, are more susceptible to crime. Besides location, other factors such as the level of external lighting, nature of surrounding landscape and the suitability of border that is installed.

Like doors, the location of the window affects their vulnerability. In the book, Design for

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Secure Residential Environments, the authors state that over half of household burglaries involve entry through read windows. Besides windows, nearby balconies and boundary walls are also at risk. The window frame design and its glazing also play a part in building security. Windows with larger pane are more secure because they are harder to break than small windows and create much more noise (which attracts unwanted attention) when broken.

2.4 CRIME PREVENTION AND THE BUILT ENVIRONMENT

Plenty of crime takes place in certain places and the characteristic of those locations influences if crime does or does not happen there (Kitchen and Schneider, 2007). According to the authors, crime and the built environment are related in the following ways:

- Building characteristic influences opportunities to commit crime
- Understanding the significance of manipulating built form to reduce or eliminate the opportunity to commit crime
- The space must be publicly accepted, both collectively and individually

2.5 CRIME: IMPACTS OF URBAN DESIGN AND ENVIRONMENT

Santana et al. (2008) cited Esteves (1995), that there is an obvious difference between the number of crimes that happen in an urban setting and a rural setting. In an urban setting, a wider range of crime occurs because of there are more things to be stolen and sold in the city. This also happens because of the obvious disparity between the wealthy and the poor, and the city offers less social control and more anonymity which encourages criminal activity. Criminal research has confirmed that there are clear patterns that are obvious to crime, with concentrations of specific place and time. These areas are called “hotspots” and they are vulnerable places where crime is likely to happen frequently.

The proper use of urban design and space could help reduce the fear of crime which leads to a better quality of life. The 2nd generation of Crime Prevention Through Environmental Design (CPTED) has deduced crime prevention to four fundamental pillars:

- Territoriality
- Natural vigilance
- Community participation
- Access control

Other studies show that green spaces like existing trees and grassy areas can reduce incidents of aggression and violent behavior in residents who live within the area especially in inner city social housing estates.

2.6 TERRORISM PREVENTION, PREPARDNESS AND RESPONSE IN BUILT ENVIRONMENT

Then and Loosemore (2005) explored the risk managements, crisis management and business continuity management practices for buildings with terrorist risks. They concluded that in risk

management, there are four key steps which are identifying assets and vulnerabilities. These are divided into two types which are tangible (building, people, equiptment, etc.) and intangible (reputation, processes, knowledge, information, etc). Secondly, identifying risks by identifying potential source of threat in an organizations asset where its vulnerability can be exploited. Thirdly, assessing risk where the likelihood and consequences of each potential terrorist strategy is identified. Lastly, develop, implement and monitor countermeasures to minimize the risks identified.

3. METHODOLOGY

This study is conducted by reviewing articles/books that discuss about the security aspects in the built environment. We will discuss the idea of a custom complex in relation to each literature, which concepts can be adopted and how it relates to a custom complex. The custom complexes that are studied include Padang Besar in Kedah, Wang Kelian in Perlis, Rantan Panjang and Pengkalan Kubor in Kelantan.

4. DISCUSSION

4.1 PRINCIPLES IN DEFENSIBLE SPACE

4.1.1 PUBLIC PRIVATE SPACE SEGREGATION: A CLEAR DISTINCTION OF AREAS INFLUENCED BY THE INHABITANTS

In Defensible Space (Newman, 1972) principles that can be applied are the segregation between public and private spaces. In terms of a customs check point, this principle can be translated into the segregation of people who have intention to cross the border to the neighboring country and people who are just visiting the area. Most custom checkpoints in northern Malaysia typically have a duty-free commercial zone that are attached together or nearby the checkpoint (Figures 1 and 2). These customs include Padang Besar, Wang Kelian (now abandoned), Rantau Panjang and even Pengkalan Kubor. Having the duty-free commercial zone creates an area which are saturated with people who have no intention to cross the border. This creates opportunities for offenders typically the ones who want to cross the border illegally to take the opportunity to hide amongst the visitors of the duty-free commercial zone.

Figure 1: Pengkalan Kubor Duty Free Zone

Figure 2: Pengkalan Kubor Immigration Complex

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4.1.2 HAVE OPPORTUNITY TO SURVEY THE SURROUNDING

In line with Jane Jacob's (1961) "eye on the street" principle, Newman (1972) believes that by having a means to overlook a property, it would create a safe zone. Openings like windows and balconies create a visual link to the surrounding and would deter crime from happening. Having high visibility would make a criminal know that they are being watched as there is a higher change of him getting caught as argued by Crouch et al. (1999).

The custom at Wang Kelian (Figure 3 and 4) is only a gate which allows cars and pedestrian to cross. There are no high points which will allow a wider area to be watched over. This would encourage offenders to sneak across the border since it is known that surveillance is weak at this area.

Figure 3: Wang Kelian Custom

Figure 4: Wang Kelian Custom Checkpoint (Courtesy of Exploring-Malaysia.com)

4.2 PRINCIPLES IN DESIGN FOR SECURITY

Healy (1983) gave principles of proper site layout of facility and his idea of The Three Line of Defense for when designing for physical security can be applied to an institutional complex.

4.2.1 PROPER SITE LAYOUT OF FACILITY

Healy's guideline (1983) to a proper site layout is by controlling the number of entry points into a complex. By reducing the number of entrances, less manpower is needed to take care of multiple entry points and this would contribute to a more secure compound. Also, it gives people less opportunity to sneak by one of these many entrances. By having the building blocks closer together also makes the complex less vulnerable to crime. Having the buildings closer would increase security effectiveness compared with the same number of manpower and a wider ground to cover.

Figure 5: Barrier Wall at Johor Premier Outlet

Figure 6: Fencing at Johor Premier Outlet

To illustrate this point, a commercial building will be used as reference. The Johor Premium Outlet (Figure 5) located in Johor has fencing at their back openings. This was done for security concerns and to prevent visitors from parking along the road to avoid paying for parking. This fencing in Figure 6 is an effort to reduce the number of entrances to the compound and reduce the number of manpower to secure the area.

4.2.2 THREE LINE OF DEFENSES

Healy believes that by creating a psychological barrier, it would deter random individual from wondering into the complex. To achieve this, the complex can have perimeter barriers like fencing or landscaping (although landscaping will not block individuals that have intention of coming in) and security towers. The second line of defense is the building exterior. This includes openings like windows and balconies and entrances to the facility. Large openings should be avoided or shifted out to the upper levels so that criminals would not easily break into the building. Entrances of connection link could also be shifted to the upper levels for the same reason. Entrances at the roof and sewerage line should also be looked at. Finally, the third line of defense is interior control which includes alarms, locks, and others. For this paper, we would be focusing on how the built form would affect security and not the mechanisms that can be adapted.

4.3 PRINCIPLES IN DESIGN FOR SECURE RESIDENTIAL ENVIRONMENTS

We will look at two ideologies presented by Crouch et al. (1999) by focusing on the use of external and communal areas and lighting.

4.3.1 EXTERNAL AND COMMUNAL AREAS

This point ties closely with Neuman's public private segregation principle. The people who are allowed into a communal space should behave accordingly but in a private space, only those who are allowed can enter (Crouch et al., 1999). This would ensure security in an area. A clear barrier between the public and private space is defined in terms of a garden gate or the front door (for residential area). In terms of an institutional building, the barrier could be a fence or entrance fate to the facility strictly for authorized personals.

4.3.2 LIGHTING

There are two elements that the authors argue affects crime in this chapter. Firstly, is the opportunity for offenders to escape in the dark and secondly, how lighting can reduce fear in people. In an example in the publication, the authors pointed out that in developments that have public lighting, pedestrian movements have flourished and even some housing development have evolved to being pedestrian only. This is proof that lighting has eradicated people's fear of crime hence the increased movements.

According to Crouch et al. (1999), criminals generally prefer low lighting levels. An American lighting evaluation has obtained positive results linking positive crime reduction to behavior. Public lighting increases safety, reduces fear and allows users to see better.

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5. ANALYSIS

From the discussion above, the aspects of security in the built environment can be summarized into five key criteria.

- Clear distinction of public and private spaces
- Opportunity to survey the surroundings
- Proper site layout
- The Three Line of Defenses by Richard J. Healy
- Lighting

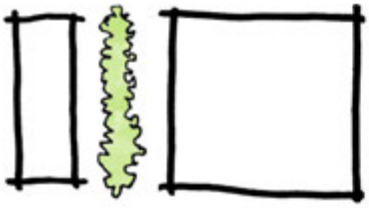

Figure 7: Segregation of Border with Vegetation

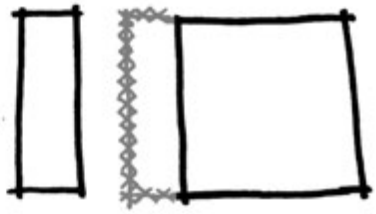

Figure 8: Segregation of Border with Fencing

5.1.1 CLEAR DISTINCTION OF PUBLIC AND PRIVATE SPACES

An institutional building like a custom complex would benefit in terms of security from having a separate circulation for visitors and people who want to cross the border. Issues such as human trafficking or criminals wishing to exit the country can be solved by having a proper distinction of who is allowed where. It would be ideal if the visitor have an entire different circulation than people who have intention of crossing the border. This way, offenders have no opportunity to take advantage of the situation and cross the border illegally. Figures 7 and 8 show two examples of how a barrier to define circulation.

5.1.2 OPPORTUNITY TO SURVEY THE SURROUNDINGS

As discussed in the previous section, windows and balconies allow the surrounding areas to be watched over (Figure 9). When an offender is aware that that an area is being watched all the time, it would deter the crime from happening. Large openings should be located at the upper floor so that it cannot be broken easily. Balconies are entrances to a building, so it should be located on higher levels too, so it is not easily accessible from the outside.

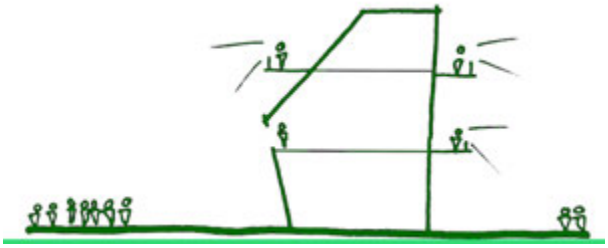

Figure 9: Openings and Balconies as Spaces that Watch Over

5.1.3 PROPER SITE LAYOUT

The two points highlighted under this principle are controlling the number of entrances and having the buildings to be closer to each other to ease surveillance. In the image above, Figure 10

has four entrances to a compound while Figure 11 has two entrances. The proposal in Figure 11 is easier to manage because less manpower is needed to guard the entrances and the possibilities for offenders to enter the compound are limited unlike in Figure 10. The distance between buildings also plays a part in building's security. As can be seen from Figure 12, if a building is further apart from each other, more manpower is needed to keep an eye on the area. Figure 13 shows two building which are closer together and it will only require lesser manpower.

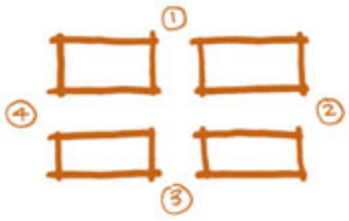

Figure 10: Facility with Multiple Entrances

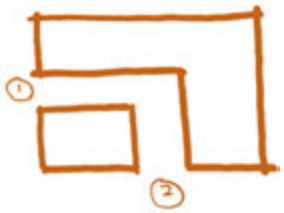

Figure 11: Facility with Limited Entrances

5.1.4 THE THREE LINE OF DEFENSES BY RICHARD J. HEALY

Fences and watch towers create a phycological barrier which deter innocent people from wondering through. As seen in Figure 14, structures like this would look intimidating. Large openings should be located at the upper floor so that it cannot be broken easily. Balconies are entrances to a building, so it should be located on higher levels too, so it is not easily accessible from the outside.

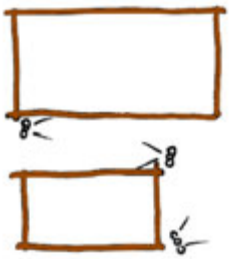

Figure 12: Facility with Large Surveillance Area.

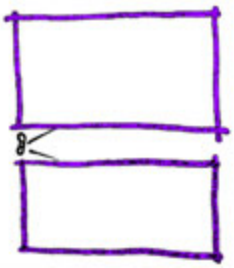

Figure 13: Facility with Limited Surveillance Area.

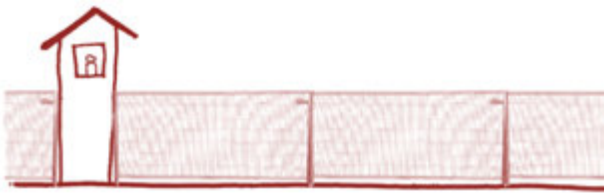

Figure 14: Facility with Fencing

5.1.5 LIGHTING

With proper lighting, fear in people can be eradicated causing an area to be busier and lessen the opportunity for offenders to escape into the dark.

6. CONCLUSION

This work has discussed many ways to incorporate security aspects in a building. All these approaches are derived from eradicating the fear in people and lessening the opportunities for offenders to act on a crime. Some approaches also use the understanding of human psychology to create a boundary between private and public spaces. These principles will be useful in buildings

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which require a secure compound but at the same time has a very busy public area like a land custom checkpoint. Custom checkpoints typically have a duty-free zone attached to them, so these approaches can be applied to a new custom complex to enforce security.

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Note: The original work of this article was reviewed, accepted, and orally presented at the 3rd International Conference-Workshop on Sustainable Architecture and Urban Design (ICWSAUD 2017), a joint conference with the 3rd International Conference on Engineering, Innovation and Technology (ICEIT 2017), held at Royale Ballroom at the Royale Chulan Penang Hotel, Malaysia, during 13-15th November 2017.