

Safety by design: a review on planning and design strategies for a safer living environment in higher education communities

Pawda F. Tjoa & Richard Devon

Pennsylvania State University
University Park, Pennsylvania, United States of America

ABSTRACT: The authors in this article examine how the design of living environments in university communities can enhance low-risk behaviour and deter high-risk behaviour by making risks harder to take, lowering the danger they pose, and by improving attitudes towards the designed environments and the communities who live in them.

INTRODUCTION

Internal and external living environments are designed. Their designs influence behaviour actively and passively. Frequencies of good behaviour and bad behaviour alike vary with the design of living environments, regardless of how good and bad are defined.

Understanding the relationship between behaviour and design is an ongoing project. A rather limited body of knowledge has so far been found and reviewed. Nevertheless, some topics will be explored that are related to safety, with the goal of enhancing low risk behaviour and deterring high-risk behaviour through the way in which the living environments are designed.

University communities have special characteristics, such as high-density populations of people between the ages of 18 and 30. These communities have frequent gatherings for academics, sports, club activities and socialising. They are also characterised by much pedestrian mobility and a 20-hour clock from 7.00 am to 3.00 am. Given their youth, these communities have relatively high frequencies of *experimental* behaviour. These high-energy environments and many functions attract non-student visitors with different age and social profiles, often in large numbers, some of whom may also be prone to undesirable behaviour or, conversely, may exercise a positive influence.

Metrics for undesirable, high-risk behaviour may be found in many places, such as case studies, in campus and community police logs, the emergency rooms of local medical facilities and surveys. These are dominated by alcohol-induced behaviour and the consequent failures in judgment. Some high-risk behaviour also occurs as a result of excitement in youthful venues of formal and impromptu sporting activities. Again poor judgment is critical in the chain of events. However, crime is also a factor to consider when designing safe environments, because not all criminal behaviour is induced by alcohol, other drugs or high spirits.

The question addressed here is whether design can mitigate the effects of poor decision-making, whether criminal or induced. Ways in which it might help fall into two general areas: design for safety and design for ownership. The consideration here mostly is design for safety and mitigation of the damage done to themselves, to others and to property, when people engage in criminal, drunken, high-spirited or simply *ill thought out* behaviour.

There will also be a brief reflection on the degree to which a sense of ownership may be enhanced through better aesthetics, functionality and participatory design. The assumption being that the better people feel about their environment, the more they feel they belong in a positive sense, and that this may lead to less alienation and less antisocial or self-destructive behaviour. Such enhanced feelings of ownership may influence an individual's behaviour towards others and make them more prone to timely intervention when observing high-risk behaviours.

THEORY

Jane Jacobs' *The Death and Life of Great American Cities* (1961) was the first work to suggest that active street life could cut down opportunities for crime. In the early 1970s, there was an increased interest in reducing crime through design. C. Ray Jeffrey's *Crime Prevention Through Environmental Design* (1971) and Oscar Newman's *Defensible Space* (1972) were influential.

Practice: Crime Prevention Through Environmental Design

Crime Prevention Through Environmental Design or CPTED (C. Ray Jeffrey, 1971) was triggered by Jane Jacobs' *The Death and Life of Great American Cities* (1961) and Elizabeth Wood's *Social Aspects of Housing in Urban Development* (1967). CPTED is an interdisciplinary approach that emerged from the conviction that crimes can be prevented through manipulating the design of dwellings and the relationship between dwellings and the neighborhood surrounding it.

The intent of CPTED is to reduce the *opportunity* for criminals to commit crimes and is also called *situational crime prevention* [1]. This *Opportunity Theory* was further expanded by Mayhew, Clarke, Sturman and Hough (1976) and Clarke and Mayhew (1980) in their work for the UK Home Office Research Unit, and by Canadian researchers Brantingham and Brantingham (1981) [1]. Two underlying assumptions for CPTED to operate are that criminals do make rational choices and can be deterred from crime.

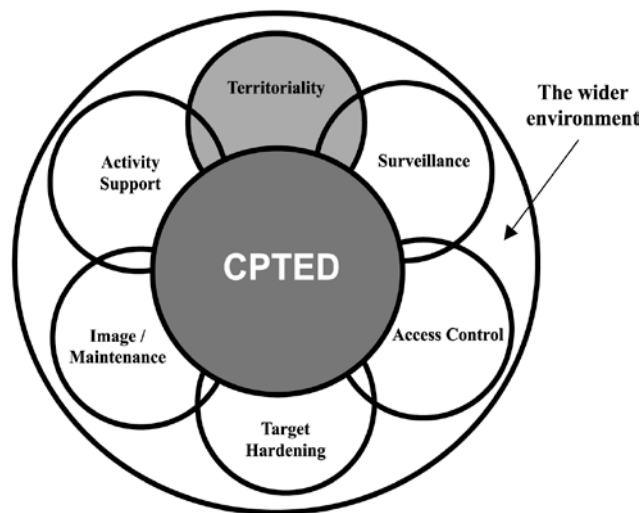


Figure 1: The key concepts of CPTED (www.emeraldinsight.com/fig/1130230502001.png, 1/2/2010).

An important focus of CPTED is the notion of *defensible spaces* as introduced and discussed by Oscar Newman. With CPTED, *architects, developers, and property owners have an important tool for proactive crime prevention*. A major criticism of CPTED through situational crime prevention is that it *displaces* crime - criminals simply move to a different location or a different type of crime. However, displacement of crimes through situational crime prevention has proven to reduce the number of crime committed in influencing the final decision of some potential criminals - through displacement, some potential offenders did not pursue their criminal intents to the end. Additionally, CPTED is considered irrelevant to certain criminal behaviours that arise as a result of unemployment, poverty, etc.

Problems with the implementation of CPTED include finding a balance between security and practicality, as too much security encourages a fortress mentality. *Perception is reality and the fear of crime can be as devastating as crime itself* [2]. Security has not been a main concern in housing development until recently when victims of crime began to seek compensation from owners and managers [3]. The issue of legal culpability is definitely a constraint on high risk behaviour as lawsuits and criminal investigations into serving drinks to underage students attest. Beyond failures to meet code requirements that already typically focus on issue of safety, it is possible that poor design at some point be viewed as a failure to exercise due diligence and appear in future lawsuits. That idea will not be pursued here, but the focus simply is on the role of even better design in creating even safer communities.

The role of CPTED has since expanded to include premises liability. Most consider that a participatory design process will help provide a safer environment for the residents of dormitory and residential communities both because the design is likely to be better for local needs and because of the heightened sense of ownership. Getting students involved in the design of educational environments is not often done, although that has been done in small collaborations with different units at Penn State for several years, with some success in both classroom and lab designs using student design teams supervised by the junior author. Two enduring attractions for CPTED is as a cost-effective way of reducing crime, particularly in the initial design rather than retrofitting later, and in lowered liability costs. However, it is still not widely known and anything new triggers resistance [4].

Defensible Space

Oscar Newman established a relationship between urban design and crime rates. His observations were mostly based on public housing projects in New York City. Newman's theory was comprised of three main factors: territoriality, natural surveillance and, image and milieu.

Territoriality suggests that spaces must be clearly defined in terms of ownership. This means a well-designed housing project would consider demographics of a housing community and cater to the needs of each group based on gender, age, lifestyles, background and so on. Natural surveillance empowers the community to develop a territorial instinct, thus enabling them to take control of their own safety. The notion of milieu is used to counteract the negative effects on residents where it insists on the harmony between a housing estate and its immediate neighbourhood [1]. Rubenstein et al developed the notion of social surveillance assuming that *changes to physical design could affect social interaction and cohesion, which in turn effect crime and the fear of crime* [1].

Through *Defensible Space* Newman proposed to redesign apartment blocks so that areas in public use would be visible by the public, thus they are under constant surveillance by the public. However, when these strategies were applied in public housing projects, the outcome was not as predicted. It was discovered that public areas, such as elevator lobbies and stairwells that have been glazed to follow Newman's proposal, became the common spaces for vandalism and crime to occur. At the same time, these spaces are also semi-private or semi-public spaces where no clear ownership has been established, which brings us back to Newman's main point on territoriality.

The Use of CPTED on University Campuses

In the United States, crime frequencies on and around campuses tend to be highest for violations of liquor and drug laws and for larceny (theft). More serious crimes of assault and rape also occur often in conjunction with the use of alcohol and drugs. Homicides and suicides are rare, but accidental injuries and deaths, again in conjunction with the use of drugs and alcohol, are of some concern. Rowdy behaviour, including throwing or dropping things from windows and balconies can easily turn very hazardous and even deadly.

There are a number of fairly practical measures that provide architectural means of reducing the frequencies of undesirable behaviour. These are increasingly prevalent in the design of the built environment in campus communities and include better lighting, surveillance cameras, more transparency through the use of more windows and fewer hard-to-see places, making structures harder to climb, removing balconies that allow objects to be thrown and people to fall, and simply reducing building heights.

The use of shrubs may keep people away from the buildings but they can also reduce transparency and provide hard-to-see locations where crimes may occur. Alternatively, a more costly method, such as a traffic post that needs to be staffed around the clock, could be proposed to control and restrict traffic access to campus.



Figure 2: Shrubs, boundaries and hidden places.



Figure 3: Controlling university access.

STUDENTS' BEHAVIOUR

I had been drinking, tried to do a handstand on the railing and fell - the student said - I did a full front-flip, and landed on my feet, then fell on my back [5].

Climbing may be in our genes, since it is very popular, even when unnecessary. When done by the untrained and/or those under the influence, it frequently leads to disaster. It may be impossible to design a building that cannot be climbed, but it may be quite simple to include design features that discourage climbing by making it very hard to climb. If a fall occurs, it

should be very obvious and there should not be any hidden areas around the base of the building. Hidden areas are generally problematic for behaviour and there should be better ways to practice Newman's notion of design transparencies.



Figure 4: Balconies raise new concerns.

Induced Behaviour

Dangerous behaviour may be induced through the consumption of drugs and alcohol or extreme social excitement. In the first instance, an individual experiences impaired cognitive functioning to an extent that handicaps them from responding to their surrounding. *Violence is a serious problem in North America, with one of the most important situational determinants of aggression being alcohol intoxication...* Bushman and Cooper's meta-analytic study of 30 relevant experimental studies concluded that *individuals were significantly more verbally and physically aggressive while alcohol-intoxicated* [5]. While design cannot directly reduce the frequency of alcohol-impaired behaviour, it can promote natural surveillance through transparent design and lighting, and formal surveillance such as security cameras in public spaces.

Criminal Behaviour

Unlike induced behaviour that can take place rather randomly and spontaneously at any time and place, criminal behaviours are characterised as time- and location-specific. This means they are more consistent in nature, usually pre-meditated and, as such, they tend to be more easily studied; therefore, more easily prevented through environmental designs.

Tim Crowe, who specialises in Security Design, asserts that *for over 5,000 years, architects have used design and space management concepts to manipulate human behaviour ... yet, for the past several decades, mistakes have been made in community development, urban planning, and architectural design that belie our ever having had a historical knowledge of such design concepts* [6]. Crowe further suggests that it may be due to our increasing reliance on technological advancement such that we forget there still remain many environmental conditions that cannot be controlled by machines.

The Crime Prevention Through Environmental Design (CPTED) recently *rejuvenated an interest in age-old concepts of environmental psychology* [6]. While security measures have attempted to combine these design concepts and current technology, there is still more to be explored. Architects and planners are challenged to combine design concepts introduced through CPTED and the current technology.

Safety issues are usually the results of dangerous and risky behaviours of students and residents of dormitory buildings. In a study on fire-safe dormitories in 1999, the National Fire Protection Agency (NFPA) identified very important and troubling habits and behaviour of student residents, particularly those who live in the dormitories. Students between the ages of 17 and 21 who live in the dormitory mostly live away from home for the very first time. The concept of safety is not one that most of them are concerned with, as Jim Ferrier, associate director of Public Safety at Northeastern said *for the most part they're not safety and security-conscious*.

Behaviours such as covering the smoke detectors and starting a prank that accidentally set off a fire alarm are very common in the dormitories. *William Brill cites an American example of how youths managed to overcome an elaborate surveillance system which controlled access to an apartment building. They first broke the system and then carefully watched the repairman at work* [7].

Such behaviours put the rest of the students in the shared building at risk, for example, since setting of the fire alarm by accident now renders the fire extinguisher useless. Ferrier adds that *when it comes to residence halls, in particular, we have the most comprehensive safety and security systems of any urban campus in the country* [8]. While in the past there was the need to retrofit campus facilities as a safety measure, current technology has enabled the integration of new systems into the construction of new residence halls.

Design Considerations

Design considerations are organised into two main categories: Larger Planning Strategies and Specific Design Strategies. The first is useful in such decisions as building heights, streets planning and landscaping. Specific Design Strategies are useful in specifying doors and windows, placement of lighting and fenestration throughout buildings, as well as the strategic siting of surveillance cameras in a parking lot/garage. CPTED aims to use the built environment to deter crime.

Larger Planning Strategies

Broader planning strategies, such as privatising residential streets and limiting pedestrian access, have helped in reducing crimes, according to criminologists. These are more encompassing design and planning decisions that likely influence the identity and cohesiveness of a neighbourhood of residential community in order to deter criminals from operating in a certain neighbourhood.

High-Rise Versus Low-Rise

According to Oscar Newman, building height is *the single greatest contributing factor in the rate of negative incidents in housing complexes ...* [9]. Buildings that are taller tend to remain conservative by excluding balconies and terraces to eliminate the possibility of such a scenario as described above. Apart from balconies, several design considerations, such as of the fenestration of high-rise buildings, demand to be re-examined. For safety reasons, some universities prefer not to have balconies or roof terraces on buildings five stories or more. Double-hung or hopper windows are generally safer than casement windows. Designers may also wish to put security screens on windows that are within 10 ft (3 meters) of grade [9].

Higher education campuses have bounced back and forth between building high-rise and low-rise dormitory buildings. A high-rise residential tower lends itself to higher expectation in terms of quality of living. In other words, compared with residents of low-rise residential towers, residents of high-rise towers are much more likely to expect to have a satisfactory living environment, the lack of which could result in *vandalism and disorderly behaviour. These are evidenced in low-cost public housing, [and] such reactions are magnified in high-rise units* [10]. *If the high-rise residence hall fails to provide the intangible values essential to a satisfactory environment, a rebellious attitude tends to develop, which leads to vandalism and disorderly group behaviour* [10].

Densities

The planning strategy for State College, Pennsylvania, will differ greatly when compared to metropolitan New York City. In State College, where there is a greater sense of ownership among students and residents, public transit stops should be located in close proximity to bars and other entertainment facilities where heavy drinking and partying take place. While it may seem that such close proximity and density tend to lead to brawling and other unruly behaviour at the transit stop (especially after heavy drinking), most crimes and dangerous behaviours such as robbery and sexual assault take place in more obscure locations where there is little or no potential for monitoring or witnessing by the public. With more people about, there might be *some inhibiting effect* [7].

Surveillance

There are two types of surveillance: natural and formal/organised. Trevor Bennett, who conducted a study of burglars' attitudes, suggests two factors most likely discourage burglary: signs of occupation and surveillance of the dwelling [1].

Natural surveillance can be achieved by designing dormitory or residential buildings such that occupants can have a visual access of their own spaces, and semi-public and public areas. In dormitory buildings, it means being able to see the streets adjacent to the building to see who enters and exits the buildings. Crimes, such as robbery, assault and rape, occur mostly in interior public spaces such as the lobby, elevators, stairwell and corridors. The shared characteristics of these areas are their relatively low activity level and their isolated nature. A possible solution may be to design lobbies, corridors and circulation areas that operate as social gathering spaces or that are visually accessible from these social spaces.

When designing a dwelling, place windows so that entryways are visible from inside houses/dwellings [1]. Figure 5 compares a dormitory entrance that allows surveillance from an adjacent semi-public space through glazing in doors with another that provides very little natural surveillance by the public.

Formal/organised surveillance, such as Neighbourhood Watch, in public housing focuses on encouraging people to note suspicious activity and report it. While this has reportedly increased social cohesion that may give a perception of a safer environment, it has not significantly reduced actual household crime rates. Organised surveillance could be in the form of formal and social events intended to promote social cohesion and familiarity among community members, thus increasing the likelihood of recognising suspicious individuals and behaviour.



Figure 5: Entrances with and without transparency.

As mentioned earlier, surveillance through CCTV can be effective in reducing thefts, such as in the Surrey University car park example. The positioning of the surveillance camera combined with the renovation of the car park to allow more natural surveillance through lighting, visibility of inner spaces of the parking spaces can reduce vandalism and thefts.

Landscape Design

Campus safety also encompasses the outdoor environment. University campuses often provide security escort services for students who walk home late in the evening. Penn State's Security Escort Service was started in 1938 by the Office of Student Affairs and then was taken over in 1969 by the University Police. These services are crucial for additional security measures. However, students using these escort services make up a very small percentage of the entire student population at Penn State. According to the statistics provided by the University Police, this number varies between 100-6,000 uses per year, which is slightly more than 1% of the entire student population at the University Park campus [11]. This may suggest that students still rely primarily on the comfort and the perceived safety of the outdoor environment when they decide to walk home by themselves.

Landscape design can make a huge impact on the safety of the campus environment. One of the guidelines given for campus safety is to know your surroundings [12]. The role of landscape design is to create an outdoor environment that can allow pedestrians to be more aware of the surroundings. Landscaping should be designed so that intruders cannot hide behind shrubbery. Height and density of shrubbery as well, and their placements in relation to the surrounding surfaces may hinder or facilitate natural surveillance, the lack of which may cause one to be unaware of intruders or criminals particularly at night time. Lighting is one of the most crucial design features to enhance this. According to the Landscape Design Guidelines for UCF, *lighting fixtures throughout campus must be consistent. An organised lighting system, with uniform colours and fixtures, create a feeling of improved safety...* [13].

Parking Facilities

Parking facilities are more likely settings for crime because they are made of large areas with a relatively low activity level. Since few people are at a parking facility at any one time, an individual can be isolated in a parking facility and, therefore, become an easy target for an attack. This scenario makes parking facilities an attractive place for people with criminal intent. Several factors contribute to parking facilities becoming a crime setting, including limited lighting, design that provides hiding spaces for criminals, unmonitored public access, inability to identify a criminal's vehicle when it tends to look just like any other car. In Figure 6, natural surveillance of the parking lot from the streets and from dormitory rooms can help deter crime from taking place in parking lots, such as this one. However, increased lighting may also facilitate surveillance at night time, as well.



Figure 6: Parking lot with surveillance.

In parking garages, retaining walls should be replaced by see-through cables, wire mesh, and metal fabric materials to maximise surveillance from the outside [14]. Figure 7 shows how it compares with a typical design of existing parking garages (left). The retaining walls obliterate any opportunity for surveillance from the streets and make these parking garages a target for crimes, such as theft and physical assault.



Figure 7: Parking garage without transparency.

Additionally, surveillance in car parks can be effective through modern technology. One closed-circuit television camera (CCTV) and monitoring equipment reduced thefts from cars parked on the Surrey University campus by 66 per cent by greatly extending the ability of existing security staff to supervise large open parking areas [7].

Street Design

CPTED reduces crime by reducing the fear of crime while increasing criminals' fear of being caught [2]. One of the main principles of CPTED is to increase a sense of territoriality through closing of private/residential streets, thus giving the area a greater sense of ownership. If it is closed, you have the feeling of control and that you are living on your own turf [7]. This kind of street will give people who live around it a sense of ownership, thus giving them the feeling of increased safety unless their territory becomes intimidated by gangs or other undesirable elements.

Access Control

Thefts and vandalism are more likely to happen in areas where there is an easy way to get in and out of and where a fast getaway is possible [1]. In the case of a residential community, the more access points there are, the higher the likelihood of crime to happen. Alice Coleman suggests that if the number of access points is reduced from five to one, through very small and inexpensive means, the number of criminal incidents would reduce by up to two-thirds [1].

The access to dwellings should be as direct as possible, with a minimal amount of turns and intermediate semi-private and semi-public spaces. In some cases when this is not possible or in renovation cases where improvements are made to existing conditions, the common entrances to an apartment building must be either *manned by doormen or similar security personnel ...* [1].

Access areas, such as stairwells and elevator lobbies, should be well lit and surrounded by windows to allow surveillance from both inside and outside. Newman's book also suggests that tenants extend their territorial control beyond the confines of their apartments [1]. Jim Ferrier also recommends the use of one entrance and exit as a way of monitoring the entrance and exit of the building, as well as identifying suspicious individuals who otherwise may enter from a more obscure access door.

Territoriality/Sense of Ownership

In *Creating Defensible Space*, it was concluded that *residents maintained and controlled those areas that were clearly defined as their own* [15]. Several strategies to build a sense of territoriality include designing cluster buildings within which residents can recognise their fellow residents, thus easily identify non-resident and suspicious behaviours. These clusters may be designed to provide a unique sense of identity through a design feature. Any open spaces within these clusters must be clearly situated within the cluster complex to discourage strangers from entering residents' territory.

Another method to mark out territory is through transitional features, such as emphasis through lighting, textures of footpaths, levels of footpath as identifiable threshold, landscaping and fencing, and a buffer space along the perimeter of the building to prevent immediate entry into a private area. It is still important to avoid fencing a whole site that

promotes a fortress mentality. As the Design Against Crime Research Centre in the UK also upholds, *secure design does not need to look criminal* [16]. If a fence is necessary, it should be left open to allow surveillance and ventilation. Other preferred options may be by using landscaping features.

Specific Design Strategies

Specific Design Strategies address smaller design decisions that are equally important in addressing safety issues but that are often overlooked for their seeming ineffectiveness or irrelevance in protecting victims of crimes. For example, there has been some evidence that the quality of doors to an apartment can influence burglary risk.

Fire Safety

As discussed in the *Criminal Behaviour* section, student communities are faced with a unique challenge in terms of fire safety. It is not uncommon for students to meddle with fire safety features from the sprinklers to the fire alarms, whether when under the influence or just out of ignorance. Due to the high frequency of such incidents, some universities implement regular inspection of apartment and dormitory buildings to ensure that any tampered devices are discovered and reset as soon as possible. *The University maintains and tests all fire alarm and automatic fire suppression systems in accordance with the appropriate National Fire Protection Association Standard to insure system readiness and proper operation in the event of a fire* [12].

Fire Precautions

On building design for high-rise buildings, Ferrier suggests the use of separating walls to prevent access between the low-rise and high-rise sections of the building [8]. Based on the NFPA Journal on Risky Behaviour, there are several questions that occupants of residential buildings must ask themselves regarding safety. These same questions may be relevant also for design considerations of building interiors. These include, *what types of waste products are associated with your heating equipment? How do you dispose of the ashes from your fireplace or the lint in your dryer? Could these waste products get hot enough to catch fire or start one?; and where and how do you use solvents, fuels, and other flammable liquids? Before you do, do you check for heat-producing objects nearby? Are you likely to be distracted when you're using heat-producing equipment? How will you remember that you've turned your stove on? Does everyone in your family know the proper way to use your space heater?*

Building interiors are often dull and badly designed or laid out such that *many people seem to be unaware of their surroundings and the way in which the different aspects of their environment interact* [17]. In this case, Marty Ahrens also suggests *...It's easy to forget that a wide variety of our possessions can catch fire and that numerous appliances we use every day produce enough heat to start a fire.* Numerous fire incidents were started by actions that vary from simply falling asleep, leaving things unattended, to being unconscious, impaired and/or being under the influence of drugs and alcohol.

Target Hardening

Target hardening involves improving building security standards. Doors, windows, halls should be designed to deter thieves. The quality of these obstacles must be high. Obstacles also include the door frames, hinges and locks, all of which must be as strong if not stronger than the door itself. Other measures such as exterior lighting, alarm systems and key control can add to security as well. Doors to apartments are the next line of defence, should the main entrance to the apartment buildings not provide the locking mechanism that ensures safety of the residence. Doors to apartments should be constructed with a good locking system. Any surrounding structure must be at least as strong as the door. Doors to apartments should not be isolated from areas used by other residents, but grouped in lobbies serving several apartments. Spy-holes in doors probably would contribute to a potential burglar's perceived risk [7].

Lighting

Lighting has two purposes: to illuminate human activities and for security [14]. It is crucial for designers to consider the behavioural effects of lighting that already exists, which is required for illuminating human activities, to promote crime and loss prevention, before spending money on security lighting.

While lighting does make people safer, this feeling is often inaccurate and misleading. Main criticism on street lighting practices is their excessive height, such that they light not the sidewalk but the street. The primary measure or objective of planning for lighting is to place light fixtures in numbers and locations sufficient to provide complete coverage of the floor within a minimum number of footcandles or lumens of strength.

CONCLUSIONS

Crime and accident prevention through manipulating the built environment contributes to the built environment and the society at different levels, including increasing the lifespan of the things in the environment, thus responding to *premature obsolescence, where the things that are stolen or vandalised need to be replaced more quickly than was*

anticipated, as well as linked to insurance upgrade [18]. It is important to treat this as system design and include full cost accounting for the designs used. The expenditure spent on addressing safety issues through design and planning strategies in the built environment may more than pay for itself in reduced impact on local first responder services and, possibly, reduced liability costs.

As discussed earlier, crime and accident prevention strategies should not imply the need for extreme measures, such as building tall fences and removing balconies from residential buildings, rather, it advocates the integration of safety with various other design considerations, such as aesthetics, structure and functionality to create a more pleasant and safer living environment in these communities.

REFERENCES

1. Geason, S. and Wilson, P.R., *Designing Out Crime*. Canberra : Australian Institute of Criminology, 2, 3, 5, 6, 23, 35, 40, 44 (1989).
2. CPTED-Reducing the Fear of Crime. *Apartment Security*, 6 January 2010, http://www.cptedsecurity.com/apartment_security_reducing_fear_of_crime.htm
3. Gordon, C.L. and Brill, W., The Expanding Role of Crime Prevention through Environmental Design in Premises Liability. National Institute of Justice, 3.
4. Crime Prevention Through Environmental Design, *Wikipedia*, 6 January 2010, http://en.wikipedia.org/wiki/Crime_prevention_through_environmental_design
5. Hoaken, P.N.S., Assaad, J-M. and Phil, R.O., Cognitive functioning and the inhibition of alcohol-induced aggression. *J. of Studies on Alcohol and Drugs*, 59 (1998).
6. Crowe, T., *Crime Prevention Through Environmental Design*. Butterworth-Heinemann, xi (2000).
7. Poyner, B., *Design Against Crime*. Butterworth-Heinemann, 10, 17, 33, 40, 81 (1983).
8. Mongeau, E., Building a fire-safe dorm. *NFPA J.*, Jan/Feb (1999).
9. Neuman, D.J., FAIA. Building Type Basics for College and university Facilities. 168, 176.
10. University Facilities Research Center, High Rise or Low Rise? 32.
11. Bywater, R., University Police Safety Statistics. [Interview] Pawda Tjoa. 7 January (2010).
12. University Police. Policies, Safety and U. University Park. 3.
13. Landscape Design Guidelines Data and Analysis.
14. *CPTED*. 88, 122 (1991).
15. Creating Defensible Space. U.S. Department of Housing and Urban Development, Office of Policy Development and Research. 11.
16. Design Against Crime Research Centre, 6 January 2010, <http://www.designagainstcrime.com/index.php?q=taxonomy/term/2>
17. Ahrens, M., Risky behaviour. *NFPA J.*, Jan/Feb (1999).
18. Design Methodology. Design Against Crime Research Center, 5 January 2010, <http://www.designagainstcrime.com/index.php?q=designmethodology#conclusion>