

## Determining and Studying the Factors Affecting the Increase of Environmental Safety in the Design of Residential Complexes



### Environmental Science

**KEYWORDS :** environmental security, residential complex, SPSS software.

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### ABSTRACT

*Nowadays, housing and establishment of security are the most important factors in creating a satisfying life. Commitment of crimes depend on the structure and characteristics of place, so surrounding environment is one of the most effective factors affecting the establishment of the security. Hence, it should be considered as one of the main priorities of designers in the architecture and design. The overall objective in this research is increasing security; and hypothesis is increasing the monitoring in space fabric through the injection of human, for increasing social activities. Therefore, initially we examine theories of prominent theorists in this field, such as: Jane Jacobs, Elizabeth Wood and Et al. then we assume some measures to meet the target. And for further evaluation of their impact, two selected samples of residential complexes are studied. We have comparative analysis of figures obtained from SPSS and finally, introduce the most effective measure in establishing security.*

### 1. Introduction:

From the beginning of creation, mankind has sought to provide a place of residence in order relax and security has been one of the most important factors in ensuring comfort, in a way that in Maslow's classification of human requirements, security is of secondary importance and it has been placed after physiological needs. Undoubtedly, for the progress, development and evolution of a society and blossoming of the talents, no element is more important than the elements of providing security and comfort in the society and social development, creativity and worthwhile activities are not possible without providing security. The concept of security implies the protection of individuals from the dangers of crime and misdemeanor. Surrounding environment can be considered as one of the most important and effective factors affecting the establishment of the security that consists of a wide range of areas, including: historical contexts of the city. More attention must be paid to the concept of security as opposed to the crime, which is effective in stabilizing the environment in terms of spatial-fabric structure and also it should be considered as one of the main priorities of professionals and designers in the development of architecture and design, in order to find appropriate solutions for the design and determination of spatial-fabric factors affecting the provision of environmental security.

Yazd, as one of the historical and touristic cities of Iran, has a special place in the world that its historical context is actually the main core of the way of its development during the period of its change and evolution.

**Image.1.Yazd. Source: www.ichtor.ir**



Dowlat Abad Garden is one of the historic regions of Yazd that nowadays it has become ineffective and problematic due to in-

consistency with the time and it is considered as an area with low safety factor and in terms of quality, it has weakened the quality of environmental safety of the region.

In today's urban design, one of the most common ways of increasing security in this type of context is the injection of human workforce, which will result in the provision of bulk of human activities for regulating the fabric and increase of monitoring and as a result the increased number of observers in these sectors and in order to provide it, by designing a residential complex and considering components and measures affecting the spatial analysis for increasing security in the design of residential complexes, we can ultimately achieve a secure environment in the examined region.

**Image.2. Location of the region Source: author and google earth**



### 2. Theoretical framework and principles

Understanding the definitions related to residential complexes is very important in the research process. The housing can be divided into two kinds of single-family and residential complexes. Residential complexes are a series consisting of a number of single-story, ground floor or multi-floor residential units that are connected to each other by shared entrance, street or area. (Ardalan and others, 53 -1976-2009) It should be noted that the design of residential complexes is not just placing a number of residential units next to each other, but rather the optimal quality must be obtained by designing safe neighborhoods, because

crimes do not always occur accidentally in terms of place, time and manner of formation, but often they depend on the structure and characteristics of place of the offense.

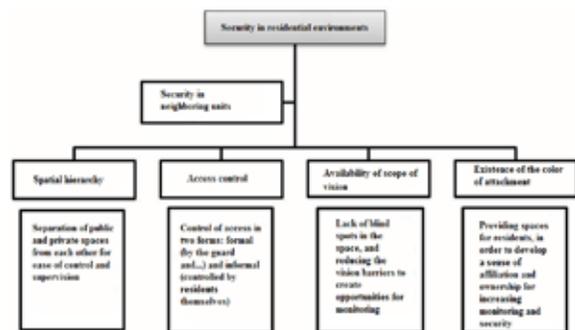
Security is a concept with special mental dimensions and characteristics and refers to the comfort and peace in building an environment. (Bemanian, 1388, 22) In fact, here the intention is that, whatever is considered to be secure, must be able to provide peace of mind and leisure, this means that it should create a sense in person which will lead him to get rid of fear and panic. Accordingly, we can assume following meanings for the concept of security:

1. Security means tranquility and comfort and safety (Amid, 1345, p. 138).
2. In Persian dictionary, security means freedom, peace, lack of fear and lack of invasion of others.
3. Also security is from the root word of secure, which means safety, peace of heart and calmness.
4. In addition to what was mentioned, security has been derived from the secure material, that according to "Ragheb", in his book of "Mofradat", it means peace of mind and peace of soul and elimination of fear and panic.
5. In Oxford Dictionary, the word security has been defined as "protection, freedom from danger or anxiety".

"Montesquieu" also believes in the concepts of peace and security, because he considers the security as the result of peace and recognizes peace as the first law of nature, and therefore considers the security as the greatest principle in the human life. (Bemanian, 1388, 25)

Security and the sense of personal security, primarily depend on individuals and family. In fact, house has been proposed as a place for relaxation of the family and it is of great importance and by considering the importance of security in the residential complexes in the impact of the quality of the surrounding environment in the formation of it, we can consider the figure 1:

Figure.1. Security in residential environments



Source: Author

❖ Explanatory views

As it was mentioned, one of the most important factors for creating a desirable quality of life, is the existence of "security". In most countries, there are residential projects such as Pruitt-Igoe residential project in St. Louis or Ronan Point project in England, which have turned to hotspots and threatened the social security and because of this problem, in today's advanced societies, in order to improve spatial quality and to increase people's sense of security, some groups have been formed to investigate

the causes of it.

"Security", the degree and the concepts that are dependent and associate with it, are considered to be as the most important and prominent issues for everyone, because security, as a reality, is proposed as one of the fundamental rights of the people.

Background and context of the theory of urban criminology issues must be examined, at least from the perspective of Chicago school of sociology and initial studies of urban ecology. Urban ecology was created for the first time in 1211 AD in the field of urban studies and accordingly pathology of biological environments, quality, distribution of crimes, diseases and riots of living environments in different parts of the world were studied.

Jane Jacobs cleverly studied the street brutality, according to her, crime and the systematic environment are observable and controllable, therefore usual cares of residents will prevent the occurrence of crime. For more safety of the streets, in her book, she suggests that public spaces must be separated from private ones and streets usages must be also varied and diverse. (Jacobs, 1961:15)

Jane Jacobs states that a successful fabric feature should possess three main features of below:

- Boundaries and limits: Existence of a clear boundary between public and private spaces and lack of penetration of public and private spaces in each other.
- More sense of possession and ownership on public spaces, it is desirable to have watchful eyes on streets and public environments of the city.
- Permanent users: Sidewalk paths should have permanent users, to increase the number of the watchful eyes of the streets and public spaces and people who are living in the buildings across the street should have a tendency to see the sidewalk. For example, in the UK to improve security in urban public spaces, mixed usage policies were encouraged and a mixture of small businesses, homes and offices in urban centers and the construction of apartments on the upper floors of shops were applied in the project to increase the level of activity and thus the security. (Boyle, 2005: p566.)

Elizabeth wood was one of the most prominent persons who defended the importance of realization of fabric design theory in the community. Wood believed that managers of residential areas can never stop the destructive actions of insouciant tenants and even a small group of dissidents. With the aim of enhancing the quality of life for residents and increasing the beauty of the residential environments, she tried to change the design of these environments, and in order to achieve her objective she believed that the frontage must be improved in the opinion of the residents. Also she built spaces where the residents gathered together that its result was increase in the possibility of supervision of the residents. Wood's opinion regarding the social control of residential environment was based on the presence and supervision by the residents themselves. (Robinson, 1996: 14)

Shlomo Angel is another theorist who always emphasized the importance of the physical environment for the prevention of crime. He believes that determination of ownership limits, decrease or increase in access to the site and conducting actions concerning the monitoring and surveillance of citizens and police that takes place through the physical environment can be applied to decreased crime rates. Angel with the book of "Discouraging Crime through City Planning" pointed out that how citizens can play an active role in crime prevention. (Bonyad Amani, 1388: 44)

The appearance of Oscar Newman's works under the title of Defensible Space reached to its peak in 1972. In other words, defensible space, rather than being a program in the field of fighting against the crime, was an exploitation of the layout that Jacob believed to them. According to Oscar Newman, in order to create defensible space every space should have a custodian and protector and the spaces which are empty and without any guardian create the conditions of committing crimes, he establishes a hierarchy for the spaces. In his studies and researches he found that in public residential complexes crimes often occur in the places where criminal activities are hardly visible and observable and public access to these places is not simple. Also Newman established his ideas about the care and use and protection of the fabric environment in a hierarchy that consists of four regions that their limits are determined by the fences. (Public space, semi-public space, semi-private space, private space) (Newman, 1966, 132)

According to Newman, prevention of committing crimes and reducing crime means:

- Fabric design capability to create a "sense of ownership of the territory," in the person (strengthening natural instinct of ownership and territory)
- Spatial fabric design capability to create an opportunity for monitoring and surveillance of citizens
- Fabric design capability to inform about the separation of public privacy from private or semi-public and semi-private domains.
- Spatial fabric design capability in order to encourage citizens to participate in public areas and having freedom to go to public places and protect personal property
- Fabric design capability to make the criminal purposes harder and prevent criminals from committing crimes
- Fabric design capability to encourage a sense of responsibility in the citizens regarding the public spaces. (Heshmati, 1380: 44)

Alice Coleman's theory, these theories were followed by the work of Mrs. Alice Coleman. She also argued that high public housing projects may also cause many social problems. Coleman argues that this type of housing is now associated with a lot of inappropriate behaviors such as graffiti, dumping of rubbish and waste and garbage. She considers that the design of this type of places is specifically influential in the creation of such social problems. Like Newman, she believes that crime and delinquency, etc. occur in areas where residents cannot monitor and be aware of outgoing and incoming of their residential buildings. (Dickens, 1389: 217)

Another type of crime prevention was for the first time introduced by Clarke (1992). This type of crime prevention is called situational crime prevention and it is consistent with ideas of Jeffrey (1971) and Newman (1972), stating that crime can be adjusted through the design and modification of the physical environment. Clarke along with Cornish is the originator of the theory of "rational choice" in criminology. In this view, criminals are rational decision makers that think about their economic and financial issues through the crime and situational crime prevention, with the knowledge regarding this issue, tries to reduce the commitment of crimes. (Carmona, and others, 2003, 120) Construction of defensible spaces has social purposes, that one of them is the establishment of spatial structure of urban areas in a way that it fulfils the care and control of surfaces surrounding houses and blocks with different applications, that by the surfaces surrounding the houses we mean the streets, lands

surrounding the buildings, corridors and hallways and stairs and other communication spaces, and the other purpose is enabling people to make better use of the space at their disposal and benefit from the real and valuable life. (Kalantari, 1382: 89)

#### ❖ Explaining factors and measures effective in environmental safety

In respect to the pathology of biological environments, according to proposed theories, factors affecting spatial analysis for increasing security in residential design can be: physical, functional, and perceptual-visual, that in line with them criteria such as: the size of space, form of space, space layout, access, circulation, territory, landscape, light, visibility from inside to outside are extractable. Criteria are related to each other in the formation of the design structure of the residential complex with high security factor, but a linear relationship cannot be considered for them and in fact the environmental dimension, which is considered in this study, is the only efficient and influential dimension.

#### - The impact of size and shape of space on the control of residents

Size and shape of the space are always two effective fabric factors on the control of residents. The size of the space is very effective factor in safety and comfort variables. Aristotle believed that the space of environment should not be too big, because otherwise it creates fear and the cries for help are not heard over its walls. Mumford, thinker of the twentieth century, also studied the social relations and restrictions in size from this perspective. The main line of Mumford's theories consisted of "organic humanism". It means a balanced character that has interaction with nature and all the parts and components of the surrounding environment. Mumford, by proposing the humanitarian dimensions and scale in the design, introduces the limits as the symbol of unity and security of tradition. Consideration of humanitarian scales has been proposed by other scholars. According to Collins, in present huge meeting spaces, many people feel anxious and prefer small and old meeting spaces that in the science of psychology it is known as agoraphobia and fear of open spaces. (Toolay, 1379: 19)

On the other hand, the argument of overcrowding and the need for solitude is proposed in small spaces, that regarding overcrowding it can be said that congestion is not necessarily an equivalent for overcrowding, however it is possible to reduce overcrowding by spatial proximity and creating flexible spaces. (Mortazavi, 1387: 85)

Regarding the form of space it can be said that, undoubtedly, lack of visual sight due to the form of space, provides very good condition for the purposes and behaviors of criminal and offenders. These types of spaces are out of sight of the people who might probably protest criminal behavior or at least by their looks blame and reproach offending people and more importantly, they are out of sight of the officials and policemen and consequently create secure environment for offenders and indefensible space for others. Therefore, the physical structure of space or in other words, space form has undeniable role in the creation of indefensible space and hence, considering the qualities of form and space is very important. In defining the qualities of form and space, Kevin Lynch reviews and studies different features such as visibility, legibility and...in the book of "The Image of the City" (Lynch, 1387: 25)

#### - The effect of visual features residential complexes

Visual and environmental comfort is considered as one of the important and basic components of the secure biological environment, because for residing and living it should possess attributes and advantages in order to make the environment desirable and comforting and thus provide comfort, convenience and security. Also the environment surrounding the house must be

warm and intimate and pleasant in order to provide optimum life. (Lynch, 1387, 17)

**-Visual features**

Visual turbulence around the residents can be reflected in their behavior through perceptions and can cause confusion in their attitudes (Bahraini, 1386:57)so the area should be designed properly.The design of the surrounding space is environmental art that the visual comfort and beauty of the environment is dependent on it in order to place its components in an appropriate place in the spatial structure.

**-Light and brightness in space**

The amount of necessary light is various in different areas.Lighting of public spaces must be shiny and bright and it must be in a form that does not cause a sense of fear and darkness in the night.Light is one of the factors that influence the legibility of space and it can be said that enhancement of lighting reduces the fear of occurrence of crimes and improves the feeling of peace and security. (Wekerle and Whitzman, 1995:28)

**- The status of accessibility**

Accessibility features, and communication networks have very large role in provision of safety and security of space, location and neighborhoods.Ease of access to place of occurrence of the crime and the possibility of a quick escape from the place takes place. According to another study, in one of the cities of England, Lautrec and colleagues reported in 1970 that almost two-thirds of the living environments, where the crime has occurred, were places with low outgoings and incomings. (Salehi, 1378: 188)

By determining territory which must be combined with access control strategy,this problem can be solved to ensure maximum efficiency. Access control, simply meanscorrect spatial arrangement and determination of boundaries of ownershipof private and semi-private spacesfrom public spaces and its philosophy is limiting the use of non-public spaces.These limitations can be symbolic (e.g. short fences or walls or landscaping and plant and the type of floor covering) or real (like high walls and fences). Oscar Newman has recommended that only limited number of the residents should use entrance of the building and it is called as classification strategy. (Heshmati,1382:55)

**- Territory**

Researchers believe that one of the most effective and important factors affecting the security are the surrounding environment. Surrounding environment includes a wide range of public and private spaces. In other words, every actions and behavior has its own privacy and domain, and correspondingly each space also has its own privacy and respect.

The definition of the term 'private' has been always placed next to the term of "public" and it has been dependent on it, in a way that it seems, none of them will have meaning without the presence of the other one. The root of the English word of "Private" is the Latin word of "Privus" meaning "single, individual, private". There are researchers who see it as an essential part of human life. For example, privacy allows people to share their intimacy and ideas on the basis of self-defined laws and therefore the ability of ignoring the "self" which is inherent part of our humanity. Privacy is part of life that is under the control of the individual in the personal capacity and it is placed out of sight and knowledge of the public and out of governmental or official control. Similarly, the private space is a part of the space, which is for the exclusive use of the individual that is out of access of the public and it is owned or controlled by him. (Madani Poor, 1389, 60)

The term of "public" which has been derived from the Latin

word of Populus, has wide implications. In Oxford dictionary, the words that have been considered as equivalent for this term are as follows: belonging to the people, belonging or having tendency towards a population or nation, or consideration of their interests; all the meanings of the word "public" refer to a large group of people that imply the meaning of "community" and "country" and also the matters related to it. In relation to "community", this word refers to various regional or ethnical scales and consists of a group, a coherent local community, a nation, or in the framework, which is used lesser at the present time, i.e. whole human race. (Ibid)

Simply, the existing spaces can be divided into three general categories in terms of their usage:

- Private spaces, the space which have been privately occupied or owned by the individuals and is utilized by them. Spaces such as residential houses, private courtyard and gardens are of these types.

- Semi-private / semi-public spaces, those spaces of the city that due to restrictions on its usage and purpose, it is used by a particular group of individuals. Spaces such as: residential complexes and their surrounding areas, stadiums and exhibitions.

- Public spaces are those spaces that all citizens, without the need of being controlled..... have right to enter and attend there. Spaces such as: streets, parks, squares, markets and mosques. This type of spaces due to functional measures and diverse and vast range of audiences possess the highest share in the collective life of citizens. Hence qualitative improvement of these spaces, more than other types of spaces, will cause the creation of healthy and prosperous urban community. (Pakzad, 1388)

Regarding the way of influence of each of measures in the promotion of security, it can be explained that by observing security models such as: good enclosures (creating apparent fabric structure and the possibility of monitoring of the situation by residents), coherence and integrity of space (obviousness of place and space), nobility and readability of space (markings and signs to define the units and spaces), access control (in two forms of official( guarding and cameras) and informal( monitoring of residents ) with proper lighting in rooms, entrances and parking) creating spatial hierarchy( existence of public spaces such as the lobby on the ground floor and semi-private and semi-public spaces such as smaller public spaces in the upper floors ), adding color of attachment to the space( increasing sense of ownership over the place and territory) reducing vision barriers and the possibility of extended scope of vision (the possibility of monitoring by residents, we will have increased monitoring for the enhancement of security in residential complexes.

With respect to the mentioned materials, the following table can be provided:

Table 1: Comparison of measures affecting the opportunities for increasing security in the design of

3. Research Methodology



**Image.6.** The residential complex of Negin  
Source. Author

In the present study, the data was collected through library studies and then to assess the validity of the measures proposed in the development of patterns of organizing mass and the space, to enhance security in residential complexes through field studies, by distributing questionnaires among residents of two residential complex in Yazd by the author, a comparison was made with SPSS statistical software. The research method was descriptive and analytical, of comparative type of samples.

❖ Identification of case samples

Two residential complexes of Negin and Baharan were selected, that the reason of selecting them was that both of them were located in the same neighborhood (Safaiyeh) with residents of the same class.



**Image.5.** The residential complex of Baharan  
Source. Author

• Statistical population, statistical sample and sampling method

The questionnaire has been consisted of 23 questions. Initially, 13 copies of the questionnaires were completed by respondents and then they were revised and after consultation with experts, some of the questions were changed to make it more reliable. Statistical population consists of the residents of Baharan and

Negin residential complexes; and method of sampling is for all age groups from teenagers to adults. The sample size in each of the residential complex consists of 10 subjects. Thus, 120 subjects were studied.

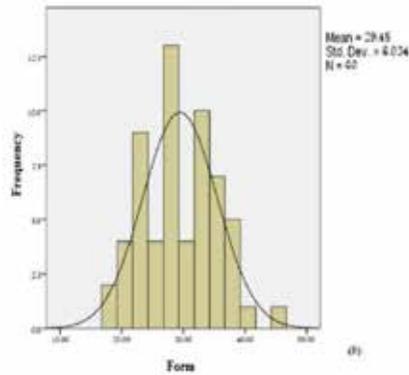
4. Findings

Now we compare the measures of two case samples to study the impact of measures in providing security in residential complexes by using Histograms resulted from SPSS software:

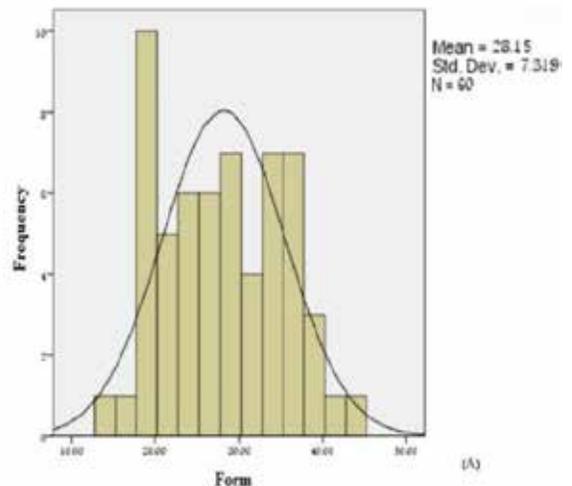
- Studying the impact of measures in enhancing security in residential complexes

-The impact of fabric form of space

The physical structure of space or space form has undeniable role in the creation of indefensible space and hence, considering the qualities of form and space is very important. As indicated in charts of both case samples, this criterion in sample A has allocated 28/15 percentage of the total significance to itself and in sample B, it has allocated 29/45 percentage of the total significance to itself.



- The impact of visual capabilities and visual visibility

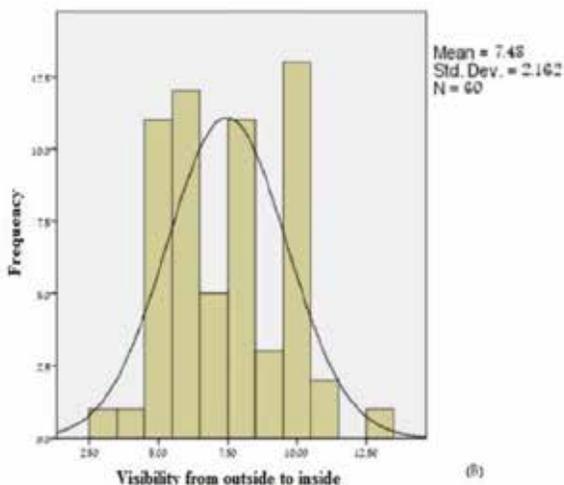
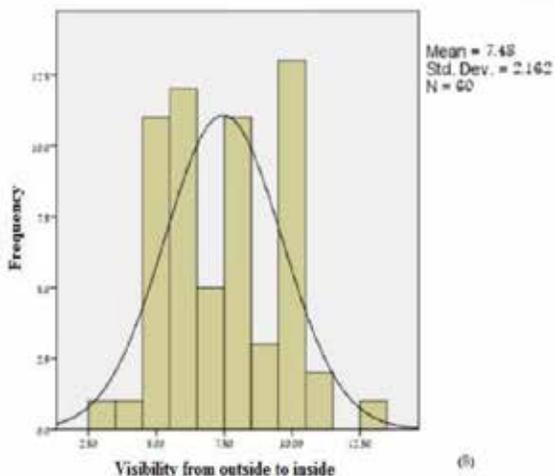
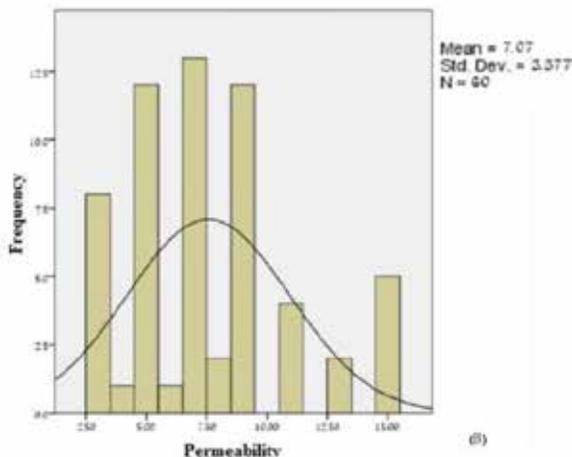
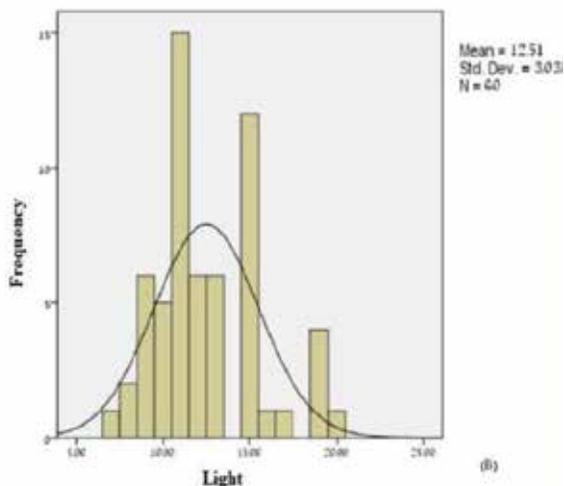
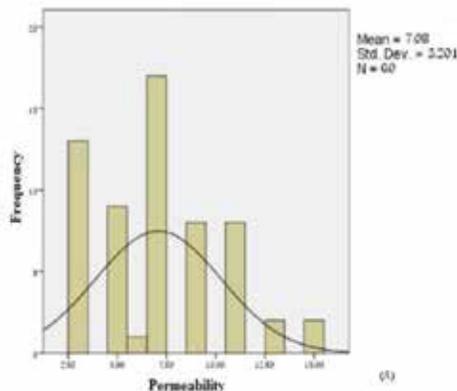
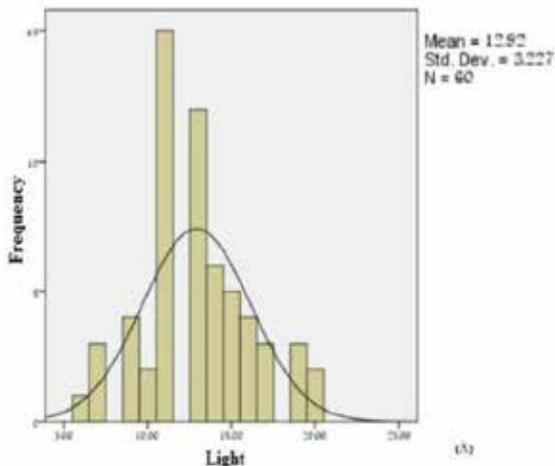


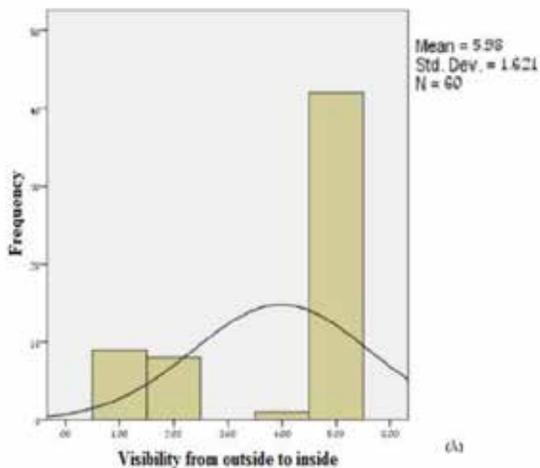
Watching the living environment is pleasant, no matter even the landscapes ordinary. Living environment like an exquisite architectural building is a construction that is created in the space and its shape may have different natures and some may have beauty, sense of security, happiness and a visual-perceptual dimension. So it can be concluded that part of living spaces that possess visual capabilities and desirable visual proportions, in other words, where there is less visual disturbance, as compared to other places will have lesser behavioral disturbances (abnor-

mal and anomic behaviors). As indicated in charts of both case samples, light criterion in sample A has allocated 12/92 percentage of the total significance to itself and in sample B, it has allocated 12/51 percentage of the total significance to itself and the criterion of visibility from outside to inside in sample A has allocated 5/98 percentage of the total significance to itself and in sample B, it has allocated 7/48 percentage of the total significance to itself.

**-The impact of access and permeability**

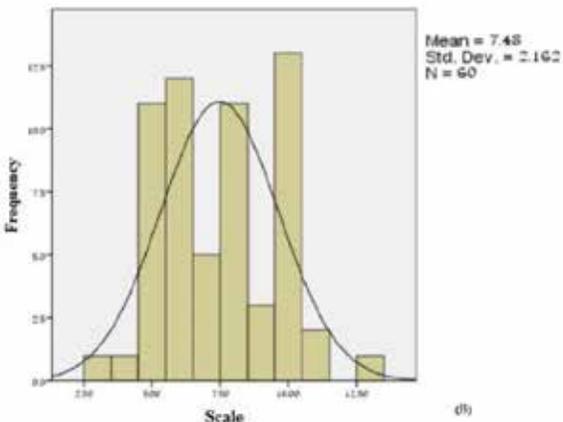
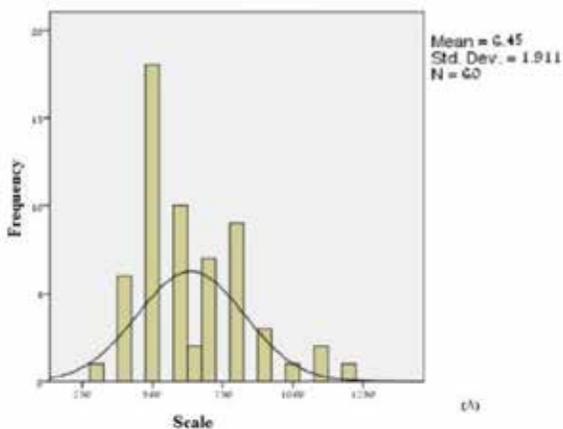
Clarity and obviousness of boundaries of territories (private, semi-private, public, semi-public,) from each other reduces the permeability (access), increases social monitoring and prevention of crime. As indicated in charts of both case samples, criterion of permeability in sample A has allocated 7/08 percentage of the total significance to itself and in sample B, it has allocated 7/07 percentage of the total significance to itself and criterion of accessibility in sample A has allocated 4/73 percentage of the total significance to itself and in sample B, it has allocated 4/52 percentage of the total significance to itself.





**-The impact of the fabric size of the space**

The size of the space or the scale is one of the variables of safety and comfort. The space of environment should not be too big, because otherwise it creates fear and it should not be too small, because in this case it will cause crowd, that in this case, flexible spaces can be considered along the main space, in order to reduce overcrowd and congestion. As indicated in charts of both case samples, this criterion in sample A has allocated 6/45 percentage of the total significance to itself and in sample B, it has allocated 7/48 percentage of the total significance to itself.



**5. Conclusion:**

The overall objective of this study was to increase security in areas with low safety factor, such as traditional and historical context. Hypothesis of the research is based on the assumption

that by increasing the monitoring in space fabric through the injection of human, for increasing social activities, which are proposed as one of the main principles of crime prevention approach through the environmental design, in the form of designing secure residential complexes, it is possible to promote security in the region.

This study has been formed on the basis of the views of theorists of this field and extraction of fabric-spatial criteria such as: the size of space, form of space, space layout, access, circulation, territory, landscape, light, visibility from inside to outside and by statistical analysis and comparative study of existing histogram charts and according to obtained averages, the percent of the impact of each of the criteria in increasing environmental security, based on the percentage of their importance among the intended statistical series have been specified as follows:

**Table.2. Evaluation of the impact of each criterion**

Accessibility	Space size	Permeability	Visibility from inside to outside	Lighting	Space form	Criteria	Complexity and diversity of spatial environment
47%	64%	76%	89%	12%	25%	Residential complex A	The urban residential complexes
45%	78%	70%	74%	13%	25%	Residential complex B	

Source. Author

Thus, according to the weight obtained in both the studies, according to their weight the criteria, were prioritize as: space form, light, visibility from inside to outside, permeability, size of space and accessibility, and as it can be seen, in both case samples, the measure of fabric form has allocated the most weight to itself and possess greater importance in promotion of security in the region, that we can implement these criteria in the form of security models such as:

good enclosures, coherence and integrity of space, nobility and readability of space, access control, proper lighting in rooms, entrances and parking, creating spatial hierarchy, adding color of attachment to the space, reducing vision barriers, the possibility of extended scope of vision for the enhancement of security in residential complexes.

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