

## The role of spatial organization in the typology of Shiraz (Iran) residential complexes

Malihe Taghipour, Hossain Soltanzadeh, Kaveh B. Afkan

Department of Architecture, College of Art and Architecture, Islamic Azad University,  
Tehran Central Branch, Tehran, Iran. Corresponding author:  
H. Soltanzadeh, [soltanzadeh.iau@gmail.com](mailto:soltanzadeh.iau@gmail.com)

**Abstract.** The purpose of this study is to understand space organization, its different schemes, and its effect on the formation of residential complexes. This study was based on typology since typology can influence the classification of various organization schemes and since many other studies are also based on typology. The combined approach was implemented using library resources and comparative methodology. For this purpose, those residential complexes in Shiraz which complied with the project requirements were studied. Various residential complexes were classified in terms of scale and height by studying their aerial photographs, satellite maps and GIS pictures. Field visits were also conducted for this purpose. Based on the conducted studies, it was observed that the following organization schemes were implemented in Shiraz: 1) individual, 2) centralized, 3) clustered, 4) linear, and 5) mixed. Ultimately, typology tables were presented based on the organization scheme used as well as the building scale and height. The results showed that the clustered organization scheme was the governing organization scheme used in Shiraz for residential complexes. Also, the following results were obtained: 1) the most prevalent tendency in Shiraz was towards constructing irregular clusters rather than regular ones; 2) the second most prevalent tendency was towards constructing linear building clusters; 3) the central scheme (which can be adapted to building around a central courtyard, the architectural form used in traditional Iranian houses) was not very popular, perhaps due to the hindrances associated with providing adequate light and ventilation and the problems related to overlooking from the neighboring properties (aristocracy?) in this type of building.

**Key Words:** spatial organization, environmental design, residential scale, residential height.

**Introduction.** Today, the relationship between man and space is reduced to a material pattern and the public spaces are reduced as a space for traffic and transport. As far as the financial interests require, man belongs to the space and otherwise the other organizations and urban management are considered responsible for its maintenance. However, with the development of plans and urban planning, the old neighborhoods and villages which have been created regardless of any pre-compiled plan are still more popular. Some people believe that man has lost his traditional perception of the past spaces (Tavassoli & Bonyadi 2007). The accuracy and review of the relationship between man and space can lead to strategies to improve the quality of this relationship.

The construction of residential houses as apartment and then residential complexes speeded up over the world from the beginning of the twentieth century. In Iran, the uncontrolled migration of rural people faced the cities with the problem of land shortage and the construction of high-rise residential complexes was a solution to compensate for the land shortage. A major advantage of this form is that includes plenty of people in the lowest area in several layers of dense residential units and it should be considered inevitable in the current situation (Eynifar & Qazizadeh 2010).

The emergence of residential complexes in Iran happened so fast that there was no opportunity to match the existing ideas in the traditional architecture of the Iranians with their architecture. This mismatch causes some problems between the residents of these complexes which include the cultural diversity, cultural conflicts, lack of proper social relationships, population density, social alienation, lack of cultural, educational and recreational spaces and lack of green spaces and etc. These problems are a reason to

reduce the social interactions between residents (Samadifard et al 2013). Thus the recognition of residential complexes can reduce their qualitative problems.

In the zoning of urban blocks, the construction of several buildings together as a complex is recommended, not as a single individual building (which is common in Iran) because the single buildings cause confusion in the urban landscape. The result will be some fragmented spaces and separate homes where the residents and builders use their power and abilities in order to provide better lighting and more individuation for their buildings in an urban environment. This problem leads to a kind of building in which the interior space and architecture lose their importance when the façade of buildings becomes important (Ramyar 2013).

One of the advantages of building sets together is caring about the whole set and spaces by the developers and investors. Gaining an integrated set with a shared sense of community for residents is another advantage that affects their future relations.

One of the missions of architects and designers is to create the appropriate relationship between the human beings and their surrounding environment. To achieve this space, the space creators should have a good understanding of human behavior in different environments, so as to build a stronger link between the human and places (Waxman 2004).

Environmental regulation is the arrangement of four factors: space, concept, communications and time (Aiello et al 2010). Spatial arrangement is done by the physical expression of ideal raised by collective or individual culture that shows itself from the areas landscaping to the layout of the interior space. Spatial order and concept order can be distinguished only as a mental form and concepts are expressed as a symbol of signs, colors, forms and perspectives (Bonaiuto et al 2003). In traditional biological complexes, the concepts order complies fully with the spatial order. In modern biological complexes, concepts are as an independent symbolic system for the expression of social situations and are far away from the spatial order (Brehm et al 2006). The ordered communication is the control of relationships between man and man, man and objects, objects and objects. This factor is also consistent with the two previous factors, so that the relationship between the environment and humans through concepts. Environment can affect the communications system by the use of spatial and conceptual order (Amole 2009). The spatial system based on the system of concepts can control and define the nature, orientation and volume of communications. Time may be understood in two senses; first the time in a large scale such as the longitudinal or rotational time and second the human activities. How to understand the totality of time affects the spatial order, concepts order and communications order, as the English retrospective thinking and American Future-oriented thinking have affected the spatial organization. On the other hand, the speed of activities at the time unit or their way of distribution over time reveals the second perception of the chronological order (Rapoport 1982).

As the space is properly ordered, it organizes the pace of activities, strengthens the concepts and the relationships between the human beings and the environment and finally the behavior appropriate to the environment will be achieved. The accurate measure of spatial organization is its adaptation to the culture (Fry et al 2009).

Typology is one of the basic studies types and its results will be very beneficial to the future studies. Environmental science is one of the basics of architecture, so that each architect should recognize the different characteristics and organizations by putting several elements together in order to define and divide the environment.

**Background of the study.** Due to the research needs and the background of shaping the housing patterns in different countries, the house typology has been done from the scale of complex to block, including the interior space of the unit and the total housing units with various measures. One of the typologies in the urban design scale and non-high complexes is single-family residential complexes including: attached houses, semi-attached houses, strip houses and houses with central courtyard. In this category, the way of putting the residential unit in the land is the typology criteria. Other criteria such as the companion of full and empty spaces, access, size and dimensions are the common factor of defining the types. Cambi et al (1980) has categorized the houses with

courtyards as the houses "Z", "T", "U", "L", "I" shape, cross and linear (Figure 1).

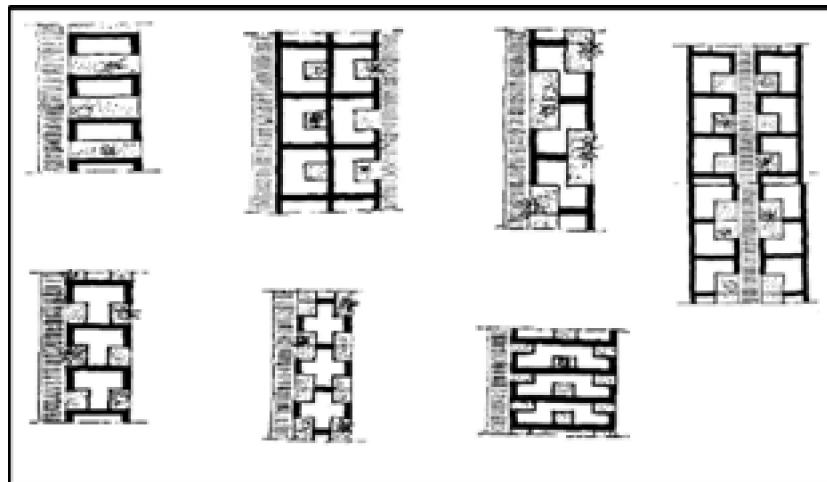


Figure 1. The typology of courtyard house (Cambi et al 1980).

Polyzodes et al (1992) have categorized the houses courtyards in Los Angeles according to the way of land occupation into unidirectional, bidirectional "O" shape and "U" shape houses with the central courtyard (Figure 2).

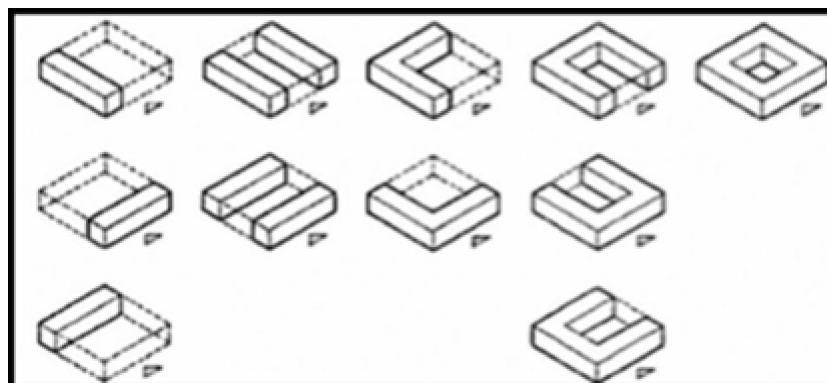


Figure 2. Courtyard housing in Los Angeles: a typological analysis (Polyzodes 1992).

Pfeifer & Brauneck (2008) separated the houses into the houses with central gardens, "L" shape houses, houses with terrace and houses with atrium. In general, the typology of the houses' internal space is usually derived from the way of access or the circulation of internal spaces. Biddulph (2007) has studied the high-rise residential complexes in terms of placement and the companion of open space and close space. The dominant type of these complexes is the environmental layout, single blocks, row blocks and the combination of other blocks (Figure 3).

Lefebvre (1991) has studied the issue of spatial organization. He considers mostly the non-material aspect of the space. The human beings organize their living space based on their social needs. Lefebvre involves the experience of historical memory and daily life in the production of space and turning it into the "places" or the cultural environment. The way of spatial organization or according to Lefebvre the "production of space" takes different forms in different historical periods due to changes in the social actors, locations, functions, way of living and etc. According to Lefebvre, it is the social space that is more important to humans rather than natural space or mental space. This space in the capitalist world is created as the interaction of daily life and urban division (Fokoohi 2004).

Haeri Mazandarani (2009) has studied the different forms of modern and traditional houses in several cities of Iran and has evaluated how they are organized.

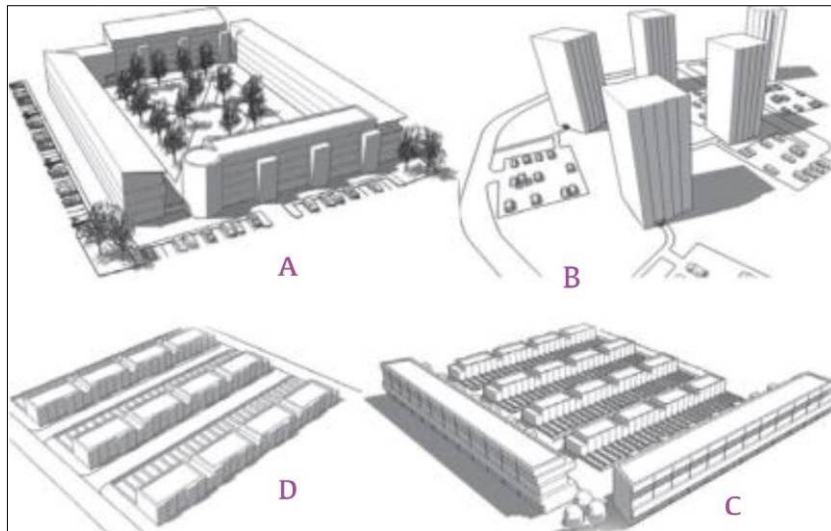


Figure 3. Spatial organization in residential complex: A - single blocks, B - environmental layout, C - mixed blocks, D - row blocks (Biddulph 2007).

**Case study.** The construction of residential complexes in Iran began from the 1950s with the growth of cities and the growth of immigration in Tehran and also the construction of complexes in Narmak and Nazi Abad. In the 1970s, the high-quality residential complexes were spread by the complexes of Nevisandegan, Saman, Park, and West consulting firms for the upper classes (Eynifar 2005). The complexes of Prince, ASP, Ekbatan, Hormuzan, and the towers of Shahrake Qods are the examples.

Behjatabad complex is one of the first high-rise residential complexes in Iran located in the Region six of Tehran at the intersection of Vali Asr Street and East Zartosht Street in 1964-1970. According to the Figure 4, this complex consists of 14 blocks, 12 storeys and a total of 380 residential units. Blocks are scattered around a central pool (Behzadfar & Qazizadeh 2010).

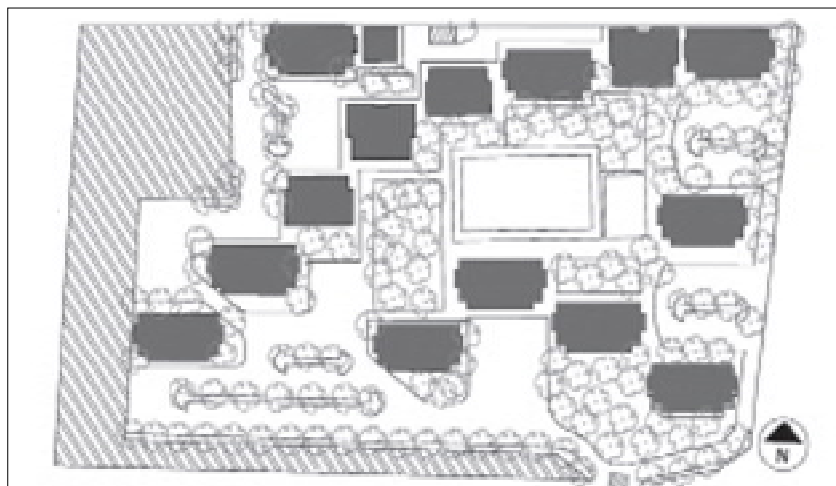


Figure 4. Site plan of Behjatabad residential complex (Behzadfar & Qazizadeh 2010).

With the eight-year war with the Islamic Revolution despite the increase in urban population and due to the economic difficulties building complexes collapsed and building high-rise structures stopped for almost 10 years and in these years, the construction of such buildings remained limited to the completion of unfinished residential complexes. Complexes built in this period, such as Arian and Ferdows in Shahrara and Sinai complex in Shahrake Qarb depends on completing the projects that started in 1971 but were stopped. In 1991 and 2001, the construction of residential complexes as cooperatives and private companies became more popular than ever. Although it's ascending growth

that depends on the decisions made by the municipality to issue the building permit has many ups and downs (Eynifar 2005).

In the first official census of Iran done in 1956, Shiraz was the sixth most populous city in Iran with 170,659 inhabitants ([www.irancities.ir](http://www.irancities.ir)). And now, it is one of the major cities of Iran with a population of about 2 million people and this population shows the need for architectural studies in Shiraz, because the problem of housing will arise after this increase in population ([www.eshiraz.ir](http://www.eshiraz.ir)).

The construction of residential complexes in Fars province began in the early 1961 with the construction of Air Force Base complex in Modarres Boulevard. After the Air Force Base residential complex, other complexes were constructed such as: Pansad Dastgah in Kooyeh Farah (Pansad Dastgah Khatoon), Army Pansad Dastgah (Pansad Dastgah Artesh), Faransavi Sazha complex in Maali Abad (Figure 5).

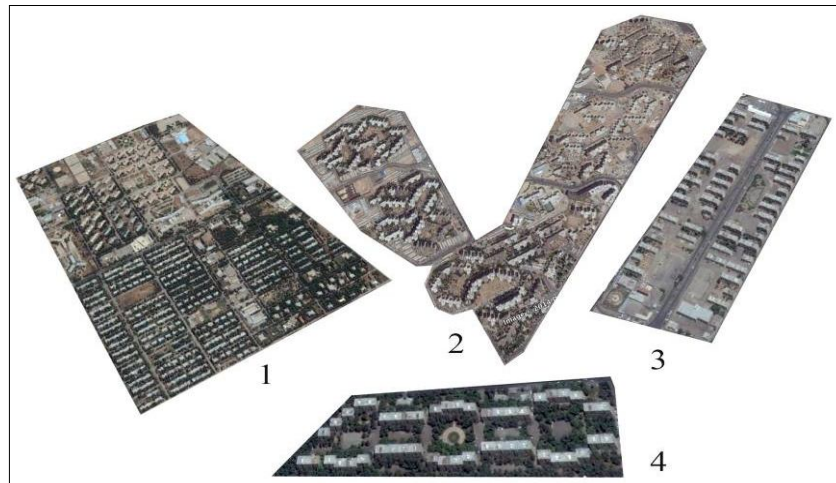


Figure 5. 1). Air Force Base complex. 2). Maali Abad. 3). Army Pansad Dastgah (Pansad Dastgah Artesh), 4). Pansad Dastgah Khatoon (source: Google Earth).

For this study, first all the ten metropolitan areas of Shiraz were studied among which only region 8 with its historical context was excluded from the study due to the lack of qualified residential complexes. Based on the interpretation of the field study and the comparison of data, the common factor between the complexes was extracted and the Typology pattern of residential complexes organization was developed (Figure 6).



Figure 6. Municipality areas in 2010 (Source: [www.eshiraz.ir](http://www.eshiraz.ir)).

**Method.** The research method used in this study is combined. The effective strategy is the use of library resources as the literature which helps the researcher to get familiar enough with the subject of typology and organization. A comparative study was conducted in the final stage of the research and the classification was made by SPSS software after collecting data through observation and field research and the use of GIS and satellite maps. Finally, using the recognition of studies and field observations the table of typology was obtained. The study population included all the residential complexes in Shiraz used by the users with the intended characteristics of this research. The research variables are organization as the independent variable and the residential complexes as the dependent variable. Since the typology is one of the basic foundations of the study on an issue, thus the present study examines the typology of a variety of residential complexes in Shiraz so that the future researchers will achieve their objectives and on the other hand one of the foundations of understanding the architectural space is recognizing the spatial organization.

This study is based on the recognition of the current status in order to access the data and predict the future. The raised questions include: How is the distribution of residential complexes in Shiraz? What are the effective organizations in the residential complexes of Shiraz? How can be the division of all types of complexes in Shiraz? In line with the raised questions, the following research hypotheses have been formulated as follows: the distribution of residential complexes is more developed in the modern areas of Shiraz. Effective organizations are linear, complex and central.

**Stages of research process.** Figure 7 shows the process of doing the research, standards and tools acquired for each section.

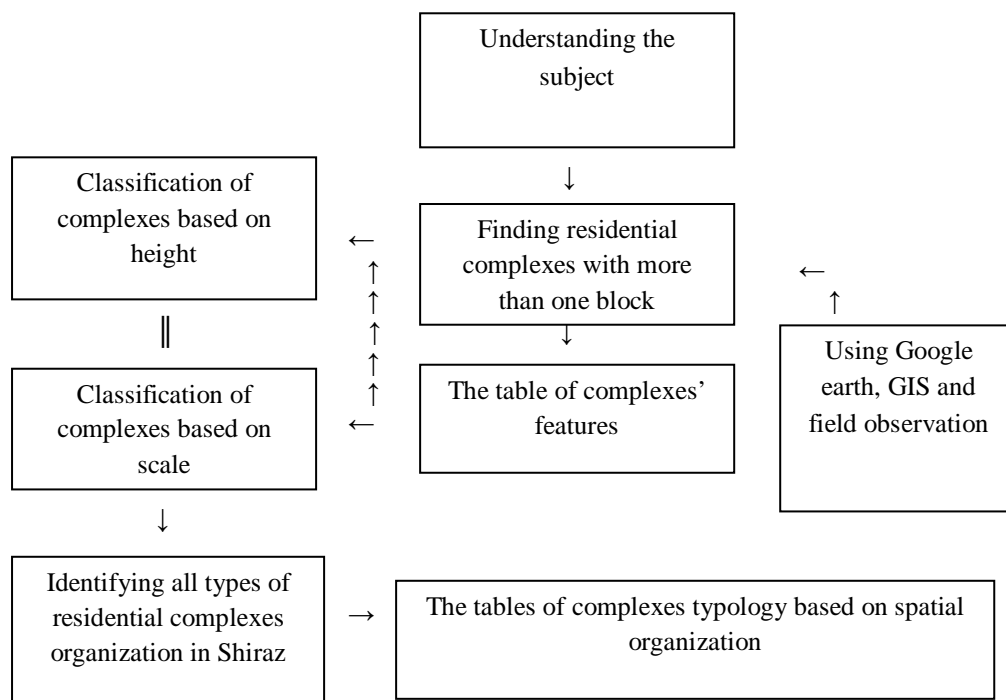


Figure 7. Stages of research, standards and tools for different sections (source: authors).

In the first step for the initial selection of residential complexes, all the residential complexes of Shiraz were extracted with the guide maps of Shiraz, GIS maps and satellite images. Next, all the required residential complexes (except those listed below) were studied and the exact characteristics of each complex were collected. Also, based on the existing maps, Google Earth images and site plan review of complexes were extracted. To access the data of this study, the following issues were excluded from the study population due to the lack of cooperation or the lack of sufficient data.

The list of complexes which were removed from the research follows:

- the military and police forces complexes which are constructed and controlled under the Ministry of Defense and the Army of the Islamic Republic and do not permit the researchers to visit such as the Air Force Base Residential complex and Oil and Gas Residential complex;
- half-built complexes which do not have any clear boundary due to the lack of design such as Hezar complex;
- complexes with one block due to the lack of a specific organization between blocks such as some of the complexes in Maali Abad.

**Results and Discussion.** After collecting data from all residential complexes of Shiraz, the data were analyzed using SPSS software and the descriptive statistics are shown in Table 1.

Table 1

Descriptive statistics of residential complexes in Shiraz

	<i>Floors of blocks</i>	<i>Number of blocks</i>	<i>Sum of units in complex</i>
Min	3	2	20
Max	17	64	1980
Median	5.90	11.24	41.23
Mean	5	7	32
Mode	4	2	12

The study of all figures and tables obtained from SPSS software, the statistics of residential complexes of each region are described divided by the number of blocks and units in the Table 2.

Table 2

The statistics of residential complexes of each region are described dividend by blocks and units

<i>Urban area</i>	<i>Sum of blocks</i>	<i>Number of complex</i>	<i>Total housing units</i>
1	13	282	589
2	6	149	1434
3	10	192	1528
4	16	251	2165
5	2	99	2466
6	15	331	3862
7	13	148	4393
8	2	32	4445
10	10	84	7577
Sum	87	1568	28459

**How to layout the residential complexes in Shiraz.** The data extracted from field studies made the classification possible according to the height and scale criteria (the number of units). Adapting these reviews to the studies obtained from GIS and Googleaerth maps makes the classification possible based on the blocks organization. Finally, with the combination of these three categories, the typology of complexes has been obtained.

The first classification criterion was the number of units in complexes which will be effective in understanding the complex scale. This classification was done by SPSS software and the complexes were divided into three categories: small, medium and large based on the frequency of residential units. The small scale included less than 128 units, medium scale included 129-338 units, and large scale included more than 338 units (Based on Spss data).

To provide a more accurate classification, the complexes of Shiraz were classified based on the criterion of height (the number of classes). Accordingly, three types of short, medium and tall were identified. The short-rise residential complexes had less than

4 floors, medium ones had 5-6 floors and tall complexes had over 6 floors (Based on Spss data). Table 3 shows the frequency of residential complexes with scale and height criteria.

Table 3

Classification and frequency of residential complexes with scale and height criteria

Number of complexes floors	Number of units per complex			Sum
	≤ 128	129-338	> 338	
≤4	11	23	12	46
6-5	7	9	6	22
> 6	7	1	11	19
Sum	30	26	44	87

**The layout of residential complexes in Shiraz.** The layout of residential complexes in Shiraz is based on a shape and epistemological approach. This study in which the classification criterion is the layout of blocks next to each other according to the different spatial combinations of plans in Shiraz five different types were found in the city, including the following ones: single, linear (strip), central (environmental) with two approaches having a central element and several central elements, a series with two regular and scattered approaches and finally a mixed types (Figure 8).

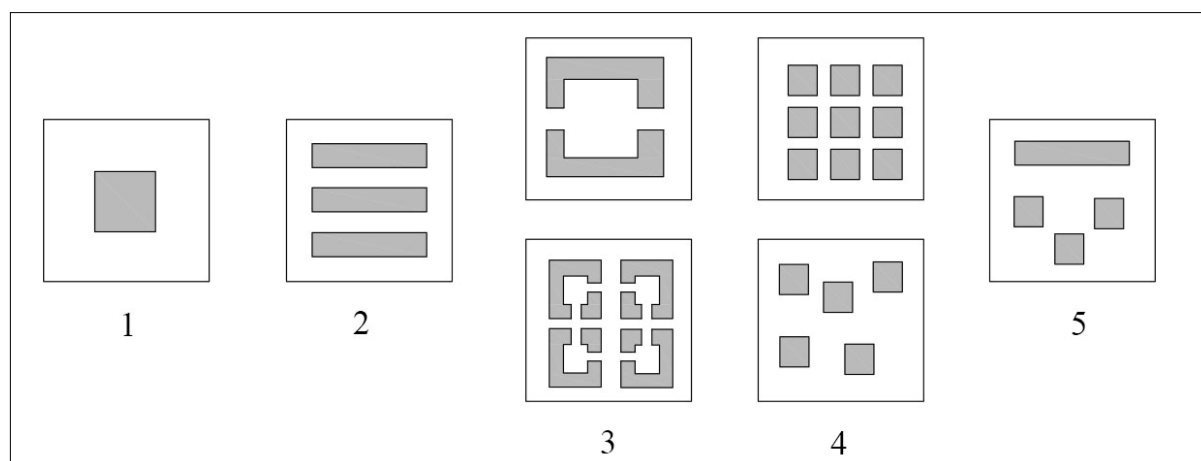


Figure 8. Different types of residential complexes layout in Shiraz 1. Single. 2. Linear. 3. Central (single-core and multi-core) 4. Series (regular and irregular) 5. Mixed.

The research criteria and limitations have led to the selection of four main types of this category by removing the single group (because in this category there is no specific organization due to the presence of an element).

Linear (strip) organization represents the direction due to their length and indicates the motion, continuity and growth (Ching 2003). This organization in complexes is mostly based on the urban arteries. Most of the complexes that were created with this type of organization are parallel or perpendicular to the surrounding streets. Linear organization creates street-like spaces due to their shape nature.

In the central organization (environmental) that the residential complexes are formed around an open space, a central open space will result. According to the studies, two different types of this organization can be seen in Shiraz complexes. The first type of residential complexes has a large central element and the second type the central element is as multiple and the residential spaces are placed around several cores. These cores are not large and wide as the first type but have the ability to be placed in the category because of the special atmosphere of the organization. The third type is a collection of residential blocks put together as a complex. This type can have two approaches: regular or irregular. In the regular approach the blocks are placed under the



laws of geometry, while in the second approach, the placement of blocks do not follow a particular approach. The fifth identified type does not comply with any of the organizations presented above and is mostly a mixture of two or more types and so is named as mixed. By incorporating the table of height and scale with the organization of residential complexes, the data in Tables 4, 5, 6 are obtained which represent the typology of these complexes.

Table 4

Typology of complexes in Shiraz (short-rise) (the first number next to the name of each complex shows the municipality region and the second number is the percentage of open space)

Hight	Types of organization	Number of units per complex		
		≤ 128	129 -338	> 338
≤ 4 floors	linear		Kooye Zahra (3 rooms) (3) 76%	Pardis (1) 44%
		Golha (4) 70%	Eram (3) 85%	Laleh (3) 76%
		Karkonan Palayeshnaft (4) 82%	Khordad (4) 72%	Salman Farsi (3) 74%
		Pars (10) 56%	Gaz & Naft (4) 80%	Baharestan (4) 79%
			Bu Ali 1 (7) 67%	Artesh 500 dastgah (5) 77%
			Bu Ali 2 (7) 67%	Amir Kabir (4) 62%
			Bu Ali 3 (7) 67%	
	series - regular	Fajr (1) 79%	Kooye Zahra (4 rooms) (2) 74%	-
	Saba (10) 52%	Farhangian seraj (4) 60%		
		Ghazal (4) 58%		
series - irregular	Emam Hadi 1 (7) 70%	Niloofer (3) 85%	-	
	Rayehe (10) 65%	Eskan 1 (7) 76%		
		Eskan 2 (7) 76%		
		Eskan 3 (7) 76%		
		Eskan 4 (7) 76%		
central - single core	-	Mikhak (3) 85%	-	
		Nastaran (3) 85%		
central - multi core	Morvarid (7) 72%	Sadaf (1) 61%	Sadaf 2 (3) 72%	
	Petroshimi khark (7) 44%		Esargaran 1 (4) 63%	
			Esargaran 2 (4) 60%	
			Tosee & Omran (10) 76%	
mixed	Sadaf (7) 72%	Zanbagh (3) 82%	Seraj (4) 68%	
		Shaghayegh (3) 84%	Goldasht Maali Abad A, B (6) 82%	
		Jannat (4) 56%		
		Farhangian (7) 61%		
		Payam (7) 58%		

Table 5

Typology of complexes in Shiraz (medium-rise) (the first number next to the name of each complex shows the municipality region and the second number is the percentage of open space)

Hight	Types of organization	Number of units per complex		
		≤ 128	129 -338	> 338
5-6 floors	linear	Ghom Abad (1) 77%	Fadakh (4) 74%	Chogan (1) 70%
		Baharan (1) 74%	Baharan (6) 74%	Rezvan (1) 70%
				Yas 1 (3) 72%
	series - regular	Arg E maskan (10) 76%	Golha (7) 80%	Esar (9) 74%
		Arshin (10) 54%		
	series - irregular	Sepehr (1) 68%	Jahan Ara (4) 73%	-
		Abrisham (1) 63%	Emam Hadi 2 (7) 71%	
			Parseh (9) 78%	
central - single core	Ferdos (10) 71%	Taamin (10) 54%	-	
		Motahhari (5) 58%		
central - multi core	Karkonan palaysh naft 2 (4) 69%	-	-	
mixed	-	Chamran (6) 59%	500 Dastgah Khatoon (2) 81%	
			Mali Abad D & E (6) 82%	

Table 6

Typology of complexes in Shiraz (high-rise) (the first number next to the name of each complex shows the municipality region and the second number is the percentage of open space)

Hight	Types of organization	Number of units per complex		
		≤ 128	129 -338	> 338
> 6 floors	linear	-	Mali Abad 2 (6) 69%	Mali Abad 1 (6) 69% Derak (6) 77%
	series - regular	Moalem (6) 73% Mali Abad 3 (6) 53%	-	Farhangian (3) 76% Esar (4) 72%
	series - irregular	Yas (2) 71% Farhangian (10) 69% Sanatt & Omran (10) 71%	-	Modarres (2) 91% Apadana (3) 49% Sarv Naz (6) 60% A.S.P (6) 82%
	central - single core	Asatid (1) 64%	-	Mohandesin (1) 68%
	central - multi core	Sattar khan (1) 45%	-	-
	mixed	-	-	Yas 2 (3) 71% Goldasht MaliAbad H (6) 82%

According to Table 4, 5 and 6, the organization governing the construction of residential complexes in Shiraz is a series among which the desire to build irregular complexes is more than the regular ones. Then the desire to build linear (strip) complexes is more than other types. A closer look at the statistics shows that the largest number of short-rise complexes is related to linear ones but among the medium-rise and high-rise complexes the series complexes have been highly received. However, the number of constructions with series organization in short-rise complexes is much more than the other heights.

According to the Figure 9, in comparing the results of the organization and the scale of complexes, the following issues can be mentioned:

- the maximum number of complexes with linear organization is seen in the large scale;
- the maximum number of complexes with series organization is seen in the medium scale;
- the maximum number of complexes with central organization is seen in the large scale;
- the maximum number of complexes with mixed organization is seen in the medium and large scale;
- the dominant type in small, medium and large scale is series and the dominant type in large complexes is linear;
- the linear type is mostly used in short-rise complexes;
- the series structure is more seen in short and tall heights;
- residential complexes with central organization have the highest frequency in short-rise ones;
- mixed organization is more seen in short height.

The best method of classifying the public space into the residential complexes is when each building has its own space, because the residents will have more sense of ownership towards the exclusive area and will prevent the social crimes and deviations. In addition, by limiting the residents and owners of a land and area their sense of responsibility becomes more toward its maintenance and the residents become more sensitive towards the maintenance and participation in affairs. It should be noted that the number of residents using the building and its neighborhood is effective in the definition of the sense of belonging and ownership of residents on the environment. Since the number of residents is very important to create a "zone of influence" but the less is the number of residents using an area the more will be the concentration and assistance of residents in the area and also their willingness to maintain and control the area. In designing a complex, due to the existing density, constructible units and the type of audience in these spaces the needs of residents of the area should be highly considered and the minimum number of families should be involved in the acquisition of these

spaces. Thus, the designers can divide the land into smaller pieces and put it into a single building or the small groups of residents (Ramyar 2013).

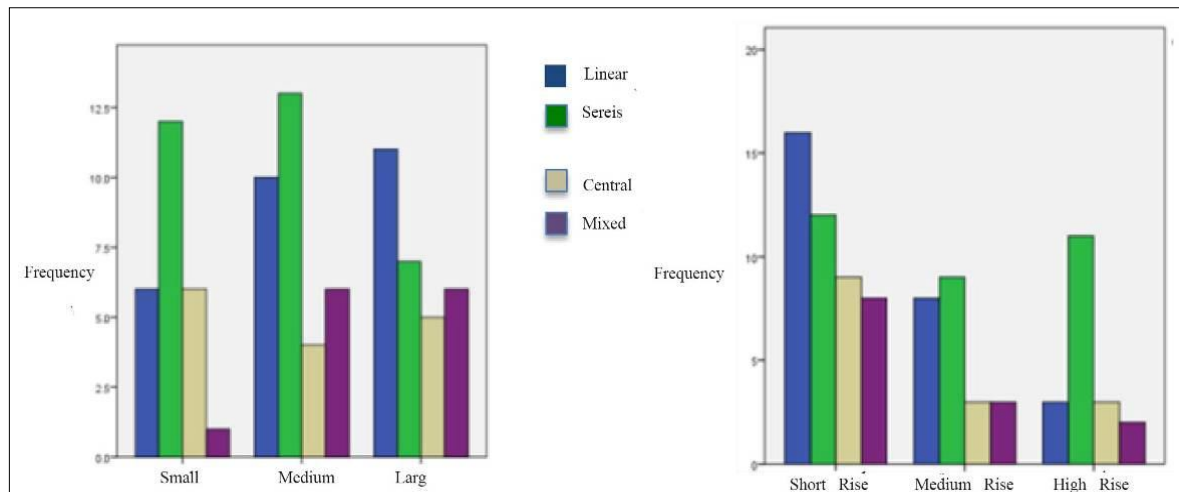


Figure 9. Left - comparison of a variety of spatial organization in different scales of complexes in Shiraz; Right - comparison of a variety of spatial organization in different heights of complexes in Shiraz.

**Conclusions.** In the complex layout which has been highly received among other types, the advantage can be seen that there is the possibility of ventilation for the block through the four sides, while the made open space does not create any specific boundary for the residents and does not create a sense of ownership in them. Open space will be mostly public. The strip layout which was made of connecting the blocks provides the possibility of skylight and ventilation from two sides and the number of units is more in a block. The open space is mostly as regular streets and is not widespread.

The central layout (environmental) is in accordance with the principles of the traditional central courtyards in Iran. One of the advantages of this method is creating large communal areas such as basketball and football lands and the residents will be deprived of this advantage by dividing the land into smaller pieces. Also in this case, different spaces with different functions can be assigned to families by expanding the uses. One of its disadvantages is that these large spaces require increased costs for their maintenance; while the residents protect the separate lands especially when the buildings are in the use of the groups with their relatives, colleagues or friends. In the design of such areas for residential complexes it is better to use the both methods and obtain a combination of them. It means that the area is divided into a central space for shared activities and the space next to the building is considered for the specific activity of each building and also the neighborhood groups are very effective in the relationships inside the building that provides the semi-private realm for residents. But according to the results obtained in this study, this type is not well received so much. Further studies on the effectiveness of this type can better identify the degree of acceptance or non-acceptance of this type.

In the primary types of Shiraz, two complexes with linear type are seen: one as central and another as mixed. Given that the primary types had a diverse range, it seems that a detailed study about their impacts on human relationships in the construction of residential complexes could help the officials to make decisions more easily. The study, which could be the basis for many subsequent studies attempted to provide an appropriate ground for achieving this goal in a variety of organizations used in the residential complexes.

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Authors:

Malihe Taghipour, College of Art and Architecture, Tehran Central Branch, Islamic Azad University, Enghelab str., no. 9, 14169-33116 Tehran, Iran, e-mail: mal.taghipour@gmail.com

Hossain Soltanzadeh, College of Art and Architecture, Tehran Central Branch, Islamic Azad University, Enghelab str., no. 9, 14169-33116 Tehran, Iran, e-mail: soltanzadeh.iau@gmail.com

Kaveh Bazr Afkan, College of Art and Architecture, Tehran Central Branch, Islamic Azad University, Enghelab str., no. 9, 14169-33116 Tehran, Iran, e-mail: k\_bazrafkan@yahoo.com

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