

# Structure with Convertible Shape, a Solution for Improving the Quality of a Residence

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## ABSTRACT

The diversity of usage and space in traditional residences, considering the life in megacities, has been overshadowed by the lack of space and economic situation of modern cities. Urban families live in a set of limited spaces where they should fulfill all their operational and psychological needs. Therefore, this question is asked if it is possible to find a solution, despite all the limitations, to provide a versatile function of space based on the traditions of Iranian lifestyle. Can the spaces of a modern house, by combining and connecting, change into the spaces that a family needs in different conditions? The purpose of this research is to find an answer to these questions and to provide a practical solution for flexibility of a residential space. Consequently, there will be a harmony in society among the culture, the attitude towards life and a relative comfort in different parts of the city. So by choosing Neemat Abad, an old texture, as a sample and by using modern building technology, it can be designed expandable residences which is conforms to their lifestyle and the culture of that neighborhood.

**KEYWORDS:** old texture, flexible residence, biological comfort, construction technology.

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## INTRODUCTION

When you think about the word “residence” and its meaning, a place for living, comfort, serenity and peace comes to mind. Therefore, a designed house should provide the fundamental criteria that “resident” brings to mind in such a way that it can practically give its inhabitants a sense of pleasure and satisfaction. In the recent decades, the progress of our country into becoming a modern society and the expansion of its cities has become faster and of more significance. One of the important criteria of this development and progress is the growth and expansion of the cities, especially big cities. Sustainability in designs and development plans has been set as an international goal. A development is sustainable that satisfies today’s need without endangering the capability of next generation. (Barton, 2001)

In the past, couples began their marital life beside their parents. Gradually, as the families grew bigger, a need for a bigger space was felt and they moved to other places. This constant increase and decrease in the population over time, made the need for a suitable space for different purposes evident. In this age and especially in Tehran, there are some families who are still interested in living in big families and their youths are also inclined to follow this lifestyle beside the older generations. Because of the mentioned process, which has been seen a lot in the old textures of Iran and is common in the traditional lifestyle, a house will be designed based on the needs of its residents and is expandable or shrinkable. Its interior can be changed as needed. The word “flexibility” is manifested in this lifestyle. Flexibility, here, means changing the interior of the space for different daily usage while respecting the religious beliefs. Then, we are going to discuss how to design multipurpose spaces in a residence and transportable and flexible structures.

The purpose of this article is preservation and revival of the old tradition that is the importance of family, the need for its focal role and also paying attention to the culture of Iran in providing a residence. In this article, a house, which can be expanded or contracted and the interior space can be changed if needed, will be designed based on the lifestyle of its inhabitants and some alternatives will be submitted for flexible apartments that complies with the culture and social milieu of Neemat Abad will be suggested by reviewing the studies of the social and cultural texture of that neighborhood.

## 2. History of residence:

Since the time when cavemen sought sanctuary in his hand made home rather than the cave and openings of mountains, the concept of residence was born. The human of before the industrial world, because of little change in that world over time, could feel the comfort in which he tried to eternalize his existence. The changes caused by the industrial revolution not only altered the old lifestyle, but created a world in which being is so fast. The man today is experiencing a new form of a nomadic life, without forming its social structure. If at that time a nomad had the opportunity to choose his residence, now this man can’t.

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Long before the existence of man on Earth and its residence, there were no inside and outside. Residence shows “inside” to us. Therefore, the concept of residence in architecture means the interior of the house. The house itself suffices the need for residence and since human beings have built it, the need for it has emerged.

### **3. Flexibility, spaces Convertibility:**

By including the necessary potentials in flat and creating spaces that can be adjusted to the needs of the inhabitants, the desirability of the residence increases and the residential space can become multipurpose. Based on how much change can be made inside and outside of a house or how big or small the changes are, we can call it flexible. But a flexible house generally is a house that can actually satisfy all the needs of its inhabitants and can potentially satisfy all the predictable and sometimes unpredictable needs of them. There are two concepts in this field that are used instead of each other by mistake: adjustability and convertibility. The difference is the amount of change that can be made in a house. An adjustable house, in addition to rearranging the furniture, needs more changes, while in a convertible house it has the potential to endure drastic changes. (Chan Shek Lun, 2000)

#### **3.1. Why we need a flexible house:**

If we carefully examine the lifestyle and pattern of life in the contemporary cities, we will come to this conclusion that in order to prevent the disintegration of society, people and environment, the residences should be designed based on the contemporary needs of him, so that we can overcome the problems caused by the lack of interaction between indoor and outdoor. Adjusting a shelter with the needs of its inhabitants has always been one of the concerns about people’s habitation. The habitation and residence were flexible, when communities were nomads. (Einifar, 2004) It seems that in the recent decades, societies are used to witnessing constant and unavoidable changes, which shows the necessity of new methods that emphasize on the flexibility of the houses and their adjustability to the dynamic needs of society and their inhabitants being created by architectures.

Some of the reasons why flexible houses are required are as follow:

- **Change in the structure of family:** the change in the traditional structure of Iranian families is one of the main reasons of a need for a flexible house. As the merits of families change, the meaning of a family is also expanded.
- **Tendency to seek variety:** since people usually seek variety and a static environment agitates them, they find the potential of change appealing.
- **Increasing the quality and desirability of a house:** these kinds of characteristics that make a flexible house popular are mainly personal, since people can change their house based on their needs and taste.
- **Physical and psychological comfort of the inhabitants:** one of the factors that bring about physical and psychological comfort of the inhabitants is by satisfying their physical and psychological needs. Different needs of people are answered in different spaces. It should be noticed that spaces should be designed in such a way that private area can be changed to a “public” one.

#### **3.1.1 The necessity of designing a flexible house:**

A daily life in a residence requires a proper and sufficient contact (interaction) between the lifestyle and the demands of its inhabitants. However, inhabitants change and one generation replaces the old one and even families change rapidly and live differently. Therefore, a flexible house whose interior can be altered will satisfy changing demands, tastes, variety seeking, etc. of the inhabitants. It increases the desirability of the residence and is a solution for the interior of a house being unfitted for the changing need of its inhabitants. (Habraken, 1980)

### **4. Flexible and transportable structures:**

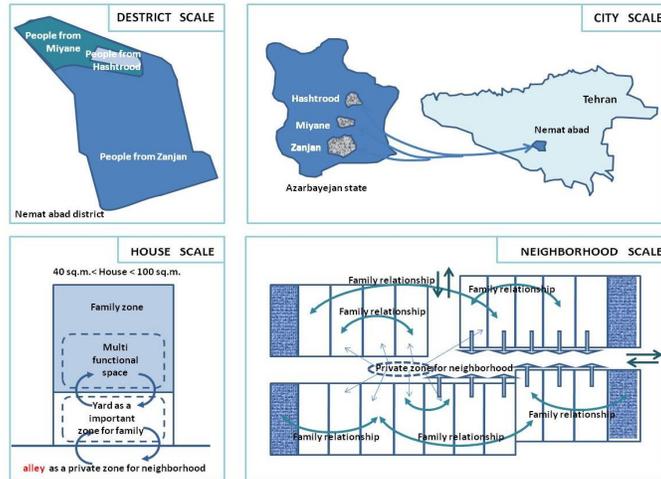
Flexible structures have generally been comprehended to be used in a permanent place, while they only work for a certain period of time. Instead, the buildings that need to be compatible with their surroundings also require a flexible structure (Chilton, 2006) Change in form should suggest this process and alters it: instead of moving through buildings, the spectator stands still and buildings change. Walls appear and disappear. One thing expands and encircles another thing. (Hoberman, 2006)

Since the plan is for a certain pieces of land, then the design should use technology in such a way that its inhabitants can benefit an easy and modern lifestyle. Most of the flexible structures are designed for big public buildings, but it hasn’t been used for a smaller society such as a family and the more private spaces. Therefore, we have focused on this part of the research and try to use a flexible structure in a small scale for the optimum result.

### **5. Designing a flexible flat as a pilot project in Neemat Abad:**

Ne’mat Abad is in Tehran, zone 19. Most of the inhabitants of the area are from four cities of Zanjan, Miane, Ardebil and Hashtroud, and most of them speak Turkish. (Civil Engineers of Razandishane Omran, 2008) since the structures are of low quality, there is no legal document that shows the ownership and for that

reason any renovation hasn't been done there, and shortage of public service, this neighborhood in the outskirts of Tehran has become drastically dilapidated and old. However, despite the old skeleton, social problems are much less than similar neighborhoods in Tehran, because tribal solidarity (5.66% families and relatives) prevents cultural and social disintegration. Social interactions and the relationship of the neighbors are considered as merits. It is noticeable that newly weds prefer to live in the same neighborhood. On the other hand, the studied texture is a young one that most of its residents are between 10 and 25. This age group definitely has different demands from their older generation and requires a safe and healthy environment. Studying the behavioral pattern in different scales for finding the flexible structure of a house in Ne'mat Abad is based on the following process. (See picture 1)



Picture 1: Assessing behavior pattern in different indicators

**6. Design process:**

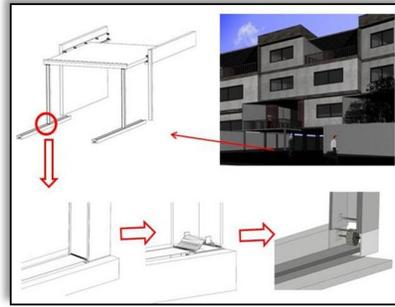
Since this neighborhood is listed among old textures and is based on the renovation project, some measures such as widening of the streets, retreating of the buildings, combining the lands under 200 meter and expanding the green space, have to be applied. Minimum number of lands should be combined and the building with the same number of floors should be considered for that. In the new format the public edges are designed higher and inside the texture and its potential and the vastness of the lands, etc. is kept lower with lower number of floors in order to keep the skyline and the visual field.

The interior of the flats has been designed in such a way that is flexible enough and allows maximum usage. In some places transportable ceiling, wall and floor have been used. In addition, the yard, which is an inseparable part of the life in Ne'mat Abad, has been separately designed for each floor. (See picture 2)



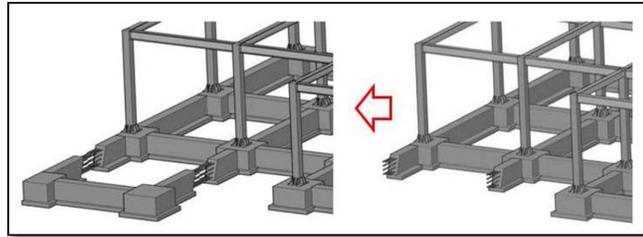
Picture 2: Increasing in residential spaces via flexible structures

The design of each floor is modular and the best module has been chosen so that it can provide the best circulation. Some of the factors that have been considered in planning are: preserving the integrity of existing spaces, not unifying the private and public areas, increasing the operational spaces and good circulation, and keeping the space between different spaces. In addition, the details of the operation of beams and columns in the joints of mobile parts have been designed lucidly and in such a way that it can be built easily and inexpensively. (See picture 3)



**Picture 3: Retractable column details in pilot**

Since one of the main purposes of designing a residence is creating flexibility and increasing the quality of operation in the future developments, in the one-story houses with implementing technology we reached this goal. If in future there is the need for more people to reside there, it is suggested that during the construction the lands for future operation be marked and cut the tie beams in a proper place that in case in future to concrete from the tie beam we complete the project. (See picture 4)



**Picture 4: Making prospect foundation for future expansion**

## 7. Conclusion

Here it is concluded that with the help making the residence flexible and by using flexible structure in creating these spaces, inhabitants are able to live in a place with different spaces for different purposes. If they can't afford to buy a house they like, they can use a small multipurpose space as they like. It is used significantly with having extended spaces for live and paying attention to human natural needs in Iran traditional architecture and existing flexibility with making different spaces and respect for hierarchy in them without using specific technology to build. So it can be accepted as principle and use it as a pattern in reconstruction of old textures with structures which are convertible.

In terms of conclusion, if it is chosen these principles of past as the key factor of shaping flexible houses and with the help of ever advancing technology, it can be hoped that through research and planning and preparing a suggestion for the authorities, it will be taken a big step toward incorporating new space to the cheap houses of the poor and increasing the quality of life.

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