



TYOLOGICAL STUDY OF TRADITIONAL HOUSES OF SEMNAN CITY

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ABSTRACT:

In Semnan, there are several valuable historic buildings that, despite their diversity and innovative nature, have a standard and unbreakable identity. With their erosion and degradation, their architecture and construction are rapidly being destroyed and forgotten. Therefore, a multifaceted study of these buildings is essential to recognize the patterns of building homes as the primary focus of development, relying on valuable samples mostly dating back to the Qajar and Pahlavi dynasties. In this research, forty historic houses in Semnan have been studied and analyzed in terms of climate, culture, geometry, form, spatial communication, structure, and all architectural elements that are the basis of the formation of the patterns of these houses. It was realized that architectural designs and constructions of these houses had undergone fundamental changes over time based on changing social conditions and habits of life. Traditional houses were studied in three specified periods, including before the reign of Naser al-Din Shah Qajar, from the power of Naser al-Din Shah to the early reign, and Pahlavi. By reviewing all the details of historical houses and categorizing them we will achieve a guideline for providing conservation and restoration projects in the historical context of Semnan.

Keywords: Urban fabric, historical houses, typology, Iranian Architecture, cultural heritage

1. INTRODUCTION

Lacking reliable information about the performance and specifications of existing houses is one of the significant barriers that hinder promoting the housing renovation and providing renovated homes in the market (Iwamura, Takashi Hayatsu, 2001). This information is intended to encourage communities and development actors to reach a wide range of physical forms of the house and to select the species that fit their environment appropriately and provide details and examples sufficient for further discussion, without considering additional issues at the very early stages (Metropolitan Design Center 2005). Typology is an approach that isolates the attributes of the architectural coherence, identifies them as characteristics, to then compare them with similarly abstracted details from other contexts and to define similarities or differences (Lack, Reichlins, Architekturkritik, n.d. Del, Tabrizi, 2020). In Iran, due to the wide geographical area, there is a great variety of housing types. In each climate, despite the same environmental conditions, according to other mentioned patterns in this paper, and in terms of lifestyle in the social classes, housing has a pattern diversity. One of the most important architectural centers in the warm, dry climate of Iran is Semnan city which enriched by numerous historical houses with well-known values (Soltanzadeh, 2011). In this research, forty historic houses in Semnan are examined based on the location in the historical context of Semnan and also the periods of their construction. The method of collecting information was first done in the field by the researchers and it was divided into three categories based on the periods of construction and the cultural, formal, decorative and material characteristics were investigated.

using the combination of existing relevant theories and methods. Finally, they are sorted, and the patterns of any kind are presented. This information is very significant in the design of new houses in Semnan, as well as the renovation of historic homes. Studies reveal that most of these houses are related to the late Qajar dynasty (Soltanzadeh, 2011; Mehr, Noghrekar, Mozaffar, & Taghdir, 2015).

The first Pahlavi period based on the houses of the preceding periods influenced by the patterns used in them and from Land topography conditions, ownership and orientation of gardens and agricultural land has also been affected. Due to the variety in types and number of these houses, the typology and classification of similar samples in groups and the study of patterns used in them are necessary. For this purpose, after studying the climatic, cultural, form, structure, space, materials and architecture of these houses, the typology and adaptation of these patterns will be addressed through social and political changes.

2. Climate patterns

The climate, as far as the comfort of humans, is the result of the interaction of elements such as sunlight, temperature, humidity, wind, and rainfall (kasmaei, 2003). In traditional Iranian architecture, the climate has been a significant factor in orientation, spatial organization, form, type of structure and materials, elements and components of buildings (Ghasemi Sijani, Memarian, 2010).

Semnan is located in the desert; it has a dry climate with hot summers and cold winters, see the graphics. Semnan has also a dense and compact urban texture.

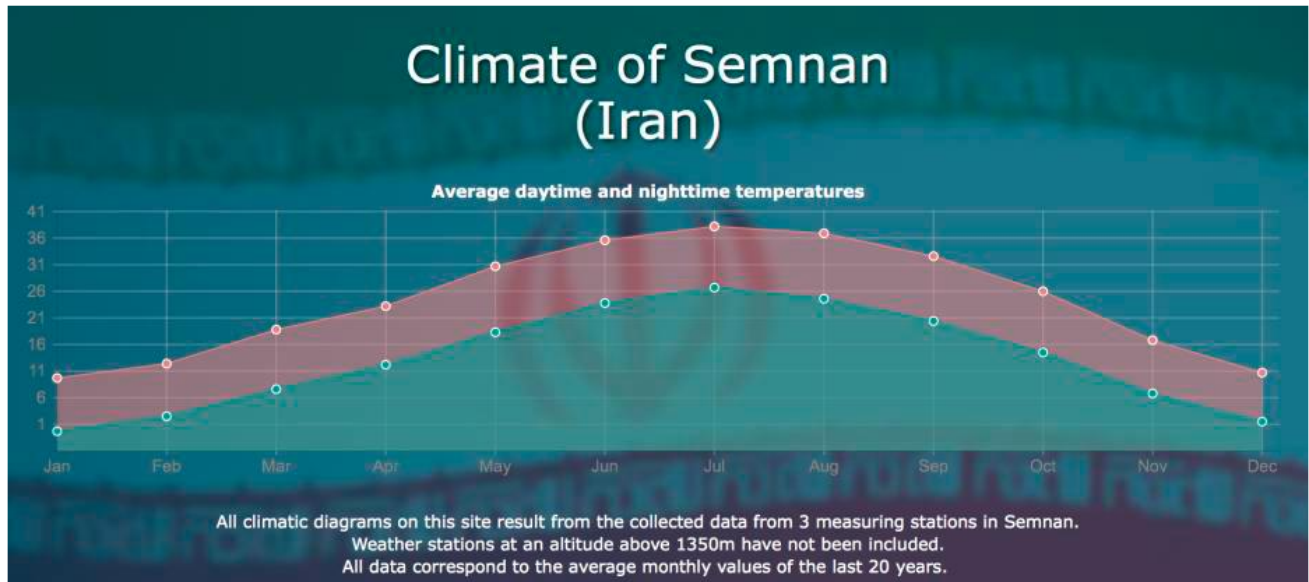


Fig. 01. Average temperatures for every month Source: WorldData.info

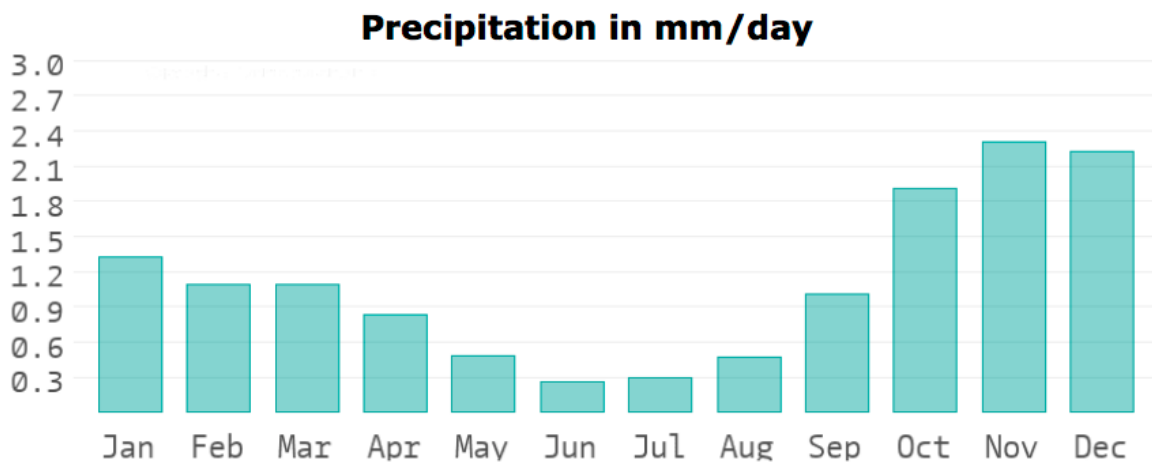


Fig. 02. Average rainfall for every month Source: WorldData.info

So, most of its historic houses have a central yard, and around this courtyard, room space is built without having windows to the streets (Eiraji, Namdar, 2011 Mehrabi, Rahimpour-Bonab, Enayati-Bidgoli, & Esrafil-Dizaji, 2015). ().

The wind catcher is used in Qajar houses of Semnan as an essential element of cooling and ventilating in the halls. Also, sometimes they used this form of windows as a decorative element and a symbol of luxury (Kalantar house (Figure 3).

In general, the following features are known for the climatic model of the historic houses of Semnan city:

- The geographical orientation of these houses is generally influenced by the location of agricultural lands and access routes to these lands, the climatic factors in their direction are less interfering. They do not follow the familiar axes of Iranian architecture.
- Use of three types including open, semi-open and closed (yard, porch, room)
- Making wintertime part (facing the sun) and summertime part (back to the sun)
- The lack of direct access from open spaces to closed spaces and observance of space hierarchies (the presence of vestibules and corridors)
- Use elements and arrangements such as the sunshade, the porch, the wind catcher, the cellar (in the house of Tadayon)
- The composition of the ceiling is arched and flat (the dominant roof is arched), the Channeling of the tops and the walls for being weightless due to climatic conditions
- Use of local material such as clay, brick, and wood
- The difference in lighting
- Placing the entrance of water supply and aqueduct in the central courtyard

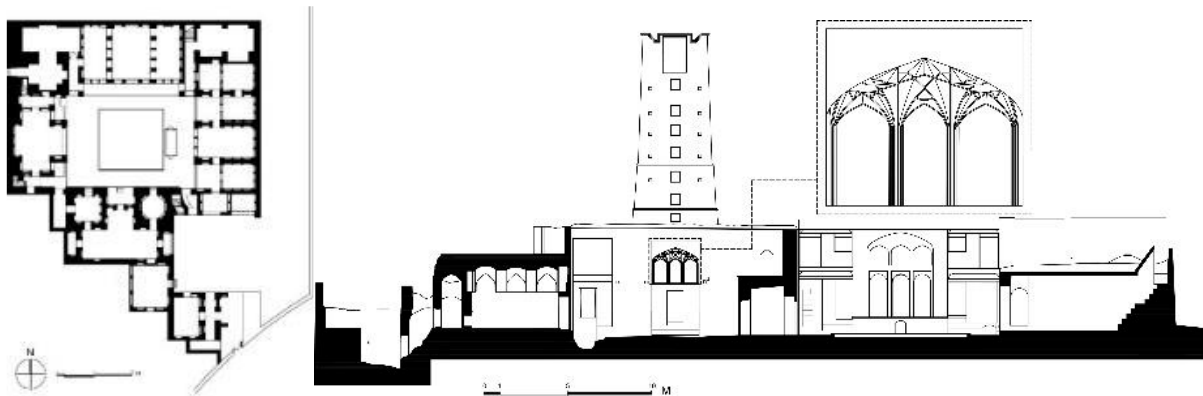


Fig.03 Planning and Facade of the Kalantar House (Documents Center of the Organization of Cultural Heritage, Handicrafts and Tourism of Semnan, Edit: Writers)

3. Cultural patterns

Architectural identity comes from the value of the society. The value of the society is also driven by architecture and architecture reflects the designer's cultural identity (HAGHIGHI, 2014). Lifestyle is fluid and people's taste cause changes and dynamism (rastjoo, bemanian, 2019). The identity of Islamic Iranian culture influences the culture of living in a contemporary house and, consequently, on the house's spatial connections. In Iranian culture, introversion has been institutionalized and has also been found in architecture (Mahmoodi, 2012) Physical, social, psychological and cultural environments help create a "sense of place." A high-quality environment brings a positive concept of location, which, in turn, results in a high level of satisfaction, ownership, and identity of the inhabitants (Saraf, Sohan, Ahlen, 2010). On the other hand, people in the "space and time" organize activities and the views of different cultures on the concepts of "space and time" affect the event of human activities (Afshari, Mohsen, and Poordeihimi, 2014). Since humanity has left the cave and started to build a shelter based on the ethnic and climatic requirements of the land, there is a direct connection of the type of architecture with the economy, social class, family, belief, political and, ultimately, ethnic traditions of social groups; and even the kind of architecture is closely related to the clothing and language of people (Roholamini, 2007).

The most important cultural factors affecting the architecture of the historic houses of Semnan city are:

- The political situation in Semnan and its proximity to the capital during the construction of these houses.
- The positioning to the trade routes such as the Silk Road in the past and the main roads of Tehran-Mashhad and the railway lines. The construction of this line began on March 15, 1938, and the first train passed on July 23, 1956, (Haghighat, 2006).
- Economic situation and number of family members.

4. Shape patterns

Historic houses in Semnan are divided into three types of introversion: 1.the Safavid house (1501 to 1722) 2.the Qajar and early Pahlavi buildings (1796 -1941), and 3. Pahlavi II (1941-1979). Concerning interior design, the courtyard is the center of space division, which, in addition to connecting the spaces also incorporate the architectural elements of the house (Edwards, 2006). The various aspects of the yard are different from the type of home. In ordinary homes the garden, water wells, ponds, and small waterfalls are the main elements of the yard (G. H. Memarian, 2011).

Normal houses had generally a garden with orange trees or a large courtyard. Introversion houses in Semnan can be divided into porch-houses (the central porch on the main front or several fronts)

The construction of a house with a veranda is a feature of Safavid architecture. The Safavid porches had three-part divisions. In decorating these porches, seven-color bricks or tiles were used, and they used sash window instead of windows. Other features of these porches were indirect access from both sides by corridors. Torabi House is the only remaining house of Safavid architecture in Semnan. However, there have been changes in the structure of this porch throughout history. These changes include the construction and annexation of stairs. Windowless dwellings with a yard or a few yards like Tafozli, Taherian, Nazemian, Kalantar (Rajabi), Monshiyolatebba and sash-windowed houses with a yard or a few yards like Tadayon, Abdus, Ranjbaran.

The main spaces in Semnan's introversion houses are composed of entrance, vestibule, corridor, porch, courtyard, cellar, cistern (mostly in the aristocratic Houses), Rooms, wind catcher hall (multi-yard houses), parlor, wintertime part, summertime part, baths and toilet(Valian, Moffi Shemirani, Mahmudi, 2020).

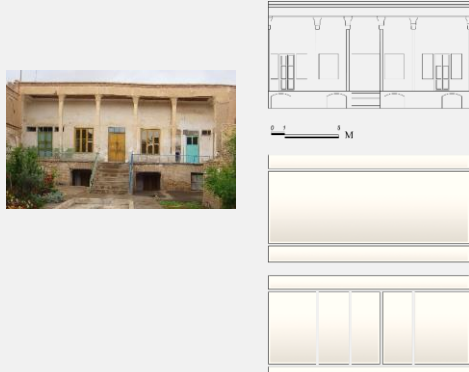
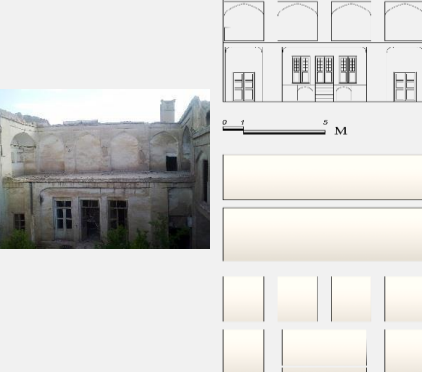
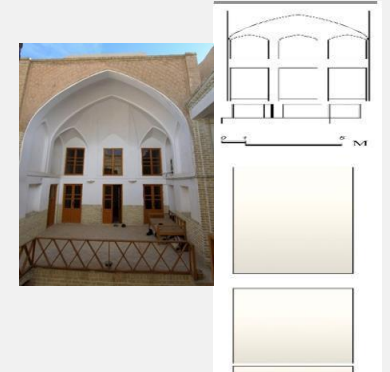
Physical divisions of the northern facade of Monshiolateba house	Physical divisions of the Southern facade of Family house	Physical divisions of the Southern facade of Torabi house
		

Table 1. Physical Divisions of the main facade of Semnan prominent Houses.

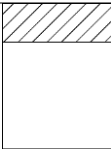
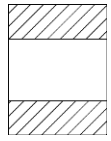
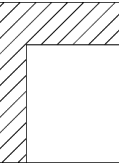
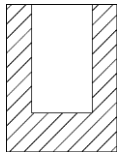
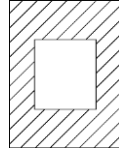
Pattern	Schema	Characteristics	Case studies
1. The spaces are organized on one front of the yard: mostly in the houses of the first Pahlavi period.		In these houses, spaces such as a room or a parlor on one side of the yard are designed in one or two floors.	Jaffari house, and most houses in the central part of the historic center of Semnan.
2. With spaces on two fronts of the yard (facing each other)		In these houses, due to the low width of the houses, the rooms are built on both sides of the courtyard on one or two floors.	Houses of the Monshiolatebba, Abdus, houses of the Eastern side of Kohandezh pathways
3. With spaces on two fronts of courtyard perpendicular to each other (L shape)		These houses were often made up of two floors, with openings on the first floor for ventilation in the heating season.	Case studies reviewed by the writers (Houses No. 13 and Sohrabi).
4. With spaces on the three fronts of the yard (U shape). The only remaining Safavid house in Semnan (Torabi House) was built with this form		These houses are designed as one or two floors and usually with smaller closed spaces on the first floor.	Houses of Adab, Torabi, and case studies reviewed by the writer (houses number 3, 6, 7, 8, 12, 14, 22).
5. With spaces on the four fronts of the yard		In this type, the courtyard is positioned in the center. This type is divided into the house has in all sections two floors or only one floor.	Houses of Rajabi, Tadayon, Ranjbaran, Nazemian, Tafazoli, Taherian, Fani, Familie, Nazari, Talebbidokhti and houses No. 5 and 9.

Table 2. Shape Patterns of the introversion Houses of Semnan city

5. Spatial Communication Pattern

One of the methods of analyzing the architectural data is the spatial syntax method. This method includes theories and methods for analyzing the configuration of space. It is introduced in the late 1970s by Bill Hillier-Julian Hanson and their colleagues at the Bartlett School of Architecture and Design at University College London (Zimring, Khan, Craig, Haq, Guzdial, 2001; Brown, 1997; Wineman, Kabo, Davis, 2009; Persian, 2017). In this method, the social and cultural foundations affecting the building's layout are considered, which can express different customs and beliefs. The attitude of space syntax to investigate the factors in the building space. These factors or indicators include: depth, choice, control, relinking, and communication.

In the table below, the communication pattern of each house's spaces is drawn in A-graph software. Each room at home is defined by its GR= Guest room, KR= King room, H= hall, BR= Bed room, LR= Living room, K= Kitchen, W=WC, P= Parking, E= Entrance. Also, in this analyze NCn means Number of connections from actual node, CV means Control Value and CVe, short for Common Vulnerabilities and Exposures, is a list of publicly disclosed computer security flaws. When someone refers to a CVe, they mean a security flaw that's been assigned a CVe ID number.

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Table 3. Graph and spatial diagram of the studied houses based on shape pattern segmentation

Diagrams of Table 3 show that the most interlinked space in the houses,' spatial structure, is the courtyard, which can be inferred from the diversity of connections between the yard and other surrounding rooms. However, table 3 data show that the amount of yard seemingly in the pattern of houses reviewed in Table 2, yard U-shaped, L-shaped, and central courtyard houses have 9, 5, and 21, respectively maximum values compared to other patterns. Accordingly, the amount of linking in Spaces on two sides of the house and one side (pattern no. 1 and 2 in table 2) are in the next categories. In other words, increasing the mass relative to space in courtyard patterns increases the yard's bonding to them, and by decreasing this ratio the amount seemingly reduces. Therefore, the courtyard model has the highest adhesion rate, and the one-way pattern has the lowest rate.

We have analyzed an extroverted home in Semnan city for getting better results and comparing spaces in traditional house and extroverted or normal house. Koshk house which is built in late Ghajar and first Pahlavi era has been chosen for this aim. We have analyzed this home in AGRAPH software. The exciting result is that in extroverted houses, the Hall or living room plays a role like a courtyard in traditional houses. People enter the living room, and then they seek their way to the bedroom or kitchen from there. The connectivity factor in these houses in the living room is more than the courtyard. Even in houses that don't have a courtyard and open

directly from entrance to the hall or living room, we can claim that the living room plays a significant role in reaching other spaces. Compared to traditional introverted houses, when a person entered the house through the entrance, he first made his way to the courtyard. The courtyards of these houses made the most connections with other spaces, and people could make their way through the courtyard to all the spaces. In extroverted houses, the living room is most connected to other spaces of the house.

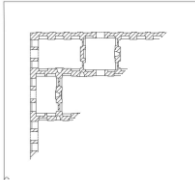
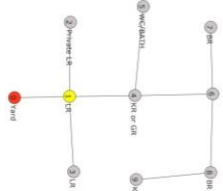
Schema	Characteristics	Case studies	connecting home spaces
Koshk house			NCn
			CVe
			CV
			0 Yard 1.00 1.00
			1 LR 4.00 0.
			2 Private LR 1.00
			3 LR 1.00
			4 KR or GR
			5 WC/BATH
6 6			
7 B			
8			

Table 4. Graph and spatial diagram of the extroverted house based on shape pattern segmentation

6. Patterns of decoration, structures and materials

In each building, the decorations are more distinguished of other elements of architecture in accordance with the live styles of its inhabitants and reflect their taste and manner. They can watch the effects of their artistic talents in the mirror of this ornaments, so while the flourish of an era maybe sometimes judged with the decorations of buildings, such as the use of types of gilding, mural painting, of decorative arches (Zarei, Ashkzari, Khadim Zadeh, 2016).

Most of the decorations in these houses are executed with stone, brick, gypsum, wood, and glass, and the use of tile decorations is rarely seen, as well as lacking painting and mirroring. The most important features of these house structures are the use of flat ceilings alongside arched ceilings.

Decorating	Case studies
Gypsum board	Tedayon House, Kalantar, Torabi and Ranjbaran
Courtyard brick decoration	Houses of Kalantar, Torabi, Taheri, Nazemian, Family and Zamani
Brick coping ornaments	Houses of Torabi, Monsholatebba, Taheri, Nazemian, Fanni, Zamani and Madani
Decorative pillars of gypsum	Houses of Monshiolatebba, Taheri, Fanni, and Madani
Wooden roof with decorating the role of Toranj and Shamse	Houses of Taheri and Monshiolatebba
Entrance door bricks ornament	Taheri and Ranjbaran houses
Stucco network ornament	Houses of Taheri, Nazemian, Tedayon, Adib, and Family
Arcades	Houses of Nazemian, Torabi, Taheri, Ranjbaran, Family
Gypsum frames with flower designs	Houses of Tadayon, Ranjbaran and family

Table 5. Types of decorations used in Semnan prominent Houses

7. Typology based on the changing patterns governing the way houses are built over time

After collecting information and studying the properties of homes in terms of the components proposed in the practices mentioned and the separation of high-similarity dwellings, some of these houses are common in ways of design and construction time. They can be divided into three distinct types.

7-1. Type 1: Houses of the Safavid dynasty (1501 to 1722) and early Qajar dynasty (1789 to 1925):

These are houses that were built before the rule of Nasser al-din Shah (1848 to 1896) and were less influenced by the architecture of other countries. From this period, a few houses remain in the city of Semnan, the most prominent example of which is Torabi house. The most significant architectural elements of this house are the

architecture of the Safavid dynasty, which has not been replicated or structurally altered in the homes of subsequent periods. One of the essential parts of this Safavid house is a gypsum board that runs in the southern region and has the highest elevation in the skyline of the house. The essential features of the homes of this period are:

- Split the house spaces into wintertime and summertime part. The northern side of the courtyard, where the sun shines in the winter is refreshed and warmer is used in winter. Rooms on the south side of the yard, which are in the shade, are more relaxed and used in the summer.

7-2. Type 2: Late Houses of the Qajar dynasty:

These houses were built during the reign of Nasser al-din shah until the early days of Reza Shah Government. The most important historical feature is the beginning of the widespread and unilateral effects of Western art and architecture in Iran, combined with the traditional European classical architecture, these effects are first seen in decorations. The invention of the basin is aimed at creating summer space in the blind spots of the building and providing light from holes in the roof (Ghasemi Sijani, Memarian, 2010).

7-3. Type 3: houses of the first and second Pahlavi government

In this period, the ancient historical cities were forgotten, and it accelerated its degeneration and listed it as an obsolete object that should be used only to the extent possible. With this way of thinking, the disadvantages of worn-out homes were exacerbated by neglecting the possible improvement of sanitation, light and ventilator facilities that covered the courtyards (Gazzola, 1971).

At that time there was no policy to promote rehabilitation and modernization of the old dwellings for improvement. Consequently, new neighborhoods with modern houses were constructed and habitants of the historic neighborhoods abandoned their homes in the search for better living place unconsent of the value of their homes. Until decades later no strategy was established by the municipality to preserve these historic sites, which marks the transformation and degradation of these places. The proposed architectural planning suggestions for rehabilitation and conservation plans in Semnan historical houses are presented below:

Values derived from research	The principle used	How to use in traditional architecture	Rehabilitation guideline
Observation	Fitness of the building with his users	All spaces as well as doors and windows, all had the right sizes.	Maintain sizes of all rooms and spaces considering the authenticity (shape and integration)
Avoiding futility	Avoiding luxury and extravagance	Efficiency in planning. For example, all the paintings in the building were done with reason; if tied with wood or plaster and stained glass in traditional doors (called Orosi) and windows, it is because there is a shelter in the face of the hot and sometimes scorching sun to protect the eye.	Maintaining all measures for energy sustainability and pay attention to the climate of the area. Design by considering the climate, culture, sociopolitical and environmental conditions.
Static and Materials	Optimizing construction methods	Avoiding incompatibility of materials, especially new materials with traditional materials	Considering the materials of the region, especially natural construction materials
Self-sufficiency	Avoiding derivation from the original architecture	Taking advantage of symmetry and improving asymmetry in the building	Use of available materials and respect original construction solutions. Study and coordination of new and old construction solutions to prevent damages
Introversion	Paying attention to privacy and human rights	One of the beliefs of the Iranian people is to value and respect personal life, which caused the introversion in Iranian architecture. Taking advantage of the central - courtyard. -No windows to the road	Identity, security, confidentiality, hierarchy, home interaction with family and guests'; cultural indicators are the result of preliminary studies that should be considered in any rehabilitation measures

Table 6. Study of practical values in the construction of historical buildings of Iran and how these principles and values are used in the conservation of Semnan historical houses

Granting a new use to Semnan's monuments, and bringing life to these buildings based on their style and methodology, can provide a simpler yet more authentic path for rehabilitation and architecture designers.

8. CONCLUSION

The historical places of Semnan city are divided into three types based on the chronological sequence of history. The criterion for a division is according to the changes of government and the fundamental changes in society. The typical characteristics of houses of each period are based on these patterns. Knowledge, study and classification of these patterns are among the requirements of improvement and any rehabilitation plan in Semnan's historical houses.