Recognition of the architecture of Safavid caravanserais from the view of passive defense

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Abstract: A study of Safavid history shows that security is a factor in the emergence of political authority and directly affects trade and the economy. The concept of defense can be defined in two ways: active defense and passive defense. Although the same goals are seen in both types, the methods used in passive defense are very different. The purpose of this study is to study the caravanserais of the Safavid period from the perspective of passive defense. The research method is a comparative description. 43 Safavid caravanserais are classified into four groups and the principles of passive defense are examined in them. The results show that the relationship between active defense factors or passive defense in caravanserais has varied, depending on the geographical location, the importance of the routes, and the architectural form of the caravanserais.

Keywords: Architecture; caravanserai; passive defense; Iran.

1. Introduction

Throughout history, human beings have always traveled for various reasons and motives, such as economic and commercial factors, tourism and pilgrimage, visiting relations and friends, and so on. One of the most important travel requirements is a shelter for comfort and safety from dangers along the way. In this regard, the Iranians have built caravanserais along the transportation routes, an architectural type that reached its peak of evolution during the Safavid period; Therefore, studying the different architectural aspects of this building can be an effective step in recognizing the architectural values of the past as much as possible, but so far no independent research has been done on the security of caravanserais.

Threats have always been an integral part of human life, endangering his material and spiritual capital and even his life at various levels. In this direction, in an effort to counter these threats and create security, human beings have pursued measures in three areas: prevention, countermeasures, and action to return to pre-accident conditions. Passive defense is one of the topics that has always been considered in cities and villages and the transportation routes between them in different historical periods.
Looking back on Iran’s past, one can see the role of stable states and governments in expanding roads and communications, with different social, commercial, religious, political, military, and security goals. On-the-road facilities such as caravanserai, towers, bridges, toll-houses, etc. are among the buildings that have played different roles in line with the above objectives, and among these, caravanserais are one of the most important types of architecture (from the perspective of this research).

Regardless of the types of classifications, security, accommodation, and trade have always been the most important factors in shaping caravanserais. Due to the obvious differences in the caravanserais of different regions, the present study examines their physical differences from the point of view of security and passive defense. Knowing the factors affecting the body of past architecture is a way of discovering identity as well as recognizing form and content in these ancient works so that the missing link between past and contemporary architecture can be revived. From this point of view, the authors hope that other aspects will be considered in future research.

Given the purpose of the research, the question is, what is the relationship between the use of active and passive defense in the formation of caravanserais? The research hypothesis is based on three principles:

1. In areas where there are no natural elements of passive defense and active defense has not been justified, the maximum use of physical elements of passive defense has been done.
2. In areas where there are natural elements of passive defense (e.g., mountains) in the construction of caravanserais less physical-security components and elements (such as towers and fortifications, etc.) have been used.
3. In areas where active defense is available, the use of passive defense elements has been minimized.

2. Theoretical foundations of research

2.1 Definition of specialized terms

Passive Defense: Passive defense is of particular importance as a defensive strategy in land management. The term is in contradiction with Active defense. The word ‘passive’ indicates the use of civilian facilities (Hausen, 2013, p. 6). Conceptually, active defense means defending against military aggression; therefore, the passive defense is a set of policies and measures that can maintain the security and repel the enemy and risk without the need to use military equipment (Lacina, 2006, p. 91). History shows that the formation of early civilizations in the world has always been associated with war. To prevent enemy attacks and save lives, humans created group security by refuging in caves, building fortifications and forts, and digging trenches (Nagaraj, 2015, p. 319). The people of Iran have always faced threats and attacks as a result of the specific Iranian-Islamic worldview, and therefore many of the defensive considerations have their roots in this type of worldview (Tahan et al., 2009, p. 50).

Among the measures of passive defense in different historical periods, the following can be mentioned; In Urartu civilization, the castle was built at the highest points. Although these points had a special defensive value, the Urartians did not content themselves with them and used various methods to defend the walls using earth and topography facilities. In the Median period, the use of environmental factors for defensive purposes has been well used. During this period, forts were built on top of natural heights and features. The special feature of these cities was their location at heights and multi-layered forts, which became stronger as they approached the ruling residence.

In the Achaemenid period, factors such as heights and rivers (as natural factors) and the creation of fences and defensive towers (artificial factors) to create security were mentioned. Parthian cities often had only one gate, and the Parthians used circular schemes to deal with the tension of the time. In the
Sassanid period, although the construction of circular cities continued, to achieve greater security than the Parthian period, a quadrangular shape was also used. The passive defense has been used to secure settlements, especially important cities or crossroads. The above-mentioned defensive fortifications and measures of defense reflect the defensive thoughts and ideas based on the principles that we now recognize as passive defense measures. The more sensitive and vital the centers were, the more complex and advanced protection measures were employed.

The above implies that any action taken by the human community, the natural and artificial environment, with a protection-oriented approach and civilian action, is considered a passive defense. Passive defense follows the rule of prevention rather than the function of structural strength (Kamran et al., 2011, p. 109).

Caravanserai: The word "caravanserai" is originally taken from Persian ‘karavan-sarai’, literally means caravan-house or the house of a caravan and was a place where travelers temporarily resided. In some Persian texts other terms have been used as equivalents including ‘karavangah’ and ‘karavan khane’, literally meaning ‘caravan place’ and ‘caravan home’ respectively (Hadizadeh Kakhki, 2014, p. 60). Various functions have been mentioned for the caravanserai, some authors have considered it as a center for the exchange of goods and a kind of guest house in the eastern lands (Tavernier, 1990, p. 122), and others have called it a safe place for the protection and comfort of caravanserais (Wicquefort, 1984, p. 121). In fact, the caravanserai was a large building outside the city or within the city that caravans used primarily for commercial purposes and later for military, political, religious, and social purposes. Its architecture depended on the geography of the region and also had service and welfare facilities. (Shenvaz and Khaghani, 2015, p. 20).

2.2. Literature review

Sources about caravanserais: Kiani & Kleis (1994) introduced different architectures of caravanserais from climate and shape perspectives in their book 'The list of Iranian caravanserais'. They have provided lists of Iranian caravanserais by province. In the context of introducing caravanserai’s roles, they emphasized the security of travelers. In addition, a caravanserai can provide services such as bakery, milling, mosque, etc. to the villages located in the area. In another book titled 'Iranian caravanserais', Kiani & Kleis (1983), mentioning the above points, provided documentation and maps of Iran's caravanserais in different locations. The book can be considered a complete reference of Iran’s caravanserais, and it has been employed by the authors of this study as one of their main sources.

In his book of ‘Islamic architecture: form, function, and meaning’, Hillenbrand (2004) investigated the features of Islamic architecture from different perspectives and described the most significant patterns of each period. He introduced different terms & concepts related to caravanserais and defined it as a place where caravans used for trade as well as taking protection from thieves and natural trouble of roadways (2004, p. 397). Through an analytical study, he introduced some of the most well-known caravanserais of Islamic countries and stressed the function of caravanserais in providing services to pilgrims in roadways to religious places (2004, p. 441).

In a book titled ‘Iran’s caravanserais and small mid-way buildings’, Maxime Siroux (1983) mentioned Iran’s trade routes, caravans, and transportation instruments. He gave various classifications of caravanserais from perspectives of financial resources, geographic location, and type of construction. He
divided caravanserais to two types, on the basis of their climate: mountainous and desert caravanserais (1983, p. 12).
In his book titled ‘Remembrance of the caravanserais, robats, and caravans in Iran’, Ehsani (2002) discussed the history of caravanserais, defense and welfare, roadway, caravan and other details of caravanserais. Hadizadeh Kakhki (2014) in ‘Caravanserais in Iran’ discussed caravanserais from different perspectives such as type of roadways, dependent structures, functions, architectures, and different styles of caravanserais depending on the climate. In his book of ‘Iranian architecture in Islamic period’ Kiani (2014) investigating caravanserais from the historical perspective, classified them into three types based on the climate conditions: Fully covered mountainous caravanserais, near low-altitude areas of the Persian Gulf, and caravanserais with a courtyard in the central areas of Iran.
In the book of ‘Iranian caravanserais in the Safavid era’, Shahnavaz and Khaghani (2015) gave another definition of the caravanserai. According to them, a caravanserai was a large building outside or inside the cities which was used by caravans for trade purposes as their first goal, and military, political, religious, or social purposes as the other secondary purposes. This book discussed the history, development, function, and architecture of the Safavid caravanserais. The authors believed that the peace and stability of the Safavid era was the reason why there were no military towers, or only decorative if any, in the layout of caravanserais (2015, p. 54).
In addition to these books, many articles are written about caravanserais. Rafifar and Lorafshar (2013) emphasized the role of business and commercial activities in the economic growth of the Safavid period and subsequently the construction of more caravanserais (2013, p. 46). They studied the caravanserais on a certain route and investigated the cultural structures as well as anthropological of people through studying the caravanserais. Soheili and Rasouli analyzed the specific relations dominant in the architecture of Iranian caravanserais through space syntax technique. They believed that security and accessibility were the most important factors in the generation of spacial relations in Iranian caravanserais (Soheili & Rasouli, 2014, p. 47). Kaviyan and Gholami (2016) investigated the evolution of caravanserais, leading to higher safety and comfort of caravans, in different historical periods. Ebrahimzadeh and Gharakhani (2017) discussed different functions and physical typology of caravanserais in respect to climate and shape perspectives.

About passive defense: The concept of security includes all dimensions of human life and has a meaningful relationship with human survival. Security is a feeling which rises from structures and processes in which a person considers himself protected from any subjective or objective threat. With these explanations, it is clear that security is an inferential issue which is realized through special efforts. Experts mentioned various perspectives about security and related issues. Investigation of such ideas leads to the discovery of the link between securing caravanserais and knowledge of the passive defense. In the book ‘architectural requirements in the stable passive defense’, Asghariyan Jeddi (2013) discussed the history of theories about threats, passive defense, and architecture. In the book ‘Defensive structures in the Islamic era of Iran’, Pazouki Taroudi (1997) analyzed the defensive strategies and structures used in different historical periods for ensuring the security of Iran and emphasized the role of position and geographic features in the establishment of security.
In their book titled ‘Passive defense, national and urban security’, Moghli et al. (2015) investigated the basis and historical philosophy of passive defense and security in the context of urban planning. They proposed three main approaches in the field of passive defense which are threat-based, capability- based, and opportunity-based, describing and discussing the features of each one. The authors believed
that camouflage, concealing, covering, tricking, distributing, defensive structures, notification, survivability, and deceptive position are the main elements of passive defense.

In terms of articles about passive defense, the research by Asghariyan Jeddi and Mirhashemi (2016) can be mentioned, in which the authors discussed the native knowledge of the passive defense and its role in architecture and urbanization in different periods of Iran’s history. The researchers believed that passive defense in the context of architecture and urbanization consists of a few stages: planning, anti-surveillance and visual distraction, protection against direct observation of the enemy, and architectural designing. The efforts made in each of these stages are different. The planning stage consists of steps such as positioning, making obstacles, and distribution. The anti-surveillance and visual distraction consist of acts such as the installation of anti-radar and satellite systems is modern warfare and actions such as smoke removing in previous centuries. In the stage of protection against direct observation of the enemy, solutions such as camouflage, concealing, and tricking are used. In the architectural designing phase, actions such as multi-functional spaces, secure internal architecture, emergency entrance and exit, repair ability and design of the internal and external facades are considered (2016, p. 7).

Amanpour et al. (2015) in a paper titled ‘An investigation of the defensive considerations of Iran’s historical cities’ analyzed the passive defense features in different dynasties including Medes, Achaemenids, Seleucids, Parthian, and Sasanian. They believed that positioning of the city’s initial core, the city’s defensive hierarchy, the impact of distance measure in the efficiency of distance measure in efficiency of passive defense, and efficient use of topographical features in urban positioning and accessing are the most important considerations for ensuring the safety of cities. In total, 15 principles of passive defense were mentioned as follows: Selection of safe locations inside the geographical conditions of the country; determining the appropriate scale of population and urban activities in the provided space; distribution of activities according to threats and geographic considerations; decreasing the scale and cost as well as innovation in the field of passive defense; economic feasibility of the project; parallelization of supportive systems; improving the strength of structures; positioning of functions; management of defensive crisis in the situations; camouflage and invisibility; blocking the enemy’s information system; concealing by natural and geomorphological features; having initiative and diversity in all activities; information protection for critical systems; construction of bi-dimensional structures.

In addition to the above-mentioned factors, the authors emphasized other factors such as the creation of new defensive buildings, increasing the depth of accessing essential spaces, and control of physical communications. Most of the studies considered resources, positioning, strengthening, defensive buildings, distribution, and coverage as the most important elements of passive defense. Some of these factors can be extended to the urban areas and residential buildings. After reviewing the available studies, it became clear that no research investigated the relationship between passive defense and caravanserais in a meaningful way.

3. Methodology

In accordance with its main objective, the current study takes a proving approach as its methodological choice. The variables extracted according to documentary studies are geographic location and the importance of roads, the shape of caravanserais’ plan (caravanserais with rectangular and polygonal courtyards, covered introverted and extroverted), elements related to passive defense (number of entries, guard room, watchtower), physical analysis (the depth of accessibility to rooms, number of
space layers). These variables focus on security and passive defense. The statistical population of the current study consists of caravanserais constructed in the Safavid era which are classified into 4 groups based on the shape of plan and form, as shown in Table 3. The samples were selected on the basis of the judgment of researchers in a non-probabilistic and non-random way. In order to eliminate any obscurity about the validity of sampling, samples are selected in a way which satisfies the following considerations:
- The caravanserais should preferably be registered as national heritage. Although some of them are not registered in this list and some others are destroyed in previous years. Therefore, the selection of these structures for analytical purposes has a much higher value for maintaining their documents.
- They have the required artistic and architectural values so that they can be studied analytically.
- The geographical distribution of samples covers all parts of the geographical area under study.
- The temporal distribution of samples (year and interval of construction) and establishment in the Safavid dynasty was the last requirement.
According to the consideration mentioned above, 43 caravanserais were selected as the sample and classified into four “shape groups”. It is clear that in respect to a large number of analytical features and elements of the statistical population, the size of the sample is selected in a way that minimizes the number of repeated data. The acquired samples are:

**Type I. Rectangular with a courtyard:** Baladabad, Behjatabad, Bahram, Koohpayeh, Hoseiniyeh, Poldooshan, Zavareh, Barsiyah, Sagzi, Shahvan, Miyankotal, Dokoochak, Chehelsangzi, Yangieman, Quseheh, Jam, Qalehpahlou, Badni III.

**Type II. Polygon with a courtyard:** Zeynoddin, Aminabad, Banarood, Khankhoreh, Dehbid.

**Type III. Roofed Introverted:** Shelbi, Kooycheh Beel, Sang too, Khanah Sorkh, Gadook, Mirza Abdollah, Aminabad, Emamzadeh Hashem.

**Type IV. Roofed Extroverted:** Bargeh Seta, Badni I, Badni II, Hashem, Dasht, Tekyehkhaneh, Shono, Berkeh Soltan, Berkeh Sefid, Shargh Tanghe No, Tanghe Dokan, Gachineh II. (Figure 1)

4. Research findings
The study shows that the physical factors that create security are:
- Using rampart and extended towers in four edges of building and sometimes parallel to the walls (defensive factor: creation of fortifying elements)
- Necessity of passing through spaces such as internal gate, porch, corridor, courtyard, and balcony in order to reach residential rooms (defensive factor: increasing the depth of access to spaces with a higher level of security)
- Using the entrance gate (defensive factor: controlling connection between inside and outside)
- Creating guarding spaces or rooms in entrance porch (defensive factor: controlling connection between inside and outside)
- Using polygonal or circular shapes (defensive factor: having higher control on location of caravanserai)
- Creation of spatial layers such as outdoor fence, stable, rooms, courtyard from outside toward inside in a continuous manner (defensive factor: positioning the location of functioning units)
Since form and shaped are considered as basic elements in analysis of caravanserais, five influencing factors are used for dividing caravanserais to four types. In fact, these variables lead to significant differences in passive defense methods and their level of implementation. (Table 1).
Figure 1. Several plan of the selected caravanserais. (Source: Kiani, 1994)
5. Discussion and analysis

5.1 Physical analysis of rectangular caravanserais with the courtyard (Type I)

The initial core of this type of caravanserais consists of an open space (central courtyard) and some small independent spaces which were used as rooms and units for caravans and travelers to rest in. Such spatial arrangement has a significant impact on the creation of spatial layers (Soheili and Rasouli, 2014, p. 57). Asghariyan Jeddi & Mirhashemi (2016) considered it an important architectural factor for ensuring the security of passive defense (2016, p. 7). In these caravanserais, the linkage between courtyard and rooms is generated through only one door and this limitation leads to better control of entrance and exit and so the security of caravanserai would increase. Towers constructed in a semi-circular or cylindrical shape and located in four edges or in line with external walls were structured to protect the building from thieves and attackers (Ebrahimzadeh and Gharakhani, 2017, p. 7). Towers, guarding rooms, and thick external walls were the main fortifications of caravanserais.

5.2 Physical analysis of polygonal caravanserais with the courtyard (Type II)

The general form of these structures is circular or polygonal from outside; however, the internal space where courtyard and residential rooms are located has a polygonal arrangement. The arrangement of spatial layers, like rectangular caravanserais with the courtyard, includes the external wall, stable, rooms, and the courtyard. Access to residential rooms only through one entrance door and pass through the porch, the guarding room, and the courtyard indicates that entering and exiting was strictly controlled. The extended cylindrical towers, located along the external wall, were used for improving the defensive capacity of caravanserais and its surrounding.

According to the reports of tourists and contents documented by researchers, these caravanserais were mostly constructed for military and security purposes (Siroux, 1983; De Silva Figueroa, 1984). Hillenbrand (2004) believed that Khankhore caravanserai with octagonal architecture had military and security functions (2004, p. 365).

5.3 Physical analysis of roofed introverted caravanserais (Type III)

The simplest form of these caravanserais consists of central roofed rooms or a line of roofed rooms and a set of stables in the same location. Such caravanserais had only one entrance, a feature which had a significant role for controlling the internal space of caravanserai and implementation of passive defense. In some cases, the entrance of the rooms is directly after the gate, while in some others they are located after porch or corridor. These features reflect the fact that factors such as fortifications, spatial layers, and depth of access weren’t considered as the main components of passive defense (Tahan et al., 2009).

5.4 Physical analysis of roofed extroverted caravanserais (Type IV)

These caravanserais usually have a rectangular structure with a central cross-shaped room and some other rooms. There were no guarding rooms or watchtower in any of the caravanserais in this area. Not using passive defense measures in this area is only due to the fact that security and peace of this era were provided by the active defense (Shahnavaz & Khaghani, 2015, p. 53). According to a formal report provided by English officers who traveled to Iran in the Safavid era, the Isfahan-Jask path has a high level of security and most travelers used these paths with a large amounts of money, without the fear of being robbed (Steensgaard, 1974, p. 400).
6. Conclusion

Although the transformation and evolution of the architecture of Iranian caravanserais in different historical periods (from Sasanian to Safavid) were influenced by factors such as climate, culture, religion, skill, etc. There is no doubt that the security of caravans was one of the most important needs of people, and the architecture of caravanserais was defined in order to ensure the security of them. Although it is clear that various factors had affected the generation of different parts of caravanserais.

Table 2 shows that three types of caravanserais had great similarities using physical elements for ensuring security, while roofed extroverted caravanserais (type IV) had some features different from other caravanserais. This study shows that in locations where natural elements of the passive defense (such as mountain, river, etc.) were unavailable and the active defense is infeasible because of other factors, the architecture tried to use the physical elements as much as possible. Reducing the number of entrances, establishment of guarding room and watchtower, increasing the depth of access or number of spatial layers all led to better passive defense against probable threats. On the other hand, the strategic location of roadways along the Persian Gulf and the important role of these business roadways in providing national, commercial, and economic services made it necessary for the government to guarantee their security through the active defense measures. Therefore, less pressure was put on architectures to ensure the safety of caravanserais in this region.

Finally, it should be mentioned that ensuring the safety of caravans and the lives and properties of people shows the political and economic power of the government. The intelligent Iranian architects, considering the type and importance of commercial roadways, used contextual and climate factors, geographical features, and physical elements to create or improve the security of caravanserais.

Given that the study of the history of architecture focuses only on a part of history, the authors hope that future studies will be conducted in other historical periods as well, through which we can find solutions for architectural design in the contemporary period by considering the principles of passive defense.

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Table 2. Analysis of research findings, (Source: Authors)

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