DOI: 10.22034/JACO.2024.419191.1354

Persian translation of this paper entitled:
بررسی ویژگی‌های دفاعی قلعهٔ فلک‌الافلاک از منظر اصول معمارانهٔ پدافند غیرعامل
is also published in this issue of journal.

Original Research Article

An Analysis of the Defensive Features of the Falak-ol-Aflak Castle From the Perspective of Passive Architectur Defense Principles

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Received; 04/10/2023 accepted; 05/07/2024 available online; 01/01/2025

Abstract

Falak-ol-Aflak Castle is one of the most prominent historical remains from the Sassanian era. It was used as a military fortress or a secure sanctuary. However, this study aims to examine the specific architectural structure and tall walls of the castle and seeks to answer the question of which passive defense components exist in this castle and how they are manifested in its spatial organization. The objective is to introduce the components and features of passive defense in Falak-ol-Aflak Castle and explore how these components are applied in its spatial design and architectural elements. Relevant data regarding the principles and foundations of passive defense were collected through documentary methods, while the architectural features of the castle were documented and recorded through fieldwork. The results indicate that the spatial organization of the castle has incorporated factors such as facilitating the provision of vital needs during emergencies, decentralized design of residential areas, enclosed and defensive fabric, compactness, and the creation of escape routes. Additionally, the winding passages and labyrinthine paths are examples of the principle of deception in their spatial organization. In terms of architectural elements, measures such as angled access to interior spaces, elevated control rooms for monitoring movement, lowered courtyard levels compared to the streets, and structural reinforcement through connection and adjacency of buildings have been considered to reduce vulnerability and ensure the safety of residents in Falak-ol-Aflak Castle. The inward focus in the architecture of the castle units aligns with the principle of deception in the castle's architectural elements.

Keywords: *Khorramabad, Castle, Falak-ol-Aflak, Architectural structure, Passive defense.*

Introduction

Passive defense, as one of the most effective and sustainable methods of defense against threats throughout human history, has been rooted in the struggle and defense of civilizations. The purpose of implementing passive defense plans is to reduce the vulnerability of human forces and vital, sensitive equipment of the country, despite hostile and destructive attacks by enemies, and to ensure the continuity of infrastructure activities, essential services, and the management of the country during crises caused by war. In this regard, human defensive measures have not always been carried out using weapons and military equipment; rather, in many cases, humans have employed methods of defense where weapons and military equipment played no role. Falak-ol-Aflak Castle is one of the prominent historical remains from the ancient Iranian era, situated on a hill near the city of Khorramabad in Lorestan province. The castle's geographical location placed

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it on the communication route between the central plateau and the western and southern regions of the country, making it a passageway through the mountains (Beiranvand & Malek Hosseini, 2019, 310). Throughout history and different periods, this castle has played a significant role and served as a military fortress or a secure sanctuary. It possesses a unique architecture, and its walls are tall and defensive in nature. Throughout history, when constructing a defensive castle, architecture and design were given top priority. This article aims to introduce the components and features of passive defense in Falak-ol-Aflak Castle as one of the prominent examples of ancient architecture. For this purpose, the components of passive defense in the castle's design and their application have been examined. The data collection in this research was carried out through fieldwork and documentary methods, and the research itself was conducted as a qualitative study using a descriptive-analytical approach. Initially, primary information about the castle's structures and architectural elements was collected and recorded through fieldwork. Subsequently, firsthand historical sources were studied, and after validating their credibility, information about the castle's defensive elements was extracted. Furthermore, based on contemporary research, theories, and principles of passive defense have been examined, and the components and essential elements of passive defense have been identified. A theoretical framework for the study has been developed based on these documentary studies. Finally, by aligning these components with the architectural structure and spatial organization of the castle, the data has been described and analyzed.

Research Background

• Theoretical background

The main objective of passive defense is to ensure safety and reduce the vulnerability of the necessary infrastructure for the people, gradually creating conditions for security. If these measures are integrated into the country's development through planning and design, they will pave the way for a bright future in the field of passive defense (Bekraee & Azmodeh, 2019, 23). Passive defense refers to a set of actions that do not require the use of military equipment or firearms and rely solely on the structure design and spatial characteristics in the two aspects of shape, form, and functionality. Therefore, any non-militarized action that reduces the vulnerability of human forces, buildings, equipment, infrastructure, and vital channels falls under passive defense (Hemmat et al., 2023, 165).

In most periods, fortifications were built at the most remote and elevated points, making them difficult for attackers to reach due to steep slopes or mountains. Defenders would occupy the high ground, ensuring a dominant view while also protecting against tunneling by attackers and making it challenging for siege equipment to be brought to the base of the walls. In fact, the principles of passive defense consist of a set of fundamental and foundational actions that, when employed, can achieve the desired objectives of passive defense, including reducing vulnerability. The principles and objectives of passive defense are illustrated in Fig. 1. The chosen location should be such that the construction of facilities and the deployment of equipment do not disrupt the natural landscape and maintain harmony with the environmental conditions, aligning with the principle of positioning. Furthermore, the use and implementation of measures, equipment, and techniques for concealment, standardization, shape alteration, and elimination of regular geometric patterns have also been emphasized, serving the principles of concealment and camouflage. Asymmetrical geometry can serve this purpose. Also, the concept of accessibility which involves routes, means of communication, and spaces can be designed in various types and scales. Communication routes with the external environment should adhere to regulations that affect or eliminate the characteristics of threats, making underground routes considered to be more protective in terms of security.

Given that the purpose of implementing passive defense plans is to reduce the vulnerability of human forces and critical infrastructure and facilities, ensuring vital

needs has always been a priority. Failure to meet these needs would pose a fundamental problem for the forces, making the facilitation and provision of vital needs one of the most important aspects of passive defense.

• Literature review

Several research studies have been conducted on the subject of passive defense. For example, Farhadiyan et al. (2022) addressed the "Principles of smart city design with passive defense approach: A case study of District 3 in Khorramabad]" and stated that considering passive defense can contribute to the creation of a smart and secure city, protecting against threats and ensuring the comfort of citizens. Bigdeli & Shirali (2023) examined strategies for urban risk reduction with an emphasis on passive defense. They employed a descriptive and analytical approach using library studies and documentary research to clarify the principles, objectives, and considerations of passive defense and analyze the passive defense approach in urban areas, with a focus on integrated urban management.

Yeganeh Fard & Yeganeh Fard (2021) proposed that adherence to passive defense principles, aimed at reducing vulnerability, should be considered in all areas, including architecture and urban planning, through their examination of the evolution of passive defense in the historical periods of Iranian cities. Additionally, Beiranvand & Malek Hosseini (2019), in their article entitled "Factors of identity persistence in the city of Khorramabad with emphasis on Falak Al-Aflak Castle", explored the factors of identity sustainability in Khorramabad's city center, particularly emphasizing the Falak-ol-Aflak, and with a focus on the natural geography of Khorramabad city, indicated that the security factor has played a significant role in its formation, and the primary nucleus of this city has developed organically in the vicinity of the Falak-ol-Aflak Castle.

Another study by Mohammadi et al. (2022) in their article entitled "Investigation and of the effects of urban resilience components on passive defense (Case study: Sirjan city)", examined the effects of urban resilience components in passive defense, defining urban resilience as the capacity for resistance against emergency conditions, planning for tolerance, post-disaster reconstruction, and successful adaptation to its consequences in the spatial and living complex called the city and communities.

Farzin et al. (2020), In his article entitled "Shahdiz Fortress, Leading the Passive Defense Principles of the Ismaili Period South Khorasan", emphasized the necessity of studying and employing components that are needed to prevent potential damages by governmental groups and minorities in the past of the South Khorasan region (Qahestan).

Didehban et al. (2020) conducted a study entitled " Passive Defense Strategic Measurement and Zoning in Urban Historical Context (Case Study: Dezful, Iran)", in which they used research methods to find solutions for the revitalization of the old fabric of the city based on principles and research methodologies.

Based on the aforementioned studies, the present study is the first research on the components

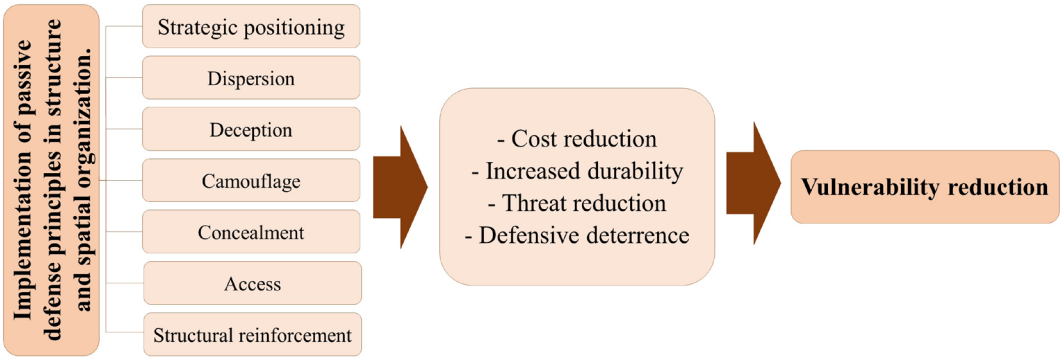

Fig. 1. The principles of passive defense in the space organization. Source: Authors based on Moradian & Mohammadpour, 2014.

of passive defense in the spatial and physical organization of the historical Falak-ol-Aflak Castle in Khorramabad.

Research Methodology

To achieve the research objective, first, the passive defense components in design and their application are determined and examined. Data collection in this study has been conducted through field and documentary methods, and the study has been carried out as qualitative research using a descriptive-analytical approach. Initially, primary information about the structures and architectural elements of the castle was collected and recorded through fieldwork. Then, primary historical sources have been studied, and while validating their credibility, information about the defensive elements of the castle has been extracted.

Research Findings

• General architectural features of Falak-ol-Aflak Castle

Falak-ol-Aflak Castle, also known as Shapur-Khast Castle, is situated on an ancient hilltop in the middle of the city of Khorramabad, the capital of Lorestan Province in southwestern Iran. Throughout different historical periods, Falak-ol-Aflak Castle has been used as a governmental fortress, and for this reason, defensive walls have encompassed its southeastern riverfront area, covering an area of 10 hectares. The Khorramabad River, located in the southern part of the castle, acted as a protective moat. The overall shape of Falak-ol-Aflak Castle is a regular pentagon, and its towers have various dimensions (Beiranvand & Malek Hosseini, 2019, 300-303). The geographical location of the castle is illustrated in Figs. 2 & 3.

The extent of the ancient site, which is the true embodiment of historical transformations, is approximately 400x300 square meters, and the height of the hill, including the height of the building walls from the adjacent street level, is about 40 meters. The area of this castle on the hill is currently around 5300 square meters. The castle has eight round towers located at various corners of the hill. The tower and rampart of the castle are built on the vertical edge and slope of the hill and have battlements. These towers, which often differ in height and volume, have served as observation and defense points in the past (Sayehmiri & Nazari, 2020, 86) (Fig. 4).

The interior structure of the castle can generally be divided into four relatively large halls and several small and large chambers (Table 1). The courtyards of the castle are interconnected by a corridor. In the past, the entire castle had a single courtyard, but later it was divided into two parts (Figs. 5 & 6). The first courtyard measures 22.5x31 meters, and its length is oriented north-south. It has eight chambers. The entrances to the western chambers, the northern hall, and the renovated southwestern towers open into this courtyard. The second courtyard is rectangular and measures 29x21 meters. Its length is oriented east-west, and it has sixteen chambers and eleven antechambers outside the chambers. The floors of

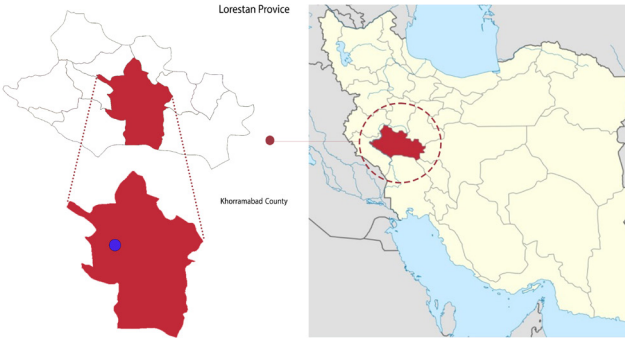

Fig. 2. Castle Location. Source: Authors.

Fig. 3. Overall View of the Castle. Source: Authors.

the chambers are one and a half meters higher than the courtyard floor. The entrances to the western, northern, eastern, and southern halls open around this courtyard (ibid.).

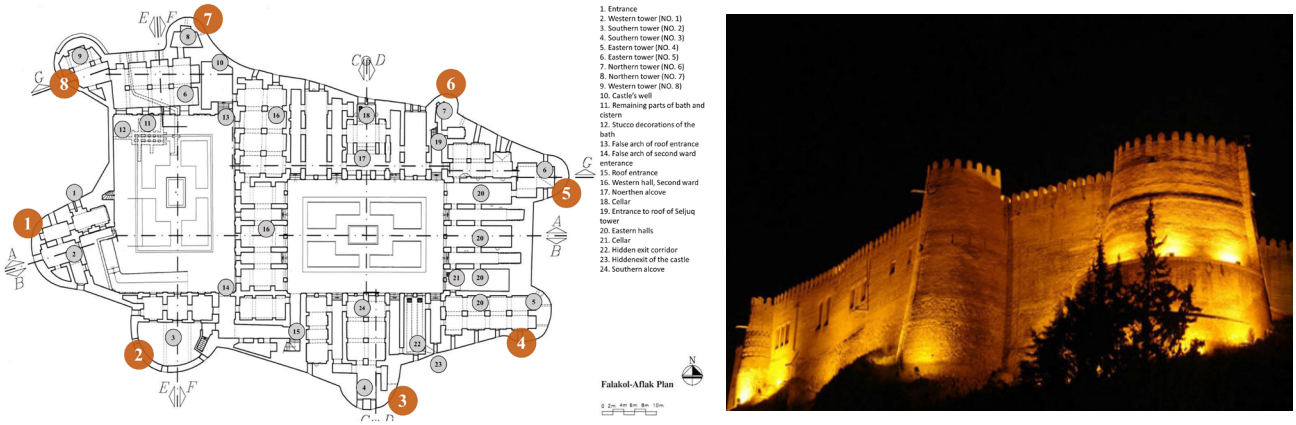

Fig. 4. Towers of Falak-ol-Aflak Castle. Source: Authors.

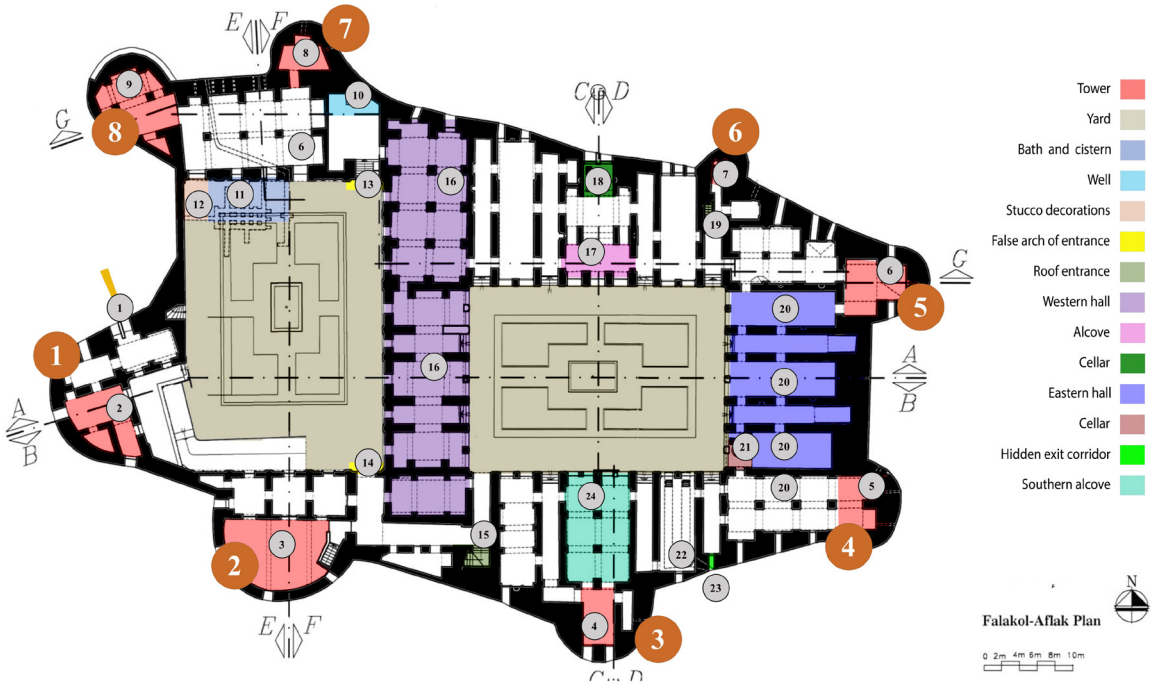

Fig. 5. Castle Map and Spatial Usage. Source: Authors.

Fig. 6.View of the Falak-ol-Aflak castle's courtyard. Photo: Arash Mirsepasi, 2020.

Table 2. Area and Percentage of Space for the Two Courtyards of Falak-ol-Aflak Castle. Source: Authors.

Castle perimeter	Castle area	Area of the first yard	Area of the second yard	Percentage of yard space
60.228 meters	5300 square meters	697.5 square meters	609 square meters	24.6

• Architectural-spatial characteristics of the Castle, and analysis of passive defense components

Falak-ol-Aflak Castle, which has been used throughout history as a military fortress or a secure refuge, has distinctive architecture, and its walls are tall or, in other words, defensive (Fig. 20). The materials used in the construction of the castle include brick, stone, clay, gypsum mortar, and lime. Its overall shape is a regular pentagon, and its walls absorb moisture. For added safety inside the castle, there are cavities to drain water and wooden cladding installed on the walls for additional protection (Beiranvand, 2020, 8).

• Spatial organization design

The structure of the building, the spatial distribution of elements, their combination, and their primary functions, which constitute the structure of the castle, play a significant role in its vulnerability to various incidents, especially threats. Additionally, the structure's fabric, geometric shape, area, dimensions, and size, as well as the proportion of dimensions in relation to usage, are important criteria for assessing resistance and vulnerability. The impact of these characteristics directly affects the vulnerability coefficient and efficiency. Moreover, the pattern of combining open and closed spaces and the security level provided as an open space are among the most important criteria for performance evaluation. On the other hand, the level of enclosure also affects vulnerability (Kazemzadeh Raeef & Mirdrikvandi, 2019, 8). In addition to the mentioned factors, the ease of meeting basic needs can also be evaluated as part of the structural fabric.

• Ease of meeting vital needs

The purpose of implementing passive defense plans is to reduce the vulnerability of human forces and critical and sensitive national facilities and equipment, despite hostile and destructive enemy attacks, and to ensure the continuity of infrastructure activities, vital needs, and the functioning of the country in crises caused by war. One of the important principles in passive defense is the ease of access and provision of vital needs, which has been considered in previous eras as well. Among these vital needs is the provision of drinking and non-drinking water resources .This principle has also been considered in this architectural masterpiece, including the mysterious well of the castle for water supply. At the northern end of the first courtyard of the castle, next to Tower No. 7, there is a well that supplies water to the castle. The well has a depth of 41 meters. The mouth of the well is four-sided, with each side measuring 2.75 meters, and up to a depth of 10 meters, the well walls are made of stone and brick, while the remaining 31 meters are carved into the rock. An important point to note about this well is that it is carved into the rock upon which the castle is built (Figs. 7 & 8). The original builders of the castle were able to solve one of its fundamental problems, which was water supply, by precise calculation.

• The enclosed, defensive, and compact structure of Falak-ol-Aflak Castle

The Falak-ol-Aflak Castle is situated on a rocky cliff, and the highest part of it is approximately 40 meters above ground level. This height difference from the ground surface has ensured effective control over all the surrounding areas of the castle. The eight towers of the castle provide a good view of the Khorramabad Valley. These towers are strategically placed along the entire outer wall of the castle, allowing for control over all movements in and out. The defensive walls of this castle cover the castle from an area of 10 hectares, extending from the river coastline in the southeast. Furthermore, the adherence of the building's geometry to the topography of the land, rocks, and hills on which the castle is constructed, with an east-west length, has resulted in the irregular pentagonal shape of the castle. This condition

has also influenced the eight towers, some of which are large and others of smaller dimensions. As a result, the castle's structure does not possess a symmetrical plan and layout (Fig. 9). Another interesting feature in the architecture of this castle is the presence of battlements and openings on its towers, which served their purpose during enemy attacks and military operations in the past. It can be said that the most important towers in Falak-ol-Aflak Castle, namely the Seljuk Tower and the Northern Tower, have been crucial in their defensive role against enemy attacks due to their favorable location (Fig. 10).

In the southern sections of the castle, where the rock is approximately 10 meters lower than the northern sections of the castle, a wooden cladding method has been used for the stability of the walls and structures. In this method, wooden beams are horizontally incorporated into the body of the walls and towers. For example, in Tower No. 4, there are over 50 wooden beams. The foundation of the castle towers is made of stone, accompanied by lime, with a height of 5.5 meters. The lower 2.5 meters form the substructure, while the upper 3.3 meters consist of finely cut limestone façade stones (Baba Abbas stone). The construction of Falak-ol-Aflak Castle, based on an anti-dampness and moisture system, is one of the wonders and architectural intricacies of this structure, which has contributed to its preservation and durability throughout history. Therefore, the reason for building Falak-ol-Aflak in the highest point of Khorramabad city might be this very aspect. This feature has directly exposed the structure to wind gusts, allowing for permeation at its foundations and consequently aiding in the drying of the building from dampness and moisture. The Khorramabad River also served as a protective moat-like feature in the southern part of Falak-ol-Aflak Castle. Furthermore, the castle is surrounded by formidable ramparts covered with vegetation, making access to Falak-ol-Aflak more difficult.

Fig. 7. Space of the castle's well. Photo: Arash Mirsepasi, 2020.

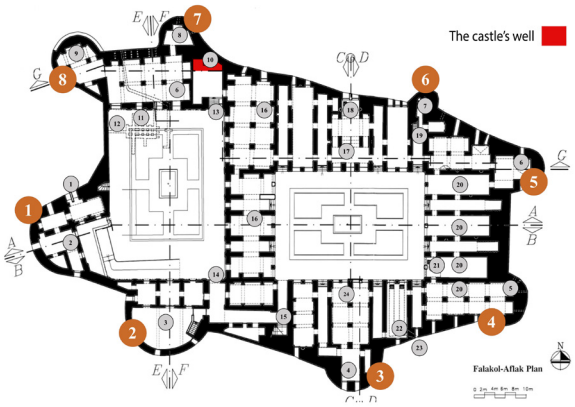

Fig. 8. The castle's well. Source: Authors.

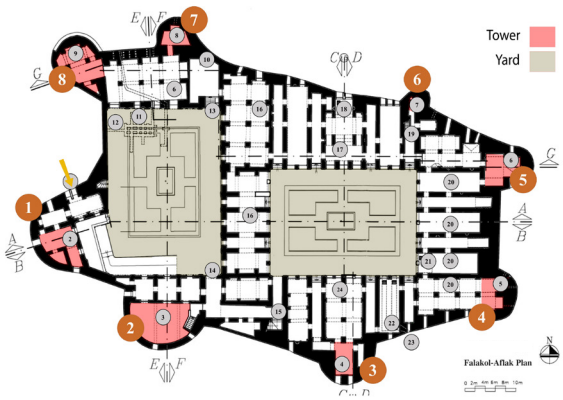

Fig. 9. Asymmetrical Towers of the Castle and Non-symmetrical Plan. Source: Authors.

Fig. 10. Battlements and openings on castle's towers. Source: www.fa.wikipedia.org.

• Escape routes

Falak-ol-Aflak has witnessed difficult, bitter, and even terrifying days in various periods. This castle has two courtyards and can accommodate 300 refugees. One of the interesting features of Falak-ol-Aflak Castle is the presence of hidden escape routes on the southern side and underground spaces on the northern and eastern sides (Figs. 11, 12 & 13). This principle of passive defense has also been observed in this complex.

• The principles of cover, camouflage, and concealment

These principles refer to the harmonization of the color and shape of installations and equipment with the surrounding environment. It is one of the most effective and common methods of passive defense (Vafaei & Hashemi Fesharaki, 2012, 14). Concealment acts as protection against enemy observation, while camouflage reduces the likelihood of detection of forces, equipment, and installations. Creating hidden and winding passages and indirect routes is among the measures taken to provide cover, concealment, and camouflage (Amanpour et al., 2016, 9). In the historical Falak-ol-Aflak Castle, the principle of cover is also incorporated into the spatial design. The presence of winding passages, access points, and hidden corridors supports this interpretation (Fig. 14).

Fig. 11. Location on the Hill. Source: www.salameno.com.

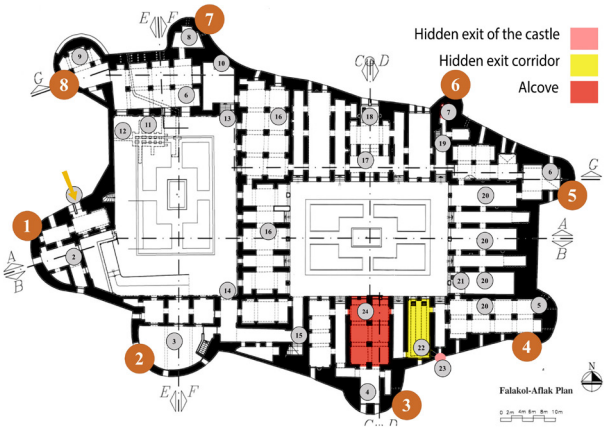

Fig. 12. Existence of Escape Routes. Source: Authors.

• Obstacles

The Falak-ol-Aflak Castle, being constantly used as a governmental seat throughout various historical periods, falls into the category of a governmental fortress. The height of the tallest wall to the level of the hill is 5.22 meters, and its total area is 5,300 square meters. The old access route to the castle was from the southern side, and remnants of this route can still be found on the rock slope, measuring approximately 5.20 to 6 meters in width. The rock has been cut and leveled in this section. Currently, the slope percentage of this route and the method and details of its stone pavement are uncertain due to being covered by construction debris that has been discarded from the castle. However, the traces of this route, approximately 40 meters in length on the hill slope with a gentle gradient, are clearly visible. In a section of the route, the rock has been cut and a pathway has been created (Fig. 15).

• The architectural elements of the castle

The castle is situated on a rocky cliff, and the highest point of the castle is approximately 40 meters above ground level. This significant difference in elevation from the surrounding areas ensures effective control over the entire vicinity of the castle, which is crucial

Fig. 13. Hidden Passageways. Photo: Zainab Baharond , 2023.

for defense and security. Additionally, the towers of the castle are strategically positioned along the outer walls, allowing for control over all movements through them. In the Falak-ol-Aflak Castle, after the entrance gate, there is an octagonal space followed by a corridor that leads to the first courtyard. On both sides of the octagonal space, some areas are likely to have served as guard stations, and behind the space on the right side, there is a small chamber believed to have been used by the guards. Furthermore, on the right side of the corridor, there is a space that is approximately 70 centimeters lower than the corridor floor, but its specific purpose is unclear. These factors collectively provide sufficient dominance and control over the entrance and exit points of the castle, which are among the most important principles of passive defense (Figs. 16 & 17).

On the other hand, the design of the pathways was in accordance with defensive principles, creating a series of winding passages to prevent easy penetration and disruption. This feature created a defensive fabric. Additionally, the covered pathways with low-height coverings not only hindered the movement of infantry but also reduced the enemy's ability to effectively utilize certain weapons, especially projectile weapons. This aspect has been well-preserved in the historic Falak-ol-Aflak Castle (Figs. 18 & 19).

The principle of fortification is implemented through various methods. The materials used in the construction of this castle include stone, large red bricks, adobe, gypsum, and lime mortar. In the Falak-ol-Aflak Castle, the external façade of the ramparts and towers is built with a proportional slope from bottom to top, gradually

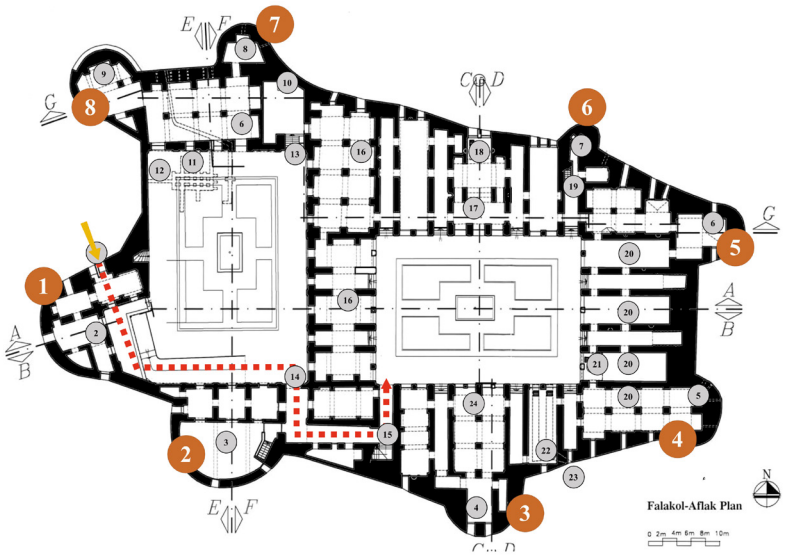

Fig. 14. Winding Passages. Source: Authors.

Fig. 15. Access Route to the Castle. Source: www.parstoday.ir.

reducing in thickness from the lower sections to the upper parts. Furthermore, the castle's coverings are designed in a way that distributes the weight of the coverings towards the interior and terminates at the corners of the structure with four-sectioned domes. This effectively neutralizes the heavy pressure of the dome and vault coverings on the exterior walls. The walls of Falak-ol-Aflak Castle are made of lime to withstand moisture. In the upper sections of the castle, beneath the vault and dome coverings, windows are embedded in the body of the structure, which, based on conducted investigations, indicate the role of structural balance or pressure distribution. All these factors not only ensure the safety of the residents but also contribute to the castle's stability against significant events. Additionally, the construction of elevated and inaccessible structures has been considered, emphasizing the adherence to defensive principles in the Falak-ol-Aflak Castle. Fig. 20 illustrates load-bearing and non-load-bearing walls in the castle.

Compact structure is also an important component of passive defense. By organizing the building's elements around one or more central courtyards, the structure is separated from the outside world, with only an octagon connecting them .Considering the military nature of the fortress and the threats that jeopardize its security from the outside, the construction needed to be inward-oriented, similar to other castles and fortresses. On the other hand, unifying the various elements

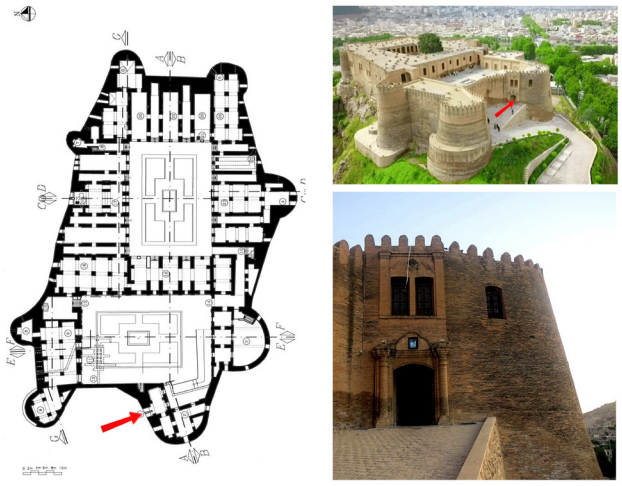

Fig. 16. Main Entrance. Source: Authors.

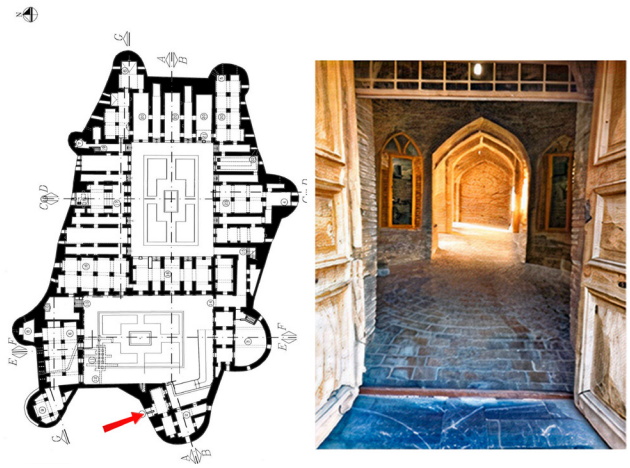

Fig. 17. The Octagonal Entrance. Source: Authors.

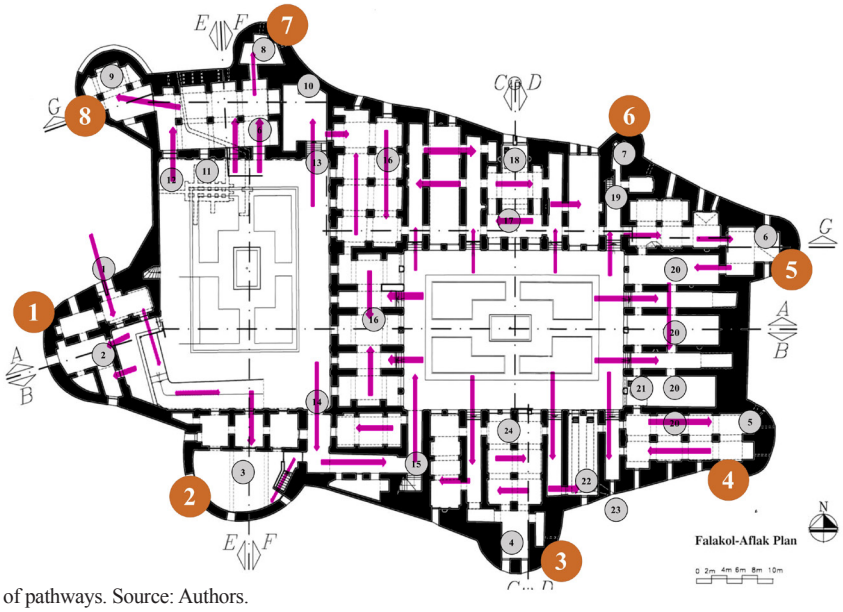

Fig. 18. Direction of pathways. Source: Authors.

present in a structure has always been a focal point (Heidari & Taghipour, 2019, 80-84). This was achieved through the use of two central courtyards, and all the spaces were arranged around these courtyards in such a way that the entire structure appeared as a unified whole (Fig. 21). This feature, from the perspective of passive defense, aligns with the principle of deception.

Furthermore, the construction of hidden shelters is also among the measures that have been taken to adhere to the principle of concealment. In the architectural design of Falak-ol-Aflak Castle, this matter has been considered to emphasize the importance of the principle of concealment. Additionally, a three-dimensional model of the castle is shown in Fig. 22, and an overview of the components is depicted in Table 3.

Conclusion

The evolution of castle and fortress architecture in Iran throughout different historical periods has been influenced by various factors such as climate, culture, religion, skills, and more. However, the formation of any structure (governmental, urban, or architectural) is primarily driven by the practical needs of the people and plays a fundamental role. Security has been one of the

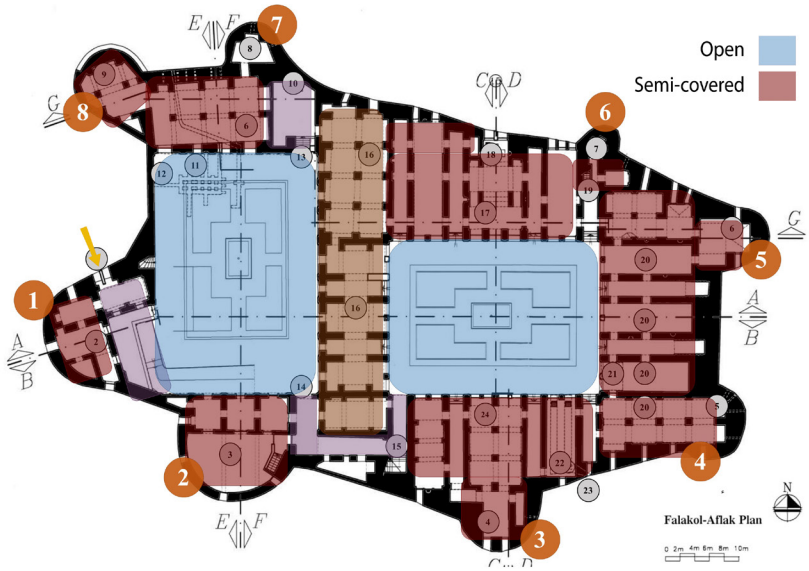

Fig. 19. Open and Semi-Covered Spaces. Source: Authors.

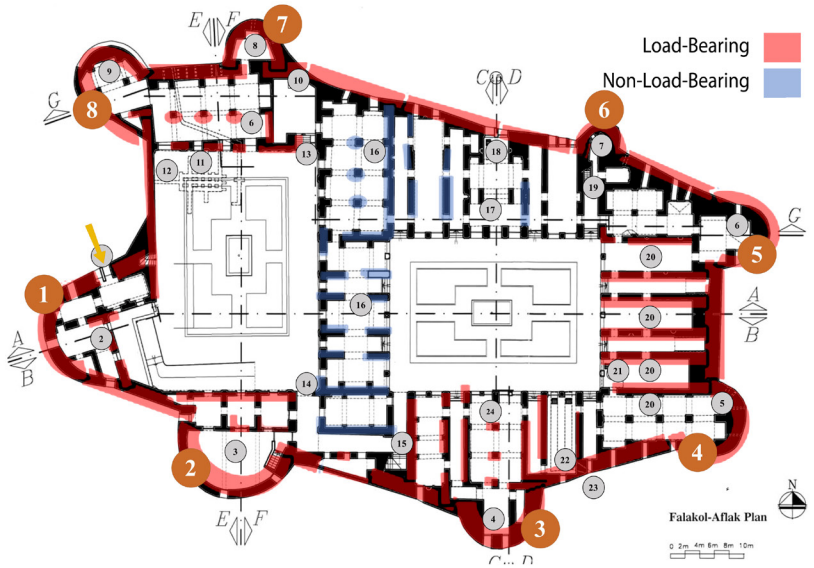

Fig. 20. Load-Bearing and Non-Load-Bearing Walls in the Fortress. Source: Authors.

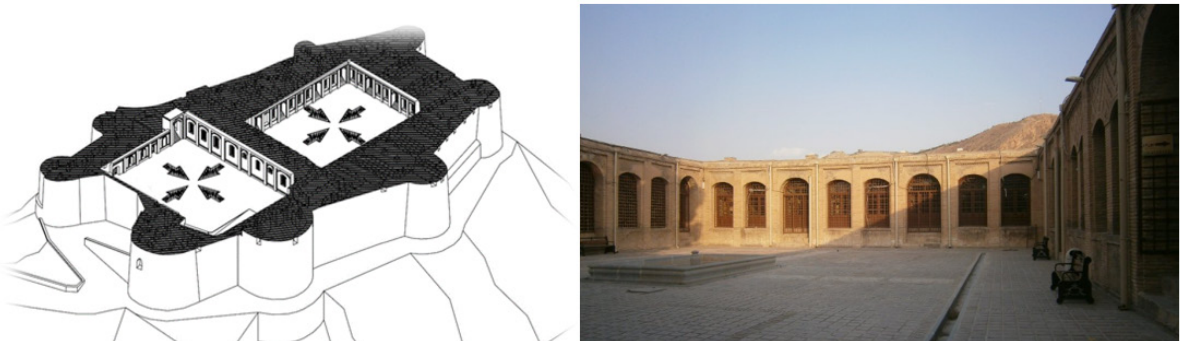

Fig. 21. Inward Orientation in the Falak-ol-Aflak Castle. Source: Authors.

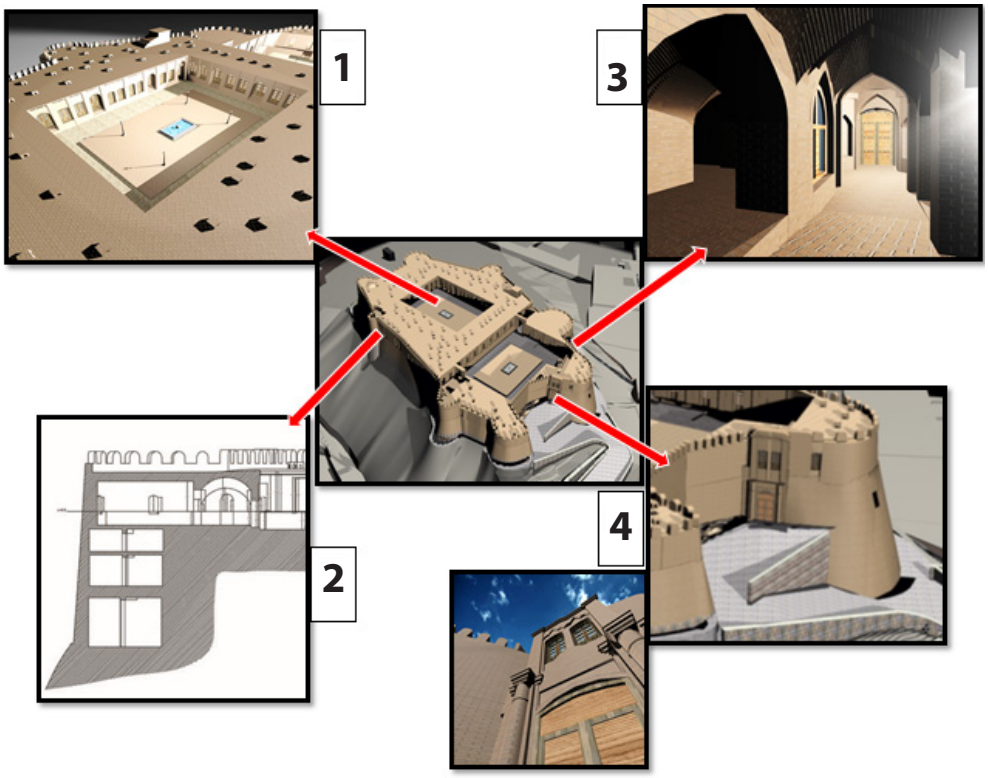

Fig. 22. Three-Dimensional Model of the Castle; 1- Enclosed and Compact Defensive Structure (Inward Orientation); 2- a) The 40-meter height difference of the tower from the ground level and suitable visibility for controlling the surroundings, b) The northern and Seljuk towers are the most important towers in terms of defense location; 3- Covered pathways providing disruption in infantry movement; 4- a) Break of structure in the entrance space and no direct view into the complex, b) Existing space above the entrance for monitoring external entry into the courtyard. Source: Authors.

most essential needs of the people, ensuring stability and economic prosperity, and fortress architecture has been shaped accordingly to provide security.

The present study indicates that the physical fabric of the historical fortress of Falak-ol-Aflak is in a suitable condition in terms of the principles of passive defense. The spatial organization of this fortress has employed measures to enhance its defensive capabilities and reduce potential vulnerabilities during crises. Important measures include facilitating the provision of vital needs, designing a decentralized residential layout, creating a defensive and compact structure, and establishing escape routes. For example, the presence of a well and water reservoirs and storage spaces has been arranged to easily meet vital needs. The fortress also features a compact and inward-oriented structure, with characteristics such as elevated winding pathways and hidden accesses, allowing residents to seek refuge and

Table 3. Principles and Components of Passive Defense in the Historical Castle of Falak-ol-Aflak. Source: Authors.

The principle of passive defense in the historical castle of Falak-ol-Aflak.						
Spatial organization design						Design of architectural elements
Principles of dust protection	Establishing escape routes	Enclosed, defensive and compact fabric	Ease of meeting vital needs	The principle of deception	The principle of cover (camouflage and concealment)	Angular access to interior spaces, An upper room at the entrance for monitoring traffic, The lower level of the courtyard compared to the surrounding pathways, Structural reinforcement through connection and adjacency, Inward orientation, Hidden passageways
Non-operating defense components	The existence of secret underground passages	The difference in yard level, winding passages, inward orientation	The existence of a well for water supply, reservoir and bathroom	Passages and winding pathways	Winding passages and accesses and secret passages	

concealment. Regarding structural reinforcement, the external walls and towers of the Falak-ol-Aflak castle are constructed with a gradual incline from bottom to top, providing stability and durability. Additionally, the diameter of the walls gradually decreases from the bottom to the upper parts. The compact and inward-oriented nature of the castle aligns with the principle of deception. Falak Ol-Aflak castle is situated on a rocky hill, with the highest point approximately 40 meters above ground level. This significant elevation difference ensures effective control over all surrounding areas. The nearby Khorramabad River, located in the southern part of the fortress, acts as a natural defensive barrier like a moat. Thus, the principle of strategic positioning, an essential principle of passive defense, has been adhered to in the construction of this castle.

Architects have made optimal use of natural features and geographical conditions, minimizing architectural elements and reducing construction costs. The fortress's inward-oriented design shares similarities with other fortresses in terms of utilizing structural elements for security purposes, as seen in the construction of Falak-ol-Aflak fortress. Security, which guarantees lives, was considered an indicator of the political and economic power of the government. Architects have utilized environmental conditions, climatic factors, geographical features, and architectural elements to establish or enhance security, depending on the type and importance of trade routes. Furthermore, in the design of architectural elements and details, principles aligned with passive defense have been taken into account. For example, one can mention indirect access to interior spaces, the lower level of the courtyard compared to the pathways, and structural reinforcement through the connection and adjacency of buildings to reduce vulnerability and ensure safety in the historical fortress of Falak-ol-Aflak.

Conflict of Interest

The authors declare that there was no conflict for them in conducting this research.

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HOW TO CITE THIS ARTICLE

Hayaty, H., & Baharvand, Z. (2025). An Analysis of the Defensive Features of the Falak-ol-Aflak Castle From the Perspective of Passive Architectur Defense Principles. *Journal of Art & Civilization of the Orient*, *12*(46), 28-41.

DOI: 10.22034/JACO.2024.419191.1354
URL: https://www.jaco-sj.com/article_202838.html?lang=en