

Castles in Jordan: A Comparative Study of the Islamic and Crusader Castles

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Abstract Castles have always been considered the preoccupation of most civilizations in history, especially in Jordan, which is characterized by being a bridge linking civilizations. The architectural systems used in the formations and the design of the spaces that make up these castles formed the most important structural features of walls, ceilings, openings, and building materials, which are still standing until today. This makes it an experiment worth studying to deepen understanding and provide an additional benefit in Jordan's cultural heritage field. Castles in Jordan vary according to the era of their construction and expansion, so they can be divided into Islamic castles and Crusader castles, which differ in their characteristics, methods of construction, purpose, and architectural features. For more accurate details and thus the ability to compare these two categories depending on the determinants of the purpose of the castle building, the location, and the method of construction, this paper adopts the descriptive analytical method in addition to the comparative method. Ajloun Castle, Shobak Castle, Karak Castle, and Aqaba Castle were selected as case studies. The paper reviews a set of previous studies that contributed to documenting these castles, but none of them went into detail and provided a clear architectural comparison between these two types of castles, and here comes the importance of the paper. The study concludes with a set of differences between the castles in addition to a set of similarities. Despite the difference between these castles in

some functional spaces, as the Islamic castles contain a chapel and the Crusader castles contain churches, many similarities were observed, which include the use of local building materials and the need for wells and fortified walls. These results contribute to increasing an understanding of the nature of castles in Jordan. This, therefore, helps decision-makers and designers to conserve and preserve the castles in Jordan by determining the main features and characteristics of the Islamic and the Crusader castles based on the function and the nature of their uses.

Keywords Castle Architecture, Architectural Cultural Heritage, Islamic and Crusader Castles

1. Introduction

Jordan is a country with a rich history, and it has been home to numerous civilizations throughout the ages. The region has been inhabited by humans for over 10,000 years, and over time, various civilizations have left their marks on the landscape. The most notable civilizations that have existed in Jordan include the Nabataeans, Romans, Byzantines, Umayyads, and Ottomans.

Jordan represents a bridge linking ancient civilizations, the most important of which is Mesopotamia and Egypt, and links the two most important trade routes in the world.

Firstly, the Silk Rout from Asia through China to Mesopotamia, Iran, Syria, Turkey, and then Egypt - Europe. Secondly, the spice and incense route started from Africa, India, and Yemen to Mecca, Egypt, Iraq, through Jordan, especially the Nabatean kingdom "Petra" [1]. Numerous prehistoric settlements, biblical towns, Crusader castles, Christian mosaics, Nabatean temples, Roman fortresses, Islamic towns, and many more archaeological sites are found along Jordan's ancient routes. These Jordan's ancient routes are; (1) The King's Highway which considers the original road built over 5000 years ago as a part of the prehistoric network of trade and caravan routes that ran through Jordan [3]; (2) The Frankincense route which connects Egypt and the Persian Empire with Arabia, Oman, and Yemen, which were mostly ruled by the Arabs for more than 5000 years ago [4]; (3) The Via Traiana Nova which is an old Roman route constructed by the emperor Trajan as a continuation of the Appian, which connects Busra in Syria with Ayla (modern Aqaba) on the Gulf of Aqaba and is reached after passing via Philadelphia (Amman), Charachmoba (modern Karak), and Hauora (modern Hamayma).

The strategic location of Jordan on these ancient roads in addition to its rich history of civilization has left its mark on the country's architecture, resulting in a diverse range of architectural styles [3]. The Nabataean Kingdom left a mark on Jordan's architecture with its rock-cut buildings, particularly the city of Petra. The Roman period witnessed the construction of numerous cities throughout Jordan, including Jerash and Amman. Roman architecture was characterized by its use of arches, columns, and vaults, and many of these elements can be noted in the ruins of Roman structures in Jordan. The Byzantine period also witnessed the construction of numerous churches and monasteries throughout Jordan. Byzantine architecture was characterized by its use of domes, mosaic art, and intricate stone carvings. The Islamic period witnessed the rise of Islamic architecture in Jordan. Islamic architecture was characterized by its use of geometric patterns and calligraphy [6]. This rich history can be observed in numerous prehistoric settlements, biblical towns, Crusader castles, Christian mosaics, Nabatean temples, Roman fortresses, Islamic towns, and many more archaeological sites found along Jordan's ancient routes.

Castles have always been considered the preoccupation of most civilizations in history, especially in Jordan, which is characterized by being a bridge linking civilizations. The construction of castles and fortresses in Jordan was for political, economic, and military purposes, as there are many castles, military fortresses, and desert hunting palaces in the Umayyad Islamic period. The region of Jordan is considered a bridge that links ancient civilizations, such as Mesopotamia and old Egyptian civilization, and whoever controls this region owned the keys to the continents, Europe, Asia, and Africa [3]. The construction of castles was often associated with circumstances of war, especially during attacks on the

Levant and Egypt by the Crusaders and Mongols. In these situations, parties in conflict designed a specific style of architecture represented by castles and defensive walls to confront such events. The location of these castles was chosen with great care in different locations as follows; (1) on the mountain tops to ensure control, supervision, security, and protection, such as in Ajloun, Salt, Karak, Tafila, and Shobak castles; (2) on the seashore like in Aqaba, which overlooked sea and land routes connecting Egypt to the Levant with the Hijaz; or (3) on the desert's edge to control trade caravan routes, as in Azraq Castle, which controlled roads between Iraq, the Levant, and the Hijaz[8].

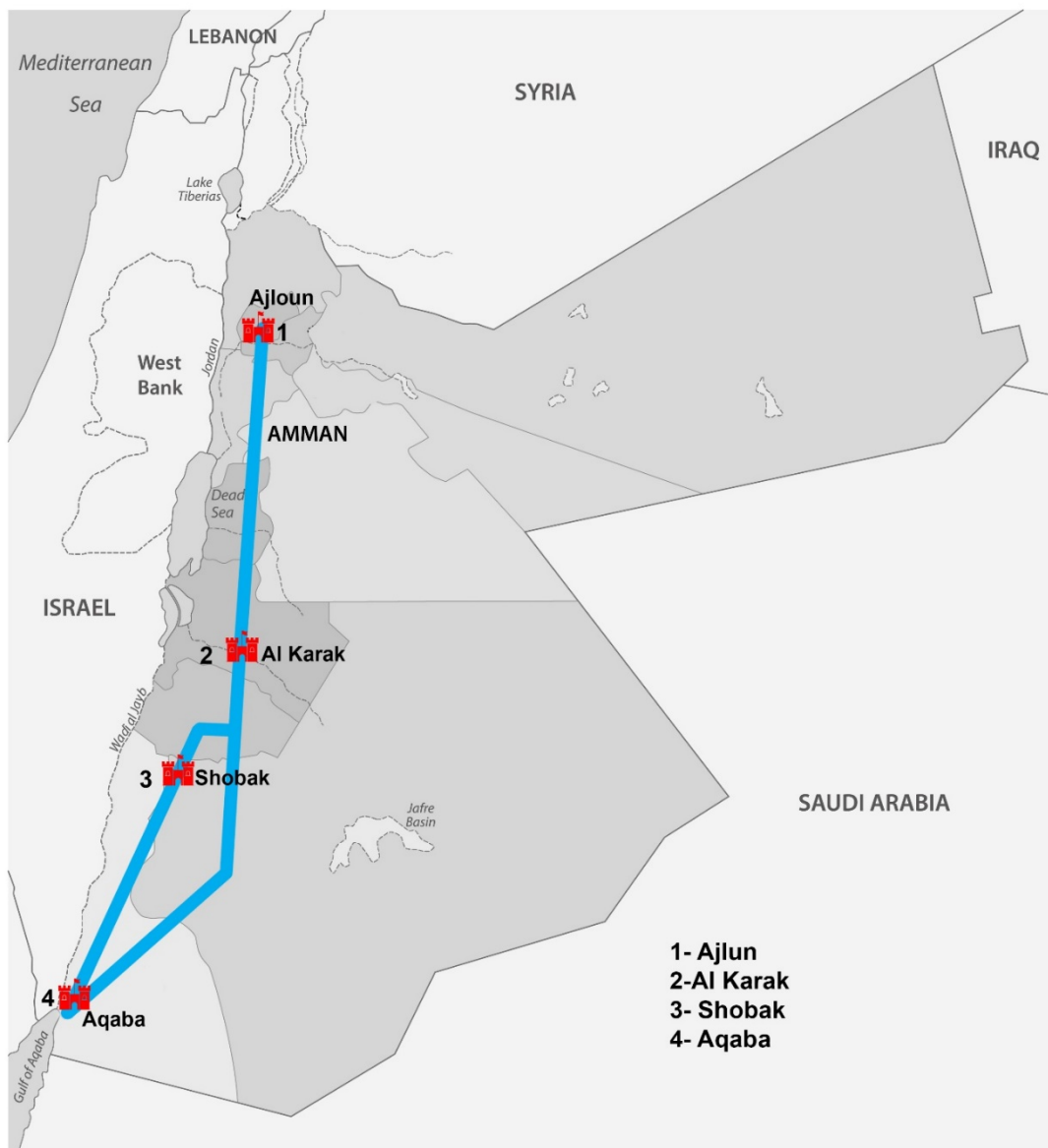
In general, castles are divided into three types depending on the function of the castle and the nature of its use. The first type is called the pilgrimage castles, the second type is the coastal castles located on the shores of the sea, and the third type is the rural inland castles located between fiefdoms that guarantee military control [9]. The different types of castles were reflected in their layout. The rural castles are distinguished by their square plan with prominent defensive towers at the level of the main wall of the castle so that the defenders can be closer to the attackers through the emergence of these towers outwards. As for the pilgrimage castles, the castle can be surrounded by another external wall from all sides, and there may be a distance between the towers and the external wall that surrounds the castle.

In Jordan, Castles vary according to the era of their construction and expansion, so they can be divided into Islamic castles and Crusader castles, which differ in their characteristics, methods of construction, purpose, and architectural features [2, 11]. The Crusader castles built by the Crusaders in Jordan in general are a prominent example of Crusader architecture. The castles were characterized by defensive fortifications. The mountain castles are distinguished by the fact that they contain cisterns for all rainwater inside the castle walls. The Crusader castles were built on a religious basis. Therefore, these castles are famous for having churches for worship, especially the Latin churches for which their settlements were famous. Karak Castle and Shobak Castle are excellent examples of Crusader architecture in Jordan, showcasing the unique blend of defensive and religious elements that characterize these fortresses. On the other hand, Islamic castles represent military architecture in Islamic civilization, often built on top of a mountain or overlooking the sea. Islamic castles served as residences, fortresses, prisons, armories, houses of money, and local government centers. The castle's outer walls were surrounded by jagged balconies and defensive walls, and these jagged balconies protrude from above the walls. Additionally, there are narrow chambers in the towers that were erected dimensionally along the walls. Ajloun Castle and Aqaba Castle are excellent examples of Islamic architecture in Jordan. Therefore, the architectural systems used in the formations and the design of the spaces that make up these castles

formed the most important structural features of walls, ceilings, openings, and building materials, which still standing until today. This makes it an experiment worth studying to deepen understanding and provide an additional benefit in Jordan's cultural heritage field.

Given the above, the aim of the study is to explore how castle architecture, which is an integral part of the historical sites affects the function and the nature of their uses. This was achieved by determining the main features and characteristics of the Islamic and the Crusader castles based on the function and the nature of their uses. This question was examined by using case studies in Jordan, which were selected based on the castle's function and the nature of its use. This research used a full-scale survey and analysis from the standpoint of Universal Design of the

selected architectural archeological sites in Jordan. The study uses four cases in four cities in Jordan with different conditions, are; Ajloun, Karak, Shobak, and Aqaba. This paper adopts the descriptive analytical method by using researcher observations in addition to the comparative method. Ajloun Castle, Shobak Castle, Karak Castle, and Aqaba Castle were selected as case studies as shown in Figure 1. These castles were selected because of their location on Jordan's ancient routes, their different architectural design references, their function, and the nature of their use. The paper reviews a set of previous studies that contributed to documenting these castles, but none of them went into detail and provided a clear architectural comparison between these two types of castles, and here comes the importance of the paper.



Source: Public archeological Department, 2022. Modified by the authors

Figure 1. Map of the 4 castles' locations in Jordan and their connections to the ancient routes

2. Data and Analysis of Castles Architecture in Jordan

Summer Road (The King's Highway) linked Jordan's ancient castles (Ajloun Castle, Shobak Castle, Karak Castle, and Aqaba Castle) which crossed Jordan from north to south. Summer Road is located on the mountain range that borders the north with the south [13]. The second road is the winter road, which is the Jordan Valley road to Wadi Araba to the south, reaching the Gulf (Aqaba Castle) and Saudi Arabia. Therefore, this paper examined these four castles in four different locations in Jordan based on their importance and characteristics as follows:

2.1. Ajloun Castle

Ajloun Castle was built in the year 1184 AD. It is an Islamic fortress built on the ruins of a Byzantine church, to be a fulcrum for protecting Muslim pilgrimage routes between the Levant and the Hijaz, due to its supervision over the Jordan Valley and its control over the area between Lake Tiberias and the Dead Sea [13, 10]. Its construction aimed to prevent the spread of the Crusader forces in the Ajloun region, and protect the trade routes with Damascus and northern Syria from the intervention of the Franks, in addition to preventing them from any expansion in the area east of the Jordan River and to control the administrative control of the population of the region [15].

The castle enjoys a strategic location that is difficult to access from the southern side, but it is easily reachable from the other three sides due to the lack of slope in the surrounding terrain. The castle was carved out of the terrain, which provided it with greater strength and fortification [8]. During times of siege, the trench was filled with water to impede the progress of the enemy and aid the castle's garrison in defending against the siege [6]. The practice of surrounding castles with trenches dates back to ancient times, with Muslims and Byzantines both using it to fortify their castles. This practice continued during the Ayyubid and Mamluk eras, as evidenced by the trenches around the Citadel of Aleppo and Homs in Syria, and the Citadel of Cairo [8]. Additionally, the castle features a well on its southeastern side. The construction of wells was an essential aspect of castle building, as almost all castles have them due to their importance in sustaining life for those within [8].

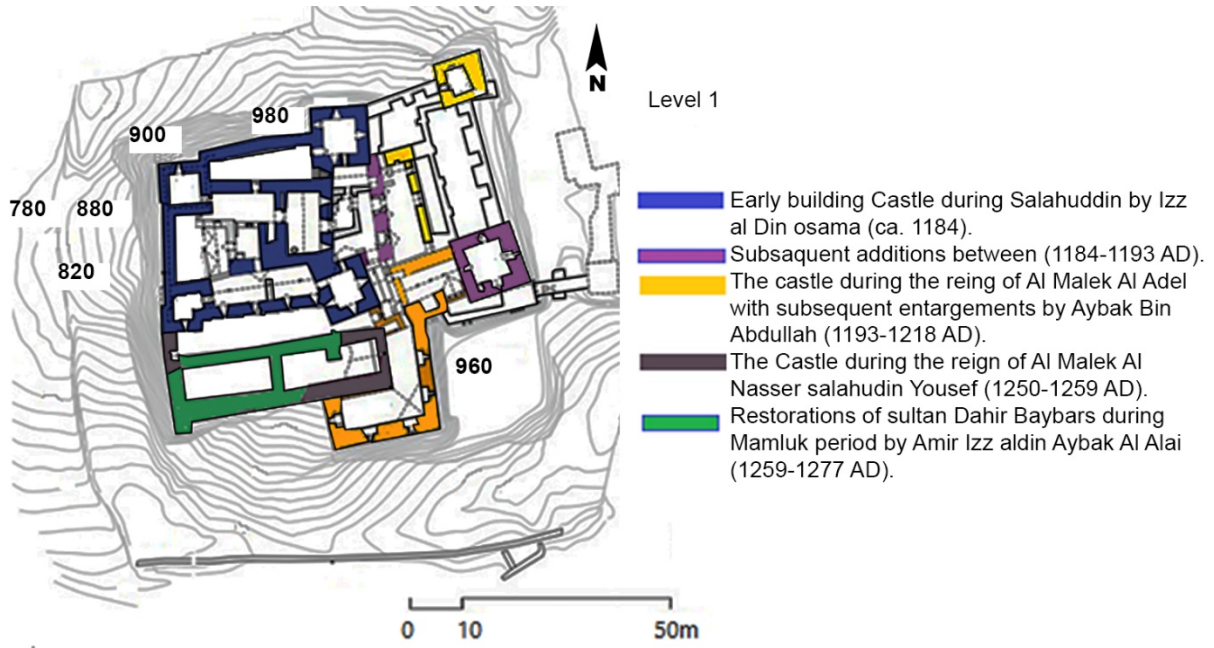
The original section of the castle for the first period of the building is a nearly square, flat structure with four towers at the corners connected by walls. Within the walls of this oldest section, several water tanks were provided, distinguishable from the rest of the building by their crude architectural style, broken-arched windows, and arrow-slit

windows [16]. The second period of construction included the southeastern tower, external doors, and more developed facilities that differed from those of the first period [6]. Decorative elements were added to the castle's arches during the reign of Al-Zahir Baybars, and some of the halls' courses and floors were modified [8].

The castle's entrance is situated on the northeastern facade. The presence of a surrounding ditch necessitated the construction of a movable wooden bridge, which doubled the value of the ditch as a defensive line for the castle. This design choice indicates progress in building strategy among Muslims, as this type of bridge was widely used in most Islamic castles [8]. The castle's main entrance follows the style of twisted entrances, also known as the Bent Entrance. Access to the castle is via the bridge, which leads to a narrow staircase corridor flanked by two walls before turning towards another large gate with two arches.

The castle floor plan dimension is (70m*80m) and consists of four levels. It is standing on the slope of Mount Awf and includes eight towers in addition to a moat, dormitories, cellars, water wells and a prayer hall. Several additions have been made to it through the Ayyubid and Mamlukian periods. The citadel was hit by devastating earthquakes in the years 1837 AD and 1927 AD, but it remained steadfast to be a living witness to the genius of Islamic military engineering. To collect water, as an impenetrable barrier difficult to break into, as well as fortified gates and tall towers, which formed a unique position for observation and defense [15]. The L-shaped tower 7 wraps around the southeast corner of the castle. It was added to Tower 6 for improving fortification at the southeast corner and main entrance to the castle [18]. Each of the three levels of the tower had a different function. The lower level was used as sleeping quarters for soldiers. The third level of the tower was used as a place as shown in Figure 4.

Additionally, there are a set of narrow corridors in the castle and spacious halls that were sleeping quarters for the soldiers and horse stables. As well as the water wells could be accommodated by thousands of cubic meters of rainwater. Figures 2 and 3 show Ajlun castle: plan showing the original structure (1188-1192) with a gateway and early thirteenth-century additions with an inner and outer gateway. Figure 2 also shows the main elements of the castle which are; (1) The moat surrounds the castle at a distance of 440 meters; (2) The movable wooden bridge at the main entrance to the castle; (3) The eight towers of the castle; (4) Al-Mazaghel (arrows shooting places); (5) Water wells, 11 wells are inside the castle; (6) The burning oil droppers in the porches of the main entrance; (7) The prayer hall on the second level; and (8) Halls, dormitories, warehouses, and corridors.



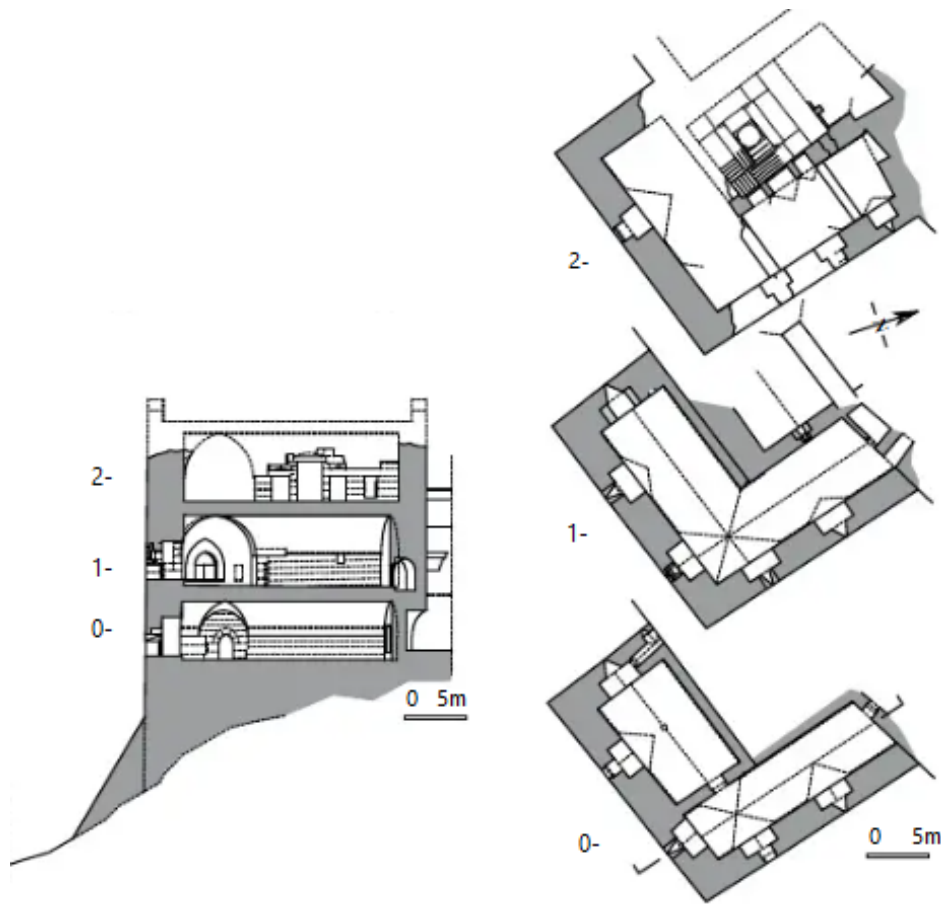
Source: (Yovitchitch, 2006). Modified by the authors

Figure 2. Ajlun castle and stages of construction: floor plan



Source: Authors, 2022

Figure 3. Ajlun castle entrance (the movable wooden bridge)



Source: (Yovitchitch, 2006)

Figure 4. The tower of Aybak, tower 7, plan & section

2.2. Shobak Castle



Source: Khamash, 2022

Figure 5. Al-Shobak Castle “Le Krak de Montreal”

Al-Shobak Castle is located on a single summit of Shara peaks, which rises (1400 meters) above sea level [19]. It is a castle built of white stone overlooking the valley from the eastern side (Figure 5). Shobak Castle was built on the ruins of an old Nabatean fortress and was rebuilt during the

Byzantine period and then Crusaders by Prince Baldwin I during the Crusades period in 1115 AD [12]. Then, it ended with the Islamic forces' control over it (1189) AD during the Ayyubid period [20]. It was also transferred to the rule of the Mamluks, who contributed to the care and restoration of it, and they immortalized the name of Sultan Baybars with the year of restoration on its stones [21]. During the Ottoman era, its military importance began to decline and it became a place for public residence in (1812) AD, which was confirmed by the traveler Hornstein when he visited the area in 1895. It is worth mentioning here that Al-Shobak Castle is one of the most well-preserved castles in the region [22].

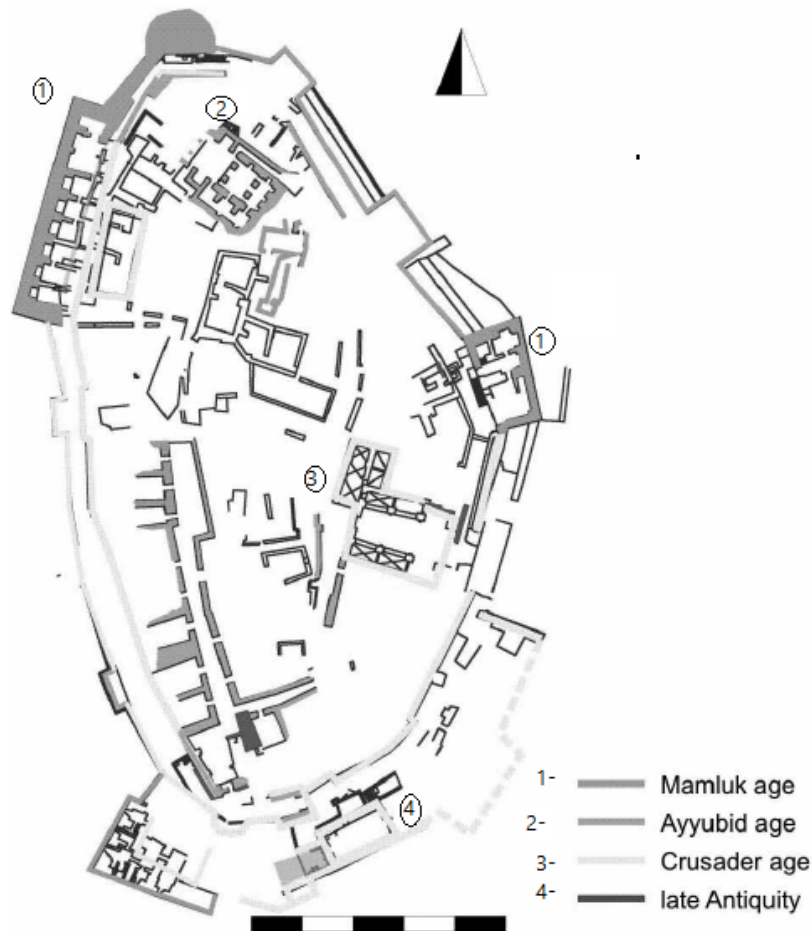
According to Khamash, Al-Shobak Castle “Le Krak de Montreal” was built during the Crusader times. The current name of Al-Shobak Castle relates to both the castle and the cluster of roughly ten neighboring settlements. The castle has passed through several eras after its construction by the Crusaders. One of the towers at the entrance to the castle has magnificent Mamluk Arabic calligraphy on the eastern elevation that dates to the later Mamlukian repair operations in the 1290s (Figure 6). Drap et al, pointed out that some of the Castle's architectural features are European, nearly gothic design, while other elements are

reminiscent of Mamluk Cairo. The most interesting part is how the views of the enormous surrounding environment interact with the castle architecture. The castle is characterized by small windows that make whistling sounds when the wind blows and allows light to enter and reflect on the floors, while the windows of other castle rooms have a majestic view of the surrounding valleys [23].

The Castle has a rectangular shape (175 by 90) and can only be accessed via an ascending spiral path that circles it. The path starts on the western side and then turns to the north and east, where the main entrance is situated. Inside the castle, there are two churches, a press, a mosque, a water tank, a tunnel and a spiral staircase consisting of more than 300 staircases that opens onto a spring for drinking water. The door is close to two locks of molten iron and leads to the interior through a portico. Figure 5 shows that the castle was surrounded by three walls; The third had water springs, the second was for planting wheat, and the last one is the main inner wall, the walls were built of solid gray stones, and some lime stones were used in the construction (Figure 6).

The entrance is a wide rectangular door that culminates in a horizontal threshold at the top [6]. This entrance bears a resemblance to the doors of Mamluk Islamic mosques [25]. The castle is encircled by a massive wall that features semi-cylindrical and square towers. These towers have windows for arrows. The slope of the mountain on which the castle stands is covered with a smooth stone pavement on the outside of the wall. This wall tends to the outside, similar to what is observed in Karak Castle [26]. On the southwestern side, there is a deep well that can be accessed through a staircase in a dark corridor. The well ends with a cave with a spring of water flowing into two pools.

The castle's architectural appearance is distinguished by the use of different colors of materials, reflecting the different working hands that renewed and renovated its structure throughout history. The materials and construction methods used by each period of history are distinguishable, allowing us to differentiate between them. The architectural elements of the Islamic period appear more embellished, with finely crafted masonry rows and carefully arranged stone courses.



Source: Vannini, 2011

Figure 6. Al Shobak Castle site plan

2.3. Karak Castle

Karak Castle is one of the largest castles in Jordan. It has an area of 25,300 square meters and is about 1,000 meters above sea level [27]. Its establishment dates back to the Moabite era and was used by the Nabataeans [28]. In the year (1142 AD), the Crusaders took over the Karak Castle and operations began to strengthen this fortress, to protect the southern side of the Crusaders' control and secure the road between Damascus and Egypt during the Crusades [27].



Source: Public archeological Department, 2022

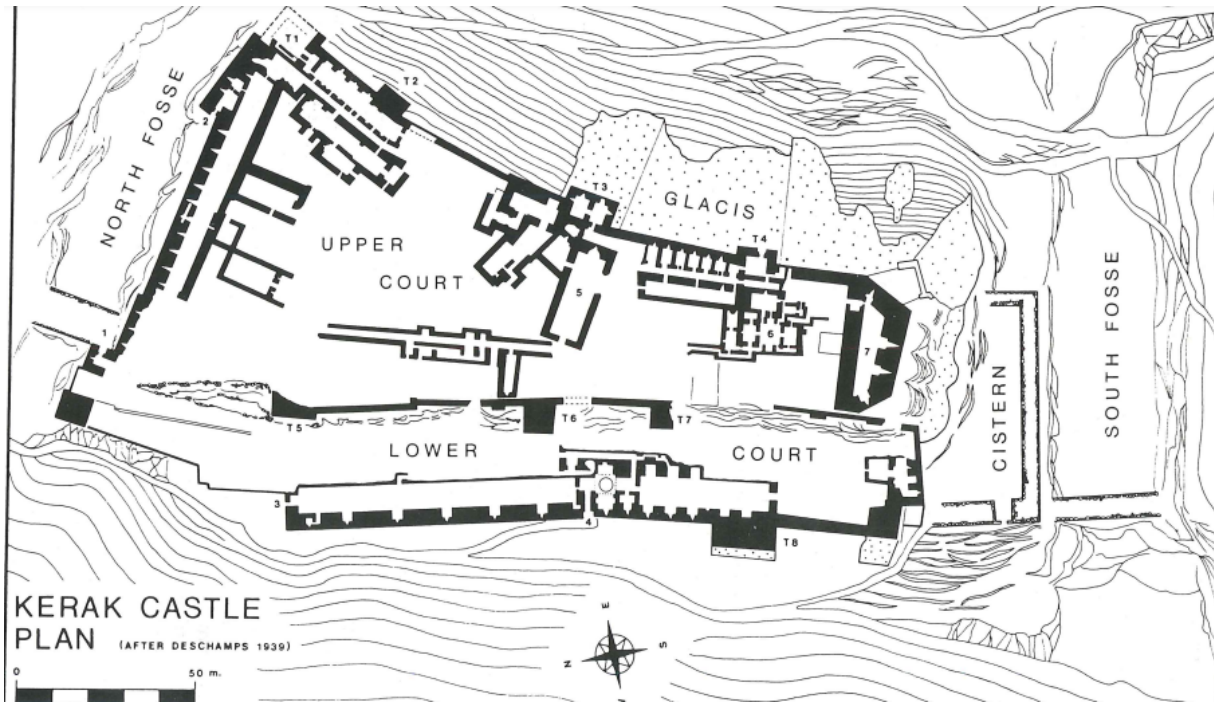
Figure 7. Karak Castle

One of the earliest Frankish castles to adopt a defended tower structure was Kerak Castle, which is also a famous example of Crusader architecture combining western European, Byzantine, and Islamic styles. Figure 7 shows that the castle was built on the southern side of the triangular plateau. The length of the castle is 220 meters, and its width ranges from 125 m on its northern side to 40 m on its southern side, as it overlooks from that side a valley in which a water channel flows (Figures 8 and 7). Additionally, the castle consists of many towers, gates, and entrances, in addition to the Crusader Church, the palace, and fortified rooms, in addition to utilities (Figure 8). Brown [27] pointed out that the Crusaders established massive walls around the castle's perimeter using rough-hewn volcanic stone. The Muslims then utilized limestone from nearby quarries to renovate and enlarge the castle. It is noted that the towers are significantly more

closely spaced apart than at other castles, which improves visibility (Figure 7). Kark Castle adopts the Byzantine tower structure, which consists of square towers the same as those used by the Byzantine Empire, which refers to the placement of the towers at regular intervals along the wall as shown in Figure 7.

This castle is a vast rectangular construction, built with stones that have an inconsistent texture but appear sturdy and cohesive. It is among the castles that boast double walls, where one of them separates the castle from the trench. According to Almomani, the wall's bases exhibit three different types of stone. The first type is slanted to black color, dating back to the Moabite period. The second type bears a similarity in both type and style to the stones present in a castle wall constructed by the Crusaders. The third type of stone is limestone, which dates back to the Ayyubid-Mamluk period. The castle contains six towers, and it features a Bent Entrance with proper lighting and ventilation. The front façade of the castle is safeguarded by a trench that has been carved into the rock and connected to the city through a wooden bridge. This entrance does not lead directly to the castle court; rather, it is perpendicular to another corridor that creates an obstacle for attackers. The entrance leads to a vestibule controlled by arrow-slit windows. The castle has another door on the south side, and it is presumed that another bridge linked it to the southern slope [29]. Additionally, secret doors are embedded in multiple walls of the castle. Numerous arrow-slit windows can be seen along the walls and towers, a set of soldier's rooms, and horse stables. On the southern side, there is a large pool that is filled with rainwater to supply the castle with water, in addition to many other wells scattered throughout the castle.

The Crusader section of the castle was mainly composed of rectangular halls that housed soldiers, as well as other rooms serving various functions and a church with a simple layout. South of the church, there were structures from the Ayyubid period, such as a mosque, school, prison, and bathroom. These structures were characterized by their simplicity, austerity, durability, strength, and meticulous planning and construction, all of which are indicative of Ayyubid architecture.



Source: Brown, 1989

Figure 8. Al Karak castle site plan.

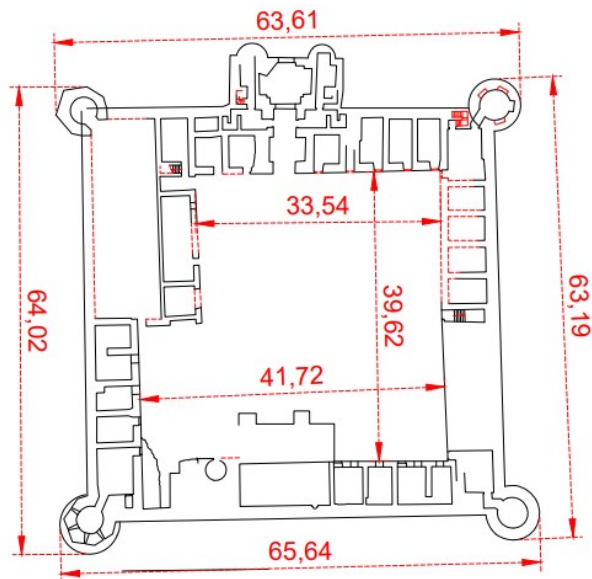
2.4. Aqaba Castle

It dates back to the region of the Mamluke Sultan Qanswahel-Ghawri (1501-1517 AD). While De Cupere et al [31] stated that Aqaba Castle was originally built on the coastline as a Crusader fortress in the 12 century AD, but its permanent structure takes the form of the Islamic Mamluks design that rebuilt it. Its site is purely strategic as it is located on the Islamic pilgrimage route and along the trade route leading from Egypt to the Arabian Peninsula and from Syria to the Red Sea.



Figure 9. Aqaba Castle. Source: Porter, 2012

According to Figure 10, the castle is a quadrilateral shape and its entrance is situated on the northeastern side and features plant motifs carved on the entrance. The castle has a great gate with an arch, from which it enters the courtyard of the castle with vestibules and arches (Figure 11). On the right and left are two large Iwans engraved on their walls referring to the builder of the castle and the one who restored it, the Mamluk Sultan Qansuh Al-Ghourri (1501-1516) (Figure 10). The vestibule of the main gate block of the Aqaba Citadel is covered by a stone dome carried on inverted spherical arches and triangles as shown in Figure 10. In the middle of the castle is an inner courtyard with a clear presence of pointed arches, and also it is surrounded by external walls (Figure 11). As for the towers, their horizontal location is characterized by being octagonal and semi-circular in shape. Above the main castle gate, stone columns in the form of carved horns are expected, decorated with stalactites and vegetal decorations (Figures 9 and 11). The entrance is flanked on both sides by two circular towers. The stones on the right tower are blackish-marine stones, while the left tower is constructed with white limestone. Inside one of the towers is a carved artistic painting, featuring the image of two lions, which is considered the main decorative element in the castle. Such a depiction of two lions was also seen on one of the towers in Karak Castle, the Citadel of Aleppo, and the fort.



Source: Public archeological Department, 2022

Figure 10. Aqaba Castle plan



Source: Public archeological Department, 2022

Figure 11. Aqaba castle

The castle interior includes three vestibules, multiple rooms, and a mosque. It is noteworthy that the towers in Aqaba Castle do not provide the same level of comfort required for the castle garrison due to their design and small area, which makes it less effective compared to Karak Castle, Al-Shoubak, and Ajloun. This is because of its location on a flat and coastal area, whereas the other castles are located on higher ground, providing greater protection and control capacity.

3. Results and Discussion

This study compared the main architectural characteristics and details of the castles as shown in Table. 2. Table 1 and Table 2 show that Al-Shobak Castle was the

oldest castle in construction date, followed by the Karak Castle, then Ajloun Castle and Aqaba Castle [36]. Two of them were built by the Crusaders (the Shobak and the Karak castles), and the other two the Ajloun and Aqaba Castles were built by Muslims. Shobak Castle incorporated in its outline design several architectural features such as three churches, a press, a mosque, a water tank, a tunnel, drinking water springs, three long walls, towers, bathrooms, cisterns, and a large Iwan (Table 2). The Karak Castle was distinguished by the moat, stone wall, gates, towers, chapel, palace, underground wells, courts, and utilities (Table 2). Table 2 shows that Ajloun Castle incorporated the moat, a movable wooden bridge, towers, the Al-Mazaghel (arrows shooting places), eleven water wells, the burning oil droppers in the porches, prayer hall on the second level, halls, dormitories, warehouses, and corridors. Aqaba Castle had a courtyard, two large Iwans, the main gate, a stone dome, external walls, octagonal and semi-circular towers, stone columns and stalactites and vegetal decorations (Table 2).

Additionally, Shobak and Karak Castles were placed at the top of two different mountains where their layout was irregular following the contours of the landscape. Contrary to the other two castles, the Ajloun and Aqaba Castles followed a square layout plan similar to other Islamic architectural buildings. The entrances to these castles were different. Ajloun and Shobak Castles used a pointed arch, while the others the Karak and Aqaba Castles used half circular arch. The interior corridors were almost the same at the Ajloun, the Shobak and the Karak Castles were half-round arches and barrel vaults used, while the Aqaba Castle used the pointed arch and barrel vaults. For the protection towers, Shobak Castle made use of square and rounded plan protection towers, while the Karak Castle used square protection towers. Ajloun Castle also made use of square plan protection tower contrary to the Aqaba Castle which used only a semi-circular and octagonal plan protection tower.

As well as, several types of openings and arches were used in the four abovementioned castles, among them the pointed arch at the Ajloun Castle, the half-circle arch at the Karak and Shobak Castles, and the rectangular opening at the Aqaba Castle. The stairs inside the four castles were almost similar in shape, type, size and material. They were narrow and made from stone. Architectural details were different in the four castles. Double walls were used in some places at the Ajloun Castle. The half arch was used at the Shobak Castle. Small rectangles were used besides the large opening at the secondary entrance at Karak Castle. Some ornamentations were used at the entrance of the Aqaba Castle. Different types of ceilings were used at the four castles. Barrel vaults were used at The Ajloun, Karak and Shobak Castles, while a domed stone structure was used at the Aqaba Castle. All are built from stone material.

Table 1. The Castles details


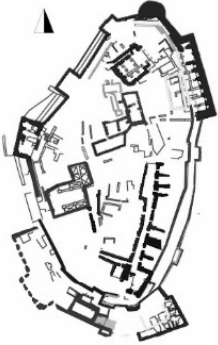

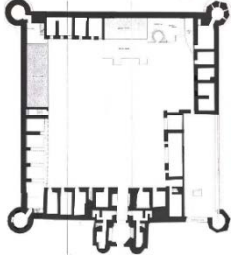

















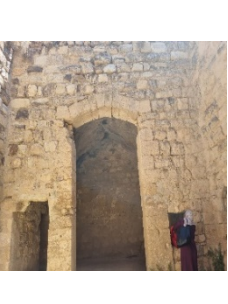

	Ajloun castle	Shobak Castle	Karak Castle	Aqaba Castle
Plan				
Entrance				
Interior corridors				
Defense Towers				
Openings				

Table 1 continued

Stairs				
Architectural details				
Ceiling				
Types of arches				

Source: Authors, 2022

Table 2. The comparison of the castles.

	Type	Date	Architectural characteristics
Ajloun Castle	Islamic castle \ Pilgrimage castle	1184 AD	The moat, a movable wooden bridge, towers, the Al-Mazaghel (arrows shooting places), in addition to 11 water wells, and the burning oil droppers in the porches. Prayer hall on the second level. Halls, dormitories, warehouses, and corridors.
ShobakCastle	Crusader castle \ rural inland castle	1115 AD	3 churches, a press, a mosque, a water tank, a tunnel, drinking water springs, 3 long walls, towers, bathrooms, cisterns and a large Iwan.
Karak Castle	Crusader castle \ Pilgrimage castle	1142 AD	The moat, stone wall, gates, towers, chapel, Palace, underground wells, courts, and utilities.
Aqaba Castle	Islamic castle \ Coastal castle	1501 AD	There are two large Iwans in the courtyard, and the main gate is a stone dome. The external walls are surrounded by octagonal and semi-circular towers, along with stone columns, stalactites, and vegetal decorations formed at the main castle gate.

Source: Authors, 2022

This study classified the examined castles in Jordan into two types of castles (Crusader or Islamic) based on the function and the nature of their uses (the pilgrimage castles, the coastal castles, and the rural inland castles as shown in Table 2 above).

Accordingly, this research discussed the architectural elements of various castles. It was observed that the castles were designed with a military character to withstand conflicts. Specific architectural styles were used to enhance their defensive capabilities. The selection of the castle sites was also carefully considered, where most of them were built on mountain tops like Ajloun, Karak, and Shobak, allowing for better control, while others like Aqaba castle were constructed on the seashore, overlooking both the sea and land roads that connect neighboring countries. Also, the construction of walls and towers was notable, as in their layout they followed contour lines for added protection. In areas where the castles were vulnerable to attack, trenches were dug, or inclined retaining walls were built to support the main walls, as seen in Ajloun, Karak, and Shobak castles.

Additionally, it was observed that the castles were constructed using raw materials available in the surrounding environment, such as locally available stone which was the main material for building castles. Stone carving and construction methods were considered one of the most prominent architectural elements of the fourth castles, which were primarily built using the Quarry Face pattern for external parts due to its strength, durability, and resistance to external factors. The Soft Face stone was used for parts that were prone to climbing and in the internal facades. As palm tree trunks were used for the thresholds of some doors and ceilings in Aqaba Castle due to their abundance in the surrounding area. As for the design of the castle's entrances, it was observed that the main doors were typically flanked by towers to enhance their protection. For instance, the entrance to Ajloun Castle is safeguarded by three towers, while the northern Karak Castle has two towers, and Shobak Castle features one tower. Similarly, the entrance to Aqaba Castle is located between two towers. In some castles, a movable wooden bridge was incorporated into the entrance design, especially for those surrounded by a moat, the castles of Ajloun and Karak featured this design element. Also, the entrances were designed as a Bent Entrance type, this type of entrance was used in the castles of Ajloun, Karak, and Shobak.

The castle's architects prioritized spaciousness in space, ventilation, lighting, and connectivity for the castle's internal functions. To provide the necessary means of life for the castle garrisons, the castles contained wells and water channels, in addition to having mosques, schools, and churches. The walls and ceilings were constructed to suit climate conditions, with an increase in wall thickness and corresponding ceiling design. Pointed arches and vaults were commonly used in the construction of castles, where Crusader castles featured cross-shaped arch stones, while Islamic halls used transverse-shaped stones. These

architectural elements were effective in military buildings, while domes and spherical triangles were used sparingly, only during the Mamluk era's wealthy stages. Differences in stone sizes between lower and upper courses at some castle sites were noticed. Regarding the decorative elements of castles, they appear to be limited, considering that they were primarily constructed for military purposes. Nevertheless, some artistic designs were found as plant decorations and engineering drawings, such as those observed in the four castles.

4. Conclusions

The Study concludes that most of the selected castles were subjected to many factors that led to a change in their original design, either due to earthquakes or because of a change in governance in the area they belong to. Despite the difference between these castles in some functional spaces, as the Islamic castles contain a chapel and the Crusader castles contain churches, many similarities were observed. These results will help decision-makers and designers to conserve and preserve the castles in Jordan by determining the main features and characteristics of the Islamic and the Crusader castles based on the function and the nature of their uses.

The study concludes that architectural characteristics are important factors that ensure the process of identifying the type of castles and the nature of their uses. This, therefore, forms a framework consisting of a set of differences and similarities between these castles, are; (1) Islamic castles can resemble some architectural elements with the Crusader castles since the two buildings are similar to the purpose for which they were established; (2) The floor plan of the Crusader castles in Jordan took an oval shape, while the floor plans of the Islamic castles tended to have a rectangular geometric shape; (3) Some of the towers of the Islamic castles were similar in design to the neighboring Islamic castles in the region, as happened in the Ebek Tower in Ajloun Castle with the towers in the Aleppo Citadel in Syria; (4) The stone material formed a basic material for building castles, which contributed to maintaining its shape and durability, and it was a very suitable material for the nature of building use; (5) Giving the place of prayer (a mosque or a church) an important place in the design of castles, whether they are Crusaders or Muslims; (6) the use of local materials and the need for wells and fortified walls were documented in constructing the castles; (7) The coastal castle in Jordan is distinguished by its rich containment of various Islamic architectural elements, such as the inner courtyard, decorations and Iwans, which made it distinct from other neighboring castles; (8) The coastal is distinguished from its counterparts in Jordan, as it is close to the sea, and the terrain of the affected area differs from the rest of the castles located on the tops of the mountains, and this has an impact on the type of fortification.

Additionally, the study proposes a set of recommendations for the castles in Jordan, which are represented in; (1) Castles in Jordan are located on the old military, commercial and religious routes that cross Jordan; (2) Each castle dates to a specific era in which it was built; many interventions and additions have taken place on the site or the castle building itself over time and in successive eras. The castle in its final form is a group of continuous interventions and additions to the original formation, which came through successive ages; (3) Castles are distinguished by their natural fortification, which is the difficult nature surrounding them, or a moat can be dug around the castle to increase its fortification; (4) The element of water was given an important place in the design of the castles because of its great importance; (5) The internal wells and reservoirs were the main source of drinking and irrigating the crops within the castle.

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