Architecture of Sasanian Dynasty: case study on square dome in Rivand, Sabzevar

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Abstract

Fire temples and square dome are certainly of great importance in Archeological studies for that of religious one in Sasanian dynasty. Fire which has been one of the sacred elements in Zoroaster teachings for the monotheists, during the five centuries of Sasanian Dynasty by establishing fire temples and square domes across the empororship or kingdom, had been considered as especially sacred. Square dome of Rivand in Sabzevar is one of the most important religious monuments from Sasanian dynasty which has been referred to by some Pahlavi Texts and document as Azar Barzin Mehr fire temple- one of the three prominent fire Temples of Sasanian Dynasty. With regard to the importance of the issue and the position of the fire temple of Azar Barzin Mehr in the history and culture of Iran in Sasanian Dynasty and due to the fact that this monument has not been scientifically examined by archeologist, so for the first time Iran – Poland Archeology Team began to study and explore the square domes in Rivand for duration of two seasons. So this article is aimed at completing the archeological studies on religious monuments of Sasanian Dynasty.

Introduction

Sasanian religious architecture has been talked about mostly based on square domes and fire temples. The religious fire temple was so important “each Sasanian king during his coronation endowed a fire, which was the symbol of his kingship” [3] At this time with religion being established, fire temple was as the display of religion’s rite in society and during the five Century of Sasanian dynasty countless fire temples and square domes were built around the country. In such a way that Ebne Hughal, geographer of forth century says “there is no city and no place that has no fireplace” [1]. The Pahlavi texts talk about a deep respect towards these fire temples, it’s said “any kind of respect is becoming toward fire temples Azar Farnbagh, Azar Goshnasb, Azar Barzin Mehr and other Azar and Atashes. According to Avesta texts, the three mentioned fire temples because of the fire of Bahram which was burning in them, were considered as more important and more sacred than the other fire temples enjoying important status in different classes of society in Sasanian community [3]. The fire temple of Azar Farnbagh which was devoted to clergies and priests is said by Christen to be located in Karian region in Fars province [3]. The fire temple of Azar Goshnasb which is called as monarchial fire temple was particularly for kings, commanders, royals and wealthy class of Sasanian age. This fire temple which was in Shizz in Azarbayjan [4] was of great importance. As Ibn kherad Adbeh writes: the Sassanid kings after crowning went such a long way on foot from Tisfon to fire temple of Azar Goshnasb for pilgrimage. [5] and finally the fire temple of Azar Barin Mehr which was particularly farmers class which is told to be located in Rivand high land of Sabzevar [6] General studies on Sasanid religious monuments show that the religious structures of this era were characterized by the part age architecture and have their own specific customs so that most of the famous religious structures from Sassanid era have square dome plan. Schippmann following studies on square dome divides Sassanid square dome into two major groups: the first group are the kinds of square
domes which are related to great structures (e.g. Takht Suleiman), the second group are the individual square domes to which fire temples or other secondary chambers are added (e.g. Niasar fire temple) [11]. Other researchers introduced different patterns in identifying the square domes, for example Gropp suggested three models concerning the usage of old fire temples. The first model is a rectangular construction in which is a square and domed chambers named Adrian which is surrounded by a hallway. In one side of Adrian, there is another room which is named Yazeshgah. This room either directly or through a hallway is connected to the main chamber. The second type is a fire temple which has a domed square chamber which is surrounded by a hallway. This type of fire temples has no Yazeshgah. The third type is a fire temple which is consisted of one or more Yazeshgah without Adrian space (the master domed chamber) [12]. Poop also divides the Sassanid fire temples functionally into two groups: the first groups were the fire temples for public prayer and usage and the second group are the fire temples which were made for keeping the holy fire and were only available for Zoroastrians and priests [7]. Merry Buis believed that the fire temples depending on the importance of the kind of fire in them were classified into three groups of Anooran fire, Dadgah fire and Bahram fire [6]. So in order to identify the structural analysis of square dome of Rivand, knowing the antiquity and its precise function to see whether the square dome of Rivand is single or complex and most importantly whether the Chartaghy of Rivand is the very well-known fire temple of Azar Barin Mehr of Sassanid made the archeological team of Iran-Poland to study and explore this important but unknown monument archeologically (pic1&2).

Pic1: South view of the heights square dome Rivand Sabzevar
Pic2: square dome interior port in South

- Geographical study of the location of Rivand square dome in Sabzevar:

Sabzevar which is located in western part of khorasan Razavi province is bound from north to cities of JaJarm and Esfarayen, from East to Nayshabour, from south to cities of Kashmar and Bardeskan and from west to the city of Shahrood is in Semnan province. It is in longitude of 57°0 and 43°0 and latitude of 36°0 and 12°0 with the area of 17617 km² and an altitude of 960 meter from the sea level. The weather in Sabzvar is moderate and dry and the highest temperature in summer. In 40 km from North West Sabzevar and in latitude of 36°0 and 16°0 and 56°0 and 44°0 longitudes in 5 km from the North of Fashtanga village, within the high lands of Rivand, a tremendous pile of rock emerged from the river bed in Rivand which is 100m. High on the very pile of Sassanid which is known by the people of the region as the devil’s home and in archeological community known as the fire temple of Azar Barzin Mehr(figuer1&pic3).

- Studies background:

Not until after the archeological studies and excavations of Iran Poland expedition in Rivand square dome, no scientific excavation was done in this building and most of the researches were restricted to some moderate visits and searches. In 1967 Fayegh Tohidi indicated to Rivand four dome in archeological study of Sabzevar region. According to his reports, Four dome called devil (demon)’s house is located in Rivand height which is the same Azar Barzin Mehr Sasanian fire temple [8]. Hassan Ghareh Khani another Iranian archaeologist also in his book known as "ancient ruins and holy Mausoleum around Sabzevar and Esfarayen" as well as representing a plan he also presented a report of the building [9]. In 2002, Ali Aldeghy, Ghasem Jaghty and Rahmane Geraili also provided a plan of the square dome (Mashhad Cultural Heritage: not publish report) In 2006 Japan expedition by supervision of Tagaya Sohi Gigy which visited and studied shrines adjacent to Abrisham road also visited Rivand square dome (Sabzevar Cultural Heritage not published). Finally the Iran Poland archeology
expedition in two seasons (years of 2008-2009) by supervision of Barbara Kaim from Warsaw University and Hassan Hashemi started to excavate in this site.

![Fig. 1: location Sabzevar and Rivnd](image)

**Fig. 1:** location Sabzevar and Rivnd

- **Square dome of Rivand or Azarbarzin Mehr fire temple?:**
  The fire temple of Azar Barin Mehr which was called Ature-Burzin Mihr (that is fire temple of Mehr Balandeh) is one of the three important fire temple of Sassanid. According to Pahlavi texts the fire of Niyayesh was in Rivand in Khorasan and was for the farmers. As mentioned earlier, some researchers introduced the square dome located in high land of Rivand in Sabzevar as the fire temple of Azar Barin Mehr. This approach is originated from the Pahlavi texts of Band Heshen where it talks about the fire and the quotations of Avesta which located the fire temple of Azar Barin Mehr in Rivand in Khorasan. As it is said in Fargard 12 and paragraph 8 of Band Heshen the mount of Rivand is located in Khorasan and Azar Barin Mehr is seated on it and Rivand, that is Raymond a magnificent regarding its height of this part and the mount of Binalood which holds a sacred fire temple itself [6]. The oldest references such as the history of Beyhagh says: Zoroaster who was the owner of monarchy (magus) commanded and ordered to plant two Cedar trees. One in the village of Keshmar (Kashan) and another in the village of Faryoomad and those trees were planted by the Zoroaster [10]. It was written in Pahlavi text, that Azar Barin Mehr fire temple was the place for the prayer of farmers in the mountains of Rivand and today with regard to the myth of planting tree by Zoroaster in khorasan, the attribution of this fire temple to farmers of the time is much more real and acceptable. Azar Barzin or the fire of farmers was located in the eastern part of Sassanid country in River Mountains and in north western Neyshabour. Lazarfaei (Langlois1867p315 &Hoffmann1880 p290) Called the Rivand village the village of magus.In Jakson’s opinion The place of Fire temple had been in Mehr village which was on the way to khorasan near Sabzevar (journal of the American oriental society1921p82). Also the Archeological studies of Khorasan Cultural Heritage experts were accomplished in Sabzevar and the other regions around it exclusively introduced the available square dome as Azar Barzin fire temple the accomplished digging and archeological studies in square dome of Rivand can help us with either the acceptance or refusal of this problem (pic4).

![Pic 3](image)

**Pic 3:** Aerial photos and access route to Rivand square dome

![Pic 4](image)

**Pic 4:** west view of the heights square dome Rivand Sabzevar
- Chronology of the site on the study:
  Site has been dated according to coin of Sasanian king. This coin which belongs to Khosrow II (590 BC) Sasanian king is silver was found in the threshold of the southern side of the square dome which undoubtedly is a valid document in relative dating of the square dome (pic 24).

  Besides of coins Sasanian architecture which was greatly decorative. This can be seen in the multiplicity of the stuccos (Azarnoush, 2002: 275) in the process of the excavation of the trench some plaster was found which is comparable with other of Sasanian period. This kind of design in Iran has a long history because in the excavations of Tepe Daghkhah of Sabzevar which was done by Iranian-French expedition a rock with meander design was found which showed the continuous use of these kinds of designs in stuccos of many Sasanian holy buildings and palaces. (4) In a way that two of the obtained forms of the square dome which have meander and a flower designs are comparable to that of the beautiful Sasanian building ((Bandian of Dargaz)) (5) in north of Khorasan and Tisfoon palace (pic25&26).

  Potsherds finding in deferens trenches are divided in to two groups of enameled and not enameled. These shards have incised geometrical and stamp pattern. In between the findings there is a shard which might be a part of a vessel’s lid and it has an interesting design like the letter M on it. Enameled crocks are green, yellow and turquoise. The indecision point is that only a few of the pottery obtained was of Sasanian period and most of them belong to Islamic period. (pic27)

Discussion:
As mentioned previously, ruined square dome of Rivand which is called devil’s home by native people is located in an area of Rivand Mountains in north of Fashtang village in a hard traveling path on top of a cliff with 100m height. First of all the expedition started to provide a topography map of the square domes (figure2). Then the expedition started to probe in different parts of the square domes in order to understand the typology and architectural spaces of the square domes. Which led to the finding of other cultures

Architecture:
Despite the fixed factors and patterns in constructing Sasanian constructions, especially square domes and fire temples, each of them has special features and none of them are completely similar in their plans. However most of the square domes and fire temples have special architectural factors such as thick pillars four wide mouth in pillars, dome like roof, cross square plan and a hall on one side or around the square domes.

A- square dome plan:
The plan of Rivand square dome is a simple rectangular with the dimensions of 13/29 *12/46 m, the corner of the walls points toward the 4 main sides. The entrance of the building is at north side. The main room of square dome is 6/6 m². The dint of the North West wall has 2/63m depth and 4/32 m width. And the dint of south east wall of the square dome has just 1/13 m depth and 4/32m width. The dint of south west wall has 4.32m width and 2.56m depth. In northeast of square dome, there is a very narrow corridor with 80 cm dimensions. Its efficiency probably is to access the main room and also the south area of square dome(figuer3).

B: Discovered areas:
During the 2 seasons of excavation, the expedition succeeded to detect interesting architectural spaces like plat forms for Odon and Brasmdan, corridors or entrance hall water reservior or patav (fig.13), waiting room or Estodan. Resting room and entrance stairs of square dome.Revelation of the discovered spaces and the studies show that the square dome consist of three different spaces (figuer3&4&5& 6). This section plays the main interactive role of the construction from entrance portico and it’s possible to have two entrances. Regarding the social classification at that time for the place which was built by the architect of construction. Thus according to the architectural evidences collected from the probing, the portico included two rooms alongside the corridor that the passage wasn’t located in main entrance of the main square domes. This style of architecture might have defined the access to the second level fire for the pilgrims which was in the rooms alongside of the corridor due to considering the time of walking in the corridor, or it may be a barrier between the contents of fire chamber and pilgrims outside the fire chamber that is the corridor was not located in the axis in order to separate authorized and unauthorized people from holy fire or looking through the number one fire (pic 7&8). Here are some spaces around the fire chamber or Ouddan (pic9)There are spaces around brazier (figuer4&5&6). These three sections have structural properties as follows:

Moduule:
Out side and in side geometry of the square domes are square platforms which are rectangular on the whole the building is square. But the rectangle particles are quantitatively dominant to the same square (Fig 7). Balance with some neglect in geometry and implementation has balance. The south platform has less depth than the other stairs. Parallelism of the building in the floor and front is widthwise and lengthwise balance. The repeated rhythm of the rectangular shape of the platforms has given rhythm to the building (Fig 8). According to the available evidences and data presumption existed from entrance of the square dome from north east area with a portico. (Fig 9) Circulation of ventilation and light is the only evidence left of the window for light and ventilation in the north east wall which is at the top of the arc. In the north area there is no evidence for coming and going from this place. Despite this and the architectural evidences left all the arcs were blocked and consequently ventilation and light were done from entrance and air out let. (Fig 10). Full spaces in the square dome are divided in: A: Covered full spaces B: loaded full spaces

C: the construction and implementation:

First step: At first, plat forms were made based on topology of the site where they were pitted and filled by stone and at a place the cliff was used as base. Nature conservancy was considered in footing of the construction and it didn’t damage the nature at all (pic10).

Second step: basing of square domes by mortar consisting sand gravel clay and lime syrup. The stones are bigger and thicker at the base of the footing and the more we move up the less the thickness and length becomes (pic11).Third step: Construction of arcs was made by mortar and clay. The scale of three portion of mortar and one portion of clay.)Forth step: construction of pillar in order to prevent the expulsion of the arcs by the same materials (pic13)Fifth step: construction of zoon of transition in internal squares of construction by carved barrel- roof stone to the center of square. In the center there are remainders of carved stones related to sky light. It is placed at the top of the arc and other than light is efficient for decreasing the weight of the arc. This gap decreased the load in old architecture.Sixth step: After turning the plan from square domes into eight columns. A circle to construct the dome is done. It’s to be mentioned that the whole square domes of the dome are constructed and just some parts of it are left. This style of dome constructing have been used for making Islamic settlement especially in making tombs in Khorasan Province and other territories of Iran Discussion. (pic14)

-2-5- decorations:

Of the important findings of the excavation we can point out to the inscription which was revealed in the second season in architectural places (trench 3) which probably is waiting room or Estodan. These paintings are inscriptions consisting Human, animal, natural and geometrical motifs which were done on the west and north walls of the room mentioned (15&16).

- picture/design Buffalo:

Buffalo is hunchbacked and has the drawing of swastika on its arm. Dimension of swastika is 1/5×1/5 cm. This cow has two horns which look like arc and probably has feed in his mouth and the head is prone to right three faces. The picture of cow’s hands and feet are incomplete. This drawing is incised and is drawn by a single move of the style/pen (pica 17&18).

Sun’s diameter is 3/5 cm. 2 simple geometrical lines with the length of 5 cm parallel to each other with 8 mm distance had made the connection between sun and earth. This sun has radiance on the upper part. This sun is bigger and thicker at the base of the footing and the more we move up the less the thickness and length becomes (pic11). Third step: Construction of arcs was made by mortar and clay. The scale of three portion of mortar and one portion of clay. Forth step: construction of pillar in order to prevent the expulsion of the arcs by the same materials (pic13) Fifth step: construction of zoon of transition in internal squares of construction by carved barrel-roof stone to the center of square. In the center there are remainders of carved stones related to sky light. It is placed at the top of the arc and other than light is efficient for decreasing the weight of the arc. This gap decreased the load in old architecture. Sixth step: After turning the plan from square domes into eight columns. A circle to construct the dome is done. It’s to be mentioned that the whole square domes of the dome are constructed and just some parts of it are left. This style of dome constructing have been used for making Islamic settlement especially in making tombs in Khorasan Province and other territories of Iran Discussion. (pic14)

picture/design of goat or Bezoar goat:

This pictured is incised and placed about 70 cm away from the cow drawing. Its face and moves are toward west. It’s possible that it has some feed on its mouth and has some kind of torque around its neck. The figure of the swastika cross is contour? On the torque of this goat it’s more like a gazelle than a goat. The pictures/form of its leg and hand are incomplete (pic 21&22). This drawing is incised. The mouth of the camel is out of the ordinary limitations. Its ears are sharp and just the neck, ears and faces of this animal are incised. The drawing is incomplete. Picture of donkey, this picture is incised and incomplete. Drawing of the donkey is side view/profile. Its tail is short and its mouth is open. The drawing is not complete and its move is toward north. Picture of Monkey, This picture is 2 cm below the picture of the donkey and its move is toward north. This drawing is not strong. And picture of the eye and hand is incomplete. Picture of elephant. This picture is incised. The elephant moves toward west and its head leans to right and is pictured from behind and its right foot shows moving. Picture of several crisscross lines, their general shape is like Mehr’s cross these lines are crossing each other and are erratic. They make shapes of different erratic square and rectangular. It is most probable that these
lines show the number of the dates a guard works or a magus guardian of Fire are present. Or it is possible that these were used for dating (pic23).

Pic 24: Sasanian coin related to Khosrow II, 590 BC, 29 in diameter, silver, rediscovery place found in the threshold of the southern side of the square dome

Pic 25: plaster piece/fragment with herbaceous and meander designs

Pic 26: the stuccos of Sasanian building ((Bandian Dargaz)) in north of khorasan
Pic 27: shows the analyzing has been done by SEM and AlSi phases, Pb, Na, Ti, K, in the chalk composition

pic5: North portico Altar Room
pic6: Space of explore
Pic 7 & 8: North portico room entrance square dome and operations of Explore

Pic 9: one of the platforms within explore square dome

Fig. 4: Cutting tree dimensional of reconstruction plan square dome Rivand
Fig. 5 & 6: Level – tree dimensional of reconstruction plan square dome Rivand

Fig. 7: four sediment, blue, rectangular, yellow
Fig. 8: Balance and symmetry in square

Fig. 9: Circulation access: Yellow Level 1 and Level 2 blue access
Fig. 10: Space filled square dome: blue space filling space filling bearing non-bearing

Pic10: Vestibule and inside of Altar before research, north tangent to entrance
Pic11: Excavation test tranch2 and input Alter
Pic 13: north façade square dome see in inside
Pic 14: zoon of transition (squinch)

Fig. 11: Hypothetical reconstruction of the spaces Altar Sabzevar explore the spaces

Pic 15 & 16: the discovered room, a waiting room and the renovation activities after the excavation
Pic 17 & 18: motif of cow and Swastika on the arm found in trench 3e

Pic19: image of a human’s hand in Kangan in Afghanistan
Pic20: The role of the human hand square dome Rivand

Pic 21 and 22: image of goat and Mehr’s cross in Rivand square dome. Picture/design of a camel with the carriage under its Mouth
Pic 23: crisscross lines probably a dating table

Pic 3: square dome plan and explore the space

Conclusion:
Before the archeological studies of Iran Poland the expedition it was supposed that the square dome of Rivand is a single square dome but the data obtained from the excavation showed that this construction is a fire temple and the holy fire was kept there. It had porticos, entrance portico, reservoir of water, an ablution room waiting room or Estoodon, resting room entrance stairs from reservoir to the central place of the fire temple. According to the pattern represented by the Gropp for knowing this four vaults, it can be said that the Rivand square dome in Sabzevar is the first kind called Edgier. In this pattern the square dome is a rectangular building through which there is a room with dome named Adriyan. This room is surrounded by a corridor. Discovered spaces of this construction show that this construction has two architectural periods: one belongs to the Sasanian kingdom and others are built out of it. Chalk workings the coin, the earth wares, used materials and brick dimensions show that this is a construction of Sasanian kingdom. The last era of fire temple architecture belong to Islamic age, especially in accordance with cultural evidences, belongs to Kharazmshahin’s kingdom. During this era a wall is built on the inference stairs and these two rooms are separated from each other by this wall and also the entrance to fire is from the southern room. Historical evidences show that Zoroastrians left Khorasan and moved to the areas out of Iran, especially they went to India. By comparing the plan of the square dome to each other, Sasanian square dome such as Azar Goshnasb and Bandian fire temple in Iran shows that despite having a cross like plan and similar structure to them, this square dome has very thick pillars and ratio of interior space to the structure does not rhythmic and because of this, it’s similar to the Sasanian square dome called Bzehur in Khorasan. With regard to the style of architecture used in the building of Rivand square dome, according to cruciferous architectural space, which is the common form of Sasanian fire temples [17] and also arc type, plaster type mortar (which was recognized by testing) using carved stone and façade working of the walls with plaster and specially zoon of transition(squinch) technique in transforming a circular base in
building a dome—which is a Sasanian architectural Innovation was used for the first time in Ardashir’s building in Firozabad Fars- is one of the special features in Sasanian architecture which is mentioned by Reuther and Schlomberger as an important sign in recognizing the source of Sasanian buildings. Other than this the discovery of important cultural materials such as beautiful arcograph with meander designs which is comparable to the arcograph Sasanian building Bandian Dargaz which was discovered in the excavation of Bishapur palaces and most important of all is the discovery of a coin which belongs to khosrow II Sasanian king. These are very valid and undeniable documents in proving that this square dome in Rivand is a Sasanian building. Although some researchers introduced this construction as Azar Barzin Mehr fire temples but despite it being proved that it is a Sasanian construction and the discovery of many architectural spaces discovered, one can’t say for sure that this is the Azar Barzin Mehr fire temple. Thus proving this assumption needs more extended excavation and complete archaeological studies in other areas of Rivand Mountains. We hope to gain it in the third season of excavation.

Addition:

Laboratorial studies shows the mortar used in square dome, a few samples were taken from the mortar of the building and sent to laboratory. The recognition of the mortar was done by SEM method. However the results obtained of SEM test is not reliable in quantity aspect but one can specify the fundamental elements of the sample structure. Main and Index phase of the unknown sample are: calcium, sulfate with ions of potassium, sodium, magnesium Which in the process of sedimentation (CaSO4) forms calcium sulfate which is plaster? Therefore regarding the Analyzing and the results obtained from the SEM analytical methods the existence of plaster as the main fundamental element of mortar’s structure of Rivand square dome was proved. (pic27)

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Post script:

1) Foshtongh is small village 35 km North West Sabzavar and 10 km of Rivand river
2) During these two excavation seasons the group probed seven sondage (bore hole) 3 in the first season and 4 in the second season in the interior and exterior parts of square dome Taghy
3) The excavation in Damghany hill of Sabzavar happened in 2009, supervisor on this excavation was Henry Frankfort and Ali Aghar-e Valdhy. The data of cultural material found by the excavators was third millennium BC.
4) Bandian site is placed in 2 km North West of Dargaz country which is 20 km away from border. Excavation in this place which was lead by Iranian Archaeologist Mahdi Rahbar-was leaded into the revelation of important architectural structure like a big hypostyle a room for keeping the votives fire temple Ivan/veranda, s round structure and a room for ossuaries. The excavator of bandian calls this complex a devout/ hieratic place which belongs to Sasanian period.
5) The historical complex of Takht-e Suleiman is placed in 43 km north of Takab and 3 km east of Takht-e Suleiman in Azerbaijan e Gharbi province Takht-e Suleiman fire temple as one of the 3 important fire temples of Sasanian period, belongs to the royal family and is known az Azar Goshnasb fire temple in Pahlavi script.
6) Baze-Hur is the famous square dome of Sasanian period which is placed on the way of Mashhad to Torbat e Heydarye near a place called Robat Sefid a vary thick pier and squinch of the dome built by wood are the special features of this lean to.

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