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## **Analysis of Dome Structure in Iranian - Islamic architecture and urban structure**

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### **Abstract**

The most important characteristic of dome and factors influencing it in the Islamic Iranian architecture that is different from other courses is construction and construction methods of them. Over time, different factors are involved in the process of formation of the domes. It is one of the factors influencing the structure of Iranian-Islamic domes. By examining the structure of Iranian-Islamic domes form can be read part of forgotten knowledge of architectural past among architects. This paper aimed to analyze the impact of changes on aspects of the architecture of dome. Other researchers on the review of the reports for reviewing and rethinking dome shows the analysis so far mainly structured approach to the process of the formation of the dome is recognized in Islamic Iranian architecture. Other researchers on the review of the reports for reviewing and rethinking dome shows the analysis so far mainly with structural approach recognized the process of the formation of the dome in Islamic Iranian architecture. Analysis result show there is a clear distinctive relation between the dome and the size, height, form, shape and overall structure. This article is collection of library documents on the one hand and filed documents on the other hand. In this study, after the study of the certain structure of elements and measurement, sensitive and form relationships and relationship between components will be examined. The study aimed to investigate the relationship between Islamic Iranian architecture and architectural structure of the dome. The investigation carried out revealed that resizing dome plans structure directly depend on form and method of making them.

**Key words:** *dome in Islamic-Iranian architecture, formation of dome, dome plan structure*

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## Introduction

If the network is curved in two directions, it called dome, maybe process of a dome to be part of a sphere or a cone or a connection of several procedures. Dome structures with high rigidity and a very large crater about 250 meters (modern dome) are used. Dome height must be greater than 15% the diameter of the base of the dome, the dome has center. Iranian traditional architecture in different climatic conditions according to their needs by creating unique elements and specific to the environment is a generator of environmental sustainability. The dome is one of the sustained elements that attention to issues of aesthetics, responding to the needs of each region. Domes of its own specificity lead to the formation of the principles of their construction techniques. If background of Iranian domes generally is square-shaped and the type of materials used in the dome is adobe and brick as the main materials used in the construction of these buildings that are subject to wear. This article aims to analyze the structure of the dome for the first time.

One of the most important parts of structures built in Iranian traditional architecture on the formation of impact of architecture and urban landscape has a considerable impact, the section of covers especially is domes and arches. In this paper, we studied the dome; type of dome in term of shape, structure and in terms of reference arc has been investigated. An outline of the components and parts are made of a geodesic dome. Then the three main parts of dome expressed and a variety of them explained. Then we study arrangement of the material in domes and forming material to build the dome and its implementation publicly. As a result, the importance of the study of the structure of traditional Iranian architecture defined for the continuity and sustainability of Iranian architecture authentic art.

### Dome in Iranian Architecture

Dome cover has a long history in Iran. Lack of solid and pulled wood in fact is the main ele-

ment of bed covers, has led Sagh coverage and dome find reliability, particularly in large spans under cover. The oldest form of the curve in the lower cover Choghazanbil belongs to the second millennium. By intervening in Achae-menid architecture, a brilliant high and flat cover at the height of its power and efficiency effects; But before and after that due to the lack of specific economic conditions in the period from Jabal 'Amil and cedar wood teak from Gandhara is not always possible. In addition, in the forests and plains of this land tree coverage is not growing therefore curved arch and the dome to its original place as a structural phenomenon and climate in Iranian architecture easily find. Unfortunately, the architecture of Parthian period actually begins Segh cover and in the Iran a sample is not remained. Outside the scope of Iran we find a couple of examples of Segh cover that one is hatra or Al-hazar and the Assyrian palace and is also clear face of the cover is not lose.

Dome during the Sassanid era constructing a dome is so common and evolves from then until today to build that dome in patterns and recipes are generally exploited. Mathematical precision in the formation and building and by applying proper procedures done at all kind, the dome without the need for clamps and body and against all the forces of compression and drift has a good resistance. Although in a few corners from the early Islamic period have been changes the method of constructing a dome in Iran has always pursued its own cultural characteristics and performance. What is noteworthy that these properties either in the form of what is on the run (no template) always does it with oriental domes.

### The importance and value of research

The importance of this study is that we find in the dome and the application of different sites and that dome is not only represent an art but some of the domes effect a set of decorative arts such as design, calligraphy, tiling, Mogharnas, decorative motifs stronghold anthology of geometric designs and floral variety. The aim

of this study was to evaluate the use of the dome on different sites and materials used to make this architectural element and analysis of the various parts of understanding the history and appearance of the dome.

### **Population**

The population consisted of all Iranian domes at different periods of Iranian architecture. Research method is historical interpretation and data collection through the valid documentation.

### **Study of dome in Iranian architecture:**

Architecture at all times is the most influential art that Iran has in all this period of Islamic art has become art land. Iran's pre-Islamic architecture with its high technique and after Islam with specific concepts tied together heaven and earth. Several buildings and architectural elements involved eternal immortality and eternal retained, that one of the elements had a significant role in the period before and after Islam, (dome).

- What is dome?
- What dome of consist of parts?
- What is the domes usage?
- What was the dome constructed at the time?
- Research objectives:

The aim of this study is to use what used domes in the emergence of the first dome and later in different locations such as mosques, tombs of saints how it is used. Constituent parts of the dome are Greve, Bishan, Chapirh, and dome. It fully explained the history of the formation of the dome at what time and what has been done during the reign.

### **History dome in Iranian Architecture**

Dome is one of the types of coatings that can be used to cover the roof one place. Therefore, first, the building is fully functional. If we want to simplify the discussion, we should say the roof or cover is an architectural space can be flatted or curved (Arch). One of the stereotypes about Iranian architecture, there are descriptions about its beautiful domes. In the dome as one of the forms used in architecture, it can be beautiful and harmonious how much

is indisputable. However, the problem is that in most cases these descriptions, to become literary metaphors that might have nothing to do with the reasons for the emergence of this form of architecture in the history and evolution of it is not. You must have heard that many of those who are fond of art, the dome are considered a symbol of the sky. However, is architecture dome in the past having only symbolic function or structural requirements and reconstruction requirements to the creation of architectural form?

### **Building needs**

Dome, is one of the types of coatings that can be used to cover the roof one place. Therefore, first, the building is fully functional. If we want to simplify the discussion, we should say the roof or cover an architectural space can be flat or curved (Arch). Alternatively, flat bed cover, is the cover that is normally used in ordinary residential buildings. Non-flat coatings, of various types, such as domes and other types of coatings where the arches and curves are no longer used dome of the geometry of the arch during a vertical axis is created. However, the necessity of using this type of coverage has been in the past?

### **Lack of proper materials**

As told to cover a space, or should be used flat or curved coating. The architect for the application of a flat coating horizontal beam is element needs to transfer forces the roof and this is precisely the point made in certain areas, the dome is revived. The shortage of wood is suitable for use in the ceiling in places like Plateau of Iran and Mesopotamia, it made the cover of curved domes, and without using a bow can be created to cover large spans. From several different locations as the first places where there used to curved cover; Among the eight Millennium and the Neolithic village in Cyprus, Chaldea in Mesopotamia and Egypt and Iraq as well as areas in southern Iran near Susa and Haft Tappeh.

### **Open plan**

Arch and dome in the Persian architecture as



the original coating architectural space reach to perfection. In fact, the use of flat cover, as was the case during the Achaemenid Persepolis is an exception in this regard. At the time, the extent and the great ability of the Achaemenid Empire, wood for use in ceiling beams from other locations such as Lebanon and Iran was brought. However, in other periods, the use of local materials such as adobe and brick was more effective, and therefore dome form grows and reaches perfection. Except for the capacity building of the dome, which can be necessary in areas where materials such as wood is not available to be used in the coverage areas of architecture, interior spaces can be capable of bringing about free and wide-spread noted. Use wooden beams for the roof, this limit should colonnades along the beams used to pass close to each other. Because the wooden beams that could be too much for their maintenance be established, therefore, a greater number of columns. For example, if the architecture of Persepolis careful, the palace like a hundred columns, number of columns, ten rows of ten rows that inevitably restricts interior of the building, although the magnitude of it. In contrast, it makes use of the dome cover to open and free space inside the building to open space inside the building is more.

#### Dome growth in the Sassanid era

During the Parthian and Sassanid, use of arch and the dome became more common and important innovations in this area performed. Firuz Abad Palace in Fars province, making it attributed to Ardashir, three Great Hall using the dome were built which the diameter of each of the dome was slightly more than thirteen meters. Other important examples of Sassanid domes can be named Sarvestan Palace Dome related to King Bahram Gur in Sassanid era and it is known as the oldest brick dome in Iran. The widespread use of the dome forms in Iran creates innovations that were used by architects elsewhere in the world.

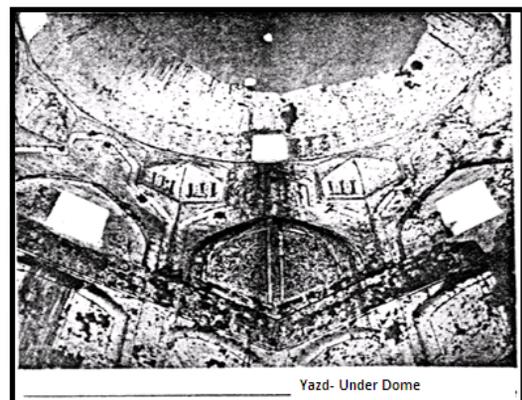
#### 1. Installation of arch or closed arch

Installation of arch refers to the niche on the niche and execution is therefore that the dome jump to the next corner before they gradually thus a span of four sides comes forward. Consequently, it limited after the implementation of tightened the eight arches (four arches in the corners and four arches on all four sides of the square aperture) area convert to octagon. To convert 16 on the vault octagonal one ((Barnakhesh)) are correct. Barnakhesh is arch like Kelil to connect walls parties (such as arch is upon-load-bearing and Amood. To create Barnakhesh a Klok sit in front and the mouth are tightened. On the Barnakhesh arrows that are on the Barnakhesh is in fact complementary.

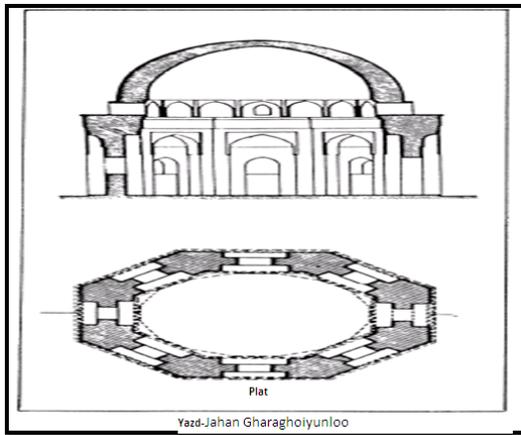
The gap between the arrows fill with Sanboseh, Sanboseh curved equilateral triangle that almost final shape to their close circle after performing Sanboseh again a Klok sit back and make Grivar. Gryvar then starts the Ahinaneh dome. Usually the inscription of the dome built on Grivar. It is worth mentioning that by creating Sanboseh a jump of 16 polygons to 32 polygons converted.

#### 2- Closed work or fastening work

Another type of torture is fastening work to the vault of the principles of self-identity and without turning high dome height of the rectangle to circle jump is possible. It seems that the implementation of closed work in Yazd areas under the dome and its surroundings is taken and applied to other parts Yazdi assigned to this type of performance is probably



Yazd-Under Dome



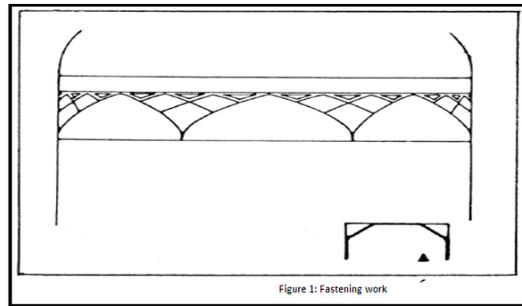
▲ Fig 2. One or more rows Moth (curved square parallelogram) that formed the middle right.

for this reason. From this point on the arches assigned later by running a 32-sided octagon to become suddenly and the sharp enough to hit the dome of their Grivar assigned to the dome mounted on it. Sometimes using the assigned even need to run eight primary vaults to convert field is octagonal thus, from the beginning, jump on the square, an assigned run. The sample above is seen in the dome of the monastery Bandarabad in Yazd.

As can be seen in the form of a routine consists of the following sections is assigned: One of a series of Sanboseh (formerly referred equilateral triangles curves) that form the highest part assigned.

In Yazd closed work in form of fastening work may be simplified and the number of small feet is low completely removed so that sometimes riding on a narrow leg of Sanboseh seen that in the Shahvali Tafet mosque. In this situation, narrow leg from a linear cut in half and the two halves together find a common denominator. The evidence shows that this form of Yazd, by the architects who worked for Jahan Gharaghoyunloo goes to Kashan and it is common.

Kashan Miremad inn next to the mosque entrance corridor which is pretty much sample is Yazd closed work in Kashan. Moreover, the Kabod Mosque in Tabriz must reflect the common and perfection of form in Tabriz. In addition, a good example of the Sheikh Lotfollah Mosque is visible. Installation of arch in



▲ Fig 3. A series of small feet (square foot arch leading to the end or arch)

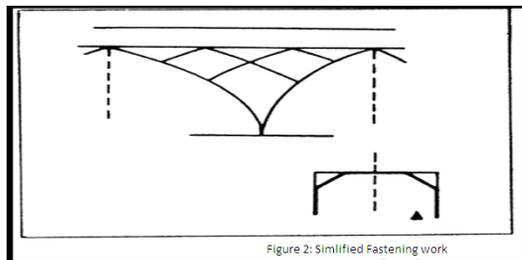
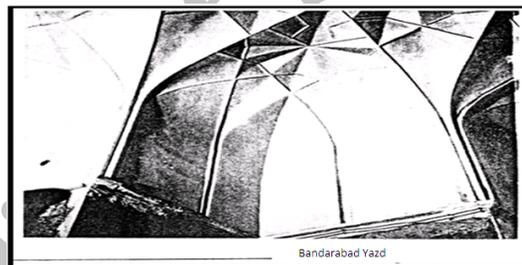
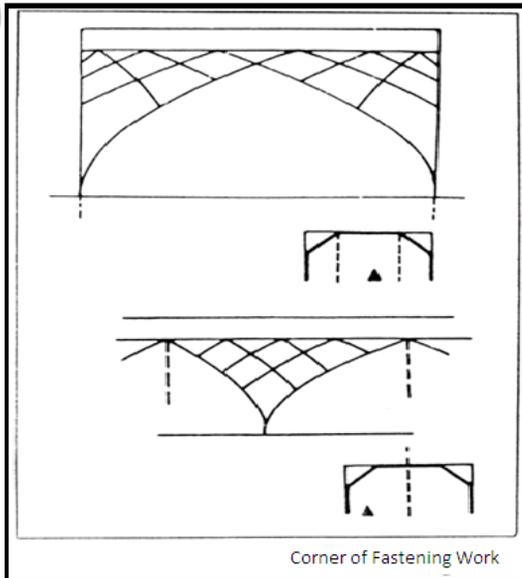


Figure 2: Simplified Fastening work



Bandarabad Yazd



Corner of Fastening Work

▲ Fig 4, 5, 6. Corner of fastening work & simplified of fastening work



▲ Fig 7. Architecture dome of the tomb of Shah Nematullah Kerman

prevalence of AD increases so that the domes usually are at this period of the vault. Each sample must Sydrkn dome din Yazd, Yazd four brick dome, the dome of the Taj Almolck earthen dome of the mosque is named. Assigned the vault of the dome, however, occur over a period and they continued and are the larger arch is common, but in the eighth century so that the domes usually are at this period of the vault. Each sample must dome din Yazd, Yazd four brick dome, dome or dome of the Taj al-Mulk Mosque or Gonbad Khakhi of Isfahan is named.

#### Under the dome

Iranian domes are made of two shells:

1. inner shell
2. outer shell

Inside cover the dome cover on the side of the interior space and their foreign surface is usually ridged and (so will come in the following pages reasons and structural issues) to be made step by step. Inside cover ((parietal)) or Kodombeh said outer cover (self) called.

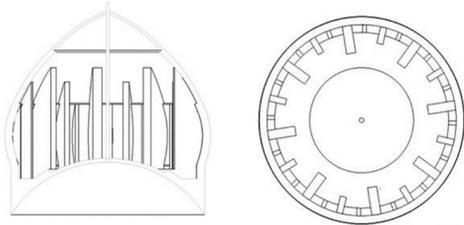
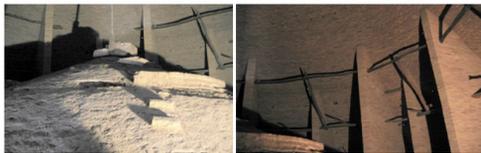
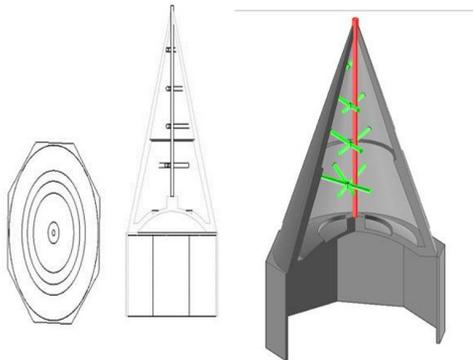
It is clear that over time of three types:

1 if the two shell components that are interconnected. That is immediately placed on the parietal and sharp finds just the tip of the dome itself has sometimes driving rain and

snow slope and so on. The best example of such domes at the peak of perfection and beauty, Sheikh Lotfollah Isfahan Dome has feature is implemented and that is that, unlike other parietal domes on Arbanh ride. The grille can be seen around Arbanh and update will do light work. Due to the extent of your mouth and parietal fasten is parietal.

#### How to build a dome

How common the dome like building around Tapu, as it is Tapu around of Tapu and it makes the dome and to climb back rows of the Iranian domes due to the lack of mold cannot begin to build up inside. In the beginning, they used an instrument called Shahng and norms. Shahng bar portrait of their arrest. The bar is usually a wooden dome in the center of science, such as the dome of the mosque Rahim Khan Shahng in Isfahan budged from around tightly shut up. In terms of building science wood ((Hedge a)) is called. To cinch Shahng the two walls are wood dome of eight to ten believe wood ((Toby)) does not, then the two points that should be the focus of the ellipse Shahng two will throw up a stud and to connect the two chains are very fine with which to draw the desired oval. The chain is the norm and it is elegance like ardakani chain.



▲ Fig 8. Architecture dome of the Masjed Shah in Isfahan

### Constituent parts

Samples of study domes:

### Conclusion

In addition to the methods of the Chinese vessels and build parietal round the norm used Shahng in this method, the ratio of AB to F1F2 and certain chains moving. With this technique then in the end, half of the oval will be built. In the end, the conclusion of the discussions in order to sustain the gains of the past and continue the way they carried out joint manipulation. Iran developed countries and the emergence of differences in the construction of the dome if the dome is the emergence of on-demand and the possibility of responding to the needs found. Inevitably,

things are reminded that the need for large craters, tall, according glory and majesty, and on the other hand the limitations associated with the strength of materials, skills and technologies of his day's labor.

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