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Constructive Formation of Domes in Architectural Monuments

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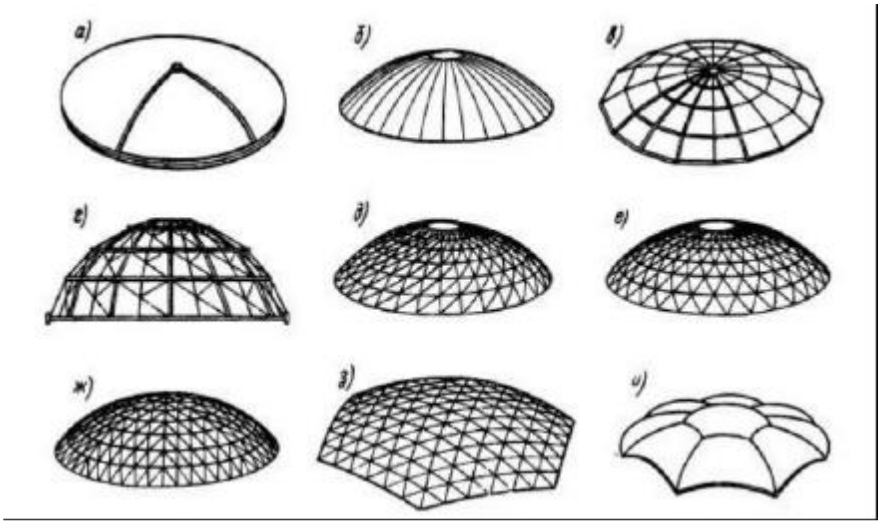
Abstract. The article provides information on the history of the construction of domes and the formation of constructions in Central Asia and Uzbekistan, their geometric analysis and typological structures are analyzed.
Basic word. Domes, construction, history, construction, formation, scheme, mesh domes, double dome.

Introduction.

The following information can be given about the history of the construction of domes and the formation of constructions in Central Asia and Uzbekistan. The origin and development of domes in the Middle East and Central Asia is generally recognized for both residences and individual buildings, and large building complexes played an important role in Islamic architecture. It can be seen that they are completely different in size and type. Dome constructions have been known since ancient times. Domes were used in Iraq, Syria, Iran, ancient Rome, Central Asia and other regions of the world. In those days, the main building material was brick. In the excavations carried out in the Bundzhikent palace in the VII-VIII centuries, the first evidence of wooden archways in the memory of Central Asia was found: a curved archway with a "T" cut surface. African builders used the trunks of palm trees, covered them with mud, and made arches, the roof structure was circular with a characteristic "dome and ribs" and above the square room was a grid of studs and mud plaster. formed domes. In the memory of the Nigerian people, "ribbed domes" have become a common construction method. Domes like these were used to cover the palace and vestibule in Kano.

Many domes have been gradually developed since the Islamic era and continue to do so. Over time, the transition from one-story domes to two-story domes began. Both shells of two-story domes have a considerable distance. Such domes are considered to indicate a correspondingly higher level. Two-story domes, suitable for geometric analysis and syntactic systematization of diversity of typological structures, help to understand their styles and reveal their aesthetic principles in architecture. Despite the fact that the domes have been studied by scientists many times, they have not been fully studied from a scientific point of view. For this reason, their research is one of the urgent issues. By studying the construction of the dome, new ideas can be awakened to give a modern form to the traditional architectural design.

The following can be said about the structural forms and structural schemes of the domes. Domes have a curved (usually circular, elliptical) or polygonal structure, and have a curved or polygonal contour in the



vertical plane.[4] According to the design schemes, they are divided into dome-shell (smooth or ribbed), ribbed, ribbed-ring, lattice joint and mesh domes (Fig. 1).[2-3]

Figure 1. Constructive schemes of domes:
a) smooth domed shell; b) ribbed; c) ribbed ring; g) ribbed ring with lattice joints; d) Shvedler mesh dome; e) Foppl mesh dome; j) Chivitt mesh dome; z) grid dome based on Chebyshev grid geometry; i) composite polygonal shell.

Shell domes have a surface formed by the rotation of a plane curve (in the form of an arc, ellipse, parabola, cycloid, or a combination thereof) around a vertical axis. The elements of the dome are an axisymmetric continuous thin-walled shell of revolution and an elongated support ring. If necessary, a high compression headlight ring is installed. The shell of the dome can be made of wavy and folded elements. Dome-shells are mainly made of reinforced concrete.

Edged domes consist of individual flat ribs installed in the radial direction. The ribs are connected at the top, and at the bottom they rest on the supports. Pyramidal or conical domes are formed with straight ribs. The elements of the dome are the lower support ring, the ribs themselves and the upper ring. Open-edged domes are an intermediate system in which a separator can be obtained by the construction of foundations, walls or a special support ring[1].

Rib domes can be reinforced concrete, metal and wood. In the first case, thin-walled reinforced concrete slabs can be laid along the rib frame. Later, provided that design methods ensure that the plates work together with the ribs, the ribbed dome becomes a domed shell.

Ribbed ring domes consist of flat radial plates, which are connected by purlins in the direction of the ring, and together they form a rigid spatial system. Progon can be used as a dome fastener. In this case, the ring beams not only act in local bending due to the weight of the roof, but also experience normal forces from the general work of the dome.

Ribbed ring domes with lattice connections are inscribed on the surface of the revolution
formed by polygons. They consist of radial ribs and rings with braces between them. The presence of the latter reduces the forces on the ribs and rings. The expansion of the dome is felt by the elongated support ring. At the top, all the radial ribs are connected by the upper ring, which simultaneously serves for the device of the light lamp. Ribbed ring and ribbed ring domes with grid connections are usually made of metal.

Mesh domes (Figure 1). Such domes are polygons inscribed on a spherical or other surface of revolution and consisting of one layer of structural elements. Such domes are mainly made of metal; they can be made of wood or reinforced concrete.

Domes without a surface of revolution can be arranged using double curved shells or cylindrical shells intersected in meridional planes, forming surface refraction angles. Such structures are called composite polygonal shells or polygonal domes (Fig. 1). [1]

Another type of dome construction is the double dome. When building a double dome, depending on the proportions of the building, the outer dome can be built higher or lower. For it, the first, that is, the inner dome is tied, then the foot (drum) is picked to build the outer side. The last job is to close the outer dome. It is not placed on the roof like a normal dome, and it is determined by its height, and a template (cup) is made for it from the outside. A groove is laid in the middle of the dome. Bricks are laid on this template at the place where the dome will be completed. When making bricks for domes, they are usually made one brick thick, which is strong and light. The space between these domes is called khataba in the language of architects [8].

Methods.

To find the shape of the dome, the bottom of the dome is carefully leveled. When working on a dome, like working with a bow, if the rules are not followed, both the masters and the students will undoubtedly get distracted. According to the current rule, the size and height of the dome are taken into account, then the inner two edges are determined, a line is drawn on the ground, the wide board is leveled and smoothed to the line, and other types of arches are processed in the same order. In architecture, this method is called linga.

The linga helps the masters in the work of the dome. Depending on the dome, the distance between the two lingas should be one to two meters. Several pieces of linga are prepared in this size. Before installing them, the place, that is, the perimeter of the wall, is leveled with the help of an obtaroz, then the upper part of the linga, that is, the round part, is aligned with the inside of the wall, and the place to be placed is against the

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xtimol, which rides on the linga. is strengthened taking into account the load. Then, the diameter of the dome is straightened up from the center using a shovel tool, and a flat wood or similar groove is installed with a size higher than the height of the dome.

The internal height of the dome is determined by this wood. After this task is completed, the lower part of the prepared linga is placed in place on the wall, and the upper part is fixed according to the mark on the installed wood, and it is fastened to the end of the attached wood, and everything is connected to each other. This method will be the internal, that is, the main key of the dome. Bricks are laid from the inner part of the dome where the mold is ready, and it is picked over the linga. At least 50 cm from the top of the dome when working towards the center. a pipe or wood should be pulled out from between the bricks and attached.

Experienced craftsmen connected the dome without a linga. However, a dome with a linga is easy and correct to build. Another method of tying the dome is to install a straight piece of wood or similar in a length that is above the height of the dome. The inner height of the dome is determined by this groove. Where the dome begins, a wire is inserted into the tube, and the inserted wire rises uniformly up to 45° without being high or low, and after 45°, the wire is resized. In each row, the throne is elongated based on the form drawn on the ground.

The technique of tying the dome in the bagal, kaftarak (parus) method. Baghal style dome is medium and beautiful. Similar to a normal dome, a certain amount of wall is raised from four sides. Only 8-10 cm wide on each side of the foundation corner. two angles are separated and developed.

Results.

The results of different configurations of internal brick and wooden formwork placed in the middle of the dome can be seen in the image below.

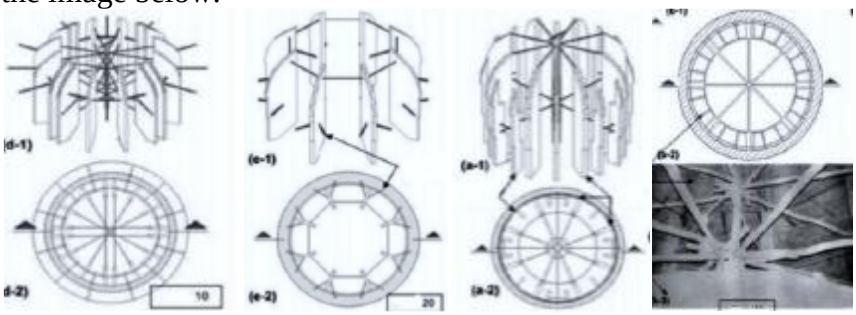

Figure 2. Wooden forms used in the construction of domes:

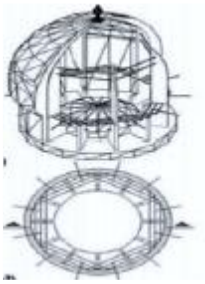

Figure 3. A brick mold used in the construction of domes.

Conclusion.

The fact that the domes used in architectural monuments have developed in different forms, it is necessary to study many methods to study them;

In the process of researching the dome structure, it was found that actually construction by Lin's pull method allows to make a high-quality dome;

According to the results of the study, it can be seen that the roof part of the building is protected from various atmospheric effects by using double domes;

Through the mausoleums made of double domes, it was determined that the shape of the roof part of the building takes on a majestic appearance;

In the future, it will be possible to learn new information about the formation of domes by conducting such research

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