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SCIENTIFIC VIEWS ON THE GEOMETRIC MODELING OF THE OPTIMAL DESIGN OF ENCLOSURES FOR SPATIAL SHELLS, COATINGS

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Annotation: This article presents thoughts and comments on some studies on geometric modeling of the optimal design of structures for spatial shells of coatings.

***Keywords*:** Dome, cylindrical, canoid, ellipsoid, ovoid, paraboloid, hyperboloid, modeling, constructor, architect, configuration, frame, parameter, aesthetics, parquet, construction, approximation, transcendence.

The rapid development of modern science and technology is taken into account, it is recommended in our life of computer technology and information systems "Internet", the century of sustainable development of all scientific research in science and technology, taking into account the vast construction and creative work carried out in foreign countries under the conditions modern architecture. It is known that the patterned architectural decor and geometric figures in mosques and madrasahs with arches, domes, minarets, mainly port facades, used and embodied in the construction and installation works of historical architectural monuments, have a special appearance.

Given this, the issue of implementing the closures of spatial shells, which play an important role in architectural and construction objects, remains problematic, based on modern requirements. However, it is known from history that the use of coatings with a curved surface was used in various objects.

If we look at the history of the development of the geometry of the drawing, we should pay attention to such a slogan. This is interpreted as follows, i.e. "nature, geometry and architecture". From this it follows that it is known that all practical work, creative and inventive work done from ancient times to the present, was definitely taken as a model from natural scenes.

Therefore, taking into account the existence of problems in the production and use of construction devices used in all types of construction and installation works, where modern construction work is carried out, modern construction devices that have good efficiency and fully meet the requirements of the time, that is, the closure of spatial envelopes in addition to improving the conditions of moderate climatic conditions indoors in application environments, one can distinguish comfort, sound dispersion, normalization of air exchange in the room, reduction in the need for heating networks used in winter, savings in closing costs, increased load-bearing capacity of the device , high seismic resistance, etc., but until this issue is resolved.

As we know from history, our ancestors, as a result of their extensive research, found it acceptable to use domed, cylindrical roofs in order to improve their living conditions.

Therefore, it can be considered expedient to use non-traditional building devices, i.e., thin-walled spatial reinforced concrete structures of coating shells, instead of the main devices used in construction and installation works, i.e., traditional building devices used in closings. Examples of these include cylindroid, canoid, ellipsoid, ovoid, paraboloid, hyperboloid, etc.

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Based on the foregoing, it should be noted that the use of spatial enclosing structures in residential and public buildings and extensions to these buildings and structures, as well as in other maintenance and operation facilities, gives good results.

Based on this, it is necessary to conduct large-scale scientific research on the scientific optimal design and implementation of spatial shells using geometric modeling of spatial shells of coatings and computer engineering graphics.

The main feature of spatial enclosure-shells is that it should be noted that the fences of large construction objects include indoor sports complexes, shopping malls, hangars, station buildings in the direction of providing cultural and community services to the population, cinema and concert halls, and others.

Since the beginning of the 20th century, from developed foreign countries: Australia, Japan, the American continent, in a number of countries on the European continent and in a number of cities of the former Soviet Union, including the coverage of the waiting room at the airport "Borispol" in Kyiv, 40 * 60 m coverage of "Dmitrovsky" market size coverage 36 * 36 m, the building of the circus in Tashkent, sports complexes "Bunyodkor".

In order to take into account the following issues in the work of architects and designers when creating shells, coatings:

1. The design and operation of body railings is affected by the whole complex of predetermined requirements. If many of them are modeled geometrically, this allows us to approach the design of architectural coating shells from a geometric point of view. Geometric analysis of several hundreds of architectural shells, coatings carried out in our country and abroad shows that even for the corresponding shells, such as cylindrical and spherical, adjustments are required to give them an optimal configuration, division into elements, definition of metric problems, etc. Moreover, this is the study of geometric analysis and the calculation of a shell of complex shape;
2. So that architects can freely control the shape of shells, coatings, they must master the geometric apparatus for the formation of curved surfaces, which is characterized by sufficient flexibility, variability and at the same time simplicity. Based on the frame-parametric method, which has great shaping capabilities, methods for constructing shell surface frames can be created;
3. the construction of shells in architecture has its own characteristics, their shape is not determined by such stringent requirements and a large number of parameters, for example, in some areas of mechanical engineering; fast and such high accuracy of surface fitting is not required, at the same time, aesthetic qualities are necessary for the shell in architecture, taking into account its internal and external perception, compliance with the image of the structure, etc. Thus, the designer of the closure must take into account both "quantitative", and "qualitative" characteristics;
4. In wildlife there are many surfaces that can be called "form constancy". As a result of millennial evolution, representatives of the animal and plant world have acquired the most reasonable form in terms of energy efficiency and the effectiveness of their functional activities. The identification and study of geometric patterns found in the forms of individual representatives of wildlife makes it possible to use them in whole and in part, in the form of separate surfaces or in various combinations, to build architectural shells. In a certain sense, one can speak of the bionics of form;
5. for the practice of architectural design of coating shells, it is important to obtain sections of shells from known or constructed surfaces, as well as composite shells formed by combining one surface or several sections of different surfaces;

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6. prefabricated reinforced concrete or other elements for the manufacture of the shell, its surface is divided into the minimum number of elements that can be made at the factory and assembled at the construction site. Despite the existing proposals, the question of such a structure remains relevant. It is necessary to study the optimality of the division when approaching the shells of the coatings to the elements and precise parquet;
7. When designing shells of coatings, problems of a metric order arise, associated with the areas of the surfaces of the shells and the volumes that they cover. In this case, it is necessary to solve problems in direct formation that determine metric properties and vice versa, for example, finding the geometric parameters of a shell covering a given volume;
8. At present, the problem of determining the optimal form of the shell that satisfies a number of criteria in quantitative and qualitative terms is very relevant. There can be different formulations of such a problem, in particular, if its geometric side deserves attention, from one or another set of surfaces, one should choose the optimal shell that meets a number of criteria.

As can be seen from the above, a wide range of geometric issues related to the basic rules and requirements that affect their formation cannot be ignored in order to increase the efficiency and widespread adoption of architectural shells.

The geometric design of closures presents two main problems:

1. Determining the shape of the middle surface that best suits the given conditions and requirements of other surfaces;
2. Solving special issues of geometric construction and formation of the existing median surface, approximation, determination of metric characteristics, etc.

The shape of the shell is influenced by many factors and conditions: the static properties of the shell, its functional and aesthetic qualities, economy and construction technology, etc. Although most of these factors are non-geometric in nature, they somehow affect the geometry of the shell, but all these factors are related to the shape shells.

Therefore, based on the analysis of the surface shapes of several dozen shells, the most important and general aspects of the factors that determine the geometric nature of the shell are systematized and geometrically modeled, along with the requirement to study.

Often, a slight change in the shape of the shell significantly increases its load-bearing capacity. The shape of the shell and the nature of its fastening also affect the distribution of forces in the shell due to its own weight. The calculation of the shell directly depends on its geometric shape: the type of midpoints, the nature of its support contour, the nature of the connection of its constituent parts, etc. can be taken into account.

The main technological feature of the classification of closures is their strength or assembly. In addition, an important technological point, which simplifies and reduces the cost of the projectile, is the possibility of its pneumatic execution. In this regard, transcendental surfaces of displacement and transfer are very widely used as intermediate surfaces of shells. An increase in the variety of shells defined by surfaces of revolution and translation can occur through the use of some spectacular curves in three-and four-dimensional order, as well as transcendental curves as shapers and guides.

Thus, cost savings in the implementation of volumetric enclosing structures will be from 40% to 60%.

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