POSSIBILITIES OF USING THE APPROXIMATION OF HELICAL SURFACES IN CONSTRUCTION.

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ANNOTATION

The article proposes methods for the manufacture of columnar trunks, geometric descriptions, approximation of right and left multi-bypass cylindrical helical surfaces, optimal solutions for constructing a sweep of column barrels, a sequence for constructing a model from flat materials, the cross-section of the columnar trunk is determined, the dependence of the number of sides of a regular polygon in the barrels of the columns and the number of ribbons on the sweep.

Key words: right and left helical lines, meridians, approximation, octahedron, icosahedron, tetraer, unfolding contour, column trunk, parquetting, border of motifs.

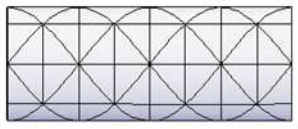
When designing various architectural forms, the approximation of their middle surface is widely used. The service purpose of the approximation consists in a simplified technology for the manufacture of a particular design [1]. The structures of the columns, obtained by the approximation of cylindrical helical surfaces, are parquetted with equilateral triangles. Such columns improve the architectural expressiveness, tame the exterior and interior views of buildings and structures [2].

Consider the approximation of the right and left four-round cylindrical helical surface. Replacing the surface with triangles gives the best performance.

The design is repetitive from a single motive. The motive consists of two parts - left and right. They are mirrored. The border of the motives and the middle are squares. The motif is parked from equilateral triangles.

The helical surface can be right or left and several leads.

If at the same time give several (four) approaches of right and left helical lines, which form a mesh on the surface of the cylinder (Fig. 1.). When drawing at the points of intersection of the right and left helical lines of the plane passing through the axis of the torus, we get squares (Fig. 2.).



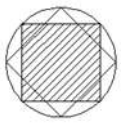


Fig 1. Helical lines on the cylinder. Fig 2. Cylinder with parallels and meridians

A mesh is built on the surface of the cylinder. Replace the grid cells with equilateral triangles - approximate. Column bore design has been obtained.

To construct an unfolding of this construction, consider the properties of polyhedra:

A tetrahedron is the simplest polyhedron with four triangles as its faces. A tetrahedron is a triangular pyramid when any face is taken as a base. The tetrahedron has 4 faces, 4 vertices and 6 edges. A tetrahedron, in which all faces are equilateral triangles, is called regular (Fig. 3).

An octahedron is a polyhedron with eight faces. A regular octahedron is one of five convex regular polyhedrons, its faces are eight equilateral triangles (Fig. 4.).

An icosahedron is a polyhedron with 20 faces. The most famous is the regular icosahedron - one of the regular polyhedrons, the faces of which are 20 regular triangles (Fig. 5.).

Fig 3. Tetrahedron. Figure 4 Octahedron

Fig 5. Icosahedron

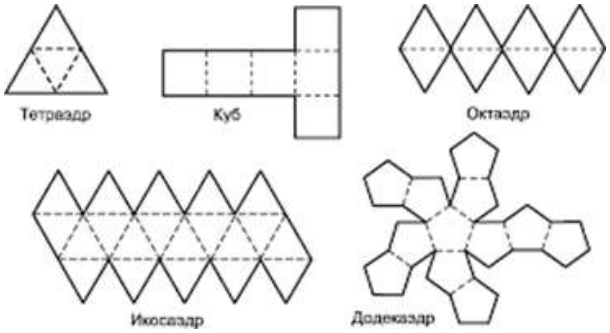
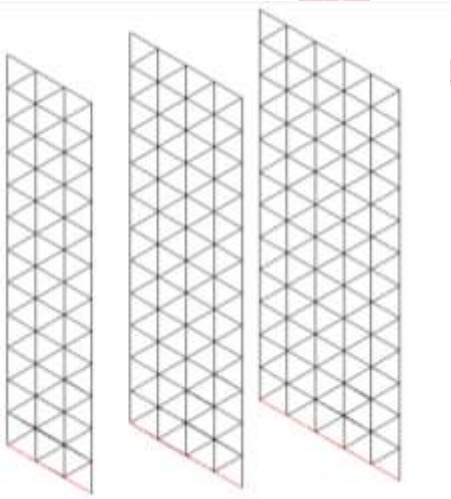


Fig 6. Unfolding of polyhedra

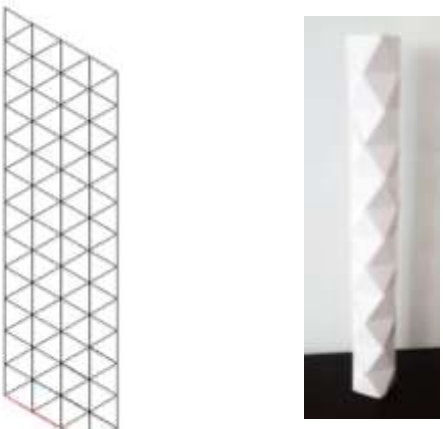
The sweeps of these polyhedrons are shown in Fig. 6. The tetrahedron, octahedron and icosahedron consist of equilateral triangles. The unfolding of these polyhedra can be constructed in many ways.

The optimal solution for constructing the sweep of the column shafts is tape. Each tape is composed of equilateral triangles. Unfold, the tetrahedral column consists of three, the octahedral column consists of four and the icosahedral column consists of five ribbons (Fig. 7.).



а) *б)* *в)*

Fig 7. Column sweeps: a - tetrahedral, b-octahedral, c-icosahedral.



а) б)

Fig 8. Column: a) development, b) model

The sweep contour is a quadrangle (Fig. 8.a). The sequence of building a model from flat sheets (For example: paper): 1. On the sweep, a groove is made along the lines with the help of charcoal. 2. The edges of the sweep are cut off (leaving a short strip for joining). 3. The resulting workpiece is transformed into a long prism. 4. Slightly, make one end stationary and turn the other. As a result, the long lines become helical, and the short sides of the sweep contour become square. The long sides are connected (Fig 8.a).

The cross-sections of the columnar trunk are always the same regular polygons. The number of sides of a regular polygon is equal to the number of ribbons on the sweep.

CONCLUSION

1. The approximation of the right and left of a four-round cylindrical helical surface is considered. and the proposed replacement of the surface with triangles gives the best indicator.
2. Optimal solutions for constructing the sweep of the column shafts have been proposed, the sweep contour has a quadrangle, in which there are three or more strips of ribbons, each ribbon is packed with equilateral triangles.
3. It was determined that the cross-section of the column shaft is always the same regular polygons. The number of sides of a regular polygon is equal to the number of ribbons on the sweep.

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