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Development Of Spatial Metal Wooden Bar Constructions Of Coatings, From Composition Wooden Elements

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ABSTRACT

Metal wooden spatial core structure, including upper and lower grids, braces, combining the nodes of the upper and lower grids, and vertical strands, characterized in that, in order to ensure redistribution of forces and uniform load of structural elements and giving additional stiffness compressive composite small-sized boards of the upper belt and the lower metal belt with a special tensile nut to give the building a structural lift, are displaced in plan relative to each other by 45 °, while the braces in the nodes of the grids are located mutually perpendicular and in one direction they are made descending, and in the other ascending, through one node.

KEYWORDS

Metal-wood, spatial structure, rod structure, upper belt, lower belt, descending rod, ascending rod.

INTRODUCTION

The main directions of economic and social development of Uzbekistan for 2020-2025 and for the period until 2030 outlined measures to reduce the material consumption of structures and increase the efficiency of capital construction. One of the ways to solve the set tasks is to develop and put into practice new lightweight effective building structures, including metal-wooden structural structures, which allow to save materials, reduce labor input and increase installation speeds. Currently, in Uzbekistan and abroad, intensive searches are underway for new solutions of spatial wooden structural bar structures, methods for their calculation are being improved.

Very effective are lightweight orthogonal metal-wood structural structures. However, their known schemes have a number of drawbacks, and calculation methods require clarification. Limited information on the

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deformability and long-term bearing capacity of such structures. It is necessary to further improve the nodal interfaces and study them in real conditions to study the actual operation of the structure. Based on modern requirements for structural coatings, the development of new effective orthogonal metal-wood structures and the improvement of methods for their calculation is an urgent and sought-after topic.

The metal-wooden structure of composite wooden elements belongs to the field of construction and is intended for lightweight collapsible (if necessary) coatings of buildings with significant spans. With a small unit cell size of 1500x1500 mm, it will be possible to build structures with dimensions of 6.0x6.0 m, 6.0x9.0 m, 6.0x12.0 m, 6.0x15.0 m, 6.0x18.0 m, and t The width and length of the structure can be adjusted by adding a unit cell. These prefabricated structures are recommended for agro-industrial, farm and dekhkan farms, livestock, poultry and horticultural complexes. The small size of the unit cell allows the use of wood up to 2.0 meters in size, which will allow modification of wood rods in small bathtubs and transport in small vehicles.

It is known that a spatial bar structural structure, including intersecting rods of the upper and lower zones and a lattice in which the vertices of the pyramids, the bases of which are located in one belt, are located at the centers of the bases of the pyramids located in another belt, and the faces of the pyramids are shifted one relative to another 120 °, and their tops are connected by strands [2].

The disadvantage of this technical solution is that it is impossible to obtain a rectangular coating in plan and redistribute the forces on the elements.

The closest to the invention in technical essence is a spatial bar structure including upper and lower grids, braces combining the nodes of the upper and lower grids, and vertical strands, in order to ensure redistribution of forces and uniform load of elements structures, the upper grid is shifted in plan relative to the lower one by 45 °, and the braces in the grid nodes are mutually perpendicular and in one direction they are made descending, and ascending in the other, through one node [3]. The disadvantage of this spatial design is that it does not fully ensure the redistribution of forces and uniform load on the structural elements, and also does not impart a structural lift to the structure, as well as the cross section of the compressed upper belts and braces made of solid beams.

The aim of this study is to ensure redistribution of forces and uniform load of structural elements and giving the structure a building lift, as well as additional rigidity due to composite compressed rods. In this case, the goal is achieved by the fact that the metal-wooden spatial bar structure, including the upper and lower grids, composite braces connecting the nodes of the composite upper and lower metal grids and vertical strands, the lower grid is shifted 45 ° in relation to the upper one, and the composite the braces in the nodes of the grids are arranged mutually perpendicularly and in one direction they are made descending, and in the other direction ascending, through one node [1].

For the proposed version of the structural design measuring 12.0 x 12.0 m, the dimensions of the cell elements are shown below: in Fig. 1 shows the described construction, plan view; in fig. 2 knot on the upper grid; in fig. 3 knots on the bottom grid. The proposed metal-wooden spatial bar structure includes elements 1 of the upper composite mesh, elements 2 of the metal tie pulled together with special nuts to give a structural lift to the lower metal mesh, composite braces 3, metal tie-rods 4 tightened with special nuts. The upper and lower nodes

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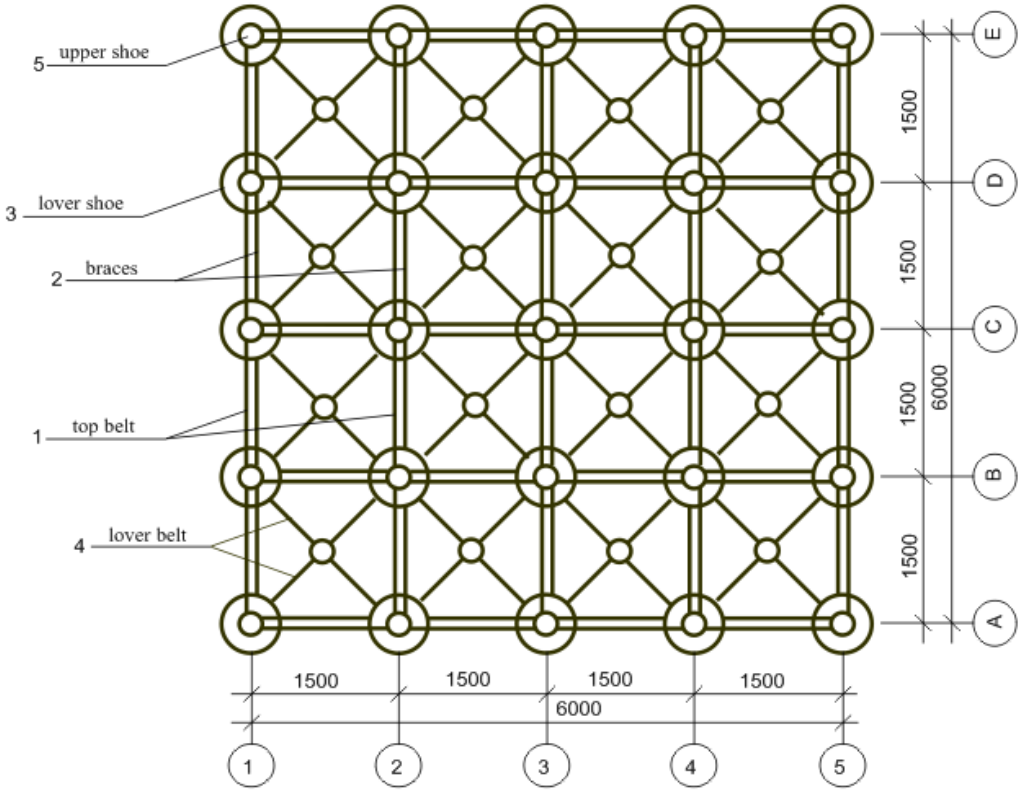
of the intersection of the mesh elements are connected by composite braces. Two braces are suitable for each node, and the planes of these races 'alternate sequentially in mutually orthogonal directions. The nodes of the upper and lower grids are pulled together by strands 4, so that only compressive forces arise in the braces. Compressed elements are made of composite small-sized boards, stretched metal with a special tensile nut. Elements of the upper mesh and braces are combined in a knot by means of a shoe 5 pivotally with one bolt of a frontal emphasis, and metal 6 - with the help of nuts at their ends. The roof supporting structure is laid along the upper grid, which transfers the load through the upper grid to the upper nodes of the structure and through the braces from each upper node to the next two lower nodes. The strength of the lower nodes through vertical strands is transmitted to the following upper nodes. Due to such a structural implementation of the structure, such a redistribution of forces occurs intensively to the edge of the coating. This allows you to evenly load all structural elements.

Currently, work is underway on the preparation of an experimental installation of a structure measuring 12.0 x 12.0 m in 1/4 of a full size, i.e. size 3.0 x 3.0 meters. The consumption of materials for the manufacture of a metal-wooden structural structure measuring 12.0x12.0 meters in plan (144m2): wood - boards with a section of 50x150 mm-4.8m3-2500kg-16.7 kg / m2; metal strip steel with a thickness of 4 mm-500 kg-3.47 kg / m2; metal pipe with a diameter of 180 mm, thickness 4 mm - 18.0 meters; reinforcing steel with a diameter of 10 mm of a class A-II-48 meter; reinforcing steel with a diameter of 12 mm of a class A-II-220 meter; metal bolt with a diameter of 5 mm and a length of 165 mm-972 pieces; metal nut with robbery M12-1296 pieces.



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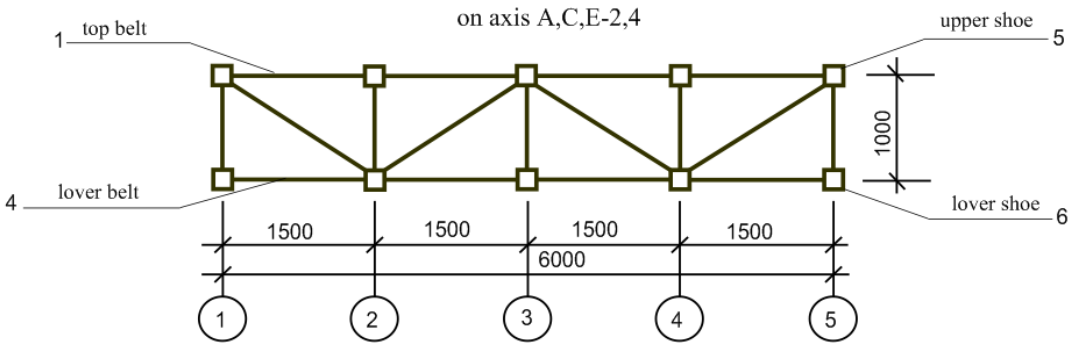
b)



v)

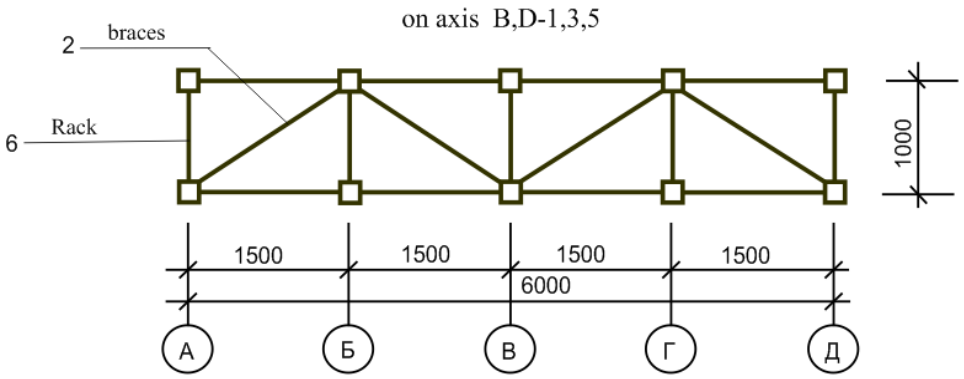
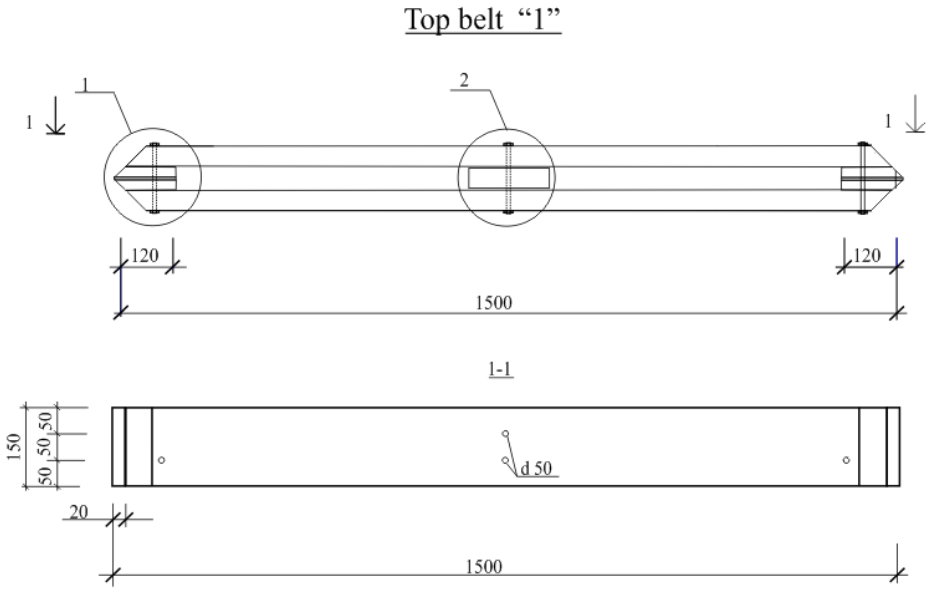


Fig. 1. a) - a method of forming a cell structural structure; b) is a transverse section of the structure; v) is a longitudinal section of the structure.



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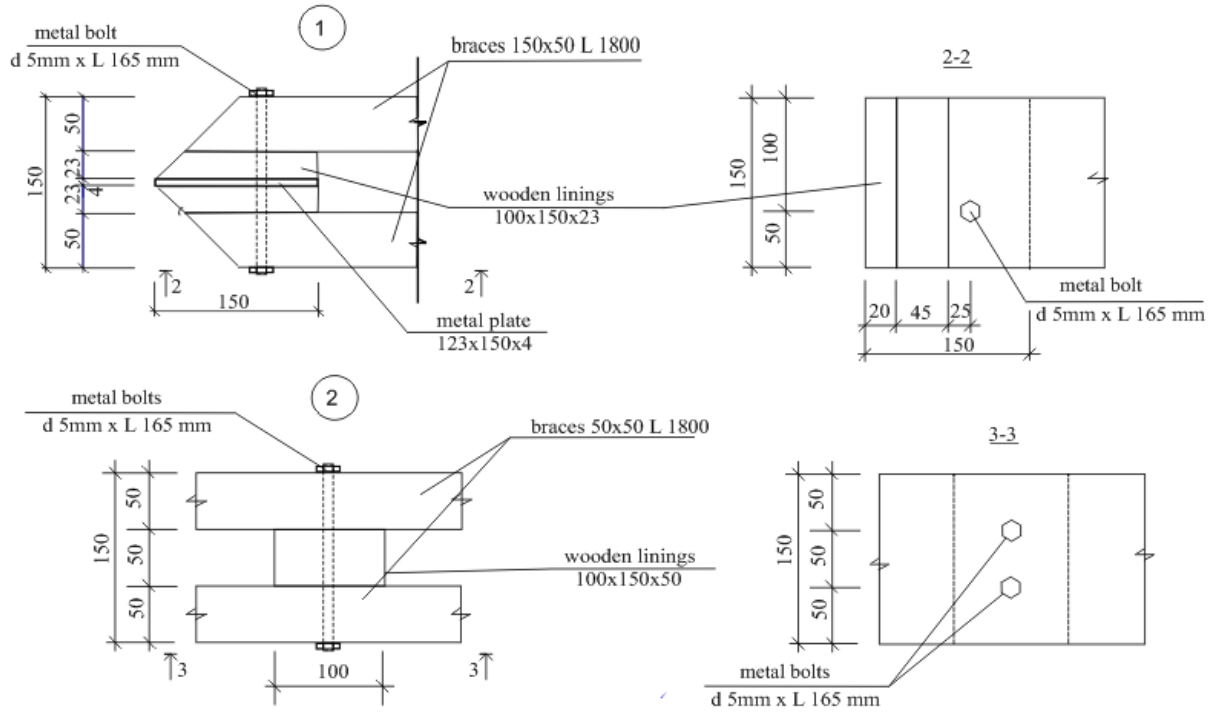
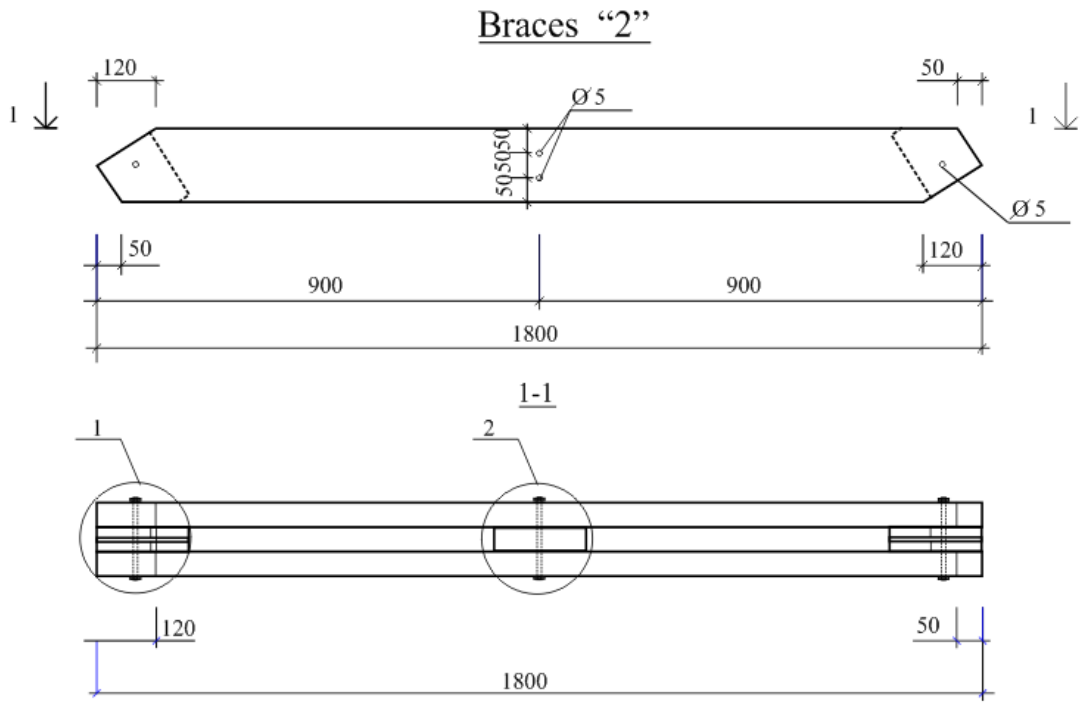


Fig. 2. The upper belt of the structure, composed of two composite boards measuring 50x150mm and a length of 1500mm, connected using 50mm thick wooden plates in three places



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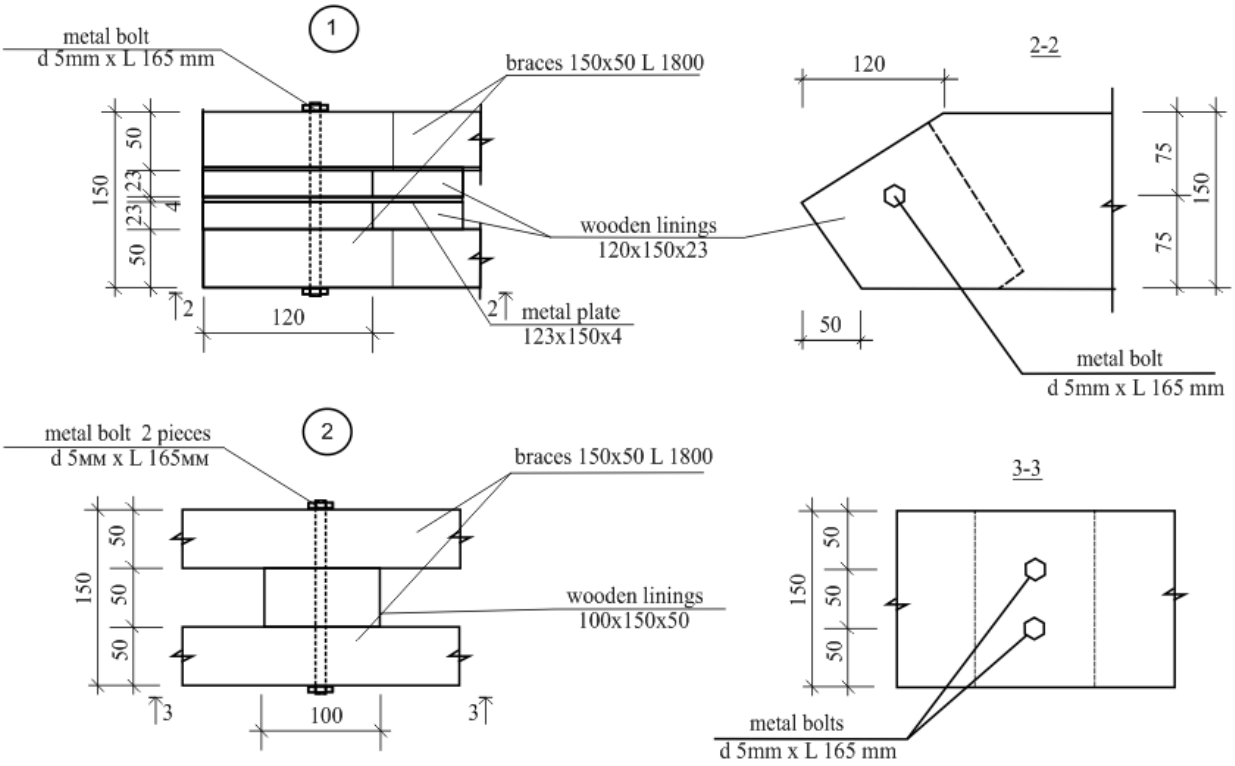

Fig. 3. The spatial braces of the structure, consisting of two composite boards measuring 50x150mm, length 1800mm, connected using wooden plates 50mm thick in three places.

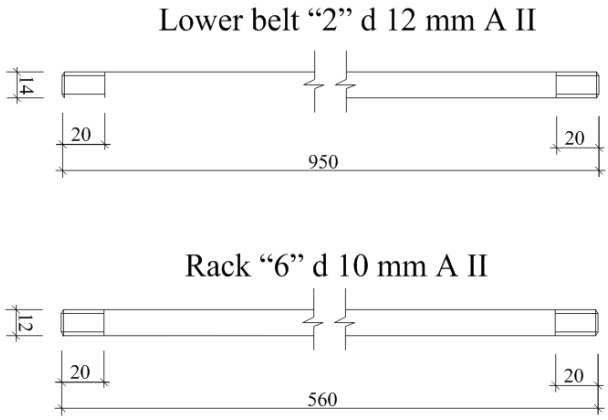

Fig. 4. A tie-rod made of a round metal reinforcing bar with a diameter of 10 mm and a length of 560 mm, having 20 mm at both ends of the thread, Fig. 4 the lower belt of the structure made of a round metal reinforcing bar with a diameter of 12 mm and a length of 950 mm, having two ends of the thread length of 20mm.

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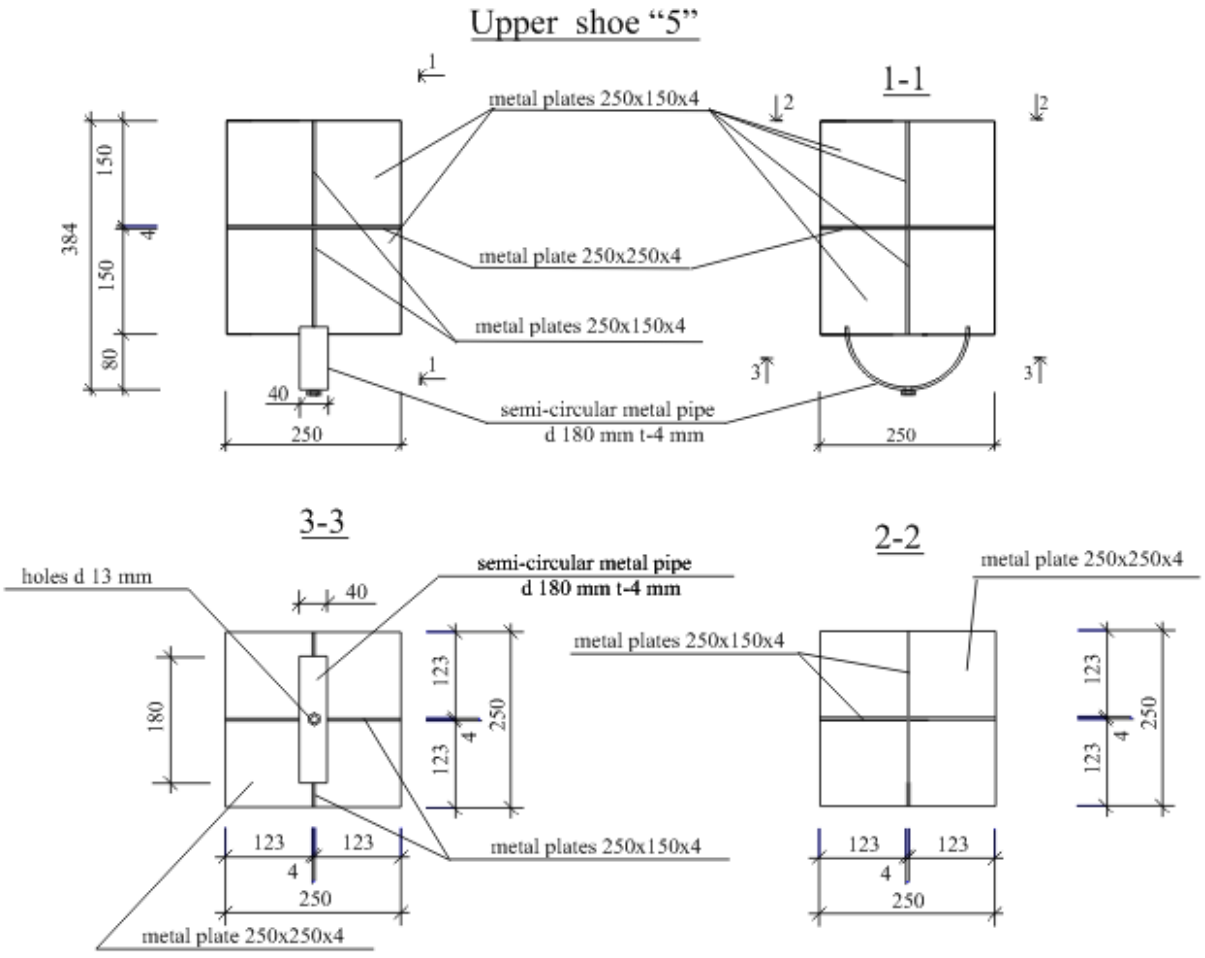

Fig.5. Upper shoe structure.

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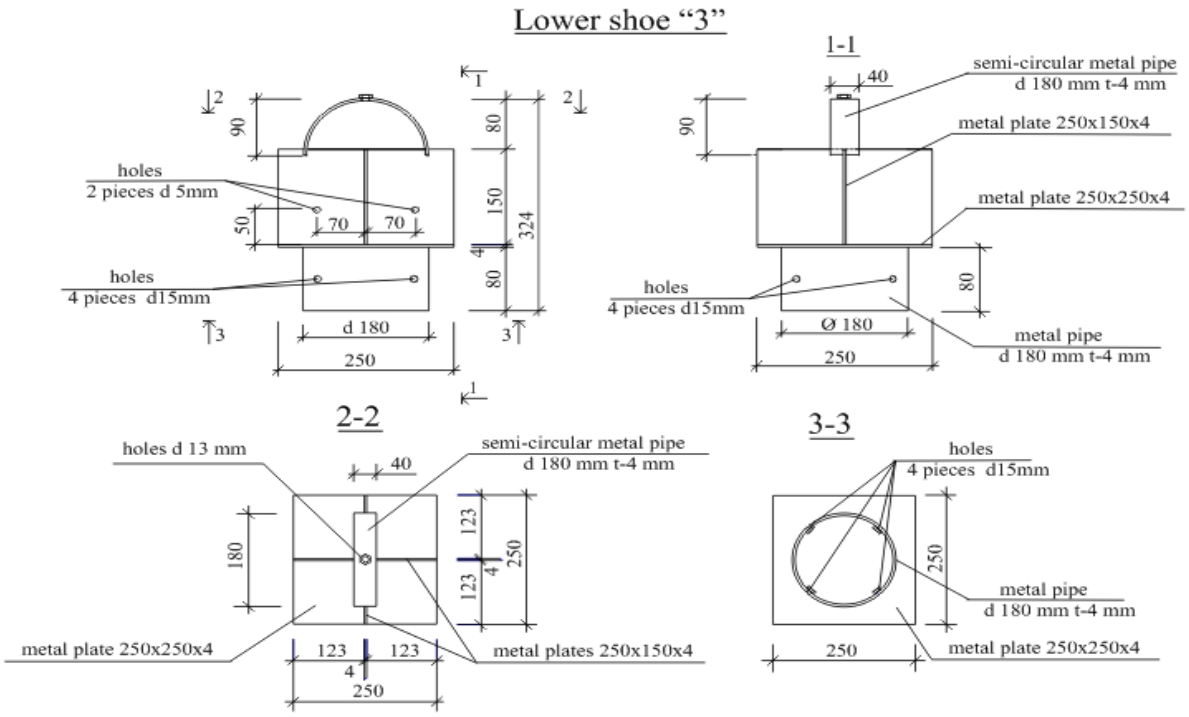

Fig. 6. Lower shoe structure

Findings

1. A metal-wooden structural structure of composite wooden elements belongs to the field of construction and is intended for lightweight collapsible (if necessary) spatial structures with medium spans.

2. Structural cells with dimensions of 1500x1500 mm will make it possible to adjust the dimensions of the structure in width and length (as intended).

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