ТЕХНІЧНІ НАУКИ

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THE RESEARCHES OF COMPOSITE AND SPATIAL GRID CABLE-STAYED CONSTRUCTIONS FOR CIVIL ENGINEERING

Composite and spatial grid cable-stayed constructions consists of reinforced concrete slabs, steel bars and steel rope (Fig. 1). In order to implement the constructions to practice necessary to researches stress-strain states considering structural features. Therefore determination the optimal geometric parameters and studies the stress-strain states is a key issue. Process of determining the optimal parameters includes a wide range of experimental and theoretical studies.

Because the design is composite and includes plates, flexible and tough components, research focused on the problem of forming. Considering that the lower chord structures made of steel rope, it is necessary to determine the optimal geometric dimensions of the coating type shell, cylinder, arch and arch. The search for the optimal parameters and constructive solutions to these surfaces caused by the possibility of occurrence in the lower zone of compression that is not acceptable. To determine the optimal design parameters was developed research program that included theoretical and numerical calculations and experimental tests. In the first phase it was determined the optimal angle α, boom of arched f and span L (Fig. 2). Then to confirm the results obtained were manufactured prototypes of designs.

To confirm the results obtained by numerical methods, using the theory of similarity were produced samples composite and spatial grid cable-stayed constructions. Bench tests showed the reliability of the results obtained by numerical method and justice geometrical parameters. This assertion is made based on the deformation graphs depending on the load (Fig. 3, Fig. 4).

Besides determination of the main geometric parameters were experimentally determined as follows:

1) The feasibility of cable-stayed elements in hinge-moving scheme support in which case all elements of the lower chord tension force there;
2) The feasibility of cable-stayed elements in the fixed-hinged scheme support at an angle of inclination α of 12 °.

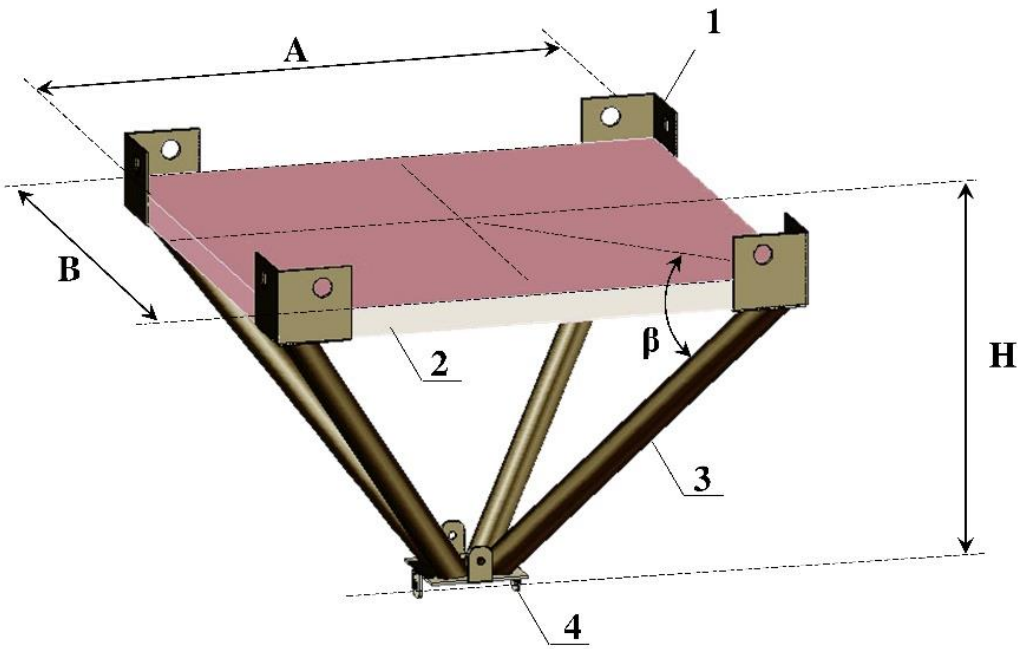

Figure 1. Composite and spatial grid cable-stayed element:

1 – top node connections; 2 – slab; 3 – web; 4 – bottom node connections; A – length; B – width; H – height; β – angle.

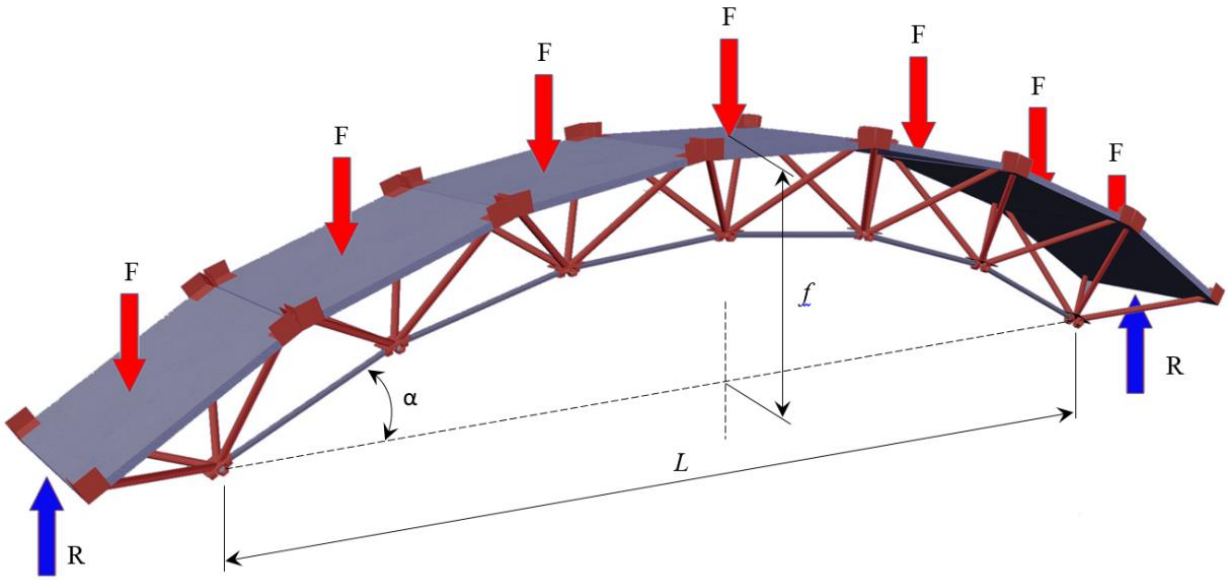

Figure 2. The optimal parameters composite and spatial grid cable-stayed constructions:

α – angle covering to the first element of its horizontal projection; f – boom of arched; L – span covering; F – Load; R – constraint.

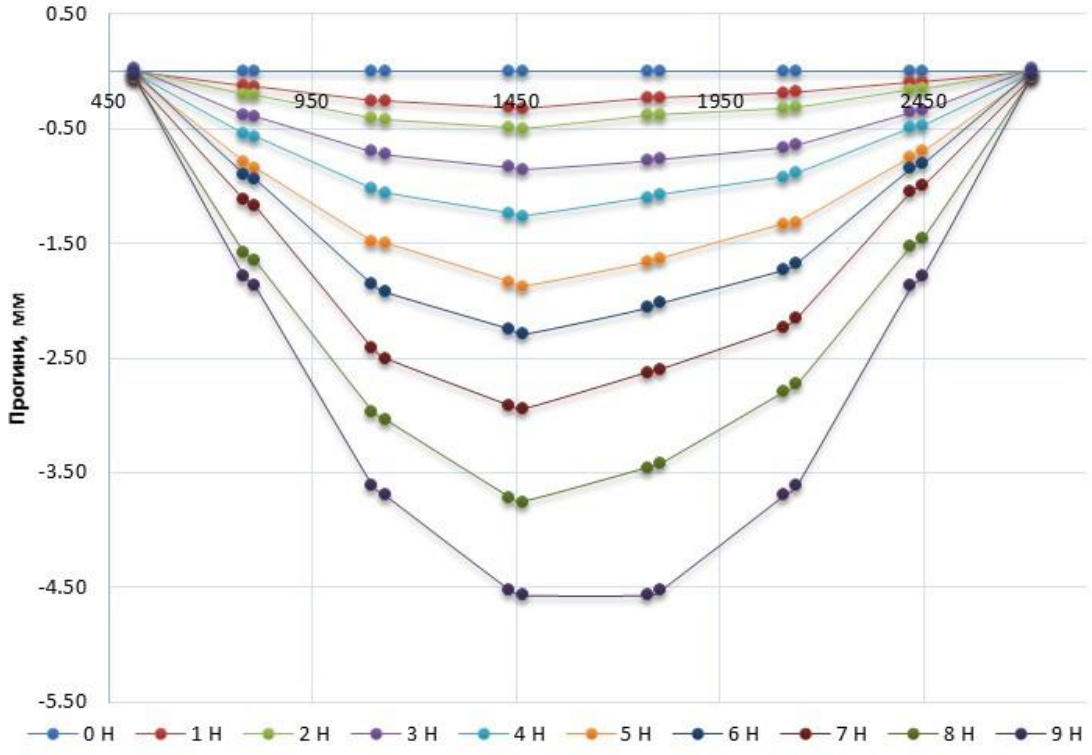

Figure 3. The dependence of the deflection of the load on the upper belt

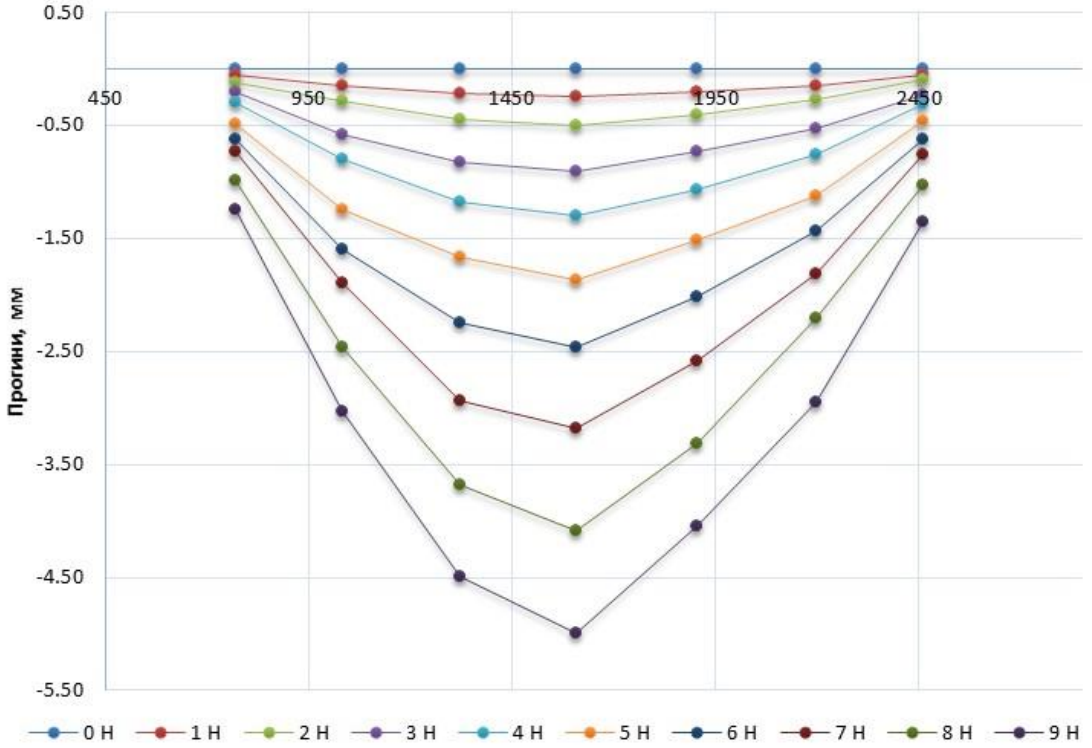

Figure 4. The dependence of the deflection of the load on the lower belt

Based on the data on the stress-strain state of individual elements composite and spatial grid cable-stayed covering has been extended experimental study. To do this, we designed a new research program that included detailed numerical calculations and experimental research the design as a whole.

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INVESTIGATION OF THE INFLUENCE OF GEOMETRICAL PARAMETERS ON THE TAKE-OFF MASS OF UNMANNED AIRCRAFT WING

1 Introduction

The aim for carrying out investigation on the wing parameters of an unmanned aircraft take-off mass is to look for its geometrical and structural weakness so as to be able calculate and deduce new parameters that will increase the general performance of the aircraft, thus reducing its take-off mass. These parameters include the relative airfoil thickness, aspect ratio, taper ratio and sweep angle. Along the line in the research, limits are used to define load factor and landing speed. These limits are used, as when displayed on the graph, give the ability to determine the minimal mass within the limit range.

2. Investigation

2.1 Work description

As earlier stated, the geometrical parameters of the aircraft greatly influence its takeoff weight. Geometric parameters of the wing have the greatest influence on the aerodynamic characteristics of the aircraft. For this proposed study, the first four basic parameters proposed by the software which are relative thickness, aspect ratio, taper ratio and sweep angle are used. They are then corresponded to seven different aircraft parameters which are lift to drag dependency, specific thrust, relative mass of power plant, relative mass of fuel, relative structural mass, optimal cargo mass and take off mass. Scientific article proposes a study on the basis of these parameters. Increase in wing aspect ratio generally leads to improved aerodynamic performance and increases weight.

Improving aircraft parameters can be achieved in two ways. Which are improving the aerodynamics and reducing the take-off weight. The first way is the