EUROPEAN JOURNAL OF LIFE SAFETY AND STABILITY (EJLSS)
ISSN 2660-9630
www.ejlss.indexedresearch.org

DETERMINATION OF THE CARRYING CAPACITY OF PYRAMIDS MODELS OF CROSS-ROD SPATIAL CONSTRUCTIONS.

Candidate Technical Sciences,
Isabekov Kamolboy,
Khushvaktov Usmon Ashurovich.
isabekovkamolboy@gmail.com
Samarkand State Architectural and Construction Institute

Abstract: *The article examines the bearing capacity of the pyramid model of cross-bar spatial structures. A diagram of the arrangement of electric load cells and loads during testing of pyramids is given. The residual deformations in the controlled sections of the rods and the forces in the rods of the pyramids at the design load are given. The destruction of all experimental pyramids and the general form of the loss of stability of compressed rods in the experimental pyramids are considered. The constructive correction for the normal force is determined at all stages of testing in all pyramids.*

Key words: *model, bearing capacity, experimental tests, pyramids, constructive correction, deformations, destruction.*

INTRODUCTION

The purpose of the test was to determine the bearing capacity of the compressed rods, taking into account the work of the joints. The experiments were carried out on pyramids 300x300x150 mm, made of experimental rods and nodal elements [2,3,5].

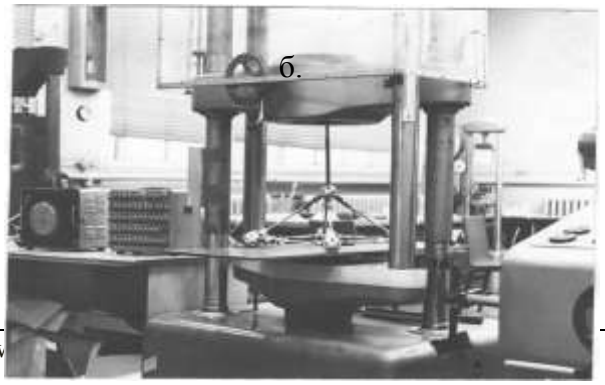
The pyramids were tested for the effect of vertical and horizontal forces applied at the top of the pyramid perpendicular and parallel to the plane of the base (Fig. 1.)

The pyramid was supported in all cases at the corners of the base. The pyramid was loaded on a TsD-40 universal testing machine.

Methods and materials.

In order to eliminate the effect of friction, the support units of the pyramid were installed on special plates and attached to them with bolts. The tests were carried out in two stages [1,4]. At the first stage, the work of bar elements in compression was investigated at the value of the experimental load Rex ≤ Pras. On the second, the pyramid was brought to destruction Reks = Rraz.

а.



б.

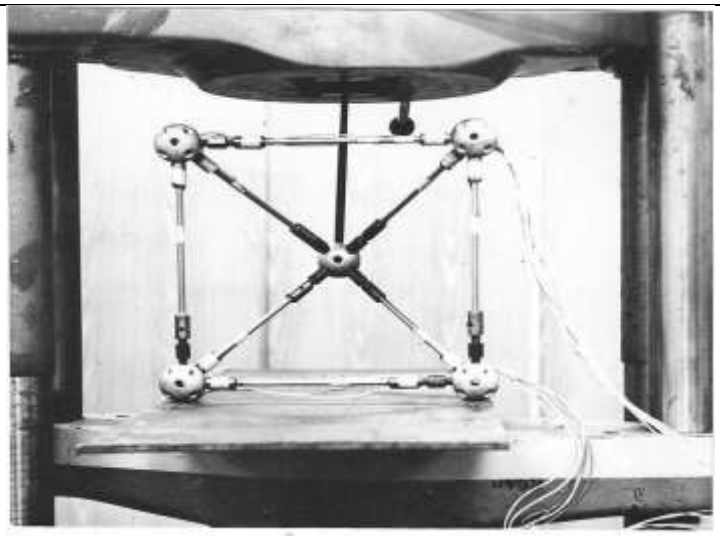


Fig. 1. General view of the installation for testing the pyramid for load:
a - applied perpendicular to the plane of the base; b - applied parallel to the plane of the base.

The load on the pyramid was applied in steps of 200-400 N. At each load step, readings were taken from the instruments. A diagram of the installation of electric sensors on the elements of the pyramids with their symbols is shown in Fig. 2.

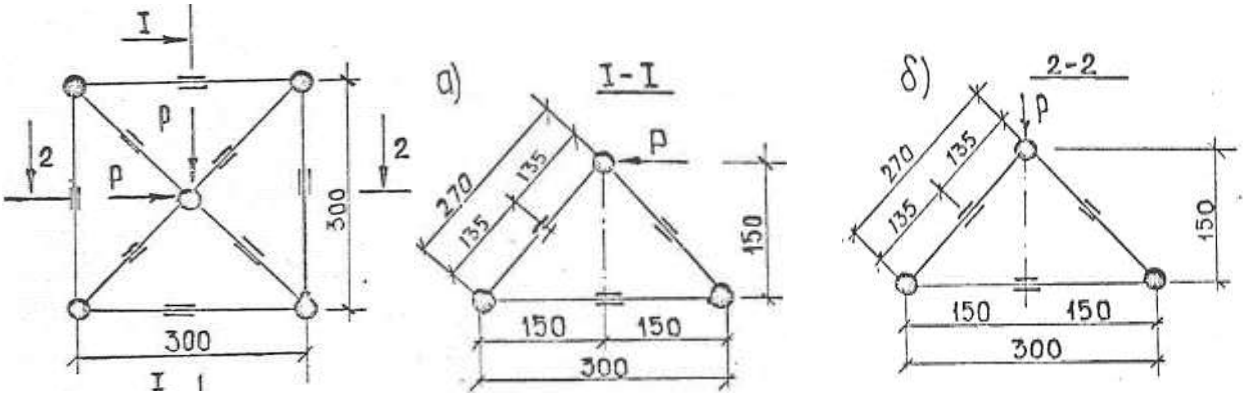


Fig. 2. Layout of electric load cells and loads when testing pyramids:
a - load parallel to the plane of the base; b - load perpendicular to the plane of the base.

Results and Discussions.

Figure 3. the graphs of the stress distribution in the rods of the experimental pyramids are shown.

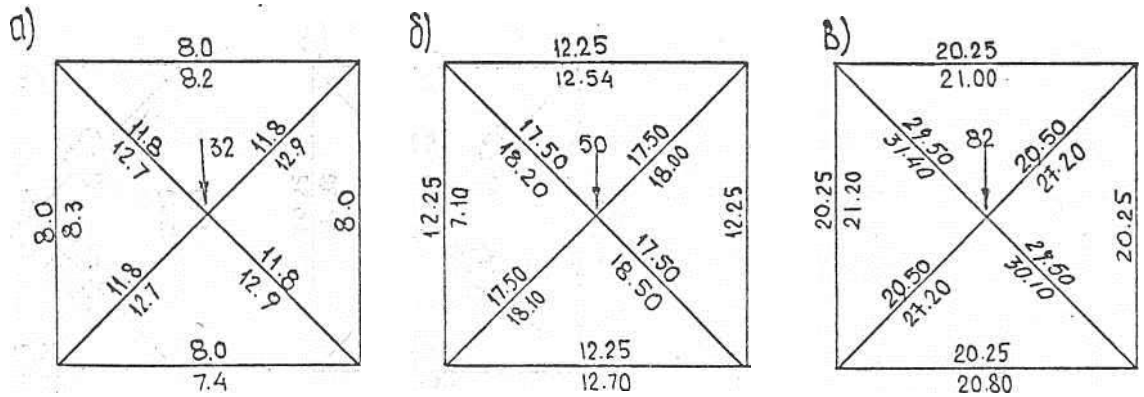


Fig. 3. Efforts in the rods of the pyramids at the design load:

a - for the pyramid d = 6mm; b - for a pyramid d = 8mm; c-for pyramid d = 12 mm. The numerator contains the calculated data, and the denominator is experimental (kN),

It follows from these graphs that the greatest spread of fiber stresses occurs in a tubular rod with a diameter of 12 mm. The average value of stresses in the braces of this pyramid turned out to be equal to σav = 45.9 MPa. At the value of the calculated load on the bar. For a pyramid made of pipes with a diameter of 6 and 8 mm, the average value of stresses at the value of the design load, respectively, reached σav = 63.5 MPa and σav = 56.8 MPa.

A small discrepancy in the direct force dependence indicates a good centering of the rods at the nodes and the symmetry of the applied nodal experimental load at the apex of the pyramids.

The constructive correction for normal force at all stages of testing in all pyramids turned out to be equal to 1.15.

The destruction of all experimental pyramids occurred from the loss of stability of one of the compressed rods, as a rule, the one where the scatter of the values of fiber stresses was observed along the average section of the pipe (Fig. 4.)

а) б)

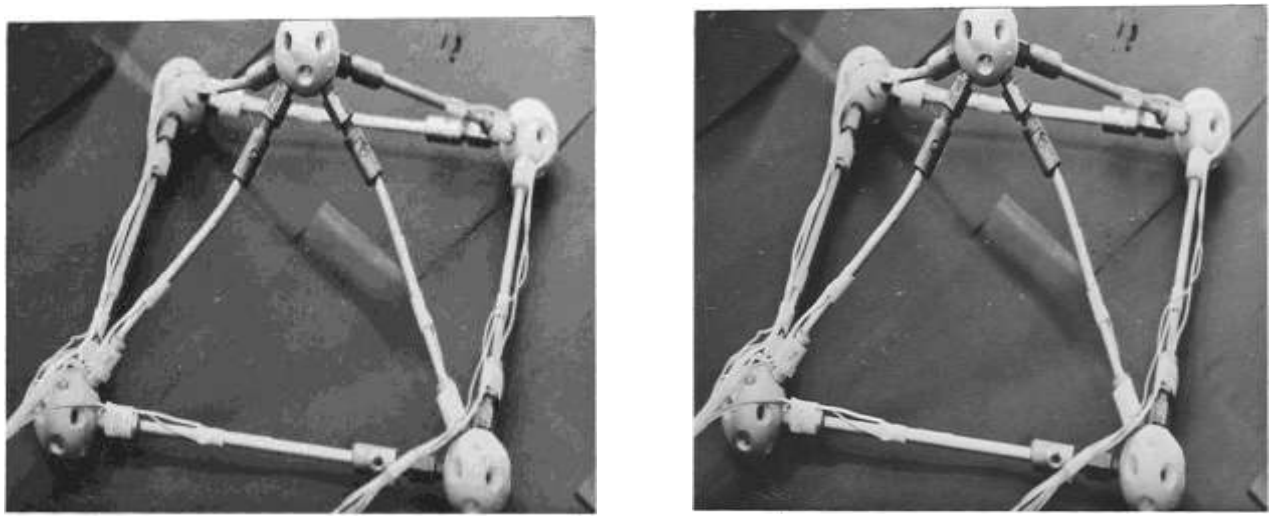


Fig. 4 General view of the loss of stability of compressed rods in experimental pyramids: a - at d = 6mm; b - at d = 8mm.

Conclusion.

Fiber stresses are unevenly distributed over the section of the tubular rod in all tests. Hence it follows that tubular rods operate under eccentric compression [4].

Under the calculated loads on the pyramid, the stress in the compressed rods increased mainly in proportion to the increase in the load, i.e. there was a linear relationship between the applied load and the value of fiber stresses in the design sections. No residual deformations were observed in the controlled sections of the rods.

The result of the study of the bearing capacity of the pyramid of the model suggests that their bearing capacity is sufficient and they can be used in the manufacture of PSPK models.

References

1. Alabuzhev P.M., Tereninus V.B. and other Theory of similarity and dimensions. Modeling. M .: Higher school. 1968 p. 33-41.
2. Isobekov K. Experimental and theoretical studies of seismic resistance of PSPK coatings. Abstracts of the regional seminar-meeting effective spatial structures in the practice of design and construction of the republics of Central Asia and Kazakhstan. Frunze: 1981, pp. 11-12.
3. Isabekov K. Work of cross-rod spatial structures under seismic influences. Abstract of Ph.D. thesis. M., 1984, pp. 14-16.
4. Nazarov A.G., Shaginyan S.A. Guidelines for the Study of Mechanical Properties of Building Structures on Models. Publishing House of the Academy of Sciences of the Armenian SSR, Leninakan. 1976, pp. 25-29.
5. Faibishenko V.K, Isobekov K. Nodal connection of rods of a spatial frame. Author's certificate No. 885478. M., 1982. p.1.