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Analysis of Behavior of Spatial Structures in Bridges Deck With Changes in Diameter and Length of Members

The use of spatial structures despite the ease and speed of execution is always limited to covering the roofs with long spans. While these types of structures, which by their mechanism of load distribution to all members, have acceptable resistance to incoming loads, both dead and live, can be a good alternative for use in bridges deck. Therefore, in this paper, numerical modeling of a two-layered lattice spatial deck with different diameter and length of members, its behavior against dead and live loads caused by moving motor vehicles according to the AASHTO Code is investigated. The geometrical forming of the different topologies was performed using Formex algebra by Formian 2.0 software and numerical modeling of spatial decks using SAP2000 finite element software with linear static analysis. The results showed that with increasing the diameter of the members of the double-layered lattice deck from 13.94 to 19.37 cm, the cross-sectional area and consequently the stiffness of the members increase, which leads to an increase in the stiffness of the whole structure and as a result it leads to an increase in its resistance to dead loads due to the weight of the structure and to the moving loads due to the passage of motor vehicles. Also, with increasing the length of the members of the double-layered lattice deck from 1.5 to 4.5 meters, the distance between the nodes has increased and the number of nodes and members of the two layers, and their between which most of the elements of the whole structure are located at this distance has decreased, and consequently it leads to a reduction in the dead loads of the structure and deflection due to these loads. On the other hand, because these nodes are selected from the joint type, which have freedom of movement in all directions, the reduction in the number of nodes leads to a relative decrease due to moving loads.

Keywords: Spatial structures, Bridge deck, Diameter and length of members, Deflection.

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