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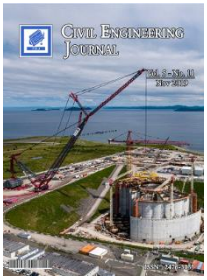

Ways to Minimize Volume (Weight) and Increase the Bearing Capacity of Rigid Pavement

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Abstract

The objective of research is finding of a possibility economy of rigid pavement weight and volume of material. The subject of the research is a mathematical model of rigid pavement in the form of a multilayer structure on an elastic foundation. The method of a research consists in modeling the behavior of rigid pavement in the form of a set of equations. These equations reflect the change in the stress-strain state of such structures. The system of equations takes into account the geometric nonlinearity of the work of materials and makes it possible to investigate the influence of various parameters on the values of stresses and displacements. Critical force coefficient and stress of shells are calculated by Bubnov-Galerkin. The formation way of the elastic foundation allows modeling the spreading layers with various characteristics. Use of two-layer model allows considering of a surface course and base course of road pavement designing (for example concrete and crushed stone). The graphs show the patterns of change of the stress of rigid pavement when changing the characteristics. The form of rigid pavement allowing to maintain big loadings is exposed to improvement. Findings shows the possibility of optimizing the geometric parameters of the design and achieving the savings in weight and volume of the consumable material.

Keywords: Rigid Pavement; Nonlinearity; Elastic Foundation; Critical Force; Strength; Variable Form.

1. Introduction

Structures in the form of plates on an elastic foundation have found wide application as designs of rigid pavements. Rigid pavement [1-6] differ from flexible pavement [7-10] in existence of a concrete layer in a surface course. Such constructions perceive big loading. One more advantage of such constructions is the speed of mounting and lack of the special mounting equipment. For this reason, such constructions are considered in our work. However, it is more expedient to use shallow shells that have a definite rise in the center. This makes it possible to provide the necessary transverse slope at the manufacturing stage. In addition, to reduce material costs. The work is necessary as it provides a technique for determining the stress-strain state of such structures. The difficulty is that it is necessary to consider a multilayer structure on an elastic foundation.

Different properties of the foundation must be taken into account. Optimization of the shape of the shallow shells on the elastic foundation and the characteristics of the elastic foundation will allow achieving greater effect. Currently, the optimization of rigid pavements is on the way to improving the material. Various plastics and recycling elements are mainly considered. However, savings can be achieved regardless of material. This can only be obtained by changing the shape of the construction. The innovation of the work is to develop a form of rigid pavement that reduces production costs and increases bearing capacity. Taking into account the geometric nonlinearity of the material makes it possible

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