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## Stress And Strain Evaluation of Crane-runway Beam with Heterogeneous Structure

Current research indicates insufficient study of heterogeneity problem and reveals the necessity to continue laboratory tests of building materials. Thorough examination of scale effect will make it possible to develop calculating theory for both concrete and reinforced concrete structures taking into account real material properties.

Scale effect is especially seen when material of the object under study is structurally heterogeneous (concrete is considered in our case). Both structure and size of the construction influence concrete heterogeneity. It means that the larger structures are, the higher heterogeneity percent is. In its turn, heterogeneity impacts performance properties of concrete objects. The majority of theoretical and laboratory tests shows that ruggedness of solid bodies decreases along with the increasing volume. Scale effect depends considerably on both material structure and type of stress state.

During laboratory compression tests it has been determined that the development of scale effect is connected with the growth of geometrical dimensions of test cubes. It is clear that increasing structural defects are the main reason of scale effect development. The more the size of test cube is, the higher probability of defect development is. Concrete compression fracture has allowed to determine the physical reasons for scale effect development. Test data have made it possible to conclude that strength and deformation characteristics change according to Gaussian probability distribution.

Crane-runway beam (Fig. 1) is represented as linear structure with random connection distribution loaded with concentrated weight. Beam body is divided into finite elements which properties are specified randomly according to distribution law that is defined during laboratory tests. While solving the problems, stress components are determined, reduced to equivalent stresses, and compared with concrete uniaxial compression strength limit.

In this study models of variations of physical and mechanical properties as well as calculating models are built using license program COSMOS based on finite element method.

Along with the increase of the initial data variation of physical and mechanical properties of crane-runway beam distributed according to normal law, coefficient of strength reserve decreases nonlinearly within 25%. It means that while considering material heterogeneity calculation changes considerably.

Stress and strain of crane-runway beam were calculated both without initial data variation (homogeneous problem calculation) and with it.