BUILDING CONSTRUCTION, BUILDINGS AND STRUCTURES

THE INFLUENCE OF TEMPERATURE AND CLIMATIC INFLUENCES ON THE STRESS-STRAIN STATE OF REINFORCED CONCRETE MONOLITHIC FRAME OF THE BUILDING

A. V. Lebedeva, S. A. Tumakov

Annotation. The article considers the influence of temperature and climatic influences on the General stress-strain state of the monolithic reinforced concrete frame of the building. The problem of estimation of influence of temperature and climatic influences in comparison with other loadings is set. The task is to assess to what extent not taking into account this temperature impact can affect the reliability and durability of structures. The study of the model is carried out in three design situations: in operation mode with conditional separation of the building into temperature-deformation compartments, in construction mode with a reduced value of "positive" temperature loads, in construction mode with a reduced value of "negative" temperature loads. During the calculations, some assumptions are made, including the method, procedure and timing of installation are not considered. The influence of temperature and climatic loads is considered in the software package SCAD Office (license № 800908099), on the model of multi-storey residential monolithic reinforced concrete building with underground Parking and non-residential premises of the first floor. Several typical sections of different lengths are considered in the calculation. The work of the sections is calculated together with the base of the building. The analysis of calculation results is carried out proceeding from size of change of reinforcement in the basic bearing elements: transition to other diameter of working armature for columns and change of percent of reinforcement for overlapping plates (covering).

Keywords: temperature and climatic effects; reinforced concrete frame; stress-strain state; temperature closure.

COMPUTATION OF THE COMBINED FOUNDATION SETTLEMENT WITH TAKING INTO ACCOUNT NONLINEAR STRAINS OF THE SOIL BASEMENT

V. S. Glukhov, P. K. Gavrilov

Annotation. In modern building and construction practice, one of the most promising research in the field of foundation design is about combined pile-plate and pile-strip foundations, where both parts transfer forces from the building structures to the soil basement. At the same time, the aspiration to achieve the maximum possible economic effect without losing the strength properties of constructions contributes to an increasing interest in studying the work of the soil foundation in the

stage of nonlinear strains, when the linear dependencies between tensioning and settlement go beyond the limits. The authors of this article, using the example of a solid-cast domestic building, considered options of pile-plate and pile-strip foundations, using prismatic piles, which are set up according to the pile jacking technology. Taking into account the fact that, when designing the buildings and structures basements, it is important to normalize the pressure on the soil, and also to use, when calculating, models and schemes describing the stress-strain state of the soil, the model of the stress-strain state of the soil of the foundation was considered, which takes into account the development of nonlinear strains on the limited depth. In the framework of the task, we made the computation of settlement of various footings, according to the linearly deformable half-space scheme, and also taking into account the nonlinear nature of the dependency between tensioning and deformations of the footings. A technical and economic comparison of the proposed options for combined foundations is made, as well as a conclusion is formulated on the practicability and economic benefits obtained as a result of applying the method of computation of settlement of buildings and structures taking into account nonlinearity.

Keywords: settlement; nonlinear strains; soil foundation; combined foundation; pile-plate foundation.

RESEARCH STRESSED-DEFORMED STATE OF THE NODE STEEL-CONCRETE BUILDING FRAME IN ANSYS PC

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Annotation. The article presents the results of computer simulation of the lateral node of the joint of columns and beams of steel-reinforced concrete frame of a high-rise building. The node, sections of its elements and efforts in it are determined by the results of static calculation of the model in the LIRA PC. The node was modeled using Ansys PC in a linear statement of the problem. The main factors that need analysis are identified - the property of steel-reinforced concrete structures to change their equilibrium state after laying the concrete mix in the formwork and the redistribution of stresses and changes in deformations when the concrete section is included in the work. Four stages of the construction life cycle are considered, depending on the mounting stage: steel elements work before concreting; state during concrete curing; combined section work without application of operational loads, work at the exploitation stage. As a result of the studies, a change in the stress-strain state of the elements of the node at the stages of installation of steel-reinforced concrete structures was found, necessary to clarify the methods for calculating the joint.

Keywords: computer modelling; ansys; stress-deformed state; the console; high-rise building; steel-reinforced concrete frame; mounting sequence.

AN EXPERIMENTAL STUDY OF THE STRENGTH, DUCTILITY AND DEFORMABILITY OF REINFORCEMENT JOINTS

PERFORMED WITH PRESSED COUPLERS

T. R. Barkaya, A. V. Gavrilenko, S. A. Sokolov, R. Z. Tsybina

Annotation. This paper contains information about an experimental study of main physical and mechanical characteristics of reinforcement joints performed with cold pressing threadless reinforcing bar couplers (pressed couplers). Reinforcement bar with strength class A500C and diameters 18, 20 and 25 mm was reviewed. Strength, ductility and deformability of joints were investigated. There were different setting conditions of couplers to reinforcement bar. Results has shown, that use of pressed couplers for reinforcement gives opportunity to reach joints strength equal to strength of reinforcement bar under static loads. Deformability of pressed joint does not exceed deformability of relevant solid rebar.

Keywords: reinforcement; reinforcing bar coupler; mechanical connection; cold pressed joint; tensile test.

CONSIDERING THE NON-LINEAR SOIL DEFORMATION IN THE SETTLEMENT OF PILE IN PUNCHED HOLES WITH BROADENING

M. V. Glukhova, V. S. Glukhov

Annotation. Piles in the punched holes with broadening (PPH), executed on technology of foundation in the rammed pits, it is possible to consider as perspective option of the piles. A feature of the PPH is considered to be a high pile bearing capacity compared to traditional driven piles. According to the results of long-term monitoring, there is an excess of calculated base settlement compared to the actual ones. This is due to the significant difference between the estimated soil resistance of compacted zone and the pressure under broadening. And one of the determining reasons should be considered a nonlinear nature of the dependence of base settlement from soil pressure under the pile broadening, which is not taken in the designing. In the article is the check the limit resistance of the compacted soil zone, and the settlement calculation into account nonlinearity by the method of M. V. Malyshev is considered. The foundation settlement calculation scheme are designed, in which the nonlinear soil deformation stage is within the total soil compressible thickness is proposed. The conclusion about the need for the limiting soil states calculation of second group under the sole of piles in punched holes with broadening taking into account the nonlinearity. The nonlinear dependence of soil deformations from stresses should be taken into account within the growth borders of the limit equilibrium zones.

Keywords: piles in the punched holes; pile with broadening; foundation in the rammed pits; nonlinearity coefficient; base settlement.

ENGINEERING SYSTEMS AND COMMUNICATIONS

SUBSTANTIATION OF THE CHOICE OF THE PIPELINE BALLASTING METHOD IN SEASON-FREEZING SOILS

I. A. Parshakov, S. A. Sazonova

Annotation. On the territory of the Russian Federation there are a large number of fields and their development is impossible without the use of oil pipelines for various purposes. Particular attention is paid to these issues when crossing pipelines through waterlogged, marshy and flooded areas in seasonally frozen soils. Pipelines with positive buoyancy in such sections of the routes are prone to surfacing, which entails a change in the thermal regime of the transported oil, an increase in the stress state in the pipe walls, and in some cases, their destruction. The use of ballast devices prevents the emergence of oil pipelines, however, the use of these devices entails a significant increase in the cost of construction. Due to the special importance of ballasting and reliable fixing of oil pipelines at design elevations, the issue of substantiating the use of a particular type of ballast device when laying oil pipelines in waterlogged areas is relevant. The aim of the authors' research is to determine the most cost-effective option for ballasting oil pipelines, depending on the technological features and engineering and geological conditions of construction. Previously, the authors analyzed various types of ballasting devices. As a result of the analysis, five of the most common types of ballast devices were selected: reinforced concrete weighting agents UBK, concrete coating, polymer container devices (PKU), textile containers (CT), anchor devices VAU-1. This article presents analytical calculations of the number of ballasting devices of the five most commonly used options. The conclusions obtained on the basis of calculations are presented. In the future, the results of this article are planned to be used as initial data for calculations in the GRAND-SMETA software package, in order to refine the results obtained and determine the most cost-effective option for ballasting.

Keywords: ballasting; cargo; flooded area; oil pipeline; ascent.

EXPERIMENTAL SUBSTANTIATION OF THE POSSIBILITY OF CREATING A COMFORTABLE AIR ENVIRONMENT WITH APPLICATION OF AIR CLEANERS

D. V. Lobanov, E. S. Isaeva, E. A. Lobanova, A. V. Milyaeva

Annotation. The article discusses the need to develop systems based on the use of air cleaners that can improve the environmental situation in rooms with people staying. A person, while indoors, releases a variety of organic and inorganic substances: carbon dioxide, ammonia, acetone, ethyl and methyl alcohols, etc. Carbon dioxide (CO_2) concentration is used as air quality indicator. The problem of healthy air environment in the premises is acute, requires a complex solution. The inventors

propose one of the solutions to this problem, consisting in joint application of ventilation systems, with supply of external air in minimum quantity, and mobile high-efficiency air cleaners capable of adsorbing gas pests. The research was carried out in a room where a person is engaged in mental work with the use of PEVM. Measurements were carried out in two stages: the first - in case of inactivity of microclimate support systems, the second - in case of operation of activated carbon-based air cleaner. According to the results of the experiments, the carbon dioxide concentration was plotted, according to which its value during operation of the air cleaner was lower than in the first stage of the study. The effectiveness of this solution depends on many factors: the type of air cleaner, the nature and mode of operation of people in the room, etc. The authors justified the possibility of using air cleaners in the rooms in order to reduce design air exchanges.

Keywords: Air quality; air cleaner; carbon dioxide concentration; mental labor.

APPLICATION OF THE WALL HEATING SYSTEM TO ENSURE THE ROOM MICROCLIMATE PARAMETERS

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E. O. Chebotaryova**

Annotation. The comfortable existence of a person in an apartment or a private house is provided primarily by the interior, decoration, decor, area and location of the rooms. One of the components of such comfort is the microclimate in the living room, humidity, temperature and lack of drafts. In order for the heating system to be really effective enough, it is necessary to think well and calculate what type of heating system to choose to achieve the optimal temperature in the room. Currently, in addition to traditional radiator systems, floor, ceiling and wall heating systems have been developed. The article highlights the possibility of performing wall heating by two methods. Wall heating, first of all, has a high thermal comfort than radiator. In the materials of the article the thermal calculation of different types of heating systems is made, the surface area of heat removal is determined, the pressure losses of wall heating systems are determined by «wet» and «dry» methods. On the basis of the performed calculations the comparative analysis of efficiency of heating systems was made.

Keywords: wall heating, heat flow, heat supply, heat comfort, lack of convective flows.

ECOLOGY AND SAFETY OF THE URBAN ENVIRONMENT

INFLUENCE OF ANTHROPOGENIC SOIL TRANSFORMATION OVERTHE CONDITION OF WOODY VIEWS IN YOSHKAR-OLA CITY

N. E. Serebryakova, K. V. Grinchenko, V. N. Karasev

Annotation. The article presents the results of studies of the stability of trees in the conditions of anthropogenically changed urban environment. The influence of the state of urban soils on the viability of the most common tree species in the plantations of the Central part of the city of Yoshkar-Ola was assessed. The level of species viability was determined on the basis of the analysis of impedance of close to cambial complex of tissues of the trunk tissues in comparison with the indicators of plants at the control site in the Botanical garden-Institute of Volga State University of Technology with a low level of technogenic load. The problems of urban soils in the study areas are increasing the density of soils, their alkalinization and contamination with oil products. It is established that the deciduous species Tilia cordata and Sorbus aucuparia that make up the main range of landscaping of the Yoshkar-Ola city justify their use and withstand significant anthropogenic transformation of soils. However, a strong seal, 1.36 g / cm3, still weakens the homeostasis of Sorbus aucuparia. At a Tilia cordata already at moderate soils compaction and pollution by oil products stability indicators can decrease. The types of Picea, with a superficial root system, respond to the transformation of soils. Vitality Picea pungens «Glauca» is reduced with its strong compaction Picea abies in an urban environment on light loam and the absence of strong compaction and latching is able to develop satisfactorily and perform its functions.

Keywords: urban soils; Yoshkar-Ola city; green plantations; impedance of close to cambial complex of tissues of the trunk; vital state; stability; soil compaction.

ROAD TRANSPORT, AGRICULTURE AND CONSTRUCTION MACHINES

THE ASSESSMENT OF THE SUITABILITY OF MATERIALS BASED ON RECYCLED ASPHALT PAVEMENT STONE MASTIC ASPHALT CONCRETE FOR REPAIR WORK OF ROAD COATINGS

N. A. Krasilov, E. V. Danilin, V. M. Dudin

Annotation. In this work the actual problem for today directly connected with the main defects and damages of automobile coverings is considered. The main task at the time of the study is to assess the suitability of materials based on regenerated asphalt concrete coating from crushed stone-mastic asphalt concrete for the repair of asphalt concrete coatings. The solution to this problem is to select the optimal composition of the materials used in the repair, which would not only meet the basic criteria of state standards, but also show improved performance. To achieve this goal, from the regenerated asphalt coating on the basis of crushed stone-mastic asphalt concrete, prototypes of different fractions were formed, manufactured at dif-

ferent temperature conditions. During the experimental studies, the following parameters were determined: volume density, water saturation and compressive strength. After each experiment, the dependence between the composition of the samples, the temperature of the mixture during molding and the studied parameters was made. The dependence was presented in the form of graphs. Based on the obtained dependencies, intermediate conclusions were made, on the basis of which further adjustments will be made, in order to select the optimal composition and modes of forming asphalt concrete on the basis of asphalt concrete chips from bitumen.

ASSESSMENT OF ROAD NETWORK RELIABILITY BY CONDITION OF COATING

S. V. Aleksikov, M. I. Alshanova

Annotation. With all the variety of approaches to planning road repair work, there is no methodology for creating a road network repair plan based on the international IRI evenness indicator. Currently, large-scale diagnostics of the road network is being carried out in terms of longitudinal evenness and the presence of coating defects. The result of this diagnosis, in turn, is a significant array of reliable data convenient for further statistical analysis. The purpose of the statistical analysis was to assess the reliability of the road network by the state of coverage and to identify the laws of distribution of the IRI evenness indicator for roads with varying degrees of wear. The result of the studies was the functional dependencies: between the length of the destroyed sections on the length with the IRI evenness indicator, between the average IRI and the length of the destroyed road sections, between the IRI variation coefficient and the length of the roads with the evenness index more than the acceptable value. The established dependencies in the future will allow to determine the effect of the IRI indicator on the average speed of traffic flows and road safety indicators, to develop an economic and mathematical model for optimizing the road repair plan to restore its evenness and roughness.

ECONOMICS AND ORGANIZATION OF CONSTRUCTION

FEATURES OF EVALUATION OF INVESTMENT PROJECTS

M. S. Magomedov

Annotation. The article deals with the main problems associated with the evaluation of investment projects. The task is to study the methods of evaluation of in-

vestment projects and identify their advantages and disadvantages, as well as to analyze for which projects they can be applied. When analyzing the methods of evaluation of investment projects, some assumptions are made, including the fact that each project needs an individual approach, since it has its own specifics and characteristics. To achieve this goal, the methods of evaluation of investment projects such as discounting cash flows are analyzed; assessment of conditional requirements; comparative assessment. The article shows the importance of the chosen method on the basis that the assessment should be exactly what the investor needs – to focus on the study of certain indicators that are priority for the investor. The conclusion is formed that the analysis of economic and financial indicators of the project will show the investor how their money can change over time, investing them in a certain asset.

Keywords: asset analysis; evaluation of investment projects; investments; capital investments; methods of asset evaluation.