

BUILDING CONSTRUCTION, BUILDINGS AND STRUCTURES

DESIGN OF A MONOLITHIC REINFORCED CONCRETE FLOOR WITH UNEVEN LOAD DISTRIBUTION

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Annotation. The article considers the validity of the calculation of a monolithic overlap for the action of a uniformly distributed load. The task is to determine whether the forces that occur when the load is evenly distributed differ from those that occur when the load is not evenly distributed, and in which direction. A search for articles and other information on the topic of the work was carried out. The literature has been analyzed for existing methods for determining calculated loading schemes and typical loading schemes. To achieve this goal, a building with a monolithic frame was selected, loads on one floor were collected, based on recommendations, and a design model was drawn up that is as close as possible to the actual structure. The forces for uniform load distribution are determined. The selection of calculated combinations of forces is performed and the combinations of «spots» where these forces occur are determined. The «spot» loads obtained during the analysis of the DCS reports were modeled, and a number of models were drawn up randomly. The simulation was carried out by making combinations of loads from individual «spots». A comparison of the received forces from different loading schemes is performed. The results showed that the DCS gives very close results to a similar load modeled without lowering coefficients. The force variations obtained during uniform continuous loading do not fully reflect the possible extreme conditions in the design mode of operation.

Keywords: load case of uneven spots; design combinations of forces; the monolithic slab.

ASSESSMENT OF THE INFLUENCE OF RESONANCE IN THE CABLES OF CABLE-STAYED BRIDGE ON ITS AERODYNAMIC STABILITY

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Annotation. This article studies the resonance phenomena in cables of cable-stayed bridge, and presents the results of numerical research to assess the effect of such phenomena on the superstructure. As a part of study, the critical speeds causing resonance in cables for the first mode of natural vibrations were calculated (previously, the entire structure was calculated for static loads). To assess the effect of resonance in cables of the bridge on its aerodynamic stability, the natural vibrations frequencies and periods of the entire structure were obtained. The critical wind speed for cables was calculated using analytical formulas; the entire structure behavior under static and dynamic loads was modeled in Lyra CAD software in a nonlinear setting (cables are modeled by KE-310 - thread). The simulation model was tested on

the example of a cable-stayed pedestrian bridge over the channel of the Kanriver in Krasnoyarsk Krai.

Keywords: cable-stay bridges, resonance phenomena in cables.

INFLUENCE OF THERMOELASTOPLASTES TYPE SBS ON VISCOSITY OF POLYMERIC-BITUMINOUS BINDER AND TECHNOLOGICAL TEMPERATURES OF ASPHALT CONCRETE MIXTURES

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Annotation. The values of dynamic viscosity obtained using Russian-made thermoplastic elastomers and ready-made polymer-bitumen binder PBV 60 in the temperature range of 70...180 °C are obtained. When additives of thermoplastic elastomers are added to road bitumen produced by «Voronezhskintezkauchuk JSC», the bitumen viscosity significantly increases. The highest values of dynamic viscosity are observed for the SBS L 30-01A polymer additive, this is pronounced at a consumption of 8 % of the additive by weight of bitumen and at temperatures below 130 °C. SBS L 30-01A additive is more refractory than other thermoplastic elastomers produced by Voronezhskintezkauchuk JSC, because its dissolution temperature is 10 °C higher than that of DST L 30-01 (SR) and DST L 30-01, and the dissolution time is longer by 15...20 minutes. The permissible technological temperatures of the asphalt concrete mixtures at the PBB at the stages of the formation of asphalt concrete are determined.

Keywords: polymer additives; thermoplastic elastomers (TEP); polymer-bitumen binder (PBB); allowable process temperatures of asphalt mixtures; dynamic viscosity of PBB; structural and rheological characteristics of PBB.

ENGINEERING SYSTEMS AND COMMUNICATIONS

IMPROVING THE EFFICIENCY OF DRAINAGE OF MELT WATER FROM THE ROOFS OF HOUSES IN THE AUTUMN AND SPRING

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Annotation. The reasons for the formation of ice on the roofs of houses and in drainpipes are considered. Features of snow cover melting on the roofs of houses with metal roofs and its movement on the roof deck are given. The analysis of known methods for removing snow cover and ice from the roofs of houses, as well as ways to remove meltwater, are carried out. A method for removing meltwater from the roof of a house without the formation of icicles and ice is proposed. A description of the design of a device for removing meltwater from the roof of a house in relation

to various types of downpipes is given. The results of full-scale testing of two samples of devices that were carried out on the roof of a residential building of the GZI-68 series with a roof covering made of rolled material in the autumn-spring period in the climatic conditions of St. Petersburg are presented. The advantages of the proposed device in its application are described. Recommendations are given when using it on buildings with drains that bypass protruding eaves.

Keywords: water drainage from the roof; drain tray; drainage system; guides.

THERMAL MODELING OF HEAT RECOVERY SYSTEM COOLING MEDIUM WITH A VARIABLE AIR FLOW

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Annotation. The relevance of the application of energy-saving technologies in the air conditioning system is proved. A comparative analysis of the characteristics of heat exchangers is performed. A solution is proposed to improve energy efficiency by implementing a heat recovery system using a glycol recuperator, when an ethylene glycol solution is used as an intermediate heat carrier. The use of this type of equipment will ensure fire and explosion safety when operating microclimate systems in the premises of a multi-purpose public building. A schematic diagram of the cold carrier recovery system in the warm season is proposed and a detailed description of the principle of its operation is presented. Using The ID-diagram of the state of humid air, the construction of its processing processes in the Central air conditioner during the warm period of the year is performed. A method for calculating the heat transfer coefficient of a heat exchanger and determining its efficiency depending on the heat content of the air is given. A numerical experiment was performed and the value of the heat transfer coefficient of the heat exchanger for variable air flow was determined. A graph of the dependence of the heat transfer coefficient on the temperature of the outdoor air at variable flow rate is constructed. The initial data for improving the design of heat exchange equipment and developing an algorithm for its functioning in a rational range of thermal characteristics are determined.

Keywords: heat exchanger; heat recovery unit; ethylene glycol; intermediate heat carrier; variable air flow; temperature; heat gain.

CITY. RECONSTRUCTION, RESTORATION AND LANDSCAPING

MODELING A RESIDENTIAL HOUSE OF A MIDDLE FLOOR IN THE OCTOBER DISTRICT OF TAMBOV

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Annotation. The paper describes the stages of development of the basic set of drawings and the creation of a 3D volumetric model of a mid-rise residential building with elaboration of the general plan and graphic design of the project on a

stretcher. In the design process, educational versions of software for 3D modeling and photo processing were used. The technology of modeling the objects allowed to create a realistic perspective image of the object, the materiality of all structural elements, sunny shadows from the protruding parts, the surroundings with adjacent buildings, transport and pedestrian roads. The construction of residential elevator-free houses of 3-5 floors on the territory of the city of Tambov is relevant, therefore, the concept of the projected object was aimed at developing a complex of apartments for families with children in the Oktyabrsky district of the city near the park area.

Keywords: fire; mid-rise residential building; 3D-modeling; technical drawing; design; rendering.

ECOLOGY AND SAFETY OF THE URBAN ENVIRONMENT

STUDY OF THE INFLUENCE OF TERRAIN ON THE FORMATION OF ZONE SIN CREASED AIR POLLUTION (ON THE EXAMPLE OF VORONEZH)

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P. M. Vinogradov**

Annotation. Environmental conditions have been always influenced the layout of settlements. The wind rose determines the direction of the streets and the functional areas city location; depending on the climatic zone, the pre-property orientation of buildings in dimensions and the type of dwelling are determined; insolation treatment is an important factor in the planning of the adjacent area; rainfall patterns and wind characteristics are used in the design of building structures. Terrain features are usually taken into account when organizing surface runoff from the city streets. A comprehensive consideration of environmental conditions is necessary to create a comfortable and environmentally friendly urban environment. Mountain-valley circulation deserves special attention in cities with complex terrain, which in anticyclone weather conditions and radiation cooling of the underlying surface can lead to the formation of air stagnation zones, often very polluted in urban environments. The study of the terrain influence on the formation of high air pollution zones was carried out on the example of Voronezh city. Using ArcToolbox spatial analysis tools in ArcGIS 10.5. geoinformation analysis of slopes and their steepness is carried out, probable accumulation of air masses zones is described and the characteristic of ambient air quality is presented.

Keywords: environmental conditions; terrain; mountain-valley circulation; air pollution.

ROAD TRANSPORT, AGRICULTURE AND CONSTRUCTION MACHINES

TRANSIT SERVICE IN THE CITY AS A MEANS OF SOLVING TRANSPORT PROBLEMS IMPROVING BUS

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Annotation. The article considers measures aimed at improving the quality of public transport. The methods of granting priority to public transport used in foreign and domestic cities are analyzed. Based on the research of bus traffic in Ekaterinburg and the definition of the main elements of time expenditure, the main delays and the nature of their occurrence during bus traffic during rush hours are identified. It also considered measures to improve bus transit services in Ekaterinburg and assessment of their expected efficiency.

Keywords: public transport; bus traffic; delays; metrobus; bus priority.

ECONOMICS AND ORGANIZATION OF CONSTRUCTION

FORECASTING THE ECONOMIC EFFECTS FROM CONSTRUCTION AND OPERATION OF HIGH-SPEED HIGHWAY YEKATERINBURG – CHELYABINSK

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Annotation. The task is to study the impact of the implementation of the Yekaterinburg–Chelyabinsk high-speed highway project on the integrated development of the territories of the Yekaterinburg agglomeration and identify possible socio-economic effects. The stages of the project implementation, the planned amount of funding and the route scheme of the high-speed highway are considered. The strengths and weaknesses of the project are analyzed. The analysis of the impact of the construction and operation of the high-speed highway route on the growth of employment, the increase in the number of jobs, the development of construction companies and industrial enterprises, the modernization of production, the development of municipalities that are part of the Yekaterinburg agglomeration. Major investment projects that are being implemented or planned for implementation in the region, for which transport infrastructure and accessibility are important: the international transport and logistics hub, the special economic zone «Titanium valley», the special economic zone «natural Park «Bazhovskie mesto», agro-logistics Park. It is concluded that the construction and operation of the Yekaterinburg–Chelyabinsk high-speed railway will positively affect the development of the region's economy and increase the investment attractiveness of large projects in the Yekaterinburg agglomeration.

Keywords: high-speed highway; infrastructure project; transport corridor; agglomeration.

COMPARATIVE ANALYSIS OF THE COST OF WINTER CONCRETING TECHNOLOGIES USING THE BASIC INDEX METHOD

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Annotation. The article provides a comparative analysis of the cost of the most common winter concreting technologies. Three options are considered: the use of antifreeze additives, the thermos method, and the electric heating method. The costs were determined using the basic index method. The method of performing such an analysis is given, taking into account the amount of additional costs for winter concreting. The calculation was performed for four types of monolithic structures with different values of surface modulus. Based on the results of calculations, recommendations are given for the application of winter concreting technologies. The results of the analysis can be applied in the development of projects for concreting building structures in winter.

Keywords: technologies of winter concreting; analysis of the cost of concrete works; monolithic reinforced concrete structures; basic index method.

ELIMINATION OF DILAPIDATED AND EMERGENCY HOUSING - AN IMPORTANT TOOL FOR SOLVING THE HOUSING PROBLEM

E. S. Ivanova

Annotation. The level of dilapidated and dilapidated housing in Russia is quite high, which is associated with problems of housing and communal services of housing funds and a high percentage of wear and tear of houses. In addition, maintenance work is currently hampered by the significant dilapidation of housing and communal infrastructure. Statistical data were analyzed, as well as the legal framework for recognizing dilapidated and dilapidated housing. The problem of collecting statistical data for regions, which leads to a distortion of the real state of the housing stock, is considered. Important bills in the field of emergency and dilapidated housing were considered. The aspects that make it difficult to recognize a house as an emergency are identified, as well as the consequences of making such a decision are considered. When demolishing a house, there is a complex problem of relocation of citizens. The key points of the new draft law on resettlement were given.

Keywords: housing and communal services; emergency and dilapidated housing; major repairs; demolition.

ECONOMIC EFFICIENCY AT OPTIONAL DESIGN OF ENERGY-SAVING FENCING CONSTRUCTIONS FOR BUILD- ING A HOTEL IN TAMBOV

I. G. Elagina, K. O. Suchkov, O. V. Umnova

Annotation. Three options for energy-efficient solutions to the building envelope of a hotel building with a space-planning decision adopted in accordance with the functional process: roofs, walls and floors are considered. At the first stage of the technical and economic comparison of the options, a heat engineering calculation of each option was performed according to the Technonikol program. An analysis of the results made it possible to select the thickness of the insulation and draw up an estimate on the basis of existing regulatory and regulatory documents for the implementation of each of the options at current prices for the first quarter of 2020. The main technical and economic indicators of the options considered are summarized in tables and are presented in the form of comparative diagrams for clarity. The most costly and economical combinations of the design solution in each segment of the fence for the city of Tambov are established, as well as factors affecting the cost.

Keywords: construction; design solutions; heat engineering calculation; energy efficiency; building envelope; cost estimate; economic efficiency.