

BUILDING CONSTRUCTION, BUILDINGS AND STRUCTURES

ASSESSMENT OF TECHNICAL RISK FOR THE ROLLOVER STABILITY IN BUILDINGS AND STRUCTURES

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Annotation. The article considers and analyzes the requirements of the current regulatory and technical documents regulating issues related to the calculation of a building (structure) for rollover stability, from the point of view of ensuring the mechanical safety of the building (structure). Additionally, we analyzed the available scientific literature and publications of recent years, dealing with the calculation and assessment of the risk of accidents on buildings and structures, including the occurrence of rolls in high-rise structures and their development. Based on the analysis of the requirements of various regulatory and technical documents from the list of documents used on a voluntary basis, we have compiled a list of general requirements for both buildings (structures) and for calculating the stability of the rollover position. Using the simplest model of a building (structure) as well as the loads and influences acting on this model, including snow and wind, we determined the rollover moment and the holding moment. Taking into account the values of the acceptable and unacceptable risk of an accident of a building (structure), according to GOST 31937-2011, we have developed a list of conditions and assumptions for calculating the values of the technical risk of an accident for rollover stability. Based on the obtained models of accident risk development in terms of rollover stability, we drew conclusions about the provision of mechanical safety of buildings (structures).

Keywords: stability of position; holding moment; rollover moment; building; structure; rollover; roll; rollover point.

MODIFICATION OF DESIGN METHOD FOR THE STRENGTH OF INCLINED SECTIONS OF RUBCON BENDING ELEMENTS

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Annotation. When operating structures made of "traditional" materials (reinforced concrete, steel) at industrial enterprises in aggressive environments, it is necessary to either protect the structures with special coatings (regularly restoring them), or regularly perform major repairs aimed at restoring the bearing capacity and operational characteristics of the structures. Chemically resistant polymer concretes are free from the above-mentioned drawback, one of which is rubber concrete (rubcon), which has (in comparison with other types of polymer concrete) increased strength properties and almost universal chemical resistance. At present, only partial studies of rubcon as a material for structures have been

carried out with resolved issues of designing individual elements. For example, the issue of designing the strength of inclined sections of bending elements of rectangular cross-section made of rubcon has not been fully resolved. The article presents the results of modification of the method for designing the strength of inclined sections of bending elements of structures made of rubber concrete (rubcon) based on the experimental studies of the said elements. In the article we consider the bending elements made of rubcon reinforced with longitudinal reinforcement, as well as with and without transverse reinforcement. The design takes into account the value of the shear span, and also the actual degree of influence of longitudinal reinforcement. As a result of the modification, the deviation of the designed strength of inclined sections of rubcon beams from the experimental values was on average 2,5 %.

Keywords: bending element; inclined sections; shear span; rubber concrete; rubcon.

ENGINEERING SYSTEMS AND SERVICES

MATHEMATICAL MODELING OF THERMAL CHARACTERISTICS OF INFRARED HEATERS IN LOW TEMPERATURE CONDITIONS

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Annotation. This paper presents a mathematical model describing the thermal characteristics of infrared heaters used in low-temperature conditions. The main focus is on the analysis of the key external factors, such as ambient temperature, air humidity, wind speed and properties of the heated surface, and their influence on the heating efficiency and heat flow distribution. The model allows taking into account various heater installation parameters, including height and angle of inclination, radiation type and features of heat absorption and reflection by various materials. The conducted modeling and calculation of heat losses allow us to determine the optimal operating conditions for infrared heaters in the open air, minimizing heat loss and increasing the efficiency of the system. The results of the study can be used to design energy-efficient heating systems for outdoor and semi-enclosed spaces in cold climates.

Keywords: infrared heater; mathematical modeling; thermal characteristics; low temperatures; heat transfer; convective losses; radiation losses; heating optimization.

CALCULATION OF THE COMPRESSIBILITY COEFFICIENT OF NATURAL GAS IN MUNICIPAL GAS SUPPLY SYSTEMS

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Annotation. When determining the volumes of natural gas received by the consumer, it is necessary to bring the meter readings to standard conditions. In this case, it is necessary to take into account the value of the natural gas compressibility factor under standard and operating conditions. Modern reference data and the recommended minimum value for the application of equations of state of real gases is limited to 250K, but in practice, actual values may be significantly lower. Errors in the use of substitute values of the compressibility factor affect the calculation of the final volumes of natural gas. The article presents the results of calculating the compressibility factor of natural gas of the estimated composition using two equations of state that take into account real properties in the temperature range of 223,15...303,15 K and pressures of 0,1...0,6 MPa used for gas supply to consumers of the housing and communal complex. We propose an equation that allows calculating the compressibility factor of natural gas of the estimated composition depending on the pressure and temperature in the considered range with high accuracy.

Keywords: public utilities; gas supply; gas consumption; real gas; compressibility coefficient.

PROBLEMS OF THE CURRENT WATER SUPPLY SYSTEM IN BUJUMBURA CITY, THE CAPITAL OF BURUNDI

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Annotation. The article considers the main reasons why the water supply system of Bujumbura city is in a problematic state. In this regard, it seems relevant to develop an approach aimed at analyzing the functioning of the network and to propose proper solutions in the creation of interconnections of network sections to ensure greater reliability of the served sector of the water supply system. The issue of choosing a rational solution to this problem is very relevant, since many urban neighborhoods have interruption in water supply, and the amount of water supplied in some communes is not proportional to the number of inhabitants, also, some consumers receive water with an interval of one or several days. The process of urbanization and population growth have a significant impact on water resources. Despite the initiatives taken by REGIDESO, the company which is responsible for the preparation and distribution of drinking water, the water supply issue is still up in the air. This article attempts to analyze the drinking water supply problem in Bujumbura. We tend to identify the causes of instability and insufficient water supply, propose technical solutions to eliminate the main problems encountered,

and predict the future state of Bujumbura's urban water supply network. We try to do that not only by reconstructing the water distribution network, but also by making structural changes to the network topology in order to improve the quality of water supply in the future. It is planned to convert the existing dead-end network into a ring network and to install another water intake point at Lake Tanganyika to eliminate the existing water deficit for consumers.

Keywords: water supply system; ring network; dead-end network; rundown pipes.

REASONS OF DECREASE IN PRODUCTIVITY OF WELL PUMPS IN WATER MANAGEMENT SYSTEMS

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Annotation. The article describes the problems of using groundwater as a source of water supply. The main attention is paid to the performance of borehole pumps in water management systems. I show the scheme of the operating water lifting station of the first lift, which is being described here. It consists of a linear series of wells connected to a prefabricated water conduit laid in one line. This scheme is the most common in the existing practice of organizing water intake from underground sources. The paper presents generalized values of specific flow rates of water intake wells from the beginning of their operation, brands of installed pumps, as well as changes that have occurred since the commissioning of the first lift water station. Based on the actual characteristics of the interacting elements of the system at the operating water lifting station of the first lift, I present the consequences of lowering the dynamic water level for the borehole pump. The study has shown that the permissible lowering of the water level in wells must be set in such a way as to ensure stable operation of pumping equipment at a constant flow rate. I also recommend how to prevent a decrease in the flow rate of the well.

Keywords: water intake well; well pump; dynamic water level; specific yield of bore well.

HYDRAULIC CHARACTERISTICS DETERMINING THE EFFICIENCY OF WATER SUPPLY NETWORKS IN THE FAR NORTH

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Annotation. In the article we consider the issues of designing a water supply network in the conditions of the Far North, as well as modern technologies and approaches that make it possible to effectively solve water supply problems in difficult conditions. The purpose of the work is to perform a hydraulic calculation

of the water supply network, to determine the possibility of failures in the network. The main method is to simulate the mode of operation of the water supply network under different modes of operation, modeling hydraulic shock in the main network. The object of the study is a ring water supply network with a length of 4.7km. Using the example of a water supply network for a village with a population of 4 thousand people, we considered operating modes and identified problem zones. We propose to increase the diameters of the ring water supply network. We as well give the main parameters for the hydraulic calculation of the water supply network and determine the main parameters for the joint operation of pumps and pipelines. Also, we determined the main parameters for the joint operation of pumps and pipelines. Besides, we justified the increase in the diameters of the water supply network, which is necessary to comply with the operating mode in the event of a fire in different calculation units.

Keywords: water supply networks; hydraulic calculation; hydraulic shock; modeling.

CITY. RECONSTRUCTION, RESTORATION AND LANDSCAPING

VERTICAL LANDSCAPING OF BUILDINGS AS AN INNOVATIVE METHOD OF URBAN AREAS IMPROVEMENT (ON THE EXAMPLE OF THE CITY OF VOLGOGRAD)

N. V. Korosteleva, V. B. Buchina

Annotation. The article proposes an option to improve the quality of improvement of the urban area by introducing innovative technologies into the landscaping system of urbanized areas. As an alternative to typical methods of landscaping of urban areas, we consider the option of vertical landscaping of facades. The relevance of this proposal is justified, firstly, by the lack of standard landscaping facilities in urbanized areas, and secondly, by the lack of required free areas in the city, and thirdly, by the uneven distribution of landscaping facilities throughout the city structure, which significantly reduces the quality of improvement of urban spaces. We indicate the main advantages and disadvantages of using this type of landscaping in modern urban conditions. To justify the introduction of vertical landscaping in urban space, we analyzed existing techniques and technologies of vertical landscaping and implemented projects in world urban planning practice. So, we determined the strengths and weaknesses of each method of vertical landscaping and identified the types of buildings that are most suitable for each type. Based on the data obtained, we considered the possibility of using this type of landscaping for the city of Volgograd, taking into account its climatic and urban planning features. We as well recommend to use the most suitable methods for organizing this type of landscaping, to select an assortment of vegetation and opt for the most suitable implementation of these

solutions. We determine the prospects for the use of vertical facade landscaping in the architectural and landscape organization of the urban area and the feasibility of adapting successful foreign vertical landscaping practices to the conditions under consideration. In addition, we determine the direction for further research in this area for the city of Volgograd.

Keywords: vertical landscaping of facades; innovative landscaping; green facades; green walls; vertical gardens.

THE CONCEPT OF RECONSTRUCTION OF THE NOVOPRAK PARK IN THE CITY OF NOVOVORONEZH

M. S. Kononova, E. V. Sazonov, O. V. Telyuk

Annotation. The article presents a brief overview of current trends in the field of urban park space reconstruction. Hereafter we describe features of the considered Novopark park related to its location and citywide significance, as well as the existing state of the landscaping elements. We substantiate the necessity of developing a comprehensive reconstruction project. As part of the pre-design analysis, we studied the surrounding development, location of business and service enterprises, and evaluated transport organization of the territory. Based on the analysis of the territory, we developed a concept for the formation of functional zones, taking into account the already established structure of the park, while maximizing the preservation of existing pedestrian links and green spaces.

Keywords: urban park; functional zoning; reconstruction of public spaces.

ECOLOGY AND SAFETY OF THE URBAN ENVIRONMENT

CREATING A SITE CATEGORIZATION SYSTEM EFFECTS OF NOISE FROM RAILWAY TRANSPORT IN THE PRACTICE OF URBAN MAPPING

E. I. Golovina, D. A. Sokolov

Annotation. The article presents analysis of key factors influencing the level of noise and vibration from rail transport. We proposed a classification system for areas subject to vibration and acoustic impact. We list the main elements and parameters taken into account in the classification such as the level of impact (strong, medium, low), the length of the section under study, the condition of the railway track, the location of the tracks relative to the residential area. We describe the measurement methodology, the results of which can be used as input data for creating a noise map. We as well propose a methodological approach to the visual representation of noise levels in a given geographic location, taking into account the specifics of railway transport.

Keywords: noise; vibration; vibroacoustic factor; railway transport.

ENVIRONMENTAL ASPECTS OF THE USE OF SECONDARY BUILDING MATERIALS

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Annotation. In the article we present the analysis of the environmental component of the assessment of possible options for waste management of reconstruction and demolition of the construction industry. The analysis made it possible to identify factors that reduce the impact of these wastes on the environment if they are used as secondary building materials. The analysis also showed that in the process of preparing the waste to be reused, it is necessary to take into account potentially negative environmental aspects. Here we present *ribbed floor slabs*, the technologies that we developed and effectively applied for the reuse of waste from the piecemeal dismantling of buildings and structures. The conducted environmental assessment of possible options for waste management of demolition of buildings and structures made it possible to rank them from environmentally unacceptable to environmentally preferable and, accordingly, highlight the tendency to choose environmentally positive options. We as well show the necessity of evaluating the effectiveness of the use of secondary building materials, taking into account environmental indicators calculated according to the requirements of current regulatory legal acts.

Keywords: construction waste; secondary building materials; environmental assessment of waste management processes; piecemeal dismantling; demolition and reconstruction waste.

ANALYSIS OF THE ATMOSPHERE STABILITY OF THE TERRITORY IN THE CENTRAL PART OF THE RUSSIAN PLAIN ACCORDING TO THE PASQUILL PARAMETER

L. M. Akimov, E. L. Akimov

Annotation. The article presents the results of studying the spatial and temporal features of the distribution of the Pasquill stability class (F. Pasquill) in the central part of the Russian Plain. The materials and methods of the study are based on the analysis of daily ground-based observation data from stationary meteorological stations located in the study area for the period (1973...2023), as well as data from aerological stations. The study resulted in the establishment of spatial and temporal patterns of distribution of Pasquill stability classes in different seasons of the year. It was found that according to the wind regime, in the central part of the Russian Plain, Pasquill B-C stability classes prevail in summer, and C-D classes do prevail in winter.

Keywords: atmospheric stability; buoyancy indices; Pasquill parameter; meteorological parameters; synoptic situation; weather type.