

BUILDING CONSTRUCTION, BUILDINGS AND STRUCTURES

FEATURES OF DESIGN AND CALCULATION OF TEMPERATURE-SHRINKAGE EXPANSION JOINTS OF BUILDINGS WITH STONE EXTERNAL WALLS

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Annotation. The article analyzes the current regulatory and technical documents concerning issues of calculating and assigning the lengths of sections of masonry on the outer walls of buildings between temperature-shrinkable vertical expansion joints. We reviewed the design features of expansion joints in standard designs of the first mass construction. We indicated some criteria on the basis of which the maximum distance between temperature-shrinkage expansion joints is accepted. We also analyzed regulatory documents governing the design of expansion joints. It is shown that there are no uniform recommendations on the methods of their calculations, which can lead to the destruction of individual building structures during operation. We present some examples of structures that have thermal deformations in the form of cracks caused by malfunction of temperature-shrinkage expansion joints. We revealed a tendency for the formation of predominantly vertical cracks. We as well considered the main provisions of the methodology for calculating temperature deformations of stone walls, based on the simultaneous use of several regulatory documents. It is shown that calculations performed using formulas from various documents give significantly divergent results.

Keywords: vertical temperature-shrinkage expansion joint; stone structures; multilayer masonry; facing layer of masonry; calculation of temperature deformations.

ENGINEERING SYSTEMS AND COMMUNICATIONS

MAJOR REPAIRS AND REPLACEMENT OF SHUT-OFF VALVES ON HEAT AND GAS SUPPLY SYSTEMS AS PART OF IMPORT SUBSTITUTION

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Annotation. During the operation of the shut-off valves, the efficiency of its operation decreases, and in case of failure, the issue of major repairs or complete replacement of equipment is raised. The main purpose of the study is to extend the service life of pipeline fittings, as well as to determine the possibility of replacement or major repairs under the sanctions pressure and the import substitution program. In this article we consider the main options for maintaining the operation of pipeline

transport nodes. We as well evaluated the implementation of the production of domestic analogues of shut-off valves in the context of import substitution. Also, we identified the main directions of import substitution in the production of pipeline fittings for heat and gas supply systems, as well as the possibility of repair and extension of its service life.

Keywords: shut-off valves; import substitution; major repairs; main gas pipeline.

ASSESSMENT OF THE FEASIBILITY OF USING SOLAR SYSTEMS IN THE CLIMATIC CONDITIONS OF THE CENTRAL CHERNOZEM REGION

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Annotation. Mini-solar stations are used quite effectively to generate electricity in the areas of detached housing, industrial facilities and small public facilities such as private hotels. The feasibility of their use is determined by the sufficient amount of solar radiation. The work analyzes the cost of a solar hot water supply installation performed by a contractor at the current price level and the main technical and economic indicators of similar installations from domestic and foreign manufacturers. In this article we consider four options for solar power plants, three of which are widely known and are currently the most competitive. We also present the results of calculating the payback period, replacement rate, and cost of these installations in the conditions of the Central Chernozem Region, depending on the manufacturer. It is shown that the feasibility of application depends on the initial capital investment and design option, with an important indicator being the cost of maintenance and the possibility of duplicating these systems in the traditional way.

Keywords: solar installation; energy efficiency; cost price; expediency; hot water supply.

EXPERIENCE OF DIGITAL MODELING TO IDENTIFY ZONES OF CONDENSATE DROPOUT ON TRANSPARENT ENCLOSURES

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Annotation. In the article we present the experience of using digital modeling of the temperature and humidity conditions of residential premises in order to identify and predict any factors influencing the process of condensate dropout on the inner surface of transparent enclosures. Since the solution to this problem is complicated by the multifactorial impact on air quality, as temperature, humidity, and weather conditions can change randomly, the use of methods based on sound scientific approaches in conjunction with modern digital technologies acquires particular

significance. Based on the methodology set out in SP 50.13330.2012 ‘Thermal protection of buildings’, the possibility of condensate dropout on the inner surface of the window was theoretically tested for further comparison of the calculated values with the results obtained on the basis of a full-scale experiment conducted in residential premises. At the same time, the convergence of calculated and experimental data was 75 %. Based on the results of a digital experiment, we determined the nature of the temperature distribution on the surface of the window unit and glazing. We also determined and visualized the influence of the heater on the formation of a downward flow near the glazing and an upward flow from the convector. We obtained satisfactory convergence (within 18 %) of the temperature determination results based on natural and digital experiments, which allows us to conclude that the digital model is adequate and can be used to solve practical problems.

Keywords: full-scale and digital experiments; digital model; temperature and humidity conditions; microclimate parameters; condensate; window unit.

FEATURES OF CALCULATING THE MINIMUM FLOW RATE OF THE SUPPLY AIR

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Annotation. In the article we present an overview of sources considering the need to adjust the methodology for determining the minimum indoor air exchange, including the value of the sanitary norm for outdoor air supply per person. It has been established that the current standards adopted several decades ago do not correspond to modern trends in the development of ventilation systems, since they do not take into account modern regulatory possibilities and non-stationary operation. Here we present the results of calculations of the required air exchange according to various methods on the example of a mental labor room. The presented results demonstrate a significant difference depending on the different ways of organizing air exchange. Finally, we list the main parameters that should be taken into account when rationing air exchange.

Keywords: sanitary norm of outdoor air; minimum air exchange; air quality; ventilation efficiency.

INVESTIGATION OF THE UNEVENNESS OF THE TEMPERATURE FIELD IN THE VOLUME OF AN AIR-CONDITIONED OFFICE BUILDING

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Annotation. In this article we present the architectural and planning features of office-type premises. We display here methods of air conditioning of premises

and characterize the basic model of climatic equipment. We studied the uniformity of heat distribution in an air-conditioned office-type room in a full-scale experimental way. The experiment was carried out on the basis of the laboratory of ventilation and air conditioning named after Professor Ivan Ivanovich Polosin of Voronezh State Technical University. As a result, we obtained the values of the microclimate parameters in the supply and outgoing air, as well as in the working and upper zones. Also, we determined the cooling time of the room volume to the normalized temperature values. We noted some shortcomings in the current methods of calculating the power of climate equipment associated with incomplete assimilation of heat surpluses over the internal units of cassette air conditioners. Analytical studies have been carried out using an *Id* - diagram of the state of humid air, the results of which will be useful for the development of new technical solutions for air conditioning offices with a uniform distribution of heat over the volume of the room without violating the conditions of comfort of the microclimate for humans.

Keywords: heat exchanger; temperature field; cold supply; air conditioning; experiment; workspace.

ASSESSMENT OF MICROBIOLOGICAL CHARACTERISTICS OF WATER IN AQUIFERS IN BELGOROD AND VORONEZH REGIONS

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Annotation. In the article we present the results of laboratory studies of water quality in non-centralized water supply in the Belgorod and Voronezh regions. On the basis of the results of their assessment (based on hydro-chemical and microbiological monitoring, as well as on the analysis of water register data), we established that in approximately half of the places there may be found non-compliance with hygienic standards for sanitary-chemical and microbiological indicators in the territory of two regions. In the Belgorod region the data is the following: 30 % of samples exceeded the values of the total microbial number, 70 % of the samples exceeded the content of colimorphic bacteria, 50 % exceeded the values of general toxicity. As for the Voronezh region, the data is the following: in 75 % of samples the values of the coli index were exceeded, in 20 % of the samples the values of the total microbial number were exceeded. At the same time, the main reason for the non-compliance of centralized water supply sources with sanitary and epidemiological requirements is the lack of sanitary protection zones. The revealed facts of contamination of underground aquifers indicate a potential danger for the population of the regions and the need to improve the system of hydroecological monitoring and water protection.

Keywords: microbiological water analysis; spring water; bacteria; water quality.

URBAN PLANNING. RECONSTRUCTION, RESTORATION AND LANDSCAPING

ON THE ISSUE OF POSSIBILITY OF ACHIEVING THE PLANNED BILBAO EFFECT AND INCREASING THE INNOVATIVE POTENTIAL OF THE TERRITORY

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Annotation. The article examines some current phenomena and trends in architecture and design, namely the Bilbao effect and the use of fractal-like structures in architectural design, in relation to urban planning, as well as development and improvement of the innovative potential of territories. These phenomena and trends are considered in terms of increasing the expressiveness of the architectural appearance of the city and its attractiveness for tourism. Also, we analyzed the possibility of achieving the planned Bilbao effect and increase in the innovative potential of the territory using an integrated approach, including fractal-like structures and specialized software products, one of which is artificial intelligence.

Keywords: Bilbao effect; fractal; architectural expressiveness; innovative potential of the territory; fractal dimension; fractal self-similarity.

ECOLOGY AND SAFETY OF THE URBAN ENVIRONMENT

MONITORING OF ACOUSTIC POLLUTION OF TERRITORIES ADJACENT TO ARTERIAL ROADS IN THE CITY OF VORONEZH

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Annotation. The annual increase in the number of cars entails a number of urgent problems, including noise pollution of urbanized territories, which leads to a decrease in the comfort of living conditions of the population, especially near busy roads. The purpose of the article is to carry out a comparative analysis of the results of the research of motor transport noise level on the streets of the city Voronezh. Here we present the results of the study for four seasons of 2023. The measurements were carried out during the day and night time. The measurement results are presented in the form of histograms, which show the average and maximum recorded values. Based on the data obtained, we identified the zones of acoustic discomfort.

Keywords: monitoring; motor vehicle noise; equivalent noise level; territories adjacent to arterial roads; acoustic discomfort zone.

DEVELOPMENT OF A PREDICTIVE ALGORITHM FOR ATMOSPHERIC POLLUTION BY CARCINOGENS UNDER VARIOUS METEOROLOGICAL CONDITIONS

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Annotation. The aim of the research is to study the peculiarities of the influence of air temperature in various atmospheric conditions and wind speed to develop a prediction of formaldehyde concentration at several stationary observation posts in the city of Voronezh. The materials and methods of the study are based on the analysis of daily observations from stationary pollution monitoring posts on the concentration of formaldehyde, as well as on data from temperature and wind sensing of the Voronezh atmosphere. Graphical, analytical and probabilistic methods, as well as correlation analysis, were used to determine the relationship between the meteorological parameters of the atmosphere and the concentration of formaldehyde. The results of the study were the establishment of spatial and temporal patterns of formaldehyde distribution in different seasons of the year and the dependence of its concentration on the thermal regime. We determined the boundary values of temperature, as well as ‘dangerous’ wind speed under various atmospheric conditions. Finally, we present the scheme of the algorithm for predicting dangerous values of formaldehyde concentration.

Keywords: formaldehyde; concentration; atmospheric stability; buoyancy index; carcinogens; synoptic situation.

JUSTIFICATION OF THE NEED FOR ASSESSING THE ENVIRONMENTAL SAFETY OF FACILITIES OF MULTI-FUNCTIONAL ROAD SERVICE ZONES FOR TRANSPORT TOURISM

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Annotation. We conducted the analysis of the development of domestic transport tourism aimed at the formation of a comfortable well-developed transport infrastructure, which will be based on road service facilities exclusively as part of multifunctional zones (MFZ). We reviewed the layout of the new MFZ and MFZ under construction, we as well identified facilities that have an adverse impact on the environment, the surrounding area and human health. In this article we present a multi-criteria analysis of the factors influencing the spread of harmful substances from gas stations which allows assigning an environmental safety class to gas stations. We substantiated the necessity of assessing the environmental safety of individual facilities and as a whole the MFZ of the road service of transport tourism. We also describe here the development of a methodology to assess the level of the MFZ's

impact on the environment and implement a certain list of measures to reduce its negative impact.

Keywords: transport tourism; multifunctional zone; environmental safety; air flows; adverse effects; multi-criteria analysis.

ECONOMICS AND ORGANIZATION OF CONSTRUCTION

ORGANIZATIONAL AND LEGAL PROBLEMS OF THE PERSONNEL TRANSFORMATION IN HOUSING AND COMMUNAL SERVICES AND WAYS OF THEIR SOLUTION

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Annotation. The article is devoted to the problems of improving the professional level of employees of enterprises in the field of housing and communal services and ways to solve them in modern conditions. We here reveal the main reasons that influence the low level of skills of personnel at enterprises in the industry. We also carried out a retrospective analysis of existing regulatory documents and those ones that are currently at the stage of development and approval. These are the documents that can have a positive impact on improving the situation with personnel training for housing and communal services enterprises.

Keywords: housing and communal services; educational program; professional standard; direction of training; qualification requirements; quality of education.