CALCULATION JUSTIFICATION OF TEMPERATURE DEFORMATIONS OF STONE WALLS IN A BUILDING

G. D. Shmelev, E. V. Sazonov, A. N. Ishkov

Annotation. The article uses a specific example of a long-term residential building in climatic conditions of the city of Voronezh to consider the reasons for the uneven formation of cracks of temperature origin and development on the facades. In 2023employees of the Voronezh State Technical University carried out a sample survey of the building when the most probable causes of cracking in the external stone walls of the building were investigated and analyzed. They assessed the actual category of the technical condition of the walls and foundations of the building. As well they carried out verification calculations of temperature deformations of the external stone walls of the building. When performing calculations for the external stone walls of the building, the following factors were taken into account: uneven location of cracks in the walls of the building; the presence of three temperature blocks in the building, separated by two temperature-shrinkage expansion joints; spatial orientation of the building and orientation of the building facades according to the cardinal directions; the presence or absence of shading of the external walls of the building by trees; actual strength and deformation characteristics of the materials of the external stone walls of the building; the presence or absence of plaster coating on the walls of different facades of the building and the color of the building facades. The calculation of the thermal deformations of the building was carried out taking into account the requirements of SP 50.13330.2012 '*Thermal protection of buildings*', SP 131.13330.2020 '*Building climatology*. *SNiP 23.01.99**' and SP 15.13330.2012 '*Stone and reinforced masonry structures. Updated edition of SNiP II-22- 81**'. The calculations confirmed the actual uneven distribution of cracks on the facades of the building and within temperature blocks, as well as the temperature nature of the formation of cracks in the external walls of the building.

Keywords: stone walls; residential buildings; temperature deformations; orientation of the walls according to the cardinal directions; temperature cracks; calculation justification.

ACCOUNTING FOR THE MUTUAL INFLUENCE OF LOCAL RESISTANCE IN TYPICAL HEATING APPLIANCE CONNECTION UNITS

S. M. Usikov, D. Yu. Zheldakov

Annotation. Currently, due to the imperfections of the proposed methods of hydraulic calculation of water heating systems, the mutual influence of local resistances is not taken into account, which leads to incorrect choice of equipment and determination of the final resistance of the system circuit. This, in turn, leads to an incorrect distribution of the coolant through the system and, as a result, a decrease in the level of thermal comfort. In this paper we carried out an analysis of known methods for determining pressure loss in local resistances, taking into account their mutual influence at close proximity. We detected typical appliances used in modern water heating systems equipped with automatic regulators. So, we present the results of a study of the hydraulic characteristics of typical heating appliance connection points in modern water heating systems, taking into account the mutual influence of local resistance. We defined the methodology for evaluating the hydraulic characteristics of these units. We also compared the results of an experimental study, theoretical determination of the pressure loss in the unit, as well as the element-by-element determination of the pressure loss in the unit. We estimated the difference in the hydraulic characteristics of valves installed outside the zone of mutual influence of local resistance and actually in the unit. We estimated the influence of the coolant temperature on pressure losses in local resistance. The analysis showed a discrepancy between the results of theoretical calculations and experimental studies of up to 200% (taking into account the range of reliable measurements). This analysis confirmed the acute necessity of the work performed and the correctness of the goal set in it. Formulas are proposed for calculating correction coefficients that take into account the mutual influence of local resistances in the units, as well as the temperature of the coolant.

Keywords: heating appliance; local resistance; hydraulic calculation; hydraulic characteristic; pressure loss.

IMPROVEMENT OF PREVENTION METHOD OF COLD FALLING AIR FLOW IN THE WORKING AREA IN BUILDINGS WITH HIGH GLAZING COEFFICIENT

A. A. Mershchiev, D. V. Lobanov, E. E. Burak

Annotation. The article substantiates relevance of improving the method of preventing cold falling air flow from external enclosing structures against entering the work area. We proposed a variant of organizing the movement of air flows that prevents cooling of the working area of the room. This result is achieved through installing an additional translucent wall along the glazed facade, with the organization of a slot channel into which air from the room is drawn in. Due to this, the additionally installed wall warms up, the radiation temperature in the room increases and thermal comfort increases, too. We present the results of calculations for determining the temperature of the mixture of air flows. Finally, we show the possibility of regulating the temperature of the mixture by changing the proportions of mixed flows.

Keywords: falling cold flow; radiation temperature; heat loss; work area; external enclosure.

CHANGES IN THE AIR PARAMETERS IN THE MENTAL WORK ROOM DURING THE OPERATION OF VARIOUS VENTILATION SYSTEMS SCHEMES

D. V. Lobanov, I. I. Zvenigorodsky, S. A. Safonov

Annotation. We carried out a series of experimental studies of the operation of various ventilation systems in mental work areas. In this article we consider systems of mixing, displacement and personal ventilation. First, we measured indoor air parameters: air temperature, relative humidity, carbon dioxide concentration. Then we compared the compliance of the microclimate parameters provided by ventilation systems with the standardized values. Then we approximated the curves of changes in internal air parameters over time by functions with the highest coefficient of determination. It was revealed that displacement and personal ventilation systems are most effective in creating and ensuring standardized parameters of the air environment under the conditions of the experiment. Finally we present recommendations for organizing ventilation systems in mental work areas in order to ensure comfortable microclimate parameters.

Keywords: microclimate; ventilation schemes; mixing ventilation; displacement ventilation; personal ventilation; human breathing zone; ventilation efficiency.

SIMULATION OF BOILER OPERATION WITH OFF-DESIGN FUEL

D. N. Kitaev, Z. S. Gasanov, A. N. Ievlev

Annotation. When operating boiler plants, there are cases of using off-design fuels, in particular coal with properties that differ from the design values. The article discusses the issue of modeling the technical and economic indicators of a steam boiler when the elemental composition of solid fuel changes. Based on the calculation of the heat balance, we identified quantities that significantly affect the characteristics of the boiler. We obtained analytical dependences of fuel consumption, enthalpies of combustion products and gross efficiency with changes in the elemental composition of burned coal for a specific boiler model.

Keywords: heat generator; off-design fuel; fuel composition; heat balance; fuel consumption; efficiency.

ANALASYS OF THE TECHNOLOGY OF EFFECTIVE WASTEWATER TREATMENT AFTER ASHING IN A TWO-STAGE AERATION TANK, ON THE EXAMPLE OF THE LEATHER INDUSTRY IN MALI (IMAT), IN BAMAKO (MALI)

D. Lassana, V. N. Sainova

Annotation. The characteristics of wastewater from different tanneries vary depending on the technological processes, chemicals and types of hides used. The object of our study was wastewater formed at the stages of pre-tanning. This wastewater has a complex nature, contain both organic and inorganic pollutants in high concentrations and can cause damage to the environment. For deep purification of these waters from impurities, biological purification was used under aerobic conditions in a two-stage aeration tank. The experimental results show the purification efficiency of 88,77 % for biochemical oxygen demand$_5$, 83,53 % for chemical oxygen demand, 98,9 % for phosphate ions and 88,53 % for total nitrogen when initial substrate concentration was 800 mg/l, expressed in biochemical oxygen demand$_5$. These values were obtained at a dose of sludge of 3,5 g/l, aeration time was 6 hours daily during 7 days. The results of experimental studies show that the technology used is an environmentally viable alternative to traditional methods when potentially toxic chemicals in wastewater treatment are used at this stage.

Keywords: wastewater; tanneries; pre-tanning; aerotank; activated sludge; chemical oxygen demand; biochemical oxygen demand$_5$; nitrogen; phosphate.

URBAN PLANNING. RECONSTRUCTION, RESTORATION AND LANDSCAPING

UNDERGROUND URBANISM AS AN ASPECT OF THE FORMATION OF ARCHITECTURAL AND URBAN PLANNING SPACE IN HISTORICAL MEGACITIES AND MAJOR CITIES

I. A. Mironova, V. I. Tyokina

Annotation. In the article we consider the problem of the rational use of urban spaces in the historical parts of megacities and major cities in the aspect of the formation of an architectural and urban environment using underground space. We have analyzed the most characteristic solutions of underground structures from domestic and foreign design practice, which made it possible to correctly edit details of the urban environment that are significant from a historical and urban planning point of view. We draw a series of conclusions about the role of the underground part of cities in the organization of public spaces in the historical part of megacities and major cities. We as well assessed the influence of the aspect of underground urbanism on the qualitative indicators of the formation of the architectural and urban environment. Also, we identified two main ways of forming the architectural and urban space of megacities and major cities with the organization of public spaces in the underground part of cities. The conclusion is formulated about the expediency of using the underground part of cities to form public spaces in historical megacities and major cities.

Keywords: underground urbanism; underground space; historical megacities and major cities; architectural and urban planning space.

ALTERNATIVE LAWN AS A MEANS OF INCREASING THE EFFICIENCY OF LANDSCAPING URBAN SPACES

E. YU. Vityuk, A. YU. Obukhova

Annotation. The article outlines the basis of the hypothesis about the creation of an alternative lawn as a way of creating green facilities in the urban environment while reducing the costs of their maintenance during the period of operation. We give a definition of the term *alternative lawn*. We give some data on the average costs of maintaining lawns and present an overview of current trends in the creation and operation of urban lawns. We display a list of plants that are most suitable according to the formed group of criteria for the regional conditions of the Sverdlovsk region. We describe here an experiment of creating an alternative lawn in the city of Yekaterinburg using herbaceous plants, namely aegopodium and anemones.

Keywords: urban environment; landscaping; lawn; operation; efficiency; aesthetics; low maintenance; decorativeness.

IMPROVEMENT OF THE GROUNDS IN THE CONTEXT OF TOWN PLANNING AS WELL AS IN THE SYSTEM OF LAND AND PROPERTY RELATIONS

E. N. Karpushko, M. O. Karpushko

Annotation. The article examines a land plot as a real estate unit in the system of urban planning and land-property relations. We show theoretical and methodological foundations for carrying out improvement and land surveying when state cadastral registering of these land plots. The main characteristics of the land plot are emphasized, namely, the location of its boundaries with further identification of a specific part of the earth's surface. The key components of the grounds were classified in accordance with the rules and regulations of technical operation. We also describe the advantages of control of the grounds. We considered a land plot with the status of grounds. We identified the features of the legal regulation of housing disputes regarding the attribution of individual elements of improvement to common property, regarding the establishment of boundaries of the adjacent territory and regarding the operation of common areas in apartment buildings. We studied the main sources of the legal relations formation and the results of their implementation in the framework of ensuring the comfort and safety of the grounds of apartment buildings. As a result, we offered mechanisms for regulation and maintenance of landscaping elements and grounds based on the analysis. Finally, we drew conclusions on the need to improve the procedures for land surveying of the territory (to determine the boundaries and resolve the issue of maintenance of improvement elements and the financial participation of owners of apartment buildings). We determined the need of improvement of state cadastral registration and establishment of zoning rules (to reduce disagreements between management organizations and municipal authorities on issues of maintenance individual elements of improvement and operation of the local area). We emphasized the need of placement of improvement facilities in conditions of limited yard space. The conducted research made it possible to identify the weak points of the regulatory management of improvement activities, namely, to control legal acts and regulate arguments on housing improvement.

Keywords: land plot; land and property relations; improvement; legal regulation; housing disputes; borders of the adjacent territory; zoning rules.

FRACTAL STRUCTURES AS AN IMPORTANT ASPECT OF INCREASING THE INNOVATIVE POTENTIAL OF A TERRITORY

S. V. Artyshchenko, D. V. Panfilov, A. G. Tchigarev, S. P. Bondar

Annotation. The high rate of today's urbanization requires a conscious approach to architectural design. A person needs an environment which fills him with new strength and does not drown out his creative potential with monotony and routine. Due to its significant similarity to seamlessly occurring natural structures, fractal architecture can be considered as a medium for it. In the article we discuss the characteristics of fractal systems in relation to architecture, highlight the concept of "the principle of fractal fragmentation", and also expand the concept of "self-similarity". In addition, we analyzed the existing experience of fractal architecture, and using the example of existing facilities we made an assumption about the relationship between the value of the fractal dimension of a facility and the indicators of future design success. We made a conclusion about the positive contribution of fractal facilities to the innovative potential of the territory. The materials of this article may be useful for further development of the concepts of the theory of creating fractal architecture

Keywords: architectural design; fractal architecture; fractal structures; fractal; innovation potential.

ECOLOGY AND SAFETY OF THE URBAN ENVIRONMENT

ANALYSIS OF FRACTIONAL AND MORPHOLOGICAL COMPOSITION OF SOLID MUNICIPAL WASTE ON THE EXAMPLE OF PERM KRAI

T. G. Sereda, S. N. Kostarev

Annotation. In order to design facilities related to waste treatment and utilization it is necessary to have information on the fractional and morphological composition of solid municipal waste. Despite some success in the development of sorting facilities, a significant portion of solid municipal waste is disposed of in landfills. The article presents the results of research on waste composition on the example of Perm Krai, conducted in 2020. Forty-two components of waste, divided into 12 categories, were studied. The research was conducted on the example of two settlements with a population of less than 300,000 people (the village of Kondratovo) and with a population of more than 500,000 people (the city of Perm). We present the results of an analysis of the fractional and morphological composition of solid municipal waste according to the season. We determined in the studied samples the percentage of degradable, difficult to decompose and non-degradable fractions. The

results obtained in the work can be useful for the feasibility study of the design of facilities for the processing and disposal of solid waste.

Keywords: waste; solid municipal waste; fractional composition of waste; processed raw materials.

VISUAL PRESENTATION OF THE IMPACT OF THE VIBROACOUSTIC FACTOR FROM RAILWAY TRANSPORT ON THE RESIDENTIAL AREA

D. A. Sokolov, E. I. Golovina

Annotation. The paper presents a description of the impact of the vibroacoustic factor from railway transport. We outlined problem areas such as the impact of structural noise on residential areas, buildings and structures. We show the specificity of the influence of external and internal effects of noise and vibration from rolling stock. We considered methodical and sometimes erratic fluctuations of the ground near the rail-track, the effect of noise pressure on a person and the space near the railway track. The full set of phenomena of vibrations of the railway ground takes into account the chain: the source of vibration - the railway track - the ground, which are the source, transmitter and receiver, respectively. The main purpose of the work is to visually represent the vibration levels of the soil, taking into account all three of these elements. Each of the provisions is taken into account by an appropriate empirical factor, the product of which gives a visual representation that includes an impact on the social and everyday side of human activity. In the studied area, some studies on the topic of the influence of sound pressure levels from various sources of railway transport were conducted. Measurements were carried out on the border between the railway track and the city limits, which more concisely showed the impact of the fluctuations on humans and the environment, which is important for the formation of a high level of social comfort. In conclusion, the article presents a variant of the visual representation of the cumulative impact of vibroacoustic factors from railway transport, which affects a number of key factors that should be taken into account when predicting the complex effects of noise and vibration on both the environment and the train during movement.

Keywords: noise; vibration; railway transport; environment; buildings and structures.