

BUILDING CONSTRUCTION, BUILDINGS AND STRUCTURES

ANALYSIS OF APPLICABILITY OF VARIOUS NATURAL LIGHTING SYSTEMS FOR CIVIL DESIGN BUILDINGS

A. N. Malysheva, M. S. Kononova, Y. A. Vorob'eva

Annotation. In this article, an overview analysis of existing constructions of natural light systems (NLS) of buildings was carried out. The separation of these devices according to the principle of action into two groups: transmissive and reflective was proposed here. A summary list of advantages and disadvantages of NLS, affecting to the possibility of its using for buildings of various purposes was drawn up. Technical characteristics of the NLS are studied and systematized, its classification was developed. Several groups of technical characteristics of its devices were allocated, such as optical, structural, heat-shielding, operational. Three categories of buildings were considered as objects for the analysis of the applicability of systems. These are individual, multi-apartment houses and public buildings. It is established that the determining factors that influence the choice of NLS are the space-planning decision of the building and its functional purpose. Given the complex analysis of all groups of technical characteristics, a summary table has been developed, with the indication of the possibility of using the NLS in the design and reconstruction of the types of buildings under study. And also conditions for limiting the applicability of NLS for the individual objects are described here.

Keywords: systems of natural lighting; translucent structures; light shelf; light shaft; lantern; hollow tubular skylight.

COMFORTABLE ORGANIZATION OF SELECTIVE COLLECTION OF SOLID WASTE IN BUILDINGS

A. N. Ishkov, N. A. Maleva, V. O. Mal'tsev, A. E. Chursin

Annotation. The article presents an overview of the ways to solve the environmental and economic problems of separate collection of municipal solid waste (MSW); presents a number of specific case examples of the implementation of the system of separate collection of MSW in certain constituent entities of the Russian Federation; gives a description of advantages and disadvantages of the methods of collection and sorting of MSW both out of premises (in the yards and parks on the garbage collecting platforms equipped with special containers) and out of the apartment buildings; provides an analysis of innovative waste disposal systems within residential buildings while they are under construction. The author of this article proposes a system of separate collection of municipal solid waste (MSW), providing for the abandonment of traditional waste chutes and allowing efficient separation of MSW in apartments, without compromising sanitary conditions and comfort of use. The peculiar feature of the proposed system is the possibility of differentiation of

the cost of MSW removal for each apartment, depending on the intensity of use, and partial compensation of costs of the waste removal services due to the profits of processors of secondary raw materials. The operation of the system provides for the personal responsibility of users for the quality of MSW sorting by means of using removable interchangeable containers marked with a bar code corresponding to the type of MSW fraction and the number of the apartment in which it is used.

Keywords: municipal solid waste; sorting; containers; separate collection of waste; container construction.

ENGINEERING SYSTEMS AND COMMUNICATIONS

SUPPLY AIR DISTRIBUTOR OF LOCAL AIR SUPPLY TO TECHNOLOGICAL ZONE OF PROCESSING OF TEXTILE MATERIALS

I. N. Filchakina, A. I. Eremkin

Annotation. Considering the shortcomings of the existing air conditioning systems, the most effective method is proposed for industrial premises of textile enterprises by the example of a spinning mill. The authors suggest improvement of the process conditioning system due to local air supply based on the principle of displacement ventilation. Air exchange is carried out according to the "bottom-up" scheme, namely, the supply air with the required microclimate parameters is locally supplied directly to the process equipment, and the exhausted polluted air, together with the heat excess, is removed from the upper zone of the room, above the level of stratification. A new air distributor is proposed, which is an improved design of the device for local distribution of air in a spinning machine. The improvement of the air distributor is realized due to the use in its design of a new additional element in the form of arc-shaped screens that allow forming six streams inside it, repeatedly dividing and colliding with each other, which contributes to a decrease in the velocity of the resulting jet at the outlet of the air distributor. The scheme of motion of air masses inside a new air distributor is considered in detail. The scheme of the experimental installation for the investigation of the resulting jet of fresh air at the outlet from the air distributor is presented. The carried out researches allowed to reveal the most expedient solution when choosing the dimensions of the air distributor design, which provides a sufficient angle of lateral expansion of the jet, permissible air velocity at the exit and compact overall dimensions, for the purpose of placing it in technological equipment. In addition, an equation for determining the coefficient of local resistance was obtained to estimate the energy costs when air is discharged from the opposite channels of the air distributor.

Keywords: air distributor of local air supply; organization of air exchange for rooms with heat losses; the principle of displacement ventilation; the effect of collision of counter flat jets.

COMPARATIVE ANALYSIS OF ENERGY EFFICIENCY OF TRADITIONAL AND ALTERNATIVE METHODS OF AIR CONDITIONING

A. A. Zamyatina, M. N. Zherlykina

Annotation. The traditional and alternative methods of air conditioning in office buildings located in cities of Russia with different climatic conditions are considered. The main air conditioning solutions in office buildings, most common today, are analyzed. The results of research in the field of power consumption by air conditioning systems of public buildings, demand for products, namely electric energy, and its release in order to identify the main reasons for rising costs of the traditional air conditioning method are given. The method of cooling of office buildings with the help of thermoactive systems is described. Solutions are provided for the placement of equipment and additional elements in the office building used for alternative air conditioning. Design features of the air conditioning system with the use of building structures are presented. Recommendations are given on the advisability of using types of equipment and types of materials in alternative air conditioning systems. The results of calculating the estimated cost of air conditioning systems equipment, installation, operation and repair costs for traditional and alternative systems for an office building for which architectural and planning solutions are most frequently encountered are presented. A comparative analysis of the cost of air conditioning for two ways of climate control of office buildings under different environmental influences was made. A significant excess of operating and capital costs has been revealed in the traditional method of air conditioning. Recommendations are presented for the selection of the construction area in the design of air conditioning systems with the use of building structures in view of ensuring rational energy consumption and improving the energy efficiency of office buildings.

Keywords: air conditioning; microclimate; traditional approach; an alternative approach; power consumption; heat supply; radiant heat exchange; coolant; energy efficiency.

ENSURING THERMAL COMFORT IN HOUSING ESTATES OF THE INCREASED NUMBER OF STOREYS

A. V. Isanova

Annotation. In new multi-storey blocks, there is an increase in wind speed in the inner-yard territories and often exceeding its normalized values. This fact leads to non-compliance with the parameters of the thermal comfort of residents at the time they are on the street. Due to the «blowing out» of the accumulated heat, there is an effect on the internal microclimate of buildings. The decrease in the normalized temperature characteristics of the internal air of a part of the building does not favorably affect its overall thermal regime, which in turn leads to an increase in the

cost of thermal energy and a decrease in the energy efficiency of the structure as a whole. As an example of an energy-saving measure, a description of a thermo-pump system with a per-zone regulation is given. The model in question includes a station consisting of two series-connected heat pumps. Two circuits for circulating and regulating the temperature of the heat sink transfer excess heat energy from warm rooms from the «under-wind» side to colder rooms from the «windward» side of the structure, technical, technological and architectural-planning measures for multi-storey buildings forming urban blocks, allowing to create favorable living conditions, while observing the normalized temperature parameters of the internal microclimate.

Keywords: thermal comfort; microclimate; wind mode; thermal pump.

THE NEED TO DEVELOP NORMALIZED PARAMETERS OF MICROCLIMATE IN THE PREMISES OF MENTAL LABOR

D. V. Lobanov, V. V. Shichkin, A. N. Pertsev, V. A. Kaminskaya

Annotation. Scientific and technological progress leads to the fact that the number of people engaged in mental activity in all spheres of production is increasing every year around the world. Accordingly, the issues of mental health are becoming more and more relevant. The article compares physiological characteristics of mental and physical labor, analyzes the existing data on energy consumption of labor. It is established that mental performance during the working day differs by fluctuations of productivity of work. Favorable meteorological conditions in the workplace are essential for high-performance work and disease prevention. Currently, the development of systems to create and maintain a dynamic microclimate during labor activity is promising, since the so-called "full optimization of microclimate" excludes the impact of changing thermal stimuli and creates a certain monotony that causes the detrenirovannost of the human body. The use of such systems should be recommended in cases where the working conditions do not give sufficient excitations to the thermoregulation system. Necessity of carrying out additional complex researches on definition of power consumption of the people occupied with different types of mental activity with further development of categories of severity and intensity of labor process is proved. The algorithm of development of normalized parameters of a microclimate in premises of mental work with division into categories is offered.

Keywords: mental labor; physical labor; physiology of labor; energy costs; mental performance; dynamic microclimate.

CITY. RECONSTRUCTION, RESTORATION AND LANDSCAPING

APPLICATION OF INFORMATION SYSTEMS AT PLANNING OF CAPITAL REPAIRS OF BUILDINGS

Y. A. Vorob'eva, K. N. Gashkova, A. L. Mishurov

Annotation. The analysis of the technical condition of dwelling houses, the statistics of dilapidated and dilapidated housing, and the main shortcomings of the existing monitoring system, which does not have a control mechanism for repair and restoration work, are presented. The solution of the problems of creating a comfortable environment on the basis of a single urban geoinformation system for monitoring the technical condition of the housing stock was proposed. The principles of organization, direction of development, possibilities and advantages of using geoinformation systems in the work of the capital repair fund of the Voronezh region are described. The expediency of making operative decisions based on actual information on the condition of buildings of different construction periods, as well as the need to create a constantly updated, updated and replenished database of the entire housing stock of the city and the region with the help of geoinformation systems is substantiated. Issues related to the development and construction of a system of information and diagnostic support for the technical condition of residential buildings to determine the order of their inclusion in the program of overhaul are considered. The main layers that make up the geoinformation system are proposed, taking into account their attributive information necessary for the development of a general strategy for managing the technical condition of the housing stock and when optimizing the order of carrying out major repairs of multi-apartment houses.

Keywords: geoinformation system; major repairs of buildings; technical condition of housing stock.

ECOLOGY AND SAFETY OF THE URBAN ENVIRONMENT

FORECASTING OF THE PREVENTED ECOLOGICAL DAMAGE TO RESOURCES OF INTRACITY RESERVOIRS AT PROTECTION OF ATMOSPHERIC AIR

S. A. Yaremenko, A. I. Skrypnik, K. V. Garmonov

Annotation. The issue of determining damage to water facilities in large cities from the effects of pollutants in the atmosphere is currently insufficiently investigated. It is shown that pollutants deposited on the surface of the earth, in most cases, come with rain and melt waters in the water, so a more objective indicator of their impact on the underlying surface will be the pollution of the city water. It is also known that for the majority of harmful substances the norms set the maximum permissible concentrations in water, and the admissibility of their presence on the earth's surface is insufficiently studied. Thus, assessment of the level of harmful emissions on the water surface in cities is possible only when developing a mathematical model that takes into account the influence of the dynamics of the concentration of harmful substances on the value of the change in the environmental damage. The authors propose a method of predicting the prevented damage to water resources, which, unlike the known, allows to take into account the peculiarities of the

region of the reservoir location, the density of the emission location and to predict the required level of reduction in emissions of pollutants into the atmospheric air.

Keywords: the reservoir; polluting substances; ecological damage; concentration.

RESULTS OF THE EXPERIMENTAL STUDY OF THE TEMPERATURE MODE OF COMBUSTION OF DIFFERENT MATERIALS AT THE VARIOUS HEIGHT OF THE PREMISE

A. P. Parshina, M. V. Parshin, V. L. Murzinov

Annotation. The basic problems of study of fires are considered in apartments. With the purpose of increase of efficiency of events on evacuation of people from building and building the initial stage of fire is considered. It contingently the necessity of receipt of empiric reasonable values of parameters, descriptions and conformities to law of dynamics of temperature condition of the initial stage of fire under influence of convective streams, that will allow to produce the scientifically reasonable prognosis of dynamics of temperature condition of fire in time. For the achievement of this aim the model setting is worked out, providing the observance of scales of model apartments, feature checking of basic parameters, characterizing a fire on the whole, and also researches of dynamics of temperature of gas environment in an apartment. Methodology of realization of the experiments sent to the receipt of the most reliable information about the temperature condition of fire in an apartment and distribution of values of temperature on a height offers. Description over of realization of experimental research is brought. The model setting is the combustion chamber, made from materials heat conductivity of that corresponds to modern building materials, most widely being used at building building. Into a chamber a «tester» and hearth of fire are located. A «tester» consists of metallic plastins unconnected inter se. Measuring was conducted by means of laser pyrometer through an observational window. The temperature of surrounding air was thus estimated on the certain height of apartment. Two series of the tests sent to the receipt of reliable information about the temperature condition of burning of wares from a paper and wood are conducted. Functional dependences of change of temperature are got in time, allowing to get the given for an estimation temperatures of air into an apartment, possessing necessary authenticity. A conclusion is formed about heterogeneity of distribution of values of temperatures on the height of apartment and necessity of increase of efficiency of the events sent to research of fires in an apartment.

Keywords: fire; experimental research; dynamics of temperature condition of fire; burning of paper wares; burning of wood; initial stage of fire; dangerous factors of fire.

MODELING «URBAN HEAT ISLANDS» BY TOOLS OF GIS-ANALYSIS

I. V. Popova, S. A. Kurolap, P. M. Vinogradov

Annotation. The phenomenon of changes in the thermal regime in the city, expressed by the increase in temperatures in the boundary layer of the atmosphere, in climatology is called "urban heat island". The formation of the heat island in urban areas has a number of direct or indirect environmental and bioclimatic effects and consequences of both positive and negative nature. An example of the negative impact of the heat island is the increase in the number of days with thawed: in the cold half of the year, the transition of air temperature through 0°C creates problems not only for the economic and road maintenance services of the city, but also the state of the components of its natural environment, in particular green spaces. In this work, on the example of a large city of Voronezh, located in a temperate climatic zone, the characteristic of the main factors of the formation of urban heat island is given. ArcToolbox spatial analysis tools in ArcGIS 10.5. the evaluation of the properties of the underlying surface, the nature of its anthropogenic use, as well as the calculation of the amount of incoming solar radiation at the top of the direct, as the main climate-forming factor. The combination of the obtained raster thematic layers gives an idea of the intensity and spatial distribution of urban heat island.

Keywords: urban development; climate; heat island; thermal regime, solar radiation; transport load; capacity building; geoinformation analysis.

INCREASING THE SECURITY OF PRODUCTION AND STORAGE OF BIOGAS

N. V. Kuznetsova, T. V. Shchukina, A. M. Khodunov, A. A. Prokopenko,
V. A. Efimov

Annotation. Anaerobic digestion, accompanied by the concomitant release of biogas, is one of the priority methods for utilization of organic waste and sewage sludge. But, despite such obvious advantages of this technology for eliminating the tons of pollutants that are formed daily, it is not used in Russia as widely as in the near and far abroad countries. This is due to a fairly complex alignment of facilities with technical supervision and low temperatures during the cold season for most climatic zones, which has a negative effect on the thermal regimes of conversion, significantly reducing metagenesis. Increasing the reliability of biogas stations, including ecological ones, can be ensured by the use of facilities with high reliability indicators, which can be achieved through further constructive improvement. To this end, the article reviews reactors with an additional function of gasholders, analyzes advantages and disadvantages. Technical solutions aimed at increasing the stability of the course of anaerobic processes and the accumulation of biogas. The use of solar energy to maintain the required thermal regime, will avoid the additional heating necessary, including for heating the environment in which the floating gas holder is

located. An equation is obtained that allows to predict the fuel yield depending on the residence time of organic waste in the methane tank, which can be used for all temperature regimes corresponding to the conditions of the life of bacteria.

Keywords: organic waste; anaerobic digestion; biogas, reliability of methane tanks and gasholders.

ECONOMICS AND ORGANIZATION OF CONSTRUCTION

TECHNO-ECONOMIC PERFORMANCES OF ENERGY SAVING ACTIVITIES FOR APARTMENT BUILDING

O. O. Andriyashkin, O. A. Zhdanova, P. M. Khaustova, E. A. Sheina

Annotation. The problem of evaluation of technical and economic parameters of energy saving measures, with the aim of identifying the most energy efficient and quickly pay off. The results of calculation of the energy performance of a five-story apartment house built in 1974 located in the city of Voronezh. The calculation was based on the compilation of energy passports for several states of the building: the original (no insulation), as well as improving the heat resistance of the outer fences of the building to the level of modern requirements for thermal protection. The approximate cost of the heat measures is determined, estimated savings of heat for their implementation and payback period are calculated. To ensure the rational flow of heat to the heating of the building, the installation of an automatic temperature control unit of the coolant is offered, devices are selected, their cost is calculated. Potential savings of heat by the installation of devices for automatic regulation are determined, the expected annual savings and payback period are estimated. Calculations on determination of the class of power efficiency of the building taking into account considered variants of power saving up actions are carried out. It is established that in the initial state the energy efficiency class of the building is low (E), and taking into account the introduction of all thermal protection measures can be increased to high (B+).

Keywords: energy-saving measures; building insulation; heat saving; thermal protection; energy performance; energy efficiency class.