

## **BUILDING CONSTRUCTION, BUILDINGS AND STRUCTURES**

### **ESTIMATION OF PROBABILITY OF PREDICTION OF THE EMERGENCY TECHNICAL CONDITION OF CONSTRUCTION STRUCTURES**

**G. D. Shmelev, A. N. Ishkov, N. V. Golovina**

**Annotation.** The work is aimed at researching and substantiating the possibility of assessing the likelihood of an emergency or emergency technical condition of building structures using several independent forecasting methods. In the course of the work, it has been shown that it is possible to adopt the boundary values of the service life for each method as the confidence limits for the normal distribution of the projected lifetimes. The possibility of estimating the mean and average quadratic deviation for each of the methods from the boundary values using the «three sigma» rule is shown. By applying the graphs of the normal distribution of the predicted lifetimes for all forecasting methods used, a histogram of probabilities was obtained. The possibility of estimating the probability both for each time interval of forecasting and for the total time interval is proved. Based on the results of the probability estimation at each time interval, the final predicted time interval for reaching the limit or emergency technical state can be narrowed.

**Keywords:** forecasting; limiting state; building structures; boundaries of normal distribution; confidence probability; emergency technical condition.

### **ENSURING PRESERVATION AND UPDATES TYPICAL MASS CONSTRUCTION OF THE VORONEZH REGION WITH THE APPLICATION OF THE MONITORING SYSTEM**

**Y. A. Vorob'eva, E. E. Burak, S. A. Novikov, K. N. Gashkova**

**Annotation.** One of the most important housing tasks in our country, along with increasing accessibility and quality of housing, is to ensure the preservation and renovation of the housing stock of the 1950s and 1970s. The work is devoted to the identification of the most significant factors affecting the attainment of the dilapidated and emergency state of the mass series buildings in order to increase the efficiency of their major overhaul or reconstruction. At the same time, economic results should be expressed in eliminating physical depreciation and saving operational costs, and during reconstruction - also in increasing the area, the volume of services provided, throughput, and security of facilities. Issues related to the development and construction of an information and diagnostic system for the technical condition of multi-apartment residential buildings are considered, to determine the order of their inclusion in the capital repair program. The results of monitoring the condition of structures, engineering systems and equipment of buildings of typical mass series,

taking into account their number of storeys and wall materials, carried out in Voronezh, as well as the obtained dependences of physical deterioration of buildings against various factors revealed in the course of practical study of objects are presented. A number of problems have been identified to ensure the preservation and renovation of the housing stock, including those related to the lack of insufficient funding for resettlement of emergency housing stock and capital repairs of apartment buildings. Analyzing the practical experience of using the system of information and diagnostic support of the technical condition of buildings, a method for solving the task is proposed.

**Keywords:** mass building; technical condition; emergency condition; physical wear; monitoring; building repairs.

## **ENGINEERING SYSTEMS AND COMMUNICATIONS**

### **EFFICIENCY OF COMBUSTION OF GAS FUEL IN TWO-CONCRETE WALLED HOUSEHOLD BOILERS**

**M. G. Ziganshin, A. I. Shaymardanova**

**Annotation.** Improvement of heating systems based on individual boilers is currently an urgent task. In the modern market of heating equipment there are many types of domestic boilers, corresponding to different requirements. Boilers are classified on various parameters. As the main classification parameters are considered: the use of boilers, the accommodation, the way of organizing the removal of products of combustion, state of aggregation of water in the removed combustion products. One of the ways to improve the efficiency wall-hung boiler is to develop ways that intensify combustion processes under all modes of operation of the boiler and gas supply. A promising direction in solving this problem is the use of condensing boilers. The main advantage compared to conventional technology for generating thermal energy is to use the heat released during condensation of water vapour from combustion products. A study of the effectiveness of the gas domestic wall boilers. Studied the possibility of optimizing energy consumption when the work of wall Combi domestic boilers. A comparative analysis of the characteristics of traditional and condensing domestic boilers domestic and foreign manufacturers. Studied the efficiency at different temperatures of coolant. It was found that for maximum fuel economy it is necessary to provide a low wall temperature of the final heating surfaces of the boiler. The most rational solution is the transition to a low-temperature heating system, temperature chart which guarantees the possibility of condensation of vapors even at maximum system load.

**Keywords:** double-circuit boiler; condensing boiler; forced and natural draft; modulation burner; flame detector; dew point; higher and lower heat of combustion.

# TO THE QUESTION OF DEVELOPMENT OF ENGINEERING SYSTEMS FOR STORAGE OF RAW MATERIALS IN WINE-SIBER PRODUCTION

**S. M. Koltsov, M. N. Zherlykina**

**Annotation.** The period of storage time of the sugar beet raw material is affected by the efficiency of engineering systems designed to divert excess heat from the roots. The review of technical solutions used to store sugar beets is given. Attention is focused on the work of engineering systems designed to create conditions for storage of raw materials in bulk without enclosing structures. It is established that the engineering systems of active ventilation of the root embankment play an important role in solving the problems of supplying production needs. The peculiarities of storage of sugar beet are revealed and the tasks are presented, the solution of which contributes to the increase of the efficiency of storage of raw materials. The analysis of the values of the aerodynamic resistance of the embankment for beets from regulatory documents, which confirmed the inadequacy of reference data for the design of active ventilation systems. The range of permissible air velocities in the inter-root space of sugar beet is proposed taking into account the influence of the environment and the absence of enclosing structures. Recommendations for the design of active ventilation systems are presented. The types of enclosing constructions of structures for the storage of root crops, which have received the greatest distribution in the sugar beet production at present, are considered. The principle of operation of engineering systems for cooling the embankment for vegetable stores based on the average daily temperature fluctuation is proposed. The existing solutions are systematized and the tasks that need to be solved when designing the engineering systems of the storage facilities are presented.

**Keywords:** storage of beet; sugar beet; ventilation of the mound; active ventilation; vegetable store.

## ANALYSIS OF MICROCLIMATE PARAMETERS IN THE PREMISES OF THE MENTAL LABOR WITH THE USE OF A PC

**D. V. Lobanov, R. A. Sheps**

**Annotation.** The analysis of the system modes provide for the microclimate of office premises (office designers). The study room is in the second category (facilities mental work) for which the normative documents regulated parameters of the internal microclimate and determined the air quality. For the studied facilities were experimental researches by definition of key parameters of a microclimate and carbon dioxide concentration. Measurements were performed every working day, for two calendar years. The studies were carried out for the five operating modes of ventilation, different combinations of simultaneous operation of devices that affect air quality: ventilation system, cooling system (split system), natural ventilation with

different regime of open Windows. The analysis of the obtained results of measurements on the basis of which for each of the studied regimes were determined for the periods with different air quality. It is established that none of the considered modes or their combinations are not able to provide the room at the same time the temperature and gas facilities.

**Keywords:** ventilation of office spaces; systems of microclimate; modes of ventilation; personal ventilation analysis of operation of ventilation systems.

## **ASSESSMENT OF FORECASTED ENERGY SUBSTITUTION OF BUILDINGS USING SOLAR HEAT AND COLD**

**T. V. Schukina, D. M. Chudinov, V. V. Shichkin, I. A. Potekhin, R. A. Sheps**

**Annotation.** The possibility of using solar energy for heat and cold supply of buildings in the climatic zone of the Central Black Earth region is considered. The main principles of engineering calculation of active systems for utilization of solar radiation for heating premises during the cold season and their cooling in the summer season are given. The results of calculations for the average monthly values of the daily heat consumption of the building allowed us to compare the replacement rates of traditional power supply for two possible design solutions. The first version of the solar system involves the disposal of solar radiation only for heating purposes, and the second - for cooling in the warm season and the subsequent use of an array of radiation-absorbing panels in the heating season. The calculated value of the energy substitution during the installation of an array of collectors with different total area, picked up the required number of solar collectors, justified the choice of the type of the used collectors. The calculations revealed that the additional costs associated with the arrangement of the absorption chiller and an increase in the number of devices that absorb solar radiation, will eventually provide year-round operation built solar system, but also significantly reduce the consumption of traditional resources.

**Keywords:** solar energy; calculate the number of solar collectors; solar heating; solar cooling; replacement of traditional energy.

## **CITY. RECONSTRUCTION, RESTORATION AND LANDSCAPING**

### **ARCHITECTURAL AND TOWN-PLANNING RECONSTRUCTION PROBLEMS OF THE HISTORICAL CENTER OF VORONEZH**

**T. V. Mikhaylova, D. S. Parshin**

**Annotation.** During the analysis of the historical city district development Voronezh were the main problems of reconstruction of urban areas with historical buildings: the vulnerability of the documents on the protection of cultural heritage;

the lack of budgetary funds for the maintenance of cultural heritage; mismatch architectural appearance erected buildings and structures approved project documentation; lack of stylistic and compositional integrity of the urban areas; lack of urban planning documents, aimed at creating a unified architectural and artistic composition of streets, neighborhoods and areas of the city. The proposed solutions to the identified problems of architectural and urban planning urban redevelopment focused on the creation and restoration of architectural expression of the city, the question of attracting investments for the restoration and maintenance of cultural heritage, as well as to protect them from uncoordinated changes. Introduced the concept of reconstruction of the territory from the historic buildings along the street Vaytshovsky aims to upgrade the housing stock, creating a comfortable environment for living and get acquainted with architectural monuments, as well as the creation of a single architectural and artistic composition.

**Keywords:** town-planning; urban environment; reconstruction of residential areas; historical buildings; objects of cultural heritage.

## **ANALYSIS OF CONFORMITY OF THE PROJECTS OF PLANNING THE BUILT-UP TERRITORIES TO TOWN PLANNING REGULATIONS**

**E. E. Burak, Y. A. Vorob'eva, S. P. Egorova**

**Annotation.** The peculiarities of the renovation of the city building compression method on the example of the approved draft plan of residential district city district city of Voronezh. It is shown that the projects do not include full regulatory requirements for the establishment of a domestic territories, infringing the rights of citizens to have a comfortable stay. Checking calculation of the minimum area of land considered as an example constructed homes showed the presence of significant violations of the construction parameters of a residential zone in the development of the project of renovation of the existing building. The main disorders to place elements of a domestic structure planning: insufficient number of sites for temporary storage of cars, failure to comply with the standardized size of fields for various purposes. There are also no proposals for the provision of the population with places in preschool educational institutions. The results of the study lead to the conclusion about necessity of updating of the existing regulatory framework with the aim of developing criteria for evaluating the placement of «point» building in the existing planning structure of residential areas.

**Keywords:** town planning; renovation; development of built-up areas; infill development.

## **ECOLOGY AND SAFETY OF THE URBAN ENVIRONMENT**

### **CALCULATION OF ROUGHNESS PARAMETERS AND EVALUATING THE AERATION CAPACITY OF URBAN AREAS**

**I. V. Popova, E. V. Luibimova, S. A. Kurolap**

**Annotation.** Urban development substantially changes the direction and force of the air flow. In this paper, on the example of large cities of Voronezh method is presented for morphometric calculations of the roughness parameters of urban development, based on the solution of the equation roughness by evaluating the square front surfaces oriented to the main wind direction in an irregular grid of Thiessen polygons formed relative to the centroids of buildings. Given the necessary variables to solve equation roughness. Based on the results of the calculation of the roughness  $z_0$  and the existing classifications of the possible aerodynamic corridors of urban areas, play a significant role in aeration of urban areas and reducing air pollution in the Central areas of the city. Also calculated bias level zero plane  $z_d$  and porosity of the urban fabric  $P_{h-var}$ , which are indirect indicators of the aeration potential of the city. A comprehensive assessment of the aeration capacity was performed using methods of spatial analysis in ArcGIS on three main roughness parameters:  $z_0$ ,  $z_d, P_{h-var}$ . Based on these results, we can highlight areas that require development of planning recommendations on preservation and provide adequate aeration.

**Keywords:** urban development; the wind; the layer roughness; roughness parameters; aeration capacity; ventilation path; GIS analysis.

## **ROAD TRANSPORT, AGRICULTURE AND CONSTRUCTION MACHINES**

### **APPLICATION OF METHODS OF SPATIAL OPTICAL FILTRATION SYSTEMS IN THE SYSTEMS OF REMOTE CONTROL OF TECHNOLOGICAL MACHINES OF ROAD-BUILDING COMPLEX**

**A. A. Kononov, A. D. Kononov**

**Annotation.** Improving the performance of road-building complex is connected with the solution of problems of increase of efficiency and accuracy provide automatic control of the working group of technological machines. To improve remote control systems moving and road construction machines on the basis of the analysis and comparison of the currently used devices determine the position of the mobile object and its operating equipment by means of ultrasonic and laser copying, it is proposed to use an optical system that provides high precision tracking of the boundary by analyzing the differential contrast of treated and untreated surfaces. Examines the possibility of building optical devices, and suggests specific variants of its implementation with the objective and cylindrical lenses. Examines the possibility of «perspective distortion» and suggests methods of their compensation. The results of optical filter such «distortion» and recommendations for the future joint work of the optical system of tracking trajectories with previous devices for rapid assessment of physico-mechanical properties of soil. Focuses on the «smoothing»



properties of the proposed device in relation to the fluctuations of the previous working path.

**Keywords:** road-building complex; technological machines; spatial filtering; the boundary separating.

## **ECONOMICS AND ORGANIZATION OF CONSTRUCTION**

### **TECHNO-ECONOMIC COMPARISON OF VARIOUS MATERIALS OF PIPES USED IN THE DOOR-TO-DOOR LAYOUT OF THE HEATING SYSTEM**

**M. N. Zherlykina, M. S. Kononova**

**Annotation.** We considered six options for the implementation of the door-to-door layout of heating system from different pipe materials: chrome plated steel, polypropylene, metal plastic, cross-linked polyethylene (PEX), corrugated stainless steel tube, copper. Some of the technical characteristics of the compared materials are given, such as: the standard period of service, the acceptable values of temperature and pressure and also some characteristics that affect the installation and operation of the heating system. Comparison of the pipe materials was conducted for the door-to-door layout of the heating system for one floor. The cost of the pipe materials and installation work for each option was counted. The calculations take into account the specifics of the connection pipes. In the calculations the cost of heating appliances and finishing works was not counted, as they are taken as equal in the considered variants. The lifetime of the compared pipe materials are significantly different, so for the comparison there were selected the discounted costs over 50 years. Calculations included the number showing how many times during this period the pipes will be replaced, regarding their normative service life. The calculations revealed that the lowest costs correspond to the pipes made of polypropylene. Almost equal discounted costs are demonstrated by corrugated pipes and chrome plated pipes. But the service life of steel pipes is three times less, so during the calculation period it will be required to replace them two times. Pipes from the sewed polyethylene and metal plastic have the same cost, service life and similar operating characteristics. When choosing between these materials, it is necessary to consider the mode of operation of the heating system. Note that results may vary from the ones shown in this article, when using other type of heating system. Additionally, there may be different installation costs depending on prices of the organizations involved in the installation of heating systems.

**Keywords:** door-to-door heating system; pipe material; comparison of the options; discounted costs.

### **THE COMPARISON OF TECHNICAL AND ECONOMIC PARAMETERS OF LOCAL DEVICES FOR CLEARING OF INLET AIR**

**O. O. Andriyashkin, O. A. Zhdanova, M. S. Kononova**

**Annotation.** Examines the causes of the deterioration of the air environment inside buildings. As a possible solution to the problem of providing normalized parameters of microclimate describes the local of the air purifying device (mechanical ventilator and breather). Based on the review of the Russian market of the considered devices, their classification. The main parameters of the developed classification are: availability of heating; the type and number of used filters; the ability to control the parameters of the supplied air. The analysis of designs and functionalities of local treatment devices, compiled a summary table of the analogues with the prices, characteristics and brands of filters you can apply. As a result of the research recommendations on the choice of the local cleaning device with regard to their technical and economic indicators.

**Keywords:** breather; clearing of inlet air; ventilating of living locations.