ANALYSIS OF REGULATIVE AND TECHNICAL DOCUMENTATION FOR A COMPREHENSIVE INSPECTION OF RESIDENTIAL BUILDINGS BEFORE DEVELOPING A CAPITAL REPAIR PROJECT

G. D. Shmelev, A. N. Ishkov, D. A. Drapalyuk

Annotation. The article discusses the main provisions and contradictions associated with the implementation of preparatory work before the design and capital repairs of residential buildings. The paper provides an in-depth analysis of the actual state of regulatory and technical documents in the field of preparation and conducting inspections of residential buildings, as well as conducting technical surveys of residential buildings before developing a capital repair project. Based on the analysis of the main provisions of normative and technical documents we revealed a non-standardized concept of *instrumental inspection*, ambiguously interpreted in various regulatory documents related to the requirements for inspections. We substantiated the need to perform a comprehensive technical inspection when assessing the actual technical condition of a residential building and engineering systems before putting it under capital repairs. The authors of the article emphasized the need for mandatory inclusion in conducting a comprehensive inspection of the technical state of a residential building of parts of buildings not mentioned in the regulatory documents, namely internal load-bearing and self-supporting walls, including the walls of stairwells; floor-to-floor ceilings located in apartments (especially for wooden floors); attic floors; staircases and landings, as well as inspection of engineering systems, as those most often in need of capital repairs to eliminate physical and moral technological wear and tear.

Keywords: regulatory documents; comprehensive inspection; technical state; capital repairs; housing stock.

RESEARCH OF THE STRENGTH PROPERTIES OF COMPOSITE AERATED CONCRETE LINTELS WITH EXTERNAL COMPOSITE REINFORCEMENT

A. A. H. Obaidi

Annotation. In this work I analyzed the stress-strain state of composite lintels consisting of aerated concrete blocks with the inclusion of rods from steel reinforcement and external composite reinforcement, when they work in bending. Steel reinforcement is embedded into aerated concrete blocks both longitudinally and transversely to enhance their strength. Composite reinforcement is carried out using carbon fiber tapes. These tapes are used on the stretched surface of the element over its entire width, as well as in the form of parts of tapes on the sides of

the aerated concrete block in places of vertical seams or in the center of the element. Based on the test results I assessed the strength of the normal section and the deformation characteristics of aerated concrete bending lintels, which made it possible to evaluate the effectiveness of gluing carbon fiber tapes to aerated concrete and determine the optimal reinforcement options. In general, the study showed that the load-bearing capacity of composite aerated concrete lintels with external composite reinforcement is sufficient to withstand operational loads.

Keywords: aerated concrete blocks; composite lintel; external composite reinforcement; carbon fibers.

MODELING OF STRUCTURE LOADS IN THE FORM OF HYPERBOLOIDS OF ROTATION

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Annotation. The article is devoted to the study of the experience of operating structures in the form of hyperboloids of rotation (such as the Shukhov tower) made of polymer elements. We carried out laboratory studies on modeling deformations of such structures. Laboratory studies were conducted to study physical loads on polymer elements, depending on the number of mesh shell elements in the diameter of the hyperboloid rotation tier. We intended to study the deformation of the material and of the mesh shell joints. The data of the laboratory experiment give an idea of the physical features of structures in the form of a hyperboloid of rotation, as well as an idea of possible changes in loads in these types of structures made of polymer materials.

Keywords: hyperboloid of rotation; the Shukhov tower; loads; vertical shift.

ANALYSIS OF THE HEAT PROTECTIVE CHARACTERISTICS OF WALL ENCLOSURES USING THERMAL IMAGING RESEARCH

S. P. Chernukhin, M. N. Zherlykina, M. A. Kretov

Annotation. In the article we consider the issues of thermal efficiency of enclosing structures, applied to a specific situation. The article shows an example of an experimental measurement of the actual characteristics of a building, erected in the mid-90s. Also we feature some general problems of the construction of buildings of that period as a whole, including the lack of thickness of the thermal insulation layer in the structure. The surveys were carried out by the Testo 881-1 thermal imager, serial number 2141704. We show compliance with sanitary and epidemiological requirements, but complete non-compliance with the normalized and basic values of the element requirements. Theoretical modeling of the resistance of materials to heat transfer is performed in layers. We as well

determined some negative factors of influence on the structures, and recommended a few measures to correct design inconsistencies with modern requirements.

Keywords: thermal efficiency; resistance to heat transfer; sanitary and epidemiological requirements; element-by-element requirements; thermal imaging research; thermogram.

ENGINEERING SYSTEMS AND SERVICES

ACCIDENT ANALYSIS OF LINEAR PART AND PIPELINE TRANSPORT FACILITIES

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Annotation. In order to ensure reliable, accident-free and safe transport of oil and gas through pipelines, it is necessary to use a set of measures, in which the main thing is the analysis of the accident rate of the linear part and pipeline transport facilities. Various methods are used to analyze accident incidence rate. One of these methods is presented in this article, namely, study of data on accidents that have occurred. Here we present the results of statistical processing of data on accidents on main oil and gas pipelines. We divided emergency situations on the basis of reasons of a technical, organizational and natural character. Accident analysis allows not merely identifying the causes of accidents but taking measures to prevent them in the future.

Keywords: accident; statistics; pipeline transport; main pipeline; analysis; damage; causes of accidents.

THE OPERATION OF THE FUME HOOD

N. A. Markov, S. V. Ugorova

Annotation. We have been examined the efficiency of the developed fume hood for capturing harmful substances and heat emissions during work with chemical reagents in laboratories. The objectives included modeling gas flows in the fume hood's operation and evaluating the respiratory protection of laboratory personnel. Calculations took into account heat emissions from heating devices, emissions of harmful substances, and the operational characteristics of the fan. To achieve the objectives set, a fume hood model was constructed based on the provided drawings of the developed design. We conducted theoretical calculations of the fan's performance, and performed gas flow modeling using computer simulation. The description outlines the research methodologies, parameters of mathematical modeling, and the obtained results, allowing an assessment of the device's effectiveness, along with forming conclusions about its operation.

Keywords: local ventilation; local exhaust systems; air removal; fume hood; flow modeling; computer simulation.

EXPERIMENTAL DETERMINATION OF PERFORMANCE INDICATORS OF THE DESIGN OF A FLAT SOLAR COLLECTOR ABSORBER WITH ARTIFICIAL SECONDARY SURFACE

I. S. Kurasov

Annotation. The article provides an overview of modern methods for developing new designs of high-efficiency flat solar collectors. First, I briefly describe the parameters for evaluating the effectiveness of various types of structures. Then, I propose to analyze a convenient form of the efficiency equation of flat solar thermal collectors, which allows us to experimentally evaluate the effect of secondary surface on the efficiency value. I carried out a number of experimental studies on samples of absorbers with longitudinal ribs and hemispherical spikes. Analysis of the body of experimental data showed an increase in the performance of the absorber with longitudinal ribs by 5,44 % with a decrease in the optical loss coefficient by 4,11 %. It is proved that the presence of ribs of a certain height does not lead to a significant increase in heat loss of absorbers, as previously stated. Thermal imaging examination confirmed that an increase in the absorption capacity of the absorber is accompanied by an increase in the average temperature of the panel and a slight increase in radiation heat loss. Is propose to correct this effect by changing the hydraulic mode of the absorber heat exchanger in the direction of increasing the coolant flow.

Keywords: flat solar collector; absorber; secondary surface; efficiency factor; optical loss coefficient; solar energy; efficiency.

EXPERIENCE OF WASTEWATER FACILITIES DEVELOPMENT ON THE EXAMPLE OF THE CITY OF TYUMEN

V. A. Gurskiy, D. A. Bychkov, M. V. Obukhova

Annotation. The purpose of the work is to assess the modernization of wastewater disposal facilities in the city of Tyumen from the perspective of increasing the environmental and resource efficiency of the enterprise of *Tyumen Vodokanal* LLC. We present a description of the municipal wastewater disposal system of the city of Tyumen, including urban sewage treatment facilities. We highlight the results of the phased implementation of programs for the reconstruction of existing and creation of new wastewater disposal system facilities, namely modernization of the system for transporting and pumping urban wastewater; and reconstruction of urban sewerage treatment facilities. We describe the main achievements in the field of implementation of digital technologies. Large-scale work on the reconstruction of the wastewater system facilities of the city of Tyumen and the Tyumen region ensures a high level of provision of public services to the population and helps improve the environment in the region. The strategy for the development of the wastewater disposal system and measures to

modernize facilities carried out in the city of Tyumen can be implemented in other large cities of Russia.

Keywords: wastewater system; reconstruction; sewage collection and treatment; treatment facilities; ecology.

PROBLEMS OF OPERATION OF SWIMMING POOLS AND THEIR SOLUTION METHODS

N. V. Popov, I. V. Zhuravleva, V. V. Pomogaeva

Annotation. The article provides an analysis of pollutants entering the water of swimming pools. We identified the main factors affecting the quality of water filtration and circulation in swimming pools. Based on extensive practical experience, we considered the main methods of water disinfection using chemical reagents with the formation of disinfection by-products as well as commonly used methods of their removal. We also analyzed additional water disinfection methods using specialized equipment, with a description of the harmful substances formed during their application. We described possible options for determining free and combined chlorine levels. We as well discussed water analyzers for swimming pools, focusing on the types of sensors that determine the free chlorine content and the impact of external factors on the final readings. Finally, we recommended ways to improve the operation of swimming pools.

Keywords: swimming pools; filtration; circulation; disinfection; disinfection; disinfection by-products; chlorine analyzer.

CITY. RECONSTRUCTION, RESTORATION AND LANDSCAPING

INTEGRATED APPROACH IN URBAN PLANNING ASSESSMENT OF THE URBAN ENVIRONMENT COMFORT BY EXAMPLE OF A EIGHBORHOOD IN THE CITY OF OREL

E. V. Zolotareva, L. A. Volkova

Annotation. Both negative and positive experience accumulated in urban planning practice require the search for qualitatively new principles for the formation of urban housing both in new built-up areas and in existing developments. The overwhelming majority of residential areas in towns and cities of our country are “sleeper” neighborhoods with mass-produced apartment buildings. The quality of the living environment in most of these areas does not meet up-to-date requirements and ideas about comfort and safety. The effectiveness of decisions for the renovation of neighborhoods and the entire area directly depends on the completeness and quality of the urban planning assessment of the comfort of the living environment at the pre-design step of work. Urban

planning analysis and assessment of the quality of the urban residential environment must be led to complex indicators of comfort, including economic, environmental, socio-psychological components. In the process of the research, the comfort of the Northern neighborhood of the city of Orel was assessed from the point of view of the formation of general functional and comfortable conditions; bioclimatically comfortable conditions; conditions of comfort and safety of pedestrian paths; aesthetic and psychological qualities of the residential environment. We formulated the main criteria for creating a more favorable urban environment for people.

Keywords: comfortable urban environment; urban planning analysis; neighbourhood unit; improvement of courtyard areas; accessible environment; criteria for assessing the urban environment.

THE ARCHITECTURAL AND URBAN APPEARANCE OF THE FACILITIES UNDER CAPITAL CONSTRUCTION AS AN IMPORTANT TOOL IN THE FORMATION OF AN ORGANIC ARCHITECTURAL SPACE OF CITIES

N. V. Korosteleva, M. S. Politsinskaya, A. P. Ivanova

Annotation. In this article the authors study the degree of elaboration of the requirements for architectural and urban appearance (AUA), in the normative legal acts of the city of Volgograd and their implementation in the urban planning practice of the city in comparison with Moscow and St. Petersburg. In the course of the study, we analyzed development of regulatory and legal regulation of the architectural and urban appearance of facilities within the country, namely cities of Moscow, St. Petersburg and Volgograd. We as well analyzed the provisions of Federal Law No. 612-FZ concerning innovations in the regulation of AUA in recent years. The article defines the relevance and importance of compliance with the requirements for the architectural and urban appearance of capital construction facilities being built in Volgograd, as well analyzes local regulatory legal acts for compliance with the requirements of the Decree of the Government of the Russian Federation No. 857. We analyzed regulatory legal acts on compliance with the requirements for AUA in Volgograd, Moscow and St. Petersburg, as well we assessed the degree of their implementation. We also carried out photo analysis of the results of the regulation of AUA in the central part of Moscow and St. Petersburg. The main changes in the architectural and urban appearance of the centers are highlighted in accordance with the requirements of local regulatory documents and the Decree of the Government of the Russian Federation No. 857 regulating the AUA. We also highlighted the main problems of regulating the architectural and urban appearance in Volgograd and the main shortcomings in compliance with the requirements of the AUA. Based on the positive experience of compliance with the requirements for AUA in the cities of Moscow and St. Petersburg, we identified several additional requirements for AUA that should be

added in the city of Volgograd, and gave some recommendations for improving the AUA of the city of Volgograd.

Keywords: architectural appearance of the territories; architectural and urban appearance of facilities under capital construction; land use and development rules; legal acts.

ECOLOGY AND SAFETY OF THE URBAN ENVIRONMENT

REMOTE SENSING OF THE URBAN HEAT ISLAND AND THERMAL POLLUTION SOURCES IN THE CITY OF BELGOROD, RUSSIA

D. V. Sarychev, I. V. Popova, S. A. Kurolap

Annotation. Studying the phenomenon of a positive temperature anomaly in the city, the urban heat island, and the processes that cause it, is an urgent scientific task that stands at the intersection of scientific fields, namely urban planning, geography and climatology, geoecology. The use and analysis of the results of remote sensing of the Earth, in particular space imaging in the thermal range, is a widely used and promising method for studying the spatial structure of urban heat islands. The article analyzed satellite imagery materials obtained from Landsat 8 and 9 in the period from 2020 to 2022 for the territory of the city of Belgorod. Taking into account the requirements for the quality of images in the study of thermal anomalies, we selected 5 «winter» and 5 «summer» images for 2022. As a result of processing the selected images we obtained multi-temporal images, on the basis of which we created maps of temperature variations of the underlying surface above the background; later we determined there locations of the main 17 sources of thermal pollution. Surface temperatures of these locations were approximately 4-10 degrees above background in winter and 10…15 degrees in summer, respectively. Our findings and produced maps form a geodatabase and contribute to further thermal pollution monitoring in urban areas of the Black Earth Region.

Keywords: remote Earth sensing; thermal photography in the infrared range; urban heat island; thermal pollution; Landsat.