

# Contents

## BUILDING AND ARCHITECTURE

### ARCHITECTURE, URBAN PLANNING, DESIGN

- D. V. Boytsova, T. A. Datciuk, L. N. Kondrat'eva, R. A. Mangushev.* The influence of the Crimean peninsula factors on formation of architecture of local scientific-tourist archaeological centers .....5
- A. G. Vaytens, Y. S. Yankovskaja, G. E. Rusanov, Yu. N. Lobanov.* Problems and prospects of architectural and town-planning transformations of border territories (on the example of Ivangorod) .....12
- M. Yu. Vilenskii, G. E. Rusanov, V. I. Volkov, Yu. N. Lobanov.* Urban planning as a professional activity area .....27
- S. G. Golovina.* Architectural and design features of historical residential development stages in St. Petersburg in the XVIII – early XX centuries .....36
- N. S. Novokhodskaya, T. A. Datciuk, L. N. Kondrat'eva, R. A. Mangushev.* The fate of lacuna in the quarter 2006 at the Spit of Vasilevsky Island .....44
- S. V. Sementsov, M. S. Stieglitz.* Development of industry and crafts in St. Petersburg and vicinities under Peter the Great .....53
- P. V. Skryabin, G. E. Rusanov, V. I. Volkov, Yu. N. Lobanov.* Factors determining the spatial model of the urban development of the Baikal-Angara settlement system .....59
- V. D. Filippov.* Linear city of Arturo Soria: analysis of the reasons for the project failure .....67
- M. S. Iakunenkova, T. A. Datciuk, L. N. Kondrat'eva, R. A. Magnushev.* Stages of formation of the transport hub as a new type of the public complex .....79

### BUILDING DESIGNS

- V. A. Kravchuk, E. V. Kravchuk.* Research development of prestressed metal construction structures .....86
- E. K. Opbul, D. A. Dmitriev.* Calculation of prestressed structure strength on the basis of nonlinear deformation model (on the example of multi-hollow core slab without using formwork technology) .....93
- V. V. Pavlov, D. V. Krainov, G. M. Akhmerova.* Influence of electric heating on concrete strength of individual sections of monolithic reinforced concrete multi-span slabs ..... 111
- O. A. Tushina, S. A. Pavlov.* Evaluation of resistance to the progressive collapse of the converter shop frame ..... 114
- D. V. Urazgildeev.* Bending-torsion stability of rod curvilinear elements of steel arches beyond the elasticity limit ..... 123

### STRUCTURAL MECHANICS AND CALCULATION OF STRUCTURES

- V. N. Glukhikh, A-Kh. B. Kaldar-ool.* Anisotropy of brick barrel vaults ..... 130
- L. M. Kagan-Rosenzweig.* On the effect of shear deformations on the stability of the rod with variable cross-section ..... 137
- V. I. Morozov, A. G. Chernyh, E. O. Khegay.* Some proposals for regarding heavy armored cement as a multi-module material ..... 143
- V. G. Sokolov, I. O. Razov, S. I. Volynec.* Investigation of free oscillations of thin-walled straight-line gas pipe lines of large diameter at semi-underground laying ..... 149
- S. O. Chepilko.* Linear creep in steel-reinforced concrete beams ..... 157

### GEOENGINEERING

- V. V. Konyushkov, A. Zh. Zhussupbekov, V. V. Lushnikov, A. V. Popova.* Construction of a multi-level underground structure in condition of modern urban development ..... 166
- T. V. Maltseva, A. N. Korkishko, V. F. Bai.* Assessment of the stress-strain state of the soil base during field development ..... 175

### TECHNOLOGY AND ORGANIZATION OF CONSTRUCTION

- S. A. Bolotin, Kh. V. Biche-ool, A-K. Kh. Dadar.* Scheduling Visualization Methodology in Autodesk Revit 2018 ..... 179
- V. Z. Velichkin, Yu. I. Tilinin, D. A. Zhivotov.* Combined technologies for strengthening piers and columns ..... 186
- Ya. V. Zharov.* Organizational technological design in construction based on an intelligent planning unit ..... 193

### BUILDING MATERIALS AND PRODUCTS

- A. V. Dolzhonok, A. A. Bakatovich.* Distinctive features of microstructure and surface relief of plant aggregates, which determine the thermal conductivity coefficient and compressive strength of wall blocks ..... 200

### Scientific-technical peer reviewed journal

*The Founder* — the Federal State Budgetary Educational Institution of Higher Education “Saint Petersburg State University of Architecture and Civil Engineering” (SPSUACE)

### The Editor-in-Chief

*Ye. I. Rybnov*, Dr. Sci. Ec., Professor, Honorary Worker of Higher School of the Russian Federation (SPSUACE)

### Assistants to the Editor-in-Chief

*Yu. P. Panibratov*, Dr. Sci. Ec., Professor, Winner of the State Award of the Russian Federation and the Award of the Government of the Russian Federation, Honorary Worker of Sciences of the Russian Federation, Academician of RAACS (SPSUACE)

*I. V. Drozdova*, Dr. Sci. Ec., Professor (SPSUACE)

*V. I. Morozov*, Dr. Sci. Tech., Professor, Winner of the Award of the Government of the Russian Federation (The Senior Editor) (SPSUACE)

### Editorial council

*A. A. Akaev*, Dr., Prof., Foreign Member of the RAS (Lomonosov Moscow State University, Russia)

*L. Ungvari*, Dr. Sci., Professor, (Technical University of Applied Sciences Wildau, Germany)

*N. V. Kazhar*, Dr. Arch., Professor (Czestochowa University of Technology, Poland)

*G. Kipiani*, Dr. Sci. Tech., Professor (Georgian Technical University, Georgia)

*H. V. Tokmajyan*, Dr. Sci. Tech., Professor, Rector of SEUA (State Engineering University of Armenia)

*J. Eberhardsteyner*, Dr. Sci. Tech., Professor (Vienna University of Technology, Austria)

*S. N. Leonovich*, Dr. Sci. Tech., Professor (Belarusian National Technical University, Belarus)

*Y. Iwasaki*, Dr. Sci. Tech. (Geo-Research Institute, Japan)

*T. Tanaka*, Dr. Sci. Tech., Professor (University of Tokyo, Japan)

*A. Zh. Zhussupbekov*, Dr. Sci. Tech., Professor (L. N. Gumilyov Eurasian National University, Astana, Kazakhstan)

### Editorial Board

*G. V. Yesaulov*, Dr. Arch., Professor, Academician of RAACS

*N. I. Karpenko*, Dr. Sci. Tech., Professor, Winner of the Award of the Government of the Russian Federation, Honorary Worker of Sciences of the Russian Federation, Academician of RAACS (NIISF RAACS)

*L. S. Lyahovich*, Dr. Sci. Tech., Professor, Honorary Worker of Sciences of the Russian Federation, Academician of RAACS (TSUAB)

*V. Sargsyan*, Dr. Sci. Tech., Professor (National University of Architecture and Construction of Armenia)

*V. I. Travush*, Dr. Sci. Tech., Professor, Winner of the Award of the Government of the Russian Federation, Academician of RAACS (RAACS)

*V. S. Fedorov*, Dr. Sci. Tech., Professor, Academician of RAACS (MSURE)

*S. V. Fedosov*, Dr. Sci. Tech., Professor, Winner of the Award of the Government of the Russian Federation, Honorary Worker of Sciences of the Russian Federation, Academician of RAACS (IVGPU)

*E. M. Tchernyshov*, Dr. Sci. Tech., Professor, Honorary Worker of Sciences of the Russian Federation, Academician of RAACS (VSUACE)

*M. I. Alekseev*, Dr. Sci. Tech., Professor, Winner of the Award of the Government of the Russian Federation, Honorary Worker of Sciences of the Russian Federation, Academician of RAACS

*G. I. Belyy*, Dr. Sci. Tech., Professor, Honorary Worker of Sciences of the Russian Federation

B. G. Vager, Dr. Sci. Phys.-Math., Professor, Honorary Worker of Higher School of the Russian Federation  
 T. A. Datciuk, Dr. Sci. Tech., Professor  
 S. P. Zavarikhin, Dr. Arch., Professor, Honorary Architect of the Russian Federation  
 B. N. Karpov, Dr. Sci. Tech., Professor  
 L. N. Kondrat'eva, Dr. Sci. Tech., Professor  
 L. P. Lavrov, Dr. Arch., Professor, Honorary Architect of the Russian Federation, Correspondent Member of RAACS  
 R. A. Mangushev, Dr. Sci. Tech., Professor, Honorary Worker of the Higher School of the Russian Federation, Correspondent Member of RAACS  
 A. M. Maslennikov, Dr. Sci. Tech., Professor, Honorary Worker of Sciences of the Russian Federation  
 S. N. Nikiforov, Dr. Sci. Tech., Professor  
 Yu. V. Puharenko, Dr. Sci. Tech., Professor, Winner of the Award of the Government of the Russian Federation, Correspondent Member of RAACS  
 S. V. Sementsov, Dr. Arch., Professor  
 V. D. Kharlab, Dr. Sci. Tech., Professor  
 V. M. Ulyasheva, Dr. Sci. Tech., Professor  
 S. A. Evtyukov, Dr. Sci. Tech., Professor, Honorary Worker of Higher School of the Russian Federation  
 P. A. Kravchenko, Dr. Sci. Tech., Professor, Honorary Worker of the Higher School of the Russian Federation  
 V. N. Dobromirov, Dr. Sci. Tech., Professor  
 Ju. G. Kotikov, Dr. Sci. Tech., Professor  
 A. E. Pushkarev, Dr. Sci. Tech., Professor  
 A. A. Kapustin, Dr. Sci. Tech., Professor  
 R. N. Safiullin, Dr. Sci. Tech., Associate Professor (SPSUACE)  
 V. S. Lukinskiy, Dr. Sci. Tech., Professor (HSE in St. Petersburg)  
 V. N. Lozhkin, Dr. Sci. Tech., Professor, Honorary Worker of Sciences of the Russian Federation (Saint-Petersburg University of State Fire Service of EMERCOM of Russia)  
 A. N. Asaul, Dr. Sci. Ec., Professor, Honorary Builder of the Russian Federation, Honorary Worker of Sciences of the Russian Federation  
 G. A. Tokumova, Dr. Sci. Ec., Professor  
 A. A. Petrov, Dr. Sci. Ec., Professor  
 N. G. Pletneva, Dr. Sci. Ec., Professor  
 A. I. Solodkiy, Dr. Sci. Ec., Professor  
 V. V. Asaul, Dr. Sci. Ec., Professor  
 E. G. Guzhva, Dr. Sci. Ec., Professor (SPSUACE)  
 G. F. Shcherbina, Dr. Sci. Ec., Associate Professor  
 CEO (AO SSMO "LenSpetsSMU")  
 L. M. Kaplan, Dr. Sci. Ec., Professor (St. Petersburg Union of Construction Companies)  
 R. A. Faltinskiy, Dr. Sci. Ec., Professor (JSC «Lenenergo»)

The address of the Founder and the Editorial Office:  
 2<sup>nd</sup> Krasnoarmeyskaya St. 4, 190005, St. Petersburg, Russia  
 Ph./ Fax: (812) 316-49-06  
 E-mail: [vestnikspb@mail.ru](mailto:vestnikspb@mail.ru)  
 The contents and abstracts of articles are presented on the site: <http://vestnik.spbgasu.ru>

The journal is registered by the Federal Service for Supervision of Communications, Information Technology and Mass Media (Roskomnadzor). The registration certificate of the mass media organization is ПИИ № ФС77-69753, of 05.05.2017.

The journal is included by the Higher Attestation Commission (HAC) of the Russian Federation into the List of leading reviewed scientific journals and editions in which the major scientific results of theses on competition for the academic degree of the Doctor of Science are to be published.

In case of reprinting, the link to the "Vestnik grazhdanskikh inzhenerov – Bulletin of Civil Engineers" is obligatory. On the cover one can see the monument to Nicholas I, the Emperor, in honour of whom the Institute of Civil Engineers (nowadays SPSUACE) was named on December 17, 1892.

N. K. Manakova. Foam silicate material on the basis of silica-containing raw materials with addition of ash-slag mixture ..... 210  
 T. M. Petrova, A. V. Poletaev, E. Yu. Chistyakov. To the issue of corrosion resistance of prestressed reinforcement in transport structures after long-term operation..... 215  
 Ye. B. Uteпов, D. A. Akhmetov, Ye. N. Root, M. A. Yermuhanbet. Reinforcement of self-compacting concrete with polypropylene fiber ..... 220

#### SANITARY ENGINEERING AND ECOLOGY

M. A. Vardanyan. Resource-saving and environmental activities of the heat power enterprise..... 228  
 T. A. Datciuk, V. M. Ulyasheva, A. V. Tsygankov, E. A. Anshukova. Air regime and condition of building structures of underground passages..... 235  
 I. I. Ivanenko, V. N. Vlasov, E. Ya. Lapatina. Biological treatment of industrial sewage water..... 240  
 I. D. Kibort. About application of neural networks to simulate the pipe air flow ..... 246  
 A. V. Podporin, L. I. Tsvetkova, N. A. Chernikov. The use of steel pipes in the water supply systems of St. Petersburg..... 252  
 V. M. Ulyasheva, A. Ya. Martyanova, A. V. Tolstik. Numerical study of heat and mass transfer process during mixing flows in the aspiration system ..... 257  
 L. I. Tsvetkova, E. Neverova-Dziopak. How to assess the danger of anthropogenic eutrophication of freshwater ecosystems ..... 262

#### DESIGN AND CONSTRUCTION OF ROADS, SUBWAYS, AIRFIELDS, BRIDGES AND TUNNELS

S. A. Evtyukov, E. P. Medres, E. E. Medres, E. U. Matyusova. On the problem of design and calculation of lightweight embankment structures constructed of polystyrene foam blocks on soft soils..... 271

#### TRANSPORT

S. S. Evtyukov, I. S. Brylev, I. V. Vorozheikin. Estimation of the reaction time of a driver of a two-wheeled motor vehicle when applying braking ..... 277  
 R. N. Gorbunov. Calculation of buffer index based on the «Yandex. Traffic Jams» data service..... 284  
 V. N. Dobromirov, A. M. Voytko. The impact of the ambulance vehicle mobility on the efficiency of using the «golden hour» in metropolis conditions ..... 290  
 S. A. Kasaj, A. A. Tretyakov. Comparative analysis of on-board electronic control systems on trucks of domestic and foreign production ..... 299  
 A. A. Kondratiuk, A. E. Pushkarev. Increasing the level of environmental safety of special purpose vehicles using alternative fuels..... 305

#### ECONOMICS

O. V. Vinogradova. Practical recommendations for ensuring investment attractiveness of organizations as objects of human capital investment ..... 310  
 A. J. Gamzatov. The impact of the transition of construction to project financing with accounting of construction organization's competitiveness ..... 316  
 V. A. Koshcheev, K. V. Malinina, A. S. Zaytseva. Experience of introducing digital technologies in construction by countries with developed economies..... 325  
 M. B. Laskin, A. Yu. Talavirya, P. A. Cherkesova. Statistical analysis of real estate value changes in the area of commissioned toll road ..... 331  
 K. V. Malinina, A. A. Skidan, R. A. Faltinskiy. State regulation of innovation activities in the investment and construction sector ..... 344  
 T. N. Orlovskaya. Methodological approaches to the essence of the economic security of a megalopolis ..... 351  
 N. V. Chepachenko, M. N. Yudenko, S. A. Nikolikhina, N. A. Polovnikova. Development of tools for effective management of construction organizations ..... 358  
 A. Eh. Chul'dum. The main factors of the human capital reproduction process in the innovative economy ..... 366

#### CHRONICLE

S. A. Ershova. Review of the textbook "Introduction to urban planning. Regulatory and information support" ..... 374  
**Abstracts** ..... 377  
**Submitting materials requirements** ..... 400  
**Subscription rules** ..... 401