SCIENCE AND TECHNOLOGY COMPLEX

НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ
М И С И
МГСУ

FEDERAL STATE BUDGET EDUCATIONAL INSTITUTION OF HIGHER EDUCATION "MOSCOW STATE UNIVERSITY OF CIVIL ENGINEERING (NATIONAL RESEARCH UNIVERSITY)"

Principal Regional Equipment and Software Sharing Center

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Moscow State University of Civil Engineering (National Research University), or MSUCE (NRU), acting in the capacity of a national research university, implements its Development Program for 2010-2019 (the Program). The category of a National Research University (NRU) contemplates the equally effective performance of educational and research activities in furtherance of the principles of integrated research and education.

The university's advanced initiatives in research, production and education correlate with the following top priority development areas set by the Program:

- housing and architecture;
- high technology in civil engineering and architecture (including design, construction, technological upgrade and operation of high risk, complex and unique structures).

Apart from the knowledge generation, the innovative activities of the university encompass:

- the effective transfer of technologies into the real sector of the economy,
- the performance of a wide range of fundamental and applied research,
- the availability of a highly efficient system of training for master students and highly skilled researchers,
- the availability of sophisticated programs for the professional development and advanced vocational training of specialists.

MSUCE (NRU) set up a continuously developing Science and Technology Complex (STC), a cluster of scientific research and production units, engaged in the performance of work and implementation of research projects, target-oriented personnel training for hi tech industry specific markets.

The above features of the STC structure and operation serve as the premises for the efficient formation of the most advanced domestic center for research and technology on the basis of STC.

The university has 1,585 faculty members, including 213 Doctors of Sciences and 813 Candidates of Sciences. Over 480 postgraduate students study at MSUCE (NRU). Both the faculty and the postgraduates are involved in the university research projects.


МГСУ

PRINCIPAL REGIONAL EQUIPMENT AND SOFTWARE SHARING CENTER

The lab facilities of our Science and Technology Complex comprise the most advanced, highly valuable and unique equipment of international standard. The Principal Regional Equipment and Software Sharing Center ("PRESSC") was set up by the university to assure its efficient involvement in the implementation of advanced cross-disciplinary research projects in compliance with the top priority areas of research and development in the Russian Federation. PRESSC also promotes cooperation with the leading research centers and makes the most advanced equipment, machinery, tooling and software available to the university researchers.

PRESSC consolidates the efforts of the leading university centers for education, research and testing. All PRESSC projects are developed and/or implemented by highly skilled specialists, including the researchers, engineers, postgraduate students and the university staff.

SCIENTIFIC RESEARCH INSTITUTE FOR BUILDING MATERIALS AND TECHNOLOGIES

LABS

- Climatic testing
- Composites, mortars and concretes in construction
- Physical-chemical analysis
- Paint coatings and polymers
- Drilling and oil well cements
- Power efficiency, ecology, and sustainable construction

CHAIRS INVOLVED IN R&D PROJECTS

- Building materials
- Technology of binders and concretes
- Polymeric building materials and applied chemistry
- Technology of finishing and insulation materials
- Construction of thermal and nuclear power stations

The Building Materials Testing Center was organized on the premises of the labs of the Scientific Research Institute for Building Materials and Technologies. The Building Materials Testing Center is authorized by the RF National Accreditation System to perform certification testing.

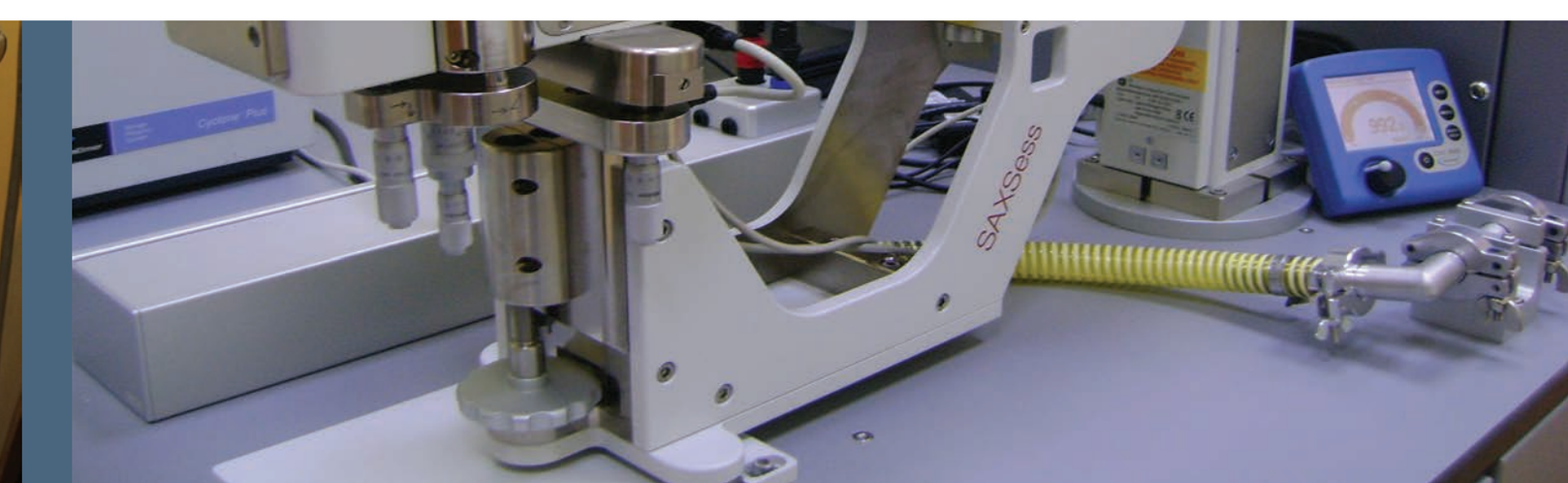
PRINCIPAL AREAS OF ACTIVITIES

- Development of new effective building materials and technologies
- Development of technologies for structural materials and products
- Research in the area of energy saving, energy efficiency of buildings and structures
- Testing and quality control of building materials and products
- Development and application of advanced physicochemical methods for structural assessments and methodologies of their protection
- Research into dry mortars

EDUCATION ACTIVITIES

The training of postgraduate students specializing in

- 05.23.05 Building materials and products
- 05.02.22 Organization of work performance in the process of construction



CLIMATIC TESTING LAB

Dozens of millions of square meters of residential housing are built in Russia every year, and millions of square meters of facades are constructed. The construction warranty period, applying to each envelope structure, must reach 25 to 50 years.

However, materials, unable to withstand the local climatic conditions, are often used. Thus, the quality of structures deteriorates, and structures need repairs before the expiry of the warranty period. The budgets of cities and regions cover the major portion of repair works. The Climatic Testing Lab applies its unique testing tools to reproduce the natural temperature/humidity cycles, typical for various Russian regions, in the accelerated mode. The Lab staff also correlates the experimental climate modeling cycles with the real cycles of operation of envelope structures, façade insulation systems, and the terms of their service life. The Lab staff also assesses the applicability of particular envelope structures to specific construction projects in Russia.

The Lab researchers have developed a unique standard software methodology to climate test various envelope structures and façade systems and to obtain the trustworthy assessments of their (1) applicability in many Russian regions, that may be diverse in terms of their climatic conditions, and (2) their service lives. The methodology, developed by the Lab researchers, was invested into the small enterprise, specializing in construction innovations. The enterprise has a European business partner, and its objective is to adapt the European standards to the Russian climate.

WORLD-CLASS SCIENTIFIC RESEARCH EQUIPMENT

•Heat/cold climate chamber. The line of chambers, varying in size and temperature range, is designated for the testing of the frost resistance of any building materials.

•The roll up façade testing unit is designated for the full-scale climate testing of wall envelopes. Its basic standard is ETAG 004.

•ATLAS accelerated temperature testing unit designated for coatings. The unit is designated for the simultaneous testing of coatings exposed to the impact produced by frost, humidity, and ultraviolet emissions. The testing of polymeric façade coatings, exposed to ultraviolet emissions, is particularly

relevant. The testing methodology was developed by the university specialists.

•Salt spray lab simulates the impacts produced on tested samples by versatile aggressive media. This lab is designated for the testing of corrosion resistance and, hence, for the prognostication of service lives of materials.

CONSTRUCTION COMPOSITES, MORTARS AND CONCRETES LAB

The principal objective of the Lab is to perform the research into dry mortars. Development of the whole set of regulatory and technological documentation, needed to continue the production or to launch the whole-scale new production within a period of two or three months, is the ultimate result of research sessions completed by the Lab. Thanks to the efforts, invested by this Lab, a dry mortar production facility was launched in Russia.

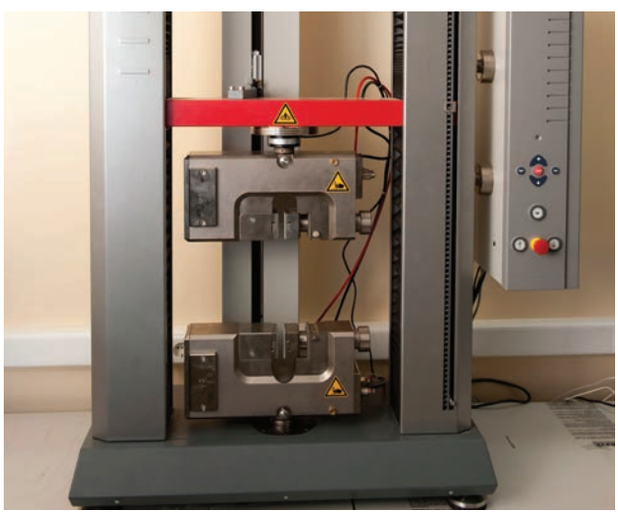
The most advanced Lab equipment simulates the application of various modifying additives, used to develop high-quality concretes, mortars and dry mortars, meeting the pre-set technological and technical characteristics to assure extra competitive properties. The Lab equipment is used to check the efficiency, to control the quality of advanced modifying additives, and to develop novel modifiers, including those designated for international producers.

The Lab testing tools are used (1) to perform the physical and mechanical testing of building materials and products, and (2) to develop the methodologies for the assessment of physical and mechanical, thermophysical properties of materials having different applications.

Lab researchers develop and introduce experimental methods of research into the strength of products at the stage of their R&D and operation; they are engaged in the development of technical specifications for new materials, including methods of control over their physical and mechanical properties.

The methodologies, developed by the Lab researchers, serve as the framework for the certification of Russian products in compliance with the European norms and standards, and this fact streamlines the access to the European markets.

The Lab researchers have developed gypsum binder modifiers that help to use gypsum as an outdoor



material and as part of bearing structures of buildings. The Lab has also developed new types of translucent/ vapor-permeable/corrosion/ wear resistant concretes.

WORLD-CLASS SCIENTIFIC RESEARCH EQUIPMENT

•The laser shrinkage meter measures the shrinkage of cement materials more accurately than its conventional strain-gauge counterparts. Besides, the laser shrinkage meter can measure the shrinkage at any moment within the time period between the liquid state of the mix and its setting.

•MX-50 moisture analyzer employs an advanced weighing technology to measure the moisture content in sample materials. The moisture analyzer weighs the initial sample, dries it in accordance with the pre-set parameters, and measures the weight of the dried sample in the computerized mode. The moisture analyzer is highly sensitive.

•The laser particle size analyzer is applied to test granular materials and dispersions, having the particle size of 1 to 300 micron.

•Presses are used to identify the physical and mechanical properties of sample materials (including their strength, deformation, and elasticity modulus) in compression/stretching/bending pursuant to GOSTs and ENs.

•Zwick test machine identifies the compressive/ bending/stretching strength of sample materials and products. The machine is applicable to thin films (coatings).

•The computerized vapor-permeability meter is applicable to thin films (lacquers and varnishes, synthetic materials).

•The mobile adhesion meter measures the adhesive strength of materials and their adhesion to the lower layer (including masonry, massive-block/large-panel buildings, plaster coverings) in the site conditions.

•CO244/AV water permeability meter for concretes identifies how deeply the pressurized water penetrates into concrete samples.

•Muffle furnace 2300°C is used to perform the thermal firing of ceramic composite materials, including refractories.

•Drying boxes prepare samples of construction materials for versatile testing procedures.

•BCA wear resistance tester is applied to test floor coverings and structural materials exposed to the motion of ice (footings of lighthouses and dams).

PHYSICAL-CHEMICAL ANALYSIS LAB

The lab staff develops and improves the research methodologies applied to perform the quantitative and qualitative analyses, to identify unknown building materials and to track the formation of new structures; the Lab controls the quality and the composition of mineral construction materials, develops methodologies and provides the data support for the x-ray phase analysis of Portland cements and gypsum binders. Moreover, the Lab develops quality control methodologies for fillers, mineral fillers, and pigments; the Lab staff studies the micro-structure of building materials, hydration products of binders in the low vacuum mode and free from any conductive coatings. The Lab is also engaged in the performance of qualitative and quantitative energy-dispersive chemical micro-analysis of materials, development of chemical mapping and profiling of the analyzed samples, and it performs qualitative and quantitative porosity analyses.

The Lab employs the following methods of research:
- Raster electronic/optical microscopy
- X-ray fluorescence
- Laser diffraction
- Isothermal and differential scanning calorimetry
- Infrared spectroscopy
- Differential thermal and gravimetric analysis
- Reference sorption porosity metering
- Gas chromatography
- Mass spectroscopy

The Lab staff has developed advanced methods of quality control for building materials on the basis of x-ray and other methodologies employed in the process of construction of nuclear power plants and other unique buildings and structures.

WORLD-CLASS SCIENTIFIC RESEARCH EQUIPMENT

- Quanta 200 scanning electron microscope is applied in any area of material engineering, nanoscale and biotechnologies. This microscope generates images with the magnification of 100,000 diameters and in great detail. This microscope saves the time needed to prepare samples for the operator to take advantage of the maximal focusing depth when observing the items of research. The microscope is equipped by the x-ray spectrometer to perform the element micro-analysis (EDAX).
- Olimpus BX-51M metallographic microscope.

Dark and bright field microscopy. Conoscopic and orthoscopic projections. The study of the micro-structure of samples.

•ARL Quant'X energy dispersive x-ray fluorescence spectrometer is used to identify the chemical composition of samples of substances and components of materials. This spectrometer is used to examine the technical condition of structures of buildings, and to develop new/improve existing building materials.

•The computerized porosimeter. Unlike traditional mercury porosimeters, this advanced unit is completely safe for its operator. This porosimeter measures the dimensions of pores, the pattern of their distribution inside samples, and the liquid permeability. It also identifies the true density of substances.

•ARL-XTRA x-ray diffractometer employs the powder x-ray diffraction to perform the qualitative and quantitative phase analyses of polycrystal samples in order to identify their crystallinity, to perform the crystallographic analysis, the analysis of thin films and traces of phases.

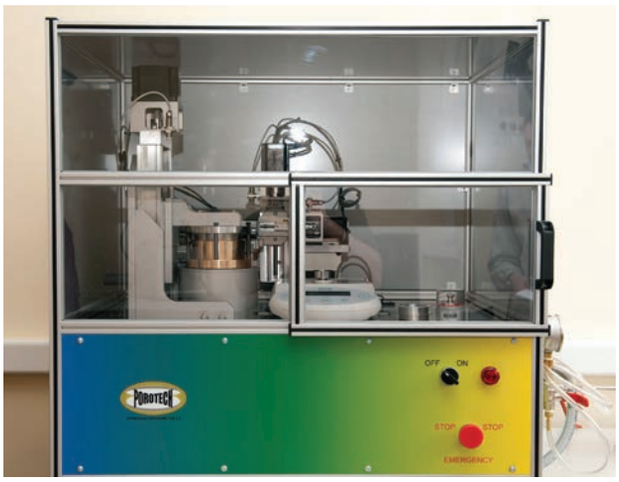
This diffractometer boasts such a wide range of applications, that it may be employed in diverse industries, including the material engineering, the chemical industry, the petrochemical industry, the metallurgical industry, and it may also be used by the labs maintained by production companies and scientific research institutes.

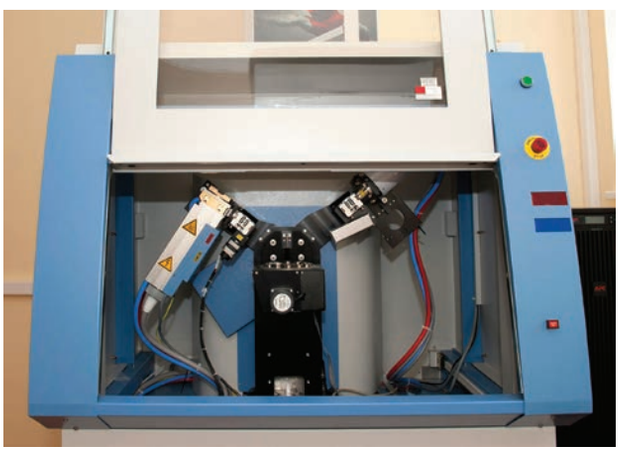
ARL-XTRA x-ray diffractometer is controlled by the PC having Win XRD V: 2.0-6 software installed (supplementary options include ICDD 2007, SIROQUANT). The software generates x-ray diffraction patterns, removes backgrounds, identifies diffraction peaks and their intensity, compares the lists of peaks with the database of ICDD powder diffraction, and produces lists of potential correlations for further qualitative analyses.

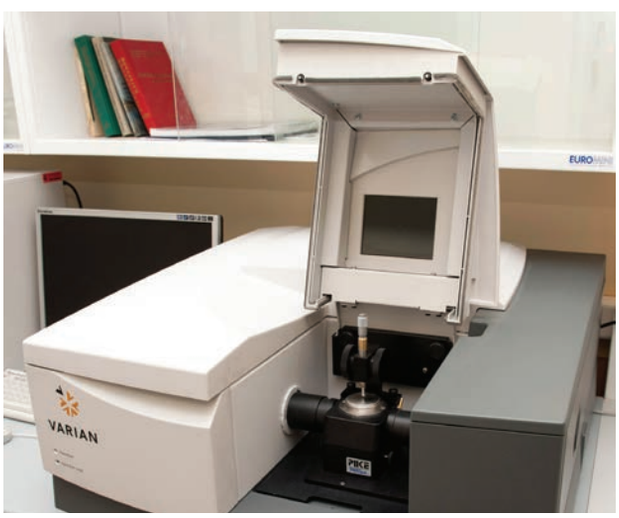
The software can measure (1) the angle between incoming and diffracted beams within the accuracy of up to 0.0001°; (2) the distance between adjacent planes of diffraction grating within the accuracy of up to 0.0001A.

•TAM AIR 8 channel calorimeter analyses heat emissions accompanying reactions in the isothermal mode. The unit helps to analyze the kinetics of exothermic and endergonic reactions, i.e. hydration reactions of cement, gypsum and other mineral binders.

•Varian 640-IR IR Fourier-transformed infrared spectrometer is designated for the registration and







study of optical spectrums in the infrared domain, needed to perform the qualitative analysis and to assure the quality control in the construction, chemical, petrochemical industries, in the production of semiconductors, pharmaceuticals, food and perfumes, as part of environmental monitoring projects and expert examinations.

•SETARAM LABSYS thermogravimeter employs thermogravimetry, differential scanning calorimetry, and differential thermal analysis methods. This thermogravimeter can employ one or several of the above methods at a time. The methods can be employed at a time in the following combinations: thermogravimetry + differential scanning calorimetry, thermogravimetry + differential thermal analysis. The analyses can be performed in versatile atmospheres at variable heating rates.

•BIC ZetaPlus zeta potential analyzer is used to observe the processes of aggregation and dispersion, to identify the zeta potential of particles and their sizes in the range of 30...300 nm.

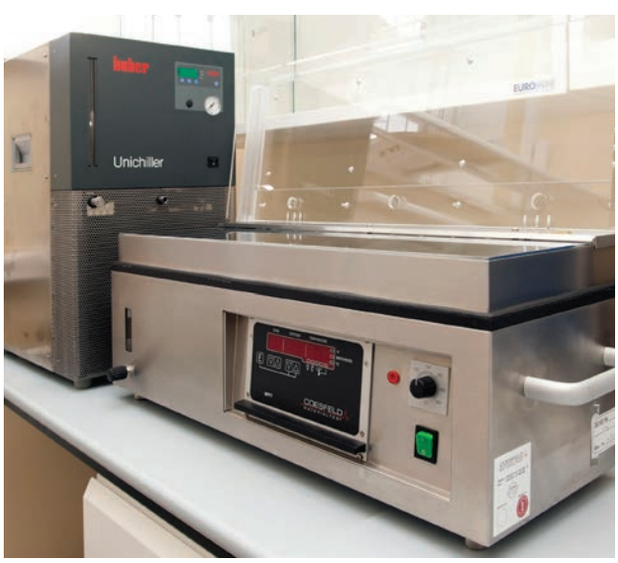
PAINT COATINGS AND POLYMERS LAB

This Lab checks the compliance of the product quality with the RF and EU standards and studies the efficiency of coats/varnishes and polymeric materials, entering the Russian and international construction markets.

The Lab performs the scientific research into the development of advanced lacquers, varnishes, and polymeric coatings demonstrating extended durability. The methodology of accelerated testing, developed by the Lab staff, helps to identify the durability of any lacquers, varnishes and polymeric coatings for any climatic zone. For example, the durability of materials must be improved, advanced work process technologies must be employed, and the climatic zone must be taken account of in order to cut the cost of the road marking repair performed every year.

WORLD-CLASS SCIENTIFIC RESEARCH EQUIPMENT

•Brookfield viscometer determines the dynamic viscosity of liquids, pastes, emulsions, and suspensions. Brookfield viscometers are included into numerous international standards and specifications. This viscometer determines the dynamic viscosity pursuant to GOST 1929-87. Its changeable metering components and the adjustable measuring rate help to cover a wide range of viscosity values.



•Minimum film formation temperature tester assures the appropriate application of tested and novel lacquers and varnishes. The minimum film formation temperature is a most important characteristic of water dispersions of polymers, as polymers are unable to form continuous films at the temperature below the filming values. The maintenance of the temperature value, pre-set by the minimum film formation temperature tester, guarantees (1) the film formation in the course of the coating application and (2) the reliability of the coating.

•Elcometer 1720 abrasion tester identifies the durability of decorative coatings exposed to regular cleaning routines. This testing procedure complies with EN 53778.

•X-rite spectrophotometer. This unit controls the quality of lacquer and varnish coatings, inclusive of their compliance with selected colors. The testing is performed both in the regular environment and in the aftermath of cyclic exposures to negative temperatures and ultraviolet emissions.

•REFO 3 glossmeter. This small size device measures the gloss at the angle of 20°, 60°, 85°. Glossmeters are efficiently applied in every area of activities, where gloss determines quality. However, REFO 3 glossmeter is especially designed for coatings, as it guarantees the top accuracy of measurements (ISO 2813-78, UNE 48026-80).

DRILLING AND OIL WELL CEMENTS LAB

This Lab operates a set of testing tools designated for the standard testing of mortars used in the construction of tunnels and wells. The properties tested by this Lab include spreadability, pumpability, setting time, strength, etc. The set of testing tools includes one digital viscometer, one fluid loss analyzer, one HPHT thermobaric consistomer, one OFITE ultrasonic cement structure analyzer, and one gas permeability meter designated for the cement rock.

POWER EFFICIENCY, ECOLOGY, AND SUSTAINABLE CONSTRUCTION LAB

This Lab operates a set of tools designated for the standard and special-purpose testing of insulation materials used to build energy efficient envelope constructions of buildings and structures.

INSTITUTE FOR COMPREHENSIVE SAFETY OF CONSTRUCTION

RESEARCH AND EDUCATION CENTER FOR FIRE AND EXPLOSION SAFETY OF CONSTRUCTION

- Scientific research lab for materials, structures, and fire retarding compositions
- IKBS MSUCE testing lab
- Professional vocational training center
- Research and technology department

RESEARCH AND EDUCATION CENTER FOR PRODUCTION SAFETY OF CONSTRUCTION

- Technical regulation and quality testing lab
- Testing lab for envelope structures, mounting facilities and sub-systems of ventilated facades

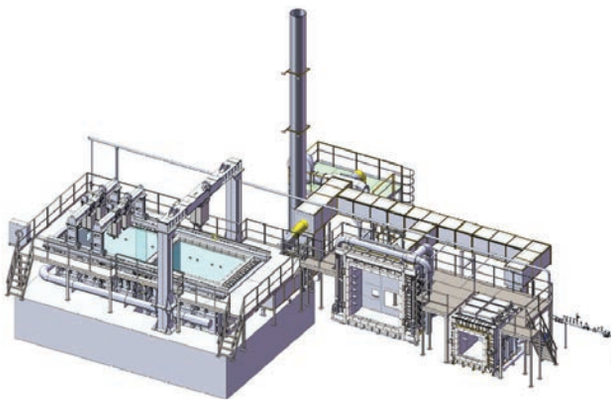
RESEARCH AND EDUCATION CENTER FOR ECOLOGICAL SAFETY OF CONSTRUCTION

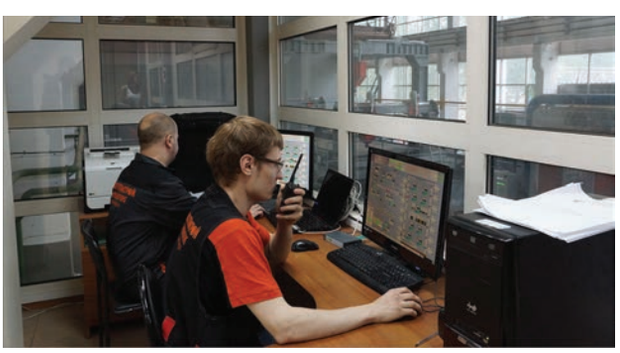
- Lab for development and introduction of national green building standards

IKBS MSUCE testing lab is authorized by the RF National Accreditation System to perform certification testing.

PRINCIPAL AREAS OF ACTIVITIES

- Certification of products in terms of their compliance with the fire safety requirements (RF GOST and EN)
- Examination, expert evaluation, and certification testing of products and structures in terms of their production process safety
- Experimental research into sample products at the stage of development, production launch, development testing of mix compositions and technological solutions
- Applied research performed within the framework of projects developed in cooperation with potential developers of fire safety systems, producers of building materials, building structures, fire retarding compositions, and fire-engineering products
- Project solutions: improvement of the explosive safety of buildings and structures, fire safety systems, security systems, fire protection systems, evacuation facilities
- Development of special specifications, analysis of fire risks for public, office, residential buildings, production premises, and warehouses in accordance with the approved methodologies
- Expert evaluation of compliance of buildings and structures with the BREAM Green Building Standard. Compilation of the required set of documents at the design stage and through the building commissioning stage
- Professional counseling and project support in accordance with German Sustainable Construction Standards (DGNB). Assessment of the life-cycle of buildings (LCA) and life-cycle costs (LCC)
- Professional development/vocational training programs
- Special assessment of labor conditions





SCIENTIFIC RESEARCH LAB FOR MATERIALS, STRUCTURES, AND FIRE RETARDING COMPOSITIONS

The Lab tests products to confirm their compliance with the Technical Regulations for Fire Safety (RF GOST) and the requirements set by the European standards (EN). The Lab tests the fire resistance of structural units, the fire safety of construction materials, and the fire-fighting capacity of substances. The Lab is engaged in the experimental research into sample products at the stages of their development, production launch, development testing of mix compositions and technological solutions. The Lab conducts applied research within the framework of projects developed in cooperation with potential developers of fire safety systems, producers of building materials and building structures. The fire resistance testing unit comprises three fired furnaces; each has no comparable counterparts in Russia.

The fire testing of structural units contemplates:

- Automated activation of different fire modes ("temperature-to-time")
- Automated control over any excessive pressure and oxygen content in the fire furnace
- The fire furnaces can be safely exposed to multiple heating and fast cooling cycles
- Availability of the carbonaceous temperature mode pursuant to EN 1363-2
- The maximum temperature inside the fire furnace is 1,200°C
- The furnaces use pipeline gas as the fuel

UNIQUE TESTING EQUIPMENT

Horizontal fire furnace testing bench. This testing bench meets the requirements set by EN 1363-1, EN 1363-2, and ENV 1363-3, GOST 30247.0 and GOST 30247.1. This testing bench can test the following structural units:

- Suspended ceilings (with the combustion spreading from above and from below according to EN 1364-2);
- Floor slabs (including loaded floor slabs), ceiling structures, roof coatings (having the inclination angle of 0 – 45 degrees) according to EN 1365-2, GOST 30247.1; beams (including those loaded) according to EN 1365 – 3, GOST 30247.1;
- Horizontal protection membranes (EN 13381-1), to assure the protection from the natural fire, as well (according to Exhibit A CEN/TS 13348-1);
- Fire protection structural units (EN 13381-3…4…5…6…7…8);
- Penetrant structures (EN 1366-3).

The testing bench can simulate several temperatures modes (up to 1,200°C), including the carbonaceous temperature mode in accordance with the European standards. Varied loading modes and fire intensity values can be applied in the course of simulating the fire resistance properties of bearing structures with the help of the system of hydraulic presses. This loading system applicable to structural units can expose tested samples to the loads of pre-set values. The maximal loading values are:

- Up to 1,000 kH for concentrated loads;
- 4 x 125 kH for distributed loads.

The loading system can simulate the uniformly distributed load, the concentrated load (via distribution slabs), concentric loads, axial or eccentric loads, including those applicable to oblique arrangements, having the inclination angle of 0° - 45°. The loading system can maintain the permanent value of the testing load (5% of the pre-set value) and prevent any load distribution over the loaded surface.

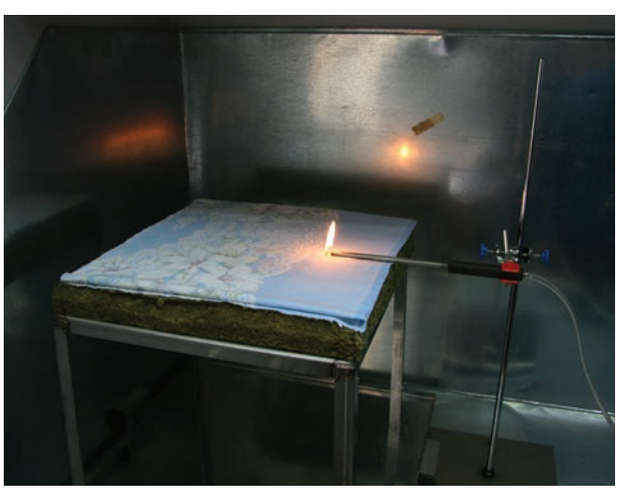
Vertical fire furnace testing bench. This testing bench is applicable to the following structures:

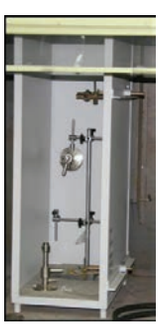
- Partitions (EN 1364-1, GOST 30247.1, GOST 30247.1);
- Fire doors and gates (RF GOST 53307-2009, EN 1634-1);
- Walls (loaded) (EN 1365-1, GOST 30247.1);
- Vertical protection membranes (EN 13381-2);
- Fire resistant structural units (EN 13381-3..4..5..6..7.8);
- Penetrant structures (EN 1366-3);
- Facades (EN 1364-3, EN 1364-3);

The fire furnace complies with the requirements set by EN 1363-1, EN 1363-2 and ENV 1363-3, GOST 30247.0, GOST 30247.2. The dimensions of the fire compartment of the fire resistant chamber are 3.0m x 3.0m x 1.3m. The fire furnaces can be safely exposed to multiple heating and fast cooling cycles. This system of loading, applicable to structural units, can expose tested samples to the loads of pre-set values. The maximal load values are 2 x 125 kH for distributed loads. The loading system can simulate the uniformly distributed load, the concentrated load (via distribution slabs), concentric loads, axial or eccentric loads.

Research fire furnace.
This testing bench is composed of:

- The fire resistant chamber
- The system of smoke gas removal from the chamber
- Gas burners equipped with gas and air supply systems





- Sample mounting systems
- Automatic temperature/excessive pressure/oxygen content adjustment system
- Automatic measured parameter registration system
- Ambient air control
- Combustion product removal system
- Testing bench power supply system

The dimensions of the fire chamber of the furnace are 1.5m x 1.5m x 1.5m. The chamber is universal, as both horizontal and vertical structural units, having the maximal dimensions of 1.5m x 1.5m, can be tested in it.

TESTING UNITS APPLIED TO MEASURE THE FLAMMABILITY OF MATERIALS

•Flammability testing unit applicable to building materials.

The unit measures the flammability, if the sample surface is exposed to the pre-set impacts of the radiant thermal flux and the flame produced by the fire source.

•Bedding and cushioned furniture flammability testing unit complies with RF GOST 53294-2009. The test findings include glowing or combustion, as well as the extent of damages caused by the fire source.

•Flame propagation index meter complies with GOST 12.1.044-89. The unit can measure the rate of the fire propagation over hard materials in the pre-set testing conditions. The testing findings include the flame propagation index.

•The smoke emission testing center complies with GOST 12.1.044-89. It measures the smoke emitted by hard substances and materials. The methodology employed by this testing center consists in the identification of the optical density of the smoke emitted in the process of combustion or glowing of the pre-set amount of tested substances or materials, distributed inside the chamber. The smoke emission ratio, characterizing the smoke emitting capacity of materials, is identified in the course of testing.

•The toxicity of combustion products is assessed for hard substances and materials according to GOST 12.1.044-89.

The material under research is combusted in the chamber under the impact of the thermal flux having the pre-set density to identify the correlation between the lethal effect of gaseous combustion products and the initial weight of the material under research.

•The cable combustion hazard identifier meets the requirements set by RF GOST IEC 60331-11-2003, RF GOST IEC 60331-21-2003, RF GOST IEC 60331-23-

2003, RF GOST IEC 60331-25-2003. The unit tests the duration of the working capacity of cables exposed to the voltage of 1,000V and the fire impact produced by the ribbon burner producing flames at the temperature of 750-800°C.

FIRE EXTINGUISHING SUBSTANCES: TESTING FACILITIES

•The unit designated for the identification of the time needed to extinguish the n-heptane flame by the foam having low, medium and high expansion ratio meets the requirements set by RF GOST 50588-2012. The unit is used to test the amount of time needed to extinguish the n-heptane flame in a tray using the foam of low, medium, and high expansion ratio in case of intensive supply of the foam generating agent before the repetitive combustible surface inflammation caused by the burning cup brought into the simulated fire bed.

•The unit designated for the identification of the time needed to extinguish the flammable liquid using the subsurface method complies with RF GOST 53280.2-2010, pp. 5.3. This methodology consists in the identification of the time period needed to extinguish the flammable liquid using the low expansion foam at the pre-set intensity of the foaming agent supply.

•The unit designated for the identification of stability and expansion ratio of the foam having low, medium and high expansion ratio complies with RF GOST 50588-2012. This methodology consists in the identification of the time period needed for the foam to lose 5% of its mass in the tank in case of the effluence of the working solution.

•The units designated for the identification of the efficiency of fire-proofing compositions applicable to timber and timber materials comply with RF GOST 53292. This methodology consists in the fire impact produced by the fire source (the gas burner) of the pre-set intensity onto the sample timber item pre-treated by the fire-proofing composition in the heat accumulation environment.

TESTING BENCHES DESIGNATED FOR THE TESTING OF ENVELOPE STRUCTURES, MOUNTING FACILITIES, SUBSYSTEMS OF VENTILATED FACADES

•The testing unit designated for the static testing of mobile facilities complies with GOST 24258-88. This unit is designated for:

- The identification of deviations of linear and angular sizes from nominal values; deviations of shape and surface layout;

- Welded seam quality testing;
- Protection coating quality testing;
- Identification of sustainability, operating reliability, elastic and residual deformations of pre-loaded structures.

•The testing unit, designated for the static testing of the woven fabric used in the course of the work performance, complies with GOST 3826-82.

The testing unit:

•Identifies the limits of the load withstood by the statically loaded grid (identification of the tensile strength if the tested sample is exposed to the static load)

•Identifies the relative extension of the loaded grid;

•Identifies the amount of energy consumed in the course of the extension process.

•The testing unit designated for the static and dynamic testing of fences meets GOST 12.4.059-89 requirements. This unit is designated for:

- The identification of deviations of linear and angular sizes from nominal values, deviations of shape and surface layout;
- Welded seam and protection coating quality testing;
- The value of the maximal concentrated static load withstood by the fence;
- The value of the maximal dynamic load applied to the middle of the span and withstood by the fence;
- Identification of strength, sustainability, operating reliability;
- Identification of general and residual deformations after the exposure to the loading.

•The testing unit designated for the testing of suspended façade systems complies with STO 75298253-001-2006. The testing objective is the compliance with the effective STO 75298253-001-2006 standards and technical specifications set by the producers. This unit is designated for:

- The identification of deviations of linear and angular sizes from nominal values, deviations of shape and surface layout;
- Verification of the mechanic strength of products.

•The testing unit applicable to the personal protective gear designated for the work at heights, including:

- Fall protection harnesses and systems
- Ascender and descender devices.

SCIENTIFIC RESEARCH INSTITUTE FOR EXPERT EXAMINATION AND ENGINEERING

PRINCIPAL AREAS OF ACTIVITIES

- Engineering counseling provided to the technical supervisor in charge of construction projects;
- R&D support to assure the high quality of design and technological solutions; development of recommendations and proposals in terms of the application of novel methods, technologies and effective materials;
- R& support of construction works to assure their top quality; development of recommendations and proposals in respect of the novel technologies and materials; organization of the lab control and various monitoring procedures;
- Expert evaluation of project budgets and findings of engineering surveys.

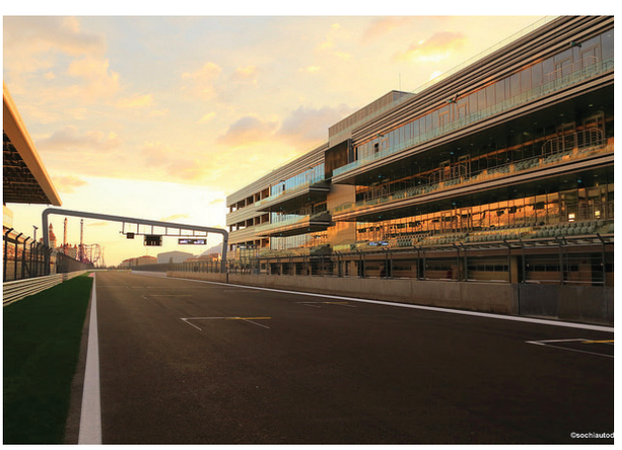
THE LIST OF IMPLEMENTED PROJECTS:

**Federal State Budgetary Institution "N.N. Blokhin Russian Center for Oncology"
of the Russian Academy of Medical Sciences**
•Construction supervision services were provided in the course of construction of the buildings of the N.N. Blokhin Scientific Research Institute of Pediatric Oncology and Hematology of the Russian Center for Oncology located at: 24 Kashirskoye shosse, Moscow, in 2012 – 2016.

Administrative Department of the President of the Russian Federation

**Reconstruction of the Staraya Ploschad cluster of office buildings located at:
2/14, 4, Staraya Sq., Moscow, and 3, Ipatyevsky per.**
•Engineering surveying, engineering support of the design process, lab control.

Non-profit organization Development Fund of the Center for Development and Commercialization of New Technologies (Skolkovo)
•Construction supervision services provided in the course of construction
•Engineering support of design and construction processes



State Unitary Enterprise "Moscow Property"
•Comprehensive expert evaluation of the project budget

Atomenergoproject Open Joint Stock Company
Novovoronezh-2 nuclear power station
•Engineering support of the design process
•Simulation of processes
•Development of specialized technical specifications
•R&D support of design and construction processes
•Aerodynamic testing of the evaporative cooling tower

Federal State Unitary Enterprise "Principal Office in Charge of Special Construction in the Far Eastern Federal Okrug of the Federal Agency for Special Construction"
•Engineering support of the design process
•Construction supervision services provided in the course of construction of SOYUZ-2 Rocket Carrier Launching Site

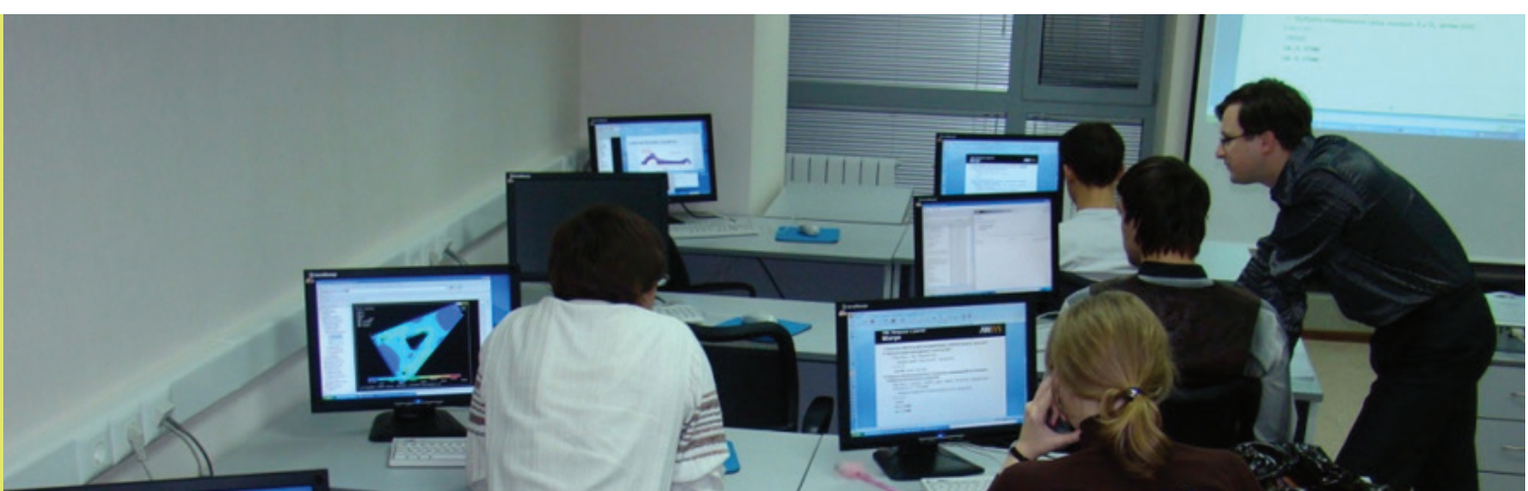
OMEGA Center Open Joint Stock Company
Formula 1 track in Sochi.
•Engineering support of the footing design
•Comprehensive geotechnical monitoring

SCIENTIFIC RESEARCH CENTER FOR COMPUTER MODELING OF UNIQUE BUILDINGS, STRUCTURES AND COMPLEXES

SECTOR FOR ANALYTICAL RESEARCH AND DEVELOPMENT

SECTOR FOR TRAINING AND PROFESSIONAL DEVELOPMENT OF SPECIALISTS

SECTOR FOR HARDWARE AND SOFTWARE



PRINCIPAL AREAS OF ACTIVITIES

RESOLUTION OF RELEVANT PROBLEMS OF MATHEMATICAL SIMULATION IN TERMS OF THE BEHAVIOR OF STRUCTURES, BUILDINGS, CONSTRUCTIONS AND COMPLEXES

- Simulation of interaction between structures and their soil foundations with account for real properties, the staged nature of the construction process and the operation history
- Analysis of physical, geometrical and other nonlinearities
- Analysis of structural and technological features of buildings
- Numeric modeling of wind flows and loads, experimental verifications of analytical analyses of wind loads
- Analyses of seismic loads
- Structural analyses of buildings, having different constructions, in terms of the progressive collapse with account for highly linear dynamic effects of elasticity, viscosity, plasticity, and extensive displacements
- Development of methods and algorithms designated for the resolution of computational problems of extensive dimensions, heterogeneity, and contrast
- Adjustable forecast models as part of monitoring systems at the stages of construction and operation of buildings and structures
- Implemented algorithms of gas kinetics towards the resolution of problems of wind flow mechanics, snow deposits and propagation of hazardous emissions
- Numeric modeling of 3D fire resistance problems

VERIFICATION OF SOFTWARE PURSUANT TO THE REQUIREMENTS ISSUED BY THE RUSSIAN ACADEMY OF ARCHITECTURE AND CONSTRUCTION SCIENCES (RAACS)

USING VERIFICATION SOFTWARE TO PERFORM EXPERT EVALUATIONS OF STRUCTURAL ANALYSES OF BUILDINGS

- Proficiency testing and certification of specialists using software to perform the analyses and to prepare expert opinions
- Expert examination of methodologies underlying structural analyses and software applied in the process of design and research into buildings and structures
- Using verification software to perform the expert examination of structural analyses of buildings and structures
- Technical expert examination of the condition of buildings, causes of localized destructions, and collapses of buildings and structures

DEVELOPMENT AND UPGRADE OF NEW METHODS OF ANALYSIS, INCLUDING THE NUMERIC ONES

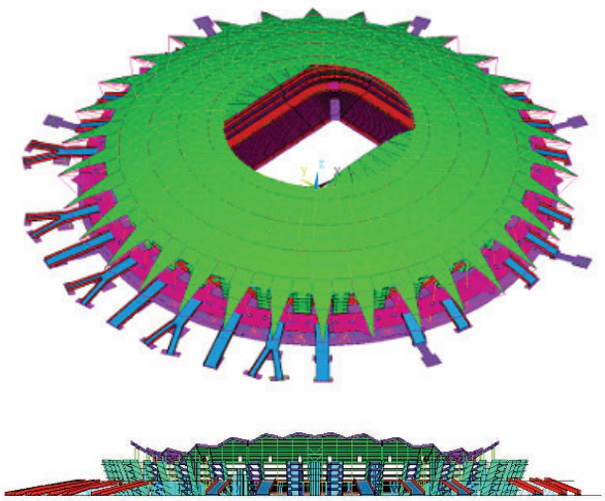
RESOLUTION OF SCIENTIFIC RESEARCH AND TECHNOLOGICAL PROBLEMS

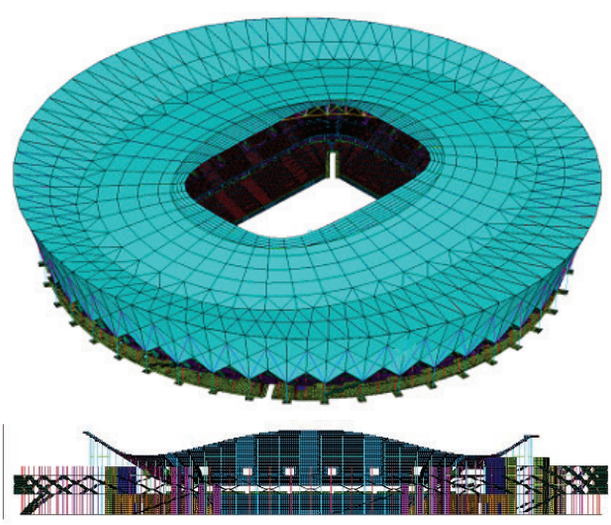
THE TRAINING OF THE RESEARCH PERSONNEL, INCLUDING MASTER STUDENTS, POSTGRADUATE STUDENTS, DOCTORAL STUDENTS

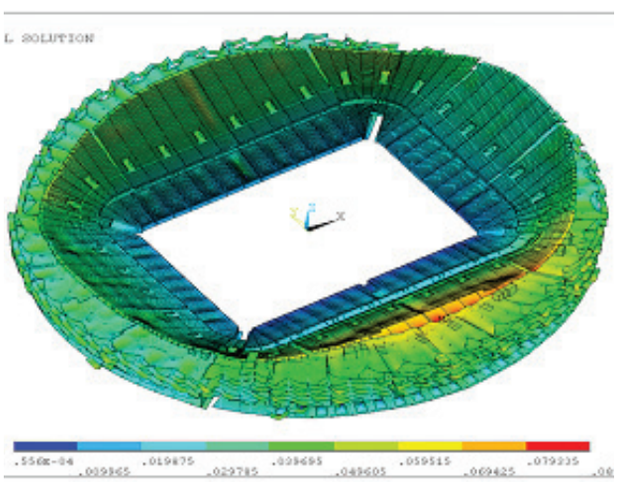
TRAINING AND PROFESSIONAL DEVELOPMENT OF SOFTWARE USERS ENGAGED IN THE MATHEMATICAL SIMULATION OF UNIQUE STRUCTURES, BUILDINGS AND CONSTRUCTIONS

- The training of the users of universal mathematical modeling software applicable to buildings, structures, constructions and complexes (ANSYS, NASTRAN, ABAQUS, ANSYS/CFX, LS-DYNA, PLAXIS)
- The training of the users of object oriented facilities employed in the computer modeling of structures, buildings and constructions (Robot Millennium, Lira, SCAD, MicroFE, ASTRA-NOVA)

TEACHING ACTIVITIES, INCLUDING THE TRAINING OF SPECIALISTS IN THE PRE-SET AREAS OF KNOWLEDGE







ПК SCAD

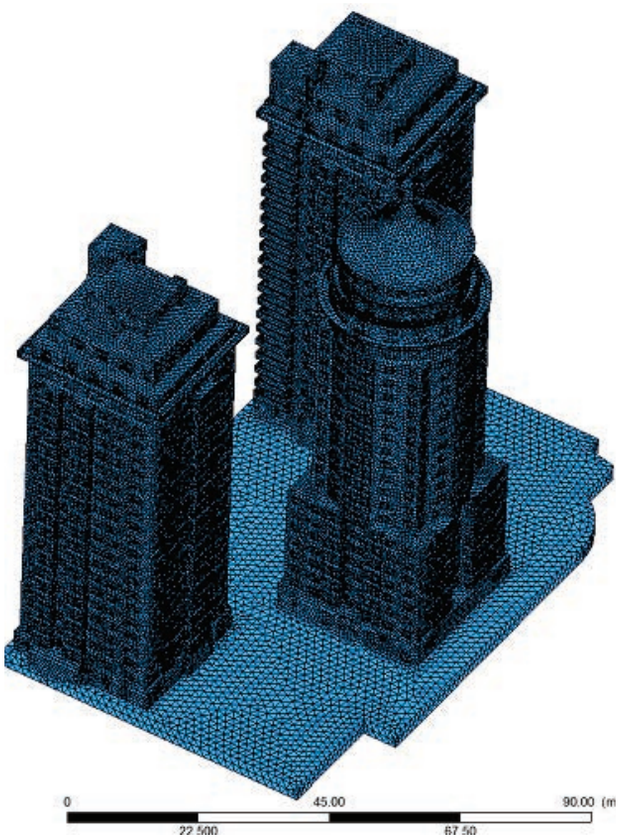
Our SCIENTIFIC RESEARCH CENTER FOR COMPUTER MODELING OF UNIQUE BUILDINGS, STRUCTURES AND COMPLEXES has advanced hardware and software at its disposal. It is composed of the computer analysis cluster, and the 20-seat computer class. This Center operates the following set of licensed software unique for the construction industry:

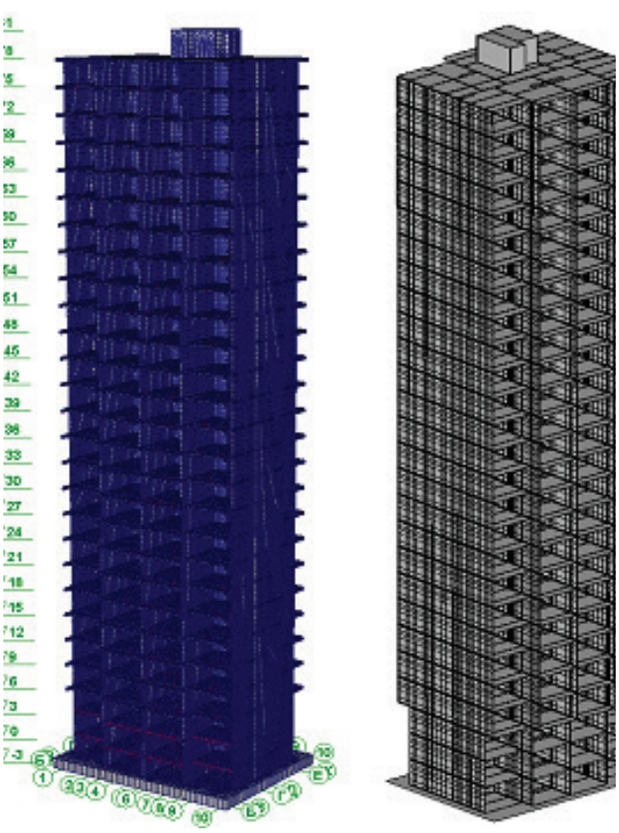
- universal finite element software (ANSYS Mechanical, MSC NASTRAN, ABAQUS, LS-DYNA);
- software designated for the resolution of structural analysis problems (LIRA, SCAD, MicroFE, Stark, Robot Millennium, ANSYS/CivilFEM)
- STADIO system of research into finite super-elements
- Modeling of soil-related problems (PLAXIS)
- Comprehensive strength analysis of pipelines (AS-TRA-NOVA)
- System for the numeric modeling of 3D problems of hydro- and gas dynamics (CFD) – ANSYS/CFX.

The above software is available in three groups of packages serving the three objectives of the Center: the limited package to serve the academic training needs, the unlimited research package to support the academic research, and the complete commercial package.

This Center has accumulated a diverse experience in the practical and theoretical research into the 3D modeling of the temperature and stress-strained state, stability and strength of pipelines, technological equipment, machinery and tools, "equipment-to-pipeline" systems, structural units, systems, including above-ground structures and their beddings and below-ground structures and their beddings, critical construction facilities, designed with account for the regulated and practical combinations of temperature, static, wind, operation (vibration) and special dynamic (seismic, shock, emergency, etc.) loads:

- reactor compartments, machinery halls, backup systems and waste tanks of nuclear power plants (Armyansk, Kursk, Smolensk, Leningrad, Ignalinsk, Bilibin, Novovoronezh, Kol'sk, Balakovo, Volgodonsk, Kalinin, Zaporozhye, Beloyarsk, Loviza, Kozlodui, Belene, Paksh, Temelin, Stendal, Kudankulam, Tyanvan, Busher, designs of new generation nuclear power plants AS-NP 500, AS-NP 1000, AS 2006, VVAR-TOI, etc.);
- arch, gravity and soil dams, subterranean structures and buildings of hydraulic power plants (Sayano-Shushenskaya, Krasnoyarsk, Bratsk, Boguchany, Zeya,

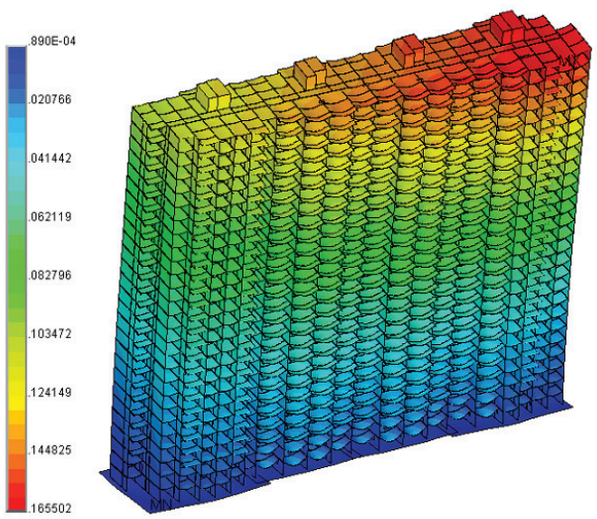


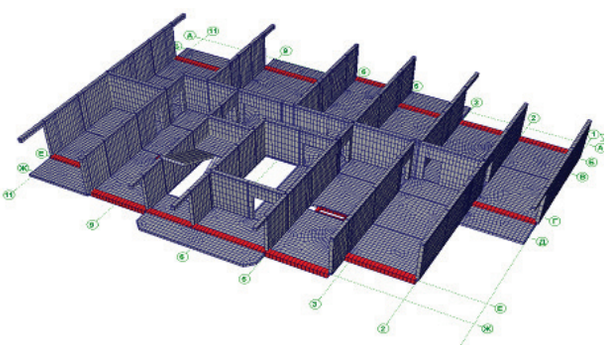


Bureya, Vilui, Katun, Chirkey, Volzhsk, Kamsk, Inguri, Hudoni, Namakhvani, Kurpsai, Nurek, Rogun, Plyavin, Gehi, Hoabin, Kapanda, Teri, Tang-E-Duk, etc.), Zagorsk water accumulation power plant, tidal power plants and hydraulic structures;

- unique and standard civil engineering structures (the roofing of the Luzhniki sports arena, the monument commemorating the 30ieth anniversary of the Russian fleet, the subterranean parking lot also known as Manezhnaya Ploschad; Aquadrom center for sports and leisure, Khodynka ice palace, Moskvich arena, Iskra indoor pool, Big ice arena, Central stadium, trampolines and bobsleigh tracks in Sochi (Sochi 2014 Olympics), FIFA 2018 World Championships arenas (Spartak arena in Moscow, Zenith arena in St.Petersburg, Samara, Volgograd, Nizhny Novgorod, Rostov-on-Don, etc.), multi-storied panel and monolithic buildings, hi-rise buildings, including Moscow City, Poklonnaya, Profsoyuznaya, other high-rise buildings constructed in Vladivostok, Kiyv, Astana, etc.)
- wind power plants having versatile structures and capacities, floating structures and oil/gas platforms operating on the shelf,
- thermal network pipelines both above and below the earth level, master oil and gas pipelines, petrochemical and gas pipelines and equipment (the gas pipeline Sakhalin-Khabarovsk-Vladivostok is the most advanced one);
- complex machine building structures, machinery and tools (aerospace systems, transport building, vessel building, power plant buildings, black and ferrous metallurgy, houseware appliances). The pioneering solutions include the kinetics and the strength of the system composed of independent power producers – drive units – solar batteries and subsystems of the Alpha component of the international space station analyzed at the stages of its launch and orbital activities.

The most notable research projects include the analysis and development of the collapse patterns of the Transvaal park accident in 2004, Basmanny market building in 2006 performed within the framework of expert examinations, limited destruction of Krylatskoye ice palace, performed with the help of both STADIO software and alternative software systems, including AMSYS Mechanical, ANSYS CFD, ABAQUS, LIRA, SCAD, Robot Millennium). The conclusions, specified in the above examination opinions, served as the basis for the new requirements applicable to the structural analysis





РОССИЙСКАЯ АКАДЕМИЯ АРХИТЕКТУРЫ И СТРОИТЕЛЬНЫХ НАУК
Научный совет «Программные средства в строительстве и архитектуре»

СВИДЕТЕЛЬСТВО
№ 02/ANSYS/2009

о верификации программного средства, применяемого для решения задач теплопроводности и фильтрации, определения статического и динамического напряженно-деформированного состояния конструкций, зданий и сооружений

Программное средство: ANSYS Mechanical – универсальный программный комплекс для решения задач теплопроводности и фильтрации, определения статического, температурного и динамического напряженно-деформированного состояния пространственных конструкций, зданий и сооружений с учетом эффектов физической, геометрической, структурной и генетической нелинейностей на основе метода конечных элементов
Разработчик: ANSYS, Inc (США)
Заявитель: ЗАО "ЕМТ Р", ЗАО НИЦ СтаДиО, ООО "ГК Текстрой", ГОУ ВПО МГСУ (России)
Авторы верификационного отчета: ЗАО НИЦ СтаДиО, ГОУ ВПО МГСУ (России)
Дата включения в реестр верифицированных программных средств: 10 июля 2009 года
Срок действия свидетельства: до 10 июля 2019 года

Перечень верифицированных возможностей программного средства ANSYS Mechanical изложен в Приложении (на 4 стр.), являющемся неотъемлемой частью настоящего Свидетельства, и в верификационном отчете (4 тома на 1200 стр.)

Вице-Президент В.И. Травуш
Академик-Секретарь Н.И. Карпенко
Председатель Научного Совета В.Н. Сидоров

РОССИЙСКАЯ АКАДЕМИЯ АРХИТЕКТУРЫ И СТРОИТЕЛЬНЫХ НАУК
Научный совет «Программные средства в строительстве и архитектуре»

СВИДЕТЕЛЬСТВО
№ 05/SIMULIA Abaqus/2014

о верификации программного средства, применяемого для решения задач теплопроводности и фильтрации, определения статического, температурного и динамического напряженно-деформированного состояния конструкций, зданий и сооружений

Программное средство: SIMULIA Abaqus – универсальный программный комплекс для решения задач теплопроводности и фильтрации, определения статического, температурного и динамического напряженно-деформированного состояния пространственных конструкций, зданий и сооружений с учётом эффектов физической, геометрической, структурной и генетической нелинейностей на основе метода конечных элементов (в том числе, совместно с методом конечных объёмов Эйлера) и бессеточного метода сглаженных частиц.
Разработчик: Dassault Systèmes (Франция)
Заявитель: ФГБОУ ВПО «МГСУ» (Россия), ООО «ТЕСИС» (России)
Авторы верификационного отчёта: ФГБОУ ВПО «МГСУ» (России)
Дата включения в реестр верифицированных программных средств: 20 марта 2014 года
Срок действия свидетельства: до 20 марта 2024 года

Перечень верифицированных возможностей программного средства SIMULIA Abaqus изложен в Приложении (5 стр.), являющемся неотъемлемой частью Свидетельства, и в верификационном отчёте (4 тома на 610 стр.).

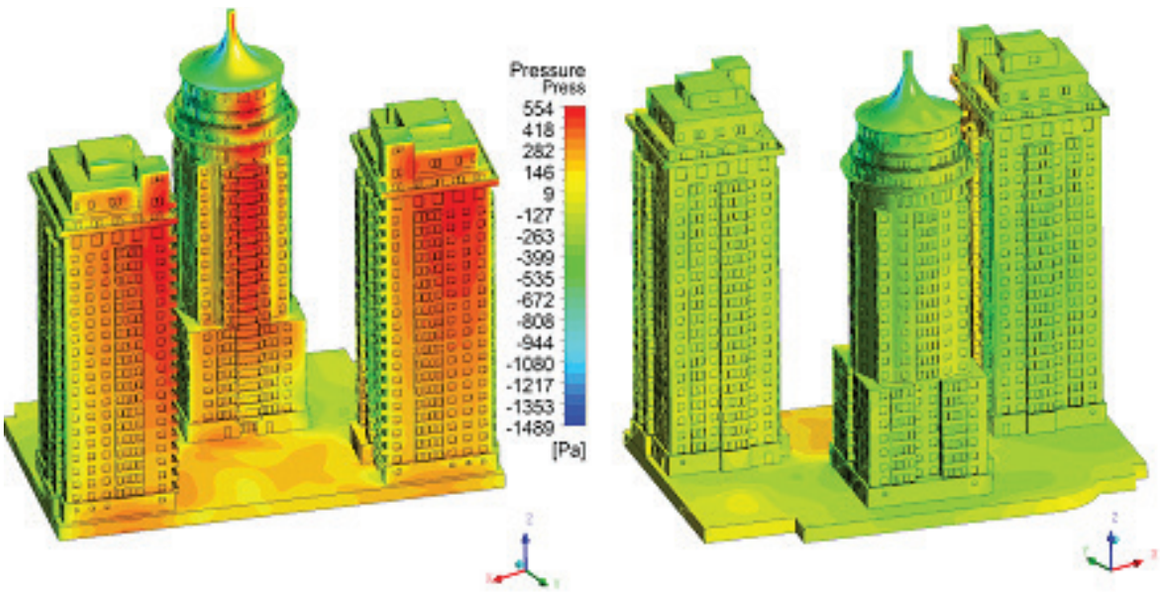
Вице-президент В.И. Травуш
Академик-секретарь Н.И. Карпенко
Председатель Научного Совета В.Н. Сидоров

of unique buildings and structures (verification of software, alternative structural analysis, construction and operation monitoring) and advanced solutions.

Numeric methods, implemented in the software, were applied to resolve the most relevant and difficult problems of structural aerodynamics (wind loads and impacts produced on high-rise and large-span construction facilities, etc.) These facilities include Zenith and Moskvich arenas, Adler railway station, high rise residential houses Aquamarine, Gasoil City, Zodiak, Sky Fort, Zeppelin, Rublevo Lights, Moscow City, etc.

Pioneering research projects were completed in furtherance of the contracts signed with Rosatom Corporation:

- Design and development, verification and pilot testing of the methodologies for the refined numeric modeling of principal, special and emergency loads and impacts (wind and snow loads, aircraft impacts, shock waves, seismic loads, tsunamis, tornadoes) produced on the principal structures of nuclear power stations;
- Comprehensive methodological modeling of the static, temperature, dynamic stress-strained state and strength of combined systems, including beddings, structures, machinery, pipelines of nuclear power stations; their implementation using the software algorithms, their verification and pilot testing by the nuclear industry facilities, and introduction of the numeric modeling methodologies into regulatory documents.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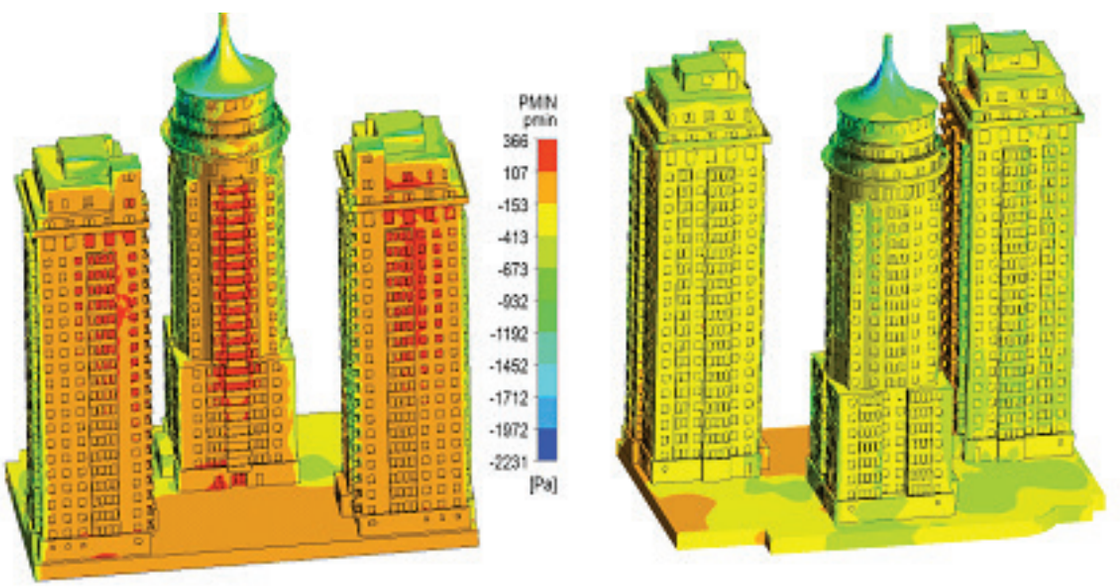
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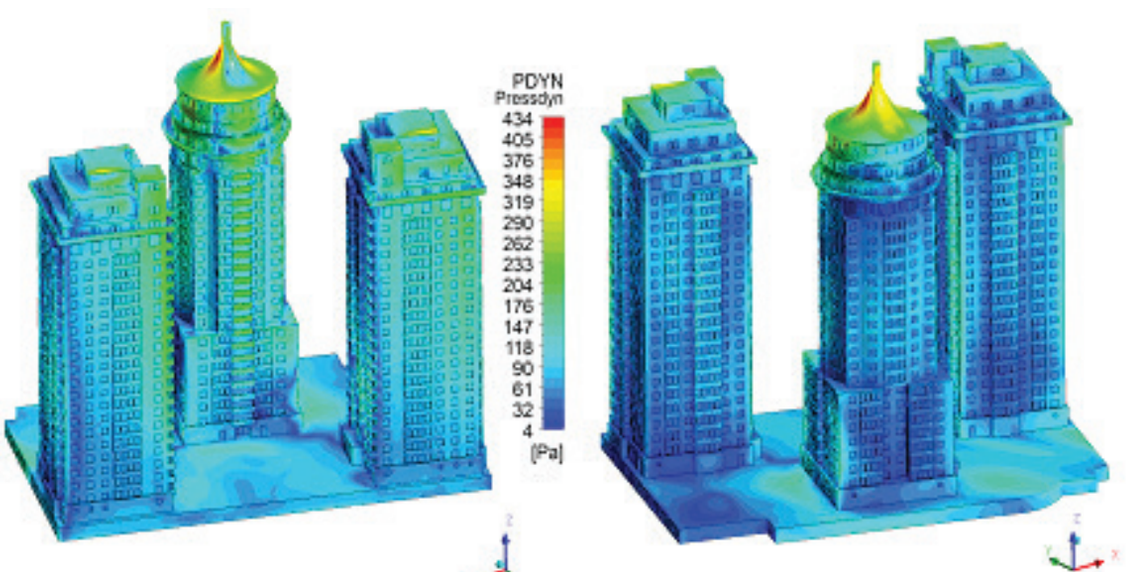
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SCIENTIFIC AND EDUCATIONAL CENTER FOR NANOTECHNOLOGIES

LABS

- Research into structural properties of nanoscale materials
- Research into physical-chemical properties of nanoscale materials
- Atomic-force microscopy classroom
- Road building materials
- Research into operating properties of nanomodified materials

PRINCIPAL AREAS OF ACTIVITIES

RESEARCH ACTIVITY

- The research activity serves to solve the most relevant problems accompanying the development of composite building materials, including
- synthesis of primary nanomaterials, designated for the regulated structure formation of building composites and their quality improvement
- control over the internal stress-strained state through the synthesis of compounds capable of compensating deformations along the phase boundary
- mechanic-chemical synthesis of mineral systems, whose surface layers (viscous and dispersive phases) have modified chemical compositions and properties
- development of methods of control over the structure formation of building composites at the stage of the product operation (durability improvement)
- synthesis of nanomaterials in the systems having equal or comparable solubility or component melting temperatures
- modeling of systems containing primary nanomaterials

TESTING PROCEDURES

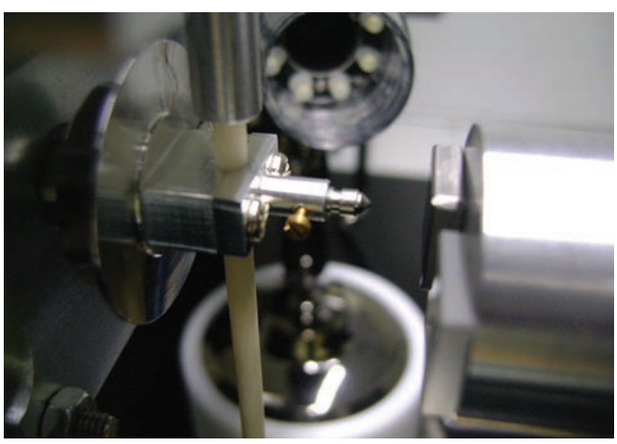
- The testing of primary nanomaterials and nanomodified materials, the expert examination of the efficiency of nanotechnologies applied to improve the quality of materials
- The testing of components and building materials of various applications, including road building materials

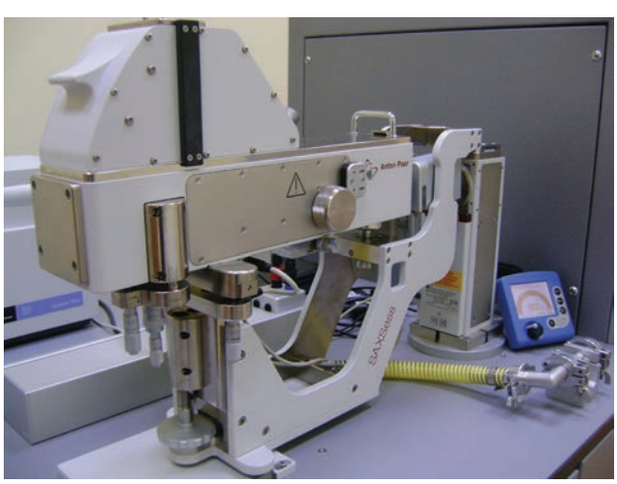
EDUCATIONAL ACTIVITIES

- The training of postgraduate, and doctoral students specializing in
- 05.23.05 Building materials and products
- 05.16.09 Material engineering
- The professional development of specialists in
- Nanomaterials and nanotechnologies in construction
- Nanomaterials and nanotechnologies in construction: empirical and model-based approaches
- Nanomaterials and nanotechnologies in construction: the tooling system
- Advanced methods of design and testing of asphalt-concretes developed in compliance with the Superpave mix design method
- Nanoscale silica: production, properties, application

ORGANIZATIONAL ACTIVITY

- The consolidation of efforts of research teams employed with the leading Russian and international universities of civil engineering to attain the nanotechnology development objectives pursued in material engineering, and the assimilation of nanotechnology-related attainments in civil engineering





RESEARCH INTO STRUCTURAL PROPERTIES OF NANOSCALE MATERIALS LAB

The Lab was established to conduct research into nanoscale facilities and systems, to identify the regularities of processes underway on the nanoscale level, to identify the dimensions, the shape and the position of primary nanomaterials, to identify the features of their structure formation, the solidity and the modulus of elasticity of the surface layers of materials, to pinpoint structural relaxation periods, and to conduct the optical research into nanomodified building materials.

•NanoTest 600 is used to test, to identify the characteristics, to study and to develop materials on the nano- and micro-level. This unit tracks the changes in the strength and modulus of elasticity values alongside the sample section; the unit also measures the adhesive and cohesive strengths of films, detects the adhesive gap, conducts creeping/stress relaxation/viscous destruction/contact fatigue/wear resistance tests, identifies the surface friction value for solid single-layer and multi-layer coatings, polymeric films and alloys.

•SAXess small-angle x-ray diffractometer is used to study dispersed systems (powders, suspensions, emulsions) with the particle size of 1 to 150 nm, using the methods of small-angle x-ray dissipation. This unit can detect the shape and size of particles, dimensions of open pores, the internal structure of the material, and the extent of crystallineness of substances.

•MA-200 optical microscope helps to analyze the structure of composite materials on the basis of the analysis of high-quality images with the 2,000x augmentation.

RESEARCH INTO PHYSICAL-CHEMICAL PROPERTIES OF NANOSCALE MATERIALS LAB

This Lab is organized to test and to study the regularities in the influence produced by the formulation and technology-related factors onto the structure and properties of nanomodified building materials and permolecular formations; phase and allotropic transitions, rheological characteristics and the dispersion composition of nanomodifiers. The Lab research machinery helps to study the thermal physical properties of nanomodified and nanostructured materials, and also to apply electrochemical, chromatographic and thermographic methods of research to a wide range of properties.

•NOVA 220e analyzer of the per-unit surface and

dimensions of pores is used to identify the parameters of the porous space of versatile materials. The analyzer identifies overall dimensions of the porous space, the average radius of pores, the pore distribution pattern, and the per-unit surface of the material. The size range of pores measured by this unit varies from 4 to 400 nm.

•MCR101 rotary viscometer is applied to study the rheological properties of materials (viscosity, stress and shear velocity) both in the oscillation and rotation modes within the temperature range of -30…+200°C. The unit also performs the thermal mechanical analysis of materials within the range of +500°C.

•Microtrac S3500 laser particle size analyzer uses the method of laser diffraction within the range of 20 nm – 2.8 mm to classify particles of suspensions, emulsions, and powders by their sizes. This unit is widely used to control the quality of process flows associated with the production of cements, ceramics, and composites.

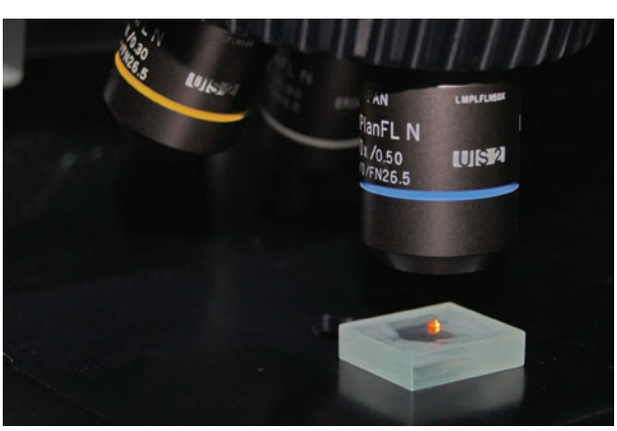
•Zetatrac laser particle size analyzer measures the size and molecular weight of particles from 0.8 nm to 6.5 μm, the value of the residual charge on or near the surface of suspended particles and identifies the electro-kinetic potential (zeta potential) of charged particles in the electric field. It efficiently studies the average size of particles, their fraction composition, and the processes of coagulation of nanomodifiers.

•K100 KRUSS tensiometer is applied to identify the surface and interfacial tension of liquids, using the method of the du Nouy ring or the Wilhelmy plate within the range of 1…1,000 mN/m; it helps to find the density of Newtonian liquids, to measure the wetting angle of solid samples, films, powders and fibers at the temperature of 5…85°C.

•HDSC PT 1600/1400 high temperature differential scanning calorimeter is used to study the structure of nano-modified crystalline materials by measuring heat flows emitted by benchmark and tested samples. A heat flow is examined as temperature and time functions. HDSC PT 1600/1400 can also be applied to control the product quality, to analyze defects and to optimize processes according to standards DIN 5100, DIN 53765, ISO/DIN L409, ASTM D 3418.

•THB analyzer of thermal conductivity and diffusivity can also measure the thermal capacity and assess the structural features of different materials using the method of non-stationary thermal current. Both solid nano-structured composite materials and materials in the process of their synthesis can be tested.

•Vertical dilatometer L75VS1600LT measures the coefficient of thermal expansion of materials. It is used



to assess the nano-modified structure of materials, to identify the pattern of changes in their mechanical properties and structural parameters. This unit is applied to identify the coefficient of thermal expansion within the temperature range of -150 to +1,600°C.

•NMR relaxometer Mnispec MQ measures the time to the attainment of the thermal equilibrium of the nuclear magnetic resonance and identifies the concentration of elements within solid and liquid compositions of raw materials and products. NMR relaxometer can also be used to analyze kinetic chemical reactions inside mineral binders or composites based on mineral binders and to assess the influence produced by different modifiers (including nanomodifiers) onto the structurization of building materials. Its operating band is 2 through 65 MHz.

•Combinational scattering spectrometer based on Senterra microscope is applied to study the phase and allotropic transfers in the course of the synthesis of nano-modified metal/ceramic materials and nano-structured composites.

•Cary 630 IR Fourier spectrometer identifies the structural composition of solid, liquid and gaseous substances on the basis of the infrared spectrum. It helps to identify heterogeneous materials and performs their high quality analysis; the intensity of straps in the spectrum characterizes the quantitative correlation of components in the material sample.

•TitrIC 4 is a fully automatic system designated for the laboratory analysis of liquid media and compositions of building mixes. TitrIC 4 is used to take immediate temperature, electrical conductivity and pH measurements,to identify the values of p and m,calcium and magnesium, to assess anion concentrations using the ionic chromatography method. TitrIC 4 assesses the influence of the media composition onto the process of structurization and performance of nano-modified composite building materials.

•Titroterm 859 is a thermometric titration facility. It is used to analyze chemical processes underway in the course of the synthesis of nanomaterials (including modifiers). The thermal titration method is highly efficient in the analysis of chemical processes in the absence of electrometric sensors, or reference electrodes, or essential solvents.

•Liquid Chromatograph LC-20AD is designated for the separation, analysis and identification of organic compounds belonging to different classes (synthesized or extracted from natural objects).

•Spectroscan spectrometer is used to identify the

availability of any chemical, from Sodium 11Na to Uranium 92U, in versatile substances, including liquids, solids, powders, applied to surfaces and precipitated through filters using the x-ray fluorescence method.

•GANG-4 gas analyzer is designated for the automated continuous control over the concentrations of hazardous substances (SO2, H2S, NO2, NH3, HF, C2H5OH, HCl, HCOH) in the air.

ATOMIC-FORCE MICROSCOPY CLASSROOM

Its principal objective consists in the implementation of research projects using methods of tunnel electron microscopy and atomic force microscopy. The laboratory is equipped with NanoEducator scanning probe microscopes.

Lectures and practical classes are held in multimedia classrooms, and they never interfere with the research process. The disciplines include construction nanotechnologies, physical and chemical processes that contemplate the synthesis of nano-modifiers, and the mathematical theory of the experiment.

ROAD BUILDING MATERIALS LAB

The laboratory was founded to initiate the research and development of new high quality road building materials that demonstrate extended durability and service life properties.

The laboratory operates an analyzer of asphalt coatings. It is used to identify the special features of road coatings as rutting, resistance to fatigue cracking, susceptibility to precipitation, wearability, and resistance to dynamic impacts. The laboratory also operates a vibration compactor used to make samples to be tested by the analyzer.

•Automated ductilometer, equipped with an electronic control panel and a digital display, is used to measure the ductility and elasticity of bituminous materials (ASTM D 113). It measures the ability of the standard sample to stretch into the rupture-free thread at the known temperature.

•Automated petroleum bitumen softening temperature analyzer employs the "ring and ball" method (EN 1427).

•Automated penetrometer measures the consistency index of the bitumen by identifying the depth of the standard testing body penetration into the tested media.

•The Fraas device finds the brittle point for the bitumen (DIN 52012).

•The Engler viscometer measures the simulated viscosity (DIN 51801).

•The semi-automated blaze analyzer measures the oil product blazing in the closed cup. The Pensky-Martens method is employed.

•The polarity identifier for particles of bitumen emulsions (ISO 1430) detects the electric discharge carried by the particles of ion emulsions.

•AVC II vibratory compactor simulates unique vibration compaction impacts applied to strengthen and compact asphalt mixes and to quickly produce beam- and cylinder-shaped samples, demonstrating the pre-set density and compliance with tight tolerances. Its impacts are similar to those that accompany the compaction of asphalt mixes by the vibration roller in the field environment.

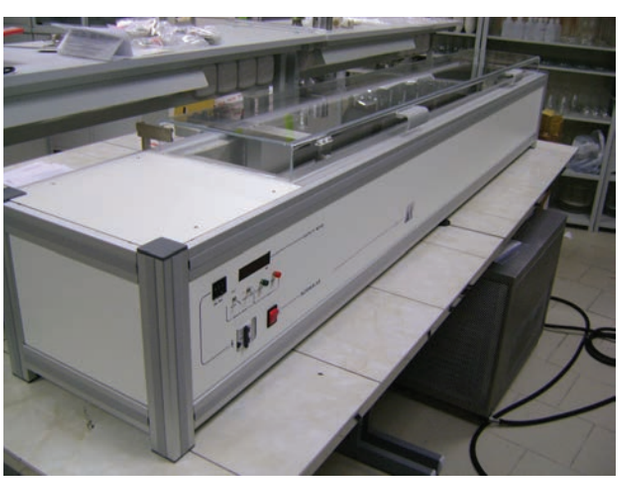
•LCE 6101T comprehensive testing chamber is designated for the testing of the temperature, humidity, artificial light intensity, sunlight intensity, UV and IR emissions, rain, acid rain, wind. The chamber performs accelerated tests of the protection from the atmospheric impacts, of the paving wear at the temperature of -70°C...+80°C and the relative humidity of 25...95%.

•Asphalt coating analyzer is a multifunctional device used to assess the irreversible plastic deformation (rutting), fatigue cracking, and water susceptibility of hot and cold mixes. The analyzer can perform the following tests:

- Hamburg rut test
- AAP rut test
- Water sensitivity test
- Fatigue destruction test
- Varied speed/load test
- High contact pressure test (take-off/landing runways)
- Test of the wear caused by studded tires, also at negative temperatures.

•Wirtgen WLB 10S bitumen foamer prepares the foamy bitumen having variable parameters, including temperature, water consumption, air pressure at the entrance into the expansion chamber. It is used to obtain samples of foamy bitumen binders to identify the formulation and technological parameters of recycled asphalt mixes.

•Dynapave 130 is a servo-hydraulic system designated for the dynamic testing of statically and dynamically loaded asphalt concretes. The tested parameters include indirect stretching, creeping, fatigue, 3D testing of uncoupled materials, etc., if the sample is exposed to the controlled loading or shear.



RESEARCH INTO OPERATING PROPERTIES OF NANOMODIFIED BUILDING MATERIALS LAB

This Lab was set up to study the durability of building materials, to identify the regularities in the alteration of operating properties of materials, if the operator diverges from the formulation or technological parameters. The Lab testing machines detect alterations in the values of resistance of materials to operating factors (water resistance, chemical resistance, frost resistance, etc.) caused by the introduction of nanoscale modifiers.

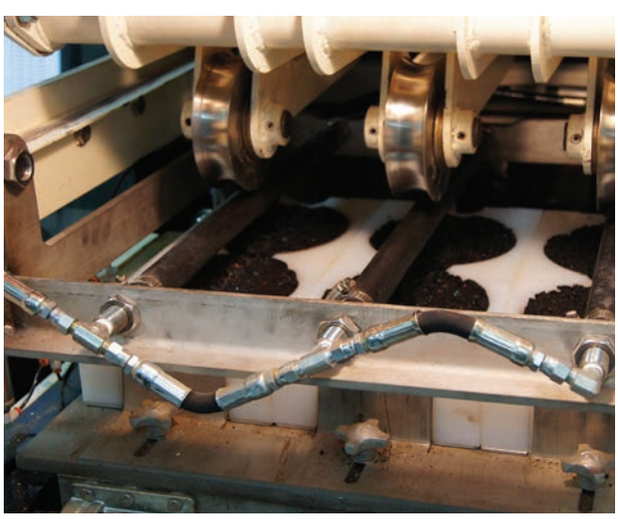
Advantest 9 servo-hydraulic system is a multi-purpose device, applied to control the frames used in the course of testing building materials in compression and in bending. The load, strain, shear and deformation parameters of this system are variable.

R&D

•High-strength lightweight concretes represent multi-component building materials, having structural applications. Their average density is 1,300…1,500 kg/m3, their compressive strength is up to 70 MPa, and their heat conductivity ratio is below 0.6 Wt. The unique combination of their properties makes it possible to produce building products having the functions of both bearing and envelope structures. The use of lightweight concretes improves the construction efficiency by, at least, 30% due to the reduction of the material consumption and thermal conductivity, as well as the reduction of the cost of construction and installation.

•Durable sulphuric concrete is a composite building material made from technological sulphur, the modifier, the filler and the aggregate. This type of concrete should be made from local raw minerals and industrial waste. Our lightweight concrete is widely used in the manufacturing of products and structures operated in aggressive environments, under the impact of high humidity and highly variable temperatures (its frost resistance exceeds F300). Sulphuric concretes are highly strong (35…45MPa), water impermeable (below W20), and resistant to chemical attacks in salt and acid solutions. Due to their zero water consumption, lightweight concretes can be used to manufacture concrete products 12 months a year at low temperatures, and this property is particularly relevant in permafrost areas. The process flow is waste free, and damaged products are recyclable.

•The complex sulphuric modifier of asphalt-concretes



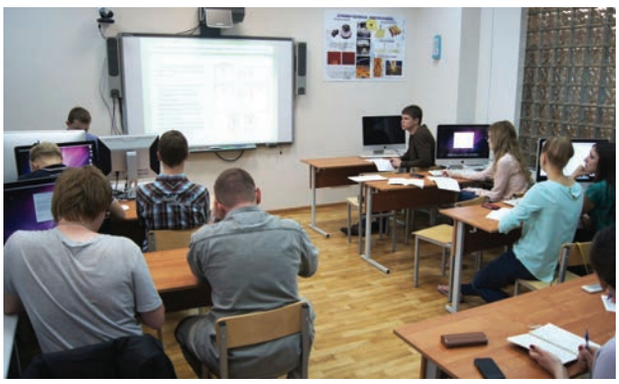
improves the durability of road pavings due to the 1.8-... 2.0-fold improvement of the rutting resistance of asphalt concretes and extension of the operating temperature range. The modifier contains neutralizing agents that assure the multifold reduction in the amount of toxic gases H2S and SO2 emitted in the course of production, transportation and casting of sulphuric asphalt concrete mixes. The modifier extends the repair interval by 40...45%, saves 30...40% of the oil bitumen and improves the paving quality. Besides, the technology employed to prepare and to cast the modified asphalt-concrete cuts the power consumption by 10...20%.

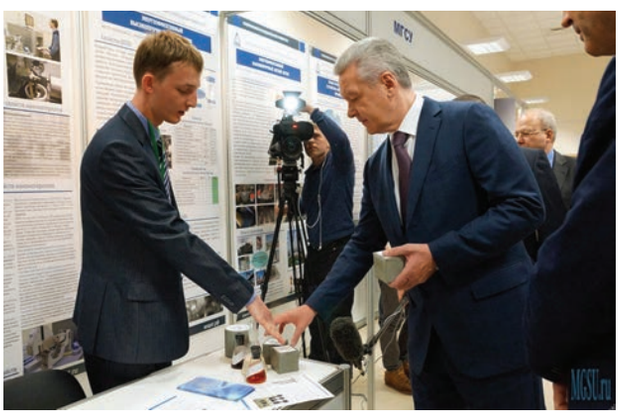
•Nanoscale and micro-sized Barium hydrosilicates serve as the modifiers for cement building materials. They adjust the chemical composition of the cement stone, the setting and stiffening time, and improve the physical-chemical and operating properties of products. Micro-sized Barium hydrosilicates are used to produce composite mineral binders having special applications. Their application reduces the x-ray emission ratio by 80%, and reduces the setting time 7...9-fold. These composite binders can be used in the production of x-ray screening coatings and specialized concretes. The combination of nanoscale and micro-sized modifiers improves the strength of the cement stone 2+-fold.

•The complex nanomodifier designated for the asphalt-concrete is made from the highly porous mineral material with the primary nanomaterial added. The nanomodifier improves the physical-chemical and operating properties of asphalt-conceretes, as their strength at 20 and 50°C goes up by 30% and 60%, respectively, their cracking resistance goes up by 13%, their shear resistance is up to 60%, and their rutting and wear resistance go up by 43...45%.

•The energy efficient ceramic material made from diatomite and the highly porous mirco-dispersed filler, pre-treated by the synthesized primary nanomaterial, demonstrates higher structural features: its maximal compressive strength is 2...40 MPa, while the density is 600...1,200 kg/m3. This material has low heat conductivity and high frost resistance.

•The metal-mineral biocidal nanomodifier serves to assure comfort and biological safety of premises. It prevents infection contamination and it suppresses Aspergillus and Penicillium fungi colonies, Tiobacillus concretivorus, Tiobacillus thiooxidant, Tiobacillus thioparus, Tiobacillus neapolitanu and other bacteria. It is highly active and its action is durable, due to the





extensive per-unit surface of the thread-shaped metal-mineral nano-sized formations, generated in the pores of treated materials. The principal characteristics of the precursor: density – 1,080 – 1,100 kg/m3; pH – 10 – 11; the precursor consumption rate - 2 liters per 1 m2 of treated surfaces; the biocidal properties manifestation period – at least, one year.

•The cross-functional nanomodified epoxy coating improves the barrier properties, the hydrophobicity and the biocidal properties of cement compositions operated in highly humid and biologically aggressive environments. The coating has excellent physical-chemical and operating properties, including compressive and bending strength, impact strength, adhesive strength, and chemical resistance. The principal characteristics of the stiffened surface: the exterior – the homogeneous white surface, the coating layer thickness – 0.5 – 1.0 mm; the nature of destruction if peeled from the concrete surface - cohesive destruction on the concrete surface; the consumption rate – 0.6 – 1.2 kg per one sq. meter of the treated surface.

SCIENTIFIC AND EDUCATIONAL CENTER FOR INFORMATION SYSTEMS AND INTELLIGENT AUTOMATICS IN COSTRUCTION

CLUSTER FOR THE MONITORING AND MANAGEMENT OF ENERGY EFFICIENCY OF BUILDINGS

TRAINING AND DEMONSTRATION CENTER FOR INTELLIGENT AUTOMATICS

LABS

- Information systems in construction
- Intelligent automatics in construction

DESIGN BUREAU

SPECILAIZED LABS

- Intelligent automatics (KNX)
- Automatic control over engineering systems (BACnet)
- Imitation of systems of automatic control over process flows
- Automatics of ventilation systems

CHAIRS INVOLVED IN PROJECTS

- Information systems, technologies and automation in construction

PRINCIPAL AREAS OF ACTIVITIES

PROFESSIONAL DEVELOPMENT IN

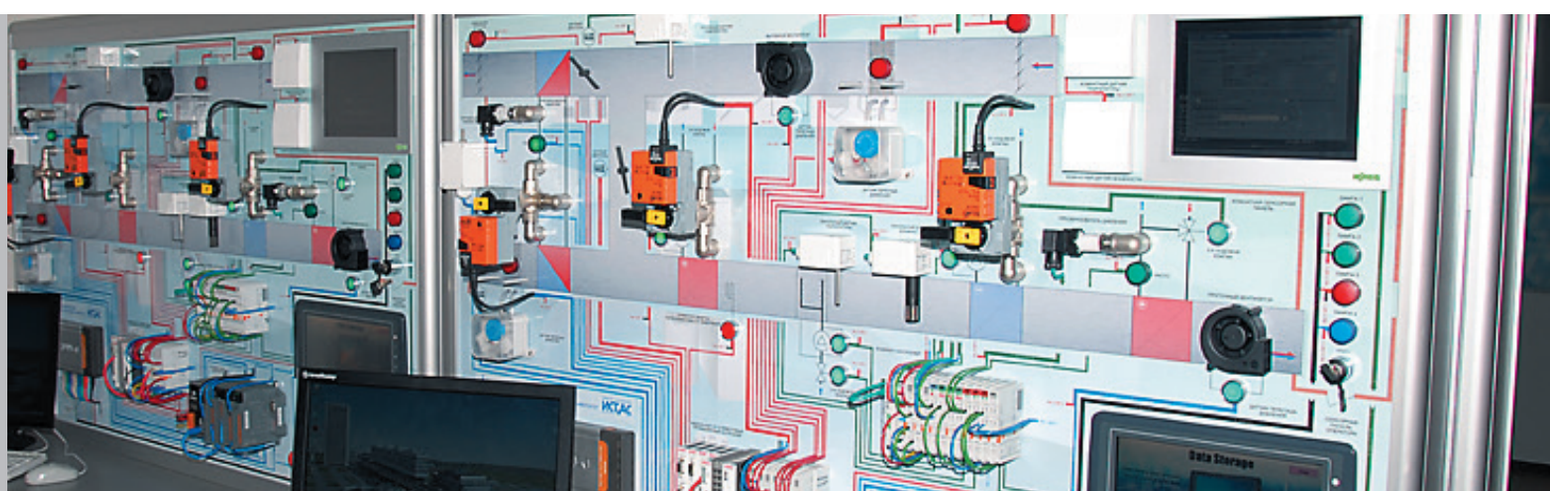
- Building automation technology
- KNX technology
- BACnet technology
- Modbus technology
- Wireless automation technologies
- Building management systems
- Passive houses
- Green buildings

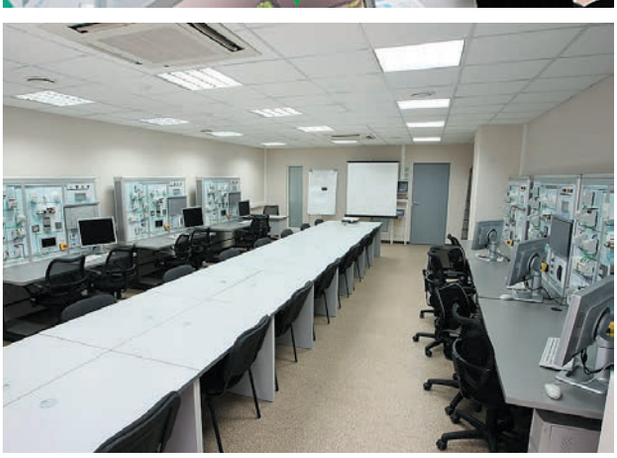
CONSULTING IN THE AREA OF ENERGY EFFICIENCY AND AUTOMATION SYSTEMS DESIGN

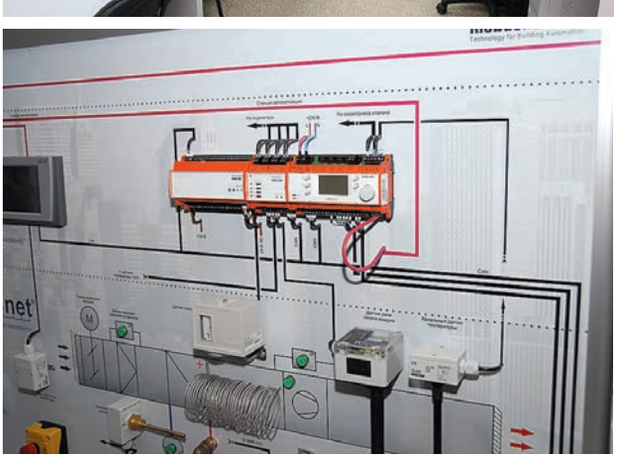
- Engineering systems of buildings
- Fire safety systems
- Environmental protection actions
- Barrier free environment development
- Power saving actions

ENERGY AUDIT, DEVELOPMENT OF ENERGY PASSPORTS FOR BUILDINGS AND STRUCTURES

DEVELOPMENT OF LAB BENCHES, TRAINING UNITS, AND EQUIPMENT TESTING FACILITIES







The Scientific and educational center for information systems and intelligent automatics in construction invests its theoretical research and methodological findings into the nurture of the novel area of research conducted in the Russian construction science and technology, that is, the design, development and operation of intelligent systems of control over buildings, clusters of buildings, cities and areas.

SPECIALIZED LAB OF INTELLIGENT AUTOMATICS (KNX) - LI

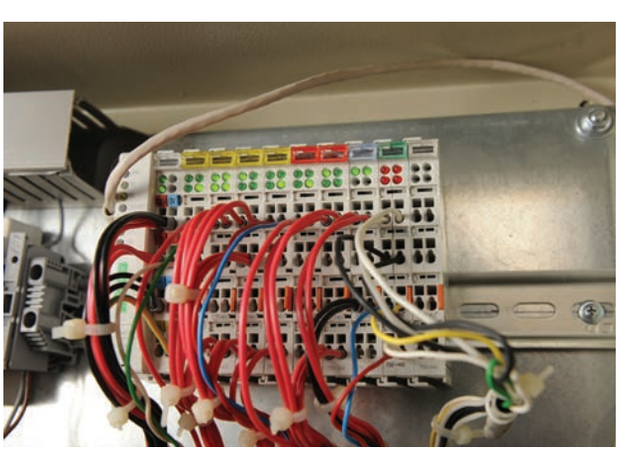
The Lab consolidates eight similar "multi-brand" laboratory benches representing optionally expandable systems comprising sets of elements for the automatic control (models of triggers, control, visualization, and alarm) designated for the physical, mathematical, and information simulation modeling, design, and testing (including the compatibility testing of the systems) of the automatic (intelligent) control over the engineering facilities installed in low-storey residential and office buildings and clusters of buildings.

SPECIALIZED LAB FOR AUTOMATIC CONTROL OVER ENGINEERING SYSTEMS (BACNET) - LII

The Lab operates eight original lab benches, representing optionally expandable complexes of automated engineering systems of the field/automatic control levels, as well as of the control level designated for the physical, mathematical, and information simulation modeling, design and testing (including the compatibility testing of the systems) of the automatic (intelligent) control over the engineering facilities installed in hi-rise residential and office buildings, major clusters of buildings, industrial systems of automation of specialized and unique structures, automation of process cycles.

SPECIALIZED LAB FOR SIMULATION OF SYSTEMS OF AUTOMATIC CONTROL OVER PROCESS FLOWS – LIII

The Lab operates the two sets of modules designated for the simulation of process flows, switching modules, mistake simulation modules, as well as the eight "multi-brand" lab benches, or automated work positions, including the switching panel, the simulator signaling block, the pre-programmable logic controller, the block of sensors, the physical model of the temperature chamber, designated for the physical, mathematical, and information simulation modeling, design and testing (including the compatibility testing of the systems) of the automatic (intelligent) control over the



engineering facilities installed in any buildings and clusters of buildings, using any combinations of any protocols.

SPECIALIZED LAB FOR AUTOMATIC VENTILATION SYSTEMS – LIV

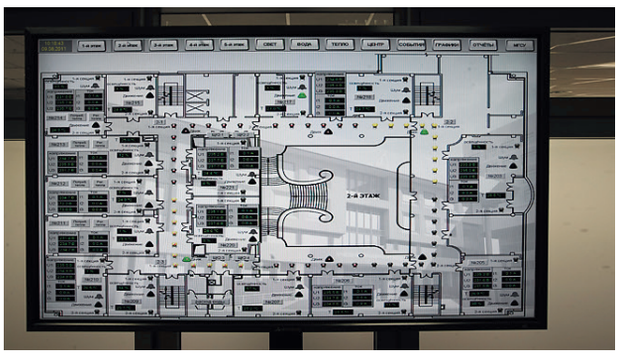
The Lab comprises eight similar "multi-brand" lab benches, representing complexes of modules of programmable logical controllers,sensors (temperature, humidity, pressure), valves, stepped motors, the simulator of sensors and executive units, designated for the multi-purpose physical, mathematical, and information simulation modeling, design and testing (including the compatibility testing) of ventilation systems of buildings and clusters of buildings of any type and size.

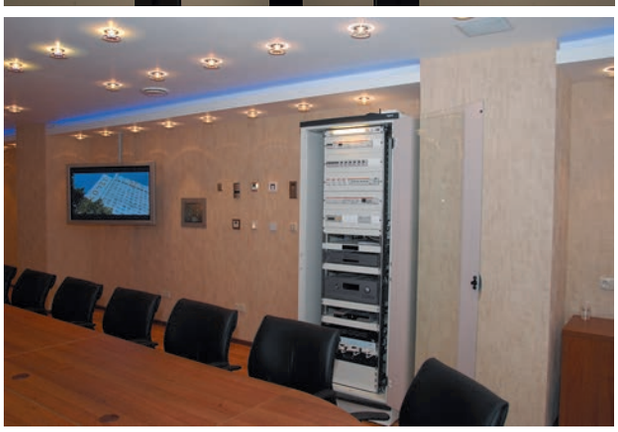
TECHNOLOGICAL FEATURES OF LI-LIV LABS CONFIRMING THE UNIQUE NATURE OF THE RESEARCH FACILITY

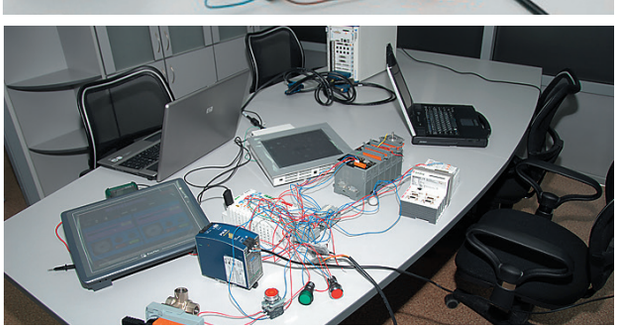
- The platform independence from any producer or protocol in charge of control over the engineering systems
- Unlimited programming of the system, or the bench adjustment to any qualitatively different experimental objectives
- System scalability, or the consolidation of benches into blocks of any combinations, their integration into existing systems of control over the engineering systems of any real facilities
- Mobile deployment of the system is possible
- The remote deployment is possible for the purpose of the organization of distance learning sessions
- The line of the bench equipment in operation (upgradable) comprises items produced by over 25 various manufacturers, including domestic ones
- The bench facility may be used for training and professional development purposes

CLUSTER FOR THE MONITORING AND MANAGEMENT OF ENERGY EFFICIENCY OF BUILDINGS

The cluster for the monitoring and management of energy efficiency of buildings is a unique hardware and software development authored by the Scientific and educational center for information systems and intelligent automatics in construction, designated for the power consumption modeling, to monitor and to control the power consumption inside any buildings, including those scattered over a vast territory, as well as the clusters of buildings having any systems of control over engineering networks operating in the real time mode.







TECHNOLOGICAL FEATURES OF THE CLUSTER DETERMINING ITS UNIQUE NATURE

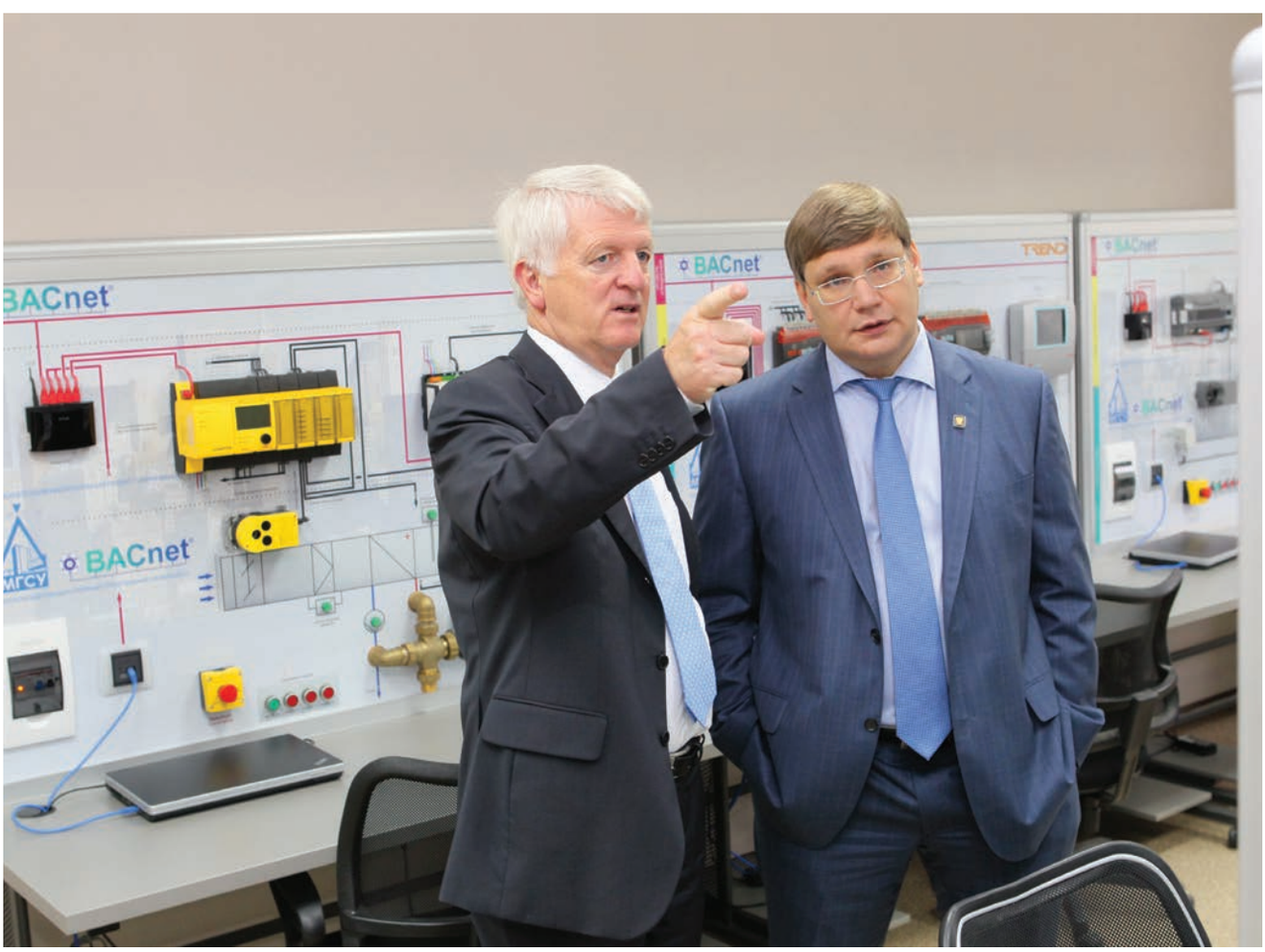
- The platform independence
- Opportunity to perform future-oriented mathematical modeling of power consumption
- Opportunity to verify scenarios of the power balance
- Remote deployment is possible
- The opportunity to conduct compatibility and reliability testing of any components of automated control over the engineering systems of buildings and clusters of buildings
- System scalability
- The system may be used for training and professional development purposes

TRAINING AND DEMONSTRATION CENTER FOR INTELLIGENT AUTOMATICS

The working model of an "intelligent" ("smart") building is a set of advanced future-oriented "multi-brand" equipment and automation technologies designated for the target-oriented and remote monitoring and control over the engineering systems of buildings. The working model is designated for the modeling of comprehensive solutions, interactive user interfaces of intelligent systems; besides, it is applied for training and demonstration purposes.

The DESIGN BUREAU is...

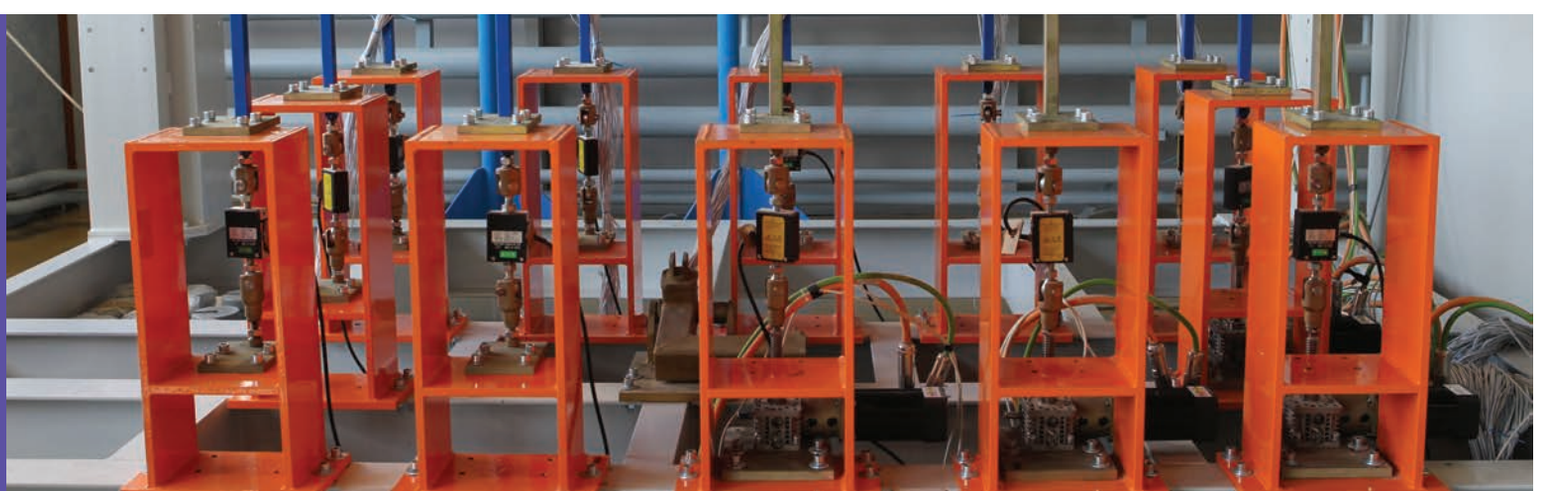
...a set of high capacity computer and office facilities, logically integrated with specialized labs LI-LIV, with the cluster, and with the training and demonstration center for intelligent automatics at the level of open data exchange protocols to ensure the mathematical and computer support of the processes of modeling and design within the framework of pre-set technology trends.


BACnet
BACnet
BACnet

SCIENTIFIC AND EDUCATIONAL CENTER FOR ENGINEERING RESEARCH AND MONITORING OF ENGINEERING STRUCTURES

CHAIRS INVOLVED IN PROJECTS

- Engineering surveying
- Testing of structures
- Metal structures



PRINCIPAL AREAS OF ACTIVITY

MONITORING

- Development of systems for the recurrent and automatic monitoring of the technical condition of building structures in the process of their construction and operation, including structures of high responsibility
- Using advanced methods and devices (robotized tacheometric mapping, laser scanning, GPS measurements) to perform the geodetic monitoring of deformation processes
- Numeric modeling of the behavior of building structures as part of the monitoring procedures:
- finite element modeling of unfavorable impacts (critical setting, loading) and
- emergency situations (progressive collapse analysis) to identify the critical zones and control parameters
- identification of the critical values of control parameters in terms of the stress-strain state of building structures
- using adequate finite element models (FEM models) to assess the stress-strain state of building structures

ENGINEERING EXAMINATION

EXAMINATION OF THE TECHNICAL CONDITION OF BUILDINGS AND STRUCTURES

- Examination of the technical condition of the foundation
- Examination of the technical condition of the bearing and envelope structures, joints and details
- Examination of engineering networks
- Using the laser scanning technology to take measurements
- Verification analysis of the bearing capacity of the structure
- Development of recommendations and conclusions on the basis of technical reports and examinations
- Development of designs towards the strengthening of bearing structures

ENGINEERING SURVEYING

- Geodetic control network for construction purposes
- Surveying control in the course of the construction work
- Geodetic control over the accuracy of geometric parameters of buildings and structures
- Executive geodetic survey
- Geodetic measurements of deformations of beddings, building constructions

GEOTECHNICAL SURVEYS

- Development of wells and shafts
- Geophysical study of soils
- Field study of soils
- Hydrogeological study of soils

ITEMS TO BE MONITORED

BUILDINGS AND STRUCTURES, INCLUDING

- Hi rise buildings
- Large-span buildings
- Unique buildings and structures
- Bridges
- Construction facilities located in areas of high seismic activity

ADVANCED TESTING UNITS

•The model of bearing structures of a multi-storied framed building is applied to control any changes in the stress-strain state of the structures caused by
- Static operating loads
- Wind loads
- Setting of the bedding
- Dynamic loads
- Damaged structural elements

The bench framework has a system of automated loading units and a remote loading control to simulate versatile operating loads.

•The bench for the geodetic monitoring of extended structures is to control the geometric parameters of extended structures using digital video registration devices and intelligent software modules for the post-processing of data inflows.
•The bench for the deformation of vertical structures helps to identify the deviations of the geometrical parameters of big size vertical structures from the design values using tacheometric mapping, laser scanning and GPS techniques.
•Adaptive monitoring systems represent intelligent systems designated for the monitoring of the technical condition of engineering structures using adaptive mathematical models of the items under control.
•Dynamic vibration monitoring systems are used to monitor the technical condition of engineering structures using methods of registration and analysis of oscillations on the basis of the model system composed of the bedding and the foundation.
•SMDS monitoring unit is used to monitor the deformations of buildings, structures, constructions, and soils in the automatic mode. The unit comprises the seismometer, the inclination meter, and accelerometer.
•The set of highly sensitive deformation, temperature, crack propagation, vibration-induced deformation sensors.


Trimble
Trimble
R7
TRIMBLE

SCIENTIFIC AND EDUCATIONAL CENTER FOR WATER SUPPLY AND DISCHARGE

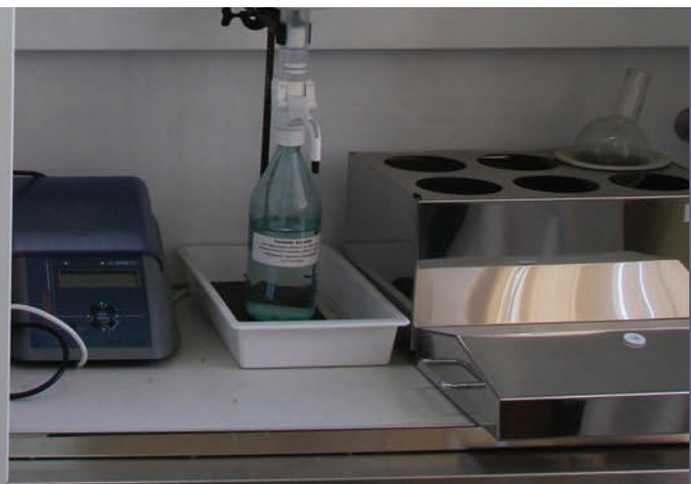
SECTOR OF WATER DISCHARGE

SECTOR OF WATER SUPPLY

ANALYTICAL LABORATORY

CHAIRS INVOLVED IN PROJECTS

- Water supply
- Water discharge and water ecology



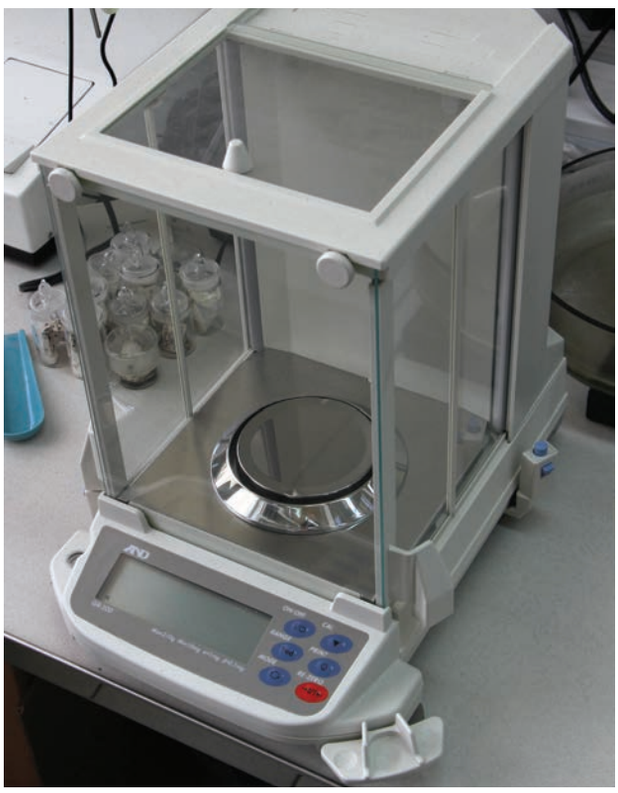
PRINCIPAL AREAS OF ACTIVITIES

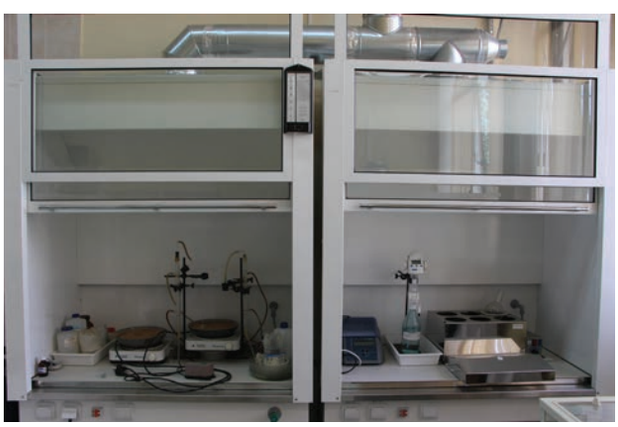
- Development of structural solutions, process flows, network restructuring and performance improvement methods, systems and structures designated for water supply and disposal
- Project preparation, project implementation, R&D, research support of the project preparation and commissioning operations
- Research into samples of natural and discharge water

EDUCATIONAL ACTIVITIES

The training of postgraduate students specializing in

- 05.23.04 – water supply, sewage, engineering systems for the protection of water resources





SECTOR OF WATER SUPPLY

The Sector of water supply is engaged in the research into and development of the most advanced technologies of water treatment, transportation and supply of potable water

The scope of research and applied projects

•Upgrade and analysis of systems of water supply and distribution inside buildings
•Research into the behavior and hydraulic characteristics of pipeline sections and materials
•Improvement of approaches to trench-free renovation and construction of pipelines of water supply and discharge systems
•Development and assimilation of membrane units designated for the treatment of natural and sewage water
•Research into the applicability of nanotechnologies in the water treatment

SECTOR OF WATER DISCHARGE

The scope of research and applied projects
•Development of solutions for sewage water treatment structures
•Development of environmental protection actions
•Development of efficiency improvement methods for the structures designated for the biological treatment of residential housing sewage water, industrial sewage water and agricultural sewage water
•Development of water treatment process flows accompanying the restructuring and upgrade of existing water discharge and treatment facilities
•Preparation of projects to be further developed in the area of systems/structures of water discharge
•The research support extended to the construction and commissioning of the systems and structures of water discharge

THE ANALYTICAL LAB

The analytical lab employs the following certified methodologies to perform the analyses (chemical, biological, etc.) of samples of natural and sewage water in terms of their principal criteria:
•The methodology for the measuring of mass concentrations of nitrate ions in potable, surface and sewage water, using the photometric method and the salicylic acid. Federal Regulatory Document for Nature Protection 14.1:2:4.4-95 (2011)
•The methodology for the measuring of mass concentrations of nitrate ions in natural, potable, and

sewage water, using the fluorometric method and Fluorat 2 liquid analyzer. Federal Regulatory Document for Nature Protection 14.1:2:4.26-95 (2010)

•The methodology for the measuring of mass concentrations of the total iron in potable, surface, and sewage water, using the photometric method and the sulphosalycilic acid. Federal Regulatory Document for Nature Protection 14.1:2:4.50-96 (2011)

•The methodology for the measuring of the water hardness in samples of natural and treated sewage water, using the titrimetric method. Federal Regulatory Document for Nature Protection 14.1:2.98-97 (2004)

•The methodology for the measuring of mass concentrations of "the active chlorine" in potable, surface, and sewage water, using the titrimetric method. Federal Regulatory Document for Nature Protection 14.1:2:4.113-97 (2011)

•The methodology for the measuring of the biochemical consumption of oxygen following n days after the incubation in the fresh surface, subterranean (ground), potable, sewage and treated sewage water. Federal Regulatory Document for Nature Protection 14.1:2:3:4. 123-97 (2004)

•The methodology for the measuring of mass concentrations of oil products in the samples of natural, potable and sewage water using Fluorat 2 liquid analyzer. Federal Regulatory Document for Nature Protection 14.1:2:4.28-98 (2007)

•The methodology for the measuring of the total nitrogen in the natural and sewage water using the titrimetric method. Federal Regulatory Document for Nature Protection 14.1:2.206 -04.

•The methodology for the measuring of mass concentrations of zink, cadmium, lead and copper in the potable, natural and sewage water using the stripping voltametry method. Federal Regulatory Document for Nature Protection 14.1:2:4.222-06, etc.

WORLD-CLASS SCIENTIFIC RESEARCH EQUIPMENT

•Zetatrac laser particle size analyzer measures the size and molecular weight of particles and identifies the electro-kinetic potential (zeta potential) in the highly demineralized water.

•UNICO 2800, Hach Lange DR 2800 and DR 5000 scanning spectrophotometers accurately measure the per centum transmission of the optical density, identify the wave length at the resolution of 0.1 nm and at the excellent timing stability.

•Flourometer Fluorat 02-3M is designated for the fluorometric and photometric identification of concentrations of organic/inorganic pollutants in the

potable and sewage water, including the chemical oxygen demand, oil products, nitrites, phenols, synthetic surfactants, etc.

•Mettler Toledo S30 and Cond 730 conductometers are designated for the measuring of conductivity, salinity, salt content, per-unit resistance and temperature of the liquid samples.

•Ekspert -001-BPK, a portable biochemical oxygen demand analyzer, is designated for the measuring of the biological consumption of oxygen in compliance with the methodology specified in Federal Regulatory Document for Nature Protection 14.1:2:3:4.123-97 "The methodology for the measuring of the biochemical oxygen demand following n days of incubation in the fresh surface, subterranean (ground), potable, sewage and treated sewage water."

•KN-2M concentration meter is designated for the measuring of (1) mass concentrations of oil products in the potable, natural and sewage water, in soils and bottom sediments; (2) fats in the natural and sewage water; (3) non-ionogenic surface active substances in the potable water; (4) hydrocarbons in the atmospheric air, in the working zone air, and in industrial emissions.

•Ta-Lab voltammetric analyzer (the polarograph) is designated for taking measurements using the stripping voltametry method. The admixtures, thus identified, include As, Zn, Cd, Pb, Cu, Hg, Fe, Se, Sb, Sn, Bi, Mn, Co, Ni, Ag, etc.

•Oxitop Control 12, a biochemical oxygen demand analyzer, employs the manometric methodology to analyze the biochemical oxygen demand of 12 samples. Automated measurements are taken each time the temperature value reaches 20°C. The contact with the air is prevented during the whole time period of the analysis. Recordings are made once in the 24 hour period.

•ITAN ion meter is a mini-lab composed of the Ph meter/ion meter and designated for the measuring of Ph and Px, mass and molar concentrations of ions, Eh, or the oxidation-reduction potential, and the temperature in the water and in the water media. This unit is also used as a high resistance voltmeter to analyze the chemical consumption of oxygen, to perform the potentiometric titration and to take other potentiometic measurements on the basis of the appropriate qualitative chemical analysis.

•The roughness tester (the profilometer) is applied to measure the roughness of flat, round and inclined surfaces, and the roughness of surfaces inside slots and hollows having the dimensions of, at least, 80 mm x 30 mm.


BIOHIT Biotrate

SCIENTIFIC AND EDUCATIONAL CENTER FOR GEOTECHNICAL ENGINEERING

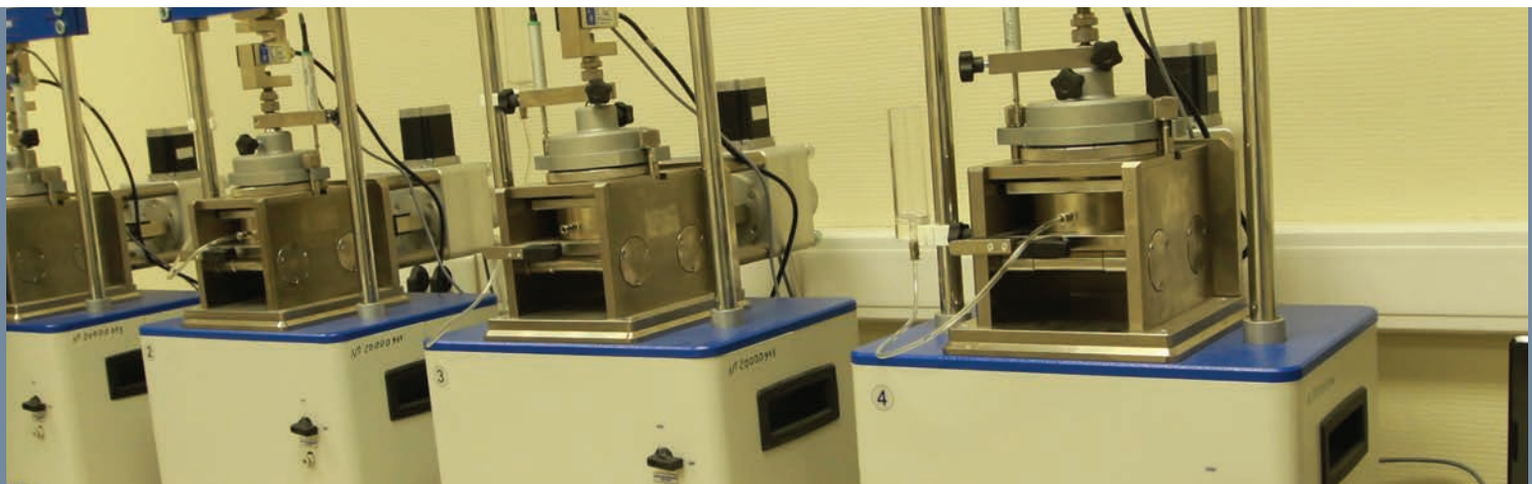
DEPARTMENTS

- Research into physical and mechanical properties of soils on the basis of the findings of lab and field tests of soils
- Numeric modeling of the stress-strain state of the soil body
- Design of subterranean structures and parts of buildings
- Field testing of soils and other materials

CHAIRS INVOLVED IN PROJECTS

- Mechanics of soils, beddings and foundations
- Engineering geology and geo-ecology

The Lab of the Scientific and educational center for geotechnical engineering is authorized by the RF National Accreditation System to perform certification testing.



PRINCIPAL AREAS OF ACTIVITY

- Resolution of relevant problems of theoretical and applied geo-mechanics and geotechnical engineering
- Resolution of research, technological and technical problems in the area of theoretical/applied geo-mechanics and geotechnical engineering
- Compression, shear and 3-axial Lab testing of soils exposed to static, cyclic, and vibration loads
- Computer modeling of the stress-strain state of soil bodies, that serve as the beddings for the subterranean parts of buildings and structures in complicated engineering geology environments
- Design of subterranean parts of buildings and structures, including the fencing of construction pits, design of hollow and deep foundations, water depression and drainage
- Research support of projects and construction works in terms of subterranean parts of buildings and structures, including the technical examination of buildings and structures, geo-technical monitoring performed in the process and in the aftermath of construction

EDUCATIONAL ACTIVITIES

The training of postgraduate students specializing in

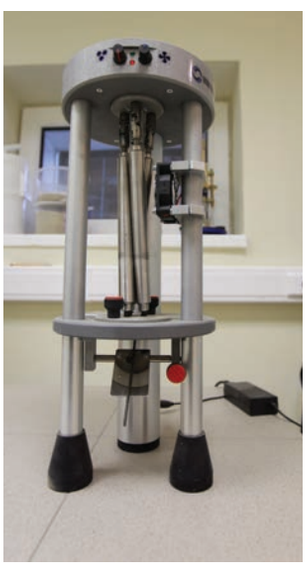
- 05.23.02 Beddings and foundations, subterranean structures

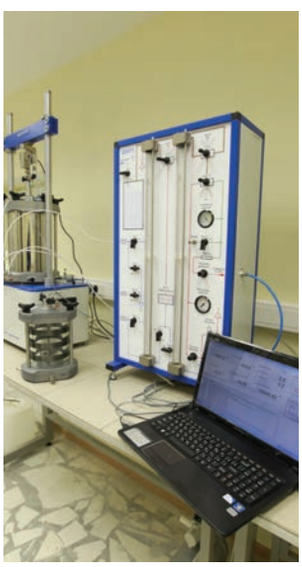
WORLD-CLASS SCIENTIFIC RESEARCH EQUIPMENT

Soils are tested with account for the natural loading and the loading coming from buildings and structures, if the construction pit is ready.

The tests feature static, cyclic vibration and dynamic loads coming from vehicles, machinery and mechanisms, coupled with seismic loads, if any. This methodology makes it possible to simulate the whole cycle of loads transmitted to beddings. These tests are needed to identify the designed parameters of soils and to perform the quantitative assessments of stability, settings, and inclinations of buildings and structures.

- The universal unit designated for the dynamic testing of compressive strength has the following parameters: frequency – up to 100 Hz, and the natural frequency of 5,000 Hz.
- The unit designated for three-axial testing is equipped with a supplementary drive to add the cyclic load of 5 kN/5 Hz.
- The set of testing units designated for the testing of soil samples exposed to three-axial compression by the vertical load of up to 45 kN.
- The set of testing units designated for the testing of soil samples exposed to three-axial compression by the vertical load of up to 25 kN.
- The set of testing units designated for the testing of soil samples exposed to compression by the vertical load of up to 10 kN.
- The set of testing units designated for the testing of cubic samples using three-axial compression.
- Plasticity meter used to identify the limit plasticity value.
- A set of unit designated for pre-compacting and water impregnation.
- The set of testing units designated for the testing of cubic-shape soil samples exposed to three-axial compression by the vertical load of up to 25 kN.
- The set of testing units designated for the identification of physical properties of soils.






Wille
GEOTECHNIK

IMPLEMENTED PROJECTS

The research and technological support of design and construction of the cross-functional residential house and the subterranean parking area:

•The certificate confirming the reliability of completed design and construction and authorizing the further construction of the building was issued

•The numeric modeling of the stress-strain state of the system, including the bedding, the foundation and the subterranean part of the building, was performed

•The ratios, needed to perform the verification testing of the stress-strain state of the bedding, the foundation and the subterranean part of the building, were obtained

•The numeric modeling of the stress-strain state of the bedding, the foundation and the subterranean part of the building was performed

The customer: ZAO SK Donstroy

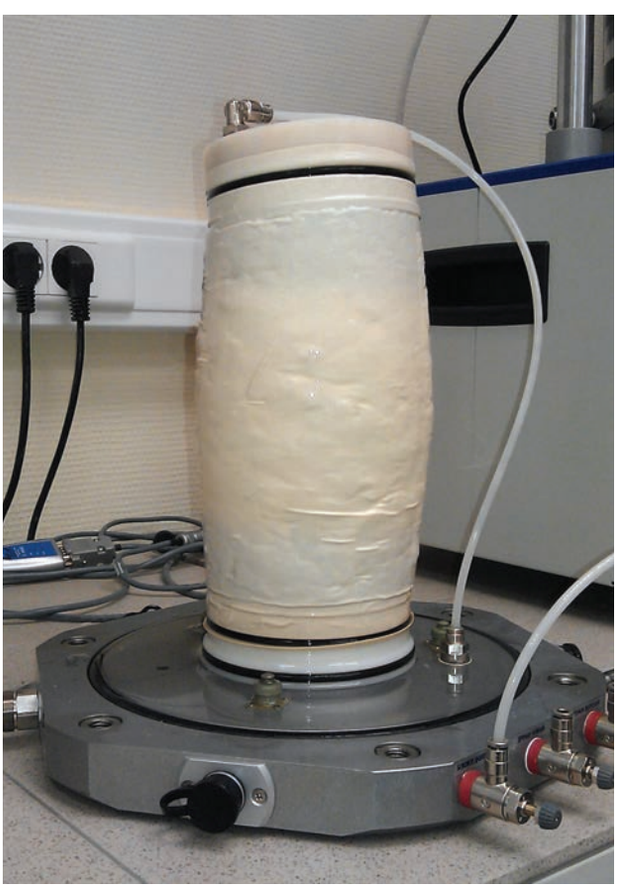
The expert evaluation of the project documentation developed for the mobile power supply units to be installed and commissioned on the three sites to assure the continuous power supply in the Sochi Region during the 2014 Sochi Olympic Games and Paralympic Games, including

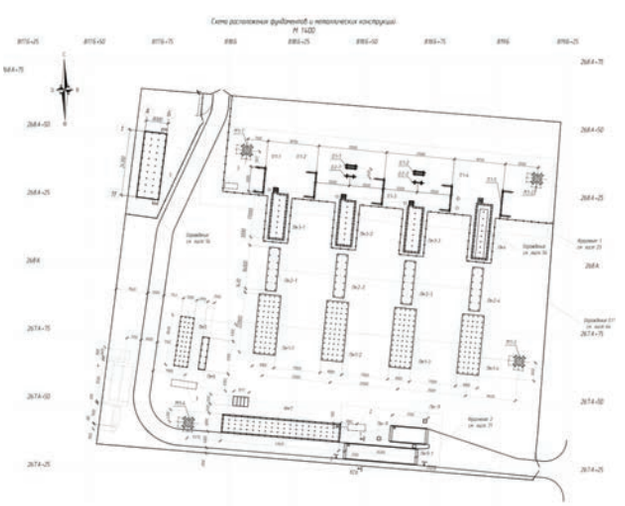
•The optimization of the foundation design

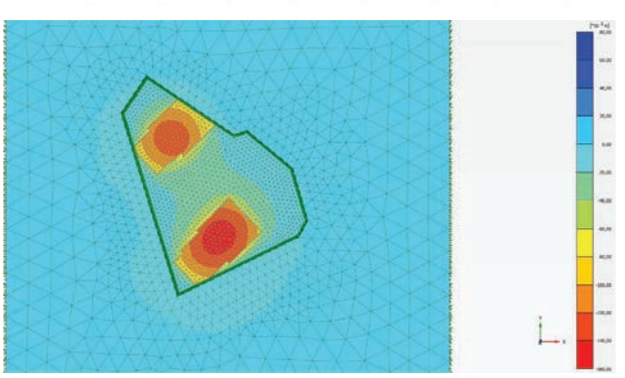
•Compilation of the opinion authorizing the installation of temporary power generators on the above foundations

•Reduction of the cost of construction

The customer: OAO Mobilnye GTES







Lab testing of soils on the site of the railroad platform of the Kozhukhovskaya line, connecting Aviamotornaya station and Nekrasovka station, including
•Reduced reinforcement of tunnel walls on the basis of the analysis performed on the basis of the construction work performed, hence, the cost reduction

The customer: OOO Geoproekizyskaniya

Lab testing of the soils accommodating the foundation of the office building, its subterranean parking area and the in-built transformer plant, including
•The optimization of the foundation design

The customer: OOO BP ESTATE

The research into the physical-mechanical characteristics of the material of the dam core (Rogunskaya Hydraulic power plant)
•Three-axial testing of soils performed in the stabilometer, having the operating chamber of, at least, 100 mm, following the issuance of the soil strength certificate and the technical report

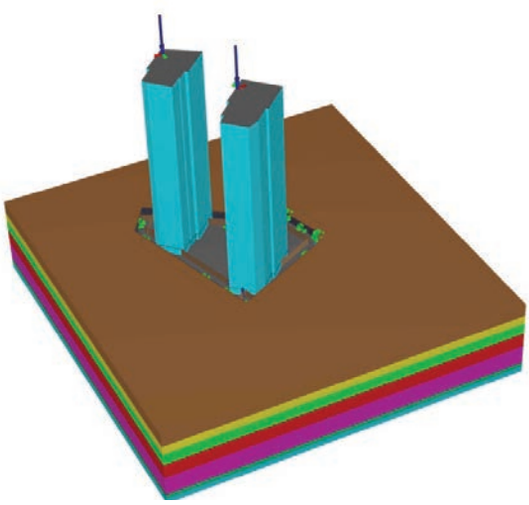
The customer: OAO Yuzhny ITSE

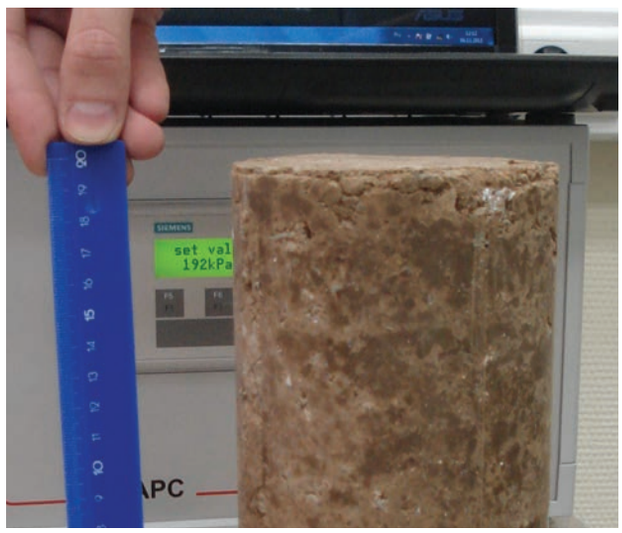
Development of the methodology for the analysis of various sheet-pile structures made of composite materials to reduce the term and the cost of construction, including
•Development of the unique methodology for the analysis of sheet-pile structures made of composite materials

The customer: OAO NIIGrafit

The scientific and technological opinion concerning the optimization of the project solutions applied to the foundations of residential houses in the north western area of Khimki, including
•the specialized lab research completed to specify the deformability parameters and the strength characteristics needed for the non-linear analysis
•the numeric modeling of the stress-strain state of the system, using the 3D FEM method with account for the non-linear properties of soils of the bedding and the 3D hardness of the subterranean part
•optimization of the foundation design solution

The customer: ZAO AMD





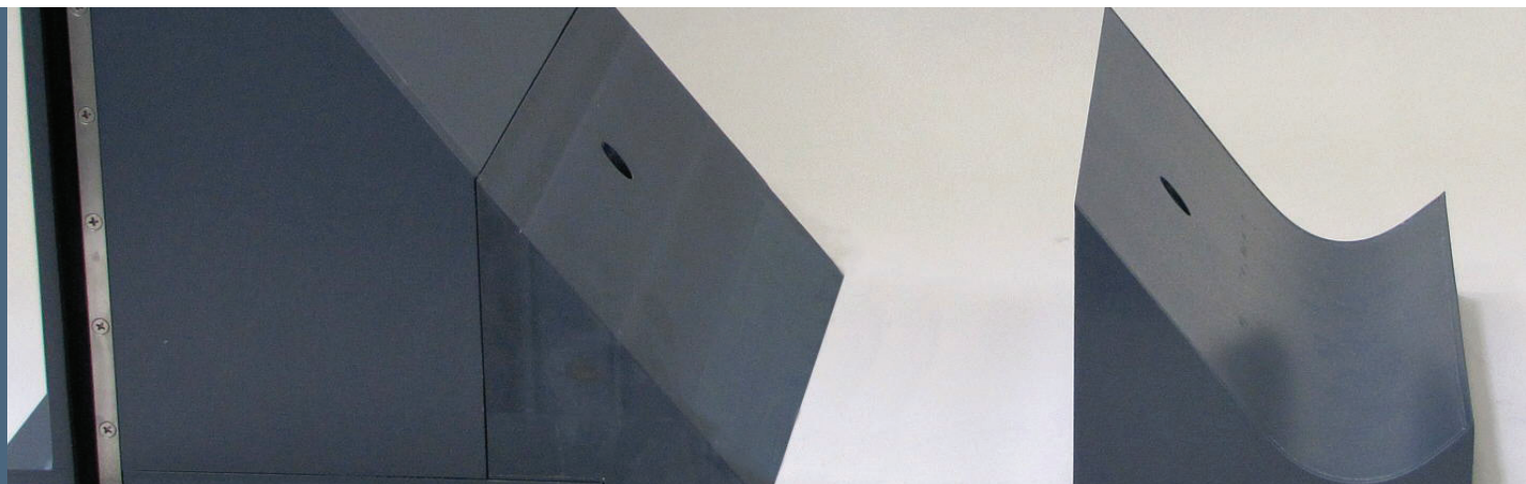
SCIENTIFIC AND EDUCATIONAL CENTER FOR HYDROMECHANICS AND HYDRAULICS

LABS

- Experimental mechanics and hydraulics
- Computational hydromechanics
- Virtual hydraulics

CHAIRS INVOLVED IN PROJECTS

- Hydraulics and water resources
- Hydraulic engineering



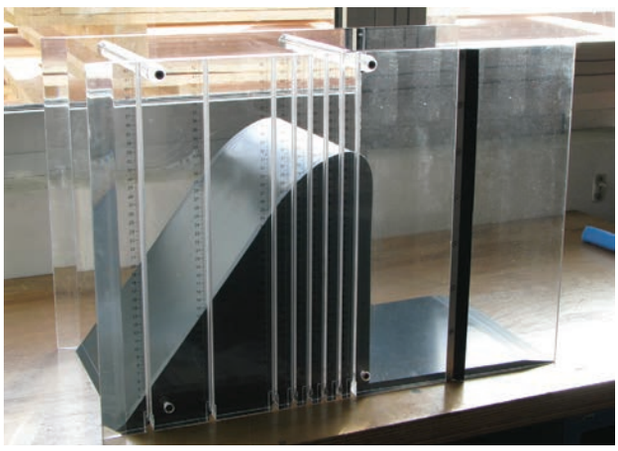
PRINCIPAL AREAS OF ACTIVITIES

THE FUNDAMENTAL RESEARCH

- The turbulence of free and pressurized currents, turbulence intensification and suppression
- The hydrodynamics of the boundary layer
- The hydrodynamics of currents characterized by high velocity gradients
- The hydrodynamics of multi-phase currents
- The hydrodynamics of circular currents
- The hydrodynamics of gravity waves
- The interaction between liquid and solid bodies
- Management of water resources of river basins and river systems on the basis of the digital model of the river network within GIS
- Simulation of hydrodynamic processes, water quality, transfer of admixtures and sediments in beds and mouths of rivers, lakes, estuaries, bays, shore zones, water basins, seas and oceans
- Modeling of urban water supply and discharge systems within GIS

INDUSTRY SPECIFIC RESEARCH

- The hydraulics of hydrotechnical and water management structures, hydraulic power plants
- The hydraulics of structures in the event of substantial aeration of flows, wave formation
- The hydraulics in the severe climate, if the water contains ice and slush ice
- The hydraulics of unstable processes underway inside pressurized water ducts and open channels
- Research into water bed processes
- Environmental impact assessment procedure in the course of design and restructuring of waterworks
- Propagation of contaminations and admixtures in the water environment
- The research into the shoreline erosion caused by wave loads
- Modeling of the flood zone behavior in case of the water level elevation, dam failure, storm-induced floods and tsunamis



ADVANCED EQUIPMENT AND SOFTWARE

The hydraulic flume featuring variable inclination is designated for the performance of lab testing and research in the area of open flows, water spills, spillway basins, aprons, and the wave hydraulics.
The length of the flume testing section is 12.5 m, its width is 300 mm, and its depth is 450 mm. Its maximal water consumption is 32 l/sec.

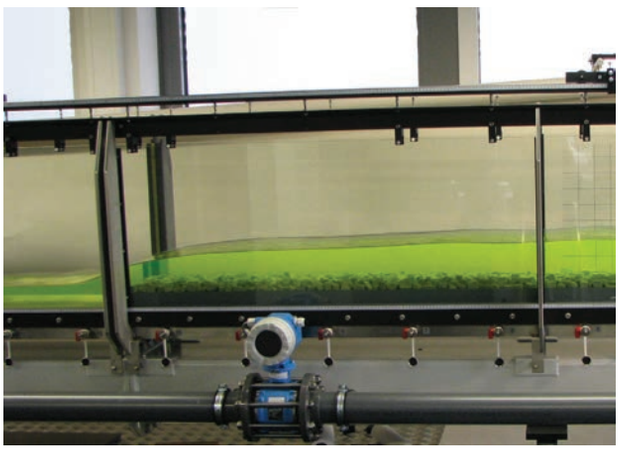
Its technical specifications are:

The pump:
Capacity – 5.5 kW
Max. head – 10 m
Max. consumption – 150 cubic meters/hour

Electromagnetic consumption meter: the diameter – 100 mm,
Measurement range – 0-150 cubic meters/hour
Accuracy class – 0.3
Wave generator: the frequency – up to 100 Hz;
the capacity – 0.55 kW.

The flume is equipped with the following dismountable items:
Thin-walled spillways, including one rectangular spillway, one triangular spillway and one trapezoidal spillway, one spillway having a wide bulkhead, sharp and rounded edges, the Crump spillway. The spillway has replaceable elements interfacing with the bottom of the lower reach, including the smooth radial interface, the trampoline nozzle, the siphon intake, trash screens having flat or round profiles, baffle plates, baffle wells, the baffle block, the culvert, the paddle, the Venturi flume, the Parshall flume, the trapezoidal flume, piles and bridge piers, concrete channel covering and natural pebble bottom of the bed, impermeable and permeable bank slopes.

The flume is equipped with the following measurement devices:
•Piezometric head
•Digital level sensors
•Pitot Prandtl tubes with digital displays
•Micro velocity/temperature meters equipped with digital displays
•High accuracy pressure meters capable of collecting the data from the 16 sensors and transmitting it to the main computer



The Doppler laser measurement system having a 3D frame and the software capable of performing the 3D research into the structure of multi-phase gas-liquid flows.
The laser Doppler anemometer equipped with an adaptive time selection option. The visualization of the velocity vector is designated for the high-precision contact-free measurement of the velocity vector of liquids and gases, as well as the multi-phase media.

Principal technical specifications:
The range of measurable velocities, X, Y components - ± 0.01...30* m/s, Z components - ±0.02...100* m/s, the error of the velocity measurement for X, Y components - ± 0.5%, Z component - ± 1.5%.
The dimensions of the sounding optical field (F = 0.5 m; λ = 0.655 mcm) – diameter = 0.05 x 1mm, the operational life – 40,000 hours, remote control over the experiments is possible.

Distinctive features:
•Visualization in the real time mode
•Wide dynamic range of the light diffusion power
•Reliable lasers of the visible range
•The optical component of the unit needs no adjustments in the course of its operation
•The unit is made from domestically produced elements

•MIKE software. The software comprises the components designated for the simulation of
- River basins, river networks
- Lakes, seas and water storage basins (2D)
- Lakes, seas and water storage basins (3D)
- Floods, water rises and tsunamis
- Ground and surface water
- Water supply and discharge networks.

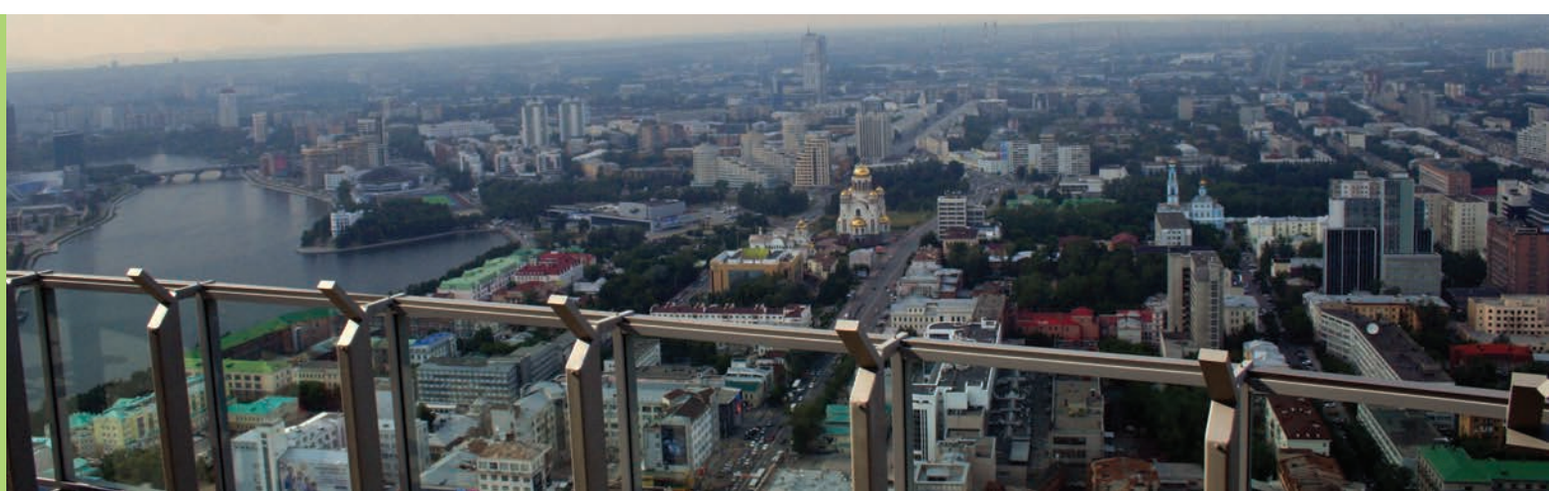
CENTER FOR RESEARCH AND METHODOLOGY OF INDUSTRIAL ALPINISM

CHAIRS INVOLVED IN PROJECTS

- Construction mechanization

PRINCIPAL AREAS OF ACTIVITIES

- Using industrial alpinism methods to examine hi-rise buildings
- Using industrial alpinism methods to examine tower cranes
- The monitoring of ventilated and translucent facades of high-rise buildings
- The testing of the individual gear, including fall arrest harnesses and systems, ascenders and descenders
- Using industrial alpinism methods to design the provision of high-rise services
- Personnel training for the provision of high-rise services in the capacity of “industrial alpinists”, “steeple jacks”
- Scientific research in the area of industrial alpinism
  - Using industrial alpinism methods to assure the safe organization and provision of high-rise services
  - The rescue and the self-rescue along the building façade in emergencies
  - The research into the risks accompanying hi-rise services
  - The testing of the individual gear needed to provide high rise services



ASSIGNMENTS COMPLETED USING INDUSTRIAL ALPINISM METHODS

•The examination of the concrete on the external surface of Ostankino television tower
•The monitoring of the wire rope reinforcement inside the concrete shank of Ostankino television tower
•The monitoring of the granite-covered ventilated façade of the Bank of Russia building
•The control over the mounting quality of translucent facades of the high-rise building of the International Trade Center
•Examination of the ventilated façade of TNK-BP office building
•Examination of the external walls of MSUCE administrative building
•The teaching of industrial alpinism methods to the service teams responsible for the maintenance of facades of high-rise buildings
•The teaching of industrial alpinism methods to riot policemen and special army forces

PARTNERS AND CUSTOMERS

•Ostankino television tower
•The Central Bank of the Russian Federation
•The International Trade Center
•The Ministry of Interior of the Russian Federation


World Trade Center

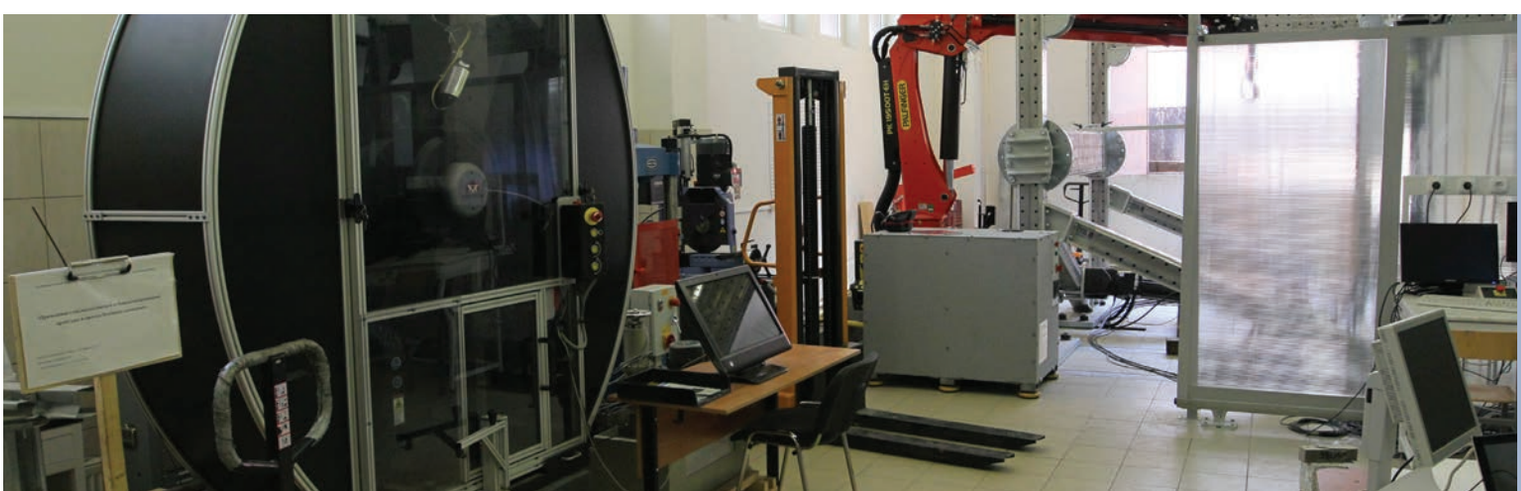

МГСУ

CENTER FOR EXPERT EVALUATION, DIAGNOSTICS AND TESTING OF ENGINEERING STRUCTURES

CHAIRS INVOLVED IN PROJECTS

- Reinforced concrete and masonry structures
- Timber and plastic structures
- Metal structures
- Testing of structures

The Center for expert evaluation, diagnostics and testing of engineering structures is authorized by the RF National Accreditation System to perform certification testing.



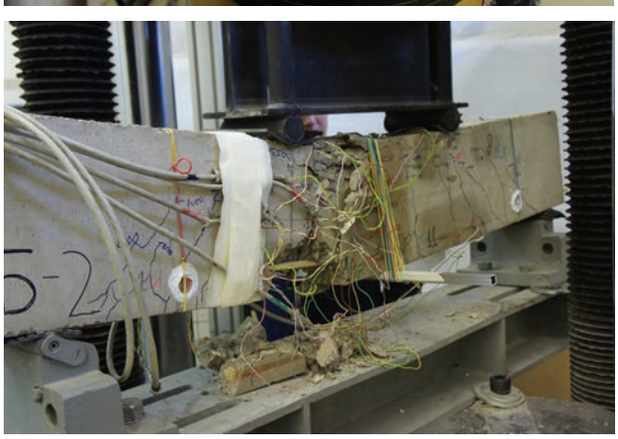
PRINCIAPL AREAS OF ACTIVITIES

- Resolution of the relevant problems of control over the quality of engineering structures and materials
- Static and dynamic testing of elements of engineering structures
- Control over the technical condition of buildings and structures
- Development of methodologies for the assessment of the true behavior of elements of engineering structures
- Static and dynamic testing of big size structures by applying the load of up to 500 tons

EDUCATIONAL ACTIVITY

The training of postgraduate students in

- 05.23.01 Engineering constructions, buildings and structures



ADVANCED TESTING EQUIPMENT AND MEASUREMENT DEVICES MANUFACTURED BY THE LEADING EUROPEAN AND RUSSIAN PRODUCERS

•The unique line of universal electromechanical, hydraulic, and servo-hydraulic testing machines having the maximal loading capacity of 100 – 3,000 kN is used to identify the physical-mechanical properties and to control the quality of metals and alloys, concretes and building mortars, polymers and composites.

•The unique floor-mounted servo-hydraulic testing machine designated for the dynamic loading at the frequency of up to 50 Hz is used to identify the characteristics of cyclic crack resistance, the testing of metals and composite materials in terms of the low/high cycle fatigue controllable in respect of deformations and strain. The unit has a thermal chamber (-150°C...+ 300°C).

•The innovative optical system for the digital correlation of images designated for the lab and field observation of deformation and shear inside the elements of engineering structures. The system is built around the stereo comparator.

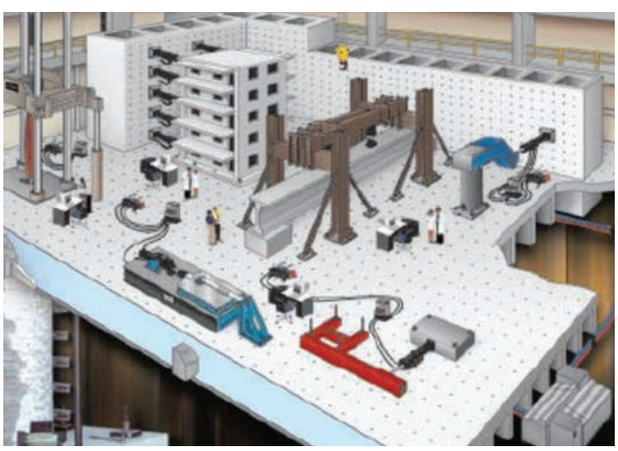
•The system of control over the stress strain state of structural elements of buildings based on the National Instruments complex and the Labview software equipped with 256 measurement channels.

•An adjustable bench designated for the testing of engineering structures exposed to milti-axial static and dynamic loads. The bench can reproduce the loading history, including the loading episodes analyzed in the course of the monitoring session and pre-set in the project documentation. The bench has 6 hydraulic cylinders producing the static load of up to 1,500 kN. The frequency range of dynamic and seismic tests varies from 3 to 20 Hz.

•The universal pendulum impact machine is designated for the identification of the impact viscosity (the failure viscosity) of samples of building materials and products. This machine helps to identify the value of the energy invested into sample destruction by the impact actions. The machine is built around the energy conservation principle.

•The universal adjustable testing bench designated for big size structures exposed to static and dynamic loads. This bench tests the constructions and elements:

- Elements of beams with the span of 3 to 24m, including those exposed to longitudinal loads applied in the two or more points
- Slabs similar to beams having the width of 1.2 – 3.6 m and loaded by the two or more forces



- Big size elements, models of building frames
- Joints between panels and prefab frame elements
- Junctions between monolithic and prefab frames of buildings (junctions between the beam-free slab and the column, etc)

The bench has five hydraulic cylinders producing static and dynamic loads having the total intensity of up to 5,000 kN.

SCIENTIFIC RESEARCH LAB FOR HYDROTECHNICAL STRUCTURES

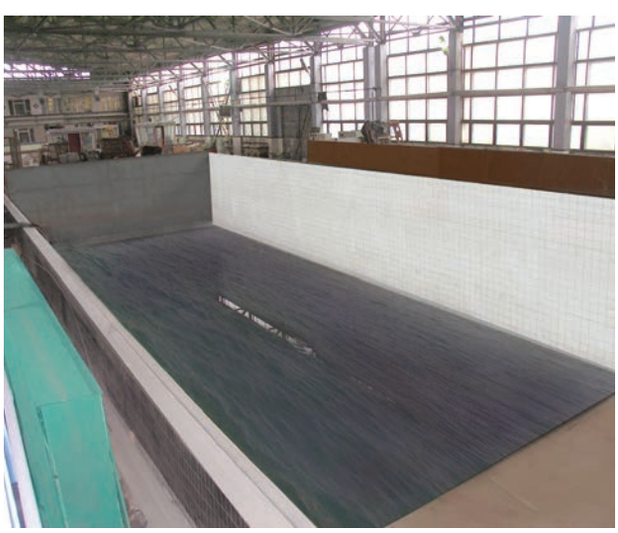
MEASUREMENT SECTOR

WAVE SECTOR

ICE SECTOR

PRINCIPAL AREAS OF ACTIVITIES

- Research into the exposure of offshore and water reservoir structures to wave loads
- Research into the exposure of offshore to ice loads
- Research into the deformability and stability of offshore structures having soil beddings



EXPERIMENTAL RESEARCH EQUIPMENT

•Three flumes are used to check the efficiency of the shoreline protection and to measure the wave loads applied to offshore and water reservoir structures.

•The shallow pool having the depth of one meter and sufficiently extensive dimensions for the large-scale research into existing and designed structures, for the modeling of the protection of the water areas of designed ports from winds, and for the modeling of the sediment accumulation pattern in the approach channels and waterways (the research into the sediment accumulation pattern in the coastal area), for the research into the waterbed processes underway in the course of construction, operation and emergency situations that may arise in respect of various offshore structures.

•The deep pool having the depth of up to 5m is the only pool of this kind in Russia. It can be used to simulate the wind load applied to the models of fixed and floating oil and gas platforms. This is the only test bench used for the testing of underwater engineering works performed under high pressure. The specialists of the Lab can examine the shore protection and water transport facilities in respect of their repair and restructuring. These structures include embankments, moorings, flood gates, dams, etc.

•The unique soil complex. This is the only soil complex available both in Russia and worldwide. The principal soil pool complex has two sections. The dimensions of Section one are 5m x 5m, and it is 4.1 m deep. Section two has the following dimensions: 5m x 8m, and its depth is 3.2m. This complex is applied to test the interaction between varied foundations and soil beddings, including

- The field testing of existing structures and soil beddings and development of recommendations concerning their restructuring and repair

The Lab studies the stress-strain state of reinforced concrete constructions of offshore structures exposed to the combination of technological loads and cyclic temperature loads in the area of variable water levels. The pool is composed of the two thermal pressure chambers each having the working capacity of 0.8m to 8 m, two hydraulic presses and measurement devices.

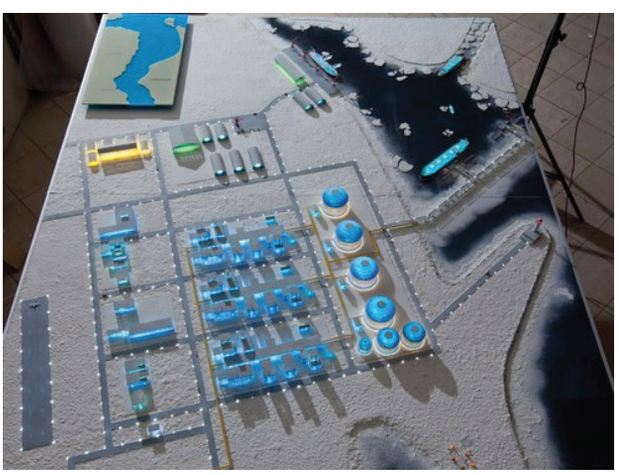
THE MOST SIGNIFICANT RESEARCH ASSIGNMENTS AND IMPLEMENTED PROJECTS

The verification of the parameters of wind waves in the water area of Sabetta sea port, being designed now, on the basis of the physical modeling technique.

The customer: OAO Lenmorniiproject

The physical modeling of the wave processes needed to assure the development of the project documentation to initiate the construction process.
The shoreline/offshore infrastructure in Gelenzhik sea port.

The customer: OAO Lenmorniiproject



The hydraulic modeling of impacts produced on shoreline protection structures in the Imereti lowland.

The customer: NPO Mostovik.

The analysis of the abrasive effect produced by the ice on offshore oil and gas extraction structures and development of their protection methodologies.

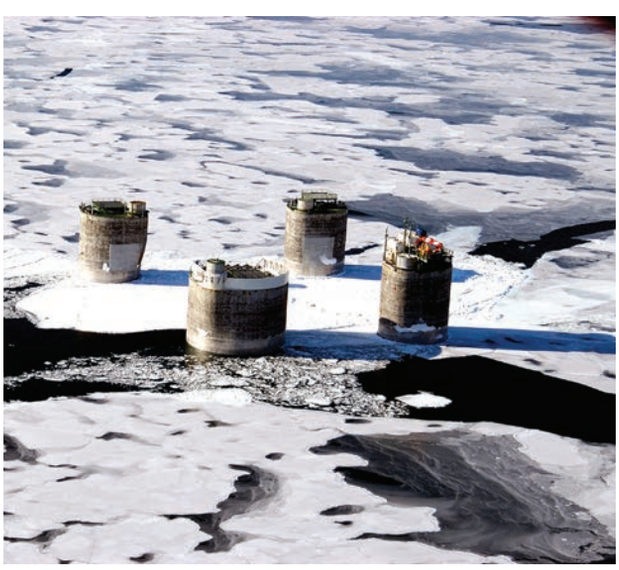
The customer: OAO Gasprom

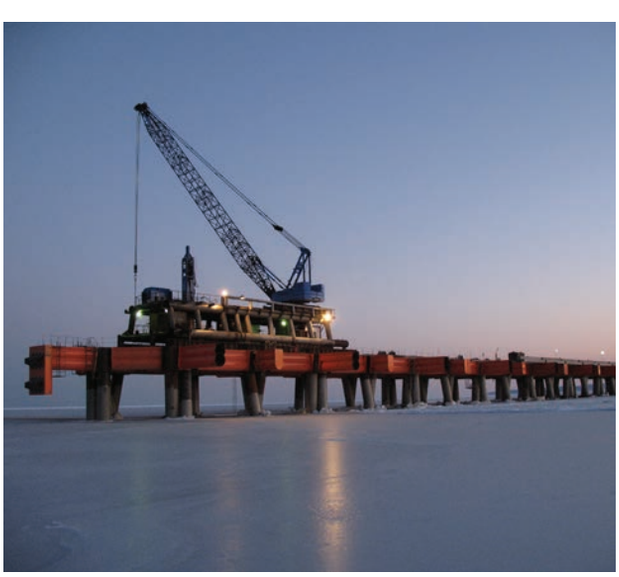
Development of specialized technical specifications needed to identify the ice loads applied to the footings of the shipping pier. The coal terminal of Vanino port, Muchka bay, Khabarovsk region.

The customer: OAO Dalvostniiprojectugol

The research support of the design of a floating nuclear thermal power plant in Pevek, Chukotka autonomous okrug.

The customer: OAO Soyuzmorniiproject





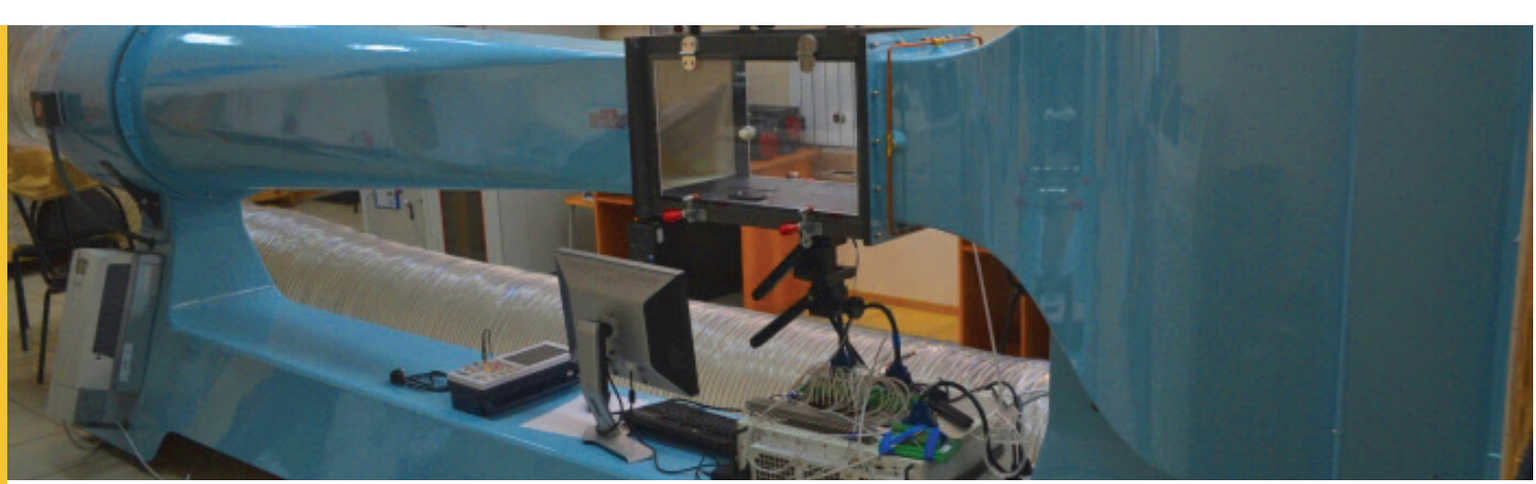
EDUCATIONAL, RESEARCH AND PRODUCTION LAB FOR AERODYNAMIC AND AEROACOUSTIC TESTING OF ENGINEERING STRUCTURES

CHAIR INVOLVED IN PROJECTS

- Theoretical mechanics and aerodynamics

PRINCIPAL AREAS OF ACTIVITY

- Fundamental research into construction-related aerodynamics
- Analytical and experimental research into the impacts produced by the wind load onto high-rise and unique structures
- Analytical and experimental research into the impacts produced by the wind load onto the span structures of bridges
- Analytical and experimental research into the aeration of urban buildings, industrial buildings and special purpose structures



ADVANCED RESEARCH EQUIPMENT

•The wind channel applied for architectural and civil engineering purposes. The wind channel has an extensive operating area (18.9m) needed to provide for the special velocity profile and for the influence produced by the underlying terrain.

Dimensions of the wind channel:
Length – 41 m
Width – 21.25 m
Height – 6.91 m
Length of the closed circuit axis – 96 m.

Parameters of the models exposed to research:
Length – 3.0 m
Width – 3.0 m
Height – up to 1.5 m
The scales of buildings and structures: 1:100, 1:150.
The scales of urban facilities: 1:1,000, 1:2,000; 1:5,000

•The small wind channel lab facility. It is used to perform aerodynamic tests of fragments of urban built-up areas and small-scale models of structures and buildings. Its principal characteristics are:
The flow velocity in the model zone – from 0 to 60 m/c.
Dimensions of the model zone – 30 x 30 x 60 cm.

MEASUREMENT EQUIPMENT APPLIED IN THE COURSE OF RESEARCH

•FlowMaster 2D PIV system can be used for 2D flow field analysis. FlowMaster 2D measures two velocity components in a plane with one camera. It has the following characteristics:
Frequency of velocity field registration – up to 4,500
Operating distance – 300 – 2,000 mm
Section of the operating volume – from 15mm x 50mm to 5,000 x 5,000mm
•LDV 200 MD Laser system of Doppler velocimetry is a diagnostic facility designated for the measurement of the flow velocities in a certain point. It has the following characteristics:
Range of the flow velocities – 0 – 35 m/c
Signal treatment frequency – 10 kHz
Working distances – 500mm, 1,000mm, 2,000mm, 3,000 mm
•Davis software. This software is applied together with LaVision equipment. It performs the research and the qualitative analysis of the 2-component vector fields of

velocities for the turbulent unstable flows of gases and liquids in the pre-set section, and the time resolution is performed using the method of high-speed digital visualization.

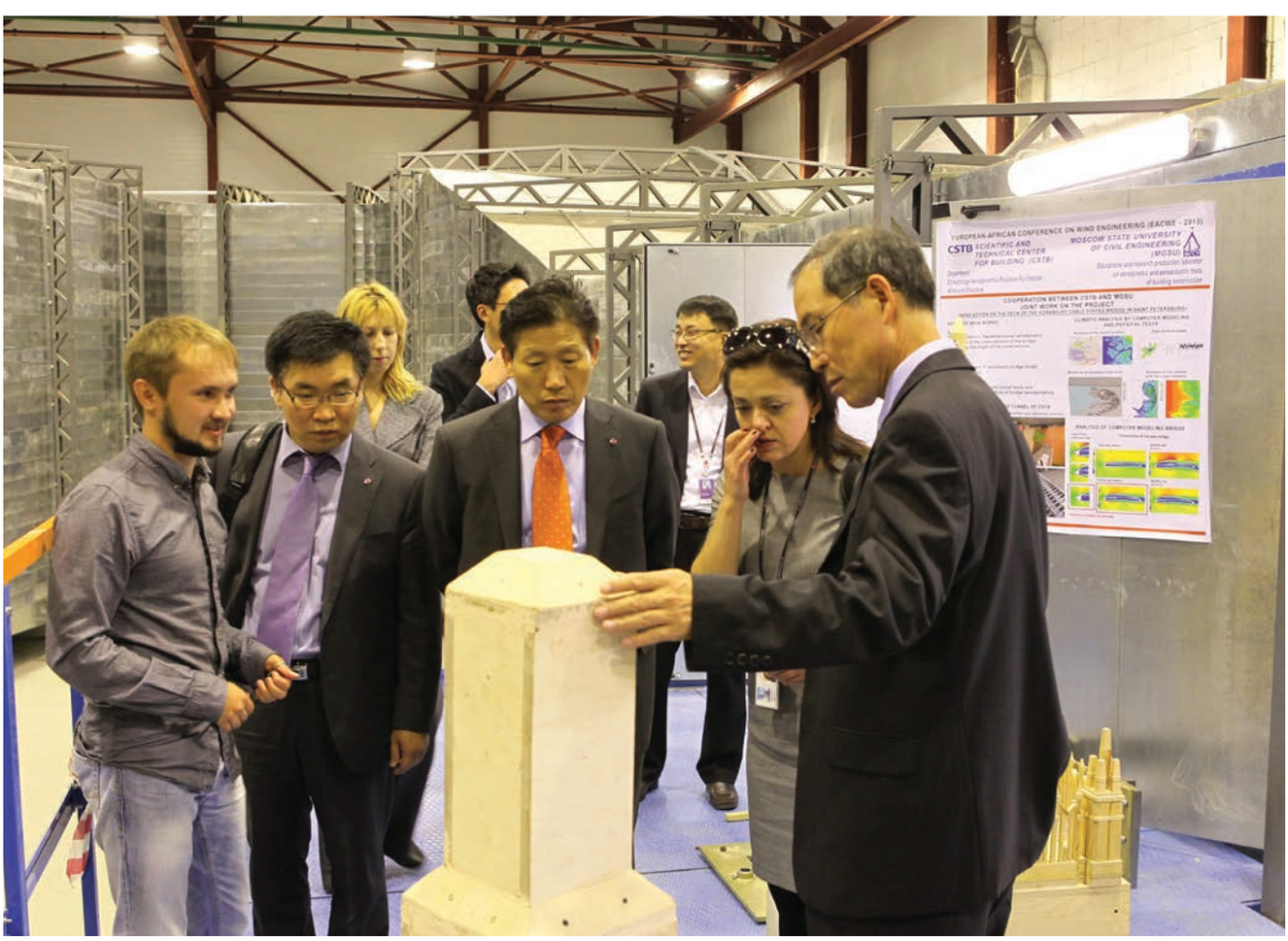
•Atrium software is used in combination with LDA. Atrium identifies the two components of the flow velocity in a point and calculates the pulsation component.

•A set of laser displacement sensors LAS-T. Multichannel pressure scanners (ESP Pressure Scanner) have the pressure data collection center.

•Schunk FTD is a set of strain-gage weighters, and they can measure forces and moments.

•The set of intelligent resistive strain sensors can measure deformations.

•The model production kit is applied to make the models needed to conduct experiments in the wind channel.



IMPLEMENTED PROJECTS:

The verification of the aerodynamic stability of the bridge over the navigation channel in St.Petersburg. 2013.

The customer: ZAO Institut Stroyproject

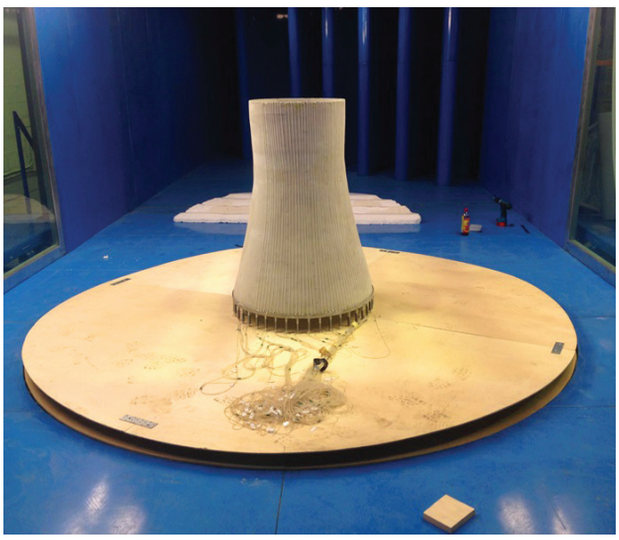
Development of materials needed to correct the project documentation of the Novovoronezhskaya npp, power generators 1 and 2. 2013.

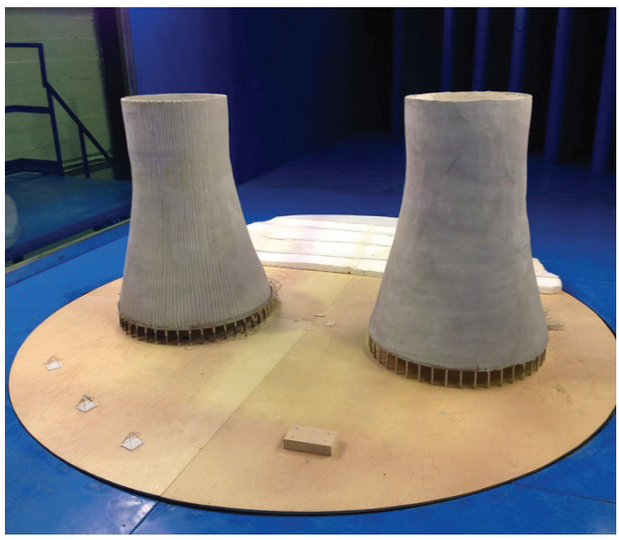
The customer: OAO Atomenergoproject

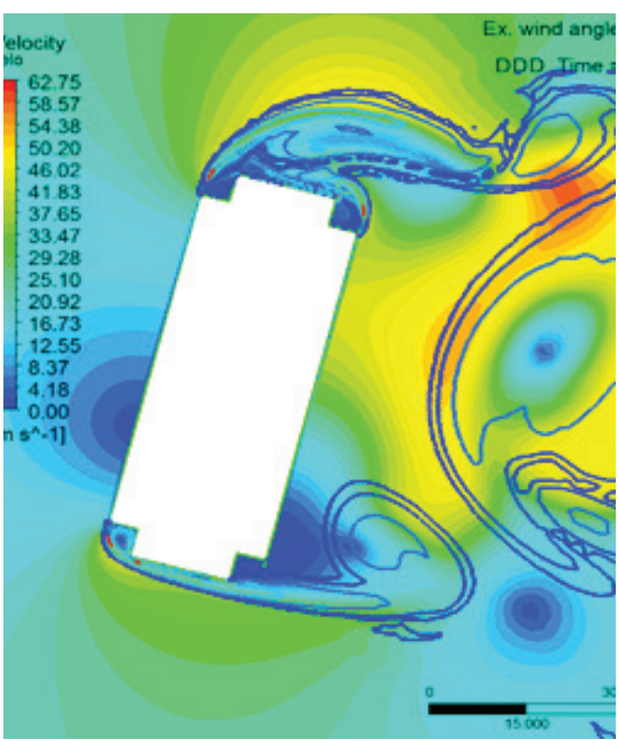
The analysis of the exposure of the administrative building comprising the hotel and the subterranean parking area located at 98 Oktyabrskaya st., Moscow, to wind loads and impacts. 2014.

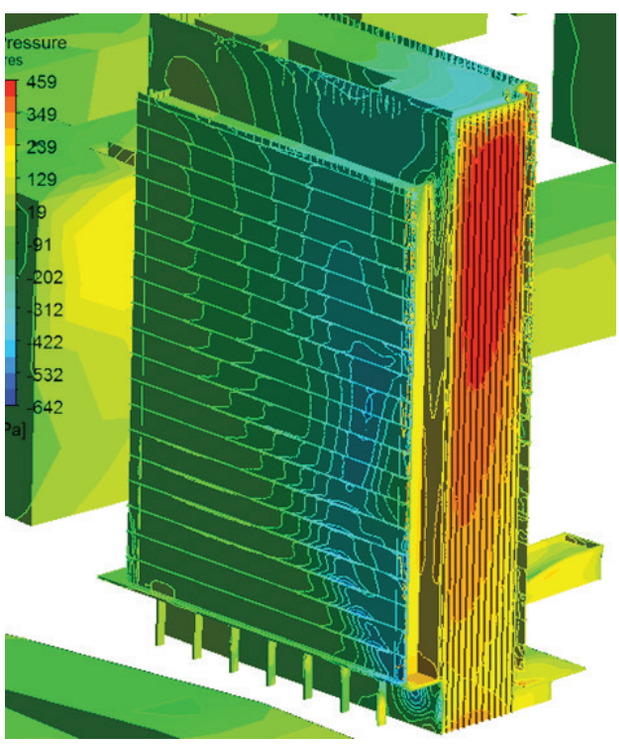
The customer: TSNIIEP zhilykh i obschestvennykh zdanii

The analysis of wind impacts produced on the spire of the building of the RF Ministry of foreign affairs located at 32/34 Smolenskaya-Sennaya sq., Moscow, 2014.






Ex. wind angle
62.75
58.57
54.38
50.20
46.02
41.83
37.65
33.47
29.28
25.10
20.92
16.73
12.55
8.37
4.18
0.00
15.000


459
349
239
129
-91
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-642

SCIENTIFIC RESEARCH LAB FOR EXAMINATION AND RECONSTRUCTION OF BUILDINGS AND STRUCTURES

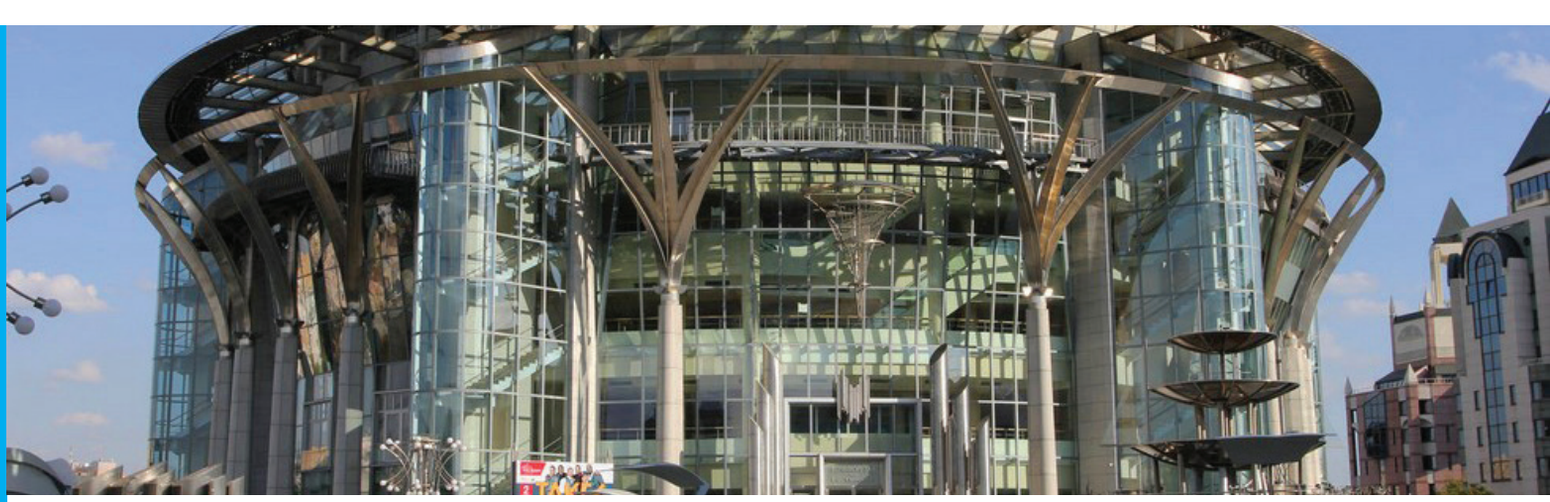
EXAMINATION OF STRUCTURES OF BUILDINGS

ENGINEERING SURVEYS

TRANSLUCENT STRUCTURES

PRINCIPAL AREA OF ACTIVITIES

- Diagnostics and identification of the physical wear of engineering structures
- Quality control of engineering structures and materials
- Monitoring of the technical state and deformation behavior of buildings and structures
- Development of technologies governing examinations, monitoring, and surveying
- Static and dynamic testing of engineering structures
- Computer modeling of the stress-stain state of structures
- Reconstruction –related project solutions
- Topographical surveys and geological engineering surveys
- Expert examination of projects



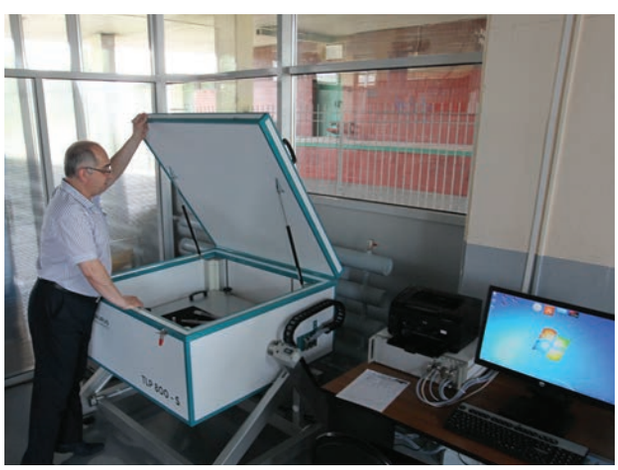



This is the oldest Lab of the whole university STC. It was founded in 1994.

The Lab facilities and resources comprise a variety of measurement and analysis performance tools that can be used on site. The Lab has advanced geodetic units, including Disto A5 electronic distance gauges, Trimbl Dini 22 and Sokkia C3 geodetic levels, 3T5 KP and 3T2 KP theodolites.

•Structural strength control units, including one Original Schmidt hammer, one fault detector Pulsar 1,2, concrete strength meters, including ONIKS OS, ONIKS-2,3, ONIKS 2,5 BETON PRO CONTROL, IPS-MG 4.0.3, one hardness meter TN-140B (for metals); one ultrasonic tester UK1401, and one TICO ultrasonic unit.
•Defect detection devices, designated for the identification of defects of reinforced concrete structures. One ultrasonic low frequency tomography A1040 MIRA, one reinforcing element scanner HILTI, strain meters designated for reinforcing elements DIAR-1, INK-2,3, EIN-MG4, Defect Detector TUD 300, Moisture detector MG4B, thickness gage Time TT 100, one eddy current analyzer VDL-5M, and one protective coating meter for concretes POISK-2.5
•Units designated for the static and dynamic testing of engineering structures. They include surface tension meters (both mechanic and tension resistors). Detectors, deflectometers, clinometers (both mechanic and electronic ones); electronic displacement meters; portable data registrator TS-32K, NI SCKI-1000 strain meter; TEREM-4 multichannel universal registrator of linear and angular displacements, deformations, forces, pressures and vibrations. Sensors and transformers designated for the registration of cracks, linear and angular displacements, deformations of angular elements of structures, Autograph 1, 2 registrator of deformations, vibration analyzer VIBRSN-2.2., Vibration meter VIST 2,4.

Since its very first days, the Lab has accumulated a vast experience in the testing of the unique and high responsibility construction facilities, including the Kremlin buildings, the Grand Kremlin Palace, the Church of Christ the Savior, Moscow International House of Music.



SECTOR FOR TRANSLUCENT STRUCTURES AND FAÇADE SYSTEMS

LABS

- Scientific research lab
- Center for certified testing of translucent structures

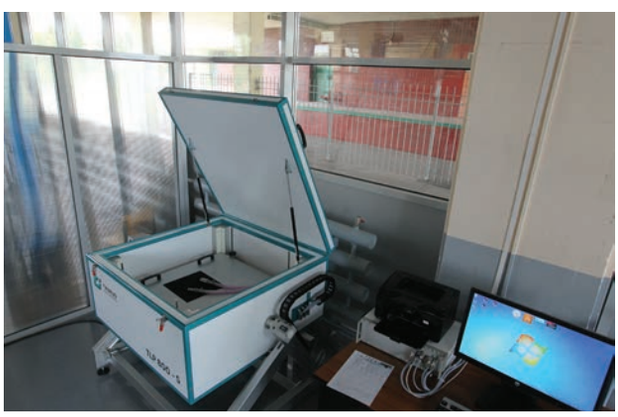
CHAIRS INVOLVED IN PROJECTS

- Testing of structures
- Design of buildings
- The architecture of civil and industrial buildings

The Sector for translucent structures and façade systems is authorized by the RF National Accreditation System to perform certification testing.

PRINCIPAL AREAS OF ACTIVITIES

- The examination, expert evaluation and exploratory research into buildings and structures having large translucent constructions
- The expert evaluation of projects and the monitoring of structures and constructions
- The quality control and the identification of true characteristics of window structures at the stage of their operation and/or supply to construction facilities
- The identification of strength properties of translucent constructions
- The identification of the operating reliability and safety of translucent constructions
- The identification of thermal protection and illuminating parameters of translucent constructions



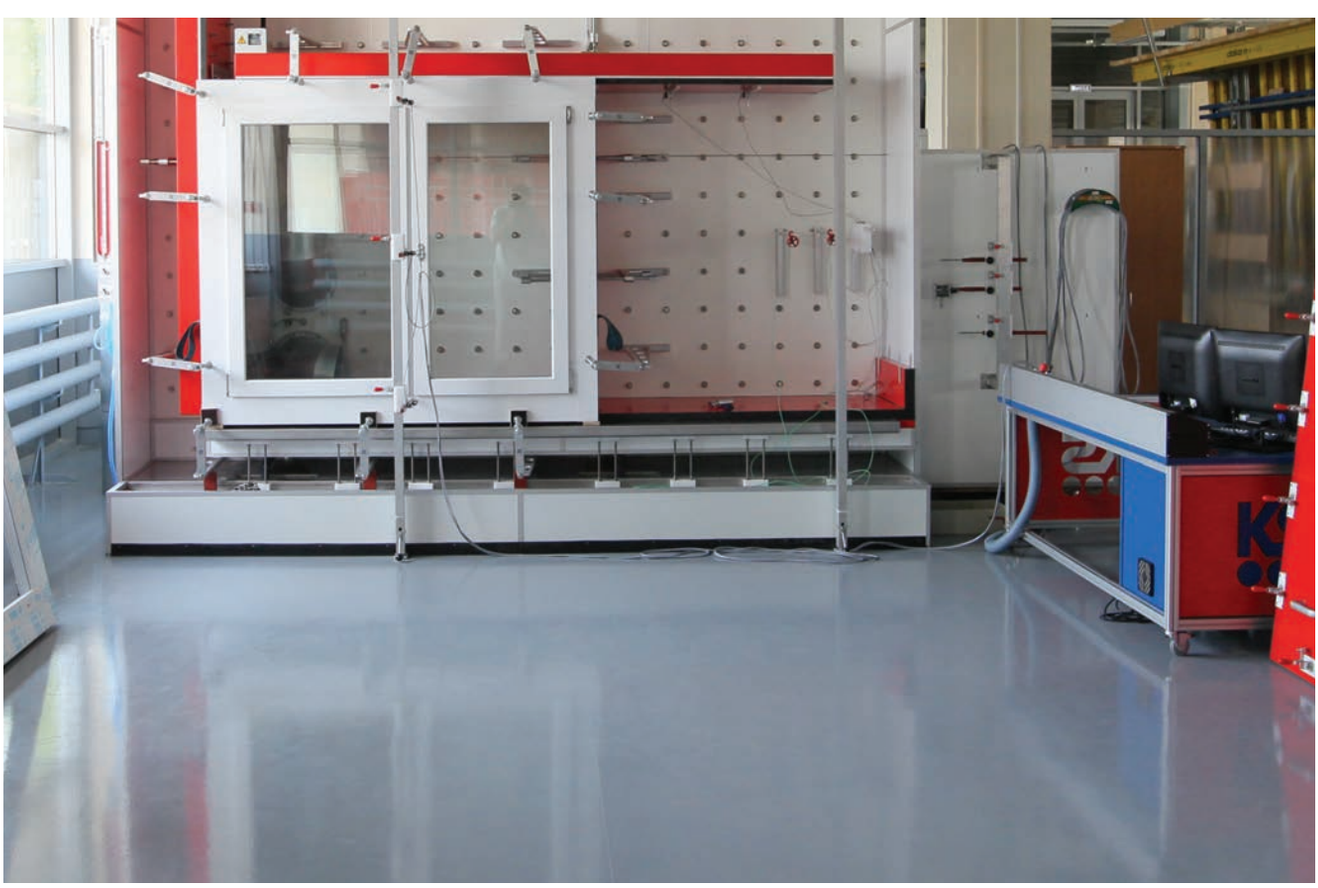
The equipment is designated for the certification testing of window and door units and the assessment of their compliance with the requirements set by GOST 30674-99, GOST 23166-99.

WORLD-CLASS TESTING EQUIPMENT

•KS 3025/650 testing bench is designated to test the air permeability, water permeability, wind resistance, heat transmission resistance pursuant to GOST 26602.2-99, GOST 26602.5-99, GOST 26602.4-99, GOST 26602.1-99, and pursuant to the methodologies contemplated by the European norms and standards (EN). The testing bench is used to observe the deformation of window units exposed to temperature and wind loads.

•KS ZDP 20kN PC bench is designated for the testing of the strength of angular joints of PVC profiles. The testing is performed pursuant to GOST 30674-99, DIN 16830-1, EN 514 and RAL-GZ 716-1. This bench can precisely identify welding defects. The reliability of the fittings fixed to the window unit can also be tested. The testing findings get processed by the bench software and entered into testing protocols.

•TLP 800 S bench checks the thermal conductivity of glass units according to GOST RF 54469-2011, GOST RF 54467-2011, as well as the thermal conductivity of other construction materials. The maximal dimensions of tested samples must not exceed 800 mm x 800mm. the sample inclination angle must fall within the range of 0 - 90°C, and the measurement range is λ = 0.01 – 0.5 Wt/m*K, and the findings get processed automatically. This bench identifies the thermal transmission ratio of the glazing and glass units having versatile constructions, including those having low emission energy efficient coatings.



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