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EDITORIAL BOARD

Research highlights

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

L. N. Gumilyov Eurasian National University (ENU) is the largest higher education institution in Kazakhstan. It is located in the fast-growing city (new capital) Nur-Sultan (former Astana). ENU is the only young university from Central Asia entered the QS Top 50 Under 50.

The university was founded on 23 May 1996 as the result of the merger of Akmola Civil Engineering Institute and Akmola Pedagogical Institute. It was named L. N. Gumilyov Eurasian University in honour of the idea of the Eurasian Union and Lev Gumilyov, a historian and ethnologist, one of the founders of the Eurasianism concept. Eurasian National University (ENU) offers more than 59 majors for undergraduates, over 46 masters and 39 doctoral programs.

International cooperation is conducted through 370 agreements with foreign institutions, think tanks and other research organizations of countries in the EU, USA and Oceania, Asia, Africa, the CIS, and with international research and education foundations, embassies and representative offices in Kazakhstan.

ENU is a member of the Eurasian Association of Universities, Association of Asian Universities, STARNET, Turkic Universities Union, Network University of CIS countries, University of Shanghai Organization, ICRA-Net. ENU is ranked in QS, Times Higher Education, Round University Rankings, URAP. Eurasian Geotechnical Engineering program has a long tradition that is celebrated every year with two invited lectures in honor of Kazakhstan Geotechnical Society core members: The Academic Aytaliyev Lecture in the fall semester and the Academic Zhunussov Lecture in the spring. The program, which is housed in the Geotechnical Institute of Architecture and Civil Engineering Faculty, has a strong emphasis on doctoral and postdoctoral level research. Also we have Affiliated Foreign Faculty with invitations of foreign geotechnical professors from famous Universities in the world.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

The ten faculty members - Askar Zhussupbekov, Zhanbolat Shakhmov, Nurgul Alibekova, Assel Tulebekova, Victor Popov, Abdulla Omarov, Rauan Lukpanov, Elbek Utepov, and Serik Yenkebayev are involved in research covering a broad range of geotechnical areas. Research is connected to the Geotechnical Company (listed at the end) or to individual faculty members of the Geotechnical Institute, Department of Civil Engineering.

Professor Askar Zhussupbekov

Director of Geotechnical institute, L. N. Gumilyov Eurasian National University
President of Kazakhstan Geotechnical Society
Academic of National Engineering Academy of Kazakhstan

Dr. Eng. in Geotechnical Engineering, Karaganda State Technical University, 1996
Ph.D., Saint Petersburg State University of Architecture and Civil Engineering (SPbGASU), Saint Petersburg, Russia, 1985

M.S., Saint Petersburg State University of Architecture and Civil Engineering (SPbGASU), Saint Petersburg, Russia, 1982

Civil Engineer, Saint Petersburg State University of Architecture and Civil Engineering (SPbGASU), Saint Petersburg, Russia, 1977

Member of Editorial Board:

- The Journal of Geotechnical and Geological Engineering (GEGE), USA.
- Journal of Transportation Infrastructure Geotechnology, Springer, USA
- International Journal of Geotechnical and Earthquake Engineering, (IJGEE), IGI Global, USA
- International journal for Computational Civil and Structural Engineering. Begell house, inc. publishers, New York, USA
- Journal on Geotechnical Engineering, Moscow, Russia.
- Journal Bulletin of L.N.Gumilyov Eurasian National University "Technical Science and Technology Series"

Professor Askar Zhussupbekov has participated in more than 130 International Geotechnical Engineering Conferences, which were organized by ISSMGE in the Netherlands, Norway, Finland, Japan, Thailand, China, South Korea, Singapore, Malaysia, Germany, United Kingdom, Italy, Australia, India, Hong Kong, Greece, Brasilia, Slovenia, USA, Saudi Arabia, UAE, Bolivia and other countries.

Dr. Askar Zhussupbekov has travelled extensively to deliver the lectures on geotechnical problems with special ground conditions in different leading universities, societies and companies all over the world. He has published more than 300 international scientific papers, including 6 books on Geotechnical Engineering.

Awards and State Grants

- The 300th Anniversary of Saint-Petersburg Medal under auspices of Mr. Putin V.V. - President of Russian Federation, 2003.
- Governmental Medal "Honorary Builder of Kazakhstan", 2004.
- Medal of Russian Society on Soil Mechanics, Geotechnics and Foundation Engineering by Name of Prof. Gersevanov for Best Paper, 2005.
- International Medal of Kazakhstan Geotechnical Society by Name of Academic T.Zhunussov for the Best paper, 2007.
- Eurasian National University Award for Best Paper, 2008.
- International Medal of Kazakhstan Geotechnical Society by name of Academic Sh.M.Aytaliyev for the Best paper, 2012.

Research highlights (Con't)

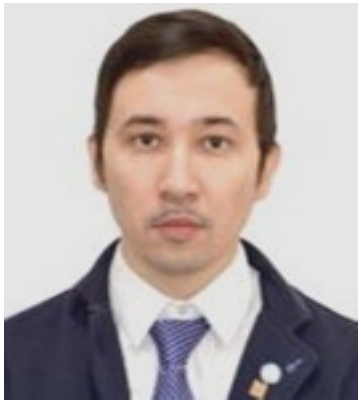
Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

- Scientific Grant "Best Professor for 2006, 2013", Ministry of Education and Science of Kazakhstan.
- The Medal "For merits in development of science of the Republic of Kazakhstan", 2016.
- Award for active work in the field science and education from Ministry of Education, Republic of Kazakhstan (awarded by Vice-Prime Minister of Republic of Kazakhstan, Mrs. Dariga Nazarbayeva), August, 2016.
- Award for active work in the field of science and education, Eurasian National University, 2016.
- The Medal "For merits in development of science of the Republic of Kazakhstan", 2016.
- Award for active work in the field science and education from Ministry of Education, Republic of Kazakhstan (awarded by Prime Minister of Republic of Kazakhstan, Mrs. Dariga Nazarbayeva), August, 2016.
- Winner of the State Scientific Fellowship, Republic of Kazakhstan, 2019

Research interests

The main field of expertise of Askar Zhussupbekov is geotechnical engineering (piling and deep foundations), geomonitoring, undermining soil ground, disaster prevention and reduction, in situ testing. He carries out theoretical and experimental research, as well as consulting work for civil and geotechnical projects at new capital Nur-Sultan (Kazakhstan), West Kazakhstan (Caspian Sea area), Almaty (old capital of Kazakhstan), Saint-Petersburg, Moscow, Yuzhno-Sakhalinsk (Russia).

He is a scientific consultant on pile foundations for such projects as the second generation plant and in Tengiz (Caspian Sea coast) and Karabotan, Kashagan (Atyrau), where the clients are PFD company (USA), AGIP (Italy); the International Airport Project in the city of Nur-Sultan, where the clients are Asian Pacific (Japan) and Alsim Alarko (Turkey); Buildings for the USA Embassy - the client is Fluor Caspian Services, Ltd (USA) and other Mega Projects on problematical soils of Kazakhstan such as EXPO 2017, Abu-Dhabi Plaza, Khan-Shatyr, and Astana-LRT (Nur-Sultan).



Associate Professor Zhanbolat A. Shakhmov

Head of Department Civil Engineering, L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan, 2018

PhD, Civil Engineering, L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan 2013.

M.Eng., Civil Engineering, L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan 2010.

B.Eng., Civil Engineer, L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan 2008.

The author of more than 80 scientific and methodological works among them: articles, manuals, monograph, theses. In 2018, Dr. Shakhmov published an Education Guidance in English on the topic: Influence of the freezing on foundations.

Current research topics

Geotechnical problems on freezing ground soil and experimental investigation in Kazakhstan. The deformation of underground structures of buildings is a main geotechnical problem in the seasonally freezing ground of Kazakhstan. Many factors influence the freezing–thawing of soil, so it is necessary to predict the values of frost heaving and freezing forces. There is tangential frost heaving, vertical frost heaving, and horizontal frost heaving, all of which influence underground structures and could deform them. The value of frost heaving of a soil directly depends on its moisture content, type, physical properties, and chemical composition. If the pores of a soil are filled with water, the soil has an especially high susceptibility to frost.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Testing methods and equipment

The freezing test followed ASTM (American Society for Testing and Materials) standards for comparison with TRRL (Transport Research Road Laboratory) testing, and showed some differences Figure 1.

Figure 1 The freezing test

The properties of soil specimens taken from construction sites are obtained. These features are very significant for the determination of soil frost susceptibility.

Freezing Test Results

The freezing pressure and heaving amount of soil specimens gave different results, which showed the frost susceptibility of the soil specimens. Taking into account the TRRL results, frost-susceptibility properties such as frost heaving could reach more than 18 mm and heaving pressure could reach 4 kg/cm^2. The sample height was 20 cm. Results of this size (to scale) could damage roads and another light weight constructions Fig. 2.

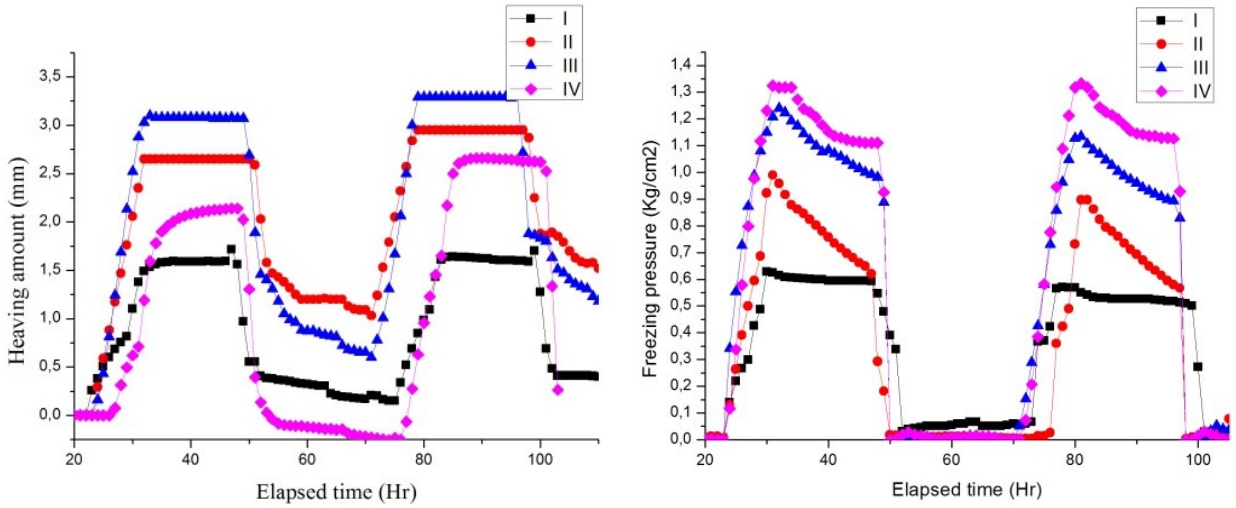


Figure 2 the TRRL results

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Associate Professor Nurgul Alibekova

Ph.D., Civil Engineering, L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan, 2009

M.Sc., Civil Engineering, Karaganda State Technical University, Karaganda, Kazakhstan, 2001

B.Eng., Civil engineer in Industrial and Civil Engineering, Karaganda State Technical University, Karaganda, Kazakhstan, 1999

Research interests include: GIS, pile foundations, model and field testing of piles, solid mechanics, structural mechanics. He is an author of numerous scientific articles, one monograph in his field of expertise.

Current research topics

1. Development of Geo-information database for installation of driving and boring piles

The actual problem for today is the introduction of geoinformation database in the management of urban planning. Development geo-information database and using it in various civil engineering projects largely depends on the accuracy of available borehole information as well as borehole distribution density. The database development has focused in urban areas because of their social and economic importance. Geotechnical database plays a significant role to investigate the regional subsoil conditions prior to detailed investigation. The regional geotechnical characteristics can easily be grasped by the distribution of those soil properties. The Geo-database can provide sufficient and helpful information. Basically, the information including soil classification, gradation, location, depth and coordinates of boreholes, NSPT and NDPT values, and groundwater levels has been entered in the geo-database. By using the geo-database, cross-sections of an area can be easily drawn over the computer screen, and soil parameters such as soil classification, gradation, the thickness of each ground stratum, groundwater level, NSPT values, etc. can also be readily known. The use was also made of the developed geo-database for assessing of the construction site and decrease expenses for carrying out surveys and design work. The given program, includes for today data of 3500 boreholes, 1402 points of static penetration and 525 points of dynamic penetration which has allowed to analyse regional conditions of soils before detailed research (Figure 3).

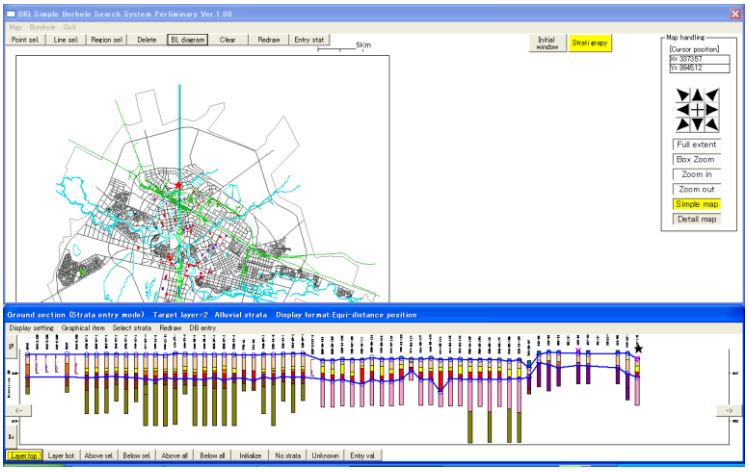


Figure 3 General view of the Geo-information database program

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

1.1 Regional conditions and genesis of soils of Nur-Sultan city

The area of Nur-Sultan city is formed by soils different in their origin and age. There have been marked out six core engineering-geological elements (EGE):

EGE-1 – *Anthropogenic deposits (t_{IV}),* are presented top-soiltop-soil layer (EGE-1a) and filled-up soil. top-soiltop-soil layer, clayey soil has thickness from 0,2 to 0,5 m. filled-up soils consists of the quaternary clayey soil, construction waste, with thickness from 0,2 to 2,0 m.

EGE-2 – *Alluvial medium-quaternary modern deposits a(Q_{II-IV}),* are presented clay soils. It is formed mostly by clayey soil (EGE-2a) with alternation of clayey soil sands (EGE-2b), clays (EGE-2c) and silts (EGE-2d), there are lentils and sand bands of different size up to 1 - 3 cm, sometimes up to 10 cm throughout its thickness. The thickness of alluvial clay deposits changes from 0,9 to 10 m.

EGE-3 – *Alluvial medium-quaternary recent deposits a(Q_{II-IV})* are presented by so-called sand-gravel formations, which consist mostly of sands of different size (EGE-3a), gravel sands (EGE-3b) and gravel soils (EGE-3c). The thickness of sands of different size changes from the 0,4 to 8,3 m, gravelly sands from 0,5 to 6,5 m, gravel soils from 1,0 to 9,2 m.

EGE-4 – *Alluvial strata of residual soil e(C_1),* are presented clayey soil and clay with clay-sandy lenses and gravel soils. The alluvial clay soils was found in the borehole on depth from 6,0 to 10,0 m, and underlay alluvial formations.

EGE-5 – *Alluvial strata in the view prevalent gravelly soil e(C_1)* was found on the depth from 7,0 to 23,0 m.

EGE-6 – *Sediments of lower carbon (C_1)* are presented sandstones, which interleave with a siltstone and a mudstone (argillite) of the same age. They are found on the depth from 11,6 to 26,2 m.

1.2 Zoning of the territory of Nur-Sultan city into conditional-uniform zones

The estimation of the city built-up territory where six core engineering-geological elements (EGE) have been marked out, and the analysis of physical-mechanical properties of soils, make it possible to note, that Geoinformation database program allows also to divide the built-up territory into conditional-uniform zones (according to foundation types).

According to the above-stated sequence of map development for the first group by means of the Geonformation Database program there were marked out engineering-geological sections which allowed to estimate soil positions. On the basis of analysis of the obtained sections it has been revealed, that the mentioned elements form about eight foundation types prior to the bedrock (Figure 4).

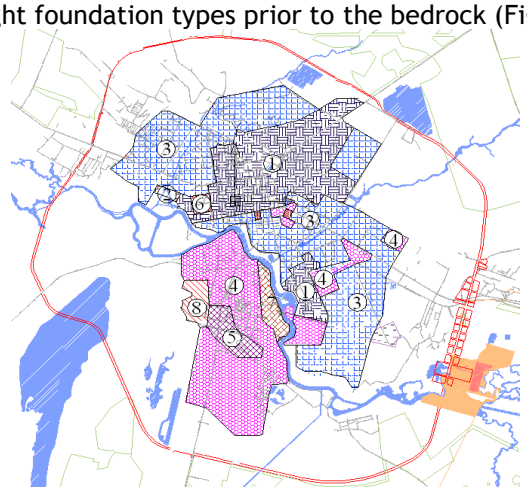


Figure 4. Zoning of the territory of Nur-Sultan city according to foundation types

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

1.3 Zoning of the territory of Nur-Sultan city for optimization length of driving and boring piles

The Geo-information database program also helped (taking field data from similar engineering-geological conditions into consideration) to make a map of engineering-geological zoning for optimization length of driving and boring piles for the buildings of the 2nd (normal) level of responsibility, according to foundation types (Figure 5).

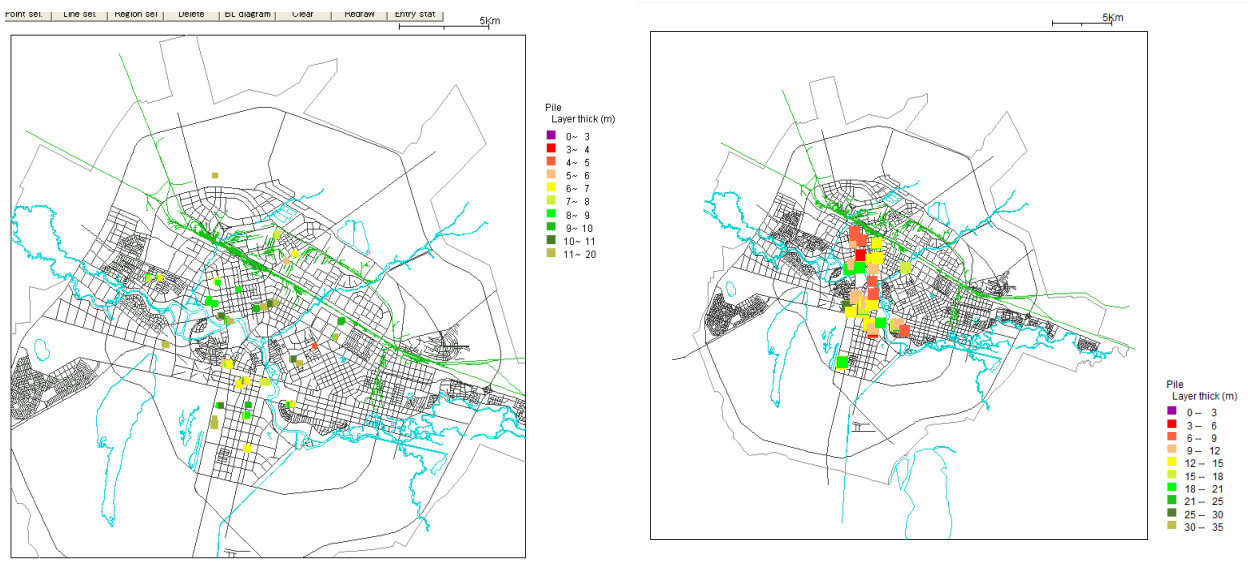


Figure 5 Zoning of the territory of Nur-Sultan city for optimization length of driving and boring piles

The obtained research results show that the Geo-information Database program for Nur-Sultan city and special geotechnical zoning maps for optimal piles length. The use of modern methods of data storage and processing allows to optimize of size of piling foundation of problematical soil ground of new capital of Kazakhstan. Optimization of foundations is one of way for decreasing of cost for new buildings and structures at during time of designing and constructions of problematical soil ground.

Associate Professor Assel Tulebekova
General Secretary of Kazakhstan Geosynthetics Society, 2015
First Vice-Chairman of the Council of Young Scientists, ENU, 2020

Ph.D., Civil Engineering, L.N. Gumilyov Eurasian National University, Kazakhstan 2012

M.Eng., L.N. Gumilyov Eurasian National University, Kazakhstan, 2009

B.Eng., L.N. Gumilyov Eurasian National University, Kazakhstan, 2007

Dr. A. Tulebekova is an Associate Professor of Civil Engineering at ENU. Her research interests are standardization in construction, pile foundations.

During the study period, she underwent a scientific internship at the Ecole desPonts Paris Teach under the guidance of Prof. Roger Frank (2010, 2011, France), the research theme is dedicated to the harmonization of Kazakhstan's regulatory framework in the construction industry with the Eurocode 7.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

A. Tulebekova has published 60 scientific publications in the collections of international and national conferences, in scientific journals included in the database Web of Science, Scopus. The results of research was published with leading scientists of Kazakhstan (Prof. A.Zhussupbekov, Dr. R.Bazilov), «KGS», LLP and are related to the problems of geotechnics and foundation construction in complex engineering and geological conditions. Some of which is: investigation of features of methodic of testing pile by ASTM (USA) and GOST (Kazakhstan) standards.

Current research topics

Pile foundations become more essential during construction of mega projects of the capital of Kazakhstan. Many advanced pile technologies are appearing today. The project provided for dynamic tests on nine sample steel piles. The length of the steel piles is 12 m. Static pile tests were carried out in accordance to the requirements of GOST 5686-12 and ASTM D 1143-18. Figure 1 presented the static testing of the metal pile.

Figure 6 Static testing of the steel pile

The analysis of static and dynamic tests at the construction site showed that the tests performed using the ASTM standard were reliable and gave detailed information about the process of testing and the associated results. According to both standards, the load applied to the pile is transferred by a hydraulic jack installed between the pile head and the support beam and is determined indirectly based on the pressure measurement in the hydraulic «jack-pump» system. However, the Kazakhstan standard does not take into account the fact that when two or more jacks are used, each must be equipped with a manometer. There is thus only one common feature on the manifold. It allows for monitoring the work of the jacks and prevents possible irregularities in their operation, thus avoiding failure in the tests. The results of research are directed to developing of recommendation for modernization of Kazakhstan Codes and oriented to adaptation of advanced geotechnologies.

A.Tulebekova is the winner of the «Best Scientific Work-2019» (ENU), winner of the «Best Report» (TRANSOILCOLD-2019, Russia).

In 2018 Ph.D. A.Tulebekova was ISSMGE Foundation grant recipient and presented the results of her scientific work in the 2nd American-Kazakhstan workshop (Orlando, NY, USA).

At present, A. Tulebekova is working as a member of the research group on two projects '*Development of Web-technology to create a digital terrain model for urban planning of the Western region*' (2018-2020 yy.), '*Development and pilot-industrial implementation of an embedded wireless sensor for non-destructive testing and monitoring of reinforced concrete structures*' (2020-2022).

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Adjunct Professor Victor Popov

General Director LLP "KaragandaGIIZ and K", Karaganda, Kazakhstan

Dr.Eng., Civil Engineering, L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan, 2005

PhD., Geotechnical Engineering, Karaganda Metallurgical Institute, 1999

M.Eng., Geodesy Engineering, Moscow Institute of Engineering Geodesy, Aerial Photography and Cartography, Russia, 1972

Professor Popov is an experienced specialist in the field of geotechnical and design and survey works. At the beginning of his career, he conducted many engineering surveys at various construction sites. He then continued his scientific research in the chosen field, the result of which was his doctoral dissertation on the topic: "Geotechnical problems of foundation engineering in conditions of activation of natural and man-made processes and ways to solve them". The work was defended at the Geotechnical Institute of the L.N. Gumilyov Eurasian National University in Astana in 2005 and was highly appreciated by the scientific community.

Current research topics

Professor Popov has published more than a hundred scientific papers in authoritative specialized editions of Kazakhstan, Japan, Italy, the Russian Federation, Azerbaijan, and North Korea. His most significant work is a fundamental monograph devoted to the analysis of soils on the territory of the new capital of Kazakhstan, Nur-Sultan, which is under construction. According to the calculations of V.N. Popov, the first Kazakhstani skyscraper, an administrative building of 40 floors, later called the "Transport Tower", was first built on complex soil conditions.

Presently, more than 80 % of the facilities of Nur-Sultan City have been erected on the recommendations and on the basis of research by Viktor Popov. Among them are the Akorda Presidential Residence, the Pyramid-shaped Palace of Peace and Reconciliation, the Duman entertainment center, the L.N. Gumilyov Eurasian University, and other architectural masterpieces. This fact is also important - it was Viktor Popov who developed a system of measures to protect Nur-Sultan from flood waters, and gave valuable recommendations on laying foundations and using piles in the construction of structures in the capital.

Professor Popov received emeritus recognition from the state and the international community. He is a Knight of the Order of the "Badge of Honor" and the "Gold Star of the Commonwealth", holder of the "10 Years of Astana" medal. Winner of awards of the International Image Program "Leaders of the XXI century": "Intellect of the nation and "Golden Mercury", the highest distinction of the European Business Assembly (Oxford, Great Britain)" Socrates Award "," Queen Victoria Award "," United Europe ". The French Industry Association honored him with the "Napoleon Medal", and the management of the International University of Vienna granted him the status of honorary professor in the field of economic and business management.

By the decision of the Council of the International Socratic Committee in 2012, he was awarded the title "Name in Science" with the entry of the name of an outstanding Kazakh researcher into the register of the best scientists in the world.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Associate Professor Rauan E. Lukpanov

Head of "ENU-Lab" laboratory of L.N. Gumilyov Eurasian National University (ENU), Kazakhstan

Ph.D., Civil Engineering, L.N.Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan, 2009

M.Eng., Civil Engineering, Karaganda State Technical University, Nur-Sultan, Kazakhstan, 2006

B. Eng. Civil Engineering, Karaganda State Technical University, Nur-Sultan, Kazakhstan, 2004

Dr. Lukpanov is a member of Kazakhstan Geotechnical Society (KGS), from 2010 is a member of ISSMGE, from 2014 is a vice-president of Kazakhstan chapter of the International Geosynthetic Society (KazGS). Dr. Rauan has been the prize-winner of Shamsher Prakash funding for the excellence in practice of geotechnical engineering in 2015. He has more than 100 journal and conference publications, and 10 patents. He is focusing his work on the promotion of geotechnical engineering in Kazakhstan; so that he had participated in development of Kazakhstan geotechnical standards and codes. He had opportunity to participate in scientific projects, including government grants in the field of geosynthetic, geosynthetic materials, pile foundation and its technologies, as well as sustainable energy. Presently, Dr. Rauan is an engineer in practice and has supervised more than 100 geotechnical and civil engineering projects. This helps him to introduce the students to the practical aspects of geotechnics and his connection with KGS and KazGS allow them to get acquainted the students with international geotechnical experience.

Research of geosynthetic materials in geotechnical engineering on Kazakhstan sites

Presently, in the progressive construction development epoch reinforced material diversity has a place on the market of Kazakhstan. Asian and European developed countries are suggesting new reinforced materials and technologies; it is approving superiority of reinforced soil model and its geo-engineering application urgency. In spite of wide proliferation and great world practice reinforced soil modeling is a not enough studied and researched relatively new geotechnical direction for Kazakhstan. Geosynthetic reliability and durability criterion under the interest of engineers of Kazakhstan, and reinforced soil model is one of the progressive solutions of engineering.

Reinforced soil has a practical value for Kazakhstan, with its principal application being in road construction. However, the most problematic objects in Kazakhstan are dams, which are subject to man-made or natural impacts, as a result of which they collapse. The main research approaches for such objects are shown in Figure 7.

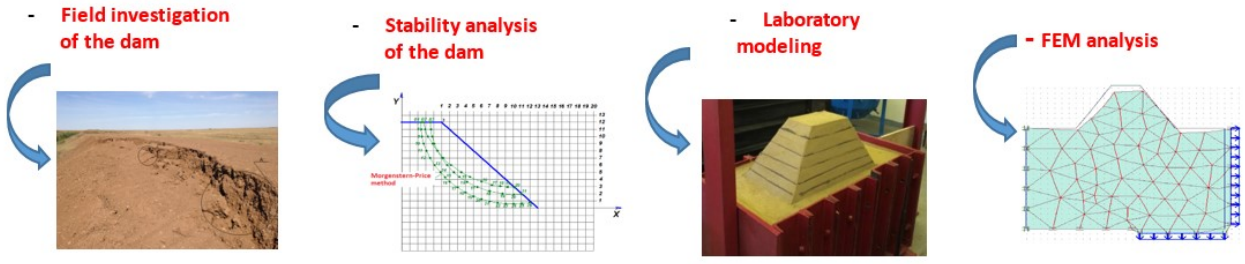


Figure 7 General concept of soil dam research

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

One of the important stages of research is a laboratory modeling, thanks to which it is possible to recreate the critical loading conditions of a structure and make a prediction of behavior in its post-concrete state (Figure 8). As an example, research was carried out on the dam from the sludge of a thermal power plant reservoir at a huge metallurgical plant in the Karaganda region, Kazakhstan (Figure 9). Periodic soil collapse accidents often lead to serious consequences - power plant failures, environmental pollution, flooding of large areas, etc. The assumed trajectory of the slope sliding (according to the results of observations) was interpreted by the equation presented in Figure 10, necessary to simulate displacements during the model tests performance.

Figure 8 Laboratory modeling

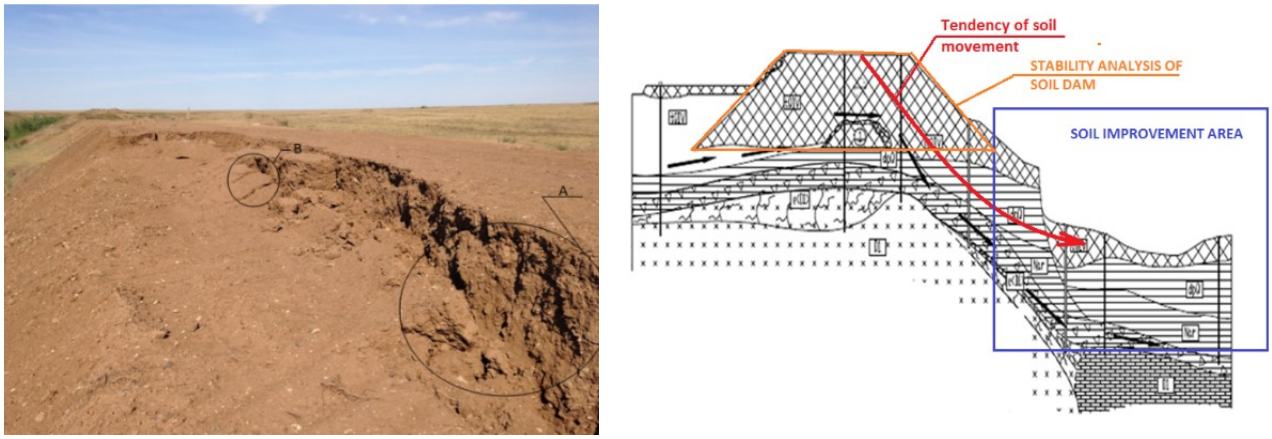
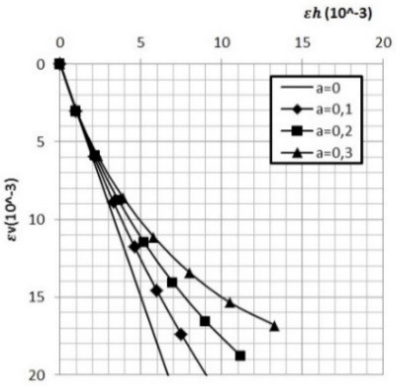


Figure 9 Land sliding of the dam investigation

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University



$$\varepsilon_h^n = \varepsilon_h^1(1 + a(n-1)) + \varepsilon_h^{n-1}$$

$$\varepsilon_v^n = \varepsilon_v^{n-1} + \sqrt{(\Delta\varepsilon_h^{n-1})^2 + (\Delta\varepsilon_v^{n-1})^2 - (\Delta\varepsilon_h^n)^2}$$

ε_h^n- horizontal strain of n step;
ε_h^1- vertical strain of the 1 step;
ε_v^n- vertical strain of n step;
$\Delta\varepsilon_h^n$- increment of horizontal strain of n step;
$\Delta\varepsilon_v^n$- increment of vertical strain of n step;
a – intensity factor of increment horizontal strain to the vertical
(for a = 0, the ratio of the horizontal to the vertical movement is a constant)
n – number of step.

Figure 10 Definition of horizontal and vertical increments for laboratory modeling

Numerical modeling is also an important applied tool for analyzing and predicting the behavior of geotechnical structures. Today there is a wide range of software in the global construction market. Numerical analysis has ample modeling capabilities, allows direct and reverse calculations. So, using the example of an embankment, which has been monitored for more than 20 years, a forecast of its behavior was carried out by reverse calculation: when not exact parameters of the soil obtained from the survey results were set, but their selection was carried out based on the possible range of values inherent in this type of soil, in order to reproduce sufficiently the creep of the embankment in time coinciding with the data of 20 years monitoring (Figure 11).

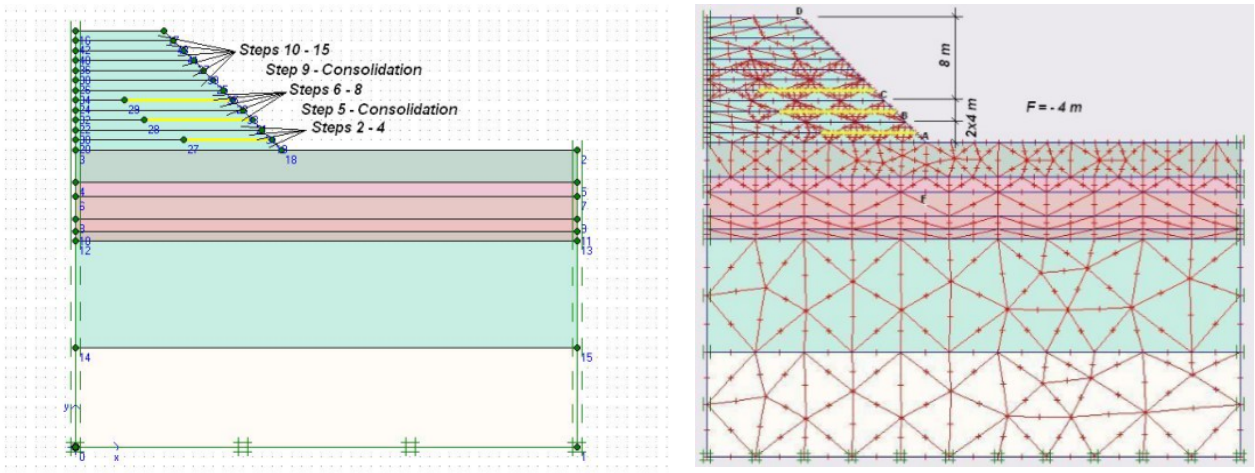


Figure 11 Numerical mesh of geotechnical structure

In any case, applied tools are very important for analysis, however the quality of research results depends on the correct approach and the quality of the survey data.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Associate Professor Yelbek Utepov

Ph.D., Civil Engineering, L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan, 2014

M.Sc., GIS, Carinthia University of Applied Sciences, Villach, Austria, 2016

M.Sc., Civil Engineering, L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan, 2011

B.Sc., Civil Engineering, L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan, 2010

Dr. Yelbek Utepov is a youngest recipient of Ph.D. in Kazakhstan, which was earned at the age of 24. Since 2011, he is a member of Kazakhstan Geotechnical Society (Branch of ISSMGE). He is a recipient of the ISSMGE Foundation Award in 2013. His research interests include: pile foundations, model and field testing of piles, geotechnical modeling, GIS, smart sensors and IT. Under his supervision, nine Masters students and one Ph.D have graduated. He is an author of numerous scientific articles, patents and copyrights related to his fields of expertise. For his scientific activities Dr. Utepov received a State scientific grant for talented young scientists in 2019. At the same year he became an Editorial Board member of Bulletin of the L.N. Gumilyov Eurasian National University. He is a recipient of Grant Funding of scientific projects from the Ministry of Education and Science of the Republic of Kazakhstan for the years 2018-2020 and 2020-2022.

Current research topics

Development and pilot-industrial implementation of an embedded wireless sensor for non-destructive testing and monitoring of reinforced concrete structures

In collaboration with: CSI Research & Lab, LLP, Nur-Sultan, Kazakhstan

The device under development represents an embedded sensor to control the strength gain of reinforced concrete structures, as well as to monitor internal and ambient temperature and humidity that may to some extent influence the structure's strength gain. Current study is conducted under the Grant Funding No. AP08052033. The research team is aiming at enhancing previously developed prototype (Figure 12) and its foreign analogues. The embedded maturity sensors significantly ease the testing procedures, especially for deep foundations (e.g. bored piles), where the influence of surrounding soil parameters and moisture compiled from rainfall and groundwater are sufficient. Determination of the true properties of concrete in deep foundations and their change during curing allows for the solving of many important problems associated with the design of reliable, durable and cost-effective buildings and facilities. The sensors are planned to be wireless and to measure temperature and humidity concurrently at a controlled by user time intervals. It will implement a maturity method to estimate in-place concrete strength, which is considered as an alternative for traditional shock impulse and compression testing methods. The prototype was tested and adequately performed in the laboratory and field conditions. Tests aimed to study the effect of internal and ambient parameters on the concrete strength gain. According to test results revealed that all parameters influence the strength gain to some extent. For a better understanding of how strongly parameters influence the strength as well as each other, proposed a multi-colored cross-correlation matrix technique.

The technique is based on the determination coefficients. It is able to show the value of significance of correlation, its positivity or negativity, as well as the degree of inter-influence of parameters. The prototype testing also recognized the inconvenience of Bluetooth control due to weakness of signal and inability to access several sensors simultaneously.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

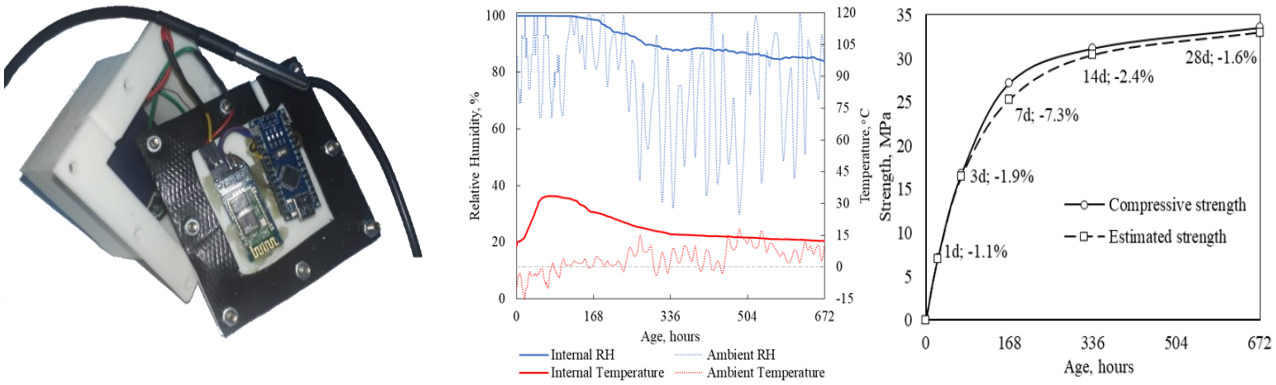


Figure 12 Prototype of embedded wireless maturity sensor and its features

Further upgrading of the prototype is being carried out as part of the funded project. Distinctive feature of the given development from foreign analogues is other protocol of wireless data transfer LoRaWAN which, unlike Bluetooth, allows receiving simultaneously data from several hundred sensors by means of the separate device - the receiver.

The way in which the maturity sensors are placed determines their number required for a particular monolithic building skeleton. Previous studies scarcely address this aspect, providing only logical assumptions. Therefore, our research team proposes an alternative placement strategy for maturity sensors based on transitional boundaries of concrete curing temperature distribution. The transitional boundaries may be determined using the heat map representation of temperature distribution, where the unknown values are computed by the Inverse Distance Weighting method. Based on the experimentally poured concrete slab and randomly embedded maturity sensors revealed that the transitional boundaries form elliptical shapes. The temperature distributions along the largest diameter of ellipses were plot on a single graph, which created regular and reverse parabolas. As a result, the distance between the closest opposite intersections of the parabolas is assumed as the maximum acceptable step to set the maturity sensors. The proposed placement strategy may be applicable for the sensors that measure various continuous phenomena acting in the concrete and in the soil.

Further development of the sensor implies structuration of Big Data workflows (collection, processing and analysis). Thus, it is planned to integrate the data-flow as an entry for structural health monitoring of monolithic building frames during operation of the building, as well as for integration with BIM workflows. The result is a clearer understanding of the quality of the material and the reliability of frame structures.

Associate Professor Serik Yenkebayev

Ph.D., Civil Engineering, L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan, 2012

Candidate of Technical Sciences, L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan, 2009

B.Eng., Civil Engineer, L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan, 2005

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Serik Yenkebayev is the author of over 50 scientific articles. He performed tests of pile foundations, carried out geomonitoring of high-rise buildings on a pile foundation, and developed a project of a pile foundation for high-rise buildings.

Current research topics

At present, Serik Yenkebayev continues to deal with the same issues; he also performs a survey of the foundations of buildings in difficult engineering and geological conditions, design, technology and organization of construction.

1. Improvement of methods for modeling deformations and forecasting the work of the pile-slab foundation of a high-rise building. Performance of monitoring of foundation of high-rise buildings.
When modeling the work of the pile-slab foundation of a high-rise building, it is necessary to use calculation models that take into account the depth of the load application, its dimensions in plan, as well as the stiffness of the pile-soil massif. On the other hand, it is necessary to take into account the provisions of the current regulatory documents and the possibility of modeling the behavior of foundations using the FEM.

Based on the analysis of the work of Professors Znamensky and Gorbunov-Posadov, as well as the analysis of the recommendations of regulatory documents, a method was developed for determining the deformation modulus E_0, taking into account the depth of application of the load and its dimensions in the plan when calculating the settlement of pile-slab foundations of high-rise buildings. The technique of determining the value of the averaged modulus of deformation Eav of the pile-soil massif was used. Calculations of the deformation of the soil base of pile-slab foundations using the Eav parameter were performed by the finite element method (Figures 13 - 18)

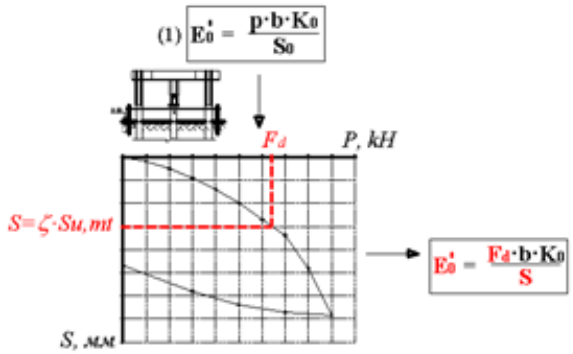


Figure 13 Determination of E_0 taking into account the depth of load application based on tests of the pile-stamp (Prof. Znamensky)

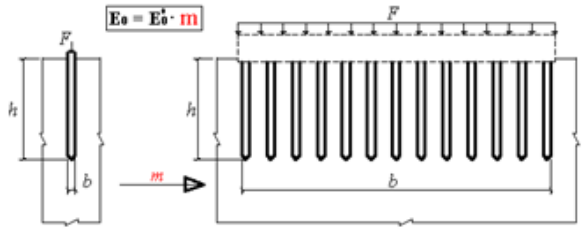


Figure 14 Correction of the deformation modulus E_0, obtained from the results of testing the pile-stamp

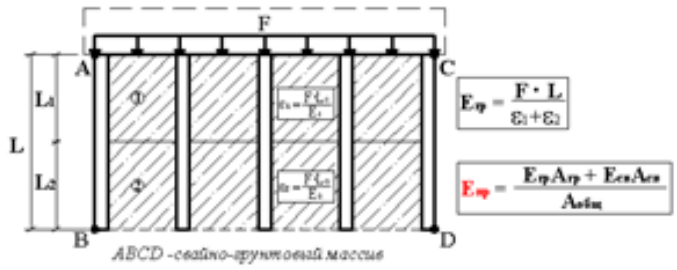


Figure 15 Calculation of the averaged deformation moduluss

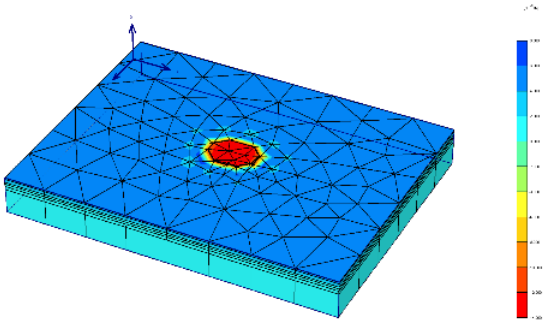


Figure 16 Numerical modeling of pile-slab foundations of high-rise buildings

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

These calculation methods were used to design the foundations of high-rise buildings in Nur-Sultan. To confirm the calculated data obtained, field observations were carried out in order to timely detect deviations exceeding the permissible values of the foundation settlement and the tilt of a building with a height of more than 75 m. Observations were carried out at several objects of Astana city such as: Complex of buildings "Emerald Towers" (average height of 50 floors), Complex of buildings "Talan Towers" (30 floors), Complex of buildings "Green Quarter" (average height of 26 floors).

The research work was carried out in order to identify deformations of the base, settlement and tilt during the construction process, and at the initial stage of building operation.

In accordance with the developed monitoring programs, benchmarks were installed on the construction site, tied to the urban coordinate system, sedimentary marks on the foundation slab and floors of buildings, several levels of geodetic reflective markers on the facades of buildings.

The identified displacements of the foundation slab, both average and along individual points of the top of the foundation and on floors for buildings with a height of more than 75 m, showed good results within the permissible limits. The maximum value of the tilt of the building, revealed during the observation period, did not exceed the maximum permissible values.

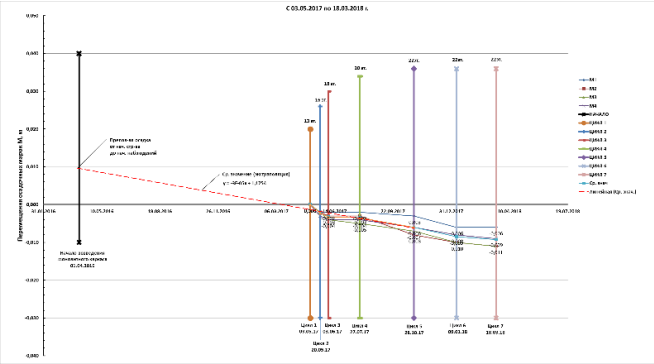


Figure 17 Curves of displacement of sedimentary marks in time from the applied load during the construction of the building

Figure 18 Reflective marks at the 15th floor During monitoring work

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

The ENU GI (Geotechnical Institute of L.N.Gumilyov Eurasian National University) has an established history of inviting affiliated foreign faculty to research advising and teach courses to Masters and PhD Students. Such activities, which broaden the educational horizons for these students, are briefly summarized below. Since its inception, the ENU GI has participated in joint research with invited foreign faculty members. Such activities, which enhance the research programs of ENU graduate students, are briefly summarized below.

Professor Eun Chul Shin
Invited Professor of L.N.Gumilyov Eurasian National University (ENU)
Professor, Incheon National University, Republic of Korea
Vice President of ISSMGE for Asia

Ph.D, Geotechnical Engineering, Southern Illionis University at Carbondale, USA, 1989

M.S, Civil Engineering, University of Colorado at Boulder, USA, 1987
B.Eng., Civil Engineering, Chungbuk National University, Republic of Korea, 1983

Professor EC Shin has been served an adjunct professor in the Ph. D program of the Geotechnical Institute at the L. N. Gumilyov Eurasian Ntional University (ENU), Kazakhstan, where he has been teaching Ground Improvement and Soil Reinforcement, Geoenvironmental Engineering, Rock Mechanics, and Soil Mechanics Laboratory since 2006. He has been scientific consultant for 6 Ph.D Students, who have a specialized in ground improvement by using PVDs, as well as roadbed reinforcement by utilizing Geogrid.

Research Activities of Affiliated Foreign Faculty
The various methods to determine the shear strength parameters were also presented in terms of thoretical and experimental expressions for use in the estimation of pile bearing capacities in clayey and sandy soils. The level of groundwater table, effective stress concept, group pile efficiency, PDA analysis are also described in the process of scientific consultations of ENU Ph.D students. Professor Shin also taught the experimental work for freezing soil laboratory test of Kazakhstan soil which is necessary to understand the heaving and thawing behavior, and freezing pressure of subgrading soil as a roadbed material under the freezing temperature. The concrete pile foundations in Kazakhstan are subjected to freezing environmental conditions, which influence the bearing capacity of pile foundations. The characteristics of bonding strength and shear strength parameters depend on the types of soil, pile, moisture contents of soil, and freezing temperature.

Internship Program Between MS ENU Students and INU Students
The more than 100 M.S. Students of Building Construction Material has been trained from 2015 to 2018 at the Incheon National University(INU) as a part of an International collaboration program of Creative Educational Program for Future City Design, which is supported by the Ministry of Education in Korea. The MS students took the construction-related classes and also classes of soil ground and concrete. The Civil Engineering faculties of Euransian National University had a technical training workshop together with the facuties of INU in July 2016, at Songdo, Incheon, Korea. Professor Shin, as a Director of Future City Education Program, fully supported not only in class lectures as well as visiting Korea Railway Research Institute and Korea Institute of Construction Technology, and field construction sites such as tunnel,Kyungin Canal, apartment complex, and a highrise building in Seoul Metropolitan area. A 10-studenrs team of INU attended the 8th Young Asian Geotechnical Engineering Symposium in august 2016, which was held in Nur-Sultan City (Kazakhstan) and made a technical trip to Transportation Research Institute and Earthquake research Institute in Almaty (Kazakhstan). Professor Shin hosted the Second Kazakhstan-Korea Geotechnical Joint Seminar in August 2012 at INU under the umbrella of the ISSMGE.

He collaborated with Geotechnical Institute of ENU and Kazakhstan Geotechnical Sosiety to host 3 International Conferences, namely July 2007, Disaster Prevention and Reduction at Yuzhno-Sakhlinsk, Russia, May 2016-Cold Region Development in Incheon, Korea, and the 8th YAGE in Nur-Sultan City, Kazakhstan.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Professor Yoshinori Iwasaki
Invited Professor of L.N.Gumilyov Eurasian National University (ENU)
Executive Director Geo-Research Institute, Japan

Dr.Eng., Kyoto University, 2002, Japan

Ph.D. in technical sciences, Karaganda state Metallurgical Institute, Kazakhstan, 2001

M.S., Geotechnical engineering, in from faculty of engineering, graduate school, University of California, Berkeley, USA, 1969

B.S., In geophysics, Faculty of Science, Kyoto University, Japan 1964

Professor Yoshinori Iwasaki has been working on conservation of cultural heritage and study of geotechnical boring data in Osaka in terms of active faults.

Research Activities of Affiliated Foreign Faculty

Here recent results of Geotechnical study is introduced Bayon Temple is a UNESCO World Heritage in Angkor Thom, Cambodia.

Figure 19 Bayon temple, Angkor Thom

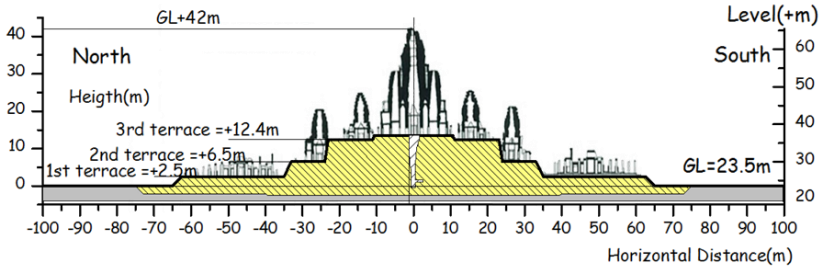


Figure 20 Sandy filled mound to support the high central tower by shallow direct foundation

The tall central stone masonry tower of 31m in height is founded upon simple base stone of shallow direct foundation without no piles upon manmade filled sandy soil of 14m in thickness.It is a common fact that structure based upon filled sandy mound is unstable under rainy season and easily failed in heavy rain.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

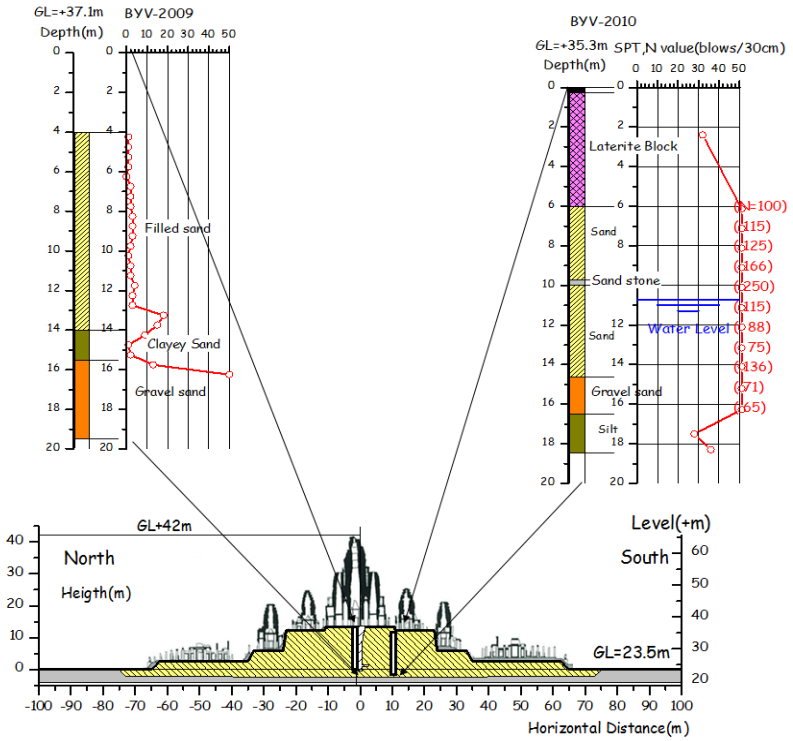


Figure 21 Boring results

It was mystery for us to realize the fact that the central tower has been standng for more than 700 years without foundation failure in heavy rain condition of squal EFEO excavated a vertical shaft with a diameter of about 2.5m at the center of the base of the cental tower .in 1933. The shaft was backfilled without compaction.

To study the inside structure of the soil mound of the platform, several borings were carried out by JSA. Some results of SPT, N-values at the vertical shaft and the sandy filled mound are shown in Figure 21.

SPT in the vertical shaft, SPT, N-values are less than 4, N<4, which means very loose sand of the refilled sand. However, the original manmade fill shows extra-ordinally large number of N=100-200.

When a core sample of the sandy fill was submerged, the stiff sandy soil was found to collapse within around 10min as shown in Figure 22.

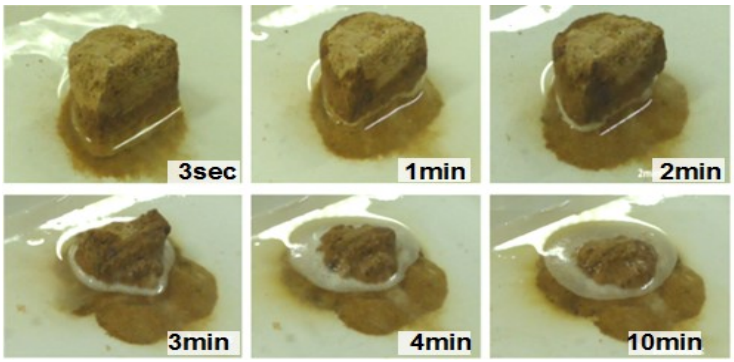


Figure 22 Collapse of stiff sand in water less than 10 min

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Why standing for 700 years - Monitoring soil moisture
Several moisture sensors were installed in the platform mound and monitored the change during rainy season. An example of the monitored records is shown in Figure 23, which shows the response of the installed sensors to a heavy rain of squall with a total of about 80mm.

The rainwater infiltrates into ground less than a hour with an sudden increase of the water contents in the soil. However, after the rain stop, the moisture gradually decreases and returns to the stable state.

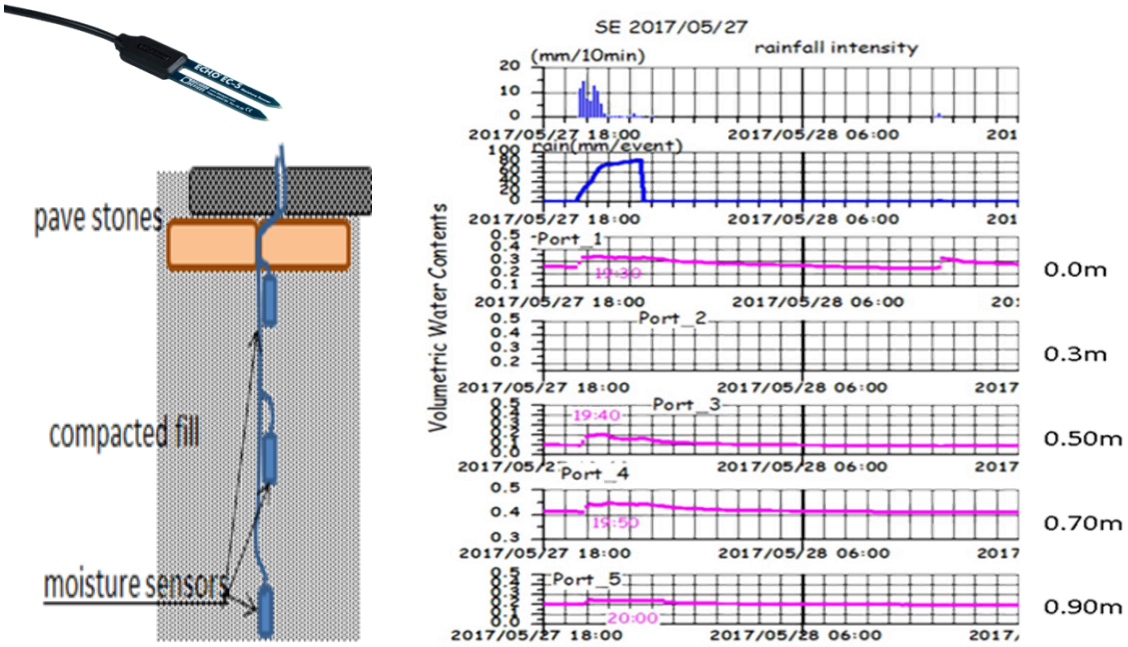


Figure 23 An example of the monitored records

In the coming global warming period, the much longer period of rain is anticipated and the increase of the water contents continues much longer and finally becomes nearly saturated state of the sandy soil of the platform mound and inevitably reaches collapse of the ground failure of the sandy soil beneath the foundation of the tower, which shall cause the failure of the Central Tower of the temple.

Character Defining Elements of the Authenticity of the Stone Structure in Angkor
Both high strength of the sandy soil of the mound in dry state and the shallow direct foundation of the tall masonry tower are the character defining elements of the authenticity of the stone structure in Angkor and shall be preserved.

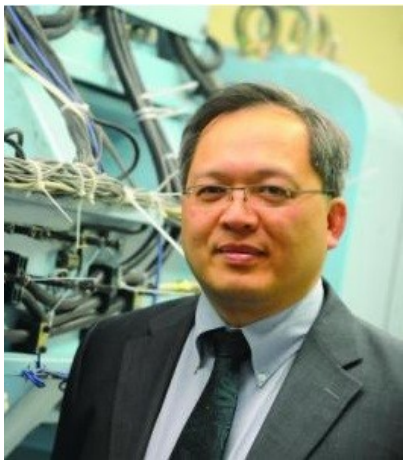
Proactive Countermeasures against the Global Warming
The simplest yet the effective way is to insert an impervious layer beneath the pave stone and the existing soil mound to prevent the rainwater infiltrating into the foundation mound.

Conclusive Remarks

A. Foundations are not always regarded important elements of the heritage structures. However, the foundation is one of the important elements of the structures to support as in case of Angkor. Geotechnical engineering was the essential field to cope with for multi-disciplinary thinking.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University



Professor Hoe I. Ling
Invited Professor of L.N. Gumilyov Eurasian National University (ENU)

Professor, of Civil Engineering and Engineering Mechanics, Columbia University, USA

Ph.D., Civil Engineering, University of Tokyo, Japan, 1993

M.S., Civil Engineering, University of Tokyo, Japan 1990

B.Eng., Kyoto University, Japan, 1988

Professor Hoe I. Ling first time heard about of Kazakhstan in the late 80's when his advisor, Prof. Tatsuoka Fumio, made a trip to Kazakhstan. At the date Kazakhstan was one part of the Soviet Union. Later, he learned that Prof. Tadatsugu Tanaka, another professor at the University of Tokyo, quite often visited Kazakhstan. His meeting with Prof. Askar Zhussupbekov happened after many years in 2006 in Rome, during the Geotechnical Symposium honoring the 60th birthday of Prof. Tatsuoka. Prof. Askar visited Columbia University for a year in 2010. So far, doctoral students from Eurasian National University have experienced frequent short stays in New York as part of an internship program.

Research Activities of Affiliated Foreign Faculty
Professor Ling gave some presentations and participated in several workshops and conferences in Kazakhstan. Among them, the most memorable experience was the 2-week stay in December 2016. He taught a course on Geosynthetics. The experience of interacting with a large group of domestic master's students for the first time was very inspiring. Many of them were trying to find out about the engineering education in the United States. By interacting with students of different backgrounds, he learned a lot from them in return, about the history, social and cultural aspects of Kazakhstan. Although professor Ling has experienced the extremely hot Kazakhstan summers, but winter was really severe. Nevertheless, piling, concrete pouring, and other construction activities did not stop in the winter. The scenery and snow under -32° C, dyed by the weak sun, looked especially nice. Suddenly, he realized that -10° C was quite warm. On December 16 (National Day), the voice of musicians was boiling inside Astana Opera House, which is one of the best in the world, with many visitors flocking in from other parts of central Asia.

Professor Ling always has been interested in the route by Marco Polo. He has visited Istanbul (Turkey) at one end and Xian (China) at the other end of the Silk Road and he needed to connect them by visiting some of the cities in between. In fact, from Astana (now Nur-Sultan), he made a short distance flight to Urumqi and visited several cities in Xinjiang (western part of China). Could this be the territory of dispute during ancient time as shown by the folk tale in the Disney movie Mulan?

Kazakhstan has certainly opened up to be part of the western world, while maintaining Russian values. Professor Askar Zhussupbekov has made a major contribution in westernizing geotechnical engineering in Kazakhstan by participating in many international conferences and interacting with world class researchers. He also brought them to interact with the domestic students, engineers and researchers in Kazakhstan.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Professor Der-Wen Chang

Invited Professor of L.N. Gumilyov Eurasian National University (ENU)
Professor, Department of Civil Engineering, Tamkang University (TKU),Taiwan

Ph.D., Civil Engineering, University of Texas at Austin, USA, 1991

M.Eng., Civil Engineering, Michigan State University, USA, 1987

B.Eng., Tamkang University, Taiwan, 1983

Professor Der-Wen Chang has been an exchanging faculty at ENU since 2010. He is actively involved in supervising Ph.D. students at the geotechnical engineering program of ENU and giving intensive lectures at the Master programs offered at the Civil Engineering Department of ENU. In addition, Prof. Chang collaborates with Prof. Askar Zhussupbekov in many academic events including The 16th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering held in Taipei (November 13-17, 2019) and The International Symposium on Design and Analysis of Piled Raft Foundation (September 11-12, 2017). As the Secretary of TC305, he also helps Prof. Askar in managing committee activities. Recent research studies of Professor Chang are focusing on analyzing piled raft foundation behavior. He has recently developed the Finite-Difference based programs WERAFT-S and WEAPR-S to analyze the settlements of a single raft and/or piled raft foundation under vertically uniform loads. The raft was modeled taking into account of the boundary effects. Non-uniform soil springs underneath the raft and pile stiffness derived from the wave equation were allocated at the discrete nodes of the raft, the solutions can provide agreeable results with those obtained from 3D Midas GTS analysis. Partial results of his study are shown as follows (Figures 24 – 27).

Research Activities of Affiliated Foreign Faculty

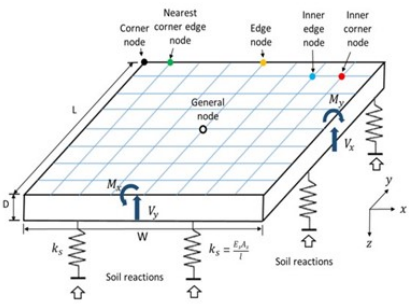
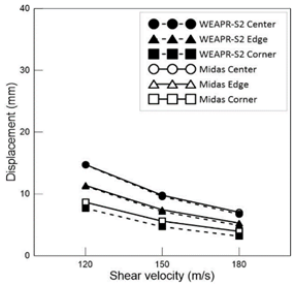


Figure 24 FD discrete layout of the raft



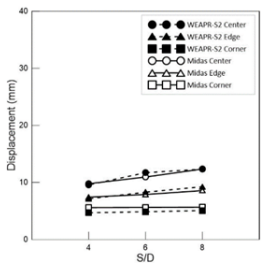


Figure 25 Comparisons of the solutions with FEM analysis

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

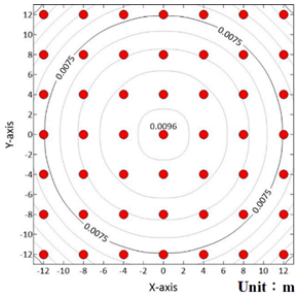


Figure 26 Piled raft foundation settlements

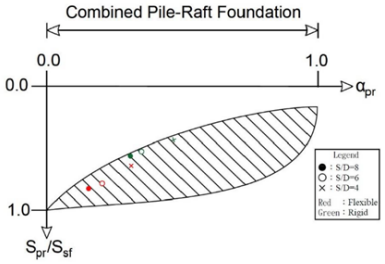


Figure 27 Ratios of loads and settlements for flexible/rigid PRF

In addition, Professor Chang also investigates the behavior of barrette subjected to lateral loads. He concluded that the barrette in clayey soils (where V_s is 120~180m/s and S_u is 32~76 kPa) will react like a long pile if the ratio of L/R is ≥5 when the barrette is subjected to lateral load in the transverse direction. For barrette in clay with load in the longitudinal direction, long pile criteria would become L/R≥7 for the barrette in clays. For L/R≤ 3 in such case, the barrette will behave rigidly. For barrette in sandy soils (where V_s is 120~180m/s and friction angle ϕ□is 28° ~34°), no matter which direction the load is applied, the ratio of L/T≥6 can be regarded as long barrette, and L/T≤ 2 can be regarded as rigid barrette.

Professor Victor N. Kaliakin
Invited Professor of L.N. Gumilyov Eurasian National University (ENU)
Professor, Department of Civil and Environmental Engineering,
University of Delaware

Ph.D., Civil Engineering, University of California, Davis, USA, 1985

M.Sc., Civil Engineering, University of California, Berkeley, USA, 1979

B.Sc., Civil Engineering, University of California, Davis, USA, 1978

Research Activities of Affiliated Foreign Faculty
Beginning in 2015, Professor Kaliakin has taught various courses in engineering mechanics and geotechnical engineering to Masters and PhD students at ENU. In 2020, the world pandemic precluded in-person instruction. Consequently, three graduate courses were delivered using Zoom technology, thus introducing students to online delivery of course material.

Professor Kaliakin's areas of research include computational geomechanics and the development and implementation of constitutive models for cohesive soils. Since 2015, Professor Kaliakin has been involved in various research projects with students and faculty at ENU. These have resulted in sundry publications in international journals and conference proceedings, as well as in ENU's Bulletin of L.N. Gumilyov Eurasian National University, Technical Science and Technology Series.

Current Research Topics

Continued Development of the Generalized Bounding Surface Model (GBSM) for Saturated Cohesive Soil
The GBSM is a fully three-dimensional, time-dependent model for saturated cohesive soils that accounts for both inherent and stress induced anisotropy, as well as strain softening and the effect of temperature on the material response. The GBSM synthesizes many previous bounding surface models for cohesive soils and improves upon their predictive capabilities.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Numerical Investigation of Dynamic Load Amplification in Buried Culverts
Most traditional research on buried culverts has looked at live load distribution through soil onto buried culverts without due attention to the dynamic amplification of moving loads. Few studies that considered the dynamic amplification of buried culverts modeled the system assuming plane-strain conditions. Under such conditions, finite area loads such as the wheel loads of vehicles must instead be modeled as strip loads that act over the entire culvert width. In this study, the load-soil-culvert system is also treated as a three-dimensional problem. Dynamic load allowance (*DAF*) is determined from two-dimensional (plane strain) and three-dimensional finite element analysis and is compared with *DAF*s calculated following the American Association of State Highway and Transportation Officials (AASHTO) procedures and field collected data. The two- and three-dimensional finite element analyses resulted in average *DAFs* of 1.11 and 1.03, respectively. Average *DAF*s from field and the AASHTO procedures were calculated to be 0.97 and 1.30, respectively. Overall, the AASHTO *DAF*s are the highest and the field *DAF*s are the lowest. The two-dimensional finite element results gave *DAF* values that are higher than the ones from three-dimensional analyses and field evaluated values. The *DAF* calculated from three-dimensional finite element analyses is the closest to the field measured *DAF*s.

Simulation of Structural Backfills in Low Confinement Geotechnical Applications
Isotropic compression and drained axisymmetric triaxial compression tests were performed on six structural backfill structural backfills commonly used in the construction of geosynthetic-reinforced soil (GRS) systems to characterize their shear behavior. The behavior of these structural backfill aggregates was then simulated using the Single Hardening Model (SHM) for frictional materials. The confining pressures that were tested and analyzed in the current study (e.g., 34 to 413 kPa) are generally consistent with those encountered with various GRS applications. The pressures at the bottom end of this range are relatively low for typical geotechnical engineering testing and simulation approaches. Certain modifications to the SHM were required in order to more accurately simulate the volume change response that occurs under drained loading conditions at these lower confining pressures. The model simulation results showed good agreement with the results from the triaxial compression tests. These findings are important, as accurately simulating the volumetric response during shear is very important for GRS systems because, although initially compacted, such systems are subjected to relatively low confining pressures during service conditions.

Professor Tadatsugu Tanaka

Invited Professor of L.N.Gumilyov Eurasian National University (ENU), Nur-Sultan, Kazakhstan

Emeritus Professsor University of Tokyo, Japan
President of JARUS, Tokyo, Japan

Dr.Eng., Agriculture Engineering, Kyoto University, Japan, 1971

B.Eng., Agricultural Engineering, University of Tokyo Japan, 1968

Current Research Topic

Elasto-plastic Dynamic Response Analyses and Deformations of Fill-type Dams
An earthquake measuring 6.6 Mw on the moment magnitude scale struck Iburi Subprefecture in southern Hokkaido, Japan, on 6 September 2018. Mizuho Dam (Height is 25.9 m) located near the epicenter of this earthquake and strongly shaken. The recorded base peak accelerations of Mizuho Dam in upstream and downstream direction was 491 Gal , and 937 Gal was recorded at the dam crest. Azuma Dam (Height is 38.2 m) also located near the epicenter of this earthquake and the spillway of this dam was blocked by debris from landslides. Recorded base peak acceleration was 297 Gal and at crest 1293 Gal. The settlement of the crest is 18cm.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

A strain softening elasto-plastic constitutive model is robust for application to a dynamic response analysis of fill-type dam. This strain softening material model is applied to embankment dams with the features of non-associated flow characteristics, post-peak strain softening, and strain-localization into a shear band with a specific width.

We carried out the dynamic response analysis of Mizuho Dam and Azuma Dam (Figure 28), then the computed settlements are compared to observed ones. Also we computed earthquake induced accelerations and displacements of Aratozawa Dam which is 74.4 m high rockfill dam hit by Iwate-Miyagi inland earthquake on June 14 2008. The recorded peak acceleration at base was 1024 Gal and 525 Gal at crest. The crest peak acceleration is much smaller than the base peak acceleration.

The measured crest settlement of Mizuho Dam is about 10 cm, and computed settlement was 7cm, so we can say that the comparable result is obtained. The computed maximum shear strain is shown in Figure 1. The measured crest settlements of Aratozawa Dam (Figure 2) are 25-30 cm, and computed crest settlement is around 21 cm, so we can say that the comparable result is obtained. The computed maximum shear strain is shown in Figure 29.

The computed accelerations at the crest of dams are compared to the observed ones and the computed displacements are also verified by the observed displacements. The strain softening elasto-plastic constitutive model for geomaterial is applicable to the dynamic response analysis of a real fill-type dam.

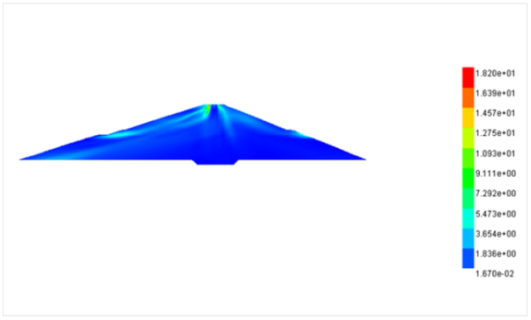


Figure 28 Computed maximum shear strain of Mizuho Dam

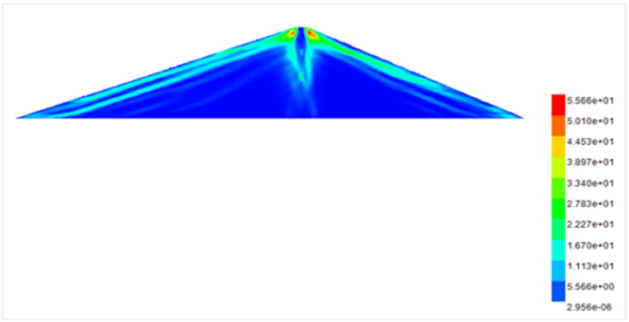


Figure 29 Computed maximum shear strain of Aratozawa dam

Research Activities of Affiliated Foreign Faculty

Professor Tadatsugu Tanaka is a specialist in the field of numerical methods for solving geotechnical problems, as well as geoinformation technologies in geotechnics and hydraulic engineering. He is also the author of numerous scientific articles in leading peer-reviewed scientific publications and several monographs.

Daily after the lectures professor Tadatsugu Tanaka has advised with PhD Students of the specialty "Civil Engineering" about subjects of dissertation together with their research supervisors. The main subject of a course is closely related with subjects of many dissertation researches of doctoral candidates. Thereby they got valuable advice about possible directions of scientific researches, literatures, also have discussed about possibilities passing of doctoral candidates' research training at the Tokyo University and carrying out corresponding in-situ testing in Japan and Kazakhstan.

Professor Tanaka's program of work includes lectures and consultations for PhD Students. At a lectures, he explains to Students the theory and method of solving complex matrices (Figure 30).

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Figure 30 Lecture of Japanese Professor Tadatsugu Tanaka on "Numerical Methods in Geomechanics"

Professor Akitoshi Mochizuki

Invited Professor of L.N.Gumilyov Eurasian National University (ENU), Nur-Sultan, Kazakhstan
Professor Emeritus, The University of Tokushima, Japan
Technical Advisor, Nippon Koei Co, LTD., Japan

Dr.Eng., Civil Engineering, Osaka City University, Japan, 1971

M.Eng., Civil Engineering, Osaka City University, Japan, 1969

B.Eng., Civil Engineering, Osaka City University, Japan, 1967

From September, 2017 to June, 2018, this Emeritus Professor of Tokushima University, Tokushima, Japan taught courses for PhD and Masters students, and took a role of supervisor for one PhD student and three Masters students at ENU. The main objective of lectures for Masters students was to teach fundamental soil mechanics, such as physical properties of soils and meaning of their property numbers, seepage flow in the ground and induced forces, shear strength under UU, CU and CD conditions. In addition, knowledge of mechanical structure of apparatuses used for direct shear and triaxial compression tests was presented. As one of latest topics, significance of centrifuge model tests in the field of geotechnical engineering was introduced with some examples of the model tests in which Prof. Mochizuki has been involved in as one of leaders in the field since 1971.

In lectures and practical exercises for the PhD students, Mikasa's consolidation theory was introduced and the difference between it and Terzaghi's theory was discussed. Then, a graphical solution method was taught to solve the consolidation's equation numerically. After a course of lectures about fundamental knowledge of apparatuses for direct shear and triaxial compression tests were given, a series of direct shear tests and triaxial compression tests under CD condition were performed which were the first series tests in the Geotechnical Institute Eurasian National University (ENU GI) laboratory using two types of apparatuses on sandy samples from a site in Nur Sultan, Kazakhstan.

Research Activities of Affiliated Foreign Faculty
Professor Mochizuki, Emeritus Professor of Tokushima University, has been instrumental in expanding the laboratory facilities at ENU's GI, which helped promote the fundamental base level of students and members of GI. A system for seepage tests, an apparatus for direct shear tests and that for triaxial compression tests were improved and modified over a period of more than six months with PhD students under the supervision of Prof. A. Zhussupbekov and Prof. Mochizuki.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

For research of a Master's thesis, an analog record of seismic waves, which were monitored at Almaty, Kazakhstan, were re-composed into a digital form. Then, Fourie's spectrums of the waves were analyzed using program codes which were newly developed by Master course student, G. Jusibekova, under the instruction of Prof. Mochizuki.

PhD Student Eurasian National University (ENU), G. Tanyrbergenova, who specializes in preservation of valuable old monuments, studied the Leaning Tower of Pisa problem. With regard to the tower first tilting northward followed by it tilting southward during construction of the fifth story to the seventh story of the tower. Thereafter, the tower continued to tilt southward for over 700 years without toppling over.

Ms. Tanyrbergenova also studied a mechanism of tilting of the tower under supervisors, Prof. Mochizuki and Prof. A. Zhussupbekov. A part of this research was presented at the 16th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering.

In addition to other upstanding activities of Prof. Mochizuki during the stay at ENU, he, as an invited speaker, visited several major universities not only in Kazakhstan (KazGASA, Kyzyl-orda state Univ. and Karaganda State Industrial Univ.) but also other countries (Columbia Univ, NYC and St-Petersburg State Architect. and Civil Eng. Univ.), which contributed to establish mutual relationships to these university's faculty members and students (Figures 31 – 33).

Figure 31 Lecture for a class of Master students

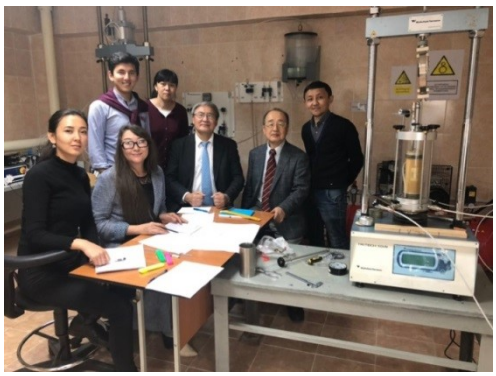


Figure 32 Group photo with a group of researchers from the Geotechnical Institute

Figure 33 Lecture on Constitutive model of soil with Double yield surfaces, developed by Prof. Mochizuki, and analyzed using examples

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Professor Akira Hasegawa
Invited Professor of L.N.Gumilyov Eurasian National University (ENU)
Emeritus Professor, Hachinohe Institute of Technology, JAPAN, 2020-Present

Dr. Eng., Tohoku University, Japan, 1990

Graduated from Graduate School of Tohoku University, Japan, 1971

Emeritus Professor of Hachinohe Institute of Technology (HIT), Hachinohe, Japan. HIT has an academic relationship with ENU since 2017. Prof. Askar Zhussupbekov of ENU and Prof. Akira Hasegawa who was the president of HIT at that time, contributed to establish the sister relationship between ENU and HIT, as we have a good and long history on the relationships for our study and education on geotechnical engineering and structural engineering since 1991.

Prof. Akira Hasegawa has visited Kazakhstan and ENU many times to have lectures, support a study, and attend international conferences. He lectured to Master students of ENU on geotechnical engineering, structural engineering and bridge engineering. He supported the studies of PhD Students on the construction and geotechnical engineering. Especially, he supported their internship in a foreign country. He invited PhD students to HIT and made a chance when they were able to get experiences on geotechnical experiments.

In 2016, Prof. Askar Zhussupbekov of ENU and Prof. Akira Hasegawa discussed about development of relationship between our university and HIT university. In 2017, with the understanding and cooperation of both universities, ENU and HIT reached an academic exchange agreement. 21st June 2017, The ceremony of signing the memorandum between ENU and HIT was held in ENU. Prof. Yerlan Sydykov as Rector of ENU and Prof. Akira Hasegawa as President of HIT, attended the ceremony and signed the memorandum. In 2018, The 1st ENU-HIT Scientific Forum in ENU was produced by co-chair of ENU and Prof. Akira Hasegawa. In last year, the 2nd HIT-ENU Scientific Forum was held in HIT with the participation of 10 people from Kazakhstan, including Prof. Assemgul Moldazhanova, at that time the First Vice-Rector for Academic Affairs of ENU Dean of Architecture and Civil Engineering Faculty Prof. Seriktay Baimukhanov and Prof. Askar Zhussupbekov. Prof. Akira Hasegawa is hoping to development of the relationship between two universities and also to countries - Kazakhstan and Japan (Figure 34 – 37).

Research Activities of Affiliated Foreign Faculty
Prof. Akira Hasegawa developed the renewal version of the Hachinohe geotechnical information database (hereinafter called "HDB") and Nur-Sultan geotechnical information database using Web-GIS and common format for geotechnical database in Japan and Kazakhstan. Creation of HDB revealed the issues for continuous managing. During the construction of HDB, developed system was designed with the prospect of locality, general trend, sustainability, and utilization of it. HDB local organization was established at the same time. Three key points to maintain the HDB continuously are common: format of database, establishment of organization and automatic upload method of new boring logs. In addition, the function for automatic calculation of PL-Value was added. In this study, the outline of the construction of HDB and a few studies using HDB was described.

Composite Structures: RCFT
In this study, composite of structure and utilization of composite of materials, especially the features of a new structure with RCFT Reinforced Concrete Filled Tubes are described. To prevent collapse of structures like buildings or bridges in Hyogoken-Nanbu-earthquake, 1995, excellent mechanical performances like strength and displacement are required for the structures. If high performance on strength and displacement

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

will be given to structures, it would be possible to built smaller size structures and use effectively the space of cities. Reinforced concrete filled steel tube (RCFT) have therequired mechanical characteristics. Therefore, the tests on RCFT is to be continued to study for the mechanical characteristics. The results on RCFT structure showed excellent deformation performance in comparison with RC or Steel structure. This research was conducted by PhD student from ENU Dina Bukenbayeva.

Asset management of Structures

Asset management is important to maintain bridges for a long time while maintaining their serviceability. The cost to maintain them is increasing with the number of bridges. In the future, we might encounter a time when new bridges can't be built. Therefore, it is required for the management to inspect the degree of deterioration and the soundness of bridges. There are two kinds of deterioration, namely material deterioration and structural deterioration. Material deterioration means deterioration of the material of bridges with the passage of time. Structural deterioration means a shortage of section area or a change of support conditions. If a bridge has structural deterioration, the vibration must be changed, because the bridge vibration is one of the reflections of structural characteristics. Two experiments on bridge vibration were tested. The 1st experiment on bridge vibration was performed on in-service bridges. The 2nd experiment was performed on RC slabs with different thicknesses with participation of PhD student from ENU Bibigul Abdrakhmanova.

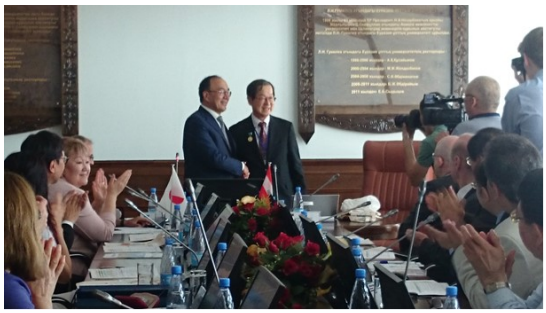


Figure 34 Ceremony of signing the memorandum between ENU and HIT, on June 21 2017
Prof. Yerlan Sydykov (Rector of ENU: Left) and Prof. A. Hasegawa (President of HIT: Right)

Figure 35 Participants of international conference held on June 21 2017.
In front of entrance of ENU.

Figure 36 Participants of the 2nd HIT-ENU scientific forum at Media Center of HIT
Sep. 24 2019

Figure 37 Construction site tour
In front of entrance of Tunnel construction site near Towada Lake Sep. 25 2019

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Dr. Naozo Fukuda
Invited Professor of L.N. Gumilyov Eurasian National University (ENU)
Representative Director of A & G Engineering Institute

Professor by Special Appointment of Hiroshima University,
Resilience Research Center, 2019-2020
Lecturer of National Institute of Technology, Kure College
Technical Advisor of Shin-nihon Consulting Engineers, Co., Ltd.

Dr. Engineering of Kyushu University Japan, 1985
M. Eng., Kyushu University, 1975
B. Eng., Yamaguchi University, 1973
PE (Construction) Japan, 1982
Examiner. PhD. Prog. EN University, Kazakh., 2005, 2006, 2008

Dr. Naozo Fukuda contributed to the publication of design and construction guidelines on the geotextile reinforcing method as the Technical Chair of Public Research Center, Tokyo in 1993. He entered Fukken Co., Ltd. Consulting Engineers, Hiroshima, as geotechnical engineer in 1975 and retired after experiencing Director of Technical Research Institute and Managing Director in 2018.

Dr. Naozo Fukuda was involved for designing and monitoring of soft ground improvement of Tokyo International Airport Extension Project. He was invited as an examiner of PhD program by Prof. Askar Zhussupbekov, Eurasian National University, Kazakhstan since, 2005 till now. He lectured on the aforementioned Japan experience to students, academic staff and PhD Students.

Later he continued a designing process and construction of the Tokyo International Airport Extension Project constructed on super soft clayey ground, the national project by Ministry of Land, Infrastructure and Transport as design chief engineer of Fukken Co., Ltd.

Research Activities of Affiliated Foreign Faculty
To meet the increasing demand for air transportation, Ministry of Land, Infrastructure and Transport had carried out the offshore extension project at Tokyo International Airport (Haneda Airport).
The construction works for Tokyo International Airport extension project was started in 1984. The project aimed at enlarging the airport from the original area of 408 ha to 1100 ha, to meet the ever-increasing aviation demands. The project area involves soft foundation, and the industrial waste disposal site was also used as a major part of the extension area. Therefore, a very reliable soil improvement method was required for the airport's facilities to be functional.

The project was divided into three stages of construction as follows:

- Stage I: new A-runway in west area was completed in July 1988.
- Stage II: apron and terminal region in west area was completed in September 1993.
- Stage III: new C-runway and apron in east area was completed in March 1997, and new B-runway in north area in March 2000. Second terminal in east area was completed in December 2004.

The airport should be constructed to be perfectly level, but the ground conditions with very thick layers of super soft dredged soils and need for reclamation made the task very difficult. Because of large amount of consolidation settlement, ground improvement by combined vertical drain method was applied to decrease residual and differential settlement after opening of new airport. Following figures are aimed to introduce the design concept and method of ground improvement for this project. In addition, the result of ground improvement is keeping satisfactory performance for operating airport confirmed by long-term monitoring for airport facilities in 2003.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Professor Dave H.Chan
Invited Professor of L.N. Gumilyov Eurasian National University (ENU)
Professor of Civil and Environmental Engineering, University of Alberta

Ph.D., University of Alberta, Edmonton Alberta, 1986

M.Eng., McMaster University, Hamilton Ontario, 1981

B.Eng., McMaster University, Hamilton Ontario, 1979

Dr. Dave Chan is a Professor Emeritus in Geotechnical Engineering at the University of Alberta. His research interests are in the areas of numerical methods for analyzing soil mobility and the development of constitutive models for geomaterials. He is interested in the deformation and flow characteristics of soils and granular materials, which encompass slow movement such as creep, or fast movement such as debris flow and avalanches. He is interested in the development of new finite element and discrete element techniques for modelling large and small soil deformations. His recent research is focused on geohazards in Western China, where he examines and analyzes the initiation of debris flow and landslides in high alpine mountainous environments of 3000 to 5000 m. His work encompasses large debris flows in Tibet and Sichuan Province in China, and cyclic movement of landslides in the Three Gorges Dam reservoir in China. Dr. Chan was awarded a visiting fellowship from the Chinese Academy of Science in 2016.

Research Activities of Affiliated Foreign Faculty
Dr. Dave Chan visited the Eurasian National University (ENU) several times. He delivered two short courses on numerical methods in geotechnical engineering and Geosynthetics and reinforced soil structure and give lectures on the analysis of ground movement and mobilities at ENU.

Professor Askar Zhussupbekov, Director of the Geotechnical Institute, Gumilyov Eurasian National University (ENU), visited the University of Alberta, Canada, in October 2011. He delivered a lecture to the Geotechnical Society of Edmonton on the "Geotechnical and Construction Considerations of Pile Foundations in Problematical Soils in Kazakhstan".

During the collaboration with the ENU, Dr. Rauan Lukpanov of ENU, conducted part of his PhD research at the University of Alberta in 2007 and 2008. He analyzed the long-term performance of a reinforced embankment built in 1986 by the University of Alberta. The title of his thesis is "Analysis of Long-Term Performance of a Test Embankment Reinforced by Geogrid". The test fill is located in Devon, about 20 km south west of Edmonton. A cross section of the test embankment is shown in the figure below (Figure 38). The embankment is reinforced with different types of geogrid with various types of geogrid embankment.

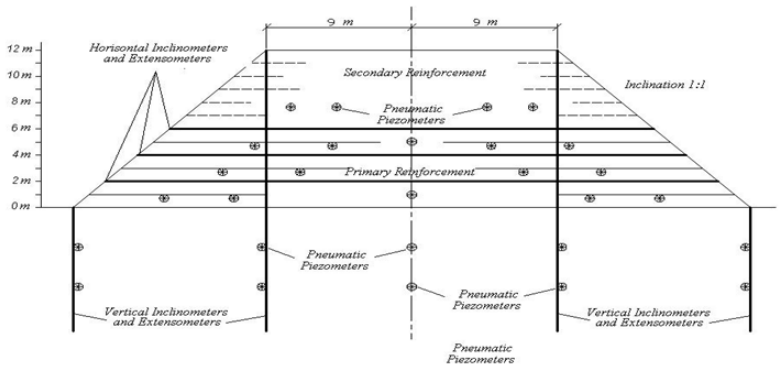


Figure 38 Cross section of test embankment with different types of geogrid and monitoring instruments

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Professor Zbigniew M. Lechowicz
Invited Professor of L.N. Gumilyov Eurasian National University (ENU)

Professor , Head of Department Geotechnical Engineering Warsaw University of Life Sciences, Poland
Vice-President of the Polish Committee on Geotechnics, Poland

Habilitated Doctorate, Faculty of Civil and Environmental Engineering, Technical
University of Gdansk, Poland, 1993
Dr. of Sc., Faculty of Land Reclamation and Environmental Engineering, Warsaw Agricultural University (SGGW), Poland, 1982
M.Sc., Faculty of Land Reclamation and Environmental Engineering Warsaw Agricultural University (SGGW), Poland, 1978

In 2013, a Memorandum of Understanding on scientific and educational cooperation between L. N. Gumilyov Eurasian National University and Warsaw University of Life Sciences – SGGW, Poland and was signed. In 2013, Professor Askar Zhussupbekov had an inaugural lecture at the Faculty of Civil and Environmental Engineering, WULS - SGGW.

Research Activities of Affiliated Foreign Faculty
In 2016, Professor Lechowicz gave lectures for Master's Students Intensive Course Program for MS students in Civil Engineering for "Construction Quality Management" at ENU and research consultations for PhD students. Professor Lechowicz had a presentation at the International Workshop on ATC-19 Dedicated of the 75th Anniversary Birthday of Professor Yoshinori Iwasaki held at ENU. In 2019, Professor Askar Zhussupbekov gave a lecture at the seminar organized by Faculty of Civil and Environmental Engineering WULS - SGGW and Polish Committee on Geotechnics. In 2020, due to the world pandemic, classes conducted at WULS-SGGW as part of the Erasmus Plus program in which ENU students participated, started in a traditional form, had to be continued with the use of MS Teams technology. In 2020, Professor Lechowicz was appointed as a Foreign Scientific Advisor to PhD Student Timoth Mkilima from Tanzania (Africa) who is a PhD Student at ENU (Figure 39).

Figure 39 Visit to ENU as a Invited Professor

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Professor Ramli Bin Nazir
Invited Professor of L.N.Gumilyov Eurasian National University (ENU)
Professor, University Technology Malaysia
Deputy Director, Centre of Tropical Geoengineering, UTM

Ph.D., Civil Engineering, University of Liverpool, UK, 1994

M.Eng., Civil Engineering, University Technology Malaysia, 1988

B.Eng., Civil Engineering, University Technology Malaysia, 1983

Professor Ramli Bin Nazir was given an opportunity to be appointed as a Invited Professor of ENU between 10th.September 2019 to 7th. October 2019. It was the early of autumn, however the chilling environment makes it feels like winter is coming. He was attached to the Faculty of Architecture and Construction in the Department of Design of Buildings and Constructions to working along with Professor Askar Zhussupbekov. The department has international educational and scientific ties with many foreign universities, including the universities of Russia, South Korea, Japan, Canada and other countries. Doctoral Ph.D annually undergo training in foreign universities and foreign professors lecture at the department. He feels very honoured to be appointed as the first Malaysian to be appointed. This is my first visit in Kazakhstan. Kazakhstan is a country which is rich in culture with the mix of Russian, Turkish and Persian. The history of Kazakhstan begins during the Mongolian empire in the 13th century until the recent Russian era, which ended in 1991 which lead to the independent of the country. The history of the country can be seen elaborated in the main building of the University.

Research Activities of Affiliated Foreign Faculty
During his visiting, he was given a task to give a Lecture to nine of the PhD candidates. Most of the lecture syllabus given is regarding the fundamental Soil Mechanics such as Soil Strength, Soil Modelling and Slope Stability. The objective is to enhance the student understanding on fundamental issue in Soil Mechanic before they embank into their research activities during their PhD tenure. From my personal opinion, this is a good start for any PhD student to study as it is a revision course or introduction to the research area that they are going to involve in their research.

Cooperation between the Visiting Professors in terms of PhD supervision, is part of the program schedule. He was also invited to co supervise one of the PhD Candidate Mr. Madi Kargin on project entitle Design and Sustainability of The Wind Turbine Foundations in Different Geological Conditions. The problem statement of the works is regarding the design sustainable issues for the wind turbine. Most of the work done is basically involving a full-scale analysis of the structure using instrumentation for data acquisition. Along with the research supervision, joint publication with the department staff was done has part of the key performance index of the visiting professor. Two papers have been prepared and submitted to the Journal and Conference. Eurasian National University is profound in research activity which lead to numerous grants in term of scholarship to the student. Most of the student has been sponsored with scholarship for their study.

In terms of collateral benefit for ENU and Universiti Teknologi Malaysia (UTM), discussion on academics excellent have been discussed with the top management of the University. UTM currently has a MOU with ENU, which has signed in 2011. However, it has been expired in 2016. During the visit, the MOU has now been extended and activities related with the MOU will be pursue at once, bringing the benefit to both parties.

Many academic programs have been discussed especially in terms of student exchange, staff exchange and academic excellent programme through research activity.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Professor Talal Awwad
Invited Professor of L.N. Gumilyov Eurasian National University (ENU)
Professor, Faculty of Civil Engineering –Damascus University, Syria

Ph.D., Soil Mechanics and Foundation Engineering, Saint-Petersburg State Architectural and Civil Engineering University, Russia, 1992

M.S., Saint-Petersburg State Architectural and Civil Engineering University, Russia, 1982

Professor Talal Awwad is Member of Technical Committee TC207 "Soil-Structure Interaction and Retaining Walls" and the Regional Technical Committee of Geoengineering for conservation of heritage monuments and historical sites (ATC19). Professor Awwad's areas of research include cultural heritage, soil structure interaction, pile foundations and numerical modeling in geotechnical engineering.

Research Activities of Affiliated Foreign Faculty
From September 2016 to December 2018 Professor Awwad has been working in Eurasian National University (ENU), as invited Professor (Figure 40).

During this time, Professor Awwad taught doctoral and master courses in Reconstruction and modernization of industrial buildings, Geoecology and Geotechnics in a seismic area, and Geotechnical Engineering in complicated engineering and geological conditions. He also has been involved in research projects with colleagues and students of ENU. As a result, several joint articles have published in international and local journals and conference proceedings.

Professor Awwad has been the scientific supervisor for MSc students, and he has taken part in the defense of several doctoral and MSc theses. In addition, he is a Member of the Editorial board of the Herald of L.N. Gumilyov Eurasian National University - Technical Science and Technology Series; also, he is a Member of the Editorial board of the Scientific-pedagogical journal "Problems of Engineering and professional education".

During his work in Kazakhstan, In recognition of his outstanding scientific achievements, as well, he was elected an Honorary Academician of the National Academy of Mining Sciences of the Republic of Kazakhstan.

Figure 40 Participation in international conferences in ENU

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

Professor Iakov A. Pronozin

Invited Professor of L.N. Gumilyov Eurasian National University (ENU)
Professor Department of Civil Engineering, Tyumen Industrial University, Russia

Doctor of Technical Sciences, Moscow State University of Civil Engineering, Russia, 2016

Ph.Dr., Tyumen Industrial University, Russia, 2001

Professor Pronozin was always interested in international partnership. During his scientific activity he takes place in international conferences and symposiums where he shears his experiences with native and foreign researches. Thus, he participated in conferences in Russia, Uzbekistan, Azerbaijan, Taiwan, Kazakhstan, Japan etc. He attracts students to engage in scientific activities. In 2019 Professor Pronozin was invited as a foreign member in the ENU GI Ph. Dr. Council.

Research Activities of Affiliated Foreign Faculty

Since 2019 Pronozin Ya.A. is a permanent member of the Ph. Dr. Council of the specialty 6D072900 – «Geotechnical Engineering» of L. N. Gumilyov National University (ENU). Now Pronozin Ya. A. is a foreign consultant of Ph. D. Students scientific works in ENU. Despite the world pandemic severl onlinemeetings were organized for PhD Students in ENU by using Zoom technology. During the meetings Professor Pronozin asked lots of questions and shared with his own view on each scientific problem. Professor is always ready to consult students on their Masters and Ph.D research works (Figures 41 and 42).

Figure 41 Professor Pronozin during the defence examination in ENU GI Ph. Dr. Council

Figure 42 Professor Pronozin with ENU Colleagues in the Soil Mechanics Laboratory at ENU GI

Pronozin's Research Highlights are the soil mechanics, foundations and underground buildings. Especially, one of Pronozin's scientific interests is the improvement of creation technologies of small-diameter drill-injection piles (with diameter is up to 0.3 m) and its calculation methods. Another area of research interest is the development of methods for correcting the tilts of buildings and structures which situated in the conditions of highly compressible bases. The further research interest is focused on the study of degradation of construction properties of dusty-clay soils in the conditions of deep pits. During the meetings in ENU IG with colleagues and students Professor Pronozin presents the results of above-mentioned scientific researches which cause a heated debate.

Research highlights (Con't)

Geotechnical Engineering Research at L. N. Gumilyov Eurasian National University

General company with which faculty members are associated: KGS-ASTANA, LLP, Nur-Sultan, Kazakhstan

www.kgs-astana.kz

Professor Askar Zhussupbekov one of founders of KGS-Astana Limited Liability Partnership (LLP), which is a construction company specialized to render services in the field of foundation engineering. It was established in May, 1999.

Today the Company is one of the most progressive and the fast-developing structure in the field of pile services in the Republic of Kazakhstan. We render the following services: piles driving, installing of bored piles, testing of soils and all types of piles.

Pile foundations are frequently used in most constructions with in Kazakhstan. KGS-Astana LLP work in cities Nur-Sultan, Almaty, Atyrau, Aktobe, Aksai, Tengiz, Aktau, Pavlodar, Kokshetau, Kzyl-Orda, Karaganda, Temirtau and etc.

KGS-Astana LLP was a subcontractor company for pile foundation installing at the following construction objects in Nur-Sultan: the amusement complex "Khan-Shatyr", Palace of Peace, the Islamic Cultural Center, Astana International Airport, the Government House, the Supreme Court, the Republican cycle track, the Skating stadium, construction of a refinery in Atyrau, Expo-2017, Abu-Dabi Plaza, Nazarbayev University, Mega Silk Way, Highvill Astana.

KGS-Astana LLP collaborated with international companies Sembol Construction, Alsim Alarko, Yda insaat, Okan Holding, Renaissance Construction (Turkey), Keller Group (UK), Mabetex Group (Switzerland), Junttan (Finland), Soilmec (Italy), Bauer (Germany) and PTC (France).

KGS-Astana LLP is interested in the latest scientific developments and achievements. KGS-Astana works with the Geotechnical Institute of the L.N. Gumilyov Eurasian National University, Kazakhstan Geotechnical Society. KGS-Astana LLP is Corporate Associate of the ISSMGE (ISSMGE - International Society for Soil Mechanics and Geotechnical Engineering).