TECHNICAL ARTICLE – 3
Taoyuan International Airport Link Project in Taiwan

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The Taoyuan International Airport Link (TIAL) is a metro system stretching from Taipei city center to Taoyuan International Airport with a total length of 51.0 km, which comprises 8 underground stations constructed by cut and cover method and 15 elevated stations. CECI Engineering Consultants, Inc. in Taiwan is in charge of detailed designs and primary construction supervision works on Packages DA115, DU01, DU02 and DE01. Some special issues about geotechnical design works in TIAL are introduced in this article.

1. Large-scale Excavation For A1 Station And Joint Development Buildings

A1 terminal station of TIAL is located asides the Taipei Main Station. The excavation was performed in very soft ground with high groundwater level and an aquifer underlying the excavation. A large-scale excavation with 27.2 m in depth and 26,000 square meters in area was constructed for A1 station as well as for the basement of joint development buildings having 76 stories and 56 stories, respectively. As indicated in Figure 1, the excavation site is situated next to many sensitive underground and above-ground structures, such as Taipei City Mall, viaduct, High Speed Rail (THSRC) and Taiwan Railway Administration tunnels etc., on which no adverse effects were allowed in order to ensure the normal operation. Protection measures, such as buttress and full height cross walls for diaphragm wall system and groundwater withdrawal from the underlying aquifer with intensive monitoring were employed to reduce deformation induced by the excavation and ensure the basal stability of excavation. Observations showed that lateral deformation up to 40 mm for diaphragm wall and surface settlement of 27 mm were found at the end of excavation.

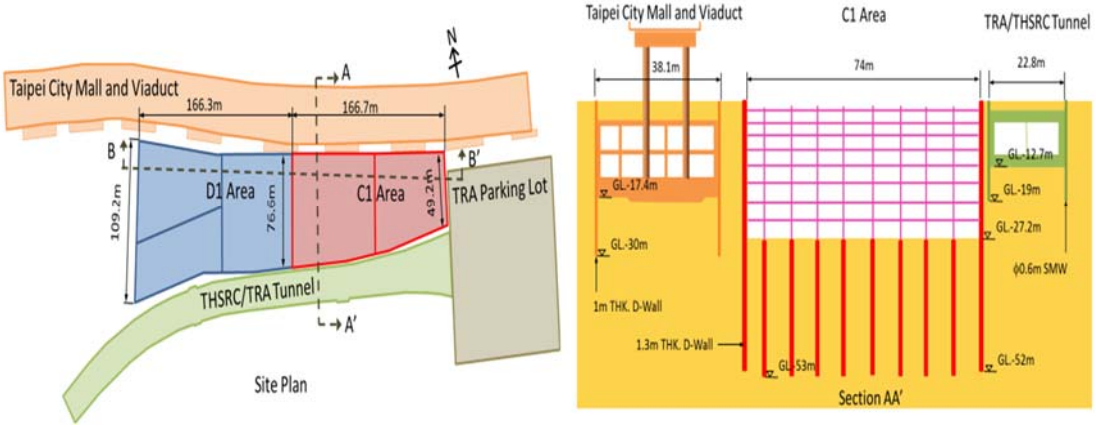

Figure 1 Large-scale excavation for the terminal station of TIAL

2. DOT Tunnel Crossing Dan-Shui River

A tunnel works with a total length of 1580m will be performed to cross Dan-Shui River and connect Taipei main station and San Chong City. If twin bored tunnels are employed, up to six cross passages shall be installed according to Fire Protection Regulation. In order to eliminate risk in construction of cross passages as well as to save land compensation for the route running underneath residential houses located, a Double-O-Tube (DOT) shield machine was employed to replace twin bored tunnels through elaborative assessment (refer to Figure 2). Similar machine was successfully adopted in Japan and Shanghai, Mainland China before. The tunnel was mainly bored in silty clay and occasionally in sand, as shown in Figure 2. The maximum vertical slope and minimum horizontal curvature radius of the alignment is 4.9% and 277.0 m, respectively. DOT shield machine was launched from San Chong end in December 2009 and arrived at Taipei end in December 2010.

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Taoyuan International Airport Link Project in Taiwan

3. Tunnel Works Under Airport Facilities

Underground stations and tunnels of TIAL are to be constructed beneath the parking lot of terminal, control tower and taxi way of Taoyuan International Airport without interrupting operation. Special cares thus were taken for both design and construction. Therefore, additional protection measures together with real-time monitoring system were employed before and during the construction so that flight safety and normal operation could be achieved. Figure 3 shows activities carried out before start of excavation and Figure 4 presents construction of tunnel under Terminal 2 which is in operation.

4. Special Excavation Method for Shaft Foundation on Slope

Bamboo-cutting method (BCM) was adopted for the excavation of shaft foundation of viaducts situated on slope (see Figure 5). Figure 6 presents the difference between the BCM and conventional excavation for the shaft foundation of viaduct. BCM foundation consists of a central column and its foundation is surrounded by an outer ring that is retained by necessary earth anchors with shotcrete on the excavated face. It can be therein seen that the excavated area by BCM is much smaller than that by conventional excavation so the amount of excavated earth is significantly reduced. By the same reason, the BCM is more advantageous to reduce both construction cost and impact on environment.

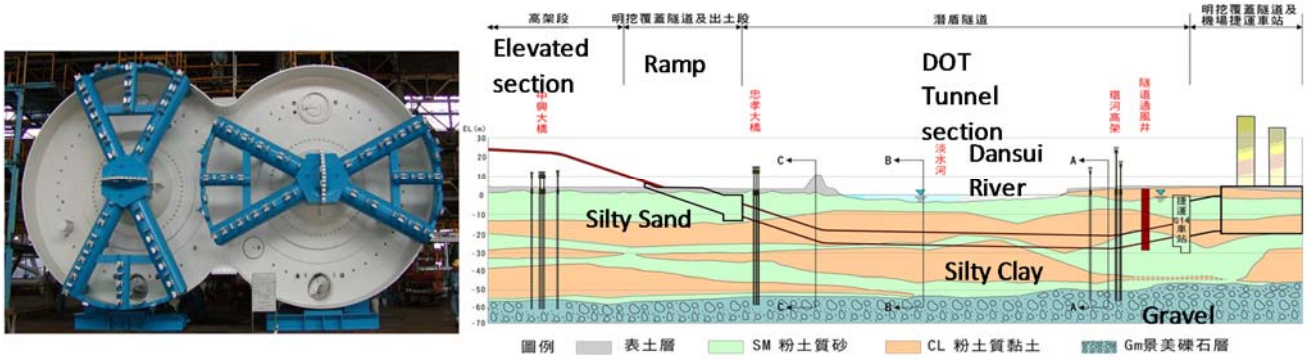
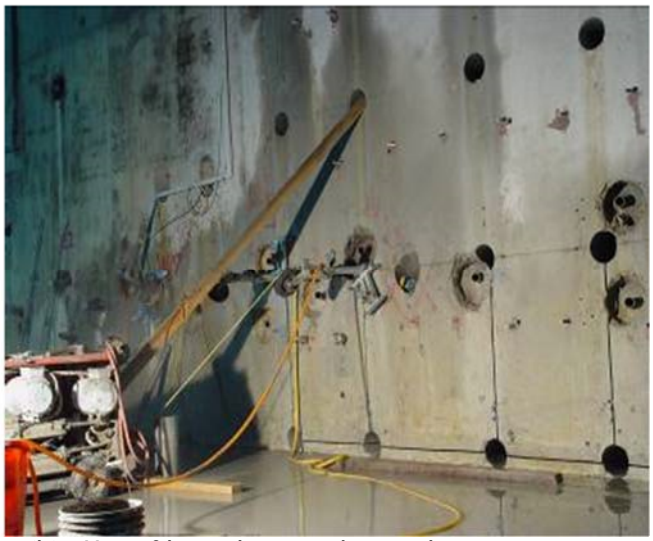


Figure 2 DOT shield used and longitudinal and ground profile of tunnel

(a) Installation of underpinning of underground car park structure



(b) Use of low vibration diamond saw for concrete cutting

Figure 3 Photos of preparing works for the enlargement of existing tunnel under Terminal 2

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Taoyuan International Airport Link Project in Taiwan

(a) Excavation (b) Cutting of side wall

Figure 4 Construction photos of the enlargement of existing tunnel under Terminal 2

Figure 5 Photo of bamboo-cutting method of shaft foundation

(a) Conventional excavation for shaft foundation

(b) Bamboo-cutting method for shaft

Figure 6 Comparison of different excavation methods for shaft foundation on slope

CONFERENCE REPORT:
XXth Károly Széchy Memorial Session and XIIIth Geotechnical Evening Forum
Budapest, 14th of February, 2014

The Hungarian National Committee of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) jointly with the Engineering Section of the Hungarian Academy of Sciences and the Geotechnical Section of the Hungarian Chamber of Engineers celebrated the XXth Károly Széchy Memorial Session on the 14th February, 2014 at the Great Lecture Hall of the Hungarian Academy of Sciences, with over 230 persons attending the event (Fig. 1).The event has beenorganized20 times since1994.

Fig. 1 Internationalguestswith the hosts on the Széchy Memorial Session; 1) János Józsa - academic of the HAS -Hungary; 2) Péter Görög - vice president of the Hungarian Geotechnical Society and ISSMGE HNC; 3) Ferenc Friedler- Rector of the University of Pannonia; 4) Dietmar Adam - professor TU Vienna; 5) Ivan Vrkljan - Zagreb - president of the Croatian Geotechnical Society (CGS) -vice president of International Society of Rock Mechanics ISR; 6) Antonio Gens - ISSMGE vice president for Europe; 7) László Nagy - Head of Geotechnical Department of TU Budapest- lecturer; 8) Heinz Brandl - em. professor TU Vienna - Head of Austrian Society of Civil Engineers and Architectures; 9) József Mecsi - president of the Hungarian Geotechnical Society and ISSMGE HNC; 10) Zoltan Melitz - Rector of the ETJ Colleges Baja city; 11) Roger Frank - president of the ISSMGE; 12) Carlo Viggiani - em.professor Naples - lecturer; 13) Peter Turček - professor TU Bratislava; 14) László Szilvágyi - president of the Geotechnical Session of Hungarian Chamber of Engineers; 15) Jana Frankovska- president of the Chech and Slovak ISSMGE National Committee; 16) Ákos Török - president of the Hungarian National Group of International Society for Rock Mechanics

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XXth Károly Széchy Memorial Session and XIIIth Geotechnical Evening Forum
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Fig. 2 "Working lunch" at the Club of the Hungarian Academy of Sciences before the Széchy Memorial Lectures

On the jubilee occasion the Hungarian Geotechnical Society presented a book of 200 pages, containing documents, biographical disclosures, commemoration of Professor Széchy, and also a set of pictures of the all-day events of the commemorative lecture session. The book was published in Hungarian; the English version will follow soon, for preview it will be available on the ISSMGE HNC website:

http://issmge-hungary.net

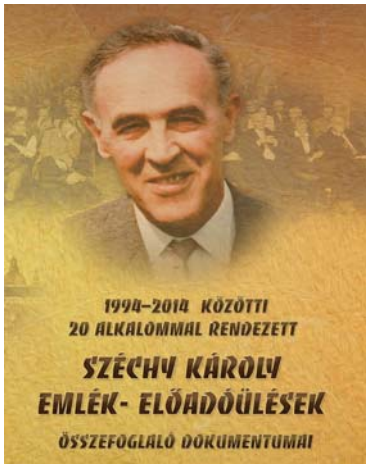

Fig.3 Cover page of the book

This series of festive gatherings has been highlighted from the beginning by lectures delivered by the most illustrious professors paying tribute to the memory of the Hungarian professor, Károly Széchy. This year, the guest speaker from abroad was Prof. Dr. Carlo Viggiani (University of Naples Federico II, Department of Hydraulic, Geotechnical and Environmental Engineering, Napoli, Italy) in Fig. 4. The presentation's title was **"The relations between Science and Geotechnical Engineering".**

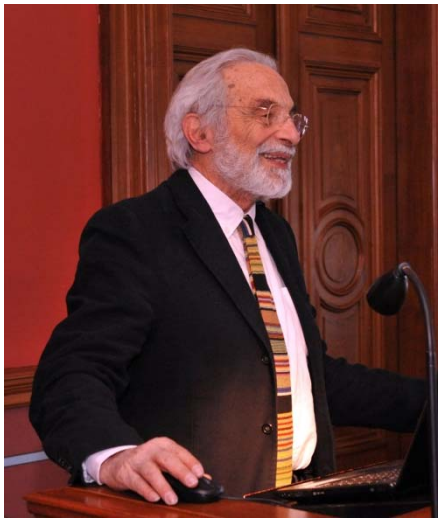

Fig. 4 Prof. Carlo Viggiani

Fig. 5 The audience at the memorial meeting

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Budapest, 14th of February, 2014

The speaker from Hungary was Dr. László Nagy (Budapest University of Technology, Department of Geotechnics, Budapest, Hungary) whose topic was **"Danger, probability and risk in geotechnics"**.

In keeping with tradition, a young engineer who has excelled as the best junior speaker at the annual national geotechnical conference is offered the opportunity to introduce himself by a lecture at the Memorial Session. This year the candidate was Ákos Tóth. The title of the presentation was "TBM performance forecast in mixed ground conditions". **About the event you can see the presentations and photos on the following website:** http://www.issmge-hungary.net

Again, as is traditional in these events, the Károly Széchy memorial plaque and prize were delivered. This year the recipient was the Diamond Anniversary Diploma holder engineer, retired college professor, forensic expert Dr. György Gabos. See Fig. 6.

Dr. László Nagy Dr. Ákos Tóth Dr. György Gabos

Fig. 6 Photographs of important speakers

The professional events were concluded with an informal dinner. The joyful spirits of the evening was enhanced by the toasts and the amusing speeches given by the recipient of the awards (Fig. 7).

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Photos: J. Philip


Welcome speech by Professor Heinz Brandl, J. Mecsi, Roger Frank and Antonio Gens from the left

Fig. 7 Joyful dinner party

(Compiled by József Mecsi)

Interview
Questioner: József Mecsi

Question 1:
Prof. Viggiani, you are the chairman of the Technical Committee 301 (Preservation of Monuments and Historic Sites) of the International Society for Soil Mechanics and Geotechnical Engineering; you have been a component of the International Committee for the Safeguard of the Leaning Tower of Pisa. In relation to the safeguard of Heritage, what do you think of the relationship between geotechnical engineering and other professions (e.g. structural engineering, but above all archaeology, historic preservation etc.)? What are the difficulties and the opportunities for cooperation?

First of all, I believe that maintaining, preserving, conserving, restoring, and improving monuments and historic sites may be the most significant contribution that Civil Engineering can give to mankind in our time. The conservation of Heritage, however, is one of the most challenging problems facing modern civilization. It involves a number of factors belonging to different fields (cultural, humanistic, social, technical, economic and administrative), intertwining in inextricable patterns. Accordingly, for a satisfactory solution an interdisciplinary approach is mandatory. A common work among different specialists is easier to auspicate than to practice because of the different cultures and even languages; it is lengthy and often conflict, but at the end it reveals fruitful and rewarding.

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Question 2:
What is your vision about the future technical, organisational and structural issues of underground construction sites in historical environment? Some of the geotechnical engineers fear that because of legal aspects construction in historic environment is going to be the "hunting field" of lawyers. Do you share this view?

Underground construction in historical environment is becoming more and more frequent; the subsoil of practically all the large cities all over the world is interested in by the construction of a network of transportation and other underground infrastructures. This is indeed one of the most challenging sectors of civil engineering in our time, because of the difficult design and construction problems to be faced and because of the need of preserving the surface built environment, often rich of monuments and historic sites. It is to underline that the basic reason for constructing underground facilities is to make the cities comfortable, but obviously without altering the specific features of the historic cities themselves. I do not believe that one must be too much concerned about lawyers; they are hunting everywhere, and we engineers are in any case exposed to their attention. The possible remedial measures include obviously high level design, transparency in the prediction of possible effects and research of a preliminary consensus on the projects.

Question 3:
What farewell message would you give for the present young generation of geotechnical engineers?

There are two messages that, in my opinion, are worth considering for a young geotechnical engineer.
1. Civil engineering, and particularly geotechnical engineering, may be perhaps not very rewarding in terms of social success and financial achievements. The contents of the profession, however, are very stimulating. In fact, the typical process of investigating, modelling, conceiving a solution, analysing and designing appears very different from the typical tasks of other profession, in the sense that it has new characters in each new case and stimulates originality and creativity.
2. We engineers are holder of a rational culture, based on science: mechanics, thermodynamics, chemistry etc.. A proper use of scientific theories is at the origin of the spectacular advances in engineering (and in the whole welfare of human kind) in last centuries. At present, paradoxically, the rapid developments in sectors as the new construction technologies and the numerical methods of analysis coupled to the powerful computing resources now currently available, often clouds the rational bases of engineering, with very detrimental consequences on the quality of our profession. I believe that we should always have in mind the warning of the great Immanuel Kant: "nothing is more practical than a good theory".

Széchy Memorial Lecturers 1994-2014

1994	FAZAKAS György (Budapest, Hungary), MISTÉTH Endre (Budapest, Hungary), VARGA László (Győr, Hungary), Heinz BRANDL (Wien, Austria), FARKAS József (Budapest, Hungary)
1996	KOVÁRI Kálmán (Zürich, Switzerland)
1997	VARGA László (Győr, Hungary), LAZÁNYI István (Budapest, Hungary)
1998	Heinz DUDDECK (Braunschweig, Germany), GRESCHIK Gyula (Budapest, Hungary)
1999	Ulrich SMOLTCZYK (Stuttgart, Germany), SCHARLE Péter (Budapest, Hungary)
2000	DULÁCSKA Endre (Budapest, Hungary), Marta DOLEŽALOVÁ (Praha, Czech Rep.)
2001	Robert MAIR (Cambridge, United Kingdom), MÜLLER Miklós (Budapest, Hungary)
2002	Michele JAMIOŁKOWSKI (Torino, Italy), NAGY János (Budapest, Hungary)

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2003	**Jubilee session** James K. MITCHELL (Blacksburg, VA USA) POSGAY György (Budapest, Hungary), TRÄGER Herbert (Budapest, Hungary) MECSI József (Budapest, Hungary),
2004	Suzanne LACASSE (Oslo, Norway), SZEPESHÁZI Róbert (Győr, Hungary)
2005	Lothar MARTAK (Wien, Austria), SZABÓ Imre (Miskolc, Hungary)
2006	SECO E PINTO (Lisbon, Portugal), SZILVÁGYI Imre and SZILVÁGYI László (Budapest, Hungary)
2007	Serge VARAKSIN (Paris, France), KLADOS Gusztáv (Budapest and Kuala Lumpur)
2008	Roger FRANK (Paris, France), SOÓS Gábor (Budapest, Hungary)
2009	Rolf KATZENBACH (Darmstadt, Germany), JUHÁSZ József (Miskolc, Hungary)
2010	William VAN IMPE (Ghent, Belgium), BICZÓK Ernő (Budapest and Hamburg)
2011	Jean-Louis BRIAUD (USA), ZÁBRÁDI Ernő (Budapest, Hungary)
2012	Walter WITTKE (Germany), DELI Árpád (Budapest, Hungary)
2013	John BURLAND (UK), KOVÁCS Balázs (Miskolc, Hungary)
2014	Carlo VIGGIANI (Italy), NAGY László (Budapest, Hungary)

Károly Széchy

1903	born in Budapest on 17th December as the son of Ilona Zwerencz and Károly Széchy, MSc in Civ. Eng. chief inspector at the Hungarian Railway and
1922	maturated at the Secondary School "Árpád" in Budapest
1926	MSc Degree in Civil Engineering at the Technical University Palatine József in Budapest
1926-27	Assistant Professor at the Water Engineering Department of the same University
1927-28	scholar at the University College London
1928-32	private engineer, construction manager
1930	married, wife Margit Kókai, son Károly Széchy (1930) MSc in Civ. Eng. and Edit Sós (1932) pharmacist
1932-45	various posts at the Bridge Department in the Hungarian Ministry for Transport and Communication
1933	Doctor of Law
1935-37	management the Widening of the Margaret-Bridge
1937-39	leader of the General Planning of the Árpád-Bridge
1938	supervisor for the Modernizing of the Ferenc József-Bridge (today Freedom-Bridge)
1939-43	management the Construction of the Árpád-Bridge
1944	Dr. Techn.
1945-51	Head of the Bridge Department in the Hungarian Ministry for Transport and Communication, administrative leader for the reconstruction ofbridges blasted in W.W.II.
1945-46	leader of the Planning and Construction of the Kossuth-Bridge (demolished in 1960)
1945-46	leader of the Temporary and the Final Repairing of the Ferenc József-Bridge
1945-47	leader of the Reconstruction of the Margaret-Bridge
1947-49	leader of the Renovation of the Chain-Bridge
1946	awarded with Officer's Cross of the Republic-Order
1948	awarded with the Golden Grade Kossuth-Prize
1948	Honorary Professor at the Technical University of Budapest
1948-50	supervisor at the construction of the Árpád-Bridge
1949	started the lectures on Foundation Engineering at the TU Budapest
1950	The Hungarian Academy of Sciences declares to Technical Fellowship
1950-53	General Director for the Underground Railway Investment Co. in Budapest, Leader of the planning and construction of the Metro

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1952	The Hungarian Academy of Sciences declares to Corresponding Member Fellowship
1952	published the first edition of the book “Foundation Engineering” Volume I and II in Hungarian
1952	awarded with "Excellent Worker of Transportation" distinction
1953-54	Director of the Underground Railway Construction Co. in Budapest
1953	Ordinary Professor of Foundation Engineering and Tunnelling at the Technical University in Budapest
1956-57	Head of the Technical Board at the Ministry of Transport and Communication
1958	published the first edition of the Book “Foundation failures” in Hungarian
1958	Visiting Professor in Egypt for 2 months
1959-60	contribution to the Planning of the Renovation of the Elisabeth-bridge
1961	published the first edition of the Book „Tunnelling” in Hungarian
1964	Visiting Professor in Egypt for 2 months
1966	awarded with "Excellent Worker in Higher Education" distinction
1966	awarded with Honourable Degree at the Technical University of Helsinki
1968	Invited Lecturer for a semester in Canada
1970	The Hungarian Academy of Sciences declares his Ordinary Member Fellowship
1970	awarded by Budapest Municipality with Distinct "Pro Urbe" for his prominent lifetime activity in the reconstruction of the bridges and the establishment of the Underground Railway network in Budapest
1970	awarded with Honourable Degree at the Technical University of Wroclaw
1972	died on 22nd May in Budapest

CONFERENCE REPORT: THE FIRST INTERNATIONAL CONFERENCE ON GEOTECHNICS IN BELARUS: SCIENCE AND PRACTICE

From 23rd to 25th, October 2013 in the Belorussian National Technical University (BNTU) was held the First International Scientific and Technical Conference on "Geotechnics in Belarus: Science and Practice" in Minsk of Belarus. This conference was dedicated to the 60th anniversary of the Department of Geotechnics and Ecology in Construction and 90th Anniversary of Memory of Professor Yuri A. Sobolevski. The conference was attended by more than 100 highly qualified specialists in geotechnics from Russia, Ukraine, Kazakhstan, Estonia, Poland and Belarus.

The opening ceremony was held on October 23rd in the auditorium of the main academic building of BNTU. The prorector of BNTU for administrative activities and development, Prof. Gennady Zemlyakov, delivered a welcome greeting speech. Also congratulations were by expressed by Prof. D. Sobolevski (son of Prof. Yuri A. Sobolevski) who is the President of the Belorussian Geotechnical Society and Head of the Department of Geotechnics and Ecology in Construction who is Prof. M. Nikitenko. Professor M. Nikitenko gave a speech marking the 60th anniversary of the Department of Geotechnics and Ecology in BNTU. The immediate Past Vice President of ISSMGE, Prof. Askar Zhussupbekov, awarded Prof. Dmitry Sobolevski with a medal of Eurasian National University and KGS (Kazakhstan Geotechnical Society).

Keynote lecturers of this conference were:

- Director of Minsk metro project Valery Chekanovon the design and construction experience of the subway in Minsk,
- Head of Department of Civil Engineering Geotechnics of SPBGASU, Prof.Rashid Mangushev on "The construction of the underground part of the 2-stage of the Mariinsky State Academic Theatre in St. Petersburg (design, construction technology, monitoring)", and
- President of the Kazakhstan Geotechnical Society, Director of Geotechnical Institute, Head and Professor of Civil Engineering Department of the Eurasian National University, Prof. Askar Zhussupbekovon "Mega projects in the problematic soils in Kazakhstan."

Avery interesting special report was made by M.P. Cerepkovski (City Globokay).This report was devoted to the participation of Y.A. Sobolevski in the partisan movement in Belarus during the Second World War (Glubokaya's underground youth organization), its front-line path(1941-1945).Moreover, the audience listened with interest to the report of the Director of the drilling company "Delta" N.V.Chernoschey which was dedicated to pile foundation engineering innovations.

The following oral sessions took place after the keynote lectures.

- ***Session №.1:*** Engineering researches and geotechnical monitoring, chaired by Professor I.A. Busel.
- ***Session №.2:*** Soil mechanics as a theoretical basis of modern geotechnics, chaired by Professor D.J. Sobolevski.
- ***Session №.3:***Design and technology for installation of foundations in complicated geotechnical conditions, Strengthening and reconstruction of Foundations, chaired by Professor M.I. Nikitenko.
- ***Session №.4:*** Regulation and technical support for design and construction of the foundations, chaired by Ph.D. G.S.Rodkevich.

Further interesting presentations were made by representatives of the company CONTROLS Ltd. Of Italy which is a manufacturer of modern laboratory equipment for testing various types of soils and is a representative of a Russian company "Geosoft" reporting software for geotechnical calculations. In general, the sessions were very interesting, because supplementary discussions were made in addition to the planned program. After the conference technical excursions in Minsk were organized to visit construction projects.

The Conference ended with a solemn closing ceremony and the participants expressed sincere appreciation to the organizing committee for the interesting technical program as well as the opportunity to communicate with colleagues and the Belorussian hospitality.