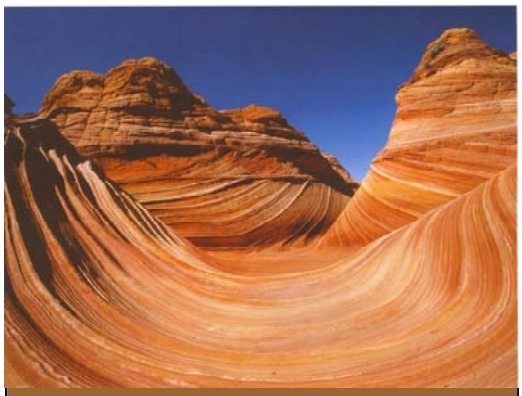

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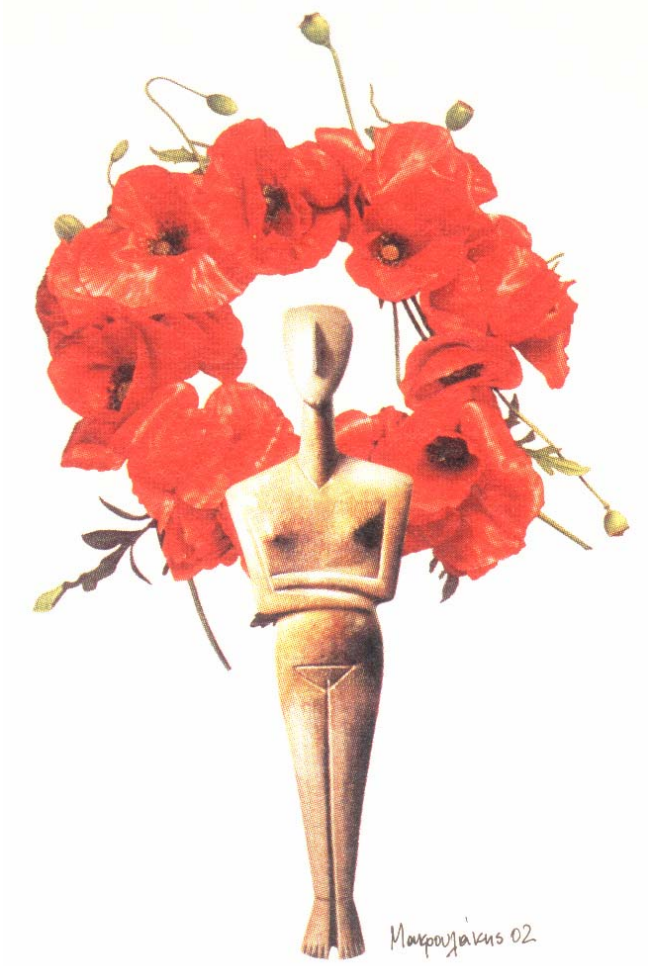
& ΓΕΩΤΕΧΝΙΚΗΣ
ΜΗΧΑΝΙΚΗΣ

Τα Νέα της Ε Ε Ε Ε Γ Μ

13

Αρ. 13 – ΑΠΡΙΛΙΟΣ 2008

Η Εκτελεστική Επιτροπή της ΕΕΕΕΓΜ
σας στέλνει τις Θερμότερες Ευχές της
για Καλό Πάσχα και Ανθοστόλιστη Πρωτομαγιά



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ΠΕΡΙΕΧΟΜΕΝΑ

Ralph B. Peck (1912 – 2008) 3

Τακτική Γενική Συνέλευση της ΕΕΕΕΓΜ 3

Άρθρα (συμμετοχές μελών της ΕΕΕΕΓΜ στο XIVth European Conference on Soil Mechanics and Geotechnical Engineering) 4

- A. Arapakou & V. Papadopoulos "Analysis of the behaviour of a deep excavation project with restraint bored piles" 4
- G. E. Mylonakis, C. I. Papantonopoulos & D. A. Chrysikos "New analytical solutions for retaining Structures under static and dynamic loads" 8

Περιλήψεις Προσφάτων Διδακτορικών Διατριβών Ελληνικών Πολυτεχνικών Σχολών 13

- Β. Μαρίνος «Γεωτεχνική Ταξινόμηση και Τεχνικογεωλογική Συμπεριφορά Ασθενών και Σύνθετων Βραχομαζών κατά τη Διάνοιξη Σηράγγων» 13

Ανασκόπηση Γεγονότων Γεωτεχνικού Ενδιαφέροντος 16

- Επαναδραστηριοποίηση της Τεχνικής Επιτροπής TC19 της ISSMGE "Preservation of Monuments and Historic Sites" 16
- FIGS was officially launched 16
- 5^{η} Αθηναϊκή Διάλεξη Γεωτεχνικής Μηχανικής 16
- Διάλεξη Καθηγητή Antonio Gens 18

Μεταπτυχιακές Σπουδές Γεωτεχνικού Ενδιαφέροντος 19

- International NATM Engineer University Course 19
- Master of Advanced Studies (MAS) on Tunnelling 19

Προσεχείς Επιστημονικές Εκδηλώσεις: 20

- International Young Scholars' Symposium on Rock Mechanics 2008 20
- International Symposium "Ground Anchors" 20
- International Conference on Geotechnical And Highway Engineering 21
- Workshop on Planning of Construction of Tunnels for High Speed Railway Connection AIS 21
- No-Dig 2008 22
- Geo-Environmental Engineering 2008 22
- 12th International Conference on Ground Penetrating Radar 22
- Geo-Environment & Landscape Evolution 2008 23
- Sixth RILEM International Conference on Cracking in Pavements 23
- DEBRIS FLOW 2008 24
- First European Conference on Unsaturated Soils 25
- GKK 08 – Geomechanics Colloquium Karlsruhe 25
- International Summer School on Rockslides and Related Phenomena 26
- ALPPS 2008 – Alpine Landslide Problems and Projects Switzerland 2008 26
- IDRC Davos 2008 International Disaster Reduction Conference 27
- 1st South American Symposium on Rock Excavations 28
- 19th European Young Geotechnical Engineers Conference 28
- Regional Conference on Geomorphology 28
- 1st Southern Hemisphere International Rock Mechanics Symposium 28
- International Symposium on Conservation of Ancient Sites 2008 29
- Τέταρτο Πανελλήνιο Συνέδριο «Διαχείριση και Βελτίωση Παράκτιων Ζωνών» 29
- 57th Geomechanics Colloquy 2008 30
- Management of Landslide Hazard in the Asia – - Pacific Region 30
- 5th Asian Rock Mechanics Symposium 31
- 5th WBI-International Shortcourse Rock Mechanics 31
- 3rd International Conference on Geotechnical and Geoenvironmental Engineering, Rock Mechanics & Engineering Geology 31
- International Conference on Rock Joints and Jointed Rock Masses 31
- RGMA-09 International Symposium on Rock Mechanics and Geoenvironment in Mining and Allied Industries 32
- Geosynthetics 2009 32
- 7th International Conference on Ground Improvement Techniques 33
- SINOROCK2009 International Symposium on Rock Mechanics 33
- SINOROCK2009 Extra-terrestrial rock mechanics 33
- 3rd International Conference on New Development in Rock Mechanics and Engineering 33
- International Symposium on Prediction and Simulation Methods for Geohazard Mitigation 34
- The 3rd International Geotechnical Symposium on Geotechnical Engineering for Disaster Prevention and Reduction 34
- GeoAfrica 2009 Geosynthetics For Africa 34
- EUROCK'2009 35
- 12th International Congress on Rock Mechanics 35

Νέα από τον Κόσμο 36

- Warsaw tower unveiled 36
- Ολυμπιακές Εγκαταστάσεις Πεκίνου 36

Νέες Εκδόσεις στις Γεωτεχνικές Επιστήμες 38

Ηλεκτρονικά Περιοδικά 41

Ralph B. Peck (1912 - 2008)

Ralph B. Peck, Professor Emeritus of Foundation Engineering at the University of Illinois at Urbana-Champaign died of congestive heart failure on February 18, 2008, at his home in Albuquerque, New Mexico. He was born in Winnipeg, Canada, to his American parents, Orwin K and Ethel Huyck Peck on June 23, 1912.

Ralph Peck earned a Civil Engineering Degree in 1934 and Doctor of Civil Engineering Degree in 1937, both from Rensselaer Polytechnic Institute in Troy, New York. In 1938-39 he attended the Soil Mechanics course at Harvard University and was a laboratory assistant to Arthur Casagrande. From1939 to 1942 Peck was an assistant subway engineer for the City of Chicago, representing Karl Terzaghi who was a consultant on the Chicago Subway Project. He joined the University of Illinois in 1942, and was a Professor of Foundation Engineering from 1948 to 1974. Since 1974, Professor Peck was a Professor Emeritus at the University of Illinois, and a consultant in geotechnical engineering.

In 1948, together with Karl Terzaghi, Ralph Peck co-authored the most influential text book in geotechnical engineering, Soil Mechanics in Engineering Practice. In 1953 with Walt Hanson and Tom Thornburn, Ralph Peck co-authored the widely used text book Foundation Engineering.

In 1942, Dr. Peck joined the Civil Engineering Department of the University of Illinois, where he remained as a teacher and mentor until his retirement as Professor Emeritus in 1974. After moving to Albuquerque, Dr. Peck continued his active consulting practice which included jobs in forty-four states in the USA and twenty-eight countries on five continents. His more than one thousand consulting projects include: the rapid transit systems in Chicago, San Francisco, and Washington; the Alaskan Pipeline System; the James Bay Project in Quebec; and the Dead Sea dikes. He authored over 250 technical publications, and served as the President of the International Society of Soil Mechanics and Foundation Engineering from 1969 to 1973. In 1974, he was awarded the National Medal of Science by President Ford. A few of his many honors include the Norman Medal, The Wellington Prize, and the Outstanding Lifetime Achievement Award in Education from the American Society of Engineers. His last project was the Rion-Antirion Bridge in Greece. It received the ASCE's OPAL Outstanding Civil Engineering Award for 2005, and is the only project outside the United States to be so honored.

Ralph Peck married Marjorie E. Truby on June 14, 1937. He is survived by his daughter and son-in-law, Nancy Peck (Allen) Young, and son and daughter-in-law, James (Laurie) Peck, and grandchildren, Michael Young and Maia Peck.

(από την ιστοσελίδα www.geoengineer.org)

ΤΑΚΤΙΚΗ ΓΕΝΙΚΗ ΣΥΝΕΛΕΥΣΗ της ΕΕΕΕΓΜ Τρίτη 13η Μαΐου 2008 Αίθουσα Εκδηλώσεων Σχολής Πολιτικών Μηχανικών ΕΜΠ

Λόγω μη απαρτίας κατά τις προηγούμενες ημερομηνίες σύγκλησης της Γενικής Συνέλευσης της ΕΕΕΕΓΜ, αυτή θα διεξαχθή οριστικά, με οποιονδήποτε αριθμό παρόντων μελών, την Τρίτη 13 Μαΐου 2008, στις 19:00, στην Αίθουσα Εκδηλώσεων της Σχολής Πολιτικών Μηχανικών του ΕΜΠ. Η συνέλευση αυτή είναι και εκλογική και η πρώτη που συγκαλείται μετά την τελευταία τροποποίηση του Άρθρου 7 του Καταστατικού, με την οποία καθιερώθηκε η δυνατότητα συμμετοχής στις ψηφοφορίες αρχαιρεσιών και δι᾽ αλληλογραφίας.

Τα θέματα της Ημερησίας Διάταξης είναι:

1. Απολογισμός πεπραγμένων της Εκτελεστικής Επιτροπής από την προηγούμενη εκλογική Γενική Συνέλευση της 24.05. 2005.
2. Οικονομικός απολογισμός οικονομικού έτους 2007.
3. Έκθεση Εξελεγκτικής Επιτροπής.
4. Έγκριση πεπραγμένων και οικονομικού απολογισμού και απαλλαγή της Εκτελεστικής Επιτροπής από κάθε ευθύνη.
5. Διοργάνωση 15ου Πανευρωπαϊκού Συνεδρίου.
6. Ενημέρωση – Διάφορα Θέματα.
7. Εκλογή νέας Εκτελεστικής Επιτροπής και Εξελεγκτικής Επιτροπής

ΥΠΟΨΗΦΙΟΙ ΓΙΑ ΤΗΝ ΕΚΤΕΛΕΣΤΙΚΗ ΕΠΙΤΡΟΠΗ

1. Αναγνωστόπουλος Ανδρέας
2. Βέττας Παναγιώτης
3. Βουζαράς Εμμανουήλ
4. Καββαδάς Μιχαήλ
5. Καβουνίδης Σπυρίδων
6. Κούμουλος Δημήτριος
7. Μπαρδάνης Μιχαήλ
8. Ντούλης Γεώργιος
9. Ντουνιάς Γεώργιος
10. Παχάκης Μιχαήλ
11. Τσατσανίφος Χρήστος

ΥΠΟΨΗΦΙΟΙ ΓΙΑ ΤΗΝ ΕΞΕΛΕΓΚΤΙΚΗ ΕΠΙΤΡΟΠΗ

1. Καμαριώτης Αριστοτέλης
2. Κοργιαλός Θεόδωρος
3. Παπαγεωργίου Ορέστης

ΑΡΘΡΑ

Τα ακόλουθα δύο άρθρα αποτελούν συμμετοχές μελών της ΕΕΕΕΓΜ στο πρόσφατο XIV[th] European Conference on Soil Mechanics and Geotechnical Engineering που διεξήχθη στην Μαδρίτη (24 – 27 Σεπτεμβρίου – βλέπε προηγούμενα τεύχη ΝΕΩΝ).

Analysis of the behaviour of a deep excavation project with restraint bored piles

Analyse du comportement d'une excavation profonde affronté par pieux de soutènement

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National Technical University of Athens, Greece

ABSTRACT

In the present study, the stability of deep excavated slopes of a Cut & Cover project has been examined. Due to the fact that part of the construction have run very close to a habitable area, the minimization of the soil displacements should be indispensable. The stability conditions have been improved by the construction of restraint bored piles. Through back – analyses, which have been based on measurements of the displacements on the head of the piles, the laboratory parameters have been confirmed, and the safety factors as well as the bending moments have been estimated. Finally, main conclusions, deduced by parametric analyses, concerning safety factors and maximum bending moments, have been mentioned.

RÉSUMÉ

La stabilité des talus des excavations profondes, qui sont construites par la méthode 'cut & cover' est étudiée. Une partie de l'ouvrage était très proche d'une zone urbaine et la diminution des déformations du sol était nécessaire. Pour cette raison, la solution des pieux de soutènement est adoptée. Des analyses numérique (back analyses), en utilisant les mesures des déformations réelles à la tête des pieux, ont été conduites. Les résultats ont confirmé les paramètres géotechniques des essais du laboratoire. Les facteurs de sécurité et le moment fléchissant sont estimés. Enfin, les conclusions des analyses numériques soulignent la relation du facteur de sécurité avec le moment fléchissant maximale des pieux.

Keywords: deep excavation, habitable area, restraint piles, bending moments, safety factors

1 INTRODUCTION

The construction of a Cut & Cover closed canal which belongs to the work concerning the bed deviation of Alfeios River in lignite mines of the Public Power Corporation in Megalopolis (Central Peloponnesus, Greece) has been examined, in this study. The bed deviation has been considered essential in order for the mines to be extended. The fact that a large part of the canal runs very close to habitable area (community of Tripotamos) deep excavations should be controlled. The whole project has been already constructed and until today no geotechnical problems have been arisen. The design for the improvement of the stability conditions has been drawn up by Papadopoulos V. and Anagnostopoulos A. (1997), based on the geotechnical investigations of the P.P.C.

The total geometrical and geotechnical data, the observations during construction and the measurements of soil deformations, have been evaluated after the construction by Arapakou A. (2004). The present study refers to the main points of the work, as well as the methodology of the back analyses and the sensitivity analyses of the results due to possible fluctuation of geotechnical parameters.

2 GEOMETRICAL DATA AND GEOTECHNICAL CONDITIONS

During the construction of the closed canal, of 25m width and 12m height, deep excavated slopes have been created (almost 40m) in the side of the habitable area. The inclination of the natural surface in this area has been generally between 1:5 and 1:7. After the recover, permanent slopes of about 27m height and 1:3 inclination, would have been remained, according to the general stability investigation.

Abrupt slopes of great height would have been necessary to be formed in the lowest section of the general excavations. In order for the stability conditions to be improved until recover, restraint bored piles, of 1,20m diameter, have been designed to be placed within distances of about 3,33m to 4,00m. The construction phases are illustrated on Figure 1. Directly after the construction of the bored piles points for the measurement of the displacements have been installed on the head of the piles. During the whole construction, additional measurements of the convergences of slopes as well as the raising of the bottom of the general excavation have been received.

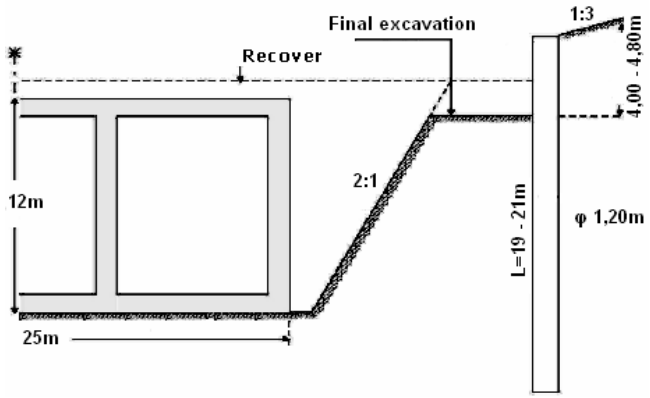


Figure 1. Typical cross – section and main phases of excavation

According to the geotechnical investigations underground, until the influence depth, consists of the following main layers:

- Layer (I): Clay or sandy clay CH, overconsolidated, brown or brownish yellow.
- Layer (II): Clay CL or CH, overconsolidated, grey or brownish grey, with cohesionless thin zones of ML – SM.
- Layer (III): zones of lignite, organic clay OH or marl.

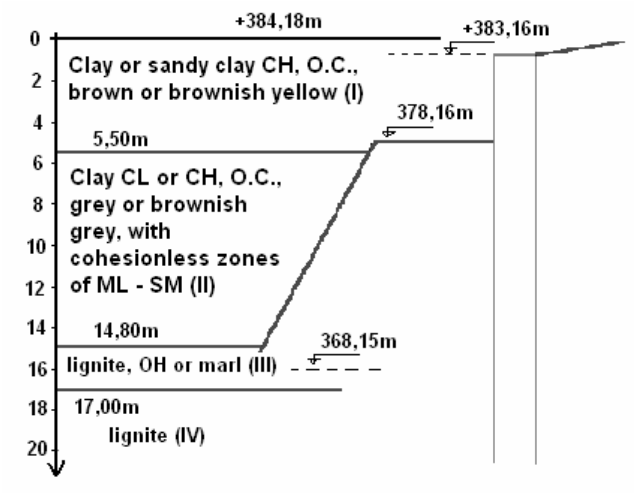
Percussion number N (SPT) has been noted generally with high values N>50 though the lowest one has been N=34.

A representative geotechnical profile, in which back stability analyses have been carried out, as well as the results from triaxial compression tests CU, concerning soil layer II, have been given on Figure 2. Results from a previous systematic investigation for lignite of Megalopolis (Anagnostopoulos A, 1980) have been re-evaluated in order for the lignite properties to be determined.

3 STABILITY ANALYSES

Stability analyses have been based on the geometrical data of the examined cross-sections, the geometrical data which have been deduced by geotechnical investigations carried out within two phases, the observations during construction phases, and finally the measurements of the displacements on the head of the piles.

Analyses have been conducted within two phases:



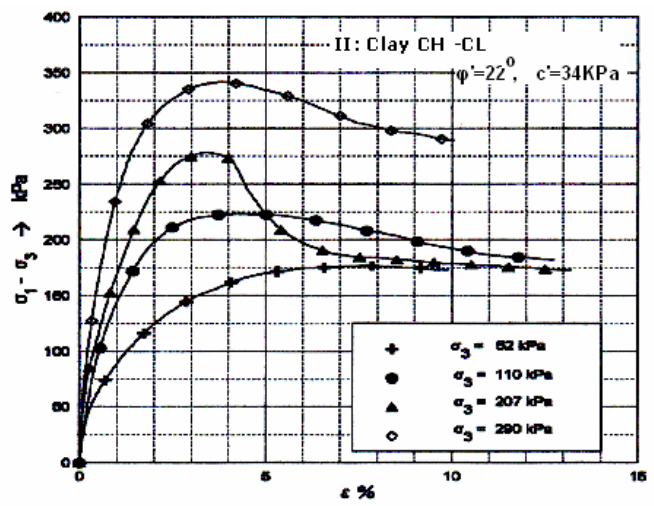


Figure 2. Geotechnical profile and representative triaxial CU tests results

a) Stability analyses according to the simplified Bishop method, by using TALREN program, in order to find out the minimum possible shear strength parameters. Analyses have been based on the excavation data, concerning mainly the lowest level of 11m height and 2:1 inclination. Failure conditions have not been observed, thus the minimum possible shear strength could be defined (set of parameters I, according to Table 1). Furthermore, maximum possible parameters (set of parameters II) have been estimated through all data. Stability analyses have been carried out for the two worst kilometer positions.

Table 1. Minimum and maximum values of soil parameters

	Set of parameters I			Set of parameters II		
	c KPa	φ (^{0})	E MPa	c KPa	φ (^{0})	E MPa
Clay I	15	17	21	20	23	30
Clay II	32	17	53	45	23	58
Silty sand	5	35	60	12,5	35	60
Lign.	100	27,5	60	100	27,5	60

b) Analyses based on finite element method, by using Plaxis V.8 Professional. Soil has been simulated as elastoplastic medium, according to Mohr – Coulomb's criterion. The first leading analyses have been conducted according to the corresponding set of parameters of Table 1. The main purpose of these analyses has been to confirm the horizontal and vertical displacements developed on the head of the piles as well as the vertical displacements occurring on the bottom of the general excavation. The results from the above analyses and the measured values of the deformations are given on Table 2.

Table 2. Comparing the results from the analyses with the measured values

		Measured values	Anal. I	Anal. II
K.P. 1+800	U_x (cm)	3.1	9.320	2.917
	U_y (cm)	1.2	1.096	1.265
K.P. 2+010	U_x (cm)	4.1	8.615	2.934
	U_y (cm)	1.4	1.332	1.770
Measurements on the head of the piles				

4 SENSITIVITY ANALYSES

4.1 General

For a better understanding of the measurements and the project's behaviour, it has been essential to investigate the sensitivity of the results in relation to the variability of soil parameters. A simpler cross – section than the two previous, has been studied, in which no ground water table has been appeared so as to avoid any uncertainty on the results. The influence of the rigidity of the piles on the displacements and on the bending moments has been examined in order to comprehend the contribution of the piles on the slope stability. Then, the influence of the phreatic – level has been also searched. In order for the vertical deformations to be estimated, an ideal excavation phase of 4m height has been simulated during the last phase.

4.2 Influence of Poisson's ratio

The effect of Poisson's ratio has been studied only according to linear elastic theory. The whole cross – section has been separated into two different districts: a) The largest one where insignificant horizontal displacements can occur (v=0,35), b) The district where great horizontal displacements can develop because of unloading (v=0,175).

Furthermore, the first simplified acceptance where v=0,30, has been taken into account. The results from the two different analyses which are shown on Table 3, are related to horizontal U_x and vertical Uy deformations developed on the head of the piles as well as on the bottom of the excavation. It is observed that there are not any important differences between the two different analyses.

The divergences, though, between the calculated deformations and the measured ones are shown to be depended on the elastoplastic and not elastic soil behaviour.

Table 3. Influence of Poisson's ratio

	Linear - Elastic		
	Analysis 1	Analysis 2	
	v = 0.30	v=0.175	v=0.35
Vertical phase displacement cm	2.057	2.232	
U_x (horizontal displacement) cm	1.725	1.783	
U_y (vertical displacement) cm	1.798	2.185	
Displacements of the head of the piles			

4.3 Influence of cohesion and safety factor versus deformations

From the corresponding analyses, it should be concluded that high values of cohesion c can lead to relatively low horizontal displacements U_x. However, if cohesion values are lower than 30KPa, the Ux may be greatly increased as cohesion decreases. The variation of U_x versus cohesion c, is illustrated on Figure 3, from which the average value of cohesion could be indirectly estimated relied on the measured U_x values. It has been noted that there is no substantial difference between the resulted value, c=38KPa, and the laboratory one (c=34KPa).

The variation of the horizontal displacements U_x versus safety factor MSF is shown on Figure 4. For MSF = 1,40, U_x values remain relatively low, though for MSF values lower than 1,25, U_x values have shown to increase very rapidly. It should be cleared up that parametric analysis has been carried out for various cohesion values but for constant modulus of elasticity E.

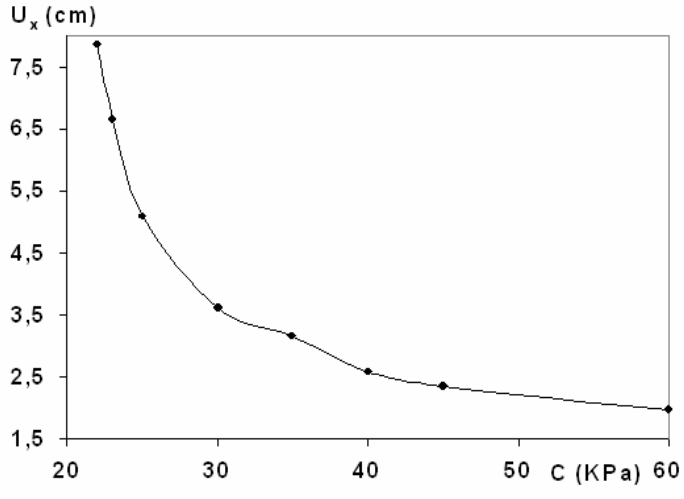


Figure 3. Variation of the horizontal displacement versus cohesion

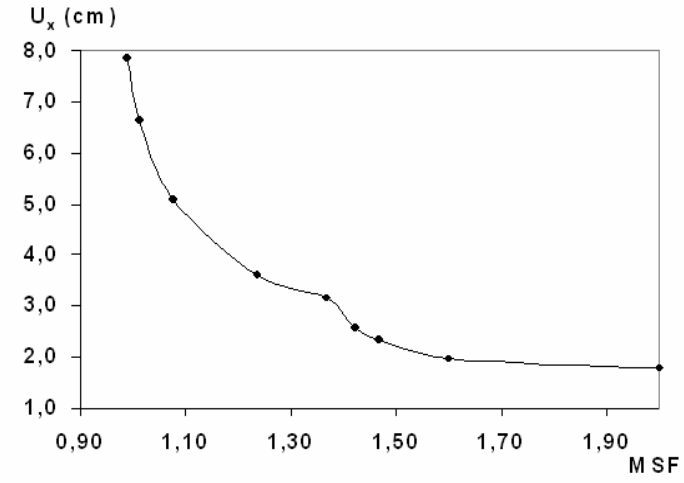


Figure 4. Variation of the horizontal displacement versus safety factor

4.4 Influence of cohesion and safety factor versus bending moments

The estimation of the bending moments should be directly connected with the dimensions of the piles, whose aim is to improve the stability conditions that are the safety factor. The variation of the maximum bending moment versus safety factor is given on Figure 5. It has been concluded that for relatively high values of safety factor against that based on the linear elastic analysis, there is little reduction on the bending moment values. On the contrary, for low values of MSF, lower than 1,25, banding moment values seem to arise. The corresponding results are given on Table 4.

The maximum bending moment resulted from the analysis according to linear elasticity, in most cases, has been higher than the respective one resulted from the second analysis. This could be interpreted by studying the point where bending moment becomes maximum (point where shear forces are zeroed). As far as the first case is concerned (linear elastic medium), this point seems to be lower than that of the second case.

According to the limit equilibrium mechanisms (which correspond to safety factor MSF=1), the maximum bending moment has been calculated as follows: a) According to Broms B.B (1972): maxM=2588KNm and b) According to Viggiani C (1981): maxM=4206KNm.

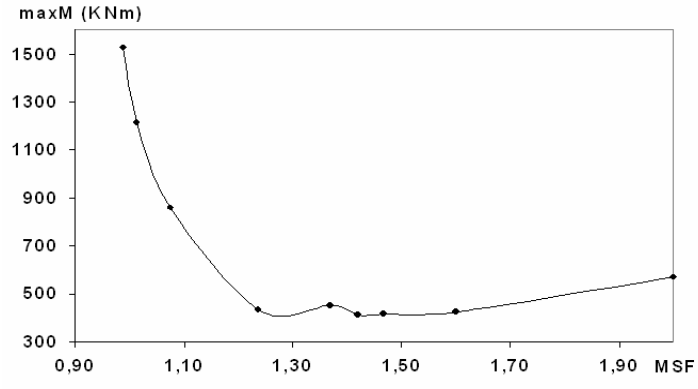


Figure 5. Variation of the maximum bending moment versus safety factor

A great difference has been remarked between the calculation of the bending moments according to finite element method and the calculation based on the limit equilibrium mechanisms. The maximum values based on the latter case have been concluded to be 8 – 9 times higher than those which have been really developed. The bending moment design of the piles relied on the above analysis has been considered as an average value computed according to Broms and Viggiani.

4.5 Influence of the rigidity of the pile

The effect of the pile's rigidity has been studied in order for its contribution to the stability conditions to be better comprehended. Two different analyses based on linear elastic medium as well as on two values of the clay cohesion (c=38KPa and c=23KPa), have been examined. According to the first analysis, the inertia moment I has been considered 10 times greater than that of the previous analyses, that is $EI/EI_0=10$. According to the second analysis, this moment has been considered much lower so that $EI/EI_0=0,10$, where I_0 is the first value of the inertia moment.

4.6 Influence of the phreatic level

During parametric analysis the influence of the ground – water table, which has been considered to arise on the level of the general excavation, has been also examined. The bending moments and the developed deformations of the piles as well as the soil displacements have been calculated. According to the above analyses, it should be noted that there are no significant differences between the calculated values and the measured ones. Therefore, it could be concluded that a possible presence of the phreatic level has not any important effect on the results deduced from finite element analyses.

5 CONCLUSIONS

From the above analyses, it has been concluded that the laboratory values of the shear strength parameters of the clay layers could well justify the developed and measured soil deformations. Thus, the reliability of the finite element model as

Table 4. Linear elastic analysis and analysis according to variation of the cohesion

	Linear Elastic	Mohr - Coulomb						
c (KPa)	-	60	45	40	35	30	23	22
maxM (KNm)	571.16	425.11	415.35	410.79	451.68	433.27	1215.25	1526.81
MSF	-	1.60	1.467	1.421	1.368	1.236	1.013	0.988
Depth of maxM (m)	5.97	5.019	4.981	4.983	4.983	4.707	9.513	9.321

well as the considered geotechnical profiles have been greatly confirmed.

The general conclusions from the whole analysis are the following:

- The detailed analysis concerning the Poisson's ratio (separation in two different districts) has not actually lead to different results from those based on the single value. However, this distinction has been taken into account in the next analyses due to the fact that it comes closer to reality.

- Horizontal displacements developed on the head of the pile as well as bending moments have shown to be greatly influenced by the variation in cohesion value (constant modulus of elasticity). The safety factor against failure, which has been calculated according to a "phi – c reduction" procedure, that is, proportional reduction of shear strength and tanφ parameters, has also seemed to influence horizontal displacements and bending moments. Results have been noted to be much more sensitive when safety factor is lower than 1,25. Then, horizontal deformations and bending moments have been greatly increased.

- Enough lateral support of the pile on the bench has been also observed, as it had been firstly supposed. However, lateral earth pressures have resulted to be much lower that the passive ones.

- Bending moments computed based on the measured horizontal displacements have resulted to be much lower (8 – 9 times) than those according to limit equilibrium mechanisms. Therefore, the safety factor of piles would have been expected to be 8 – 9 times higher than the respective one according to the latter mechanisms. Consequently, great attention is required as far as design is concerned and especially when conditions are far from limit equilibrium states.

- The comprehension of soil behaviour and measured displacements has been the main purpose of the investigation of this project through back – stability analyses. An additional aim has been the parametric investigation of the influence of some parameters against general stability, in a sensitive place which is very close to a habitable area.

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New analytical solutions for retaining structures under static and dynamic loads

Nouvelles solutions analytiques pour des structures de soutènement soumises a des charges statiques et dynamiques

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ABSTRACT

In this paper, a family of new simple "design-oriented" analysis methods for retaining structures subjected to both static and dynamic loads is proposed. While retaining analytical and conceptual simplicity, the proposed methods offer enhanced predictive power over existing simplified approaches (e.g., Rankine, Coulomb and their dynamic extensions). They include certain features which are currently available only in numerical solutions. Three such methods are outlined in the paper, namely: (1) stress limit analysis solutions, (2) elastodynamic solutions and (3) solutions for retaining walls with geofoam interface. The solutions are simple and accurate, and can be easily implemented by means of hand computations.

RÉSUMÉ

Dans cet article on propose une famille de méthodes analytiques orientées sur la conception des structures de soutènement soumises à des charges statiques et dynamiques. Tout en conservant une simplicité conceptuelle et analytique les méthodes proposées offrent une capacité de prévision accrue par rapport aux méthodes simples existantes (Rankine, Coulomb et leurs extensions dynamiques). Elles possèdent quelques caractéristiques actuellement disponibles qu'aux méthodes numériques. Trois de ces méthodes sont décrites dans cet article, notamment: (1) solutions du type analyse limite, (2) solutions elastodynamiques et (3) solutions elastodynamiques des murs de soutènement avec des interfaces en "goefoam". Les solutions sont simples, et précises et elles peuvent facilement êêtre effectuées par des calculs manuels.

Keywords: Retaining walls, limit analysis, elasticity, elastodynamics, geosynthetic materials, geofoam

1 INTRODUCTION

Current design procedures for retaining structures can be roughly classified into two main groups: (1) simplified methods, based on the Coulomb-type solutions and their various derivatives, (2) rigorous computational methods based mainly on the finite-element and the finite-difference approaches. Methods in the first group are computationally inexpensive and offer insight in the physics of the problem. However, they lack predictive power, especially for complex geometries, elastic conditions and distribution of earth pressures on the wall. On the other hand, computational methods have superior predictive power and can handle complex configurations and different types of material behaviour. Their underlying mathematical principles are complex and unfamiliar to the Geotechnical Engineer. Consequently, use of these methods is restricted to specialized users.

In this paper, a new family of simple "design-oriented" analysis approaches for retaining structures is presented. While retaining analytical and conceptual simplicity, the proposed methods offer enhanced predictive power over existing simplified methods (Rankine, Coulomb), which is currently available only in rigorous numerical solutions. Three such approaches are outlined below, namely: (1) stress limit analysis solutions; (2) elastodynamic solutions; (3) solutions for retaining structures with geosynthetic interfaces. The solutions are simple and accurate, and can be easily implemented by means of hand computations.

2 AN ALTERNATIVE TO THE MONONOBE-OKABE EQUATIONS FOR SEISMIC EARTH PRESSURES

The classical equations of Coulomb (Coulomb 1773) and Mononobe-Okabe (Matsuo & Okabe 1924) are being widely used for determining earth pressures due to gravitational and earthquake loads, respectively. Given their practical nature and reasonable predictions of actual dynamic pressures, solutions of this type are expected to continue being used by engineers for a long time to come.

It is well known that the Mononobe-Okabe solutions can be interpreted as *kinematic* solutions of limit analysis. Solutions of this type are inherently *unsafe* as they underestimate active pressures and overestimate the passive (Chen 1975). A second group of limit-analysis methods, the *stress* solutions, make use of stress fields that satisfy equilibrium equations and stress boundary conditions, without violating the failure criterion anywhere in the medium. Formulations of this type are inherently *safe,* as they overestimate active pressures and underestimate the passive. To the best of the Authors' knowledge, no simple closed-form solution of the stress type has been derived for seismic earth pressures.

The problem under investigation is depicted in Figure 1: a slope of dry cohesionless soil retained by an inclined gravity wall, is subjected to plane strain conditions under the combined action of gravity (g) and seismic body forces (a_h x g) and (a_v x g) acting in the horizontal and vertical direction, respectively. The problem parameters are: the height (H) and inclination (ω) of the wall, inclination (β) of the slope; roughness (δ) of the wall-soil interface; friction angle (φ) and unit weight (γ) of the soil material, and surface surcharge (q).

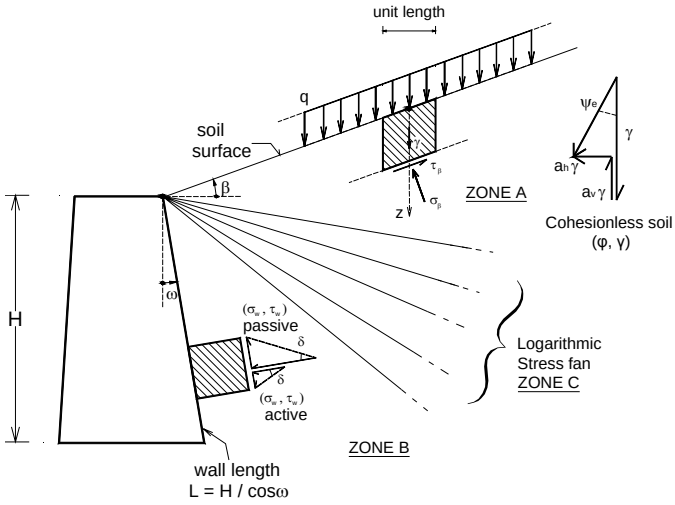

Figure 1. The problem under investigation

The resultant body force in the soil is acting under an angle ψ_e from vertical

$$\tan\psi_e = a_h / (1 - a_v) \qquad (1)$$

To analyze the problem, the backfill is divided into two main regions subjected to different stress fields, as shown in Figure 1: the first zone (A) is located close to the soil surface, whereas the second (zone B) close to the wall. In both regions soil is assumed to be in a condition of impeding yielding under the combined action of gravity and earthquake loads. The same assumption is adopted for the soil-wall interface.

Fundamental to the proposed analysis is the assumption that stresses close to the soil surface can be well approximated by those in an *infinite slope*, as shown in Figure 1. In this zone (A), the inclined soil element shown is subjected to cancelling actions along its vertical sides. Thus equilibrium is achieved solely under body forces and contact stress acting at its bottom face. For points in zone B, it is assumed that stresses are functions exclusively of the vertical coordinate and obey the strength criterion of the frictional soil-wall interface.

To determine the separation of mean stresses S_A and S_B in the two zones, a logarithmic *stress fan* is adopted in this study, centered at the top of the wall. In the interior of the fan, principal stresses are gradually rotated by the angle θ separating the major principal planes in the two regions.

2.1 Solution without Earthquake Loading

The total thrust on the wall due to surcharge and gravity loading is obtained by the well-known expression:

$$P = K_q\, q\, H + \frac{1}{2} K_\gamma\, \gamma\, H^2 \qquad (2)$$

Using the above model, Mylonakis et al (2007) showed that the earth pressure coefficient due to self weigh, K_γ, is given by

$$K_\gamma = \frac{\cos(\omega-\beta)\cos\beta}{\cos\delta\cos^2\omega} \times\left[\frac{1\mp\sin\phi\cos(\Delta_2\mp\delta)}{1\pm\sin\phi\cos(\Delta_1\pm\beta)}\right]\exp(\mp 2\theta\tan\phi) \qquad (3)$$

where

$$2\theta = \Delta_2 \mp (\Delta_1+\delta) + \beta - 2\omega \qquad (4)$$

is twice the angle separating the major principal planes in zones A and B. Δ_1 and Δ_2 denote the corresponding Caquot angles given by (Chen 1975)

$$\sin\Delta_1 = \frac{\sin\beta}{\sin\phi} \quad \text{and} \quad \sin\Delta_2 = \frac{\sin\delta}{\sin\phi} \qquad (5)$$

Regarding the double signs in Eqn (3), the upper one corresponds to active conditions and the lower to passive.

It is also straightforward to show that the surcharge coefficient K_q is related to K_γ through the simple expression

$$K_q = K_\gamma \frac{\cos\omega}{\cos(\omega-\beta)} \qquad (6)$$

which coincides with the kinematic solution of Chen & Liu (1990), established using a Coulomb mechanism. Equation (6) represents an *exact* solution for a weightless material. Note that for a horizontal backfill (β = 0), coefficients K_q and K_γ coincide regardless of wall inclination and material properties. Simplified versions of the above solutions have been derived by Powrie (1997), Lancelotta (2001) and Muir Wood (2004).

2.2 Solution including Earthquake Loading

Recognizing that earthquake action imposes a resultant thrust in the backfill inclined by a *constant* angle ψ_e from vertical, it becomes apparent that the pseudo-dynamic problem does not differ fundamentally from the corresponding static problem, as the former can be obtained from the latter through a rotation of the reference axes by the seismic angle ψ_e. Application of this concept to the problem at hand yields the following solution (Mylonakis et al 2007)

$$K_{E\gamma} = (1-a_v)\frac{\cos(\omega-\beta)\cos(\beta+\psi_e)}{\cos\psi_e\cos\delta\cos^2\omega} \times\left[\frac{1\mp\sin\phi\cos(\Delta_2\mp\delta)}{1\pm\sin\phi\cos\left[\Delta_1^*\pm(\beta+\psi_e)\right]}\right]\exp(\mp 2\theta_E\tan\phi) \qquad (7)$$

which can be used in the context of Eqn (2). In the above equation,

$$2\theta_E = \Delta_2 \mp (\Delta_1^*+\delta) + \beta - 2\omega - \psi_e \qquad (8)$$

is twice the revolution angle of principal stresses in the two regions under seismic conditions; Δ_1^* is equal to Arcsin [sin(β+ψe) /sinφ], following Eqns (5).

Evidently, the above equations are simpler than those of Coulomb and Mononobe-Okabe and possess a solid physical basis. Since equilibrium is not rigorously satisfied in the interior of the fan, the solution should not be viewed as a rigorous bound. It will be used in this work as an approximate bound, or merely as predictor of earth pressures. Nevertheless, extensive comparisons against rigorous numerical results presented in the following section, indicate that the solution consistently yields safe predictions for both active and passive pressures.

Results for active seismic earth pressures are given in Figure 2, referring to cases examined in the seminal study of Seed & Whitman (1970) for a reference friction angle of 35°. Naturally, active pressures increase with increasing levels of seismic acceleration and slope inclination and decrease with increasing friction angle and wall roughness. The conservative nature of the proposed analysis versus the Mononobe-Okabe (M-O) solution is evident in the graphs. The trend is more pronounced for high levels of horizontal seismic coefficient (a_h > 0.25), smooth walls (not shown), level backfills, and high friction angles. Conversely, the trend becomes weaker with steep backfills, rough walls, and low friction angles.

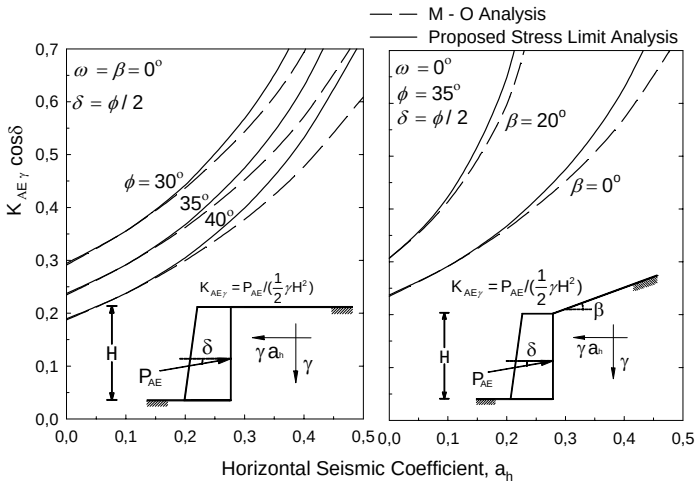

Figure 2. Comparison of active seismic earth pressures predicted by the proposed solution and from conventional M - O analysis (modified from Seed & Whitman 1970)

3 ELASTODYNAMIC SOLUTION FOR SEISMIC EARTH PRESSURES ON GRAVITY WALLS

The limit analysis solutions discussed above rely on the implicit assumption that the wall can displace sufficiently, so that active or passive condition can develop in the backfill. This assumption, although reasonable in many cases, is not always realistic. There are numerous examples of retaining walls (e.g., basement walls, bridge abutments) that do not fulfil this requirement. For such cases, elastic methods can be employed as the one outline below.

The system investigated is shown in Figure 3. A rigid wall retaining a semi-infinite soil layer that is free at the upper surface and bonded to base, is excited by uniform earthquake acceleration imposed at the base of the layer. Soil is considered a linear viscoelastic isotropic material of mass density ρ, shear modulus G, Poisson's ratio ν, and material damping δ, which is assumed to be independent of frequency.

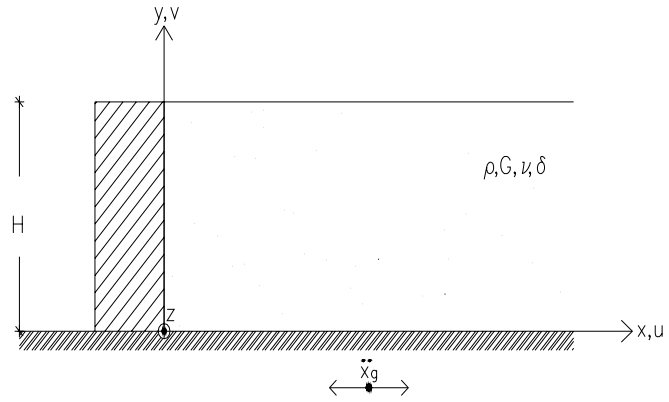

Figure 3. Gravity wall in viscoelastic soil under earthquake loading

For harmonic seismic excitation, the governing equation of motion of the medium in the horizontal direction may be written as (Arias et al 1981)

$$\chi_e^2 \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + k^{*2} u = \frac{\ddot{X}_g}{V_s^2} \quad (9)$$

where

$$k^* = \omega / V_s^* \quad , \qquad \chi_e^{\,2} = (2-\nu)/(1-\nu) \quad (10)$$

in which $V_s^* = V_s\sqrt{1+2i\beta_s}$ is the complex propagation velocity of damped shear waves in the soil medium. β_s represents the corresponding damping coefficient, which is analogous (yet not identical) to the critical damping ration of simple oscillators.

The above equation was derived based on the (reasonable) assumption that no vertical normal stresses develop anywhere in the medium during dynamic response. A direct solution to Eqn (9) has been presented by Arias et al (1981) and later by Veletsos & Younan (1994). Due to mathematical complexity associated with the use of infinite trigonometric series, that solution has been proven difficult to use in practical applications. An alternative approach is presented here: instead of solving Eqn (9) directly, the partial differential equation is integrated along the vertical direction (thickness of soil layer) and transformed to an ordinary differential equation, which is amenable to elementary analytical treatment.

As shown in Langousis et al (2006), the total soil thrust on the wall is obtained by

$$Q_b = -\frac{\psi_o^2}{\psi_e}\frac{G^*}{H} a_{oc}\sqrt{1-\left(\frac{a_o}{a_{oc}}\right)^2}\left(u_0 + \frac{\mathscr{L}}{a_{oc}^2 - a_o^2}\frac{H^2\,\ddot{X}_g}{V_s^{*2}}\right)\int_0^H \Phi(y)dy \quad (11)$$

where

$$a_{oc}^2 = H^2\frac{\int_0^H \Phi' dy}{\int_0^H \Phi^2 dy}\,, \quad a_0 = \frac{\omega H}{V_s^*} \quad \text{and} \quad \mathscr{L} = \frac{\int_0^H \Phi\, dy}{\int_0^H \Phi^2 dy} \quad (12)$$

are, respectively, the dimensionless excitation frequency, the cutoff frequency of the system below which no stress waves propagate in the medium, and a modal participation factor of the dynamic system. Φ = Φ(z) is an appropriate modal function (shape function). The negative sign in front of the solution indicates negative base shear for positive ground acceleration and vice versa.

Figure 4 shows the accuracy of the proposed solution in comparison with the Veletsos-Younan analytical solution and Wood's finite-element solution. It is obvious that the proposed solution is extremely close to Wood's solution and it is even more accurate than Veletsos-Younan's solution.

Figure 5 presents the dynamic base shear of the proposed solution for a sinusoidal shape function (Φ) and for a rigid wall in comparison to Veletsos-Younan solution. The maximum discrepancy of these solutions is 5%, observed at resonance.

Figure 6 shows the application point of the base shear, which has been calculated as the ratio M_b/Q_b. The application point for the proposed solution is constant and equal to 2/π (=0.637). Veletsos-Younan solution and the proposed solution are in reasonable agreement (discrepancy less than 10%) for all excitation frequencies ω/ω_1 below 2, which cover most cases of practical interest.

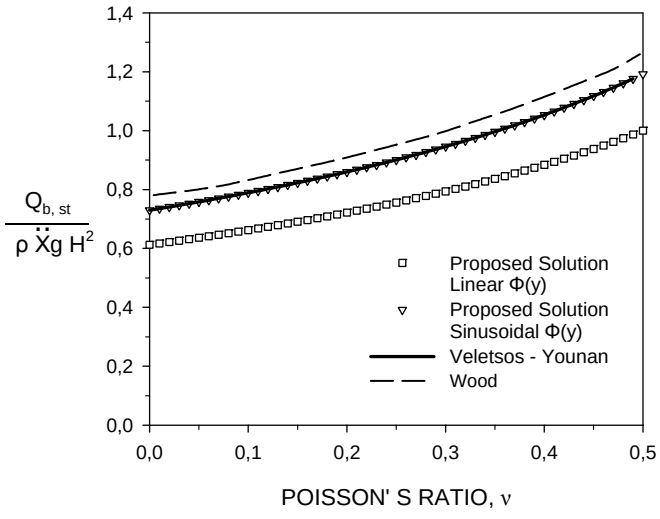

Figure 4. Comparison of the proposed solution with the solutions by Veletsos-Younan and Wood for the static base shear on a rigid retaining wall, as function of the Poisson's ratio.

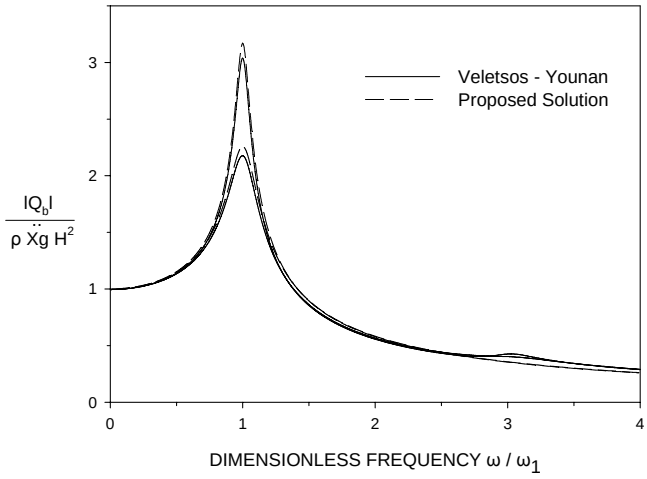

Figure 5. Comparison of the proposed solution with the theory of Veletsos-Younan, for the base shear of a rigid wall; v=0.3

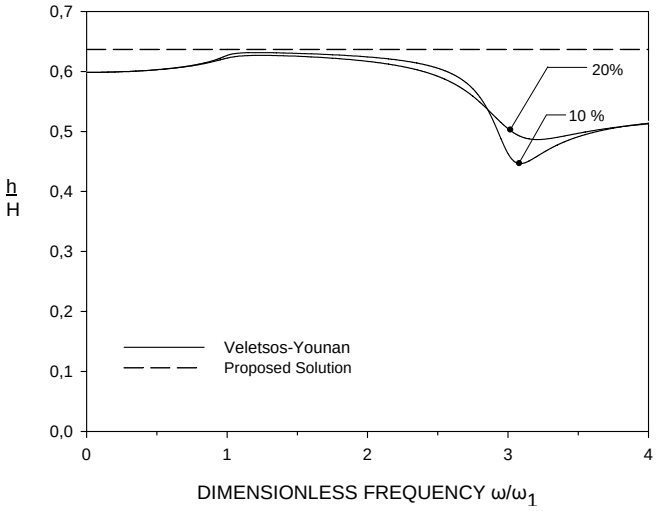

Figure 6. Comparison of the point of application of seismic thrust on a rigid wall computed with the proposed solution and with that of Veletsos-Younan, for different values of soil damping; *v=0.3*

4 ELASTODYNAMIC SOLUTION FOR RETAINING WALLS ENHANCED BY GEOFOAM MATERIAL

Research conducted at University of Patras (Athanasopoulos et. al. 2007) and elsewhere has demonstrated that use of a compressible interface of Geofoam material at the back of the wall, greatly reduces the forces on the wall, at the expense of a small increase in backfill displacements. In this section we outline an enhancement of the elastodynamic solution presented earlier, to account for the presence of the geosynthetic interface.

The reduction in base shear can be described by the following index (Mylonakis 2005)

$$I_f = \frac{1 - F\left[1 - \cosh(m_2 \frac{s}{H}) - \Lambda \sinh(m_2 \frac{s}{H})\right]}{\cosh(m_2 \frac{s}{H}) + \Lambda^{-1} \sinh(m_2 \frac{s}{H})} \quad (13)$$

which defines the ratio of soil thrust with and without geofoam, respectively. In the above equation,

$$F = \frac{1-\nu_1}{1-\nu_2}\frac{G_2^* m_2}{G_1^* m_1}, \quad \Lambda = \frac{1-\left(a_{01}/a_{0c}\right)^2}{1-\left(a_{02}/a_{0c}\right)^2}\left(\frac{V_{s1}^*}{V_{s2}^*}\right)^2, \quad (14)$$

$$m_1 = \frac{a_{0c}}{\chi_{01}}\sqrt{1-\left(a_{01}/a_{0c}\right)^2}, \quad m_2 = \frac{a_{0c}}{\chi_{02}}\sqrt{1-\left(a_{02}/a_{0c}\right)^2} \quad (15)$$

where s denotes the thickness of geofoam material and G_1, V_{s1}, ν_1, a_{01} its shear modulus, shear wave propagation velocity, Poisson's ratio and dimensionless frequency, respectively. G_2, V_{s2}, ν_2, a_{02} denote corresponding parameters for the soil material.

Numerical results are shown in Figures 7 and 8, for static and dynamic conditions, respectively. The dramatic reduction in seismic thrust is evident in the graphs. Interestingly, the reduction is smaller at frequencies close to the resonant frequency of the layer, as shown in Figure 8.

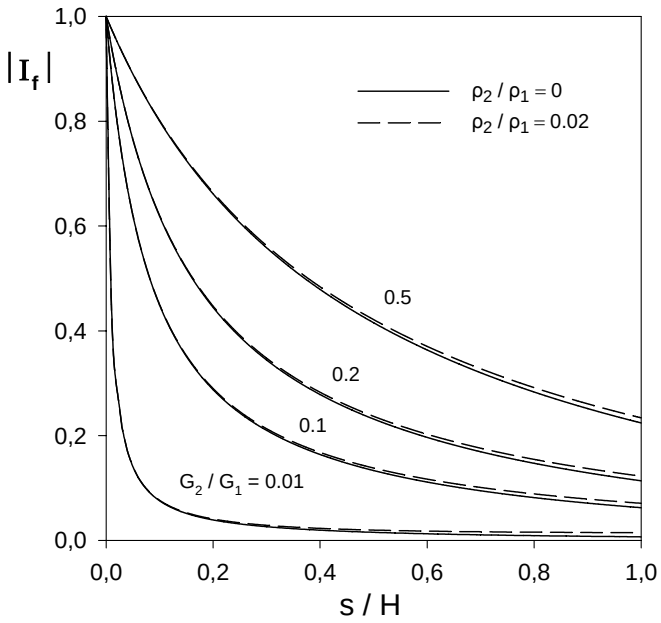

Figure 7. Base shear reduction factor for a rigid vertical wall with geofoam interface retaining homogeneous soil layer, as function of geofoam thickness.

5 CONCLUSIONS

A family of new analytical solutions was presented for assessing gravitational and earthquake-induced earth pressures on retaining walls. The following are the main conclusions of the study:

(1) The proposed stress limit analysis solution is simpler and more accurate than the classical equations of Coulomb and Mononobe-Okabe. Extensive comparisons with numerical solutions indicate that the proposed solution is *safe*, as it over-predicts active pressures and under-predicts passive resistance.

(2) The proposed elastodynamic solution is simpler than the corresponding solution by Veletsos-Younan, and can be used in cases where the wall cannot move sufficiently to induce failure in the backfill. The solution is in convincing agreement with more rigorous approaches such as that of Wood and Veletsos-Younan. The largest observed discrepancy for static conditions barely exceeds 7%.

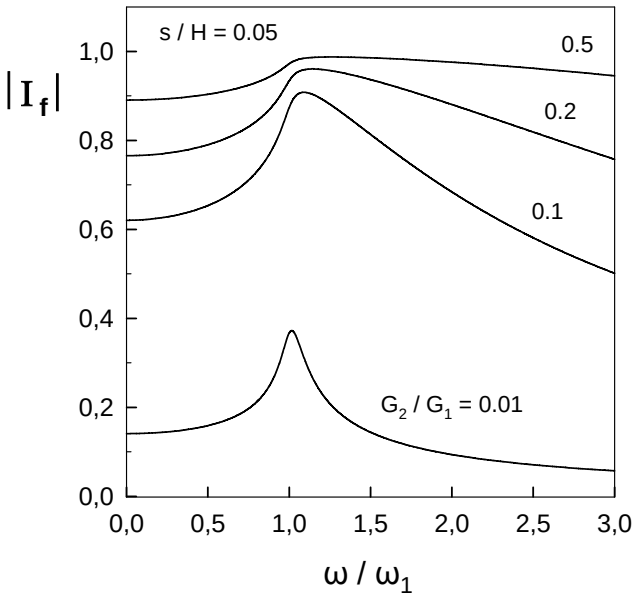

Figure 8. Base shear reduction factor for a rigid vertical wall with geofoam interface retaining homogeneous soil layer, as function of frequency.

(3) The enhanced elastodynamic solution for the geofoam interface indicates that a reduction in seismic thrust of about 50% is possible for geofoam thickness of only 5% of the wall height. The reduction is not as effective for frequencies close to the fundamental natural frequency of the soil layer. Nevertheless, given the small thickness of the backfill, this case is minor importance from a practical viewpoint.

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ΠΕΡΙΛΗΨΕΙΣ ΠΡΟΣΦΑΤΩΝ ΔΙΔΑΚΤΟΡΙΚΩΝ ΔΙΑΤΡΙΒΩΝ ΕΛΛΗΝΙΚΩΝ ΠΟΛΥΤΕΧΝΙΚΩΝ ΣΧΟΛΩΝ

ΓΕΩΤΕΧΝΙΚΗ ΤΑΞΙΝΟΜΗΣΗ ΚΑΙ ΤΕΧΝΙΚΟΓΕΩΛΟΓΙΚΗ ΣΥΜΠΕΡΙΦΟΡΑ ΑΣΘΕΝΩΝ ΚΑΙ ΣΥΝΘΕΤΩΝ ΒΡΑΧΟΜΑΖΩΝ ΚΑΤΑ ΤΗ ΔΙΑΝΟΙΞΗ ΣΗΡΑΓΓΩΝ

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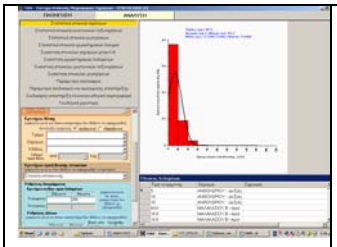
Τομέας Γεωτεχνικής

Αντικείμενο της διατριβής είναι η γεωτεχνική ταξινόμηση και η τεχνικογεωλογική συμπεριφορά ασθενών και σύνθετων γεωυλικών κατά τη διάνοιξη σηράγγων. Η έρευνα επικεντρώνεται κυρίως σε μη αστικές σήραγγες με συμβατική μέθοδο διάνοιξης. Η πολυπλοκότητα που παρουσιάζουν τα γεωυλικά αυτά επιβάλει ειδικότερη ανάλυση και τεχνικογεωλογικό χαρακτηρισμό λόγω των ιδιαιτεροτήτων που παρουσιάζουν οι βραχόμαζές τους, τόσο ως προς την δομή τους όσο και ως προς τα λιθολογικά χαρακτηριστικά τους. Οι ασθενείς και σύνθετες βραχόμαζες που εξετάζονται, έχουν τις περισσότερες φορές υποστεί έντονη τεκτονική καταπόνηση με αποτέλεσμα την καταστροφή της αρχικής τους δομής, την αποσάθρωση, τη συμμετοχή γεωυλικών με πολύ χαμηλή αντοχή και γενικώς μια ποικίλλουσα ετερογένεια. Πρόκειται περί των τύπων των βραχομαζών που μπορεί να εμφανίζει ο φλύσχης, η μολάσσα, ο κατακερματισμένος ασβεστόλιθος, οι οφιόλιθοι και οι καταπονημένοι γνεύσιοι.

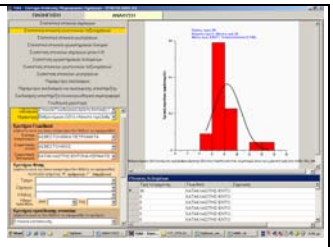
Η πρόσφατη έρευνα για τις ασθενείς βραχόμαζες και τη τεχνικογεωλογική τους συμπεριφορά και οι εμπειρίες από τη πρόσφατη διάνοιξη σηράγγων στον Ελληνικό χώρο, κάτω από ιδιαίτερα δύσκολες γεωλογικές συνθήκες, προσφέρουν ιδανικό υλικό για την έρευνα της επίδρασης των συνθηκών αυτών στην συμπεριφορά του γεωυλικού καθώς και στις μεθόδους σχεδιασμού και κατασκευής. Η παρούσα διδακτορική διατριβή στοχεύει κυρίως στην έρευνα επί των γεωλογικών παραγόντων που επηρεάζουν την τεχνική συμπεριφορά των ασθενών βραχομαζών στα υπόγεια έργα, στη συσχέτιση των παραγόντων που υπεισέρχονται στη διερεύνηση ισχύος και εφαρμογής των συστημάτων ταξινόμησης και στη σύνδεση των χαρακτηριστικών των γεωυλικών αυτών με την αντοχή της βραχόμαζας. Η χρησιμότητα της εργασίας αυτής αφορά στις απαιτήσεις της έρευνας πεδίου, στην αξιολόγηση της τεχνικογεωλογικής συμπεριφοράς, στις μεθόδους σχεδιασμού και στις τεχνικές κατασκευής σε αυτές τις ιδιαίτερα δυσμενείς τεχνικογεωλογικές συνθήκες.

Η τεχνικογεωλογική θεώρηση των ασθενών και σύνθετων βραχομαζών δεν εξετάζεται μεμονωμένα αλλά μέσα από ένα σύνολο πληροφοριών. Αυτό περιλαμβάνει τη θεώρηση του γεωλογικού περιβάλλοντος μέσα στο οποίο διαμορφώθηκαν οι βραχόμαζες, την ανάλυση όλων των τεχνικογεωλογικών χαρακτηριστικών που ορίζουν τους καθοριστικούς παράγοντες-“κλειδιά” για την ευστάθειά τους στο υπόγειο έργο, την εκτίμηση της αντοχής και παραμορφωσιμότητας του άρρηκτου βράχου, και την ταξινόμησή τους για την δυνατότητα του γεωτεχνικού χαρακτηρισμού τους που επιτρέπει την εκτίμηση της απομείωσης των ιδιοτήτων αυτών. Εκτιμάται, έτσι, η τεχνικογεωλογική συμπεριφορά της ανυποστήρικτης διατομής του υπόγειου έργου και η ποιοτική εκτίμηση των απαιτουμένων μέτρων υποστήριξης.

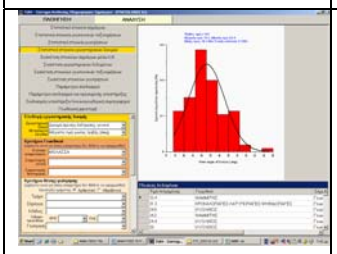
Με σκοπό την αξιοποίηση των εμπειριών που έχουν αποκτηθεί από την κατασκευή πολλών σηράγγων, την τελευταία κυρίως δεκαετία, στον Ελλαδικό χώρο και την σχετική επεξεργασία του υλικού αυτού δημιουργήθηκε μία κεντρική τράπεζα δεδομένων, η οποία ονομάστηκε «Σύστημα Ανάλυσης Πληροφοριών Σηράγγων» και αναφέρεται ως TIAS (Tunnel Information Analysis System). Από μόνη της η δημιουργία μιας τέτοιας τράπεζας δεδομένων αποτελεί ένα σημαντικό στοιχείο της διατριβής. Στόχος της τράπεζας είναι η σύγκριση των προβλεφθεισών και των πραγματικών γεωλογικών και γεωτεχνικών συνθηκών που συναντήθηκαν, η αξιολόγηση των χρησιμοποιούμενων μεθόδων χαρακτηρισμού και ταξινόμησης της βραχόμαζας καθώς και συσχετίσεις για την απόκριση της βραχόμαζας και τα μέτρα ενίσχυσης και υποστήριξης. Βασική πηγή των δεδομένων αποτέλεσαν 62 σήραγγες της Εγνατίας Οδού για τις οποίες πραγματοποιήθηκε, στο πλαίσιο της διατριβής, έρευνα υπαίθρου και επεξεργασία των στοιχείων μελέτης και κατασκευής τους. Τονίζεται ότι πολλές από τις σήραγγες αυτές έχουν κατασκευαστεί κάτω από ιδιαίτερα δυσμενείς συνθήκες. Η βάση περιλαμβάνει 96 πίνακες εισαγωγής δεδομένων, 66 γεωτεχνικού χαρακτήρα και 30 ειδικά για τις σήραγγες. Έχει τη δυνατότητα παροχής πληροφοριών αρχειακού χαρακτήρα, παροχής στοιχείων για τις ανάγκες ελέγχου των σηράγγων σε σχέση με το γεωπεριβάλλον τους καθώς και στοιχείων για σύγκριση μελέτης και κατασκευής νέων σηράγγων σε ανάλογες συνθήκες. Τα δεδομένα που εισάγονται και επεξεργάζεται το TIAS αφορούν γεωτρήσεις, αποτελέσματα εργαστηριακών ή επιτόπου δοκιμών, ταξινομήσεις, τεχνικογεωλογική συμπεριφορά (καταπτώσεις, συγκλίσεις και υπόγεια νερά), παραμέτρους σχεδιασμού, γεωτεχνικές αναλύσεις, καθώς και πληροφορίες για τα μέτρα άμεσης υποστήριξης και το κόστος.



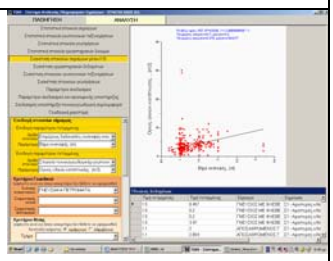
Παράδειγμα ανάλυσης στοιχείων σηράγγων (εδώ η κατανομή του όγκου καταπτώσεων στη φάση κατασκευής σήραγγας σε περιβάλλον «ήρεμου» φλύσχη).



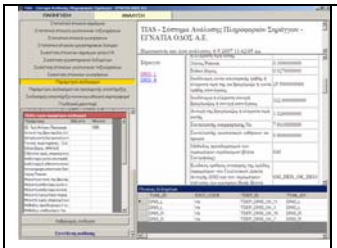
Παράδειγμα ανάλυσης στοιχείων ταξινομήσεων (εδώ η κατανομή της τιμής του GSI για κατακλαστικό ασβεστόλιθο στη φάση κατασκευής).



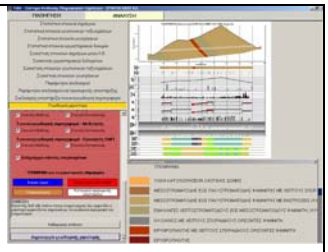
Παράδειγμα ανάλυσης εργαστηριακών δεδομένων (εδώ η γωνία τριβής επιφανειών ασυνεχειών μολασσικών σχηματισμών από δοκιμή άμεσης διάτμησης)



Παράδειγμα συσχέτισης στοιχείων σηράγγων μέσω Χ.Θ. (εδώ όγκος κατάπτωσης με το ανάλογο βήμα προχώρησης)



Παράδειγμα ανάλυσης τεχνικογεωλογικών και γεωτεχνικών παραμέτρων σχεδιασμού



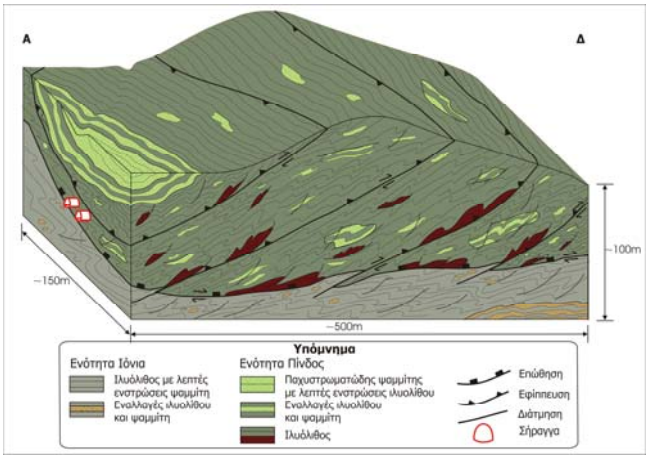
Παράδειγμα μηκοτομικής ανάλυσης στοιχείων μελέτης και κατασκευής και συμβάντων(καταπτώσεις, εισροές) σε συγκεκριμένο κλάδο σήραγγας.

Σχήμα 1. Παραδείγματα αναλύσεων της βάσης δεδομένων TIAS

Για την παρουσίαση και ανάλυση των προαναφερθέντων, για κάθε ένα από τα εξεταζόμενα γεωυλικά, δημιουργήθηκε ένα τυπολόγιο ώστε να μπορεί να γίνεται εύκολα η αναζήτηση των στοιχείων αυτών ανά γεωυλικό και τύπο βραχόμαζας.

Για κάθε κατηγορία υλικού ερευνάται το γενικό γεωλογικό πρότυπο του περιβάλλοντος των βραχομαζών τους με βάση τη λιθολογία, τη δομή των σχηματισμών, τις κύριες τεκτονικές επιφάνειες, τις υδρογεωλογικές συνθήκες, το βαθμό της αποσάθρωσης και το μορφολογικό ανάγλυφο. Στα πλαίσια αυτά αναλύεται το προσομοίωμα της βραχόμαζας με τα χαρακτηριστικά του κερματισμού, της αποσάθρωσης, και ακόμη της αποδιοργανωμένης, χαοτικής ή διατμημένης δομής.

Η γεωτεχνική ταξινόμηση των υπόψη βραχομαζών αποτελεί σημαντικό τμήμα της διδακτορικής διατριβής. Τα αποτελέσματα της αξιολόγησης των χαρακτήρων δομής και ασυνεχειών οδήγησαν στην πρόταση νέων διαγραμμάτων ποσοτικού χαρακτηρισμού μέσω του συστήματος GSI για τις βραχόμαζες του φλύσχη, της μολάσσας, των γνευσίων (στις καταπονημένες κυρίως δομές του) και δίνονται τα εύρη προβολής των διαφόρων παραλλαγών για τους ασβεστολίθους και τους οφιολίθους. Συγχρόνως, δίδονται συστάσεις εφαρμογής του συστήματος GSI, συζητούνται γενικότερα οι περιορισμοί εφαρμογής των ταξινομήσεων στις ασθενείς βραχόμαζες καθώς και οι περιπτώσεις λανθασμένης χρήσης της ταξινόμησης.

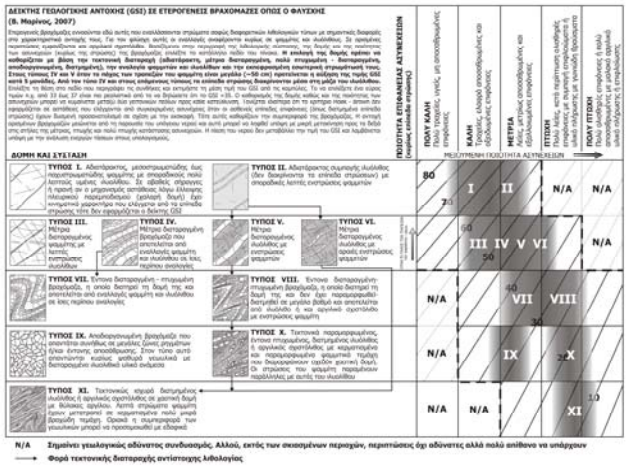


Σχήμα 2. Τεχνικογεωλογικό μοντέλο της δομής στην περιοχή της σήραγγας Ανθοχωρίου όπου φαίνεται η πολυπλοκότητα της γεωλογικής δομής σε περιβάλλον φλύσχη σε ένα μέτωπο επώθησης.

Διερευνώνται και προτείνονται φάσματα τιμών για τις παραμέτρους του κριτηρίου Hoek and Brown (σ_{ci}, m_i) και της σταθεράς παραμορφωσιμότητας MR, με βάση την επεξεργασία αποτελεσμάτων εργαστηριακών δοκιμών για τα ερευνώμενα γεωυλικά, τιμές οι οποίες χρησιμοποιούνται για την ανάλυση (με τη χρήση αναλυτικών σχέσεων ή αριθμητικών μεθόδων) των υπογείων εκσκαφών. Προτείνονται επίσης τιμές για τις ετερογενείς βραχόμαζες.

ΤΥΠΟΣ ΒΡΑΧΟΜΑΖΑΣ	ΣΥΣΤΑΣΗ	ΔΟΜΗ GSI
Τύπος Ι	Αδιατάρακτος μεσοστρωματώδης έως παχυστρωματώδης ψαμμίτης με σποραδικές λεπτές ενστρώσεις ιλυολίθου	
Τύπος ΙΙ	Αδιατάρακτος ιλυόλιθος με σποραδικές λεπτές ενστρώσεις ψαμμίτη	
Τύπος ΙΙΙ	Μέτρια διαταραγμένος ψαμμίτης με ενστρώσεις ιλυολίθου	
Τύπος IV	Μέτρια διαταραγμένη βραχόμαζα αποτελούμενη από εναλλαγές ψαμμίτη-ιλυολίθου σε ίσες αναλογίες	
Τύπος V	Μέτρια διαταραγμένος ιλυόλιθος με ενστρώσεις ψαμμίτη	
Τύπος VI	Μέτρια διαταραγμένος ιλυόλιθος με αραιές λεπτές ενστρώσεις ιλυολίθου	
Τύπος VII	Έντονα διαταραγμένη – πτυχωμένη βραχόμαζα η οποία διατηρεί τη δομή της και αποτελείται από εναλλαγές ψαμμίτη – ιλυολίθου σε ίσες αναλογίες	
Τύπος VIII	Έντονα διαταραγμένη – πτυχωμένη βραχόμαζα η οποία διατηρεί τη δομή της και δεν έχει παραμορφωθεί – διατμηθεί σε μεγάλο βαθμό και αποτελείται από ιλυόλιθο με ενστρώσεις ψαμμίτη	
Τύπος IX	Αποδιοργανωμένη βραχόμαζα που απαντάται σε ζώνες μεγάλων ρηγμάτων ή/και έντονης αποσάθρωσης. Στον τύπο αυτό απαντώνται κυρίως ψαθυρά γεωυλικά (μεταψαμμίτες – μεταιλυόλιθοι)	
Τύπος X	Τεκτονικά παραμορφωμένος, έντονα πτυχωμένος, ρηγματωμένος ιλυόλιθος ή αργιλικός σχιστόλιθος με κερματισμένα και παραμορφωμένα ψαμμιτικά τεμάχη τα οποία διαφοροποιούν σχεδόν χαοτική δομή. Οι στρώσεις των ψαμμιτικών τεμαχών διατηρούν την παραλληλία με αυτές των ιλυολίθων	
Τύπος XI	Τεκτονικώς έντονα διατμημένος ιλυόλιθος ή αργιλικός σχιστόλιθος σε χαοτική δομή με θύλακες αργίλου. Λεπτά στρώματα ψαμμίτη έχουν μεταπραπεί σε πολύ μικρά βραχώδη τεμάχη	

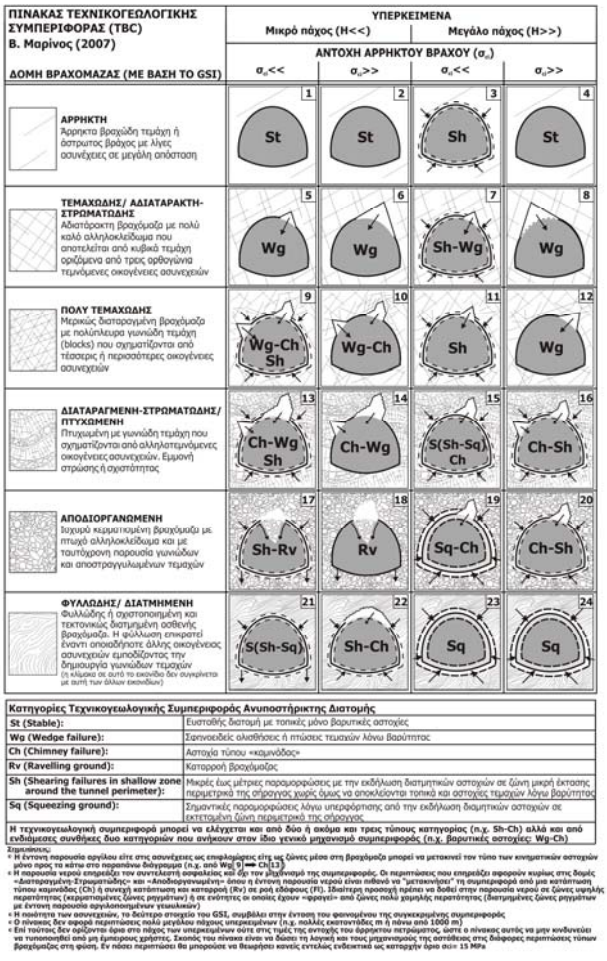
Σχήμα 3. Τεχνικογεωλογικοί τύποι βραχόμαζας σε φλυσχικό περιβάλλον



Σχήμα 4. Νέο διάγραμμα ταξινόμησης GSI για ετερογενείς βραχόμαζες όπως ο φλύσχης

Επιπλέον της γεωτεχνικής ταξινόμησης της βραχόμαζας και σε συνδυασμό με αυτή, πραγματοποιείται περαιτέρω και μία ταξινόμηση των ασθενών και σύνθετων γεωυλικών που εξετάστηκαν, με βάση τη τεχνικογεωλογική τους συμπεριφορά κατά τη διάνοιξη των σηράγγων, σε σχέση με τον μηχανισμό αστοχίας και το κατά περίπτωση τασικό πεδίο. Αντιστοιχούνται συνεπώς, οι μηχανισμοί πιθανής αστοχίας (παραμορφώσεις λόγω υπερφόρτισης, καταπτώσεις ή ολισθήσεις σφηνών, εκτεταμένες καταπτώσεις τύπου καμινάδας, καταρροή γεωυλικού) καθώς και η κλίμακα της αστοχίας.

Γενικώς, η χρήση των γνωστών συστημάτων ταξινόμησης έχει το μειονέκτημα να μην συνοδεύεται υποχρεωτικά από πληροφορίες συμπεριφοράς της βραχόμαζας στις σήραγγες. Έτσι πολλές φορές χάνεται η γεωλογική ταυτότητα του γεωυλικού, αφού αυτή δεν συνοδεύει πλήρως την ανάλυση και είναι δυνατόν να αγνοούνται οι ιδιαιτερότητες που πιθανόν αυτό να παρουσιάζει. Σε κάθε περίπτωση τονίζεται ότι η τεχνικογεωλογική κρίση έχει ιδιαίτερη σημασία όταν επιχειρείται ποσοτικοποίηση των χαρακτηριστικών της βραχόμαζας. Στο πλαίσιο αυτό, δημιουργήθηκε ένα σύστημα εκτίμησης των μηχανισμών - τύπων συμπεριφοράς της βραχόμαζας για ανυποστήρικτη διατομή σήραγγας, με βάση συγκεκριμένες τεχνικογεωλογικές παραμέτρους και το τασικό περιβάλλον. Αυτές είναι η δομή (σύμφωνα με το GSI), οι οριακές συνθήκες της αντοχής σ_{ci} και η πίεση των υπερκειμένων. Η εκτίμηση αφορά εύρη υπερκειμένων έως 300m. Αφού ορίζονται οι κατά περίπτωση πιθανότεροι μηχανισμοί αστοχίας, για κάθε τύπο αναμενόμενης βραχόμαζας προσδίδονται οι κατάλληλοι παράμετροι σχεδιασμού (είτε της βραχόμαζας π.χ.GSI, σ_{ci}, m_i αν αυτή συμπεριφέρεται ισότροπα, είτε ασυνεχειών αν αυτή συμπεριφέρεται ανισότροπα). Τα ανωτέρω συνδέονται και αντιστοιχούνται ενδεικτικά με τυπικές διατομές υποστήριξης σηράγγων με συγκεκριμένες προτάσεις για κάθε τύπο τεχνικογεωλογικής συμπεριφοράς. Με αυτόν τον τρόπο, η ορθότητα των ταξινομήσεων και το σύστημα υποστήριξης μπορούν να ελέγχονται άμεσα από τις μετρήσεις των παραμορφώσεων ή των χαρακτηριστικών τυχόν αστοχιών κατά τη διάρκεια της εκσκαφής της σήραγγας.



Σχήμα 5. Προτεινόμενο διάγραμμα εκτίμησης της τεχνικογεωλογικής συμπεριφοράς της βραχόμαζας

Δημοσιεύσεις σε διεθνή επιστημονικά περιοδικά και πρακτικά συνεδρίων

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2004. Hoek E., Marinos P and Marinos V. Characterization and engineering properties of tectonically undisturbed but lithologically varied sedimentary rock masses. International Journal of Rock Mechanics and Mining Sciences, 42, (2), 277-285.

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Η διατριβή εκπονήθηκε με επιβλέποντα τον Αναπληρωτή Καθηγητή Γεώργιο Τσιαμπάο κατά το διάστημα 2002-2007.

ΑΝΑΣΚΟΠΗΣΗ ΓΕΓΟΝΟΤΩΝ ΓΕΩΤΕΧΝΙΚΟΥ ΕΝΔΙΑΦΕΡΟΝΤΟΣ

Επαναδραστηριοποίηση της Τεχνικής Επιτροπής TC 19 της ISSMGE
"Preservation of Monuments and Historic Sites"

Μετά από απόφαση του Προέδρου της ISSMGE Prof. Pedro Seco e Pinto επαναδραστηριοποιήθηκε η Τεχνική Επιτροπή TC 19, οι εργασίες της οποίας είχαν διακοπεί μετά την σύσταση της Joint Technical Committee JTC 6 της Federation of the International Geo-Engineering Societies - FIGS με το ίδιο αντικείμενο. Κύριος στόχος της TC 19 είναι η ολοκλήρωση των οδηγιών για γεωτεχνικές έρευνες, ανάλυση και μελέτη επεμβάσεων σε μνημεία. Στην συνέχεια παρατίθενται πιο αναλυτικά οι στόχοι της επιτροπής, καθώς και τα μέλη του πυρήνα της:

Terms of Reference

1. To promote co-operation and exchange of scientific and technical information on the geotechnical aspects of preservation of monuments and historic sites.

2. To collect a number of well-documented case histories to gradually develop general criteria and, in perspective, guidelines for geotechnical investigations, analysis and interventions.

3. To present the work performed in a Satellite Conference or in an Open Meeting of the TC19 during the XVII ICSMGE in Alexandria in October 2009.

Chairman

Dr. Christos Tsatsanifos	(Greece)

Secretary

Dr. Prodromos Psarropoulos	(Greece)

Honorary Members

Prof. Michele Jamiolkowski	(Italy)
Prof. Ruggiero Jappelli	(Italy)
Prof. Carlo Viggiani	(Italy)

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Prof. Atilla Ansal	(Turkey)
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Prof. John Burland	(UK)
Prof. Giovanni Calabresi	(Italy)
Dr. Yoshinori Iwasaki	(Japan)
Dr. Efrain Ovando-Shelley	(Mexico)
Prof. Kiriazis Pitilakis	(Greece)
Prof. Vladimir Ulitski	(Russia)

FIGS was officially launched

Following the previous approval by the IAEG and the ISRM, the Council of the ISSMGE approved, last October, the Co-operation Agreement for formation of the Federation of the International Geo-Engineering Societies - FIGS. The role of the Federation is to carry out functions for the international geo-engineering community that could not be carried out with the same effectiveness and efficiency by the Members individually. The Federation is founded on the principle that each of the participating associations/societies will retain its identity and autonomy.

The inaugural meeting of FIGS took place in London, on 25 January 2008 (see photo). The activity developed until now was reviewed. The main achievement so far has been to form 7 Joint Technical Committees (JTCs) with members from the 3 societies, which are already working. Another 4 JTCs are now being established. With the formal start of operation of FIGS it is expected that its activities will be significantly increased during 2008.

Following a procedure approved at that meeting, Prof. William van Impe was elected the President of FIGS for 2008-2011.

5Η ΑΘΗΝΑΪΚΗ ΔΙΑΛΕΞΗ ΓΕΩΤΕΧΝΙΚΗΣ ΜΗΧΑΝΙΚΗΣ
Ομότιμος Καθηγητής Ε.Μ.Π.
ΑΝΔΡΕΑΣ ΑΝΑΓΝΩΣΤΟΠΟΥΛΟΣ

Στις 17 Μαρτίου 2008 παρουσιάστηκε από τον Ομότιμο Καθηγητή του Ε.Μ.Π. Ανδρέα Αναγνωστόπουλο, Γενικό Γραμματέα της ΕΕΕΕΓΜ η 5η Αθηναϊκή Διάλεξη Γεωτεχνικής Μηχανικής με τίτλο «Καθιζήσεις Επιφανειακών Θεμελιώσεων». Η εκδήλωση πραγματοποιήθηκε στην αίθουσα εκδηλώσεων του Κτιρίου Διοίκησης του Ε.Μ.Π. παρουσία πολυπληθούς ακροατηρίου.

Η παρουσίαση περιέλαβε 3 ενότητες από αυτές που απασχολούν την καθημερινή πράξη:

Α. Την εκτίμηση των καθιζήσεων των δομικών έργων

Β. Τις επιτρεπόμενες καθιζήσεις κτιρίων και γεφυρών

Γ. Τις προκαλούμενες μετακινήσεις και την Επικινδυνότητα των κτιρίων λόγω διανοίξεως σηράγγων

Καταρχήν επισημάνθηκε ότι οι καθιζήσεις / εδαφικές μετακινήσεις είναι κοινό πρόβλημα μεταξύ Γεωτεχνικού και Δομοστατικού Μηχανικού. Η επίλυση όμως ενός προβλήματος όπως των καθιζήσεων, απαιτεί μία σωστή προσομοίωση τόσο των ιδιοτήτων του εδάφους, όσο και της γεωμετρίας του προβλήματος, γεγονός που περιλαμβάνει πολλές δυσκολίες και αβεβαιότητες.

Τουλάχιστον τέσσερις συνιστώσες εμπλέκονται στο πρόβλημα:

- Η εδαφική τομή και πώς δημιουργήθηκε
- Η μηχανική συμπεριφορά των εδαφικών υλικών
- Η εκτίμηση με τη χρήση κατάλληλου προτύπου
- Η προϋπάρχουσα τεκμηριωμένη εμπειρία

Έτσι, ο μεν Δομοστατικός Μηχανικός θα πρέπει να κατανοήσει τις ανωτέρω εγγενείς δυσκολίες, αλλά και ο Γεωτεχνικός Μηχανικός θα πρέπει να κατανοήσει την «αυστηρότητα» κατά την εκτίμηση των καθιζήσεων που απαιτούν τα Δομοστατικά.

Όσον αφορά τις καθιζήσεις των δομικών έργων σε αργίλους, έγινε αναφορά στη γενική χρήση εξισώσεων ελαστικής μορφής και επισημάνθηκαν οι αποκλίσεις που μπορούν να προκύψουν, κατά την εφαρμογή της θεωρίας ελαστικότητας, όπως π.χ. σε περιπτώσεις διαστρωματικών εδαφικών σχηματισμών, σε περιπτώσεις όπου το μέτρο ελαστικότητας αυξάνεται με το βάθος, καθώς και όταν λαμβάνεται υπόψη η επίδραση του βάθους θεμελιώσεως.

Επισημάνθηκε επίσης η σύγχρονη απαίτηση για προσδιορισμό των μέτρων ελαστικότητας σε περιοχές μικρών παραμορφώσεων, καθώς και η χρησιμότητα των διαγραμμάτων που συνδέουν καταγεγραμμένες καθιζήσεις με το πλάτος της θεμελιώσεως.

Όσον αφορά τις καθιζήσεις σε μη συνεκτικά εδάφη, οι οποίες βασίζονται κυρίως σε αποτελέσματα επί τόπου δοκιμών (SPT-CPT-PMT), αναφέρθηκε αφ' ενός μεν ο μεγάλος αριθμός μεθόδων υπολογισμού που υφίστανται, αφ' ετέρου δε ότι δεν υπάρχει η δυνατότητα συγκρίσεως των διαφόρων αποτελεσμάτων με κάποια θεωρητικού χαρακτήρα μεθοδολογία. Έτσι τελικά, η ακρίβειά τους ελέγχεται μόνο με τη σύγκριση αποτελεσμάτων εκτιμήσεως-μετρήσεων των καθιζήσεων από περιπτώσεις της πράξης. Προς τούτο δόθηκαν διάφορες περιπτώσεις από τη διεθνή βιβλιογραφία.

Έγινε αναφορά στην ανάγκη εκτιμήσεως της αλληλεπίδρασης εδάφους-κατασκευής, όταν αυτή αναμένεται να είναι σημαντική και τονίσθηκε η δυσκολία που προκύπτει κατά τον καθορισμό της προσομοίωσης της συμπεριφοράς του εδάφους.

Τέλος παρουσιάσθηκε ένα πλαίσιο τιμών ανεκτών εδαφικών μετακινήσεων και στροφών για τα δομικά έργα, με βάση στοιχεία από τη σύγχρονη διεθνή βιβλιογραφία και αναφέρθηκαν οι σχετικές απαιτήσεις του Ευρωκώδικα ΕC-7.

Η οριακή κατάσταση λειτουργίας στις γέφυρες πραγματεύεται κριτήρια για τα οποία εξασφαλίζεται επαρκής συμπεριφορά υπό τις αναμενόμενες συνθήκες φόρτισης. Η καθιέρωση όμως κοινά αποδεκτού κριτηρίου καλής λειτουργίας συνδέεται με πολλούς παράγοντες όπως:

- Ποιότητα, άνεση και αίσθηση ασφάλειας κατά τη διέλευση
- Εξασφάλιση ικανοποιητικής λειτουργίας των αρμών διακοπής
- Δομικές βλάβες
- Κόστος συνήθους και βαριάς συντήρησης στη διάρκεια ζωής του έργου

Ο καθορισμός τέτοιων κριτηρίων εμπεριέχει μεγάλο ποσοστό υποκειμενικής κρίσης και υφίσταται δυσκολία για ενιαία κριτήρια.

Η εκτίμηση της επίδρασης των μετατοπίσεων των θεμελιώσεων / βάθρων στην ανωδομή των γεφυρών μπορεί να αξιολογηθεί με δύο τρόπους:

- Κριτήρια δομοστατικού σχεδιασμού
- Καταγραφή της επίδρασης των μετατοπίσεων από υπάρχουσες γέφυρες

Βάσει των αρχών του δομοστατικού σχεδιασμού προκύπτουν εξαιρετικά αυστηρά κριτήρια σε σχέση με καταγραφείσες μετατοπίσεις που θεωρούνται αποδεκτές σε πραγματικές γέφυρες. Πραγματικές όμως καταγραφές της συμπεριφοράς γεφυρών μέσω μετρήσεων των μετατοπίσεων, αποτελούν σήμερα τον πλέον αξιόπιστο τρόπο για τον καθορισμό μέγιστων ανεκτών ορίων στη φάση λειτουργίας

Η σύγχρονη μεθοδολογία για τον καθορισμό των ανεκτών μεγεθών μετατοπίσεων για τις γέφυρες περιλαμβάνει την εκτίμηση: α) των ανεκτών οριζοντίων μετακινήσεων και β) την ανεκτή επιμήκη γωνιακή παραμόρφωση.

Μετακινήσεις χαρακτηρίσθηκαν ως ανεκτές ακόμη κι εάν προκαλούν περιορισμένες βλάβες στην ανωδομή, εφ' όσον δεν επηρεάζουν τη συμπεριφορά του φορέα της γέφυρας στη φάση λειτουργίας. Έτσι, με βάση στοιχεία πρόσφατης έρευνας στις Η.Π.Α. από τους οργανισμούς NCHRP και TRB, δόθηκαν κριτήρια τόσο για νέες, όσο και για παλαιές κατασκευές γεφυρών.

Η εκτίμηση των εδαφικών μετακινήσεων λόγω διανοίξεως αβαθών σηράγγων σε αστικό περιβάλλον αποτελεί ένα από τα πλέον σημαντικά προβλήματα που σχετίζονται με την κατασκευή των σηράγγων. Η καμπύλη των μετακινήσεων που προκύπτει επί του εδάφους (κάθετα προς τον άξονα της σήραγγας), προσομοιώνεται με ικανοποιητική ακρίβεια από μία καμπύλη Gauss για συνθήκες «ελεύθερου πεδίου». Αυτό έχει προκύψει μετά από αξιολόγηση και στατιστική επεξεργασία ενός μεγάλου αριθμού επί-τόπου μετρήσεων. Κατά τη διάνοιξη όμως των σηράγγων, εκτός των κατακορύφων μετακινήσεων πραγματοποιούνται επί του εδάφους και οριζόντιες μετακινήσεις.

Η εκτίμηση της επικινδυνότητας ενός κτιρίου λόγω των ανωτέρω εδαφικών μετακινήσεων γίνεται με βάση τα κριτήρια των οριακών εφελκυστικών παραμορφώσεων κατά Burland & Wroth (1974). Έτσι, ρηγματώσεις εκδηλώνονται σ' ένα κτίριο λόγω υπέρβασης μίας κρίσιμης εφελκυστικής παραμόρφωσης. Για την εφαρμογή όμως στην πράξη το κτίριο θεωρείται ιδεατό ως μία «ελαστική δοκός», η οποία ακολουθεί τις δημιουργούμενες κατακόρυφες μετακινήσεις. Η εκτίμηση της ακαμψίας του κτιρίου γίνεται με τη βοήθεια «μέσων τιμών» E/G και με βάση την προκύπτουσα ανηγμένη εφελκυστική παραμόρφωση λόγω των παραμορφώσεων, εκτιμάται η επικινδυνότητα.

Λαμβάνοντας υπόψη κατά τους υπολογισμούς και την ακαμψία του κτιρίου, προκύπτει μείωση των παραμορφώσεων (όπως αυτές είχαν εκτιμηθεί για συνθήκες «ελεύθερου πεδίου») και κατά συνέπεια και της επικινδυνότητας του κτιρίου-δοκού.

Η ανωτέρω μείωση της επικινδυνότητας υπήρξε αντικείμενο προσφάτων ερευνών των Potts-Addenbrooke (1997) και Franzius-Potts-Burland (2006), οι οποίοι εξέτασαν τόσο την επίδραση της ακαμψίας του κτιρίου, όσο και άλλων παραγόντων για το σκοπό αυτό. Γενικά, η συνεκτίμηση της ακαμψίας του ι.β. του κτιρίου καθώς και των τριβών στη διεπιφάνεια της στάθμης της θεμελίωσης μειώνουν την επίδραση της οριζόντιας παραμόρφωσης, καθώς και το λόγο σχετικής μετατόπισης κατά την εκτίμηση της επικινδυνότητας ενός κτιρίου.

Τα «Γενικά Συμπερασματικά Σχόλια» της διάλεξης έχουν ως εξής:

1) Η ορθή προσομοίωση των γεωτεχνικών συνθηκών και της συμπεριφοράς των εδαφικών υλικών αποτελεί τον κυριότερο παράγοντα για την εκτίμηση των καθιζήσεων και λοιπών μεγεθών.

2) Τα γνωστά κριτήρια των επιτρεπομένων καθιζήσεων αντιμετωπίζουν επιτυχώς τα προβλήματα της καθημερινής πρακτικής συνήθων (κτιριακών) δομικών έργων. Απαιτούν όμως ιδιαίτερη προσοχή:

   α) Οι περιπτώσεις όπου η καμπύλη των καθιζήσεων παρουσιάζει «κύρτωση».

   β) Η πιθανή ανάπτυξη οριζοντίων μετατοπίσεων πεδίλων.

   γ) Η περίπτωση των ανομοιογενών εδαφικών αποθέσεων, κατ' έκταση και σε βάθος .

3) Η θεώρηση της αλληλεπίδρασης εδάφους – κατασκευής οδηγεί σε ρεαλιστικότερες εκτιμήσεις καθιζήσεων, στροφών κλπ. θα πρέπει να εφαρμόζεται κατά τη μελέτη αξιόλογων έργων, ή ακόμη κατά τη διερεύνηση οικονομικών λύσεων από απόψεως θεμελιώσεως σε συνήθη έργα.

4) Η εκτίμηση της επίδρασης των μετατοπίσεων των θεμελιώσεων των βάθρων στην ανωδομή των γεφυρών μπορεί να βασισθεί σε συστάσεις που έχουν ως βάση πραγματικές καταγραφές της συμπεριφοράς των γεφυρών. Η μεθοδολογία αυτή αποτελεί σύγχρονο και αξιόπιστο τρόπο για τον καθορισμό των μέγιστων ανεκτών ορίων μετατοπίσεων στη φάση λειτουργίας των γεφυρών.

5) Κατά την περίπτωση της εκτίμησης της επικινδυνότητας των κτιρίων λόγω διανοίξεως σηράγγων παρατηρούνται ότι:

   α) Η περιοχή κύρτωσης της ελεύθερης επιφάνειας των εδαφών αποτελεί την πλέον επικίνδυνη ζώνη.

   β) Η επίδραση των οριζοντίων ανηγμένων παραμορφώσεων στη ζώνη αυτή είναι σημαντική.

   γ) Η συνεκτίμηση της ακαμψίας του κτιρίου, καθώς και άλλων παραγόντων, μειώνει γενικά τόσο το μέγεθος των οριζοντίων παραμορφώσεων, όσο και το λόγο της σχετικής μετατόπισης. Οι προτάσεις όμως των Potts–Addenbrooke (1972) και Franzius–Potts–Burland (2006) αποτελούν αξιόλογη συμβολή (για εδαφικές συνθήκες ανάλογες προς την άργιλο του Λονδίνου).

   δ) Στις ανωτέρω προτάσεις, όπως και για την περίπτωση «ελεύθερου πεδίου», για την εκτίμηση της Επικινδυνότητας των κτιρίων ισχύουν οι συστάσεις των Boscardin – Cording (1989) και Burland (2001), οι οποίες θεωρούνται όμως συντηρητικές εκτιμήσεις.

   ε) Για την περίπτωση κτιρίων από Ωπλισμένο Σκυρόδεμα:

      i) Μπορεί να γίνει μία πρώτη προσέγγιση της Επικινδυνότητας κτιρίου με βάση την πρόταση προσομοίωσης κατά Burland – Wroth (1974), με λόγο E/G = 12.5.

      ii) Πλέον δόκιμος τρόπος στην περίπτωση αυτή αποτελεί η ανάλυση με αλληλεπίδραση εδάφους – κατασκευής.

Διάλεξη
Καθηγητή Antonio Gens
Technical University of Catalonia, Barcelona, Spain
Soil-environment interactions in geotechnical engineering
(2007 Rankine Lecture)

Η διάλεξη παρουσιάστηκε την Πέμπτη 17 Απριλίου 2008 στην Αίθουσα Εκδηλώσεων του Κτιρίου Διοίκησης του Εθνικού Μετσοβίου Πολυτεχνείου, στου Ζωγράφου. Στη συνέχεια παρουσιάζεται περίληψή της.

The range of problems that geotechnical engineers must face is increasing in scope and complexity. Some examples are the collapse of unsaturated soils, foundations on expansive clays, tunnelling in sulphate bearing materials, control of subsidence due to oil or gas extraction, and containment of toxic or hazardous waste. In addition, potential climate change may pose new problems in areas such as slope stability or permafrost thawing as well as placing new emphasis on topics such as radioactive waste disposal or deep CO2 sequestration. Classical saturated Soil Mechanics is often insufficient to provide the understanding and tools to tackle these issues effectively.

In the lecture, a number of developments incorporating the effects of new phenomena and new variables on the behaviour of soils were described and discussed. Recent developments in Unsaturated Soil Mechanics were reviewed first. It was shown that they provide a consistent framework for understanding the engineering behaviour of unsaturated soils and the effects of suction and moisture changes. Building on those developments, soil behaviour was further explored by considering the effect of high and low temperatures as well as of chemical variables. The resulting generalised view of soil behaviour was then applied in the analysis of field situations.

The lecture presented documented case histories that demonstrate the relevance and implications of the developments described for geotechnical engineering practice.

ΜΕΤΑΠΤΥΧΙΑΚΕΣ ΣΠΟΥΔΕΣ ΓΕΩΤΕΧΝΙΚΟΥ ΕΝΔΙΑΦΕΡΟΝΤΟΣ

International NATM Engineer University Course
1st October 2008 – 27th June 2010
Graz & Leoben, Styria, Austria

Organizer: Graz Univ. of Technology, and Univ. of Leoben
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The continuously increasing worldwide demand for qualified tunnel engineers cannot be covered by the standard education at universities.

The University course aims at increasing the skills of the participants in the fields of geotechnical engineering and tunnelling, with an emphasis on the "New Austrian Tunnelling Method" (NATM). The degree holders shall be enabled to accomplish tunnelling projects on their own in the face of geotechnical, structural, organizational, contractual and economic needs according to the latest state of the art.

The Course addresses civil engineers, geotechnical engineers and engineering geologists who do have a distinctive technical education and aim at a specialization in tunnelling.

Future fields of work may be planning, design and consulting of underground projects for engineering offices, or construction management for contractors and owners.

The University Course lasts 4 semesters and will take place between April 2009 and October 2010. Registration will be open from July 1st 2008.

Master on Advanced Studies (MAS) on Tunnelling
August 2008 to April 2009
EPFL – Switzerland
lmr.epfl.ch/mas

Organizer: Swiss Federal Institute of Technology, Lausanne
Contact Information:
MAS Tunnelling
EPFL – LMR
Station 18
CH-1015 Lausanne, SWITZERLAND

The application for the 2008-2009 MAS on tunnelling can be send back until June 2008.

Master of Advanced Studies (MAS) on Tunnelling at EPFL is an international advanced training program, jointly organized by the Swiss Federal Institute of Technology Lausanne (Ecole Polytechnique Fédérale de Lausanne, EPFL) and the International Tunnelling and Underground Space Association (ITA).

MAS degree is awarded by EPFL at the completion of study, endorsed by ITA. The program offers advanced and specialised training to tunnel engineers.

MAS Tunnelling is an annual program starting in August. It provides high quality training covering theory, analysis, design, construction and practice, to tunnel engineers and managers worldwide. The course structure and workload are designed for motivated individuals desiring advanced learning.

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

Για τις παλαιότερες καταχωρήσεις περισσότερες πληροφορίες μπορούν να αναζητηθούν στα προηγούμενα τεύχη του «περιοδικού» και στις παρατιθέμενες ιστοσελίδες.

Συμπόσιο-Συνέδριο *«ΓΗ και ΘΑΛΑΣΣΑ της ΚΟΡΙΝΘΙΑΣ :Γεωλογία - Σεισμολογία - Περιβάλλον»,* 2-3 Μαΐου 2008, Κόρινθος.

International Young Scholars' Symposium on Rock Mechanics 2008
Beijing, China 12 - 15 May 2008

The International Young Scholars' Symposium on Rock Mechanics 2008 will be held on May 12 - 15, 2008 in Beijing, China.

This symposium aims to promote the exchange of ideas and experiences and to share recent advances in rock mechanics and engineering among young scholars in the world. Discussion on education of rock mechanics in the future is also an important topic. The symposium is held in Beijing which will as well offer an excellent opportunity for all the participants to personally contact China and the Chinese community of rock mechanics and to visit the largest rock engineering projects in the world, such as Three-Gorge Project, Qinghai-Tibet plateau railway, etc

All young scholars in rock mechanics, especially including Ph.D students are welcome to the symposium. This symposium is not limited to young people, all professors, research scientists and engineers who concern about development and education of rock mechanics and training young scholars in rock mechanics are also welcome to the symposium.

SUBJECTS:

1. Field Investigation and Instrumentation
2. Rock Properties and Mechanical Behavior
3. Underground Mining and Excavation Engineering
4. Rock Slopes and Landslides
5. Tunnels and Foundations
6. Dynamics and Blasting
7. New Techniques and Methods

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INTERNATIONAL SYMPOSIUM
GROUND ANCHORS
Limelette test field results
14 May 2008, Brussels, BELGIUM
www.bgqg-gbms.be
www.wtcb.be/go/anchorsymposium

Ground anchors have been used for several decades to anchor retaining walls and submerged structures, to stabilise slopes, quay walls, tunnel faces.

The originating installation techniques and the used material and tools are in general well known. However, this is less the case with alternatives and new anchoring systems that have more recently appeared on the market. As a consequence, current design rules are in general not adapted to these new developments.

Besides this market evolution, Belgium had no geotechnical standards in the past, which has resulted in the integration of different design and test methodologies, mostly based on French and German standards or documents, in the project specifications of different owners.

As European standardisation is fully developing, and because the Belgian Building Research Institute (BBRI-CSTC-WTCB) is co-ordinating the establishment of the national annex of the Eurocode 7 in Belgium, it identified the need to take the initiative to organise a national research project on Ground Anchors.

The research programme was initiated by the end of 2004, and is financially supported by the Belgian Federal Public Service "Economy" and the Belgian Normalisation Institute. The project is guided by an interprofessional Working Group under supervision of the project partners K.U.Leuven (Prof. J. Maertens) and UCL (Prof. A. Holeyman).

Backbone of the research project is the extended real scale load test campaign on approximately 50 ground anchors performed at the proof station of the BBRI in Limelette.

Different ground anchor systems were tested to failure in the second half of 2006, in different soil layers encountered at the test site : silt, clayey sand with silex stones and tertiary Bruxellian sand. Many parameters have been integrated in this extended test campaign, a.o. maintained load testing versus cyclic testing, diameter of the boring tools... An important added value is the excavation of approximately 30 of these tested anchors in order to observe their dimensions and to analyse their influence on the results obtained during the static load tests.

During this symposium the various aspects of the extended load test campaign in Limelette (B) will be reviewed : soil investigation, anchor installation methods, load testing and interpretation, as well as observations related to the excavated anchors. Suggestions for an approach to design and test ground anchors in Belgium following the Eurocode 7 principles will be put forward.

Moreover attention will be paid to the experience with ground anchors of three main organisations on the Belgian building market: Tuc Rail, the Federal Public Buildings Service, and the Ministry of the Flemish community.

Finally three contributions from neighbouring countries (NL, F & DE) will deal with developments in anchoring techniques and design approaches in their country and/or in Europe.

Information :
BBRI
Carine Godard

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B-1342 Limelette, Belgium
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Geotechnical Earthquake Engineering and Soil Dynamics IV, 18 – 22 May 2008, Sacramento, Ca., USA – www.geesd.org

International Conference On Geotechnical And Highway Engineering
Advancement in Geotechnical And Highway Engineering

GEOTROPIKA 2008

26-27 May 2008, Kuala Lumpur, Malaysia
seminar.spaceutm.edu.my/geotropika2008

International Conference on Geotechnical and Highway Engineering **GEOTROPIKA 2008** will be held on 26-27 May 2008 at Pan Pacific Hotel, Kuala Lumpur, Malaysia. The Conference will be organized by **Universiti Teknologi Malaysia (UTM)** and supported by Institute of Quarrying Malaysia, Institution of Engineers Malaysia (IEM) and Public Works Department, Malaysia.

The International Conference in Geotechnical and Highway Engineering, **GEOTROPIKA 2008** is aimed to provide opportunities for participants to exchange ideas and experiences via technical papers and discussions on practical applications to generate better understanding amongst practicing Geotechnical and Highway engineers and other related professionals on the importance of their professions and the impact on construction industry.

Main Theme *"Advancement in Geotechnical and Highway Engineering".*

Listed below are the topics to be discussed:

- Performance Prediction of Geotechnics and Highway Constructions
- Construction of Roads over Problematic Soils
- Soils Improvement, Stabilization and Reclamation
- Soil and Rock Slope Failures and Remedial Measures
- Innovation on Highway Construction and Pavement Materials
- Foundation Engineering
- Geological and Rock Engineering
- Other Related Topics

Conference Objective

Geotechnical and Highway engineers are always faced with problems related to the performance prediction of constructions as well as the diagnostic of past failures. Therefore the conference will be held with the following objectives:

- To provide opportunities to interact with world leading figures in geotechnical and highway engineering.
- To provide avenue to network and exchange ideas with stakeholders from industry.
- A chance to contribute and share knowledge, ideas and experiences on the practical applications in Geotechnical and Highway Engineering fields to enhance the prediction performance of construction and minimize or prevent future failures.

GEOTROPIKA 2008 Secretariat
School of Professional and Continuing Education (SPACE),
Universiti Teknologi Malaysia,
No. 40-50, Jalan Kebudayaan 1, Taman Universiti
81300 Skudai Johor Darul Takzim, MALAYSIA
Contact Person: Ms. Zarina / Ms. Hanim
Tel: +607-5218159/8170, Fax: +607-5211355
Website: http://seminar.spaceutm.edu.my/geotropika2008
Email: geotropika2008@spaceutm.edu.my

Workshop on
Planning of Construction of Tunnels for High Speed Railway Connection AIS (AUSTRIA, ITALY, SLOVENIA)
May 30, 2008, Portorož, Slovenia
www.ita-slovenia.si

Sustainable development of European Union contains bold plans of construction of contemporary and energy saving economical railway connections that they include also construction of tunnels, very often. Planned are contemporary railway connections on directions north - south and east - west and some second development sections, so that construction of these connections in next decades won't go around Republic of Slovenia.

Hilly and mountainous territory and other specialities, demand construction of tunnels often, which enables to keeping of natural and cultural heritages and possibility of development of more districts. That is why are Slovenian Society for Underground Structures and International Tunnelling and Underground Space Association ITA-AITES organise International workshop on "Planning of construction of tunnels for high speed railway connection AIS (AUSTRIA, ITALY, SLOVENIA)". It will light up more points of view of contemporary construction of railway tunnels and make transfer of newest technological solutions of construction possible for wider professional public. Lecturers, that they are internationally confessed experts for individual fields of construction of railway tunnels, will take part in foreseen debates between individual subjects in time of workshop actively.

For information regarding hotel accommodation and registration please contact:

Auditoria d.o.o.
Malnarjeva 10
SI-1000 Ljubljana, Slovenija
T: +386 1 2445 676
F: +386 1 2445 675
E: registration@auditoria.si

www.nodig2008.ru

We were very glad to know about the decision of The International Society for Trenchless Technology (ISTT) to hold the International conference and exhibition NO-DIG 2008 in Moscow. The Russian Society for Trenchless Technologies was founded just several years ago but it has come a long way since that time.

I believe that this positive decision was influenced by both the progress of Russia in the application of trenchless technologies for placement, rehabilitation and repair of pipeline networks as well as by the potential of their development in Russia.

Being the Director General of Mosvodocanal I cannot avoid saying about our achievements in Moscow. New methods of construction, maintenance, rehabilitation and repair based on trenchless technologies, which until recently were considered to be a novelty, or a risky innovation, have now have become a part of our everyday work. And this is only the beginning. I am sure that this trend will continue to accelerate in Moscow, and will spread out to the other big cities of Russia and indeed to the other countries of former USSR.

On behalf of the Russian Society for Trenchless Technologies (RSTT) I have the honour to invite you to take part in the International NO-DIG Conference and Exhibition 2008 in Moscow. I am sure that participation in the conference and exhibition will be of great interest to you in your work to improve the quality of life for your clients and customers. We, for our part in the RSTT will do all that we can to make NO-DIG 2008 Moscow the world leading trenchless technology event for 2008.

Stanislav Khramenkov
President,
RSTT

Sessions

- New machines, techniques and developments for trenchless applications
- Trenchless techniques and practices of new installations
- Trenchless techniques for repair and renovation
- Micro-tunnelling – choices and practices
- Asset management and Life Cycle Analysis
- Utility corridor design construction and maintenance

For International support please contact:

The International Society for Trenchless Technology (ISTT)
Address: United Kingdom, LONDON,
SW1X 8PS, 15 Belgrave Square
Phone: +44 (20) 7259 6755
Fax: +44 (20) 8850 7447
E-mail: info@istt.co.uk
Website: http://www.istt.com

Contact person:
Mr. John Castle
Executive Secretary
Phone: +44 (1608) 674 900 (dir.)
Fax: +44 1608 674 707
E-mail: mdwf17@dial.pipex.com

Geo-Environmental Engineering 2008

12-14 June 2008, Kyoto, Japan

The conference provides an international forum to discuss the problems facing the public and private sectors, the engineering and scientific communities, in terms of the waste management and remediation of contaminated lands, and related topics.

The conference venue is the Clock Tower Centennial Hall, which has come to symbolize Kyoto University.

The main goal of Geo-Environmental Engineering 2008 is to bring together international information, experience and research in order to give the conference participants a greater knowledge and ability to help revitalize their communities.

Conference Topics

- Waste / landfill management
- Landfill liner and cover
- Geosynthetics in geo-environmental engineering
- Geotechnical reuse of solid waste
- Contribution to global environmental problems
- Remediation of contaminated sites
- Environmental assessment
- Risk management
- Ground improvement technologies
- Lessons from the field and case studies

For more information Email: inui@mbox.kudpc.kyoto-u.ac.jp

International Geotechnical Conference “Development of Urban Areas and Geotechnical Engineering”, 16 – 19 June 2008, Saint Petersburg, Russia - www.georec.spb.ru/eng/conf/080616

2nd International Conference on Geotechnical Engineering for Disaster Mitigation and Rehabilitation (GEDMAR08), May 30 – June 2 2008, Nanjing, Chine - www.geohohai.com/news/english/2008/1.shtml

First International Conference on Education and Training in Geo-Engineering Sciences: Soil Mechanics and Geotechnical Engineering, Engineering Geology, Rock Mechanics Constantza, Romania, 2 - 4 June 2008 - www.ppm.ro/srgf

12th International Conference on Ground Penetrating Radar

15 – 19 June 2008, Birmingham, United Kingdom
www.gpr2008.org.uk

GPR2008 seeks to showcase not only the best in terms of academic and applied papers and posters, but also the cutting edge of GPR and related technology. A full conference programme, technical exhibitions, practical demonstrations and poster sessions will combine to make GPR2008 a very successful conference.

“GPR2008 in Birmingham will include all the normal activities of a thoroughly professional academic conference. Supported by four GPR departments within the University of Birmingham and the GPR industry from both the UK and

Europe it promises to be a very memorable event held in an exciting and vibrant city"

Dr Chris Rogers
Deputy Head of Civil Engineering, University of Birmingham
Co-Chairman GPR2008

Dr Richard J Chignell
Technical Director, PipeHawk plc
Co-Chairman GPR2008

"The University of Birmingham is one of Britain's leading research institutions. We seek to promote academic excellence through research of the highest standard, partnered by strong links with industry and commerce to effectively transfer knowledge and technology to the wider community. The University enthusiastically supports the GPR2008 Conference and welcomes the opportunity to engage with such a prestigious international scientific organisation."

Professor Mike Cruise
Pro-Vice-Chancellor (Research and Knowledge Transfer)

For information on registrations/bookings;
Rose Padmore
Tel: 01562 881013
Email: gpr2008@opening-doors.org.uk

Please send paper/abstract submissions to;
Michelle Web
Email: Michelle.Webb@pipehawk.com

For general enquiries or information on sponsorship/exhibitor packages please contact;
Kirsty Mack
Tel: 0121 414 7254
Email: k.a.mack@bham.ac.uk

GEO-ENVIRONMENT & LANDSCAPE EVOLUTION 2008
Third International Conference on Evaluation, Monitoring, Simulation, Management and Remediation of the Geological Environment and Landscape
16 - 18 June, 2008, The New Forest, UK
www.wessex.ac.uk/conferences/2008/geoenv08

This Conference aims to study the role of geosciences in environmental management. The geosciences understanding of natural systems and their process is of fundamental relevance for proper use of the land.

The study of the Earth's materials and dynamic processes is essential for different fields of application, and to increase our knowledge of varying environmental problems, such as air, soil and water pollution, soil erosion, waste disposal, water quality, building materials and foundations, and many others. Understanding geologic processes is also essential to other fields of study, such as engineering, environmental management, land preservation and restoration, urban environment, land and ecosystem inventories and scenery assessments and landscaping.

The objective of the Meeting is to provide a forum for discussion of these topics among researchers, engineers, planners, decision-makers, consultants and other professionals interested in the contribution of geosciences and geo-information to environmental management, land preservation, remediation and sustainable development.

The first meeting of this successful conference series was held in Segovia, Spain in 2004 followed by one in Rhodes in 2006.

Topics:

- Environmental planning and management
- Environmental modelling
- Environmental monitoring
- Environmental pollution
- Remediation
- Climateological processes
- Geo-environment in urban settings
- Geo-ecology
- Hydrological studies
- Landscape analysis
- Natural hazards and risks
- Remote sensing
- Soil and rock properties
- Vulnerability studies
- Ecological restoration

Conference Secretariat:

Rachel Swinburn
Conference Manager
Geo-Environment & Landscape Evolution 2008
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June 16 – 18, 2008, Chicago, Illinois, USA
www.ict.uiuc.edu/RILEM

This conference focuses on the causes, development, and maintenance / rehabilitation of pavement cracking, as well as techniques for abating pavement cracking. It will include contributions on theoretical modelling, experimental research, and case history studies on cracks in flexible, rigid, and composite pavements.

Topics:

- Initiation and propagation of cracks including modelling, calibration, and validation
- Top-down and bottom-up crack mechanisms
- Laboratory testing techniques and evaluation effectiveness
- In-situ experimental studies: field construction and rehabilitation techniques to inhibit pavement cracking

- Performance of crack preventative techniques and pavement service life prediction
- Construction approaches and their relation to crack development
- Crack surveys and nondestructive evaluation
- New design techniques

Conference Secretariat
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DEBRIS FLOW 2008
Second International Conference on Debris Flow including all aspects of Debris Flow Monitoring, Modelling, Hazard Assessment, Mitigation Measures, Case Studies, and Extreme Events, Erosion, Slope Instability and Sediment Transport
17 - 19 June, 2008, The New Forest, UK
www.wessex.ac.uk/conferences/2008/debris08/index.html

Debris and hyper-concentrated flows are among the most frequent and destructive of all water relater processes. They mainly affect mountain areas in a wide range of morpho-climatic environments and in recent years have attracted more and more attention from the scientific and professional communities and concern from the public awareness, due to the increasing frequency with which they occur and the death toll they claim.

Higher population pressure on natural resources in hazard-prone areas and development of activities that have the potential to increase the magnitude of hazard call for improvements in the criteria used to identify debris flow risk areas and to design suitable prevention and mitigation measures.

The Conference will provide a forum for engineers, scientists and managers from laboratories, industries, governments and academia to interchange knowledge and expertise in the fields of erosion and slope instability, sediment transport, debris flow and debris flood data acquisition, debris flow phenomenology and laboratory tests, using the most advanced, state-of-the-art methodologies in monitoring, modelling, mechanics, hazard prediction and risk assessment.

Topics:

- Debris flow modelling
- Debris flow phenomenology
- Debris flow mobilisation
- Debris flow disaster mitigation
- Case studies
- Debris flow rheology and laboratory tests
- Debris flow and landslide phenomena
- Debris and hyper-concentrated flows
- Structures and their effects on debris flow
- Problems and mechanics of solid-liquid flows
- Shape failure and landslides

Conference Secretariat:

Rachel Swinburn
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Geo-Environment & Landscape Evolution 2008
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Development of Urban Areas and Geotechnical Engineering, 16 - 19 June 2008, Saint Petersburg, Russia - www.georec.spb.ru/eng/conf/080616/

Geosynthetics Asia 2008, 17 – 20 June 2008, Shangai, China - www.4acg-2008sh.com

Journées Nationales de Géotechnique et de Géologie de l'Ingénieur – JNGG'08 : Insertion des Grands Ouvrages dans leur Environnement, 18 – 20 June 2008, Nantes, France, www.ec-nantes.fr/jngggo8

2nd International Conference on Debris Flow, Debris Flow Monitoring, Modelling, Hazard Assessment, Mitigation Measures, Case Studies, and Extreme Events, Erosion, Slope Instability and Sediment Transport, 18 - 20 June, 2008 - The New Forest, UK - www.wessex.ac.uk/conferences/2008/debris08/index.html

2nd BGA International Conference on Foundations – ICOF 2008 "Founded on Research, Design and Practice, 24 – 27 June 2008, Dundee, Scotland, United Kingdom - www.dundee.ac.uk/civileng/icof2008

42nd U.S. Rock Mechanics Symposium and 2nd U.S. - Canada Rock Mechanics Symposium, 29 June – 2 July 2008, San Francisco, CA, USA, www.armasymposium.org

10th International Symposium on Landslides and Engineered Slopes, June 30 to July 4 2008, Xi'an, China, www.landslide.iwhr.com

Gree5 Construction for a sustainable environment, 1 - 4 July 2008, Vilnius, Lithuania, www.green5.co.uk

www.e-unsat.dur.ac.uk

The 1st European Conference on Unsaturated Soils will be held in Durham, UK from 2-4th July 2008. The conference is intended to bring together researchers and practitioners involved in unsaturated soils in Europe. This is a time of increased activity in research and practice related to unsaturated soils within Europe (particularly through the MUSE project) and it will be an appropriate time to hold the first European conference. We would like to invite you to attend the conference and participate in the presentations and discussions.

The broad theme of the conference is the engineering behaviour of unsaturated soils and this covers a range of soil categories that includes expansive soils, collapsible soils, natural soils, compacted soils, residual soils, arid soils, pyroclastic soils, rockfill materials and fractured rocks. Papers are solicited under specific sub-themes including but not necessarily limited to the following:

Advances in Testing Techniques based on new or improved methods for measuring/controlling suction and determining the properties of unsaturated soils in the laboratory or in the field. These could include flow, mechanical, thermal or chemical properties.

Engineering Behaviour of unsaturated soil observed during high quality laboratory testing with measurement/control of suction and during field characterization campaigns for the in-situ measurement of suction and other unsaturated soil parameters.

Constitutive Modelling of deformation, water retention, permeability and chemo-osmotic processes in unsaturated soil. Formulations of coupled thermo-hydro-chemo-mechanical constitutive models based on generalized definitions of stress and strains are particularly welcome.

Numerical Modelling of boundary value problems in unsaturated soil by using analytical solutions or computational methods. Contributions are welcome on the development of specific computational algorithms relevant to unsaturated soils including, for example, integrators of complex constitutive relationship, solvers of large algebraic systems and techniques dealing with strain-localization.

Case Studies involving monitoring of suction and other aspects of engineering or geo-environmental behaviour. These include classical applications such as foundations, road pavements, slopes, embankments, dams, retaining structures, waste disposal and pollutant transport as well as emerging applications of unsaturated soil mechanics like the underground storage of carbon dioxide, gas release from ocean seabed and enhanced oil recovery.

Contact by email at e-unsat@durham.ac.uk.

ACADEMIC SECRETARIAT

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2008 Seismic Engineering International Conference commemorating the 1908 Messina and Reggio Calabria Earthquake (MERCEA'08), 8 – 11 July 2008, Reggio Calabria and Messina, Italy - www.mercea08.org

GKK 08 - Geomechanics Colloquium Karlsruhe

"Fundamentals and Applications of Geomechanics"
Scientific Symposium on the occasion of the
70th birthday of Prof. Dr.-Ing. Dr. h.c. Gerd Gudehus
and the centenary of Baurat h.c. Prof. Dr. techn. Dr. mont. h.c. Leopold Müller
Karlsruhe, July 24-25, 2008
www.ibf.uni-karlsruhe.de/gkk08/gkk08_en.html

The Institute for Soil Mechanics and Rock Mechanics at the University of Karlsruhe (TH) honours two of its outstanding personalities.

In 1966, the university (at that time still Institute of technology) was able to enlist Professor Dr. Leopold Müller from Salzburg, the founder of the International Society for Rock Mechanics (ISRM), as honorary professor. Until his retirement in 1976 he headed the department of rock mechanics and has strongly influenced generations of students as academic teacher. With Prof. Leopold Müller we also commemorate a scientist who has established modern rock mechanics as an interdisciplinary science by his pathbreaking research work. In January 2008 he would be 100 years old.

In 1973, Professor Dr. Gerd Gudehus was appointed to the professorship for Soil Mechanics and Foundation Engineering. His competent familiarity with the fundamentals of theoretical mechanics soon resulted in the chairs's international reputation as a centre for fundamental research in soil mechanics. Bridging the gap between soil mechanics, granular dynamics and physical chemistry has become the ultimate scientific challenge in the lifework of Prof. Gudehus. Over the years his research resulted in the emergence of a genuine "Karlsruhe school". Prof. Gudehus celebrates his 70th birthday in July 2008.

To mark these jubilees, you are invited to:

- Two days of scientific presentations from the areas of soil mechanics and rock mechanics, foundation engineering and rock engineering.
- the farewell lecture of Prof. Gudehus
- and an festive evening on July 24th, 2008

6th International Conference on Case Histories in Geotechnical Engineering and Symposium in Honor of Professor

James K. Mitchell, 11 – 16 August 2008, University of Missouri – Rolla - www.6icchge2008.org

International Summer School on Rockslides and Related Phenomena

20 August – 5 September 2008
Kokomeren River Valley, Kyrgyzstan

Rockslides (bedrock landslides) are among the most hazardous natural phenomena in mountainous regions. Though relatively rare, in comparison with landslides in non-lithified soils, they pose a threat to the vast areas due to enormous amount of rocks involved (sometimes up to billions of cubic meters in volume), their high mobility and ability to create large natural dams. The latter cause inundation of the valleys upstream and catastrophic outburst floods downstream. The aim of the International Summer School is to demonstrate various types of bedrock landslides and related phenomena to students and young landslide researchers. Annual training course includes field study of rockslides of different morphological types – long runout rock avalanches, intact and eroded rockslide dams. Various methods of rockslide identification, mapping, dating, detail study of their internal structure and of rockslide debris grain-size composition will be presented directly at the outcrops.

Numerous rockslides and rock avalanches of various types ranging from few millions to more than 1 billion cubic meters in volume are concentrated in the Kokomeren River valley (Central Tien Shan) within a limited area of about 40×40 km at a one-day trip distance from Bishkek city – capital of Kyrgyzstan. Most of them are located near a road along the Kokomeren River connecting villages in the Suusamyr and Djumgal depressions. Sites in tributary valleys without motorways require only a few hours of hiking to reach them. Due to arid climate and lack of vegetation rockslides' morphological features are well preserved and clearly visible. Some of rockslide deposits are deeply dissected by erosion that allows studying their internal structure in detail. Along with the bedrock slope failures several very large landslides in non-lithified Neogene and Quaternary deposits can be found in the adjacent neotectonic depressions.

Besides rockslides and landslides, the study area is extremely rich in the expressive manifestations of Neotectonics and Quaternary tectonics such as active faults, one of which had been ruptured by 1992 M7.3 Suusamyr earthquake, and numerous examples of tilted and folded pre-Neogene planation surface.

The annual ICL International Summer School has been organized since 2006. It was attended by participants from Czech Republic, Italy, USA and Kyrgyzstan.

The 2008 ICL training course will be focused basically on the geological and geomorphic features typical of large rockslides in rugged terrain. It will be supplemented with the training course organized within the frames of the EU Specific Support Action "International Working Group on Natural Hazards in the Tien Shan" (NATASHA) focused more on the geophysical and geotechnical methods of rockslide field studies. These training courses will be carried out from August 20 till September 5, 2008.

The participation fee is 25 Euro/day, which includes all costs at the site: camping (in tents; participants will be asked to bring sleeping bags), food, local transportation, maps, guidebooks.

Organizers will provide help obtaining a visa if necessary. Participants should arrive to Bishkek connected with Moscow, London and Istanbul by direct daily flights. Arrival via Almaty is possible as well.

ICL Summer Scholl guidebook can be downloaded from the International Consortium on Landslides homepage: http://icl.dpri.kyoto-u.ac.jp/Summer_School_Guidebook-2007-small.pdf (to diminish file size figures' resolution was reduced to 75 dpi). The NATASHA Summer School Guidebook will be available in 2008 prior to the training course. Printed copies will be provided to the participants in Bishkek.

Those who are interested, please contact:

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August 23 - September 3, 2008, Bern, Switzerland, www.alpps.ch

Welcome to the XII International Conference and Field Trip on Landslides (ICFL), the **ALPPS 2008**. Founded by members of the Japanese Landslide Society and the International Landslide Research Group, it has always been the intention of the ICFL to provide scientists, engineers and planners concerned with landslides with an environment, where they could discuss and exchange ideas about landslide processes, investigations and monitoring right in the field. After previously holding meetings in Japan, USA, Australia, New Zealand, Switzerland, Austria, Italy, Czechoslovakia, Spain, England, Poland and Norway, it is an honour for us to announce, that the XII ICFL, the **ALPPS 2008,** will again, be held in Switzerland. Through a variety of fieldtrips and a symposium, the **ALPPS 2008** will use the surrounding Swiss Alps to provide an excellent environment to observe and discuss different slide phenomena.

Program

23.08.08	Opening of ALPPS 2008 in Bern, UNESCO World Heritage Site
24.08.08	Symposium at the Institute of Geography of the University of Bern
25.08.08	Excursion to the Landslides of Schwarzsee and Falli Hölli (Western Pre Alps, Canton Fribourg)
26.08.08	Excursion to the Landslides of La Frasse (Alpine Part of Canton Veaux) and Fully (Canton Valais)
27.08.08	Excursion to the Landslide of Randa (Mattertal, Canton Valais)

29.08.08 Excursion to the Ritigraben (Mattertal, Canton Valais) and Illgraben (Rhonetal, Canton Valais)
30.08.08 Excursion to the Gemmi, Alte-Gemmi Rock Glacier and the Ancient Landslides of Kandersteg (Bernese Oberland)
31.08.08 Excursion to the Lütschinentäler (Bernse Oberland) and Bäregg (Recent Rock Slide at Eiger Mountain)
01.09.08 Excursion to the Top of Europe: Jungfraujoch, UNESCO World Heritage Site (Engineering Geology in Permafrost)
02.09.08 Excursion to the Mountain Torrents of Brienz (Bernse Oberland). Closing of ALPPS 2008 in Bern

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We are pleased to invite you to the forthcoming International Disaster and Risk Conference IDRC Davos 2008. After the successful launching of the IDRC- idea with the first global conference IDRC Davos 2006, held in Davos, Switzerland in late August 2006 and with the first region conference hold in Harbin, China, the IDRC Harbin 2007 conference with the clear focus on China and South East Asia in late August 2007, we are back again in Davos, Switzerland, with its beautiful mountain surrounds, well known as host of the World Economic Forum WEF and place for visionary thinking and strategic discussions.

IDRC Davos 2008 will last from August 25th through August 29th, 2008 and will address global problems and attract participants from all over the globe. We expect more than 1300 participants from 130 countries.

The conference will take an integrated, multidisciplinary approach when addressing the different kinds of risks affecting society today, risks which might be far beyond any particular stakeholder's capacity to control and that may adversely affect multiple parties across geographic borders, sectors and industries.

The IDRC organising committee anticipates a very successful and worthwhile conference and invites you to join this global gathering of leading experts from fields such as the natural, engineering and social sciences, government, the private sector, civil society, international organizations, NGOs and other risk management professions.

We look forward to welcoming you in Davos in August 2008!

Dr. Walter J. Ammann
Chairman IDRC Davos 2008

Conference Topics

The conference motto for IDRC Davos 2008 is: *"Public-private partnership – Key for integral risk management and climate change adaptation".*

Thus underlining the importance of the private sector in disaster reduction and risk management. Solutions for an effective and efficient global disaster and risk management and for climate change adaptation need the involvement of all stakeholders of the public and the private sector and success will only be achieved if public and private institutions share their interest and knowledge and cooperate closely in financing common solutions, in developing common standards and – most important for success - in sharing the benefits.

IDRC Davos 2008 will address a broad range of risks and threats including natural hazards, risks of a technical, biological and chemical nature, but also climate change, pandemics and terrorism, with a clear focus on a consistent and systematic risk management approach, to be able to take effective and efficient decisions for disaster risk reduction and mitigation measures, which lead to transparent and comparable results in different risk situations.

A particular focus will be set on disaster risk management policies, climate change, critical infrastructures and pandemic diseases, always with the perspective of public-private partnership and sustainable development. To continue the discussion on issues committed in the IDRC Davos 2006 Declaration, special cross-cutting themes will be addressed.

We highly appreciate abstracts which focus on lessons learned, case studies or best practice examples, in particular also abstracts on experiences with public-private-partnership projects and initiatives.

Cross-cutting themes:

A. urban risks
B. risk governance
C. risk dialogue
D. sustainable livelihood
E. gender and disasters
F. ethics in risk management
G. environmental vulnerability
H. regional aspects in disaster reduction and risk management

Specific conference Topics for IDRC Davos 2008:

Topic 1: Integral risk management

Incomplete understanding of the substantial medium and long term benefits of effective risk management methodologies and implementation strategies is the most serious impediment to overcoming disasters that cause death, loss of property, destruction of the environment, damage to critical infrastructure and disruption of livelihood.

Topic 2 : Climate change mitigation and adaptation

A holistic approach to address the impact of climate change and other disasters in the lives and livelihoods especially of the poor and vulnerable communities requires the integration of climate change mitigation and adaptation and disaster risk management. To bridge the existing gaps between the climate change and disaster risk management groups is a major challenge.

Topic 3: Pandemics, diseases

A pandemic will likely occur simultaneously throughout individual countries and strike the whole world, preventing shifts of resources. A critical shortage of personnel in im-

portant sectors is likely to occur. How can society deal with a situation, which may last for months? Business continuity planning becomes a major issue.

Topic 4: Critical infrastructures

Critical infrastructures are institutions, part of our built-environment or services, which are of essential importance to society. Single local events may lead to transboundary, progressive failures and produce in our complex, global world dramatic consequences for countries, business and societies, thus being extremely susceptible to terrorist threats.

IDRC
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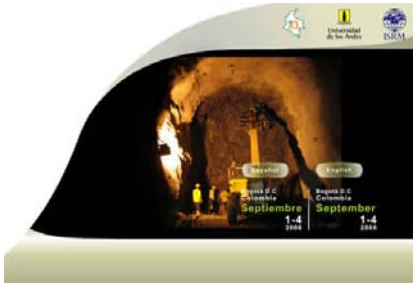

1st South American Symposium
on Rock Excavations
1 – 2 September 2008
Santa Fé de Bogota, Colombia
www.scg.org.co

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2nd International Workshop on GEOTECHNICS OF SOFT SOILS, 3 – 5 September 2008, University of Strathclyde, Glasgow, Scotland, www.iwgss.org

19th European Young Geotechnical Engineers Conference
4 - 5 September 2008, Gyor, Hungary

Contact person: Dr Emoke Imre E-mail:
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EuroGeo4 - 4th European Geosynthetics Conference, 7 – 10 September 2008, Edinburgh, Scotland, United Kingdom - www.eurogeo4.org

International Workshop on Geoenvironment & Geotechnics, 8 – 9 September 2008, Milos Island, Greece - milos.conferences.gr/?geoenv2008

1st International Conference on Transportation Geotechnics, 8 – 10 September 2008, Nottingham, United Kingdom - www.nottingham.ac.uk/ncg

"Stress Wave", 8 – 10 September 2008, Lisbon, Portugal, www.stresswave2008.org

5th International Geotechnical Seminar "Deep Foundations on Bored and Auger Piles", September 8 ÷ 10, 2008, Ghent, Belgium - terzaghi.ugent.be

12th International Conference "Geotechnika - 2008 - Geotechnics" on Techniques, Technologies and Monitoring of the Geotechnical Construction, The High Tatras, Slovak Republic, 10 - 12 September 2008

11th Baltic Sea Geotechnical Conference "Geotechnics in Maritime Engineering", 15 – 18 September 2008, Gdansk, Poland - www.11bc.pg.gda.pl

Regional Conference on Geomorphology
Landslides, Floods and Global Environmental Change in Mountain Regions
Brasov, Romania, 15-25 September 2008
www.geomorph.org , www.geoinst.ro

The Conference will promote exchange of ideas and methods for the investigation of landslides, floods, and associated geomorphic processes in connection with Global Environmental Change. Mountain Regions are very sensitive geosystems to Global Change. At the same time, they offer a variety of goods and services to mankind.

Conference Secretariat
Marta Jurchescu, Lidia Garbiz
Institute of Geography, Romanian Academy, 12, Dimitrie Racoviţă Street Bucharest, 023993 ROMANIA Telephone: 004 021 313 59 90/ 314 37 48 Fax: 004 021 311 12 42 E-mail: geoinst@rnc.ro Website.: www.geoinst.ro

1st Southern Hemisphere
International Rock Mechanics Symposium
16 - 19 September 2008, Western Australia
www.shirms.com

SHIRMS 2008 will be an innovative symposium bringing together rock mechanics researchers and practitioners from the main areas of earth sciences to exchange ideas and

lessons learnt, and to develop further collaboration and synergies. This symposium will set the agenda for future research and operational directions, and ensure the ongoing viability of the mining and civil engineering industries.

The technical programme will feature papers discussing the latest developments and improvements from around the globe.

SHIRMS will feature four main technical streams including:

- Mining rock mechanics
- Civil rock mechanics
- Fundamental rock mechanics
- Petroleum rock mechanics

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ITA – AITES World Tunnel Congress and 34th General Assembly of ITA – AITES, 19 ÷ 25 September 2008, Agra, India - www.cbip.org

4th International Symposium on Pre-Failure Deformation Characteristics of Geomaterials and Symposium Deformation Characteristics of Geomaterials (IS-Atlanta 2008), 21 – 24 September 2008, Atlanta, U.S.A., www.isatlanta2008.org

International Symposium
on Conservation of Ancient Sites 2008
21 – 24 September 2008, Dunhuang, China
www.dha.ac.cn

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ΤΕΤΑΡΤΟ ΠΑΝΕΛΛΗΝΙΟ ΣΥΝΕΔΡΙΟ ΔΙΑΧΕΙΡΙΣΗ ΚΑΙ ΒΕΛΤΙΩΣΗ ΠΑΡΑΚΤΙΩΝ ΖΩΝΩΝ

Μυτιλήνη, 23 – 27 Σεπτεμβρίου 2008

Το Εργαστήριο Λιμενικών Έργων του Ε.Μ.Π. με την υποστήριξη δημοσίων και ιδιωτικών φορέων, διοργανώνει το Τέταρτο Πανελλήνιο Συνέδριο για τη ΔΙΑΧΕΙΡΙΣΗ ΚΑΙ ΒΕΛΤΙΩΣΗ ΠΑΡΑΚΤΙΩΝ ΖΩΝΩΝ. Το Συνέδριο θα πραγματοποιηθεί στην Μυτιλήνη στις 23 - 27 Σεπτεμβρίου 2008.

Αντικείμενο του Συνεδρίου είναι η παρουσίαση των νεοτέρων εξελίξεων στο χώρο των επιστημών και των τεχνολογιών που σχετίζονται με τις παράκτιες ζώνες στην Ελλάδα και την Κύπρο, την έρευνα, τον σχεδιασμό, την προστασία, την μελέτη, την κατασκευή και την διαχείριση των παράκτιων έργων, καθώς επίσης και την εκτίμηση των περιβαλλοντικών επιπτώσεων στις παράκτιες ζώνες.

Το Συνέδριο απευθύνεται στους ερευνητές, μελετητές, κατασκευαστές, ΑΕΙ, δημόσιους φορείς, ΟΤΑ, Λιμενικά Ταμεία, περιβαλλοντικές οργανώσεις και υπηρεσίες που ενδιαφέρονται και ασχολούνται με τις παράκτιες ζώνες, τους οποίους και προσκαλεί να παρουσιάσουν το έργο και τις εμπειρίες τους.

ΘΕΜΑΤΟΛΟΓΙΑ ΣΥΝΕΔΡΙΟΥ

· Παράκτιο φυσικό και ανθρωπογενές περιβάλλον
· Παράκτια γεωμορφολογία και διακίνηση ιζήματος
· Νέες μέθοδοι και τεχνολογίες για την παρακολούθηση των παράκτιων ζωνών
· Επίδραση κλιματικών αλλαγών. Συνέπειες από την ανύψωση της θαλάσσιας στάθμης
· Έργα προστασίας ακτών
· Χωροθέτηση παράκτιων έργων
· Ολοκληρωμένη διαχείριση παράκτιων ζωνών
· Θεσμικό πλαίσιο και νομοθεσία Οικονομική και κοινωνική πολιτική. Διεθνείς τάσεις
· Παράκτιος τουρισμός
· Περιβαλλοντικές επιπτώσεις από την κατασκευή και λειτουργία παράκτιων έργων και την χρήση θαλάσσιων πόρων
· Παράκτια οικοσυστήματα
· Πολεοδομικός και χωροταξικός σχεδιασμός παράκτιων ζωνών
· Αρχιτεκτονική παρακτίου μετώπου
· Προγραμματιζόμενα μείζονα έργα στο θαλάσσιο μέτωπο

Θα παρουσιαστούν 58 εισηγήσεις και 4 προσκεκλημένες ομιλίες.

ΠΛΗΡΟΦΟΡΙΕΣ

Οι ενδιαφερόμενοι για περισσότερες πληροφορίες μπορούν να απευθυνθούν στο Εργαστήριο Λιμενικών Έργων ΕΜΠ. Τηλέφωνα: 210.7722367, 210.7722375, τοτ. 210.7722368 (Ε. Αναστασάκη, Θ. Γιαντσή, Β. Τσουκαλά), ηλ.δι. lhw@central.ntua.gr

The 12th International Conference of IACMAG - International Association for Computer Methods and Advances in Geomechanics, 1 ÷ 6 October 2008, Goa, India

AFTES – International Congress “Building underground for the future”, 6 – 8 October 2008, Monaco - www.aftes.asso.fr

HYDRO 2008 “Progressing World Hydro Development” CONFERENCE and EXHIBITION, Ljubljana, Slovenia ~ 6 - 8 October 2008, www.hydropower-dams.com

Xth International Conference "Underground Urban Infrastructure 2008", 22-24 October 2008, Wroclaw, Poland, www.wbliw.pwr.wroc.pl/uiua2008

NUCGE 2008 – International Conference on Numerical Computation in Geotechnical Engineering, October, 27-29 2008, Skikda, Algeria - www.univ-skikda.dz/conference/accueil1.html

57th Geomechanics Colloquy 2008 in honour of the 100th birthday of Leopold Müller and the 40th birthday of the ÖGG
Salzburg, October 9th to 10th 2008
www.oegg.at/english/events/events.htm

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E-mail: salzburg@oegg.at

14th World Conference on Earthquake Engineering (14WCEE), 12-17 October 2008, Beijing, China - www.14wcee.org

ICSE-4 Fourth International Conference on Scour and Erosion, Tokyo, 5 - 7 November, 2008 - icse-4.kz.tsukuba.ac.jp

3ο Πανελλήνιο Συνέδριο Αντισεισμικής Μηχανικής και Τεχνικής Σεισμολογίας, 5 – 7 Νοεμβρίου 2008, Αθήνα – www.civil.ntua.gr/3-PCEEES

Atlantis 2008 - The Atlantis Hypothesis Q Searching for a Lost Land, Athens, 10 - 11 November 2008, atlantis2008.conferences.gr/4299.html

International Conference on Deep Excavations (ICDE), 2008 10-12 November 2008, Singapore, www.icde2008singapore.org

International Conference on

Management of Landslide Hazard in the Asia-Pacific Region

11th -15th November 2008
japan.landslide-soc.org/index-e.html

Despite the increasing level of understanding of landslide phenomenon and the recent scientific and technological developments in landslide forecasting, prevention and mitigation, landslides are still threat and continue to affect human life. Even in the early years of this new millennium, several large-scale landslides, such as those induced by the recent earthquakes in Pakistan and the rainfall-induced catastrophic landslide that occurred on Leyte Island in Philippines have devastated the lives and properties of large numbers of people.

The Asia-Pacific region is seriously affected by landslides. The combination of an extremely active but diverse tectonic setting, high rates of weathering, and abundant rainfall promotes an elevated level of natural landslide activity. Furthermore, the rapid growth of the population and development of infrastructure has led to an extreme vulnerability to landslides. For example, many parts of Japan experience many landslides. In 2004 an intraplate earthquake in Niigata prefecture triggered a high density of multiple landslides. In response, a concentrated program of mitigation and countermeasures had been undertaken to lessen the hazard in this area.

During its 45-year history the Japan Landslide Society has organized annual symposia on landslides in Japan and on landslide hazard management. Furthermore, the Society convened the International Conference and Field Workshop on Landslides (ICFL) in 1985, and in coordination with the Nepal Landslide Society, it co-hosted the "International Symposium on Landslide Hazards in Orogenic Zones, from the Himalaya to Island Arcs in Asia" in 2005 in Kathmandu, Nepal.

As global trends of climate change, environmental destruction and population explosion are likely to further increase the occurrence of landslide disasters, there is a pressing need to develop opportunities for the exchange between researchers, engineers and government personnel of the most up-to-date information on the nature of landslides and on techniques for their mitigation. In this regard, the Japan Landslide Society has decided to coordinate with the related organizations to convene an international conference. The aim is to provide an opportunity to present and exchange information on landslide hazard and management, with a particular focus on the Asia-Pacific Region. This conference will precede the First World Landslide Forum, Tokyo on 18-21 Nov. 2008.

OBJECTIVES

The conference is designed to provide a stimulating forum for geoscientists, engineers, programme managers, and other decision makers concerned with landslide hazards and their management.

It will provide a forum for landslide researchers in the international community to share knowledge and exchange ideas on how to undertake landslide hazard assessment; landslide movement forecasting and prediction; landslide management and landslide mitigation using state-of-the-art techniques.

KEY THEMES

1. Landslide mechanisms
2. Measurement, instrumentation, monitoring and modeling

3. Landslide hazard mapping
4. Countermeasure techniques for landslide stabilization
5. Non-structural measures and education on landslide problems

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The First World Landslide Forum - Implementing the 2006 Tokyo Action Plan on the International Programme on Landslides (IPL) - Strengthening Research and Learning on Earth System Risk Analysis and Sustainable Disaster Management within UN-ISDR as Regards "Landslides", 18-21 November 2008, United Nations University, Tokyo, Japan - www.iclhg.org

5th Asian Rock Mechanics Symposium

24-26 November 2008 Tehran, Iran

New Horizons in Rock Mechanics - Development and Applications A technical exhibition is foreseen
www.arms2008.org

Information:

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5th WBI-International Shortcourse Rock Mechanics, Stability and Design of Tunnels and Slopes

November 27 to 30, 2008
WBI, Aachen, Germany
www.wbionline.de

After four successful events in the past 4 years, we will organize our shortcourse in 2008 again.

Acknowledged experts in their field will

- share their knowledge with you,
- illustrate the basics of rock mechanics to you,
- demonstrate the application of the WBI-developed finite element computer codes for static and hydraulic analyses on the basis of case histories,
- present interesting case studies for tunnelling and construction in rock

during four consecutive days. There will be plenty of room for questions and discussion.

3rd International Conference on GEOTECHNICAL & GEOENVIRONMENTAL ENGINEERING, ROCK MECHANICS & ENGINEERING GEOLOGY "Recent Advances"

10 - 12 December 2008, Chiangmai, Thailand
www.cipremier.com/ciframeset.htm?index2.htm

www.jointedrock2009.org

In civil, geological, mining and petroleum engineering disciplines, the engineers face problems associated with geotechnical systems that are in or on jointed rock. Some examples for geotechnical systems are underground and surface excavations made for mineral extraction, hot dry rocks for geothermal energy extraction, underground fractured reservoirs for oil and gas recovery, hazardous waste isolation caverns, underground caverns for oil and gas storage, tunnels for hydropower and transport, foundations for various types of buildings, bridges and dams, and natural and man made slopes. In some of these rock engineering problems, the concerns are the stability and deformation of the rock masses. In some other cases, the fluid and heat flow, and transport through rock masses are of central importance. In a limited number of situations, notably the design of underground radioactive waste repositories, storage of liquefied natural gas or oil or geothermal energy recovery, coupled thermal, hydraulic, mechanical and chemical effects are of concern. Design and construction of the aforementioned geotechnical structures require a sound knowledge of rock mass mechanical, hydraulic and thermal behavior. Rock mass behaviors in turn depend on rock joint mechanical, hydraulic and thermal behaviors. The International

Conference on Rock Joints and Jointed Rock Masses along with pre-conference short courses/workshops, technical field trips and exhibits are planned to provide the state-of-the-art and the new developments on the aforementioned subject areas.

The conference and the related activities will be held in Tucson, Arizona, USA from 4th through 10th January, 2009. I would like to invite the educators, practitioners and researchers in geo-engineering who work in structural geology, Engineering Geology, rock mechanics and rock engineering disciplines associated with civil, geological, mining, petroleum, construction and environmental engineering projects to participate in the conference and other related activities, and to share their novel ideas, new developments, technologies, state-of-the-art practices and experiences. We expect you to benefit in your professional career from the knowledge gained through exchange of information and discussions that would take place at these gatherings.

A tentative list of the main sessions is given below. Other topics will be included based on the abstracts received. Attempts will be made to select a leading lecture for each session based on the quality of the submitted abstracts. These leading lectures will be named as special lectures. The three-day conference (January 7-9) will consist of a technical program of parallel sessions of Special & Regular Lectures.

- Origin and Morphology of Fractures
- In Situ Stress
- Applied Fracture Mechanics
- Geophysics Applications
- Fracture Geometry Characterization
- Joint Roughness
- Joint Aperture
- Physical Properties
- Mechanical Properties
- Thermal Properties
- Flow and Transport
- Chemical Properties
- Coupled Processes
- Dynamic Properties
- Rock Mass Classifications
- Rock Mass Surface Excavations
- Rock Mass Underground Openings
- Foundations
- Dams
- Tunnels and Shafts
- Geothermal Energy Production
- Oil and Gas Production
- Hazardous waste isolation
- Oil and Gas Storage
- Blasting and Rock Fragmentation
- Rock Mass Support
- Laboratory and Field Techniques
- Physical Modeling
- Numerical Modeling
- New Numerical Methods
- Application of Probability & Statistics
- Petroleum Applications
- Mining Applications
- Civil Projects

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RGMA-09
International Symposium on Rock Mechanics and Geoenvironment in Mining and Allied Industries

12-14 February 2009, Varanasi, Uttar Pradesh, India
www.itbhu.ac.in/min/conferences

For more information contact:

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25 -27 February 2009, Salt Lake City, Utah, USA
www.geoshow.info

At Geosynthetics 2009 you'll explore important issues affecting the water resources, mining, construction, and regulatory communities in the US, Canadian and Mexican markets. As an engineer, environmental specialist, water or transportation regulator, you will have a menu of technical programs, workshops and courses to select from. You'll walk away with hundreds of new ideas—from design and engineering strategies to cost-saving geosynthetics solutions. It's everything you can use to grow your business.

Geosynthetics 2009
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www.ifai.com, www.gmanow.com

International Foundation Congress & Equipment EXPO '09, 15 – 19 March 2009, Orlando, Florida, USA, www.ifcee09.org

7th International Conference on
GROUND IMPROVEMENT TECHNIQUES
20 - 22 April 2009, Macau, China
www.cipremier.com/ciframeset.htm?index2.htm

SINOROCK2009

International Symposium
on Rock Mechanics
"Rock Characterization, Modelling and Engineering Design Methods"
19-22 May 2009, Hong Kong
www.hku.hk/sinorock

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Extra-terrestrial rock mechanics at SINOROCK 2009

Are you unworldly enough to tackle extra-terrestrial rock mechanics?

For almost 50 years now, the ISRM has studied rock mechanics on Earth – but do all the fundamentals that we have developed also apply on the planets?

Wanted: a theoretician to go through the fundamentals of rock mechanics and establish whether they all apply out of this world – and to give a report at the SINOROCK 2009 international ISRM symposium at the University of Hong Kong in May 2009. Hopefully, Newton's Laws apply. What about poroelasticity? What about the Hoek-Brown failure criterion?!

Volunteers please contact John Hudson at john.a.hudson@gmail.com

"Safe Tunnelling for the City and Environment" ITA-AITES World Tunnel Congress 2009 and the 35th ITA-AITES General Assembly, Budapest Congress and Word Trade Center, Budapest, Hungary, 23 - 28 May 2009 - www.wtc2009.org

Géotechnique SYMPOSIUM IN PRINT 2009, May 2009, www. geotechnique-ice.com

3rd International Conference on
New Development in Rock Mechanics and Engineering & Sanya Forum for the Plan of City and City Construction (NDRM'2009)
24-26 May 2009, Sanya, Hainan Island, China
www.ndrm2008.cn

The conference is to provide a forum for these engaged in research and development of not only Rock Mechanics & Engineering, but also Civil Engineering. There will be presentations and discussions on original researches, new development and case studies in Rock Engineering and Civil Engineering for topics as wide as possible throughout the industry. The conference should be attended by scientists and engineers from civil, geological, mining, hydro-electrical and a lot of related fields.

Conference Themes

A. Rock Mechanics and Engineering:
- New ideas in geology & geophysics;
- Earthquakes & other geological calamity;
- Environment & rock or soil engineering;
- Intelligent rock mechanics;
- Numerical rock mechanics;
- Experimental rock mechanics;
- Analysis of the process of rock failure;
- New techniques of design, construction & support in tunnels or large caverns;
- Underground mining & subsurface storage of gas and oil;
- Case studies or others in rock engineering;

B. Civil Engineering:
- New ideas & new development of the plan of city construction;
- Studies of base & ground foundation;
- The construction of highway and road;
- Researches & comparison between viaduct & subway;
- New ideas, new techniques, new technologies of design & construction of civil engineering;
- New building materials;
- Environment & civil engineering;
- Discuss of art of the buildings at the beautiful Sanya;
- Discuss of the plan of city construction at the beautiful Sanya;
- Case studied or others in civil engineering;

Enquiries should be sent to:
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NDRM'2009 P.O. Box 265
College of Resources and Civil Engineering
Northeastern University,
Shenyang, Liaoning,
P.R. China 110004

International Symposium on Prediction and Simulation Methods for Geohazard Mitigation
IS-Kyoto May 25-27, 2009 Kyoto, Japan

nakisuna2.kuciv.kyoto-u.ac.jp/tc34/is-kyoto

The mitigation of geohazards is an important problem in geotechnical engineering. Heavy rains, typhoons and earthquakes are the main causes of geohazards. Due to climate changes and extreme weather, geohazards are occurring around the world. It is critical to mitigation, therefore, to have an understanding of the mechanism of these geohazards which are brought about by various causes. Due to the limited experimental techniques available, simulation-based predictions, monitoring and the analyses of case records are playing increasingly important roles.

The Kansai branch of JGS (Japan Geotechnical Society) established the Technical Committee on the Mitigation of Geohazards in River Basins 2006 and has been doing site investigations on geohazards due to heavy rains and typhoons ever since. On the other hand, TC34 of ISSMGE has been working on prediction and simulation methods for geomechanics. In particular, TC34 focuses on analyzing unstable ground behavior, such as strain localization, which is a precursor to ground failure, liquefaction, landslides, seepage failures, etc.

The Kansai branch of JGS and TC34 of ISSMGE have decided to organize an international symposium on prediction and simulation methods for the mitigation of geohazards. The symposium will provide a forum for discussing new prediction and simulation methods for geohazards and for exchanging ideas and information of mutual interest. This symposium is being sponsored by the Japanese Geotechnical Society (Kansai branch), TC34 of ISSMGE and the TC34 supporting committee of JGS.

The main theme of prediction and simulation methods for geohazard mitigation includes:

- Mechanisms of geohazards, namely, heavy rains, floods, typhoons, earthquakes, landslides, slope and snow slides, tsunamis, land subsidence, coastal erosion, etc.
- Numerical and analytical simulation methods for geohazards, including conventional and advanced methods, FDM, FEM, Extended FEM, DEM and SPH.
- Advanced constitutive modeling of geomaterials and numerical implementations and constitutive parameter determination using laboratory and field test results.
- Thermo-hydro-mechanical instabilities, namely, large deformations, strain localization, progressive failure, liquefaction, ground water flow analysis, the rapid flow of complex geofluids such as mud flow, etc.
- Monitoring and non-destructive investigation methods for geostructures during floods, earthquakes, heavy rains, etc. and design methods.
- Evaluation of existing prediction methods, performance-based design methods aided by advanced numerical modeling, risk analysis and the management of mitigation programs.
- Case records of geohazards and mitigation projects

Information from:

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E-mail: foka@mbox.kudpc.kyoto-u.ac.jp

IS-Tokyo 2009 "International Conference on Performance-Based Design in Earthquake Geotechnical Engineering - from case history to practice", 15 – 17 June 2009, Tokyo, Japan.

WCCE – ECCE – TCCE Joint Conference "EARTHQUAKE & TSUNAMI", 22 – 24 June 2009, Istanbul, Turkey - www.imo.org.tr/egt2009

The 3rd International Geotechnical Symposium (IGS2009) on Geotechnical Engineering for Disaster Prevention and Reduction

22-25 July 2009, Harbin, China

Contact person: Professor MC Zhao,
E-mail: maocai@mail.ru, zhao_maocai@sohu.com
Website: igs2009.hit.edu.cn

GeoAfrica 2009 "Geosynthetics For Africa"

www.gigsa.org

Come to *"The Fairest Cape In All The World" (Sir Francis Drake in 1580),* and participate in a unique experience. *GeoAfrica 2009* will present a forum for consulting engineers, manufacturers, installers and academics to exchange informatin about current and potential applications for geosynthetics in Africa.

Thiw will be the first conference to be held under the auspices of the IGS in the region, and will present an opportunity to meet the top geosynthetics specialists and prospects on the continent. Every visitor to the exhibition floor will be a potential customer, and professionals seeking geosynthetics solutions to their challenges will attend each technical session. This will be the largest gathering of geosynthetics professionals seen in Africa to date.

The conference will include an exhibition for the specification and trade of geosynthetic products and technology to users throughout Africa, as well as those wishing to make an entry into the continent.

Details of the conference are currently being finalised. If you would like to participate in this major event and receive an invitation to submit a technical paper, please send an e-mail with your contact details to Kim Barnard at geo-

texgp@iafrica.com and we will put you on the conference mailing list. Visit www.gigsa.org for future updates

17th International Conference on Soil Mechanics and Geotechnical Engineering "Future of Academia & Practice of Geotechnical Engineering", 5 – 9 October 2009, Alexandria, Egypt - www.2009icsmge-egypt.org

EUROCK'2009
Rock Engineering in Difficult Ground Conditions - Soft Rocks and Karst
29-31 October 2009, Dubrovnik-Cavtat, Croatia

Contact Person:
Dr Ivan Vrkljan
Civil Engineering Inst. of Croatia
Janka Rakuse 1
HR-10000 Zagreb, CROATIA
Telephone: (+385)1/6125283
Fax: (+385)1/6125221
E-mail: ivan.vrkljan@igh.hr

IX International Conference on Geosynthetics, Brazil, 2010 - www.igsbrasil.org.br/icg2010

XVth European Conference on Soil Mechanics and Geotechnical Engineering, 12 – 15 September 2011, Athens, Greece.

www.isrm2011.com

The ISRM national Groups for China and Singapore warmly invite you to Beijing for the 12th ISRM International Congress on Rock Mechanics in 2011. The scheme for the ISRM 2011 Congress is "Harmonising Rock Mechanics and the Environment" to emphasize the critical roles of rock mechanics and rock engineering in sustainable development and environment preservation. In addition to the 4-day technical program, workshops, short courses, technical visits, exhibitions and social programs will be organised. Meetings and functions of ISRM Board, Council, Interest Groups and Commissions, and other ISRM related activities will also take place in conjunction with the Congress. We look forward to welcoming you to the ISRM 2011 Congress.

With the fastest growing economy and the largest population in the world, China's economic and social growths require the development of resources and infrastructures. Rock mechanics research and rock engineering practice present unique opportunities as well as challenges to science and technology. The ISRM 2011 Congress in Beijing offers an excellent opportunity for the international rock mechanics and rock engineering community to exchange, to share, and to progress. The ISRM national Groups for China and Singapore pledge to do our utmost to make the ISRM 2011 Congress the most exciting congress. With the combined efforts and experiences of China and Singapore, and supports of other Asian countries, we can assure you that this will be the congress to long for and to be remembered for years.

The Congress will cover the entire scope of rock mechanics and rock engineering, with the emphasis on interfacing rock mechanics and rock engineering with the environment. The main topics include but not limited to the followings:

- Site investigation and field observation.
- Rock material and rock mass properties testing (laboratory and in situ).
- Analysis techniques and design methods, modeling and numerical methods.
- Information system, artificial intelligence and other advanced techniques.
- Rock engineering in hazardous geo-environments.
- Rock breakage and excavation techniques.
- Underground storage of petroleum, gas, CO2, and nuclear waste disposal.

Conference Secretariat:

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E-mail: secretariat@isrm2011.com
Website:http://www.isrm2011.com

ΝΕΑ ΑΠΟ ΤΟΝ ΚΟΣΜΟ

Warsaw tower unveiled

UK-based Zaha Hadid Architects has unveiled its winning design for the Lilium Tower in Warsaw, Poland.

The 240 m high, 101200 m^2 tower for developers Lilium Polska, is a “light, transparent structure with a strong sense of identity and character”, according to a spokesman for the architects.

It will feature an apartment hotel, residential apartments, spa facilities, underground retail area with an adjacent exterior mall, restaurant, and underground parking. On the ground floor, four separate lobbies provide access to the hotel, apartments, restaurant and delivery area.

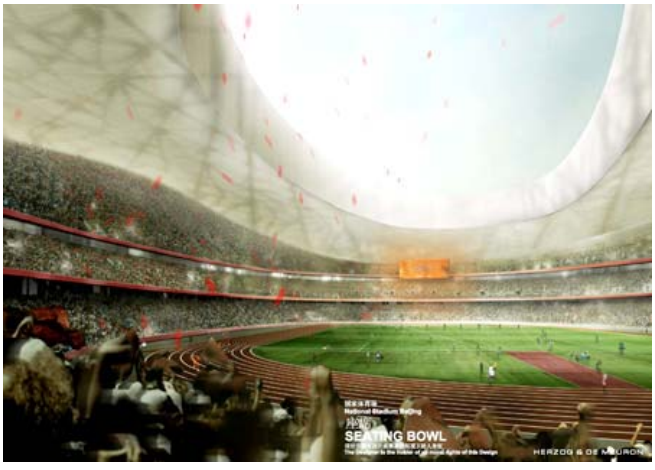
A “low energy strategy” informs the design, which includes “low-energy services designed to cope with the extremes of the local climate”, added the spokesman.

(INTERNATIONAL CONSTRUCTION, March 5, 2008, Editor: Richard High)

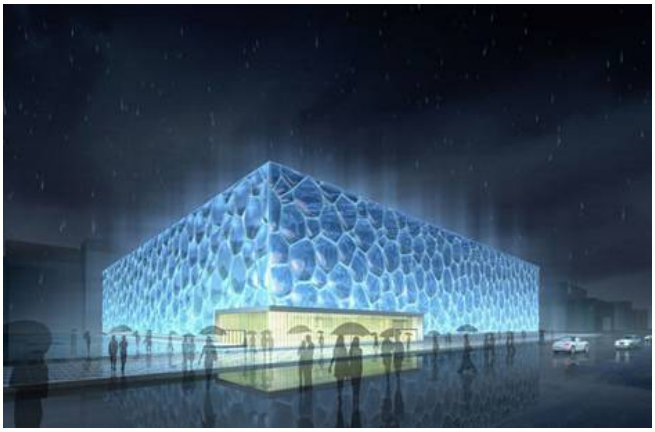
Ολυμπιακές Εγκαταστάσεις Πεκίνου

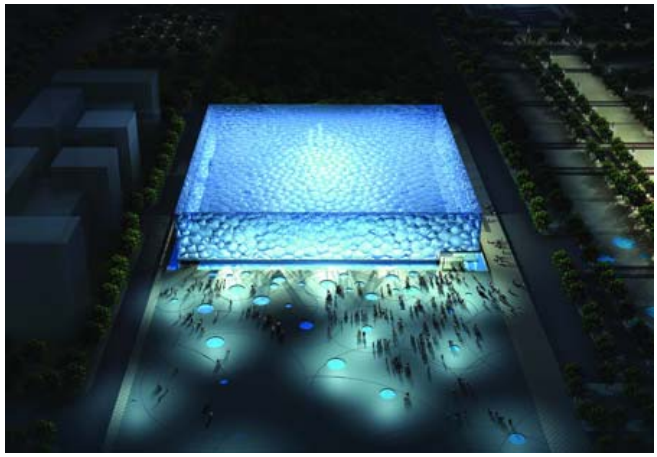
Παραθέτουμε μια σειρά «φωτογραφιών» των εντυπωσιακών νέων αθλητικών εγκαταστάσεων του Πεκίνου:

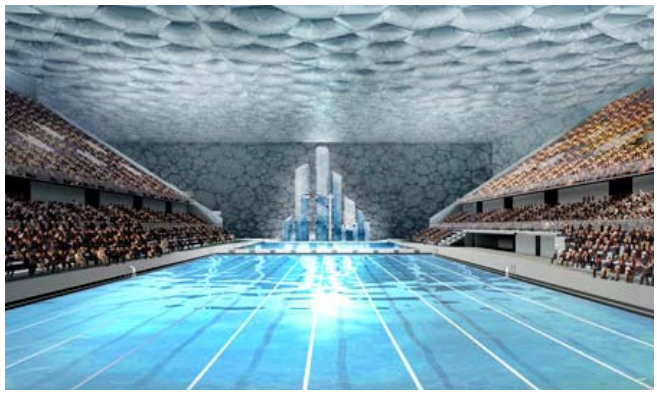
Ολυμπιακό Στάδιο



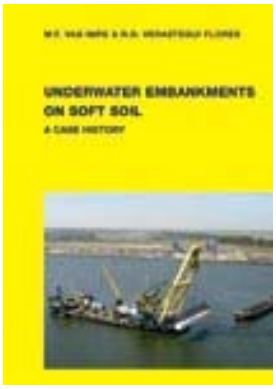
Ολυμπιακό Κολυμβητήριο







ΝΕΕΣ ΕΚΔΟΣΕΙΣ ΣΤΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΠΙΣΤΗΜΕΣ



Underwater Embankments on Soft Soil: A Case History

William F. van Impe and R. Daniel Verastequi Flores

Ground improvement is an established technique in foundation engineering. In recent decades, modern methods of ground improvement have utilised explosives, impact energy, thermal treatment of the soil, vacuum consolidation, vibratory compaction technologies, stabilization and solidification of soft soils, as well as combined systems of ingenious grouting systems and deep mixing technique. Internationally, deep mixing techniques are often the chosen method for dealing with increasingly-demanding foundation problems. Initial experiences, using inventive new developments of soft soil deep mixing technologies and various advanced high pressure mixing methods, have proved successful both onshore and offshore.

This publication illustrates a challenging example, sited in the Port of Antwerp, Belgium, of the design and construction of a large underwater embankment on very soft soil. This text will be a valuable reference case history for the geotechnical engineer, both from the academic's as well as from the practitioner's point of view.

(Taylor and Francis, 2008)

Geology and Properties of Earth Materials 2007

TRB's Transportation Research Record: Journal of the Transportation Research Board, No. 2016 includes 13 papers organized in two parts. Part 1, Pavements: Geotechnical Properties of Materials, explores rockfill embankment settlement, evaluation of the light falling weight deflectometer (FWD), performance deformation and critical stress of cohesive soil under repeated loading, elastic nonlinear finite element analysis of a flexible pavement subjected to FWD loads, mechanistic classification of unbound materials, skid resistance of unpaved roads, gravel roads surface performance modeling, seismic methods for assessment of debonding in concrete slabs, assessing early age delamination distress, and genetic algorithms-based network optimization system with multiple objectives. Part 2, Characterization of Rock Slopes and Subsurfaces, Biochemical Processes in Soils, includes papers on estimating rock slope stability using logistic regression analysis, ground proving seismic refraction tomography programs, and Monod kinetics for aerobic biodegradation of calcium magnesium acetate.

(TRB, August 2008)

Earthquake Monitoring and Seismic Hazard Mitigation in Balkan Countries

Proceedings of the NATO Advanced Research Workshop on Earthquake Monitoring and Seismic Hazard Mitigation in Balkan Countries, Borovetz, Bulgaria, 11-18 September 2005

Series: NATO Science Series: IV: Earth and Environmental Sciences , Vol. 81

Husebye, Eystein S., Editor

With the Balkans being Europe's most earthquake-prone region, this much-needed collection of the latest research in the field provides an account of past, present and likely future seismological developments in Balkan countries.

It also offers various kinds of network operations on local to global scales.

Station and network operations require near real-time record analysis and topics dealt with here include 2-D signal detectors, epicenter location and earthquake monitoring.

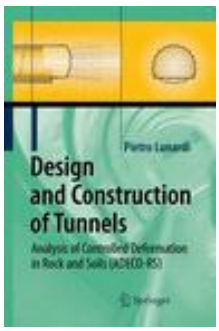
The Balkans are the most seismically active part of Europe due to multiple plate interactions in the Aegean Sea. The tectonic evolution and on-going geodynamic deformations are described in 2 articles.

Earthquake hazard analysis and topographic site effects are discussed, as are large earthquake hazards in the Aegean and the Marmara seas.

The book also examines the practical applications of such procedures.

Written for: Seismologists, seismic network operators, earthquake risk analysts, geodynamics and SE European tectonic evolutionists

(Springer, May 2008)



Design and Construction of Tunnels

Analysis of Controlled Deformations in Rock and Soils (ADECO-RS)

P. Lunardi

This work illustrates how the Analysis of Controlled Deformation in Rocks and Soils (ADECO-RS) is used in the design and the construction of tunnels.

The ADECO-RS approach makes a clear distinction between the design and the construction stages and allows reliable forecasts of construction times and costs to be made. It uses the advance core (the core of ground ahead of the face) as a structural tool for the long and short term stabilisation of tunnels, after its rigidity has first been regulated using conservation techniques. Tunnels can consequently be driven in difficult stress-strain conditions to predetermined safety standards with operations industrialised and scheduled precisely.

Thanks to this approach design engineers have been able to employ industrial criteria in tunnel excavation, even under extremely difficult stress-strain conditions.

Written for: Practicing engineers, researchers and students

(Springer, May 2008)

Geotechnical Earthquake Engineering

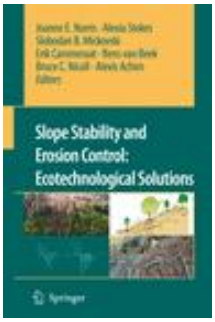
Springer Series in Geomechanics and Geoengineering

I. Towhata

This book presents all issues of earthquake geotechnical engineering in a comprehensive way. It summarizes the present knowledge on earthquake hazards and their causative mechanisms, experimental studies on nonlinear complex soil behaviour, an analysis to predict ground behaviour during earthquakes, field studies to determine nature of real ground as input data for analysis, and damage mitigation technologies. Information obtained from earthquake damage investigation (such as ground motion, landslides, earth pressure, fault action, or liquefaction) as well as data from laboratory tests and field investigation is supplied, together with exercises/questions.

Written for: Engineers, graduate students, and professionals in geotechnical engineering, civil engineering, earth sciences, soil and ground mechanics.

(Springer, April 2008)



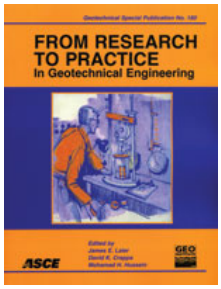
Slope stability and erosion control: Ecotechnological solutions

Norris, J.E., Stokes, A., Mickovski, S.B., Cammeraat, E., van Beek, R., Nicoll, B.C., Achim, A. , Editors

This book is designed to assist the civil and geotechnical engineer, geomorphologist, forester, landscape architect or ecologist in choosing ecotechnological solutions for slopes that are prone to a variety of mass movements e.g. shallow failure or erosion. Within this book, the 'engineer' is used in the global sense to encompass all planners, designers, etc who are involved in the stabilisation of slopes. We review the types of problematic slopes that may occur and describe briefly the nature of mass movements and the causes of these movements. In this book, we focus on the use of vegetation to stabilize soil on slopes prone to mass movements. Before a plant can be chosen for a particular function, its physical and hydrological properties must be determined, thus the root architecture of grasses, shrubs and trees are described and the soil hydrological and mechanical factors which influence vegetation are discussed. Depending on the use of the slope, the engineer may wish to ascertain either the stability of the slope or the mechanical stability of the vegetation or both, therefore slope stability analysis methods are reviewed and the contribution the vegetation has to the stability of the slope are explained. Models to assess the mechanical stability of vegetation are reviewed. This book also introduces new ecotechnological methods for stabilising active rockfalls on steep slopes and slopes that are prone to soil erosion following wild fires, as well as providing user friendly information on traditional ground bio-engineering techniques and tables of plants suitable for different functions. Case studies where ground bio- and eco-engineering measures have been put into practice are also discussed.

Written for: Research scientists, postgraduate level students and managers working in the areas of slope stability, landslide mitigation techniques, erosion control, forestry, ecotechnology and environmental protection

(Springer, April 2008)



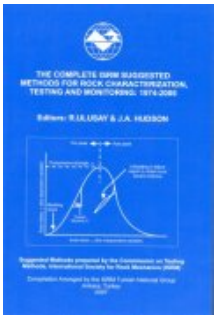
From Research to Practice in Geotechnical Engineering

(Geotechnical Special Publication No. 180)

J. E. Laier, D. K. Crapps, M. H. Hussein, Editors

From Research to Practice in Geotechnical Engineering, GSP 180, honors Dr. John H. Schmertmann, Professor Emeritus and P.E., for his contributions to civil engineering. It begins with his biography, a list of his students and writings, followed by reprints of his selection of 16 representative papers from his career. Twenty-eight new, mostly invited papers follow on a great variety of subjects, including: the installation and testing of piles; pile-structure interaction; liquefaction and its mitigation; case histories of settlement and landslide mitigation and capping a superfund landfill; and computer modeling. The authors include six members of the National Academy of Engineering. This GSP concludes with a paper by one of these, Dr. Schmertmann, which itself concludes with a suggestion for improving your technical writing. Everyone working in the geotechnical profession will find something interesting and useful herein.

(ASCE, 2008)



Blue Book - the complete ISRM Suggested Methods

The book "The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring: 1974-2006" was launched during the 11th ISRM Congress in Lisbon. The "Blue Book" was edited by Professors Resat Ulusay and John Hudson.

The book was published by the ISRM Turkish National Group and can be purchased from them and also from the ISRM Secretariat (see Products and Publications on the website).

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ

INTERNATIONAL LANDSLIDE RESEARCH GROUP

http://ilrg.gndci.cnr.it

Κυκλοφόρησε το Τεύχος Volume 22, Digital Note 1, March 2008 του International Landslide Research Group Newsletter.

www.geoengineer.org

Κυκλοφόρησε το Τεύχος #39 του Newsletter του Geoengineer.org (Μάρτιος 2008) με πολλές χρήσιμες πληροφορίες για όλα τα θέματα της γεωτεχνικής μηχανικής. Υπενθυμίζεται ότι το Newsletter εκδίδεται από τον συνάδελφο και μέλος της ΕΕΕΕΓΜ Δημήτρη Ζέκκο (secretariat@geoengineer.org).

IGS NEWS igs

NEWSLETTER OF THE INTERNATIONAL GEOSYNTHETICS SOCIETY

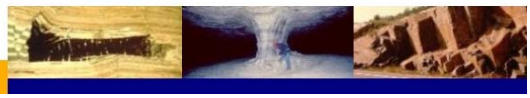
Dedicated to the scientific and engineering development of geotextiles, geomembranes, related products, and associated technologies

VOLUME 24, NO. 1 March 2008

www.geosyntheticssociety.org

ISRM International Society for Rock Mechanics

newsletter



www.isrm.net

Κυκλοφόρησε το Τεύχος No. 1 - March 2008 του Newsletter.

ΕΕΕΕΓΜ
Τομέας Γεωτεχνικής
ΣΧΟΛΗ ΠΟΛΙΤΙΚΩΝ ΜΗΧΑΝΙΚΩΝ
ΕΘΝΙΚΟΥ ΜΕΤΣΟΒΙΟΥ ΠΟΛΥΤΕΧΝΕΙΟΥ
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«ΤΑ ΝΕΑ ΤΗΣ ΕΕΕΕΓΜ» «αναρτώνται» και στην ιστοσελίδα www.pangaea.gr