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& ΓΕΩΤΕΧΝΙΚΗΣ
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Αρ. 26 – ΔΕΚΕΜΒΡΙΟΣ 2009

SIMSG ISSMGE

Ο νέος χρόνος που ΄ρχεται πολλές χαρές να δώσει,
κι αν ήταν λίγες του παλιού, να σας τις συμπληρώσει

(Κρητική μαντινάδα)

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ΔΙΑΛΕΞΗ

την Τρίτη, 12 Ιανουαρίου 2010, ώρα 18:00

στο Αμφιθέατρο

«**ΕΥΘΥΜΙΟΣ ΜΑΣΤΡΟΓΙΑΝΝΗΣ**»

στο κτίριο του Τμήματος Πολιτικών Μηχανικών
της Πολυτεχνικής Σχολής
του Πανεπιστημίου Πατρών

«Compensation grouting for limiting settlements of two railway bridges induced by a twin-tunnel excavation»

από τον

Dr. Robert THURNER
Keller Grundbau Des.m.b.H

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ΜΗΧΑΝΙΚΗΣ

ΔΙΑΛΕΞΗ

την Τετάρτη, 13 Ιανουαρίου 2010, ώρα 19:00

στην
Αίθουσα Εκδηλώσεων της
Σχολής Πολιτικών Μηχανικών ΕΜΠ
στην Πολυτεχνειούπολη Ζωγράφου

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ΣΥΛΛΟΓΟΣ
ΑΠΟΦΟΙΤΩΝ
IMPERIAL
COLLEGE

6η ΑΘΗΝΑΪΚΗ ΔΙΑΛΕΞΗ ΓΕΩΤΕΧΝΙΚΗΣ ΜΗΧΑΝΙΚΗΣ

Δευτέρα, 25 Ιανουαρίου 2010, ώρα 18:00

στην

Αίθουσα Εκδηλώσεων του
Κτιρίου Διοίκησης ΕΜΠ
στην Πολυτεχνειούπολη Ζωγράφου

«Interaction between geotechnical and structural engineers»

από τον

Prof. John Burland, CBE, DSc(Eng), FREng, FRS
Emeritus Professor, Soil Mechanics Section, Department of Civil and Environmental Engineering,
IMPERIAL COLLEGE, London

ΕΠΙΣΤΗΜΟΝΙΚΑ ΑΡΘΡΑ

Το άρθρο που ακολουθεί παρουσιάστηκε στο Satellite Conference on Earthquake Geotechnical Engineering, που διοργανώθηκε από την επιτροπή TC 4 της ISSMGE στην Alexandria, Egypt, στις 2 – 3 October 2009, εκτός προγράμματος και για τον λόγο αυτό δεν συμπεριελήφθη στην παρουσίαση των λοιπών άρθρων στο προηγούμενο τεύχος του περιοδικού.

GIS-BASED DATABASE OF HISTORICAL LIQUEFACTION OCCURRENCES IN BROADER AEGEAN REGION, DALO V1.0

George PAPATHANASSIOU[1] and Spyros PAVLIDES[2]

1 PhD, Department of Geology, Aristotle University of Thessaloniki, gpapatha@auth.gr
2 Professor, Department of Geology, Aristotle University of Thessaloniki, pavlides@geo.auth.gr

ABSTRACT

The goal of this study is the development of a database comprised by historical information regarding liquefaction manifestations mainly in Greece and the broader Aegean region in general and the presentation of their spatial distribution under a GIS environment. For the achievement of this goal, descriptions of liquefaction manifestations triggered by 90 earthquakes since 1509 were collected and a database was constructed under Ms-Acces software. The Ms-Access database is consisted of six tables that are used for adding information into the database while six relative forms have been created in order to present the dataset in a more suitable way. The independent tables include information regarding the earthquake, the liquefied site, the causative fault, the type of failure, the recorded ground motion and the historical report where the liquefaction failure was described. The navigation into the database is achieved through the introductive form "First-Page" where an option for opening the Greek or English version is presented. In addition, an option for downloading the DALO. kmz file is appeared, in order to present the data in a Google Earth interface. Furthermore, the GIS-based database is shown at the web site http://users.auth.gr/ ~gpapatha/dalo.htm where three maps regarding historical liquefaction occurrences are uploaded. Moreover, photos and figures of the ground or structural failures have been also uploaded, mainly for the events occurred after 1950. This GIS-based dataset can be helpful especially to decision makers and urban planners since it can be used as a screening guide of liquefaction hazard for avoiding in advance liquefaction prone areas

Keywords: Liquefaction, Database, GIS

INTRODUCTION

One of the preliminary studies that should be realized for the assessment of a natural – geological hazard within an area is the investigation of the occurrence of historical ground failures. In order to achieve this goal, scientists search into historical sources for reports describing primary and secondary effects induced by the event. Taking into account these historical documents, the delineation of areas prone to a geological hazard is accomplished, since ground deformations have the tendency to re-occur in the same places. Therefore, landslide inventory maps are compiled in order to define zones prone to sliding while earthquake primary effects such as surface ruptures and secondary effects such as landslides, subsidence and liquefaction can be predicted using information published on seismic catalogues.

In particular, regarding soil liquefaction, Youd (1984) stated that evidence of past liquefaction phenomena indicates a possible high liquefaction hazard because liquefaction tends to recur at the same site, providing site conditions have not changed. Additionally, Iwasaki (1986) concluded that sites, which liquefied during the past earthquakes have high potential to reliquefy by succeeding events. Thus, the identification of past liquefied sites in an area could represent the first step for its classification as liquefaction prone zone.
Following the above statements and in order to correlate the epicentral distance of a liquefied site with the earthquake magnitude, several researchers collected data and published preliminary databases of historical liquefaction occurrences. Particularly, Kuribayashi and Tatsuoka (1975) provided data from 32 historic Japanese earthquakes, Papadopoulos and Lefkopoulos (1993) updated the dataset, collected by Ambraseys (1988), with 30 new cases from Greece and Wakamatsu (1993) supplement the work of Kuribayashi and Tatsuoka (1975) with new data from 67 Japanese earthquakes. The last decade, Galli (2000) and Aydan et al. (2000) re-evaluated seismic parameters of Italian and Turkish earthquakes, respectively, and a dataset consisted of 88 earthquake-induced liquefaction cases from the broader Aegean region was published by Papathanassiou et al. (2005).

The objective of this study is to further develop and extent the dataset of liquefaction induced ground deformation in Greece (Papathanassiou et al., 2005), and to link the provided information to a GIS platform. In order to achieve this goal, the introduced parameters to the published dataset were re-evaluated while new data of liquefaction case histories, generated by recent earthquakes were added (June 8th, 2008 event). In addition, the included information to the previous excel-version (Papathanassiou et al., 2005) were introduced to a new database that was constructed under Ms-Access environment, creating the DALOv1.0. Into this new access-version database were additionally introduced information regarding the quantitative characteristics of the liquefied sites. Moreover, the DAtabase of historical Liquefaction Occurrences, DALOv1.0, was linked to a GIS platform, using the free software of Google Earth, for plotting the data. Both the Ms-Access file (.mdb) and the Google earth file (.kmz) of Dalo v1.0 are open-access files and can be downloaded from the web site http://users. auth.gr/~gpapatha /dalo.htm. In addition, the Database of historical Liquefaction Occurrences were also released on CD-ROM, where several options are offered via the first page (index.html). In particular, the files DALO.mdb (Ms-Access), the DALO.kmz (google earth projection) and a guide (Power Point file) regarding the navigation into the database can be downloaded.

Figure 1. View of the first page of the CD-ROM, showing the available options

DEVELOPMENT OF THE DATABASE

The DAtabase of historical Liquefaction Occurrences DALO v1.0 is an open-access file where information regarding liquefaction-induced ground and/or structural deformations is provided. The first entry in the dataset is in the 16th century AD while the cut-off data for this project is provided by the earthquake-induced liquefaction of June 8th, 2008 in NW Peloponnesus, Greece. However, the oldest events that are mentioned in the seismic catalogues and were correlated to liquefaction-induced failures are the 373 B.C. and 478 A.C events in Eliki and Sistos areas, respectively.

The majority of collected data are correlated to events occurred in the 20th century since almost all the earthquake-induced secondary effects, triggered at that period, were studied in detail and reported. Obviously, the small number of historical descriptions of liquefaction phenomena in the earlier centuries generally is due to the fact that most of the events were not reported in detail.

Most of the data (55 cases) in our dataset concerning earthquakes that occurred in Greece. Furthermore, information is also provided for 25 cases of earthquake-induced liquefaction from Turkey, 5 cases from Albania and 1 case from Bulgaria and Montenegro, respectively. The outcome of this study was that liquefaction manifestations were reported at a total of 321 times. In Greece, liquefaction phenomena were repeatedly triggered mainly at the Gulf of Corinth and at the islands of the Ionian Sea. In the surrounding region, liquefaction phenomena were mainly reported at the coastal zone of the Sea of Marmara (Turkey) and on river deposits in Bulgaria and in Turkey. For a comprehensive description of the dataset, the reader is referred to Papathanassiou et al. (2005).

The database was constructed under Ms-Access software and is consisted of six tables that are used for adding information while data's presentation is realized using six relative forms. In figure 2, is shown the chart of DALO v1.0 and the links among the forms that were created.

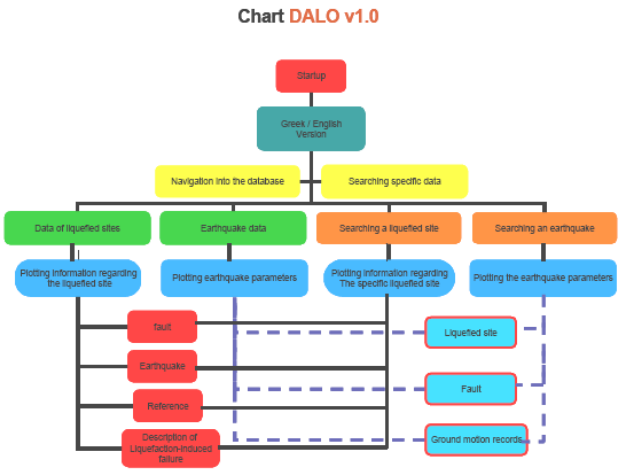

Figure 2. Chart of the Database of historical Liquefaction Occurrences where the correlations among the introduced elements are shown

Tables and Forms

The constructed six tables, used for the introduction of data, are cross-linked by key using elements that are common to several tables, such as the earthquake ID, the failure ID, site ID and reference ID. In figure 3, is shown the linking among the independent tables that is achieved based on these primary keys. The independent tables include information regarding the earthquake, the liquefied site, the causative fault, the type of failure, the recorded ground motion and the historical source where the liquefaction-induced failures were described.

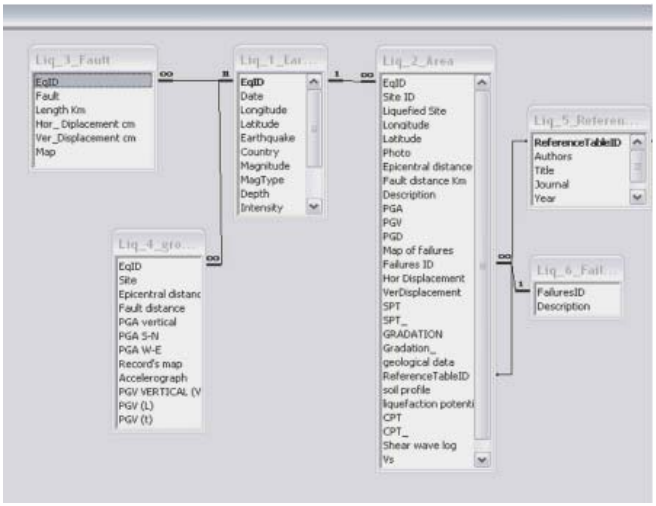

Figure 3. Relationships among the constructed tables of DALO v1.0

In particular, table *Earthquake* defines the earthquake characteristics such as magnitude, epicenter's coordinates (latitude, longitude), the focal depth of the event, date of occurrence, country, maximum intensity. Information regarding the site where liquefaction phenomena were reported is providing by the table *Area* including data regarding the epicentral and fault distance, information for the surficial geology of the area, the coordinates of the liquefied site, description and quantitative parameters of the liquefaction-induced failure, map of failures, data provided by borings with in-situ tests (SPT, CPT, Vs) and the recorded values of ground motion. Table *Fault* provides information regarding the causative fault such as the type of fault (normal, reverse, strike-slip), length (km), the average of the horizontal and vertical displacement and in few cases a map of the surface ruptures is included. Table *Groundmotion* includes the recorded ground motion, providing the values of peak ground acceleration, peak ground velocity and peak ground displacement as they were recorded by accelerometers and the relatively time-histories.
Furthermore, the table *Reference* includes information regarding the source (report) from where the description of liquefaction manifestation was collected such as the author's name, title of paper, journal and year of publication and the table *Failures* provides the coding of the description of the liquefaction-induced ground and/or structural deformation (figure 4).

Liq_6_Failures : Πίνακας

	FailuresID	Description
+	A1	ground fissures with ejection of mud
+	A2	Sand boils
+	A3	local Settlement
+	A4	Lateral spreading
+	A5	Settlement of the coast
+	B1	Settlement of building
+	B2	Tilting of building
+	B2,B3	damages to buildings and roads at the port/coast
+	B3	Settlement of quay/pier
+	B4	Lateral spreading of quay/pier
+	B5	Failure of railway embankments
+	B6	Settlement of bridge
+	B7	Failure of river banks
+	B8	Damage in the lifelines system
+	C	evidense/no subscription

Figure 4. Codification of the liquefaction-induced failures

The presentation of the collected data is accomplished using forms that was decided to be grouped in two main categories. The first group provides information of earthquake-induced liquefaction characteristics while the second one includes data regarding the liquefied site. The navigation into the database is accomplished by an introductive form which gives to the researcher the opportunity to select one of these two groups for browsing through its contents. Moreover, searching for a specific liquefied site or an earthquake that triggered liquefaction phenomena is now possible and can be achieved by selecting the relative options, appeared in the menu at the right side of the introductive form. The search is realized using the primary keys of EqID and siteID, respectively and the user can select an earthquake based on the date of occurrence or a liquefied site based on its location.

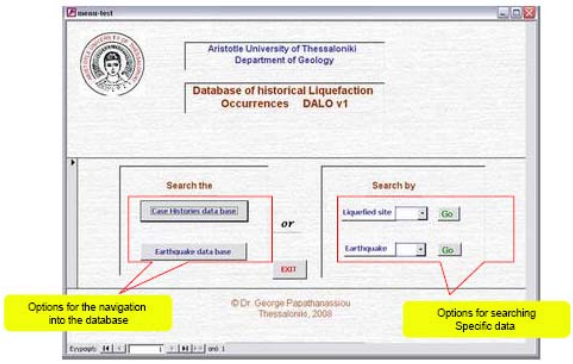

Figure 5. Introductive form of DALO v1.0

The keys located at the left of the form (figure 5), lead to the basic forms of DALO v1.0, Area and Earthquake, respectively, where information that were introduced at the tables *Earthquake* and *Area* are presented. As it is observed on the left form of figure 6, hyper-links were used for introducing photos of the failure and profiles provided by in-situ tests in order to minimize the size of the database. These elements were uploaded to the server of the Aristotle University of Thessaloniki, AUTH, and can be viewed as an html page. Moreover, the type of liquefaction-induced failure has been introduced using a failureID. In order to have access to a detailed description of the failure, the user should select the key *damage* presented in the menu located at the bottom of the *Area* form. Furthermore, the key *earthquake* leads to a form where the earthquake parameters are presented, the key *reference* leads to the form Reference and the key *fault data* leads to the form Fault. In addition, fields presenting the recorded values of ground motion at the liquefied site have been created, alhtough the fact that in the broader Aegean region such type of data/ recordings are few. On the right of figure 6, is shown the form *Earthquake* where the seismic parameters of the event are presented. Moreover, a briefly description of the secondary effects that were triggered by the event and a map of the failure's distribution are provided. The keys *site*, *fault* and *ground motion*, located at the bottom of the form, are used for the linking of the earthquake form with the relatively forms where information regarding the liquefied site, the fault and the recorded ground motion were introduced.

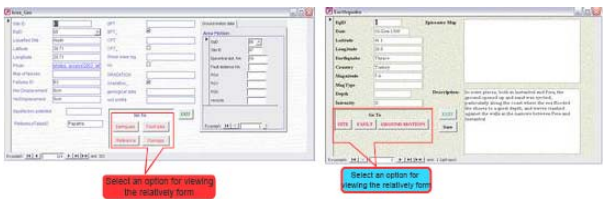

Figure 6. The two basic forms of liquefied sites (left) and earthquake (right) that are used for browsing through the contents of the database

LINKING DALO v1.0 WITH A GIS PLATFORM

The next step of our project was the development of a user -friendly web interface, where the included information to the database DALO v1.0 are presented. In particular, the goal of the project was to present the distribution of the liquefied site in conjunction with basic information regarding the liquefaction case histories. In order to achieve this goal, the Google Earth software was selected to be used due to the fact that is a free application and it can be easily downloaded from the web site http://earth.google.com/ index.html and because it provides the opportunity to compile maps accessible via internet.
The introduced liquefaction case histories to the DALO v1.0 were initially separated into two groups depending their location; sites in Greece and in surrounding region, respectively. Afterwards, two relative maps of liquefaction historical occurrences were compiled using the employed to the database coordinates. In addition, a map showing the distribution of the epicenters of the earthquake-induced liquefaction was compiled. Thereby, three maps were created using the Earth software and grouped as layers into a file of kmz format (Dalo.kmz). This file is included to the CD-ROM while the three compiled maps can be viewed as separate elements at the web site address of DALO v1.0 (http://users.auth.gr/~gpapatha/dalo.htm).

Figure 7. Home page of DALO v1.0 showing the three compiled maps of liquefied sites in Greece and surrounding countries and the earthquake-induced liquefaction epicenters.

The icons on these maps represent either liquefied sites or epicenters of earthquake-induced liquefaction. In particular, at the map located at the top of figure 7, is shown the distribution of liquefied sites in Greece while the map at the right corner includes the liquefied sites in the surrounding countries. On the third map, at the left corner, are plotted the epicenters of the events that generated liquefaction phenomena. Information regarding the liquefaction manifestations is accessed by clicking on the icons. In particular, every icon of liquefied site includes data regarding the date of occurrence, the location and a short description of the liquefaction-induced failures. Moreover, in some case histories, mainly after 1950, photo of the failure is also included as it is shown in the example of the June 8th, 2008 event in NW Peloponnesus, Greece (figure 8). The icons at the map of earthquake epicenter's include information regarding the date of occurrence, the primary source and a brief description of the secondary effects that were generated by the event. In addition, the option *See details* leads to an html

page presenting the whole data that were introduced to the database, for the earthquake.

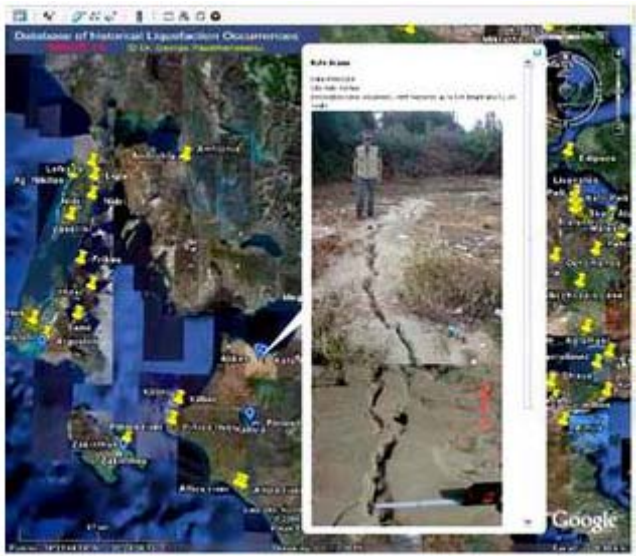

Figure 8. Example regarding the information including on the icons that are presented at the map of historical liquefaction occurrences in Greece

CONCLUSIONS

The basic aim of this project was the development of a database of historical liquefaction occurrences in the broader Aegean region and the linking of the collected information to a GIS environment. This goal was achieved using the Ms-Access and the Google Earth softwares, respectively. Initially, a digital version of the published by Papathanassiou 0et al. (2005) database was created where information regarding liquefied sites and parameters of earthquake-induced liquefaction was introduced. Afterwards, basic parameters were linked to a GIS environment using the Google Earth software and three maps regarding the distribution of liquefied sites in Greece, in the broader Aegean region and the distribution of the earthquake-induced liquefaction epicenter's were compiled. These maps that were upload to the web address of DALO v1.0, http://users.auth.gr/~gpapatha/dalo.htm included data that were further used for the compilation of the preliminary susceptibility map of Greece (Papathanassiou et al., 2009) in conjunction to the distribution of the quaternary deposits and the seismic hazard map as they were published by IGME (1983) and EAK (2000), respectively.

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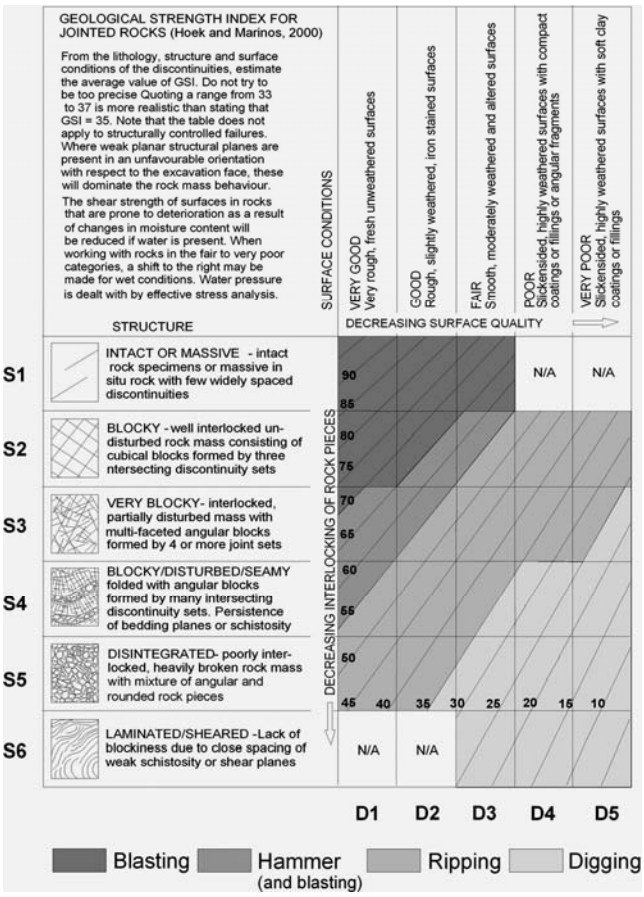
Excavatability assessment of rock masses using the Geological Strength Index (GSI)

Στο περιοδικό *Bulletin of Engineering Geology and the Environment,* Springer, Αύγουστος 2009 (DOI: 10.1007/s10064 -009-0235-9), δημοσιεύτηκε η εργασία των μελών της ΕΕΕΕΓΜ Γ. Τσιαμπάου και Χ. Σαρόγλου **"Excavatability assessment of rock masses using the Geological Strength Index (GSI)"**. Παραθέτουμε στη συνέχεια εκτεταμένη περίληψή της.

Η εκτίμηση της ευκολίας και του τρόπου εκσκαφής της βραχομάζας είναι ιδιαίτερα σημαντική στο σχεδιασμό των πρανών σε έργα οδοποιίας ή άλλα έργα Πολιτικού Μηχανικού (όπως εκσκαφές θεμελιώσεων), καθώς και σε υπαίθριες εκμεταλλεύσεις μεταλλείων. Ο όρος "*εκσκαψιμότητα*", με την ευρεία έννοια, περιλαμβάνει τις μεθόδους εκσκαφής α) με απλά εκσκαπτικά μέσα, όταν οι συνθήκες εκσκαφής είναι εύκολες έως πολύ εύκολες, β) με μηχανικό άροτρο (ripper), όταν οι συνθήκες εκσκαφής είναι μέτριας δυσκολίας έως δύσκολες και γ) εκσκαφή με εκρηκτικά, για πολύ δύσκολες συνθήκες εκσκαφής.

Στη βιβλιογραφία υπάρχουν αρκετές μέθοδοι εκτίμησης της εκσκαψιμότητας, οι οποίες λαμβάνουν υπόψη κυρίως την αντοχή σε μονοαξονική θλίψη του άρρηκτου πετρώματος, σ_{ci} ή την αντοχή σε σημειακή φόρτιση, Is_{50}, και την απόσταση των ασυνεχειών (Franklin et al., 1971 και Pettifer & Fookes, 1994). Άλλες μέθοδοι λαμβάνουν υπόψη και επιπλέον παραμέτρους, όπως την ταχύτητα διαδόσεως των επιμήκων σεισμικών κυμάτων (V_P)ή και την εμμονή, το άνοιγμα, τον προσανατολισμό και την τραχύτητα των ασυνεχειών. Τέλος, έχουν χρησιμοποιηθεί συστήματα ταξινόμησης βραχομάζας (RMR και Q) για την εκτίμηση της εκσκαψιμότητας (Weaver, 1975, Kirsten, 1982).



Σχήμα 1. Εκτίμηση της εκσκαψιμότητας της βραχομάζας με αντοχή άρρηκτου πετρώματος σε σημειακή φόρτιση (Is_{50}) μικρότερη από 3 MPa

Στην παρούσα έρευνα προτείνεται μια νέα μέθοδος εκτίμησης της εκσκαψιμότητας των βραχωδών σχηματισμών με βάση την αντοχή του άρρηκτου πετρώματος, όπως εκφράζεται με την αντοχή του σε σημειακή φόρτιση, και την βαθμονόμηση της βραχομάζας με το σύστημα GSI.

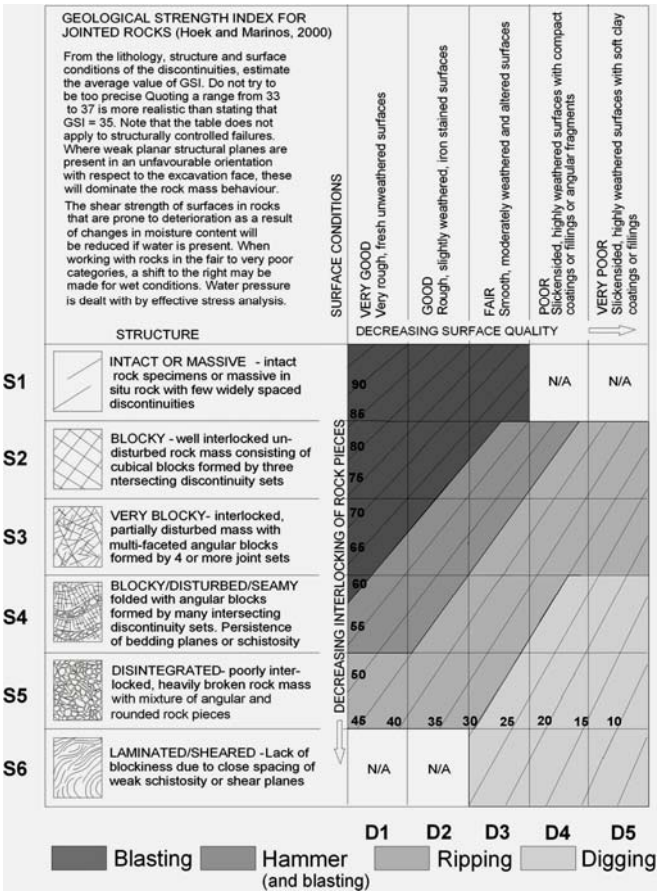
Η μέθοδος βασίζεται στην επεξεργασία μεγάλου αριθμού περιπτώσεων εκσκαφής για διαφόρους τύπους πετρωμάτων (ασβεστολίθους, γνευσίους, μάρμαρα, ψαμμίτες, σχιστολίθους)με διαφορετικό βαθμό κερματισμού.

Η πλειονότητα των βραχομαζών που ερευνήθηκαν είχαν τεμαχισμένη (blocky) έως πολύ τεμαχισμένη (very blocky) δομή, ενώ υπήρχε ένας σημαντικός αριθμός βραχομαζών με δομή στρωματώδη/διαταραγμένη (blocky/disturbed/seamy) καθώς και αποδομημένη δομή (disintegrated).

Με βάση τα στοιχεία που συλλέχθησαν προτείνονται διαγράμματα GSI για την ταξινόμηση της εκσκαψιμότητας, στα οποία διακρίνονται οι διαφορετικοί τρόποι εκσκαφής με βάση τον τύπο της βραχομάζας (δομή και κατάσταση ασυνεχειών) λαμβάνοντας υπόψη την αντοχή του άρρηκτου πετρώματος.
Συγκεκριμένως, προτείνονται:

1. για την εκσκαφή βραχομάζας με αντοχή άρρηκτου πετρώματος σε σημειακή φόρτιση (Is_{50}) μικρότερη από 3 MPa, το διάγραμμα του Σχήματος 1, και

2. για την εκσκαφή βραχομάζας με αντοχή άρρηκτου πετρώματος σε σημειακή φόρτιση (Is_{50}) μεγαλύτερη από 3 MPa, το διάγραμμα του Σχήματος 2.



Σχήμα 2. Εκτίμηση της εκσκαψιμότητας της βραχομάζας με αντοχή άρρηκτου πετρώματος σε σημειακή φόρτιση (Is_{50}) μεγαλύτερη από 3 MPa

Με βάση τα αποτελέσματα της έρευνας, προκύπτει ότι απαιτείται χρήση εκρηκτικών μέσων, για τιμές GSI μεγαλύτερες από 60 και αντοχή μικρότερη από 3 MPa και τιμές GSI μεγαλύτερες από 65 για αντοχή μεγαλύτερη από 3 MPa. Συνε-

πώς, η χρήση εκρηκτικών απαιτείται για βραχόμαζες συμπαγείς, τεμαχισμένες και πολύ τεμαχισμένες με ασυνέχειες κλειστές.

Η εκσκαφή με μηχανικό άροτρο (ripping) είναι επιτυχής για βραχομάζες με τιμές GSI μεταξύ 20 και 45. Δεδομένου ότι η αντοχή του άρρηκτου πετρώματος επιδρά σημαντικά στην επιτυχή εφαρμογή του άροτρου, το εύρος GSI στο οποίο μπορεί να γίνει εκσκαφή είναι μεταξύ 20 και 45 για βραχομάζες με αντοχή σε σημειακή φόρτιση (Is_{50}) μεγαλύτερη από 3 MPa και μεταξύ 25 και 55 για αυτές με αντοχή σε σημειακή φόρτιση (Is_{50}) μικρότερη από 3 MPa.

Στη μεταβατική ζώνη, μεταξύ εκσκαφής με εκρηκτικά και εκσκαφής με μηχανικό άροτρο, απαιτείται η χρήση υδραυλικής σφύρας. Η εκσκαφή με απλά μηχανικά μέσα (τσάπα) γίνεται γενικά για τιμές GSI μικρότερες από 25.

Το σύστημα ταξινόμησης της εκσκαψιμότητας που προτείνεται εφαρμόζεται σε βραχομάζες των οποίων η εκσκαφή γενικά ελέγχεται από τις ασυνέχειες. Σε ετερογενείς βραχομάζες (όπως φλύσχης) και σε χαοτικές βραχομάζες (bimrocks) δεν είναι εφικτή η εφαρμογή της συγκεκριμένης ταξινόμησης.

(Η πρόσβαση στο πλήρες κείμενο του άρθρου είναι δυνατή στην ιστοσελίδα του εκδοτικού οίκου Springer : www.springerlink.com/index/82g8w81865034n62.pdf)

ΔΥΝΑΤΟΙ ΤΕΧΝΙΚΟΙ ΧΑΡΑΚΤΗΡΕΣ ΓΙΑ ΤΟΥΣ ΔΙΑΦΟΡΟΥΣ ΤΥΠΟΥΣ ΠΕΤΡΩΜΑΤΩΝ

Hoek E. & Marinos P. G.

Ο Πίνακας που ακολουθεί παρουσιάστηκε στο Eurock2009, στο Dubrovnik και δημοσιεύτηκε στην εργασία: Hoek E. & Marinos P. G. (2009) "Tunnelling in overstressed rock". Proceedings of Eurock2009: "Rock Engineering in Difficult Ground Conditions – Soft Rocks and Karst", ed: Vrkljan, publ. Taylor & Francis Group, 49-60.

Οι συνδυασμοί των χαρακτήρων που περιλαμβάνονται στον πίνακα είναι αυτοί που συναντιούνται πιο συχνά στα κατά περίπτωση πετρώματα και τις βραχόμαζές τους ανάλογα με τη πετρογραφική σύσταση και τη τεκτονική τους ιστορία.

Ο Πίνακας αυτός είναι καθοδηγητικός και μόνο και σε καμία περίπτωση δεν πρέπει να θεωρηθεί ότι υποκαθιστά τις επί τόπου παρατηρήσεις και την ανάγκη συλλογής πληροφοριών από ένα γεωρευνητικό πρόγραμμα.

Table – Possible features for different rock types (Hoek & Marinos, 2009)

Rock Type	Class	Group	Texture			
			Coarse	Medium	Fine	Very fine
SEDIMENTARY	Clastic		Conglomerates Breccias 1B-D, 2A, 3B-C, 4A, 5B, 6B, 7A, 8B, 9BC, 10B, 11A, 12A-B, 13A, 14C	Sandstones 1A-B, 2A, 3B-C, 4A, 5A, 6A, 7A, 8A, 9B, 10B, 11A, 12B, 13A, 14D	Siltstones 1C-D, 2A, 3B, 4A-B, 5A, 6A, 7A, 8C, 9D, 10D, 11D, 12C, 13A, 14D	Claystones - Marls 1D, 2B, 3B-C, 4B-C, 5A, 6A, 7A, 8D, 9D, 10D, 11D, 12B, 13A, 14D
						Shales 1D, 2B, 3B-C, 4B-C, 5A, 6A, 7C-D, 8D, 9D, 10D, 11D, 12D, 13D, 14A
	Non- Clastic	Carbonates	Limestones – Dolomites 1B-C, 2A, 3A, 4A, 5A, 6D, 7A, 8B, 9A, 10B, 11A, 12A, 13A, 14C			
		Evaporites	Gypsum 1C, 2A, 3B, 4B, 5D, 6D, 7A, 8C, 9?, 10C, 11A, 12A, 13A, 14C		Anhydrite 1C, 2A, 3D, 4D, 5B, 6B, 7A, 8C, 9?, 10C, 11D, 12A, 13A, 14A	
METAMORPHIC	Non Foliated		Marble 1B, 2A, 3A, 4A, 5A, 6D, 7B, 8B, 9A, 10B, 11A, 12B, 13A, 14C	Hornfels (or cherts in sedimentary rocks) 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8B, 9A, 10B, 11A, 12C, 13A, 14D		Quartzite 1A, 2A, 3B, 4A, 5A, 6A, 7B, 8A, 9B, 10B, 11A, 12B, 13C, 14D
	Slightly Foliated		Amphibolites – Gneiss 1A, 2B, 3C-D, 4A, 5A, 6A, 7C 8A, 9C-D, 10C, 11A, 12A, 13A, 14A			
	Foliated		Micaschists 1A, 2B, 3B-C, 4A, 5A, 6A, 7C, 8B, 9C-D, 10C, 11A, 12B, 13C, 14C		Phyllites 1C, 2B-C, 3C-D, 4B, 5A, 6A, 7D, 8D, 9C-D, 10D, 11C, 12C, 13D, 14D	
IGNEOUS	Plutonic	Light	Granite - Diorite – Granodiorite 1A, 2C, 3D, 4A, 5A, 6A, 7A, 8A, 9C, 10B-C, 11A, 12A, 13A, 14A			
		Dark	Gabbro - Norite 1A, 2C, 3C, 4A, 5A, 6A, 7A, 8A, 9C, 10C, 11A, 12A, 13A, 14A			
	Hypabyssal		Peridotite 1A, 2C-D, 3D, 4A, 5A, 6A, 7A, 8B, 9C-D, 10C, 11A, 12A, 13A, 14A		Serpetinites 1B-C, 2B-C, 3D, 4B, 5A, 6A, 7B, 8C-D, 9D, 10D, 11A-C, 12A, 13B, 14A	
	Volcanic	Lava	Rhyolite – Dacite – Andesite 1A, 2C, 3B-C, 4A, 5A, 6B, 7A, 8A, 9C, 10C, 11A, 12A, 13A, 14A		Basalt 1A, 2A-B, 3A-B, 4A, 5A, 6A, 7A, 8B, 9B-C, 10B, 11A, 12A, 13A, 14A	
		Pyroclastic	Agglomerate – Volcanic Breccia 1B-C, 2C, 3C, 4B-D, 5A, 6B, 7A, 8A, 9C, 10B, 11A, 12A, 13A, 14C		Tuff 1C-D, 2D, 3D, 4B-C, 5A, 6B, 7A, 8B, 9C, 10C, 11A, 12A, 13A, 14D	

For definitions of 1,2,…, A, B,…, refer to the following table.

Note: The combinations included in the table are those found most frequently in rock and rock masses in situ depending from their petrographic nature and tectonic history. Other combinations may occur in some cases except if not applicable (N/A) is noted. This table is for guidance only and it should not be used as a substitute for site observations and data acquisition from a site investigation program.

Key to Table: "Definition of rock type features"

Property		A	B	C	D	
UCS of sound intact material	**1**	Very high > 100 MPa	High 50 -100 MPa	Medium 15 -50 MPa	Low < 15 MPa	**Intact Rock**
Alteration potential	**2**	None	slight	moderate	high	
Weathering potential	**3**	None	slight	moderate	high	
Swelling potential	**4**	N/A	slight	moderate	high	
Solution potential	**5**	N/A	slight	moderate	high	
Voids – potential for formation	**6**	N/A	possible		Yes	
Anisotropy of intact rock	**7**	None	slight	moderate	high	
Joint surface characteristics (excluding schistosity)	**8**	very rough	waviness	planar with slight waviness	very planar	**Joints**
Joint infilling from crushed rock – excluding excavation damage	**9**	None	Sandy	Clay with sandy particles	Clay	
Slickensided joints – potential in sheared rock	**10**	None	minimal	moderate	heavy	
Permeability or rock mass	**11**	Depending on jointing or karstification	-	Low	Very Low	**Rock mass**
Persistent thin bedding planes	**12**	None	possible	frequent	In most cases	
Persistent schistosity	**13**	N/A	slight	moderate	high	
Heterogeneity - Possibility of alternating weak and strong rock layers on the scale of the engineering structure	**14**	No	-	Rare	Yes	

ΤΙΜΗΤΙΚΕΣ ΔΙΑΚΡΙΣΕΙΣ ΕΛΛΗΝΩΝ ΓΕΩΤΕΧΝΙΚΩΝ

Βραβεία της Ακαδημίας Αθηνών

Κατά την εφετεινή απονομή των βραβείων της Ακαδημίας Αθηνών βραβεύτηκαν οι παρακάτω επιστήμονες, οι οποίοι ασχολούνται με θέματα γεωτεχνικής μηχανικής:

Τάξη των Θετικών Επιστημών

Βραβείο Ακαδημαϊκού Π. Σ. Θεοχάρη, με χρηματικό έπαθλο 5.000 ευρώ, για τη βράβευση της καλύτερης επιστημονικής εργασίας στον τομέα της Μηχανικής, στους κ.κ. **Χαράλαμπο Σαρόγλου** και **Γιώργο Τσιαμπάο** για την εργασία τους «A modified Hoek-Brown Failure criterion for anisotropic intact rock». Η εργασία των δύο μελών της ΕΕΕΕΓΜ δημοσιεύτηκε στο International Journal of Rock Mechanics and Mining Sciences, Volume 45, Issue 2, February 2008, Pages 223-234. Παραθέτουμε, στην συνέχεια, σύντομη περίληψή της.

Δύο (2) Βραβεία Δημητρίου Λαμπαδαρίου, με χρηματικό έπαθλο 3.000 ευρώ το καθένα, για τους ικανότερους στο μάθημα της Γεωδαισίας, αποφοίτους Πολυτεχνικών Σχολών της ημεδαπής, ακαδημαϊκού έτους 2007-2008, στους κ.κ. **Παύλο Αστερίου** και Λάμπρο Κούτα, πτυχιούχους του Τμήματος Πολιτικών Μηχανικών του Πανεπιστημίου Πατρών. Ο συνάδελφος Παύλος Αστερίου εργάζεται στην εταιρεία ΠΑΝΓΑΙΑ ως γεωτεχνικός μηχανικός, ενώ παράλληλα παρακολουθεί το πρόγραμμα μεταπτυχιακών σπουδών του ΕΜΠ «Σχεδιασμός και Κατασκευή Υπογείων Έργων».

Βραβείο Δημητρίου Λαμπαδαρίου, με χρηματικό έπαθλο 5.000 ευρώ, για ερευνητική εργασία στον κλάδο της Γεωδαισίας, στους κ.κ. **Ευστάθιο Στείρο**, Πάνο Ψιμούλη και Δημήτριο Καράμπαλη για την εργασία τους «Potential of Global Positioning System (GPS) to measure frequencies of oscillations of engineering structures». Η εργασία δημοσιεύτηκε στο Journal of Sound and Vibration, Volume 318, Issue 3, 9 December 2008, Pages 606-623. Παραθέτουμε, στην συνέχεια, σύντομη περίληψή της. Ο συνάδελφος Στάθης Στείρος είναι αναπληρωτής καθηγητής Γεωδαισίας και Γεωδαιτικών Εφαρμογών στο τμήμα Πολιτικών Μηχανικών της Πολυτεχνικής Σχολής του Πανεπιστημίου Πατρών και ασχολείται εντατικά με τις μετρήσεις μετακινήσεων - παραμορφώσεων γεωτεχνικών έργων (σηράγγων, φραγμάτων, τοίχων αντιστήριξης κ.λπ.).

A modified Hoek–Brown failure criterion for anisotropic intact rock

H. Saroglou and G. Tsiambaos

Geotechnical Department, School of Civil Engineering, National Technical University of Athens, 9 Iroon Polytechniou street, 157 80 Athens, Greece

The Hoek–Brown criterion parameters (σ_{ci}, m_i and s) are significantly influenced by the strength anisotropy of intact rock. In the present study, the criterion was modified by incorporating a new parameter (k_β) to account for the effect of strength anisotropy, thus being able to determine the strength of intact anisotropic rock under loading in different orientations of the plane of anisotropy. The range of the parameter (k_β) for the rocks tested has been analytically investigated by carrying out triaxial tests, in different orientations of the foliation plane. The proposed modification was studied for metamorphic rocks (gneiss, schist, marble), but could also be applied to other rock types exhibiting "inherent" anisotropy, e.g. sedimentary as well as igneous rocks. The proposed modified criterion is intended for use for prediction of strength of intact rock, but can also be extended to rock masses.

Potential of Global Positioning System (GPS) to measure frequencies of oscillations of engineering structures

Panos Psimoulis, Stella Pytharouli, Dimitris Karambalis and Stathis Stiros

Global Positioning System (GPS) has been successfully used to measure displacements of oscillating flexible civil engineering structures such as long suspension bridges and high-rise buildings, and to derive their modal frequencies, usually up to 1 Hz, but there is evidence that these limits can be exceeded using high frequency GPS receivers. Based on systematic experiments in computer controlled oscillations with one- and three-degrees of freedom we investigated the potential of GPS, first to record higher oscillation frequencies, at least up to 4 Hz at the minimum resolution level of this instrument for kinematic applications ($\geqslant$5 mm), and second, to identify more than one dominant frequency. Data were processed using least squares-based spectral analysis and wavelet techniques which permit to analyze entire time series, even those of too short duration or those characterized by gaps, in both the frequency and the time domain.

The ability of GPS to accurately measure frequencies of oscillations of relatively rigid (modal frequencies 1–4 Hz) civil engineering structures is demonstrated in the cases of two bridges.

The outcome of this study is that GPS is suitable for the identification of dynamic characteristics of even relatively rigid (modal frequencies up to 4 Hz) civil engineering structures excited by various loads (wind, traffic, earthquakes, etc.) if displacements are above the uncertainty level of the method ($\geqslant$5 mm). Structural health monitoring of a wide range of structures appears therefore a promising field of application of GPS.

ΑΝΑΣΚΟΠΗΣΗ ΓΕΓΟΝΟΤΩΝ ΓΕΩΤΕΧΝΙΚΟΥ ΕΝΔΙΑΦΕΡΟΝΤΟΣ

The ISRM Regional Symposium EUROCK 2009 Rock Engineering in Difficult Ground Conditions - Soft Rocks and Karst was organised by the Croatian Geotechnical Society in Dubrovnik-Cavtat, Croatia, 29 - 31 October 2009 (www.eurock2009.hr). It was a continuation of the successful series of regional ISRM European symposia, which began in 1992 in Chester, UK, and will be continued next year with the 14th symposium to be held in Lausanne, Switzerland. EUROCK 2009 was chaired by Ivan Vrkljan.

This EUROCK 2009 focused on recent developments in rock mechanics and rock engineering in difficult ground conditions, with an emphasis on soft rocks and karst conditions. Seven sections were organized and eight excellent keynote presentations were given during the Symposium.
234 participants from all over the world attended the symposium. 70 papers were selected for oral presentation and 54 for the poster session. One volume of the proceedings and a CD, edited by Ivan Vrkljan, containing 7 keynote papers and 129 ordinary papers, were published by CRC Press / Balkema.

During the symposium European Council meting has been held. 13 companies participated in an active technical exhibition. The social programme included two excursion for accompanying persons and one day excursion for all participants on Pelješac peninsula.

Από ελληνικής πλευράς στο συνέδριο συμμετέσχε το μέλος της ΕΕΕΕΓΜ καθηγητής ΕΜΠ Παύλος Μαρίνος, ο οποίος παρουσίασε και εργασία του (σε συνεργασία με τον E. Hoek).

ΕΛΛΗΝΙΚΗ ΕΠΙΣΤΗΜΟΝΙΚΗ ΕΤΑΙΡΕΙΑ ΕΔΑΦΟΜΗΧΑΝΙΚΗΣ & ΓΕΩΤΕΧΝΙΚΗΣ ΜΗΧΑΝΙΚΗΣ

Διάλεξη Nicholas Sitar

Την Δευτέρα, 14 Δεκεμβρίου 2009, πραγματοποιήθηκε στην Αίθουσα Εκδηλώσεων της Σχολής Πολιτικών Μηχανικών ΕΜΠ στην Πολυτεχνειούπολη Ζωγράφου η πρώτη εκδήλωση του εφετεινού κύκλου των δραστηριοτήτων της ΕΕΕΕΓΜ με την διάλεξη του Prof. Nicholas Sitar «On Seismic Design of Retaining Structures».

Περίληψη Διάλεξης

Starting with the Loma Prieta Earthquake in 1989 there has been an increased awareness of the potential magnitude of strong ground motions produced by major tectonically active faults. An important consequence has been the gradual tightening of code requirements for the design of retaining structures suggesting that these structures should be designed to much higher levels of seismic loading than assumed in the past. However, at the same time, field observations of these structures generally show excellent behavior inconsistent with the analytical predictions. The objective of this presentation is to introduce field observations coupled with experimental, geotechnical centrifuge model data showing that the failure mechanisms typically assumed in many of the current design methods do not match the actual behavior. More importantly, the experimental data suggest that the predicted design forces typically overestimate the actual demands on the structures, leading to very conservative designs. Thus, there is a need for a rational, observation based re-evaluation of the basic assumptions made in the current designs and for the development of a new generation of design procedures based on the best understanding of the actual failure mechanisms.
Βιογραφικά Στοιχεία

Prof. Sitar received his undergraduate degree in Geological Engineering from the University of Windsor in Windsor, Ontario in 1973, and his Ph.D. in Geotechnical Engineering from Stanford University in 1979. After receiving his Ph.D., he spent two years teaching in the Geological Engineering Program at the University of British Columbia in Vancouver, B.C. He joined the faculty in GeoEngineering at the University of California at Berkeley as an Assistant Professor in 1981 and was promoted to Professor in 1990. He served as the Director of the University of California Earthquake Engineering Research Center from 2002 to 2008.

His interest in geotechnical earthquake engineering and seismic slope stability goes back to the 1976 Guatemala Earthquake. Since then he has participated in a number of studies, including the post-earthquake reconnaissance of the Loma Prieta, Northridge, and Kobe, Chi Chi, Denali and Wenchuan earthquakes.

He is has authored and co-authored over 160 publications in geotechnical engineering, engineering geology, groundwater and groundwater remediation. He has received a number of awards for his work, including the Huber Research Prize from the American Society of Civil Engineers, the Douglas R. Piteau Award from the Association of Engineering Geologists, and the Presidential Young Investigator Award from the National Science Foundation.

A FIELD TRIP FOR CIVIL ENGINEERING STUDENTS TO DEMONSTRATE THE IMPORTANCE OF ENGINEERING GEOLOGY

Every, and each year since 1992, a major field trip is conducted in the Alps by Professor Paul G. Marinos of the National Technical University of Athens. The field trip is presented to the students of the School of Civil Engineering with the scope to improve awareness and demonstrate the importance of Engineering Geology.

This field trip constitute an important addition to the course of engineering geology, offering to the students the real scale of geological features and events together with the real scale of engineering structures.

As failures are always excellent in terms of lessons learned, the main characteristic of the trip is the visit of important and dramatic failures, well known world wide. The cause of most of them was particular geological conditions or "geological details" that were not recognized or neglected or their role in stability underestimated.

Dams are among the civil engineering structures with the greater interaction with the ground and environment. Particular attention is given to the Malpasset arch dam failure in 1959 in South France and the Vajont world's most disastrous failure at an engineered dam in northern Italy in 1963. The students are organized in working groups and spend in these 2 sites a full day.

230 students participate under the guidance of Prof. Paul Marinos and Assoc. Prof. George Tsiambaos and the valuable assistance of Sofoklis Maronikolakis and Dr. Vassilis Marinos. The students when back home they prepare a report and give group presentations.

Some logistics:

230 students, 12 days with one day break in Geneva, 4 coaches, 1 emergency coach, a doctor, special insurance, nice hotels and a cost of €780 per student greatly covered by University funds (2009 price, including almost all expenses). Every year professors from other universities or visitors from the design industry are invited to join.

The field trip includes (with selected references):

- The site of Malpasset Dam failure in south France *(Londe P., 1987, Malpasset Dam failure, Engineering Geology, 24, 295-329)*

- The site of the landslide in the Vajont reservoir *(Mueller L., 1987, The Vajont catastrophe – a personal review, Engineering Geology, 24, 423-444, Semenza E. & Ghirotti M., 2000, History of the 1963 Vaiont slide: the importance of geological factors, Bull Eng Geol Env., 59, 87-97 and Veveakis E., Vardoulakis I. & Toro G., 2007, Thermoporomechanics of creeping landslides: the 1963 Vaiont slide, northern Italy, J. of geophysical research, 112)*

- The Ancona landslide in Italy *(Cotecchia V., 2006, The Second Hans Cloos Lecture. Experience drawn from the great Ancona landslide of 1982, Bull Eng Geol Env, 1-41)*

- Pisa tower *(Burland J.B., Jamiolkowski, M.B. & Viggiani C., 2003, The stabilisation of the Leaning Tower of Pisa, Soils and Foundations, 43/5, 63-80)*

- Subsidence in Venice *(Ground engineering, January 2006)*

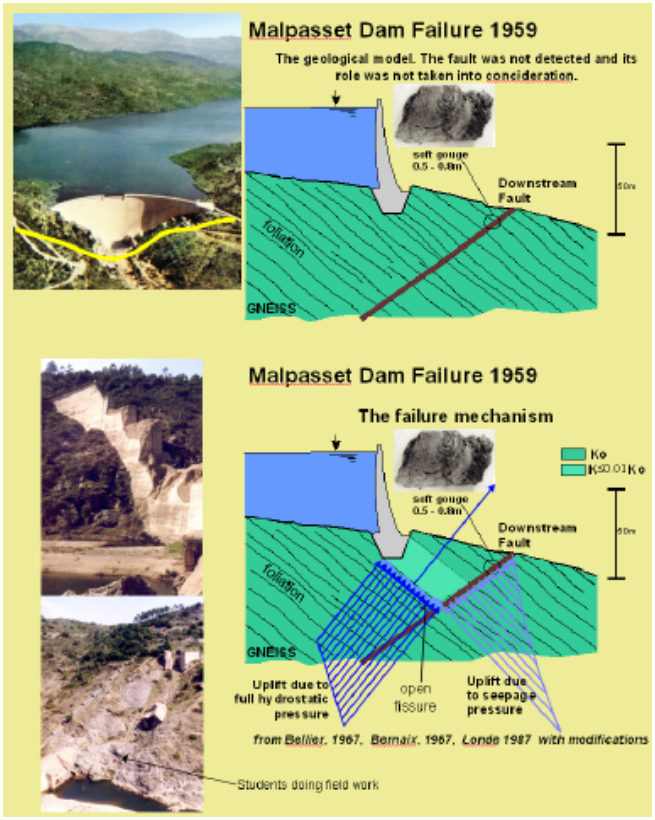
- The "La Clapière" landslide in the "Alpes maritines", South France *(Follacci J., 1987, Les mouvements du versant de la Clapière à Saint-Etienne-de-Tinée (Alpes-Maritimes), Bull Liaison Labo P. et Ch., 150/151 and Étude et surveillance du Glissement de la Clapière à St Etienne de Tinée (06), Laboratoire de Nice du CETE Méditerranée (1975-2005))*

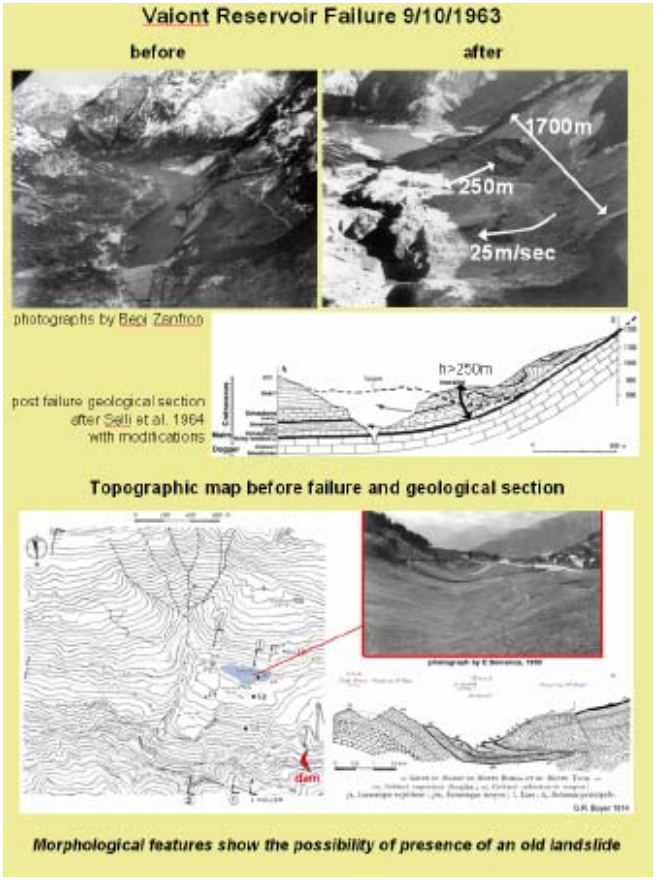
- Leakages for "Le Sautet" dam on the Drac in France *(Gignoux & Barbier, 1955, Géologie des barrages, Masson et Cie)*

- Discussion on tunnels (260km run in tunnels during the whole trip)

The Malpasset dam in 1956

Malpasset dam failure: The students inside the dihedron removed by the uplift pressure



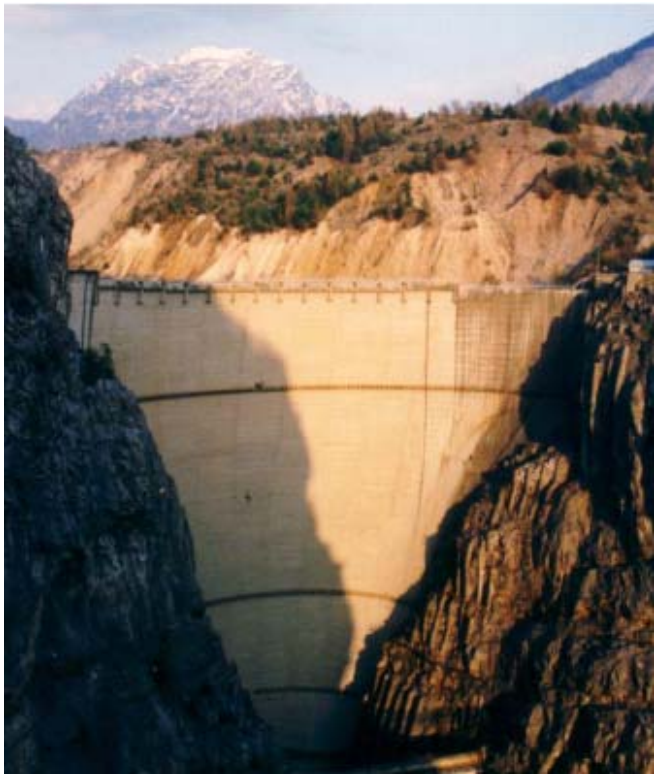


Malpasset failure: students inside the location of the uplifted wedge

Malpasset failure: the upstream crack in the right abutment

Malpasset failure: looking at the structural organization of the rock

Fault zone in sound gneiss



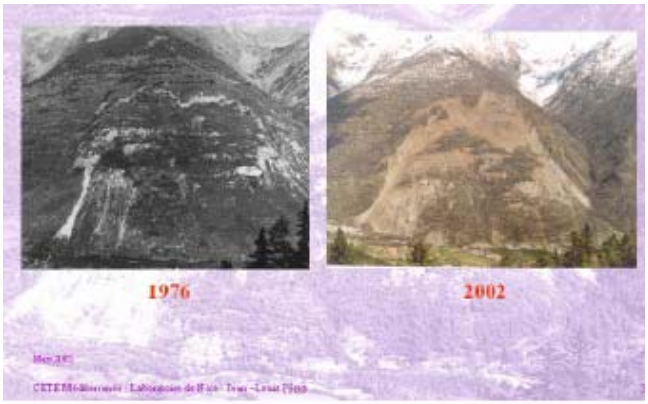
The 276m high tragic Vajont dam and the mass that slid behind it

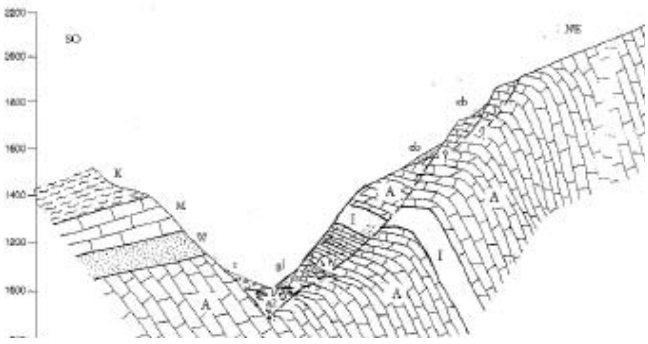
The limestone of the right abutment of the Vajont dam: excellent rock mass with high strength as also seen from the geometrical features of the slope

Discussion inside the displaced slide mass which filled the Vajont reservoir

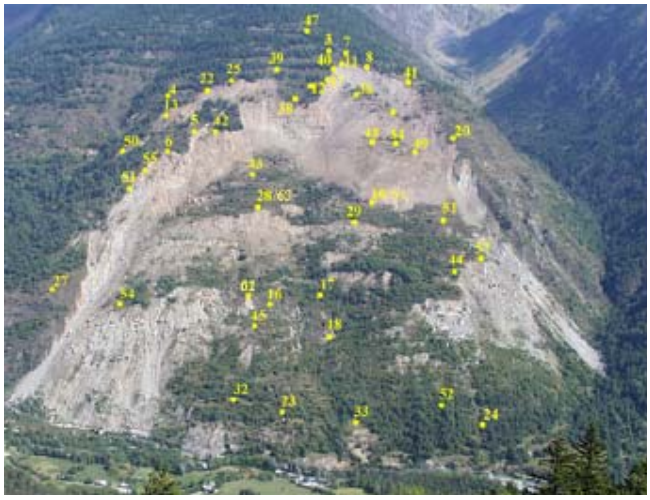
Vajont slide: The group of students gathered on the displaced slide mass. The background shows the bare side of the mountain from which the slide mass parted with a velocity of 25m/sec and within minutes nearly 1925 lives had been killed in the nearby town of Longarone. The extent of the slide was 1700mX1000m, the maximum thickness of the slide mass to about 350m, the volume of the slide 275million m3. The horizontal displacement about 240m. There was only 13m of free board in the reservoir. Professor Allen Hatheway, visitor to the trip, is at the bottom right of the picture. Picture of the 2004 field trip.

NTUA students pushing the Pisa Tower the wrong way. Today the tower has been "rectified" by a series of carefully conducted actions leading to sophisticate soil extraction. The tower stands now at the status it had a couple of centuries ago.





"La Clapiere" landslide



"La Clapiere" landslide

"La Clapiere" landslide

Paul Marinos discussing subsidence, with his students in Piazza St. Marco, Venice

The academic staff of the organization of the field trip: Professor Paul Marinos with the Associate Professor George Tsiambaos and Sofokles Maronikolakis, Civil Engineer and Dr. Vassilis Marinos, Engineering Geologist.

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

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

Hokudan 2010
International Symposium on Active Faulting
January 17th through 21st, 2010
at Hokudan Earthquake Memorial Park
in Awaji City, Awaji Island, Japan
http://home.hiroshima-u.ac.jp/kojiok/hokudan2010.html

Hokudan International Symposium on Active Faulting will be held again in January 17th to 21st 2010, on the occasion of the 15th anniversary of the 1995 Kobe Earthquake, or the Great Hanshin-Awaji Earthquake Disaster. Hokudan is the name of a town where the source fault of the 1995 earthquake ruptured the ground surface of Awaji Island, and the rupture is preserved in an earthquake memorial museum.

The theme of the 2010 symposium is "Forecasting large earthquakes from active faults –in time and space--". The aim is to understand recurrent behavior of large earthquakes and their effects on human communities.

As to the time, renewal process of large earthquake occurrence, estimation of recurrence interval and elapsed time, time-dependent forecast, shall be the crucial topics to explore and discuss in the symposium. As to the space, to define the extent of source fault in the past and in the future is an important task for active fault research. This issue includes investigations on segmentation, earthquake triggering and fault interaction, dynamic rupture process, as well as off-fault studies on source faults and isoseismal using archaeoseismology and tsunami analyses.

The strong ground motion and hazards induced by recent large earthquakes are also to be examined to understand the effects of active faulting in time and space. Earthquake hazard assessments and other applications of active fault research will be discussed both in empirical and theoretical perspectives.

Multidiscplinary approach from seismology, geophysics, geology, geodesy, geomorphology, earthquake engineering, history, archaeology and so on are the key for the symposium. The organizers expect participants from wider communities dealing with large earthquakes and hazards. Though the 2010 symposium will not be as big as 2000 and 2005, we are going to organize sessions more focused on the hottest issues on active faulting and earthquakes.

The scientific program tentatively includes following topical oral sessions, and topical and general contributions by poster presentations.

- Modelling of large earthquakes from paleoseismology
- Forecast of large earthquakes and strong motion: theory, observation and application
- Submarine active faults and tsunamis
- Surface effects and mass movements induced by active faulting
- New technologies for mapping and imaging of active faults

The organizers wish to push forward the horizon of active fault research with all of you.

Secretaries:
Koji Okumura (Hiroshima University)
Shinji Toda (Active Fault Research Center, Geological Survey of Japan, AIST)

Contact Address:
Koji Okumura
kojiok@hiroshima-u.ac.jp
Graduate School of Letters, Hiroshima University
Higashi-Hiroshima, 739-8522 Hiroshima, JAPAN
Phone: +81-82-424-6657, -6656
Fax: +81-82-424-0320

First International Conference on
Frontiers in Shallow Subsurface Technology
20 – 22 January 2010, Delft, The Netherlands
geo.citg.tudelft.nl/shallowsubsurface

The first International Conference on Frontiers in Shallow Subsurface Technology (1st FSST) will be hosted by the Delft University of Technology, the Dutch Ministry of Housing, Spatial Planning and the Environment, and Deltares from January 20 to 22, 2010. The FSST, seeks to stimulate the exchange of ideas among a community of scientists and professionals with a common interest in understanding the impacts of subsurface utilization. The FSST will be held at the Aula Conference Centre of Delft University of Technology

Topics

- Characterization, imaging, and monitoring techniques
- Subsurface engineering
- Subsurface heterogeneities
- (Bio)geochemical and physical processes
- Ecosystem functions
- Subsurface management and organization planning
- Geo-energy
- Risk management and safety

Contact information

Secretary Section Geo-Engineering (TU Delft)

Visting address:
Stevinweg 1
2628 CN Delft
The Netherlands

Mail address:
P.O. BOX 5048
2600 GA Delft
The Netherlands

T +31 (0)15 278 1880
F +31 (0)15 278 3328
E-mail: info@shallowsubsurface.org

GeoFlorida - Advances in Analysis, Modeling & Design, February 20-24, 2010, Wesi Palm Beach, Florida, USA content.asce.org/conferences/geoflorida2010/index.html

GeoX 2010
3rd International Workshop on X-Ray CT for Geomaterials
March 1-3, 2010, New Orleans, Louisiana, USA

GeoX2010 will serve as an exchange forum to discuss the latest advances and developments in the applications of x-ray computed tomography. Participants will be international researchers from academia, US Federal Laboratories, industry, government, private industry, program managers from agencies such as NSF, DOE, ONR.

This workshop is organized and sponsored by Louisiana State University (LSU) and the US Naval Research Laboratory (NRL)

Workshop Objectives:

- To bring forth research on geomaterials that utilizes the imaging capabilities of computed tomography.
- To facilitate presentations of leading edge research in a wide array of geologic disciplines.
- To further understanding on the applications and uses of computed tomography within the geosciences.

Workshop focal points:

- Progress of deformation and strain localization in soils, rocks, and sediments.
- Fracture and damage assessment in rocks, asphalt, and concrete.
- Conductivity and transport in porous media.
- Applications of CT to energy production.
- Neutron tomography.
- New experiments developments.
- Image-based modeling.
- Software and data analysis.
- Novel analytical techniques.

Workshop co-Chair : Dr.Khalid Alshibli
Email: alshibli@lsu.edu Email:allen.reed@nrlssc.navy.mil

Mailing Address:
Professor Khalid Alshibli
Dept. of Civil & Env. Engineering
3505 Patrick F. Taylor Hall
Louisiana State University
Baton Rouge, LA 70803
USA

CAVING 2010 Second International Symposium on Block and Sublevel Caving, 20 – 22 April 2010, Perth, Australia, www.caving2010.com

CPT'10 2nd International Symposium on Cone Penetration Testing, May 9 - 11, 2010, Huntington Beach, California, USA.

The Seventeenth South Asian Geotechnical Conference, Taipei, Taiwan, May 10 – 13, 2010, www.17seagc.tw

ITA – AITES 1010 World Tunnel Congress and 36th General Assembly "TUNNEL VISION TOWARDS 2020", Vancouver, Canada, May 14 - 20, 2010, www.wtc2010.org

12ο Διεθνές Συνέδριο της Ελληνικής Γεωλογικής Εταιρείας, Πάτρα, 19 - 22 Μαΐου 2010, www.synedra.gr

78th ICOLD Annual Meeting & International Symposium "DAMS AND SUSTAINABLE WATER RESOURCES DEVELOPMENT", 23 – 26 May 2010, Hanoi, Vietnam, www.vncold.vn/icold2010

IX International Conference on Geosynthetics, Guarujá, Brazil, 23 – 27 May 2010 - www.igsbrasil.org.br/icg2010

Fifth International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics and Symposium in Honor of Professor I. M. Idriss, May 24 – 29, 2010, San Diego, California, USA, 5geoeqconf2010.mst.edu

11th International Conference "Geotechnical Challenges in Urban Regeneration", 26th – 28th May 2010, ExCel London, www.geotechnicalconference.com/page.cfm/Link=20

Tenerife 2010 Cities on Volcanos, 3rd International Workshop on Rock Mechanics and Geo-engineering in Volcanic Environments, Canary Islands, 31st of May and 1st of June 2010, www.citiesonvolcanoes6.com

BRATISLAVA 2010 14th Danube-European Conference on Geotechnical Engineering, Bratislava, Slovakia, 2nd – 4th June 2010, www.decge2010.sk

NUMGE 2010 7th European Conference on Numerical Methods in Geotechnical Engineering June 2 - 4, 2010, Trondheim, Norway, www.ivt.ntnu.no/numge2010

2010 MOSCOW - International Geotechnical Conference GEOTECHNICAL CHALLENGES IN MEGACITIES, 7 – 10 June 2010, Moscow, Russia www.GeoMos2010.ru

2nd ISRM technical and cultural field trip to Switzerland (13 – 14 June 2010)

Dr Allen Reed

This 2nd ISRM Annual Field Trip takes place in June 2010 on the two days immediately before the EUROCK2010 Symposium: Sunday 13 June and Monday 14 June 2010. The Field Trip starts and finishes in Lausanne, Switzerland.

The field trip leader will be Christophe Bonnard of the EPFL, where he is the leader of the group Natural Hazard Assessment of the Soil Mechanics Laboratory and Member of the Board of Directors of the Soil and the Rock Mechanics Laboratories. He is a Lecturer of the Doctoral Program Environment at the EPFL and at the Faculty of Sciences of the University of Geneva (post-graduate course on Study and Management of Geological Risks).

The 1st day includes visits to a motorway anchored wall, landslide sites, molasse outcrops and cliffs, as well as visits to the Fribourg and Gruyères towns and castles. Dinner and overnight will be in Gruyères. On the 2nd day participants will visit a cheese cave, rock outcrops, an arch dam and a rock fall zone, a quarry and the Chillon castle.

To register contact Sofia Meess at secretariat.isrm@lnec.pt. The Field Trip information will be periodically updated on the ISRM website: www.isrm.net

International Conference Underground Construction Prague 2010 Transport and City Tunnels, 14 – 16 June 2010, Prague, Czech Republic, www.ita-aites.cz

Rock Mechanics in Civil and Environmental Engineering, European Rock Mechanics Symposium (EUROCK 2010) ISRM Regional Symposium on Rock Mechanics, Lausane, Switzerland, 15 – 18 June 2010, lmr.epfl.ch

7th International Conference on Physical Modelling in Geotechnics, Zurich, Switzerland, 28 June - 1 July 2010, www.icpmg2010.ch

ER2010 Earth Retention Conference 3, August 1 – 4 2010, Bellevue, Washington, USA, content.asce.org/conferences/er2010

Isap Nagoya 2010 - The 11th International Conference on Asphalt Pavements, August 1 to 6, 2010, Nagoya, Japan, www.isap-nagoya2010.jp

ISRS V The 5th International Symposium on In-Situ Rock Stress, August 25-28, 2010 Beijing, China, www.rockstress2010.org

Pipelines Conference 2010, August 28 - September 1, 2010, Keystone Resort & Conference Center, Keystone, (Dillon) Colorado, content.asce.org/conferences/pipelines2010/call.html

14th European Conference on Earthquake Engineering, Ohrid, FYROM, August 30 – September 3 2010, www.14ecee.mk

Geologically Active 11th IAEG Congress, 5 – 10 September 2010, Auckland, New Zealand, www.iaeg2010.com

GBR-C 2k10 - 3rd International Symposium on Geosynthetic Clay Liners, 15 - 16 September 2010, Würzburg, Germany

1st International Conference on Information Technology in Geo-Engineering 16-17 September 2010, Tongji Univeristy, Shanghai geotec.tongji.edu.cn/ICITG2010

II International Congress on Dam Maintenance and Rehabilitation, 28th-30th September 2010, Zaragoza, Spain www.damrehabilitationcongress2010.com

International Symposium on Geomechanics and Geotechnics: From Micro to Macro 10 – 12 October 2010, Shanghai, China, geotec.tongji.edu.cn/is-shanghai2010

11th International Symposium on Concrete Roads, Seville (Spain) 13th - 15th October 2010, www.2010pavimentosdehormigon.org

ARMS – 6 ISRM International Symposium 2010 and 6th Asian Rock Mechanics Symposium "Advances in Rock Engineering", New Delhi, India, 23 – 27 October 2010, www.cbip.org

2nd International Conference on Geotechnical Engineering - ICGE 2010 Innovative Geotechnical Engineering, October 2010, Hammamet, Tunisia

ICSE-5 5th International Conference on Scour and Erosion, 7 – 10 November 2010, San Francisco, USA, www.icse-5.org

ISFOG 2010 2nd International Symposium on Frontiers in Offshore Geotechnics, 8 – 10 November 2010, Perth, Western Australia, w3.cofs.uwa.edu.au/ISFOG2010

6ICEG 2010 - Sixth International Congress on Environmental Geotechnics, November 8 - 12, 2010, New Delhi, India www.6iceg.org

Rivista Italiana di Geotecnica — Italian Geotechnical Journal

Italian Geotechnical Journal – Special Issue
Seismic geotechnical design and retrofitting
agiroma.rig@iol.it

In many countries new seismic design codes, which require the use of *Performance-Based Design* procedures, have been recently introduced. Consequently, nowadays the engineering practice invokes the application of the results of advanced studies and researches in the fields of seismology and applied geophysics, earthquake engineering and geotechnics.

The Italian Geotechnical Journal intends to devote a Special Issue, of title *Seismic geotechnical design and retrofitting*, to these new design approaches and procedures. This call is open to all those who can propose research or application oriented papers about the new design approaches and, more in general, on performance based design methods. By doing so, the Italian Geotechnical Journal intends to contribute to disseminate the knowledge about the new design requirements and to transfer the recent research finding into practice.

A short summary, in English or in Italian, together with the authors' names, should be submitted by January 31st, 2010. Final Papers, that can be written either in English or in Italian, should be submitted by June 30th 2010, in order to be published in the first issue of 2011.

5th International Conference on Earthquake Geotechnical Engineering, Santiago, Chile, 17 – 20 January 2011, www.5icege.cl

International Conference on Tunnelling and Trenchless Technology, 1-3 March 2011, Kuala Lumpur (Malaysia), www.iem.org.my/external/tunnel/index.htm

Geo-Frontiers 2011 - Advances in Geotechnical Engineering, 13-16 March, Dallas, Texas, USA, www.geofrontiers11.com

7th International Symposium on
"Geotechnical Aspects of Underground Construction in Soft Ground"
16-18 May 2011, Roma, Italy
www.tc28-roma.org

The seventh International Symposium on "Geotechnical Aspects of Underground Construction in Soft Ground" will be held on 16-18 May 2011, in Roma, Italy.

Technical Committee TC 28: "Underground Construction in Soft Ground" of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE), has a major commitment towards collecting information concerning tunnel design and construction in the urban environment, with regard to both bored and braced excavations. TC28 has already organised six International Symposia in New Delhi (1994), London (1996), Tokyo (1999), Toulouse (2002), Amsterdam (2005), and Shanghai (2008).

As the host organiser, the Italian Geotechnical Association (AGI) feel honoured to be offered the chance to hold this premier event and, together with TC 28, are delighted to welcome you as our guests to Roma, Italy.

Thanks to its unique position as the centre of the Roman Empire, its significance as a religious and cultural centre, its turbulent centuries of aristocratic and papal rivalries and upheaval, Roma has a splendid and full history, resulting in some of the finest art and architecture to survive from the last two thousand years. 2011 will also be the right time to view several ongoing and exciting projects related to underground constructions, such as the works of the new Line C of Roma Underground and of Lines 1 and 6 of nearby Napoli Underground.

Finally, Roma is a colourful and vibrant living city: we hope you shall enjoy the Italian food, the culture, the ambience and the surrounding scenery.

Theme / Subject

Technical Committee TC 28: "Underground Construction in Soft Ground" of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) has a major commitment towards collecting information concerning tunnel design and construction in the urban environment, with regard to both bored and braced excavations.

The themes for the Roma symposium, in line with the terms of reference of Technical Committee TC28, are:

- Tunnelling in Soft Ground
- Deep Excavations
- Monitoring
- Numerical Analysis
- Mitigating Measures

Conference Secretariat

WELL DONE GROUP - Eventi e Comunicazione
att.n Dr. Natalia Ramadori
via Bevagna, 46 - 00191 Roma, ITALY
ph. +39 0699701270
fax +39 0697840965
e-mail: tc28-roma@welldonegroup.it
www.welldonegroup.it

AGI - Associazione Geotecnica Italiana
att.n Dr. ing. Claudio Soccodato
viale dell'Università, 11 - 00185 Roma, ITALY
ph. +39 064465569 - 0644704349
fax +39 0644361035
e-mail: info@tc28-roma.org
www.associazionegeotecnica.it

WTC2011 Helsinki, AITES-ITA 2011 World Tunnel Congress and 37th General Assembly, 21-25 May 2011, Helsinki, Finland, www.ril.fi/web/index.php?id=641

XIV Asian Regional Conference Soil Mechanics and Geotechnical Engineering, Hong Kong, China, 23 - 28 May 2011

XV African Regional Conference on Soil Mechanics and Geotechnical Engineering Maputo, Mozambique, 13 - 16 June 2011.

IS – SEOUL 2011 Fifth International Symposium on Deformation Characteristics of Geomaterials, Wednesday-Friday, Aug. 31 – Sep. 3, 2011, Seoul, Korea, www.isseoul2011.org

6th International Symposium on Sprayed Concrete, 12-15 September 2011, Tromsø, Norway, www.sprayedconcrete.no

XV European Conference on Soil Mechanics and Geotechnical Engineering, 12 – 15 September 2011, Athens, Greece, www.athens2011ecsmge.org

24th WORLD ROAD CONGRESS, 25 – 30 September 2011, Mexico City, Mexico

XIV Panamerican Conference on Soil Mechanics and Geotechnical Engineering (October) & V PanAmerican Conference on Learning and Teaching of Geotechnical Engineering & 64th Canadian Geotechnical Conference, Toronto, Ontario, Canada, 2 - 6 October 2011

Beijing 2011, 12th International Congress on Rock Mechanics, 16 – 21 October 2011, Beijing, China, www.isrm2011.com

euroGEO5 5th European Geosynthetics Conference
16 – 19 September 2012, Valencia, Spain
www.eurogeo5.org

The International Geosynthetics Society (IGS) is a global association, nonprofit, which includes most of the businesses of geosynthetics and a number of personal members associated with these materials: Public Administrations, Teachers and Students of Universities and Polytechnics, Consultants, Manufacturers, Traders, Installers and Great Builders.

The primary objective of the IGS is outreach. All actions undertaken are directed to the construction industry and the environment have a greater knowledge of geosynthetic materials and their potential uses. In this sense, the IGS organizes different types of events on a global, continental or national level.

IGS is organized into national chapters. The Spanish Chapter of the IGS was founded in 2000 at the hands of Vicente Cuellar, former Director of the Geotechnical Laboratory of CEDEX and my predecessor as President of this Chapter.
Spanish Chapter currently consists of over 50 individual and corporate members of the majors sector companies, having organized and participated in several events during these years: Technical Conferences about Landfills and Reinforcement with CEDEX, about various uses of Geosynthetics together with autonomous government of Castilla-Leon, Andalusia, Canary Islands, Valencia, among others. The National Symposium Geosynthetics with ATC; participation in geotechnical, hydraulics and environment conferences.
We have also taught Basic Courses of Geosynthetics in Universities and Polytechnics, especially designed for students in the final classes and graduate.

Spanish chapter has been in charge of organizing the next European Geosynthetics Conference'EUROGEO'in 2012. In this sense it has decided to celebrate the month of September in Valencia.

Since Spain IGS we are pleased to invite to participate in this unique event in Europe which we are responsible. We need help from all those involved in prescribing, manufacturing, installation or use of Geosynthetics materials in Spain for Eurogeo 2012 will be a success. To do this we count on your cooperation. Join IGS Spain today and will receive significant benefits in the assistance and participation of the conference in Valencia.

I remain at your disposal for any further query.

Receive a cordial greeting on behalf of all members of the IGS Spain,

Ángel Leiro López
Spain IGS-President

ORGANIZATION: IGS – SPAIN, IGS Spanish Chapter
www.igs-espana.com

CONFERENCE CONTACT: info@eurogeo5.org
Nacho Redecilla 619 94 44 10
Ianire Mancisidor 660 72 78 50

GEOSYNTHETICS ASIA 2012 (GA2012)
5th Asian Regional Conference on Geosynthetics
Bangkok, Thailand, 10 -14 December 2012
www.set.ait.ac.th/acsig/igs-thailand

ΦΩΤΟΓΡΑΦΙΚΟ ΑΡΧΕΙΟ ΕΕΕΕΓΜ

Στα πλαίσια δημιουργίας φωτογραφικού αρχείου της ΕΕΕΕΓΜ ο τεύχος αυτό κάνουμε παρακαλούμε τα μέλη και τους φίλους, που έχουν στην κατοχή τους φωτογραφίες από εκδηλώσεις της εταιρείας να μας στείλουν αντίγραφά τους στην ηλεκτρονική διεύθυνση του περιοδικού editor@hssmge.gr.

Σήμερα δημοσιεύουμε την φωτογραφία που μας έστειλε ο Καθηγητής Νίκος Αμβράζης:

Almost 60 years ago…
Carl Terzaghi visiting the EMP soils Lab in the early-1950s, with Hatzopoulos on his left, Pipas and Loizos on his right.

ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

Country/Territory Rankings in Geosciences 1998-2008

Based on citations per paper among nations with 10,000 or more citations.

Rank	Country / Territory	Papers	Citations	Citations Per Paper
1	Switzerland	6,518	81,670	12.53
2	United States of America	86,465	1,067,003	12.34
3	England	23,932	281,576	11.77
4	Denmark	3,243	37,483	11.56
5	The Netherlands	6,375	73,319	11.5
6	Germany	23,868	265,043	11.1
7	Australia	12,841	141,588	11.03
8	France	22,020	232,306	10.55
9	Sweden	4,745	50,010	10.54
10	Israel	1,808	18,278	10.11
11	Finland	2,268	22,795	10.05
12	Wales	1,794	17,894	9.97
13	Belgium	2,667	25,854	9.69
14	Scotland	3,887	37,474	9.64
15	Norway	4,631	44,564	9.62
16	New Zealand	3,142	29,736	9.46
17	Canada	18,225	171,953	9.44
18	Austria	2,663	22,841	8.58
19	Italy	12,123	96,035	7.92
20	Greece	2,211	17,291	7.82

SOURCE: Thomson Reuters's Essential Science Indicators[SM] database from Thomson Reuters, January 1, 1998 through August 31, 2008.

(Γιώργος Τσιαμπάος, 31 Δεκεμβρίου 2009)

Drilling at German geothermal plant may have triggered quake

LANDAU IN DER PFALZ, Germany — Government officials here are reviewing the safety of a geothermal energy project that scientists say set off an earthquake of 2.7 magnitude in mid-August, shaking buildings and frightening many residents of this small city.

The geothermal plant, built by Geox, a German energy company, extracts heat by drilling deep into the earth. Advocates of the method say that it could greatly reduce the world's dependence on fossil fuels by providing a vast supply of renewable energy.

But in recent months, two similar projects have stirred concerns about their safety and their propensity to cause earthquakes. In the United States, the Energy Department is scrutinizing a project in Northern California run by AltaRock Energy to determine if it is safe. (The project was shut down by the company last month because of crippling technical problems.) Another project, in Basel, Switzerland, was shut down after it generated earthquakes in 2006 and 2007 and is awaiting the decision of a panel of experts about whether it can resume.

The Landau project will be allowed to continue operating while the review panel, which held its first meeting last Friday, deliberates. Geox officials initially denied any responsibility for the temblor and continue to dispute the government's data linking the project to the quake. The panel will, among other things, have to sort through the conflicting data presented by the company and government scientists.

But some experts in the field say they worry that projects like the one in Germany, if the managers deny responsibility for inducing earthquakes or play down the effects on people's lives, could damage the reputation of geothermal energy, even in highly environmentally conscious areas of the world like California or Western Europe.

"My concern is that the project leaders for different geothermal projects are about to waste public confidence as long as they don't talk openly about the seismic risks involved in their projects," said Rudolf Braun, who is the leader of the Basel study and is following events in Landau.

Like other earthquakes that have been attributed to geothermal plants, the Landau temblor was sudden and brief and was accompanied by a sound that in some cases has been likened to a sonic boom. There were no injuries and there was no known structural damage to buildings in the city. But the 2.7 magnitude quake has stoked fears and set off debate in the state Parliament, which subsidized the construction of the plant, about the method's safety.

The police logged as many as 200 calls after the quake, which struck shortly after 2 p.m. on Aug. 15. Stefanie Schuster was at the local supermarket when she heard a loud bang. She said she wavered unsteadily on her feet "like when you feel dizzy."

"My first thought was the geothermal plant," said Mrs. Schuster, 48, a clerk in the city government. "I thought, There's definitely a problem over there."

Citing an academic paper, officials of AltaRock, the company running the California project, claimed that the Landau plant caused no earthquakes — a claim that Geox says it never made. In fact, in May, the state geological survey for Rhineland-Palatinate, the state where Landau is located, concluded that four minor earthquakes, too small to be felt by residents, had been generated by the project.

Seismologists at the geological survey said that the larger Aug. 15 quake was also caused by the project. The epicenter was roughly 500 yards from a drill site at the plant and at about the same depth — 1.5 miles — as a steam bed that the plant was extracting heat from. "We are sure it's

from the geothermal plant," said Harald Ehses, chairman of the geological survey.

In interviews last week, Geox officials conceded that the plant had set off tiny earthquakes and said that they were not certain what set off the Aug. 15 temblor. But consultants for the company dispute the data cited by government scientists to back up their conclusion that the project caused the earthquake: their own data, they said, proves that the quake originated more than two miles from the site of the plant and six miles below the earth's surface. Those figures would essentially rule out a connection with the plant.

"At this point we can neither deny nor confirm" that the power plant had anything to do with the earthquake, said Peter Hauffe, managing director of Geox.

The Landau plant, which cost $30 million, went into operation in 2007 and produces electricity for 6,000 homes by drawing heat from beneath the bedrock, nearly two miles beneath the earth's surface. Geox said a coal-burning plant producing the same electricity would emit 30,000 tons of carbon dioxide annually.

Not everyone in town was troubled by the quake. "It's really not such a big deal," said Volker Weisenburger, 43. "Gas has its own set of risks."

But other residents said they were skeptical about the new technology. "The engineers always say that they have everything under control, until something happens that they never expected," said Sabine Hofmann, 47, who lives near the plant.

(Nicholas Kulish reported from Landau in der Pfalz, Germany, and James Glanz from New York, The New York Times, September 10, 2009 / ASCE SmartBrief, September 11, 2009)

Wetland excavation requires "trenchless technology"

Workers in Cambridge, Ontario, are using hand shovels to excavate a section of a new sewer line to be located in a wetland area. The contractor decided on using hand shovels after regulators raised concerns about open cut excavation. "The trenchless technology is similar to the methods used in mining which means that -- rather than open cutting the area -- the majority of the route can be excavated or tunneled underground," noted Jim Kirchin, the city's director of planning operations.

What might be considered old technology is being used in a new way as a 400-metre-long section of the 1.2-kilometre-long 675-mm-diameter Moffat Creek sanitary sewer line now under construction in Cambridge, Ont. will be tunnelled by hand later this fall.

Workers with subcontractor Jimmy Mack & Sons Construction will be using hand shovels to remove earth and, where needed, operating jackhammers to dislodge hard till and large boulders which geotechnical tests have indicated will be found along the route.

The labour-intensive operation was proposed by contractor Brantford Engineering and Construction in response to community, city and other regulatory agency concerns about the impact of open cut excavation to a provincially significant wetland.

With the exception of the hand tunnelled section, traditional cut and fill is being used to install the sewer which is an extension of an existing east to west sanitary trunk within the Moffat Creek Valley. It is needed to facilitate the planned growth of about 4,000 homes in Cambridge's South East Galt community, say city officials.

Not only will the trenchless technology avoid disturbing that wetland, it will save the city approximately $2 million compared to other proposed methods including tunnel boring, which had been considered.

"What it means to the community is a less invasive process that preserves the environmental assets by utilizing primarily tunnelling techniques to dig. The trenchless technology is similar to the methods used in mining which means — that rather than open cutting the area — the majority of the route can be excavated or tunnelled underground," says Jim Kirchin, the city's director of planning operations.

The route of the trenchless section of the sewer alignment will run under several large trees, the wetland and will twice cross over Moffat Creek, says Brad Marin, contract administrator, Conestoga-Rovers and Associates, the consulting engineer.

A hydraulic jacking system will be used to install a 1,500-mm diameter steel liner. A shaft will be excavated to the proposed depth of the trunk sewer and a concrete thrust block will be installed at its base to commence the tunnelling. The jacking system will be prepared and installed and a hydraulic power unit will supply the thrust required to propel the liner through the ground.

An articulated mine shield will be attached to the first length of the liner. Miners at the shield will dig into the earth using hand shovels, and whenever hard till is hit, jack hammers will be utilized. As the liner sections are jacked in place, internal lasers will provide controlled guidance, says Marin. The excavated material will be removed in track-mounted cars.

While the hand-tunnelling will certainly by long and demanding, it's not the only challenge of installing the sewer, which will run Franklin Boulevard to just east of Dundas Street.

"We're working within the confines of the (Moffat) valley near the creek on one side and often near homes on the other side," says Mathew Rich, vice-president of Brantford Engineering and Construction, a family-owned firm.

An approximately 50-metre-long support wall had to be erected near Dundas Street to protect the backyards of several homes overlooking the trench site. Considerable dewatering is also required. Two 10-man crews are currently working at different sections, says Rich.

(Dan O'Reillly, Daily Commercial News, September 21, 2009 / ASCE SmartBrief, September 21, 2009)

Developer will demolish sinking Texas tower

The developer of an unfinished, 31-story luxury tower on the Texas Gulf Coast will demolish the structure because it is sinking. The tower's core has sunk up to 16 inches, according to a lawsuit filed by developer Ocean Tower LP. The developer is seeking $125 million in damages from two engineering firms.

BROWNSVILLE, Texas (AP) -- Touted as the Texas Gulf Coast's most luxurious tower and later ridiculed as the ''leaning tower of Padre Island,'' an incomplete 31-story condominium project on South Padre Island will be demolished, its developer announced Monday.

The Ocean Tower, a 151-unit luxury project slated for a spa and other amenities, started construction in 2006, but stopped last summer when it became obvious the tower was sinking more rapidly than attached parking garages, causing cracks in beams and columns.

A lawsuit filed by developer Ocean Tower LP last year said the tower's core had sunk 14 to 16 inches, while the attached garages sank less than half that amount. Ocean Tower is seeking $125 million in damages from two engineering firms.

''Unfortunately, multiple engineering studies have led us to the conclusion that it is not economically feasible to complete the building and to provide the caliber of condominium tower that we intended to build,'' a prepared Monday statement from Ocean Tower LP said.

Demolition was a difficult decision, said Michael Caddell, a lawyer for Ocean Tower. He estimated the developer invested some $65 million in the project.

''There was really not a good way to fix the building economically,'' Caddell said. ''Even if it were repaired there would always be a stigma attached to that building.''

Ocean Tower LP had maintained until late last year that the problem would be remedied. It estimated in the lawsuit filed last summer that repairs would cost $20 million to $25 million.

Named in the lawsuit are geo-technical engineers Raba-Kistner Engineering and Consulting of San Antonio and structural engineers Datum Engineers of Austin and Dallas. Zachry Construction's subsidiary Coastal Constructors, the project's general contractor, dismissed from the lawsuit.

Matthew Cano, an attorney representing Raba-Kistner, said he could not comment while the case was ongoing, but said ''I do think that we have both factual and legal defenses.''

Greg Ziegler, lead counsel representing Datum, also declined to comment beyond saying that Datum stands by its design.

The Ocean Tower was structurally complete and the interior work was under way when construction halted last summer. By November, developer Tony Domit told those who had made deposits for units that they would get their money back.

''With the future of Ocean Tower in serious question, we release you from your purchase agreement and plan to immediately return your earnest money,'' the letter read.

Court documents show those who contracted to buy condos typically made deposits of about $40,000. One contract listed the sale price of one unit at $399,000.

The Ocean Tower is expected to come tumbling down in grand fashion in mid-November.

Hired for the implosion job is Controlled Demolition Inc., best known for its Guinness World Record-setting implosion of the Seattle Kingdome.

More than 98 percent of the Ocean Tower's above-ground materials will be recycled or reused, according to the statement.

(Dan O'Reillly, The New York Times - The Associated Press, September 21, 2009 / ASCE SmartBrief, September 22, 2009)

Giant rings protect buildings from earthquakes

European researchers have developed giant plastic rings that protect a building's foundation from earthquakes. The rings, buried in the ground, redirect surface waves from an earthquake away from the building's structure. However, the rings will lose effectiveness if the building sits atop the epicenter of an earthquake.

Invisible Buildings

Sebastien Guenneau, 37, Applied Mathematician, Liverpool University sees no reason to fight Mother Nature when you can hide from her. The French mathematician has developed an "invisibility cloak," which will protect buildings from the shock of earthquakes.

Despite the fact that earthquakes are generally caused by slippage in fault lines deep underground, it is actually the surface shock waves that are most destructive to buildings. The "cloak," which Guenneau has developed with a two other researchers, Liverpool University's Alexander Movchan and Stefan Enoch from Marseille's Fresnel Institute, is actually a series of giant plastic rings buried in the ground around the foundation of a building. In the event of an earthquake, these rings would redirect the destructive surface waves around the building, keeping the structure stable and safe. They need to be large. To protect the Eiffel Tower, for example, the radius of the rings would need to range from 30 to 60 meters and they would be about 1 meter thick.

Think of a building like a cork in water; the bigger the waves, the more the cork will bob up and down. When an earthquake's surface waves hit the foundation of a building, it causes a similar motion. "You might end up with a collapse if the wave is strong enough," explains Guenneau. But if the building's foundation is surrounded by Guenneau's rings, the rings will move and the building will stay stable.

The building becomes much harder to protect, however, if the earthquake is too close. The building must be a few hundred meters away from the epicenter of the earthquake for the rings to be effective. "If the building stands on top of epicenter I can't think of any design to protect it," says Guenneau.

The cloak doesn't eliminate the surface waves, it simply redirects them. Once they've passed through the rings the elastic energy is restored on the other side. Guenneau

imagines these rings will be used to protect important structures, such as schools or government buildings. He also envisions the rings being used as anti-vibration devices in smaller-scale structures like cars, airplanes and boats.

(Anna Vander Broek, Forbes, September 22, 2009 / ASCE SmartBrief, September 23, 2009)

Landslide hazard maps assist steep slope development

Landslide hazard maps can help engineers and construction professionals plan for steep slope development. The topographic maps pinpoint where landslides have occurred in the past, and where they are likely to occur in the future. "If you're building a house, this can tell you the areas where it makes sense to take a close look at the landscape," said Rick Wooten, senior geologist at the North Carolina Geological Survey.

The Macon County committee charged with proposing regulations for building on steep slopes is still swimming in a sea of ideas but has agreed on one point. It will incorporate landslide hazard maps into a proposed ordinance, though the maps won't be the end-all, be-all.

"If we based it totally on that, I think we would be leaving out a lot of issues," said Al Slagle, chairman of the committee and planning board member.

"I think everybody wants to see the risk maps used as a cross-reference," said Susan Ervin, who serves on the committee and the planning board. "It's very clear there's going to be some kind of coordination."

The high-resolution topographic maps pinpoint exactly where landslides have occurred in the past, where they are likely to occur in the future, and how far they might travel if they occur. The North Carolina Geological Survey will eventually create maps for every mountain county to better identify high-risk areas.

While the maps have been available for curious eyes at Macon County's GIS office, as well as online, since 2006, they have not been formally integrated into the slope development process so far.

Members of the slope development strategies committee said the maps could come in handy for deciding which sites require technical study before development occurs. Other counties that have tackled similar ordinances have not had the luxury of such maps while making the major decision of which thresholds would trigger regulation.

Macon County currently has no regulations for steep slope construction. Developers and contractors can build on slopes as steep as they like without consulting with engineers or geotechnical experts.

Committee members said the ideal ordinance would not crush development on slopes with an iron fist. Rather, it would allow for safer, better-informed development.

"It's not that those things can't be done. It's got to be done right," said John Becker, a committee member and local Realtor.

Rick Wooten, senior geologist at the N.C. Geological Survey, said the landslide hazard maps could be helpful in this capacity.

"If you're building a house, this can tell you the areas where it makes sense to take a close look at the landscape," Wooten said.

In many cases, the path to improving safety can be as simple as moving a house 20 or 30 feet to one side.

Nevertheless, the landslide hazard maps are only one part of the equation.

"The maps are useful, but it still requires boots on the ground," said N.C. Rep. Ray Rapp, D-Mars Hill, who has spearheaded a campaign to require minimal slope development ordinances for all counties in Western North Carolina.

While looking at where landslides are likely to strike can be valuable, the committee is considering other criteria, like the slope's steepness and soil composition, both of which can affect safety.

The committee analyzed similar ordinances in Haywood and Jackson counties, as well as White County in Georgia, before beginning work on one for Macon County.

One idea floating around is to create no regulations for slopes under a 30 percent grade, mandate that the county conduct an in-house study to determine the need for a geotechnical investigation for 30 to 40 percent slopes, and call for an engineer or design professional to study slopes above 40 percent. Falling into unstable territory, as determined by the landslide hazard maps, would also require a technical inspection.

Others on the committee prefer a lower threshold for triggering the regulations. The in-house county oversight would kick on slopes greater than 25 percent, and mandatory engineering would be required on slopes over 35 percent.

Making data available

Traditionally, development in Macon County occurred in more accessible, gentle lying areas. But with an increasing number of second homes, as well as innovations in engineering, there has been more and more building on steep slopes and ridges.

"That's likely to continue, so we would like it to be done in a way that did not endanger the people building those [and] people living in proximity," said Ervin, who added that the county should not invest in public infrastructure for "unstable" projects.

But when it comes down to it, Ervin admits the committee is evaluating development on a "pretty low percentage of private properties," since most of the steepest slopes in Macon County lie within the Nantahala National Forest..

"The risks really are quite low," said Reggie Holland, another committee member and president of the Macon County Home Builder's Association. "If it happens, the danger is quite high."

According to Wooten, many of Macon County's debris flows occurred on the east facing slopes of the Nantahala Mountains.

In case the landslide hazard maps are not incorporated into the ordinance, they would still serve an important function by helping forecast where landslides may occur.

"They're very useful to have," said Joshua Pope, GIS coordinator for Macon County. "It's like predicting weather. It's not set in stone, but watching The Weather Channel is still useful."

And as always, they are available to anyone who wants to take a look.

"Aside from regulations, the most important thing is that people have that information," said Stacy Guffey, committee member and former county planner. "We have this information, we should use it."

The reason Macon County has this resource in the first place is because it suffered the most severe damage from the 2004 hurricanes in WNC, according to Wooten.

The Hurricane Recovery Act of 2005 required the maps to eventually be created for all counties in WNC.

Each set of landslide hazard maps has taken a year to complete, with three counties finished up so far: Macon, Watauga and Buncombe.

The N.C. Geological Survey is currently working on landslide hazard maps for Jackson and Henderson counties. It will take at least a year to finish the maps for Jackson County, Wooten said.

Pending final approval and funding from Raleigh, the agency will study Haywood County after maps are completed for Henderson and Jackson counties.

The cost of regulations

After the landslide at Peeks Creek in 2004 claimed five lives, Macon County became well aware of the dangers of locating development on hazardous areas.

"We don't want to see another Peeks Creek going on — ever," said Becker. "Profit shouldn't go before safety."

Still, Becker said he would like to see an ordinance that ensures the safety of Macon County residents without imposing too many rules and regulations.

Teresa Murray, president of the Franklin Board of Realtors, said Realtors do have concerns but understand that something needs to be done.

"There'll be some costs no doubt when it comes into play," said Murray. "Hopefully, we can have an ordinance that benefits everyone."

Requiring technical studies to evaluate dangers obviously would tack on to the cost of developing, but Rapp reminded real estate agents that it would be beneficial to sell property on a steep slope five or six times rather than sell it once and have it torn apart by a landslide.

Initially, Rapp hoped Realtors would be required to inform clients about properties that lie in areas prone to landslides.

"I'm willing to compromise on that as long as we require that the structures be built safely," said Rapp. "If you're doing it right from the beginning, then it takes the fire out of this issue."

Rapp said he will continue to push for legislation that mandates those minimum slope development ordinances in Western North Carolina.

"It's so fundamental. It's so basic," said Rapp. "It's hard for me to fathom why people will be opposed to it, other than we're talking about serious, big dollars that can be impacted."

Rapp said the next big challenge is to make sure homeowner's insurance for landslides is made widely available.

What other counties are doing

As Macon County crafts its first set of steep slope building regulations, one issue confronting planners is when the regulations should kick-in. Other counties with steep slope ordinances faced a similar debate: what is the threshold for triggering oversight?

- Macon County has the benefit of state landslide hazard maps, which will play a role in determining that threshold. Other counties didn't have such maps when crafting their ordinance, and instead rely solely on the slope.
- Jackson: Steep slope ordinance applies on slopes with a grade of more than 30 percent.
- Haywood: Steep slope ordinance applies on slopes with a grade of more than 35 percent.
- Swain: No steep slope building regulations.
- Proposed state bill: A state bill that has been percolating in the legislature would require builders to consult an engineer when building on slopes that exceed a threshold of 40 percent.

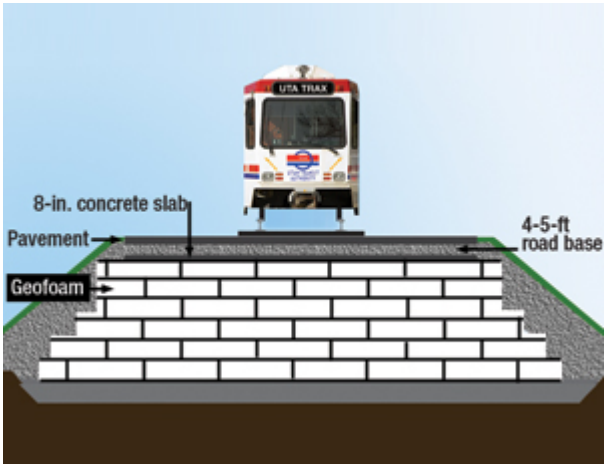
(Bibeka Shrestha, The Smoky Mountain News (Waynesville, N.C., September 23, 2009 / ASCE SmartBrief, September 24, 2009)

Polystyrene blocks save money, time on Utah rail project

The Utah Transit Authority is using a polystyrene block product to expand Salt Lake City's Transit Express light-rail system. Geofoam will be used as base embankment fill around a bridge and at seven other locations. The material will minimize soil settlement issues, save the authority $20 million and speed up the project's completion by eight months.

Foam-filled foundations consist of polystyrene blocks used to prevent settlement along route of Utah light-rail system.

In the second-largest application ever of its kind, hundreds of truckloads of polystyrene block are helping expedite an expansion of Salt Lake City's Transit Express (TRAX) light-rail system. The lightweight material, akin to styrofoam, is helping Utah Transit Authority save at least $20 million and eight months of time by avoiding soil settlement issues.



The $370-million, four-station project extends the existing 19-mile, 28-station dual-line system five miles. A joint venture of Stacy and Witbeck Inc., Alameda, Calif., and Kiewit Western Co., Littleton, Colo., holds a $160-million contract and broke ground in June 2008, with anticipated completion in June 2010. The team has earned half of $3 million in potential incentives.

Designed by Wilbur Smith & Associates, Columbia, S.C., the route alignment crosses under Interstate 15 and has four flyovers, including a 780-ft-long bridge at the Union Pacific Railroad's Roper Yard. Engineered by Ralph L. Wadsworth, Draper, Utah, the three-span steel-girder and concrete deck structure has a 24-ft-high, 330-ft-long main span.

Roughly 405,000 cu ft of Geofoam, an expanded polystyrene product produced by Denver-based ACH Foam Technologies, will be used as base embankment fill around the bridge and at seven other flyover locations. ACH claims it is the second-largest Geofoam installation, trailing Salt Lake City's $1.3-billion, 17-mile I-15 widening, which used 3,531,460 cu ft.

"It will take 620 truckloads to deliver all the Geofoam needed for this project," says ACH sales representative Terry Meier. The product has been available for 25 years, but its environmentally friendly qualities are spurring renewed interest, he adds.

The alignment crosses a former lake bed with collapsible, claylike soil, which officials anticipate could cause up to 10% settlement within three years. "The Geofoam allows us to build the project much faster and avoid settlement issues," says UTA project manager Jim Webb. He estimates the product will save at least $20 million in price-escalation delays. Traditional solutions such as excavating and importing fill proved more costly and time-consuming.

"Geofoam looks and works like Styrofoam," says UTA spokesman Gerry Carpenter. "The ground is very marshy. It could be compacted and it would still continue to settle over the years. Geofoam doesn't settle. Once you set it, it's done."

According to ACH, the material has up to 223-lb-per-sq-ft compressive strength. While soil can weigh up to 110 lb per cu ft, Geofoam weighs only up to 3 lb per cu ft.

The product is cut into giant Lego-like building blocks, each 3 ft thick, 12 ft long and 4 ft high and weighing between 165 lb to 194 lb. Blocks are stacked and arranged into a base up to 42 ft high for embankments. They are topped by layers of concrete or, for road base, aggregate and asphalt.

The new West Valley line is expected to attract 5,250 daily riders upon completion, reaching 10,000 riders by 2030. It is part of the $2.5-billion FrontLines 2015 Railway Lines program, funded by a ¼-cent sales tax referendum passed in November 2006. Plans call for 70 miles of light- and commuter-rail extensions, doubling the capacity and track mileage of the 10-year-old TRAX system in the greater Salt Lake City area.

Four of five new segments are under construction, but a dip in sales-tax revenue has UTA uncertain about future construction plans. "Cash flow is a concern with the recession," says Carpenter.

(Tony Illia, Engineering News-Record, September 23, 2009 / ASCE SmartBrief, September 24, 2009)

Connecting earthquake simulations with computing power

The Network for Earthquake Engineering Simulation has formed a new Community and Communications Center to connect earthquake simulation labs with computing power. The network of 14 earthquake and tsunami simulation labs usually tests one component of a structure at one lab and simulates the rest with software. Hybrid simulations require large amounts of computing power, and NEES plans to introduce a hub with Web 2.0 tools in early 2010.

We cannot stop earthquakes and tsunamis from happening. But with well-engineered buildings, we can prevent some of the death and damage these natural disasters leave in their wake.

First, however, engineers must understand how buildings react when shaken by earthquakes or pummeled by tsunami waves. To accomplish that goal, researchers use a combination of specialized equipment: giant tables that shake, wave tables filled with water, and high-end computing resources that can simulate just about anything.

Earthquake engineers at University of Nevada, Reno test a 110-ft bridge model to failure.
Image courtesy of Joan Dixon/University of Nevada, Reno.

To find out how sound a building will be during an earthquake, researchers can build a model on top of a large shake table. But most of the shake tables in the United States are not large enough to accommodate an entire building. Instead, they accommodate individual building components such as a column or wall.

That's where the George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) comes in. NEES is a network of 14 earthquake and tsunami engineering research facilities committed to sharing resources. To simulate how an entire bridge will behave in an earthquake,

NEES researchers can run what are called hybrid simulations.

"They'll test a column at one end of a bridge on a table in Lehigh, and they'll test the column at the other end of the bridge at another location. What happens in the middle is completely simulated in software," explained Barbara Fossum, co-principal investigator for NEES' new Community and Communications Center (NEEScomm). "They simulate the movement based on what a happens with the physical things, so it's a simulation that's tied to real things on each end."

Although a single shake test often lasts less than a minute, hybrid simulations require huge amounts of computational power. Partnerships with resource providers such as Open Science Grid will meet that need, said Fossum.

For NEES, however, cyber infrastructure is about much more than computational power. The newly-minted NEEScomm is charged with strengthening ties between NEES members, providing member sites with effective cyberinfrastructure, and engaging with the public in educational outreach activities.

This Lehigh University facility is equipped for multi-directional real-time seismic testing, combined with real-time analytical simulations. This facility is also designed to support the development of new hybrid testing methods for real-time multi-directional (RTMD) testing of large-scale structures, including multi-substructures, where the substructures involved are at different geographic locations connected by the NEES network.
Image courtesy of Lehigh University and NEES.

Earlier this month, representatives from the National Science Foundation and all 14 NEES sites gathered at Purdue University in West Lafayette, Indiana, for a kick-off meeting at which NEEScomm presented its vision for the network. "I think that everyone was very pleased, and I've had very positive responses from all the sites," Fossum said. "This is a team that's very interested in hearing what the community and sites want, what the sites need, and building a consensus with them rather than imposing change from the top down."

One way NEEScomm plans to give members voice is through an online NEES hub based on Purdue's HUBzero platform; the NEES hub will probably take its first few test users in February or March of 2010, Fossum said.

"One of the biggest advantages of the HUBzero platform is that users are allowed to publish their own tools," explained Fossum. "By using the Web 2.0 tools they can get much better feedback. On the basis of that we hope to build consensus about what are the best tools out there, what they want to see us support, or what direction they want us to go in."

NEEScomm will officially take charge of NEES on 1 October, thanks to a $105 million grant from the National Science Foundation.

(Miriam Boon, International Science Grid This Weekd, September 23, 2009 / ASCE SmartBrief, September 24, 2009)

4-winged dinosaur fossil is found in China

A four-winged dinosaur fossil unearthed in northeastern China provides new insight into how dinosaurs evolved into birds, researchers claim. "Long feathers cover the arms and tail, but also the feet, suggesting that a four-winged stage may have existed in the transition to birds," researchers said in a statement.

HONG KONG (Reuters) - Chinese researchers have unearthed the fossil of a bird-like dinosaur with four wings in northeastern China, which they suggest is a missing link in dinosaurs' evolution into birds.

In a paper in the journal Nature, they said they found the well-preserved fossil of the "Anchiornis huxleyi," which roamed the earth some 160 million years ago, in a geological formation in China's northeastern Liaoning province.

About the size of a chicken, the fossil has a total body length of less than 50cm (20 inches) and a skull about 6cm long, lead researcher Xing Xu at the Chinese Academy of Science in Beijing told Reuters in an email.

"This finding suggests that birds are likely to be descended from a kind of small-sized four-winged dinosaur about 160 million years ago," Xu said.

"It is a link between more typical theropods (dinosaurs which moved around with two rear limbs) and birds. It lived around a time period ... that we expected for birds' ancestor."

In a statement, the researchers said: "Long feathers cover the arms and tail, but also the feet, suggesting that a four-winged stage may have existed in the transition to birds."

The transition from dinosaurs to birds is still poorly understood because of the lack of well-preserved fossils, and many scientists say bird-like dinosaurs appear too late in the fossil record to be the true ancestors of birds.

The Chinese researchers believe the fossil is the oldest bird-like dinosaur reported so far, and older than Archaeopteryx, the earliest known bird.

"The presence of such a species at this time in the fossil record effectively disputes the argument that bird-like dinosaurs appeared too late to be the ancestors of birds," they wrote.

(Reporting by Tan Ee Lyn; Editing by Jerry Norton Reuters, September 28, 2009 / ASCE SmartBrief on ExecTech, September 28, 2009)

Innovative asphalt pavement transforms Calif. highway

California's $650 million Interstate 710 Long Life Pavement Project has transformed some of the highway's bumpy pavement into what some observers say is the smoothest ride in the state. The state used a sophisticated asphalt mixture that is layered nearly a foot on top of the old concrete to resurface the highway. The pavement is expected to last 30 years with regular maintenance, compared to a decade for typical asphalt pavement.

A worker sweeps the new asphalt surface on a portion of the 710 Freeway in Long Beach. The I-710 Long Life Pavement Project, as Caltrans calls it, began in 2001, is scheduled for completion in the next five years and is a projected to cost $650 million (Stefano Paltera/For the Times/July 19)

There you are hurtling southbound in the No. 3 lane on the Long Beach Freeway. Your car is rattling, your tailbone jumping to the rhythm of a concrete washboard abused by years of heavy trucks and piecemeal repairs.

Then it happens, between the 105 and Rosecrans. You hit a bump, and suddenly your tires purr, your coffee settles in its cup and the radio reception seems more crisp. You may not know why -- it is the nature of freeways that we seldom consider their mechanics -- but you are now experiencing the I-710 Long Life Pavement Project, as Caltrans calls it.

Begun in 2001 and scheduled for completion in the next five years, the transformation of one of Southern California's most neglected freeways is hardly an exercise in speed.

Think of it instead as a projected $650-million art installation with its centerpiece an asphalt roadway set in a sea of concrete; and with a new phase rolling out next month, more commuters will discover what is arguably the smoothest ride in the state -- and a possible model for freeway reconstruction in the years ahead.

Unless you're a location scout for a gangster noir, there is nothing appealing about the 710 Freeway.

Taggers find its sound walls, railroad crossings and unguarded billboards enticing canvases. Adjacent neighborhoods have long complained of the pollution it throws off, and when the center divider was a mere sliver of timber and metal, it was the scene of a number of tragic head-ons.

The roadway is a Braille text of rain grooves and uneven seams. Concrete slabs, broken into pieces like shattered panes of glass, have been replaced or resurfaced with an overlay of asphalt. It resembles a postmodern Mondrian in black and white, and it produces wobbles and vibrations that have prompted some drivers to switch to the 110 or the 605.

When John Harvey drove the freeway more than 10 years ago, his reaction was no different than most commuters'. It was so rough, he recalls, "that it hurt to drive it at 55 mph," and the number of trucks made the experience scary.

Harvey is one of the architects of the new roadway. In addition to teaching engineering at UC Davis, he is the principal investigator at the UC Pavement Research Center, a little-known testing facility in Northern California. Working beside him is a team of engineers including Carl Monismith, regarded in some circles as the dean of California pavements.

Monismith, 83, belongs to the generation of engineers who transformed California in the '50s and '60s. Their work was made easier by a Legislature that felt comfortable raising gasoline taxes and automobile registration fees, and they dreamed big.

By September 1950, according to historian Kevin Starr, the state was spending nearly $100 million a year on its highway program. When the first segment of the 710 Freeway opened in '52, it was but a small chapter in what Starr calls "an epic of freeway construction" that would define California.

In the succeeding decades, resources have dwindled, forcing younger engineers like Harvey to do more with less, or as a professor once told him: "An engineer is a person who can do for 50 cents what any damn fool can do for a dollar."

Economizing sometimes took the form of piecework, until in 1998 Caltrans decided to develop a more substantive strategy for fixing its deteriorated freeways. The agency singled out the 710 Freeway and assembled pavement designers, specialists from paving industries, academics, engineers and contractors, and began listening to proposals.

The prospect of repairing the 710 was daunting because of the challenges of the job site.

In engineering jargon, the 710 is one of the most heavily loaded highways in the state.

On any given weekday, nearly 155,000 vehicles stream north and south on the 710 past Pacific Coast Highway, 16% of which are 18-wheelers carrying up to 40 tons to and from the Port of Long Beach and the Port of Los Angeles.

Given this volume, Caltrans divided the rehab into phases and weighed the options for rerouting traffic. Recommendations included closing the freeway in increments and diverting truck traffic into the channel of the Los Angeles River.

The agency finally settled upon a weekend schedule that diverted southbound traffic into two of the four northbound lanes, switching direction on different weekends, allowing one side to be shut down completely for construction.

More significantly, though, Caltrans chose asphalt over concrete for the job.

Engineers will argue that every road is sui generis, that no one material -- asphalt or concrete -- can be perfect for all environments. Such factors as ambient temperatures, costs, traffic and construction space have to be considered, and though 94% of the 2.27 million miles of the paved roads and highways in the country are surfaced with asphalt, California is slightly different.

As the interstate highway system was developed, each state decided its own plan. California chose primarily concrete in urban areas because at the time it was the easiest material to maintain. That assessment remains popular,

and the decision to use asphalt on the 710 still rankles some of the engineers on the project.

"We typically use asphalt pavements on lower-volume roads," says Kirsten Stahl, a senior transportation engineer with Caltrans. "Concrete is chosen for roads with higher volumes and heavier loads."

Stahl, like representatives from the concrete industry, believes that concrete is less expensive to repair over its life.

Doug Failing, Caltrans director for Los Angeles and Ventura counties, explains the choice as less practical than philosophic. Both materials met the standards for the job, and the costs were comparable after factoring in maintenance. Caltrans, however, wanted to develop an alternative to concrete. The agency wanted to give asphalt a shot.

"We were using concrete for other freeway rehabilitation projects," Failing said, "and it is important to develop more than one technique for this work."

As Stahl's colleague, Scott McKenzie, also a senior engineer with Caltrans, points out, "The story of road construction is the story of always trying to find the best solution to an ancient problem." Each job, he says, no matter the materials or the process involved, is an opportunity to improve upon what has been done in the past.

There is nothing special about asphalt. Take some carbon, add a little hydrogen, sulfur, oxygen, nitrogen and a few trace metals, and you have the sticky, black, odorous compound found in the tar pits and a common byproduct in the refining of crude oil.

Combine it with a mixture of stones, or aggregate, and you have the pavement that covers most city streets and is a quick patch for the broken concrete on freeways. Often it goes down in one layer, no more than 4 inches thick. Compactors follow, squeezing out pockets of air, and the work is traffic-ready in less than 24 hours.

But not so for the 710.

The asphalt for the 710 is a more sophisticated mixture, a blended Scotch to a glass of water, the culmination of testing and experimenting that goes back to the 1960s. What makes the blend unique is the different types of asphalt being layered onto the roadway and its thickness, almost 12 inches that sits upon the old concrete roadbed (thus saving the cost of removal).

The advantage of this Dagwood sandwich, as the engineers at the center learned, is that it disseminates weight from the point of impact, broadening and lessening the load into the deeper layers.

As the old concrete beneath the road jumps -- inevitable, beneath the weight of moving traffic -- the asphalt flexes and recoils, preventing the formation of cracks.

In addition, pieces of rubber have been stirred into the top layer to mute the sound of traffic and divert water to stop hydroplaning.

With regular maintenance, scraping and replacing this layer every eight to 12 years, the pavement is expected to last at least 30 years (the typical asphalt pavement lasts 10 years, and concrete, such as the design used for the 710 Freeway, can last 40 years with maintenance).

Aside from the aesthetics -- the white and yellow stripes stand out against the blacktop -- the result is a soft and smooth ride.

How smooth is smooth? Ask Harvey, and he'll give you two answers.

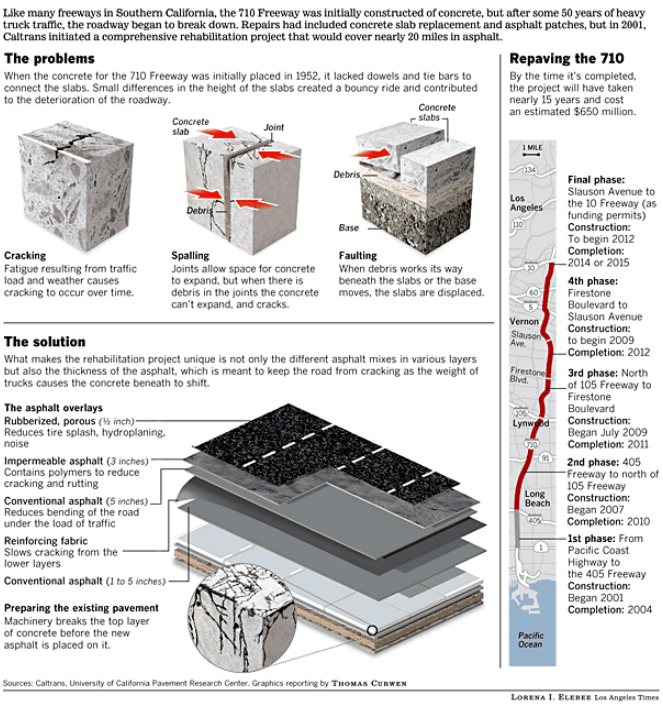
First, he'll get technical, citing the International Roughness Index developed by the World Bank in the 1970s as a way of helping governments decide whether borrowing money to improve roads was a wise decision.

The index runs from 1 to more than 1,200. Airport runways and superhighways typically rate between 12 and 100; unpaved roads can hit 800. When interstate highways measure 160, the Federal Highway Administration recommends maintenance or rehabilitation, Harvey says.

Sections of the 710 measured in 2006 before resurfacing averaged 250, and recent measurements on a resurfaced stretch -- from the ports to the 405 -- averaged 89.

Then Harvey will tell you about the coffee test. If you can drive with a cup of hot coffee held between your legs and not scald yourself, he'll be happy.

Graphic: How to repair a broken freeway



For centuries, engineers have dreamed of creating the perfect road. The Romans came close with curbstones, crushed rocks and a tortoise-shell camber, but as they -- and generations of civil engineers since -- have learned: What's right for today is often worn down by tomorrow.

Designing a smooth road is a losing proposition. No sooner has the paving machine laid down an ideal grade than the deterioration begins.

When architectural critic Reyner Banham wrote about L.A. in 1971, he observed that the freeway was not "a limbo of existential angst" as some observers had it. Instead it was for Angelenos "the place where they spend the two calmest and most rewarding hours of their daily life."

Almost 40 years later, his words carry the weight of a lost dream. Deferred maintenance and diminished budgets have spelled the end of our calm.

No one knows how innovative or exactly how costly the new 710 roadway will be, or whether it seems smooth because other freeways in comparison are so rough.

For now though, the purring of tires and the quieting of that cup of coffee might just be the only acceptable measure of success.

(Thomas Curwen, The Los Angeles Times, September 30, 2009 / ASCE SmartBrief, September 30, 2009)

Researchers make rare meteorite find using new camera network in Australian desert

Researchers have discovered an unusual kind of meteorite in the Western Australian desert and have uncovered where in the Solar System it came from, in a very rare finding published today in the journal Science.

Meteorites are the only surviving physical record of the formation of our Solar System and by analysing them researchers can glean valuable information about the conditions that existed when the early Solar System was being formed. However, information about where individual meteorites originated, and how they were moving around the Solar System prior to falling to Earth, is available for only a dozen of around 1100 documented meteorite falls over the past two hundred years.

Dr Phil Bland, the lead author of today's study from the Department of Earth Science and Engineering at Imperial College London, said: "We are incredibly excited about our new finding. Meteorites are the most analysed rocks on Earth but it's really rare for us to be able to tell where they came from. Trying to interpret what happened in the early Solar System without knowing where meteorites are from is like trying to interpret the geology of Britain from random rocks dumped in your back yard."

The new meteorite, which is about the size of cricket ball, is the first to be retrieved since researchers from Imperial College London, Ondrejov Observatory in the Czech Republic, and the Western Australian Museum, set up a trial network of cameras in the Nullarbor Desert in Western Austra-lia in 2006.

The researchers aim to use these cameras to find new meteorites, and work out where in the Solar System they came from, by tracking the fireballs that they form in the sky. The new meteorite was found on the first day of searching using the new network, by the first search expedition, within 100m of the predicted site of the fall. This is the first time a meteorite fall has been predicted using only the data from dedicated instruments.

The meteorite appears to have been following an unusual orbit, or path around the Sun, prior to falling to Earth in July 2007, according to calculations by the research team, which includes scientists from the Natural History Museum in London. The team believes that it started out as part of an asteroid in the innermost main asteroid belt between Mars and Jupiter. It then gradually evolved into an orbit around the Sun that was very similar to Earth's. The other meteorites that researchers have data for follow orbits that take them back, deep into the main asteroid belt.

The new meteorite is also unusual because it is composed of a rare type of basaltic igneous rock. The researchers say that its composition, together with the data about where the meteorite comes from, fits with a recent theory about how the building blocks for the terrestrial planets were formed. This theory suggests that the igneous parent asteroids for meteorites like today's formed deep in the inner Solar System, before being scattered out into the main asteroid belt. Asteroids are widely believed to be the building blocks for planets like the Earth so today's finding provides another clue about the origins of the Solar System.

Meteorites are the only surviving physical record of the formation of our Solar System.

The researchers are hopeful that their new desert network could yield many more findings, following the success of their first meteorite search.

Dr Bland added: "We're not the first team to set up a network of cameras to track fireballs, but other teams have encountered problems because meteorites are small rocks and they're hard to find in vegetated areas. Our solution was quite simple – build a fireball network in a place where it's easy to find them. The Nullarbour Desert is ideal because there's very little vegetation and dark rocks show up really easily on the light desert plain.

"It was amazing to find a meteorite that we could track back to its origin in the asteroid belt on our first expedition using our small trial network. We're cautiously optimistic that this find could be the first of many and if that happens, each find may give us more clues about how the Solar System began," said Dr Bland.

The researchers' network of cameras takes a single time-lapse picture every night to record any fireballs in the sky. When a meteorite falls, researchers can then use complex calculations to uncover what orbit the meteorite was following and where the meteorite is likely to have landed, so that they can retrieve it.

The research was funded with grants from the UK Science and Technology Facilities Council, the Czech Republic and the European Union.

For further information please contact:

Laura Gallagher
Research Media Relations Manager
Imperial College London
e-mail: l.gallagher@imperial.ac.uk
Telephone: +44 (0)207 594 8432 or ext. 48432
Out of hours duty Press Officer: +44 (0)7803 886 248

Notes to editors:

1. "An anomalous basaltic meteorite from the innermost main belt" Science, 17 September 2009 (embargoed for 14.00 Eastern Time) Lead author: Dr Phil Bland, Imperial College London (for full list of authors please see paper)

2. CSIRO Exploration & Mining applies world-leading science and technology to raise Australia's competitive advantage in this vital sector.

3. The Western Australian Museum makes major contributions to the collection, conservation and research of Western Australia's natural, social and maritime history and the cultural heritage of the State's Indigenous communities.

4. Ondrejov Observatory (or Astronomical Institute of the Czech Academy of Sciences) is the leading institution of the astronomical research in the Czech Republic. The main research areas are: the Sun and solar activity, interplanetary matter, including interaction with terrestrial atmosphere, stars, interstellar matter and galaxies.

5. Consistently rated amongst the world's best universities, Imperial College London is a science-based institution with a reputation for excellence in teaching and research that attracts 13,000 students and 6,000 staff of the highest international quality. Innovative research at the College explores the interface between science, medicine, engineering and business, delivering practical solutions that improve quality of life and the environment - underpinned by a dynamic enterprise culture.

Since its foundation in 1907, Imperial's contributions to society have included the discovery of penicillin, the development of holography and the foundations of fibre optics. This commitment to the application of research for the benefit of all continues today, with current focuses including interdisciplinary collaborations to improve health in the UK and globally, tackle climate change and develop clean and sustainable sources of energy.

(Imperial College Alumni e-bulletin, September 2009)

Geopolymer concrete has ancient roots, modern application

Some researchers claim that ancient pyramids were made of a type of geopolymer limestone concrete in liquid form. Industry experts note that geopolymer concrete is used in construction today. The Air Force, for example, uses geopolymer-based cement to repair runways, and Iranian scientists are developing a high-strength concrete composite for use in nuclear plants.

The story of geopolymers is worthy of a Dan Brown novel, with an unlikely cast including a maverick French scientist, a secretive caste of ancient stone masons and the U.S. Air Force Research Laboratory. Along the way, the mystery of the pyramids gets solved, but it might just end with American bombs bouncing off impervious bunkers.

Geopolymers are technically described as synthetic aluminosilicate materials, but they might be more easily described as super-cements or ceramics that do not need firing. A mug made of Geopolymer will bounce off a concrete floor.

The technology of cement-making has been repeatedly lost and rediscovered. The Romans knew how to mix crushed rock ("caementitium"), with burnt lime and water to make a versatile building material. The Pantheon in Rome boasts the world's largest unreinforced concrete dome, still just as strong after 2,000 years. But cement was unknown in medieval times, with lime mortar serving as a poor substitute.

However, by the 1950s, it was obvious that much modern cement is not as durable as the ancient variety, and many buildings succumbed to concrete cancer caused by water penetration and chemical action. Ukrainian scientist Victor Glukhovsky looked into why the ancient cement recipes were so much more durable than modern ones and found that adding alkaline activators gave a greatly superior product. His work inspired Joseph Davidovits, a French chemical engineer, to discover the chemistry behind geopolymers and how it can be manipulated.

Geopolymer mould used in steelmaking, showing temperature resistance at over 1400C – Air Force Office of Scientific Research.

Professor Davidovits was awarded the French Ordre National du Mérite, and is President of the Geopolymer Institute. His most remarkable claim is that the pyramids were built using re-agglomerated stone, a sort of geopolymer limestone concrete, rather than blocks of natural stone. This would explain many of the mysteries of pyramid construction. Handling barrels of liquid concrete and casting in place would be much easier than moving giant blocks of stone. Remarkably, recent X-ray and microscopic study of samples has supported the theory that the pyramids are made of artificial stone.

The progress of geopolymers as building materials has been slow. Builders have an understandable tendency to stick to materials which have been around for decades and whose properties are well understood. However, the U.S. Air Force has been among the more enthusiastic early adopters — I look at military applications in the current issue of *Defense Technology International* (page 42).

For example Pyrament, a geopolymer-based cement is handy for the rapid repair and construction of runways. After just a few hours a Pyrament runway is ready for the heaviest aircraft, reaching a strength that conventional concrete can only match after several days.

The Air Force Research laboratory has funded geopolymer research for runways, insulation material, rocket nozzles, and other applications. It's even been developed as special glue for holding satellite components together in the harsh conditions of space.

But the U.S. does not have a monopoly on this sort of technology. A couple of years ago Danger Room reported suggestions that Iranian scientists were working on ultra-high-strength concrete compositions. (Incidentally, high-hardness concrete is used in the construction of nuclear plants.)

The University of Tehran's Faculty of Civil Engineering has its own Construction Materials Institute, which conveniently lists research papers in English. And it turns out that there is a lot of research into concrete technology, including fiber-reinforced concrete and concrete with ultra-high electrical resistivity. The Iran University of Science and Technology also displays some of its research in English – including a number of patents for new geopolymer cement formulations. The expertise is there; the only question is over whether there are other, unseen Iranian projects in this field.

The giant new Massive Ordnance Penetrator is reckoned to be able to break through 200 feet of 5,000 pounds-per-square-inch concrete, but just 25 feet through 10,000 psi concrete. Much harder concretes might be a real challenge.

Back during the First World War, warships were equipped with armor made of a new type of steel: this was so hard that earlier armor-piercing shells would simply shatter against it.

Military history records many rounds of offense and defense leapfrogging each other: new concrete technology may see this happen again. The trick is always to be one technological step ahead of the opposition…

(David Hambling, Wired, October 22, 2009 / ASCE SmartBrief, October 23, 2009)

Earthquake resistant airport opens in Turkey

Arup said the Sabiha Gökçen International Airport (SGIA) in Istanbul, Turkey, is the largest seismically-isolated building in the world.

Turkey's new international airport based in Istanbul boasts new safety features to help minimise the effects of earthquakes according to project consultant, Arup.

The company said the Sabiha Gökçen International Airport (SGIA) is the largest seismically-isolated building in the world.

"The new Istanbul airport terminal is a model for the future," said Atila Zekioglu, principal of Arup, and seismic expert for Arup's airport design team.

"Using our international network of experts, Arup shattered industry standards to redefine what is possible.

"As a result, the Sabiha Gökçen International Airport terminal project will be recognised globally for its superior earthquake safety features and completion in record time," he added.

It took 18 months for Arup's global airport planning and engineering team, in collaboration with architect, Dogan Tekeli Sami Sisa Mimarlik Ofisi and contractor, Limak-GMR JV, to build "the most technologically superior structure of its size in the world" featuring seismic safety measures "that surpass US building standards."

Limak-GMR JV completed the airport terminal in a fraction of the time similar projects typically require, Arup said in a statement.

The company added the 200000 m² building uses 300 seismic-isolators at the ground level to help absorb and dissipate energy from seismic waves. These isolators will enable the building to move in a controlled manner should an earthquake occur.

Using extensive testing and earthquake simulations, engineers determined isolators will help the building withstand a 7.5 to 8.0 magnitude earthquake, Arup stated.

"The airport terminal is designed to save lives and property," Mr Zekioglu said.

"After undergoing extensive testing and 14 quake simulations, we are confident the design will safeguard a major financial investment and preserve an international transportation system so that it may continue functioning if an earthquake strikes."

The new international terminal also features a new multi-storey car park, a three-storey airport hotel, VIP areas, a 400 m² conference centre, a 5000 m² food court for cafés and restaurants and Europe's second largest Duty Free shopping area.

Arup's airport planners have established a long-range master plan for the site that will accommodate demand beyond 30 million annual passengers.

The new SGIA terminal marks the first phase of this growth and increases passenger capacity from 5 million passengers annually to over 22 million passengers.

(Becca Wilkins, CONSTRUCTION EUROPE, 9 November 2009)

(ΓΕΩ) ΠΕΡΙΒΑΛΛΟΝΤΙΚΑ ΘΕΜΑΤΑ

Bridge is heated by geothermal energy

A bridge that crosses a wetland in Ontario, Canada, is heated by geothermal energy. Designed by Becker Engineering Group, the bridge combines several technologies to draw heat from the ground and pump it to embedded pipes in the deck. The heat prevents black ice from forming during the winter and could reduce the need for road salt.

The County of Essex, Ont. has teamed up with Windsor's Becker Engineering Group to design and build what's believed to be Canada's first heated bridge using in part geothermal energy.

It has won the P.J. Marshall Award from the Association of Municipalities of Ontario for demonstrating leadership in public-private partnerships.

Since the bridge crosses a provincially-significant wetland it "gave us an opportunity" to try a new technology that would hopefully limit the use of road salt, county engineer Tom Bateman says.

The bridge, located along County Rd 23 and now headed into its third winter of use, combines a number of existing technologies to draw heat from the surrounding ground and warm the bridge to prevent black ice from developing, as well as to constrain bridge contraction and expansion.

Jim Hrycay, president of Becker affiliate Hrycay Consulting Engineers, credited Group president Dr. Norbert Becker as "the lead innovator" among the companies, with "always thinking outside the box." The company does accident reconstruction work and is familiar with road mishaps caused by ice. "All of this sort of came together," Hrycay says, when the County of Essex wanted a replacement span over the well-travelled north-south artery.

This bridge in Essex County crosses a wetland, so avoiding use of salt for de-icing was deemed important (Becker Engineering Group builds Canada's first heated bridge)

The reason a bridge tends to freeze more quickly than the nearby road surface is because roads are warmed from ground heat.

The Becker Group was able to transfer that heat from the ground and make the deck warmer. The technology differs from what people see at winter resorts, for example, where sidewalk snow is sometimes melted using massive boiler systems.

"We looked at whether there's a more efficient way of doing that without relying on that huge surge of power to generate the heat," Hrycay says.

Four-foot-diameter caissons were drilled into the ground adjacent to the stream bed. Below a depth of 10 feet, the soil temperature is between 50 and 55F. Heat is extracted from the caissons through heat exchangers as a glycol fluid is pumped through the system. The heat is transferred via closed loop three-quarter inch stainless steel pipes, embedded in the concrete deck, which weave up and down — six inches apart — across the 100-foot span. The glycol then warms the deck, melting ice and snow. Depending on the outside temperature, auxiliary flash boilers are activated to increase the glycol's temperature, speeding the melt.
For the time being, company and municipal officials are monitoring outside temperatures and tweaking the heat exchange system so that the glycol is warmed to the correct temperatures depending on ambient conditions.

The bridge has its own little weather station, measuring wind speed, deck temperature, the glycol's temperature and dew point. It can do algorithms to determine when to increase the speed of the heat exchange pumps or when the boilers need to be activated. This equipment is contained in a small building on the south side of the bridge – "the most compressed mechanical room you'll ever see," says Hrycay.

While officials make adjustments through an Internet connection the goal is to have the system work on its own. "We're trying to see whether it will be smart enough to run itself," says Bateman.

As for construction, the bridge was put together with mostly pre-cast concrete including the two piers, pier caps and spandrels. Besides the deck tubing, insulation was added to combat airflow under the bridge. Design-wise the spandrels are deeper than on most bridges. Typically spandrels' bottoms end at the bridge deck. But these cover the beams. Hrycay says it's largely for aesthetic reasons.

Officials expect that moderating the bridge temperature and the bridge's salt-free environment will reduce freeze damage and provide a longer life span.

Hrycay says future applications could be to melt ice on accident-prone "hotspots" such as river crossings or highway overpasses, particularly in climates like southern Ontario with frequent freeze-thaw cycles.

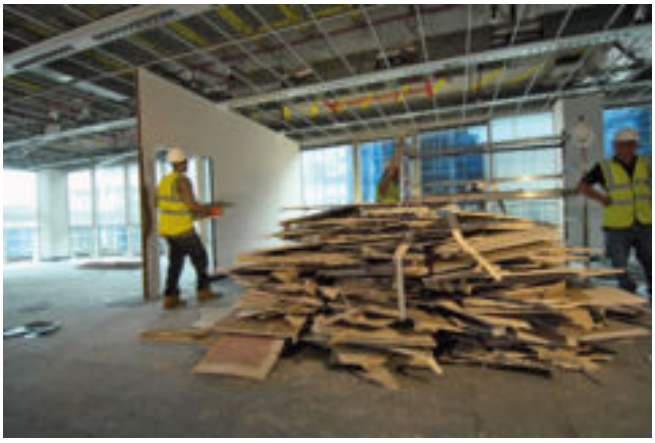
This is green technology with no chemical byproduct affecting surrounding water or land. Says Hrycay, "It's basically no different from what Mother Nature does when springtime comes and starts melting the snow."

(Ron Stang, Daily Commercial News, October 30, 2009 / ASCE SmartBrief – ASCE SmartBrief on Sustainability, November 2, 2009)

Making the most of waste plasterboard

The UK construction and demolition industries could be saving over £8.2 million (US$13.6 million) each year by diverting more of the waste plasterboard they generate away from landfill and back into the production of useful materials.

The introduction of a new Quality Protocol by the Waste Protocols Project - a joint Environment Agency and WRAP (Waste & Resources Action Programme) initiative - could help the demolition industry realise some of these savings.



Waste plasterboard - a valuable resource

The demolition industry is one of the major generators of waste plasterboard in the UK, disposing of between 800,000 and 1,300,000 tonnes of this material every year.

But of this, only around 131,000 tonnes are currently being recycled, which means a large proportion of this valuable resource is typically sent to landfill.

Until relatively recently demolition businesses were still able to landfill waste plasterboard under the '10 per cent' rule set by the Environment Agency for England and Wales.

However, since 1st April 2009 the guidance has been revised, and all gypsum waste sent to landfill must now be deposited in a separate mono-cell with non-biodegradable waste.

This has left the demolition industry facing disposal costs of £90-150 (US$150-250) in gate fees, landfill tax and transportation expenses for every tonne of material they dispose of.

At a time when business efficiency is vital, the introduction of the Quality Protocol for the production of gypsum from waste plasterboard could not be more welcome.

The protocol sets end-of-waste criteria for the production of recycled gypsum from waste plasterboard. By establishing this criteria and assuring standards, the Quality Protocol will not only help the industry save money in the form of disposal costs, but also make it easier for businesses in the UK to manufacture and use recycled gypsum made from waste plasterboard.

But what does this actually mean for the demolition industry?

Recycled gypsum made in accordance with the protocol becomes a quality assured, non-waste product; free from the need for waste management controls, and fit-for-purpose for a range of end-user industries.

By reducing the amount of regulations producers and users of recycled gypsum have to deal with - and by helping to raise quality - the protocol will increase industry confidence in products made from the material.

This means end users such as plasterboard and cement manufacturers will be more likely to buy recycled gypsum that is no longer considered 'waste' because of the time and money savings inherent in not having to comply with waste legislation.

In fact, it is anticipated that increased demand for Quality Protocol compliant recycled gypsum will help producers realise an additional £10.9 million (US$18 million) in sales over the next 10 years.

Greater demand for recycled gypsum will help to create a stronger market, and provide generators of waste plasterboard with a viable alternative to sending their material to landfill.

This will allow businesses to realise significant cost savings - it has been estimated that the construction and demolition industry could save over £8.2 million (US$13.6 million) a year if the waste plasterboard it generates was sent for recycling rather than to landfill.

In total, it is estimated that the increased market confidence and savings for end users and waste generating industries that will result from the introduction of the Quality Protocol will realise a net benefit of over £38 million (US$63 million) over the next 10 years.

A strong market for recycled gypsum is good news for the demolition industry as it means that more waste plasterboard can be diverted away from landfill.

This is beneficial for the environment but, even better, it allows businesses generating waste plasterboard to realise considerable cost savings.

To be Quality Protocol compliant recycled gypsum must be produced in accordance with British Standards Institution's Publicly Available Specification (PAS 109:2008). More information about this specification can be found on the WRAP website, www.wrap.org.uk.

The Quality Protocol for the production of gypsum from waste plasterboard can be downloaded from the Environment Agency website at www.environment-agency.gov.uk

(Mervyn Jones and Martin Brocklehurst, Demolition & Recycling International, 08 December 2009)

Canadian firm installs country's largest rooftop solar-energy system

A Canadian marketing-strategies company, Loyalty One, has installed the largest rooftop solar-energy system in Canada. The 800 roof panels will produce 165 kilowatts of power, enough for the entire building. The exterior of the building was built to LEED silver and gold standards.

The Loyalty One building, manager of Air Miles rewards programs, is now the home for the largest rooftop solar system in all of Canada. Though the system is only 165 kilowatts, it's enough to power the entire building, thanks to its LEED silver and gold certifications. (Comparatively one of the largest rooftop arrays in the US this year went online at 2.37 MW). Then again, getting 800 solar panels on the rooftop of one building, is no small feat.

PV covered carport with plug in hybrid.

The solar panels are both on the rooftop of the building and on an adjacent carport and the system itself is large enough to power 16 average sized homes. How can the building be both gold and silver LEED certified? Well, it was constructed to be one of the greenest buildings in Canada and the interior was built to LEED Gold standards, while the exterior was built to LEED Silver standards. Constructing a new building with green standards in mind ahead of time, helps when it comes to installing a PV system as the building is already trimmed down and more efficient, thus necessitating the purchase of fewer PV panels, aka financial savings. Planning ahead means financial savings by not having to purchase unnecessary energy.

The wall with the inverters has been designed so that employees and guests can see in real time how much the system is producing. Instead of just hanging the inverters behind drywall, the inverters are now exposed to the lunch and gaming room. The carport is reserved for employees with high efficiency vehicles or for those who choose to bike to work.

The LoyaltyOne program manages Air Miles programs as well as works with over 100 retail companies on marketing strategies and research. Roughly 300 employees work in the building that is now 100% solar powered.

(Kristin Underwood, Sacramento, CA, TreeHugger, December 10, 2009 / ASCE SmartBrief on Sustainability, December 12, 2009)

ΑΡΧΑΙΑ ΤΕΧΝΟΛΟΓΙΑ

5 ancient inventions that were ahead of their time

Batteries, computers and vending machines all have counterparts in the ancient world, as this blog post notes. Ancient investors even devised a rudimentary jet engine that used steam to create motion.

We think we live in such modern times, with fabulous inventions that make our lives easier and provide great convenience. But some of those inventions might not be as modern as we think. Take a look at these five inventions that may have been around for thousands of years before *we* "invented" them.

Jet engine

A jet engine in the first century B.C.? Perhaps. A jet engine in the first century A.D.? Definitely. The aeolipile is a rocket style jet engine that spins when it's heated and is the first-ever device known to use steam for a rotary motion. Although it was "invented" in 1698 by Thomas Savery, the original may have been invented in the first century B.C. Roman architect Vitruvius' *De architectura*, a work on then-modern architecture written around 25 B.C., includes a device called the aeolipile. However, it has never been verified that his aeolipile (which translates to "ball of Aeolus," who was the god of the wind, so it's kind of a generic name that could apply to various inventions) was the aeolipile that we know existed in the first century.

That's the aeolipile that Hero of Alexander wrote about, including a detailed description of how to construct one. The invention credit is usually given to Hero instead of Vitruvius.

Automatic doors

That Hero was a pretty smart guy. He also invented the vending machine long before we were prying Kit Kats out of them in our office break rooms. Hero rigged it so that when a coin was dropped into a slot, it fell on a pan, and the weight of it on the pan triggered a lever that opened up a valve that let some holy water flow out to the person who dropped the coin in. The pan kept tilting until the coin fell off of it, and when that happened the valve closed and the water would no longer dispense. The first modern-day vending machine came about in the 1880s, so you could say that Hero was well ahead of his time.

Analog Computer

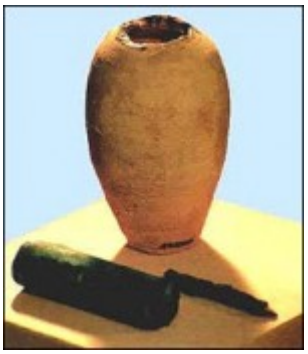
We've long thought that the first astronomical clocks didn't show up until the 14th century in Europe. That all changed in 1900 when a group of divers discovered shipwreck thought to date back to 150-100 BC. A lot of the loot was stuff you might expect from that era – statues, busts, instruments and utensils. But then one of the divers spotted what looked like a gear stuck in a rock, which was eventually found to be just one of many pieces of the same thing. Upon closer inspection and much analysis (*decades* of analysis, in fact), it was determined that the gear and its 80+ other pieces were part of a complicated mechanism that precisely calculated the position of the sun, moon, planets and other astronomical information. It was capable of predicting an eclipse right down to the hour that it would occur. Astronomer John Seiradakis has called it the "pocket calculator of its time." Its construction was so perfect and exact that many historians and archaeologists believe that the Antikythera Mechanism was just one of many similar devices – we just haven't discovered the other ones yet.

Electricity

We're not sure about this one – it's just a theory. But there is some speculation that the ancient Egyptians may have understood how to harness electricity. The entire argument is based on stone reliefs inside the Dendera Temple complex in Egypt. What the etching appears to depict, to some, are bulbs, filaments and insulators. It also looks like a lotus flower and a snake. The argument could probably stop there – obviously humans are programmed to spot patterns in things and could easily see a now-everyday object in an ancient etching when it's really not there. But English scientist J.N. Lockyer (he discovered helium) pointed out that the tombs were conspicuously soot-free – if Egyptians were using candles or torches, there would no doubt be some evidence of it on the walls or ceilings. But there is no evidence. A lot of people believe that the Egyptians used a series of mirrors to reflect the sunlight into the temple, but others say that their mirrors were too weak to do any such thing. Thus, the argument continues. What do you think? *Photo from Wikipedia user Liftarn.*

Batteries

Along the same line as the Dendera Temple light is the Baghdad Battery. In the mid-1930s, a number of artifacts thought to date back to 200 BC were found in Khuyut Rabbou'a, a village near Baghdad. The combination of objects – a five-inch long clay jar and a copper cylinder that encased an iron rod – led researchers to believe that the ancient artifacts were actually used as batteries. Batteries for *what*, we still don't know. Unlike the Dendera light though, there's some evidence that these really were batteries – replicas have been made that did, in fact, conduct an electric current, sometimes as much as two volts. One theory is that the batteries were hidden inside of idols to give tiny little shocks to people, scaring people who didn't understand the trick and often forcing them to give up secrets or confess to crimes. *Photo from the BBC.*



(Stacy, Neatorama, November 30, 2009 / ASCE SmartBrief on ExecTech, December 10, 2009)

ΕΡΕΥΝΗΤΙΚΕΣ ΔΡΑΣΤΗΡΙΟΤΗΤΕΣ

http://www.globalquakemodel.org

GEM is a public/private partnership initiated and approved by the Global Science Forum of the Organisation for Economic Co-operation and Development (OECD-GSF). GEM aims to be the uniform, independent standard to calculate and communicate earthquake risk worldwide. With committed backing from academia, governments, and industry, GEM will contribute to achieving profound, lasting reductions in earthquake risk worldwide.

GEM will be the critical instrument to support decisions and actions that reduce earthquake losses worldwide. All who face risk, from homeowners to governments, need accurate and transparent risk information before they will take mitigating action. By providing the information in a manner that is understandable to all users, GEM aims to raise awareness, lead to adoption and enforcement of building codes, promote seismic mitigation, and stimulate insurance use.

GEM will be the first global, open source model for seismic risk assessment at a national and regional scale, and aims to achieve broad scientific participation and independence. It will be conducted in three integrated modules: Hazard, Risk, and Socio-Economic Impact.

About GEM

Over half a million people died in the last decade due to earthquakes and tsunamis, most of these in the developing world, where the risk is increasing due to rapid population growth and urbanization. But in many earthquake-prone regions no hazard models exist, and even where models do exist, they are inaccessible. Better risk awareness can reduce the toll that earthquakes take by leading to better construction, improved emergency response, and greater access to insurance.

The Global Science Forum of the Organization for Economic Cooperation and Development (OECD) has called for the development of global, open-source risk assessment. In response to this need, the Global Earthquake Model (GEM) will provide an authoritative standard for calculating and communicating earthquake risk.

Mission

To aid sustainable social and economic development by providing free, reliable and uniform information on seismic risk and the impact of earthquakes around the world.

Vision

GEM brings together worldwide expertise on all aspects of seismic risk in a unique private-public alliance to produce software and tools that help to reduce earthquake deaths, destruction, dislocation, and monetary losses. GEM will provide a basis for comparing earthquake risks across regions and across borders, and thereby be the necessary first step towards increased awareness and actions that reduce earthquake risk.

GEM tools will be usable at the community, national and international level for uniform earthquake risk evaluation and as a defensible basis for risk mitigation plans. GEM results will be disseminated all around the world, GEM will build technical capacity and carry out awareness raising activities.

Objectives

The main purpose of GEM is to establish an independent, uniform standard for calculating and communicating earthquake hazard and risk, and to be a critical instrument to support decisions and actions to reduce earthquake losses worldwide.

GEM aims to achieve risk reduction through the following objectives:

- Calculate earthquake risk uniformly worldwide to the highest available standards, integrating local expertise in a global context;
- Provide tools to calculate both social and financial losses;
- Calculate scenarios with aforementioned tools to enable cost/benefit analysis of mitigating actions, such as systematic building strengthening, and to facilitate insurance and alternative risk transfer;
- Communicate earthquake risk clearly, accurately and transparently and thereby provide key information to support the social and economic capacity of a community, society or organization to reduce the level of risk, with particular focus on developing countries;
- Help to introduce sustainable building codes in countries where they do not exist, and enhance/improve existing codes.

Strategy

GEM aims to achieve its goals through two primary strategies:

1. develop state-of-the-art open source software and databases as a necessary basis for reliably mapping, monitoring, and communicating earthquake risk.
2. involve the community in its various efforts and activate professionals in all parts of the world towards raising risk awareness and promoting cost-effective mitigation actions.

Building of the first working model will take five years (2009-2013) and 35M Euro. Two-thirds of the necessary funding has already been pledged by interested partners, and additional support is being sought from governments, private industry, public institutions and foundations.

GEM will interact constructively with all ongoing earthquake risk reduction activities to ensure that GEM builds upon existing knowledge and creates unique tools with added value, but also for dissemination of results and communication with stakeholders.

GEM will not cease to exist after the creation and release of this first version of the model. GEM will strive for continuous improvement of the model and will ensure that results are disseminated, technology is transferred through training and workshops and that awareness raising activities continue to be deployed in order to contribute to risk reduction worldwide.

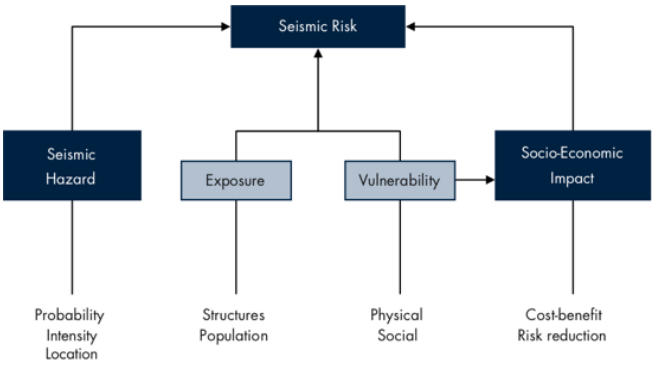
Please read the pages 'Building GEM' for detailed information on implementation of the first version of the global earthquake model.

Scientific Framework

GEM will provide state-of-the-art open source software and databases as a necessary basis for reliably mapping, monitoring, and communicating earthquake risk.

Different types of software and tools will be available, adapted to the needs of various stakeholder groups. In order to achieve this, the model will be based on a combination of national, regional and global elements, and will integrate developments on the forefront of scientific and engineering knowledge of earthquakes as well as IT processes and infrastructure.

The GEM scientific framework serves as the underlying basis for constructing the model, and is organised in three principal integrated modules:



- The hazard module calculates harmonised probabilities of earthquake occurrence and resulting shaking at any given location.

- The risk module calculates damage and direct losses resulting from this damage such as fatalities, injuries and cost of repair. Damage due to strong ground shaking is calculated by combining building vulnerability, population vulnerability and exposure. GEM will furthermore develop remote-sensing and crowd-data collection techniques to classify, monitor and regularly update building inventory and thus regional vulnerability.

- The socio-economic impact module of GEM will provide tools and indices to both estimate and communicate the impact from earthquakes on the economy and society, concentrating in particular on indirect losses. For example the impact on a company's revenue, on budgets, on poverty. The module will allow for calculations of scenarios which that enable cost/benefit analysis of mitigating actions, such as systematic building strengthening, and facilitate insurance and alternative risk transfer.

All of the three modules will be integrated in a common open IT infrastructure, using compatible, validated open-source software. A glossary of key terms used to describe the scientific modules of GEM can be found here.

Output

GEM users and beneficiaries of are broad. They include all those who make decisions based on earthquake risk: (1) governmental and non-governmental agencies / organisations that respond to natural hazards, (2) engineers and builders, (3) risk professionals, (4) large corporations, insurance companies and investment groups, (5) individuals living in earthquake-prone areas; and also include: (6) the scientific community and (7) the general public.

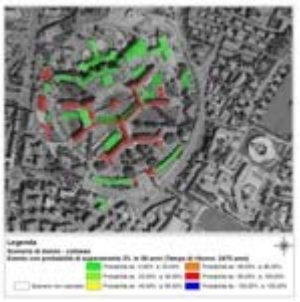
In order to serve this wide spectrum of users, GEM will ensure that products and outputs are accessible and intuitive, while pursuing the highest level of scientific rigor.

- For the non-expert user, seismic risk estimates will be available as maps or graphs in an easily understandable form, helping to raise awareness of seismic risk amongst the general public and to support individual (financial) decisions.

- The risk professional (working for instance in insurance or catastrophe modelling) will be able to access the databases to understand not only how the risk is computed, but also what its underlying uncertainty is. That information enables the organisations they work for to enhance their products and services throughout the world.

- Possibly the most important potential use is in cost / benefit analysis. The tools and data provided by GEM will allow municipalities and national authorities to directly quantify and demonstrate the effects of potential mitigation measures.

Moreover, a multitude of examples of end-user groups are envisioned at global, regional and local levels. For example:



- International bodies will be able to use global scale interactive tools allowing regional comparison as an aid for decision making, including development assistance allocations.

- Investment groups will be able to use local and regional interactive tools for investment decisions.

- Various industries, such as utilities, construction and leisure, will be able to use those same local and regional interactive tools for planning and development of projects.

GEM will enable cost-benefit analysis of risk mitigation actions.

Officials and professionals - like those involved in urban planning- will be able to use that information.

- NGOs and aid agencies will be able to target their programmes and projects to actual needs, basing themselves on realistic and uniform risk information.

- Scientists and engineers around the globe will be able to use the data and tools that GEM provides to enhance (multidisciplinary) scientific research.

Participate in GEM

GEM is a cooperative, public-private effort, structured as a partnership among a diverse group of companies, countries, institutions and organizations.

GEM takes five years and at least €35 million to build its first working model, and has already secured two-third from Public Participants, Private Participants and Regional Programmes.

Additional support is being sought from private industry, governments, public institutions, foundations and academia.

- Country governments, or corresponding representative public institutions can become a Public Participant.

- Private organizations; companies from various industries working with or being influenced by earthquake risk, but also foundations and NGOs can become a Private Participant in GEM.

- International (governmental) organizations and associations can become an Associate Participant.

- Various types of organizations and initiatives, non-governmental, public and private can become a contributor to GEM and support the building of the first global earthquake model, or related activities such as dissemination of results and information.

- Scientific institutes and professionals play an important role in GEM and can become involved in various activities, as contributor or in other ways.

There are numerous reasons to take part in the GEM initiative, which are set forth on the left for each stakeholder group, together with an explanation on the requirements and procedure.

Please click http://www.globalquakemodel.org/node/408 to download the GEM 'Business Plan', which contains more background information, milestones and a financial overview.

Hosting Institution

The GEM Secretariat is hosted at the European Centre for Training and Research in Earthquake Engineering (EUCENTRE), Pavia, Italy. The EUCENTRE is the official dedicated centre in earthquake engineering for the Department of Civil Protection in Italy, and features as its main mission the promotion, sustaining and overseeing of training and research in the field of seismic risk mitigation.

A new building is currently being constructed to house the GEM Secretariat, which is shown in the photo below, between the two current EUCENTRE buildings which house a state-of-the-art earthquake engineering experimental laboratory, "soft" laboratories that include office space to house 8 research sections, a documentation centre, a multimedia auditorium, a classroom and numerous meeting rooms.

Contact

GEM Secretariat is hosted at **EUCENTRE, Pavia, Italy**.
c/o EUCENTRE
Via Ferrata 1
27100 Pavia
Italy
Telephone: +39-0382-516933
E-mail: info@globalquakemodel.org

ΕΞΑΙΡΕΤΑ ΤΕΧΝΙΚΑ ΕΡΓΑ

THE WIDER VIEW: Taking shape, the new bridge at the Hoover Dam

Creeping closer inch by inch, 900 feet above the mighty Colorado River, the two sides of a $160 million bridge at the Hoover Dam slowly take shape.

The bridge will carry a new section of US Route 93 past the bottleneck of the old road which can be seen twisting and winding around and across the dam itself.

When complete, it will provide a new link between the states of Nevada and Arizona. In an incredible feat of engineering, the road will be supported on the two massive concrete arches which jut out of the rock face.

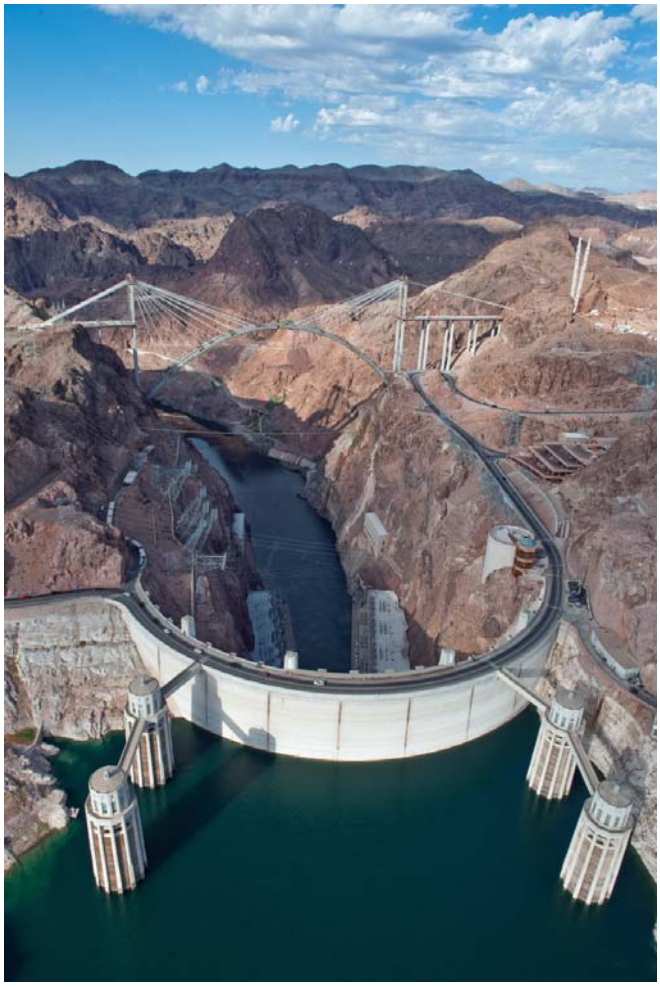
The arches are made up of 53 individual sections each 24 feet long which have been cast on-site and are being lifted into place using an improvised high-wire crane strung between temporary steel pylons.

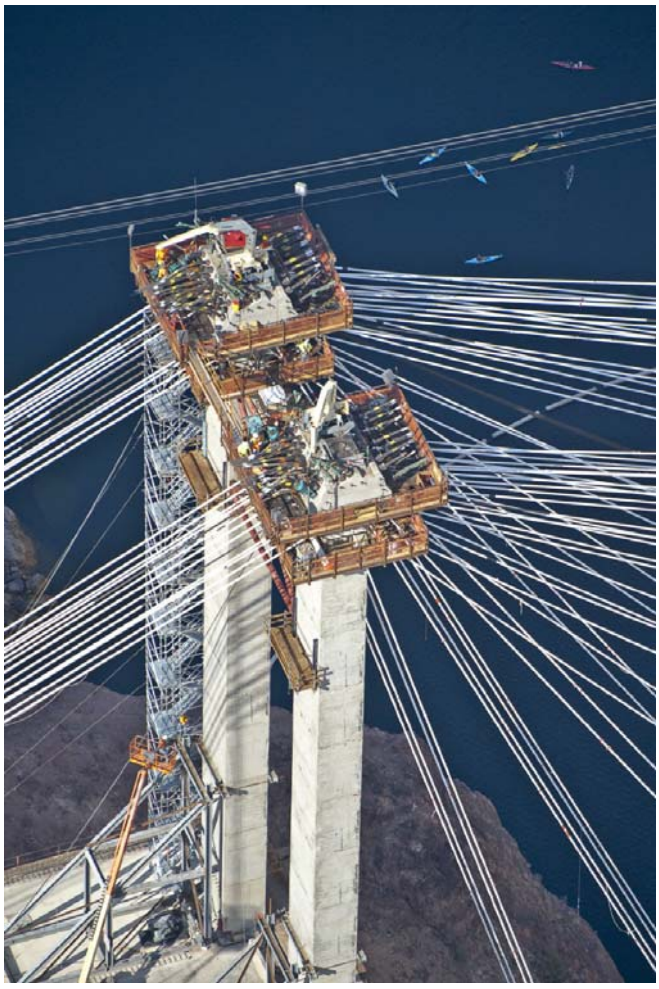
The arches will eventually measure more than 1,000 feet across. At the moment, the structure looks like a traditional suspension bridge. But once the arches are complete, the suspending cables on each side will be removed. Extra vertical columns will then be installed on the arches to carry the road.

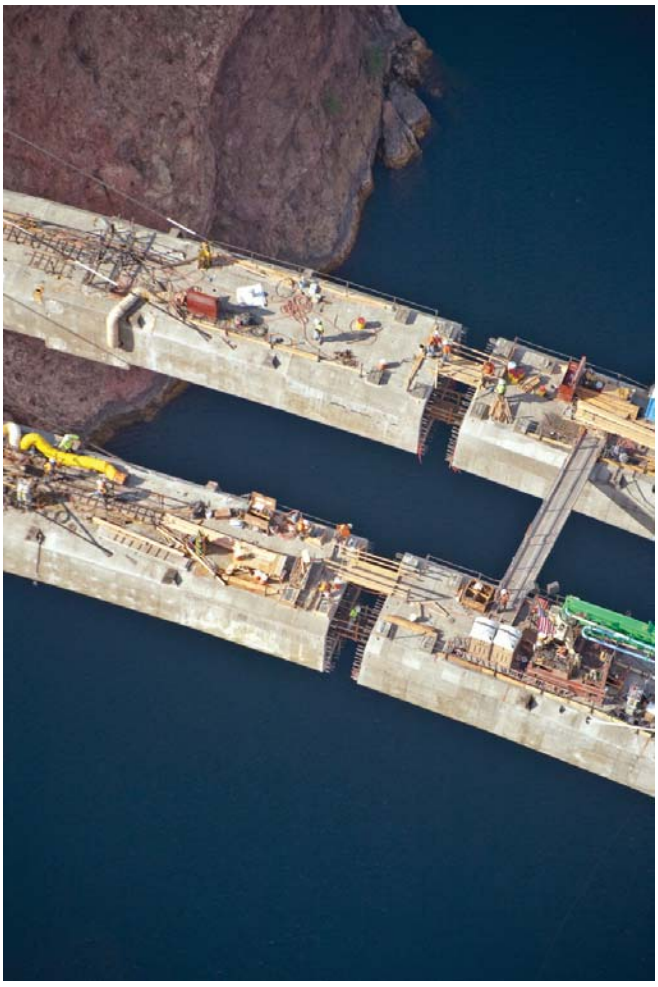
The bridge has become known as the Hoover Dam bypass, although it is officially called the Mike O'Callaghan-Pat Tillman Memorial Bridge, after a former governor of Nevada and an American Football player from Arizona who joined the US Army and was killed in Afghanistan. Work on the bridge started in 2005 and should finish next year. An estimated 17,000 cars and trucks will cross it every day.

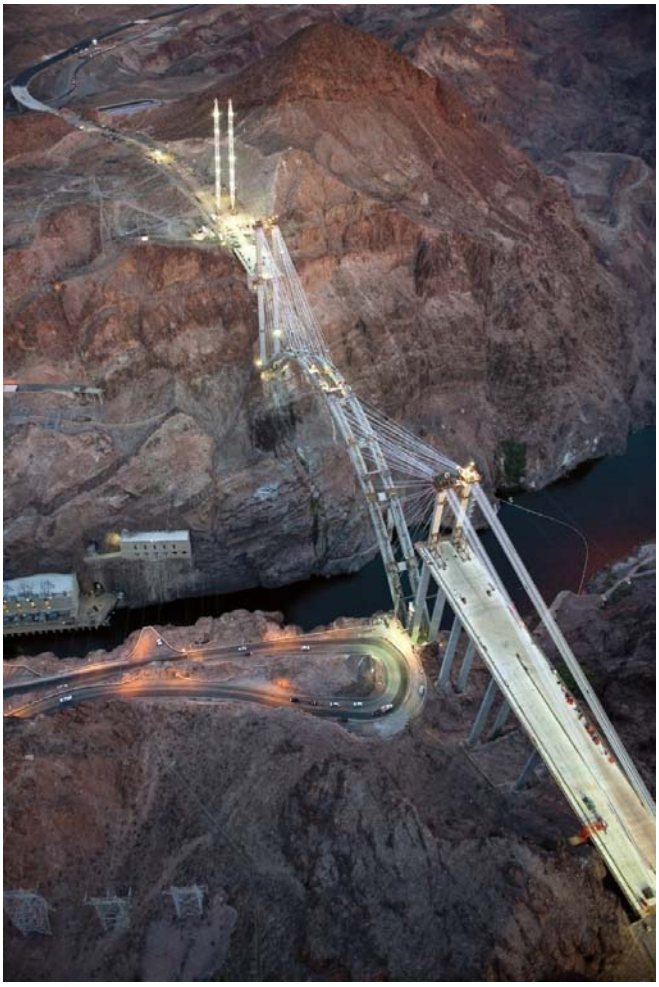
The dam was started in 1931 and *used enough concrete to build a road from New York to San Francisco*. The stretch of water it created, Lake Mead, is 110 miles long and took six years to fill. The original road was opened at the same time as the famous dam in 1936.

An extra note: The top of the white band of rock in Lake Mead is the old waterline prior to the drought and development in the Las Vegas area. It is over 100 feet above the current water level.









Dr. Nicholas Vlachopoulos, PhD, CD, PEng, CME.
Major
Assistant Professor / Professeur Adjoint
Civil Engineering Department / Département du Génie Civil
Royal Military College of Canada / Collège Militaire Royal du Canada
Queen's-RMC Geo-Engineering Centre
Tel: (613) 541-6000 ext 6398
www.rmc.ca, www.geoeng.ca

ΝΕΑ ΑΠΟ ΤΟΝ ΚΟΣΜΟ

Μετά τον σεισμό της Πάρνηθας του 1999 ψηφίστηκε νόμος με τον οποίο ο μηχανικός – μελετητής κτιριακού έργου καθίσταται διά βίου υπεύθυνος για οποιαδήποτε αστοχία συμβή στο έργο. Εκδηλώθηκε μεγάλη αντίδραση από το Τεχνικό Επιμελητήριο Ελλάδος και τους Συλλόγους Μηχανικών, χωρίς, όμως, κάποια επιτυχία. Απόφαση παρόμοια με το νόμο εξέδωσε προσφάτως δικαστήριο των ΗΠΑ με την αφορμή αστοχίας σε γέφυρα, η οποία προκάλεσε τον θάνατο 13 και τον τραυματισμό 145 ατόμων. Η μελέτη της γέφυρας είχε γίνει πριν από 40 περίπου χρόνια!

Judge rules California design company will remain a co-defendant in I-35W bridge collapse lawsuits

A judge on Friday rejected a California design company's attempt to shield itself from lawsuits over the Interstate 35W bridge collapse.

Hennepin County District Judge Deborah Hedlund ruled that Jacobs Engineering Group Inc. will remain a co-defendant in a series of lawsuits.

The Aug. 1, 2007, disaster killed 13 people and injured 145.

Federal investigators blamed the failure on connector plates that were too thin, although they said excessive weight also contributed.

Attorneys for Jacobs, which acquired the company that designed the 1960s-era bridge, claimed that too much time passed for it to be held liable. They argued in June that a state law put a 10-year limit on liability even for structures meant to last a century.

Hedlund said Minnesota lawmakers revised the law in May 2007, removing a look-back window and making the changes retroactive. That justified Jacobs' inclusion in the case, she said.

"Here," Hedlund wrote, "it is not unreasonable, arbitrary or capricious to remove the 10-year repose period for claims for contribution and indemnity in construction defect cases because it prevents defendants from being liable for others' negligence in certain situations."

A Minnesota attorney for the company, Kirk Kolbo, didn't immediately return phone and e-mail messages seeking comment Friday.

More than 100 lawsuits have been filed by victims, the state and the companies themselves.

A state compensation fund paid $37 million to those affected by the collapse, and the state is trying to recover that money.

Two other defendants — engineering firm URS Corp. and paving company Progressive Contractors Inc. — opposed Jacobs' claim of immunity. URS was under a state contract to inspect the bridge, and PCI was resurfacing it at the time of the collapse.

Attorneys for those companies said the bridge wouldn't have fallen if it had been properly designed.

Kyle Hart, attorney for St. Michael, Minn.-based PCI, said the ruling is "good news for everybody but Jacobs."

"Jacobs is a very large company," Hart said. "With them at the table, recognizing they're going to have to answer for what happened, it just increases the amount of money in the potential settlements."

URS, a company with headquarters in San Francisco, had no immediate comment but planned to make one, a spokeswoman said.

The cases have a late 2010 trial date.

(Brian Bakst, Associated Press, August 28, 2009 / ASCE SmartBrief, August 31, 2009)

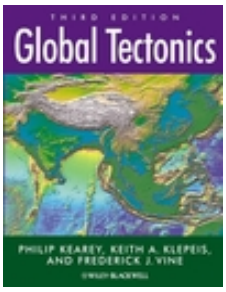
Wine no longer the road to ruin!

Researchers in the Netherlands and Chile are working together on a project that uses grape residues to improve the durability of asphalt concrete. Dutch consultant Altravie is working with the University of Delft in its home country and the Universidad Católica de Chile on the addition of polyphenolic compounds from grape residues to asphalt to retards ageing. These polyphenolic compounds can be found in red wine and are naturally occurring compounds that can help counter the effect on degenerative processes. These normally take place in the human body, leading to the degeneration of tissues and aging. The research suggests that the effects of these compounds are based on their property to absorb free radicals, which are continuously being generated as a result of the action of oxygen. However similar benefits can be seen in asphalt as well according to Altravie, which suggests that free radicals can be generated due to oxygen, UV radiation and mechanically induced stress. With the assistance of the Universidad Católica de Chile (Engineering Faculty and the Faculty of Biological Sciences) in Santiago (Chile), a PhD thesis research project is currently underway, while the Technical University of Delft has also participated in the study. Altravie approached the Chilean university because high quality grape residues are readily available, while the country's wine industry is modern and innovative and the roads can be exposed to high UV radiation impact.

It has been shown that adding polyphenolic compounds can have a positive benefit to the viscosity of the bituminous binder. This development may help extend the working life of asphalt pavements and maintenance schedules could be extended, allowing considerable cost savings as well as minimising traffic disruption. The polyphenols have been produced by treating the residues of grapes after fermentation and pressing during the wine making process. Grape residues from winemaking processes are generally considered waste at present. The patent application process is now underway.

(World Highways, November 23, 2009)

ΝΕΕΣ ΕΚΔΟΣΕΙΣ ΣΤΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΠΙΣΤΗΜΕΣ



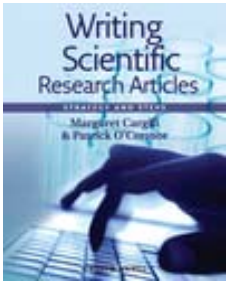
Global Tectonics, 3rd Edition

Philip Kearey, Keith A. Klepeis, Frederick J. Vine

The third edition of this widely acclaimed textbook provides a comprehensive introduction to all aspects of global tectonics, and includes major revisions to reflect the most significant recent advances in the field.

- A fully revised third edition of this highly acclaimed text written by eminent authors including one of the pioneers of plate tectonic theory
- Major revisions to this new edition reflect the most significant recent advances in the field, including new and expanded chapters on Precambrian tectonics and the supercontinent cycle and the implications of plate tectonics for environmental change
- Combines a historical approach with process science to provide a careful balance between geological and geophysical material in both continental and oceanic regimes

(Wiley-Blackwell, February 2009)



Writing Scientific Research Articles: Strategy and Steps

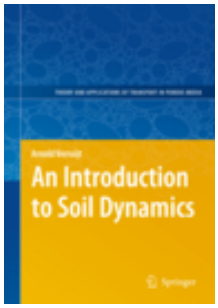
Margaret Cargill, Patrick O'Connor

Writing Scientific Research Articles: Strategy and Steps guides authors in how to write, as well as what to write, to improve their chances of having their articles accepted for publication in international, peer reviewed journals. The book is designed for scientists who use English as a first or an additional language; for research students and those who teach them paper writing skills; and for early-career researchers wanting to hone their skills as authors and mentors. It provides clear processes for selecting target journals and writing each section of a manuscript, starting with the results. The stepwise learning process uses practical exercises to develop writing and data presentation skills through analysis of well-written example papers. Strategies are presented for responding to referee comments, as well as ideas for developing discipline-specific English language skills for manuscript writing. The book is designed for use by individuals or in a class setting.

"Margaret Cargill's background as a linguist and research communications educator and Patrick O'Connor's experience as both research scientist and educator synergize to improve both the science and art of scientific writing. If the authors' goal is to give scientists the tools to write and publish compelling, well documented, clear narratives that convey their work honestly and in proper context, they have succeeded admirably." – Veterinary Pathology, July 2009

"[The book is] clearly written, has a logical step-by-step structure, is easy to read and contains a lot of sensible advice about how to get scientific work published in international journals. The book is a most useful addition to the literature covering scientific writing." – Aquaculture International, April 2009

(Wiley-Blackwell, March 2009)



An Introduction to Soil Dynamics

Theory and Applications of Transport in Porous Media , Vol. 24

Verruijt, Arnold

This book presents the basic principles of soil dynamics, and a variety of solutions of practical interest for geotechnical engineering, geophysics and earthquake engineering. Emphasis is on analytical solutions, often including the full derivation of the solution, and giving the main parts of computer programs that can be used to calculate numerical data. Reference is also made to a website from which complete computer programs can be downloaded. Soil behaviour is usually assumed to be linear elastic, but in many cases the effect of viscous damping or hysteretic damping, due to plastic deformations, is also considered.

Special features are: the analysis of wave propagation in saturated compressible porous media, approximate analysis of the generation of Rayleigh waves, the analysis of the response of soil layers to earthquakes in the deep rock, with a theoretical foundation of such problems by the propagation of Love waves, and the solution of such basic problems as the response of an elastic half space to point loads, line loads, strip loads and moving loads.

- Includes detailed derivations of solutions
- Includes listings of main parts of computer programs
- Computer programs are available from the website http://geo.verruijt.net
- Includes dynamics of porous media

(Springer, 2010)

Materials, Technologies and Practice in Historic Heritage Structures

Bostenaru Dan, Maria; Prikryl, Richard; Török, Ákos (Eds.)

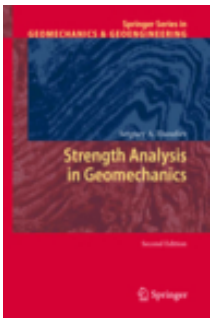
One distinct feature of human society since the dawn of civilization is the systematic use of inorganic building materials, such as natural stone, unburnt and burnt soil, adobe and brick, inorganic binders like lime and cement, and reinforced concrete. Our heritage has cultural, architectural and technological value and preserving such structures is a key issue today. Planners and conservation

scientists need detailed site surveys and analyses to create a database that will serve to guide subsequent actions. One factor in this knowledge base is an understanding of how historic materials were prepared and the crucial properties that influence their long-term behaviour. Any assessment of the way such materials perform must crucially be based on an understanding of the methods used for their analysis. The editors here add to the knowledge base treating the materials used in historic structures, their properties, technology of use and conservation, and their performance in a changing environment. The book draws together 18 chapters dealing with the inorganic materials used in historic structures, such as adobe, brick, stone, mortars, concrete and plasters. The approach is complex, covering material characterisation as well as several case studies of historic structures from Europe, including Germany, Ireland, Italy, Poland, Portugal, Scotland, Slovenia and Spain, and the My Sõn Temples in Vietnam. An equally important component of the book covers the analysis of materials, together with a treatment of sustainable development, such as the protection of monuments from earthquakes and climate change.

The authors are all leading international experts, drawn from a variety of backgrounds: architecture, civil engineering, conservation science, geology and material science, with close links to professional organisations such as ICOMOS or universities and research centres throughout Europe.

Audience: This book will be of interest to geologists, engineers, restorers, consulting engineers, designers and other professionals dealing with cultural heritage and sustainable development. Also graduate students in applied geo-science (mineralogy, geochemistry, petrology), architecture and civil engineering will find interesting information in this book.

(Springer, 2010)



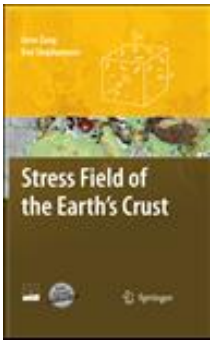
Strength Analysis in Geomechanics

Springer Series in Geomechanics and Geoengineering

Elsoufiev, Serguey A.

The book presents a new approach for the solution of geomechanical problems - it explicitly takes into account deformation and fracture in time, which are neglected in classical methods although these properties create important effects. The method reveals the influence of the form of a structure on its ultimate state. It uses the rheological law which accounts for large strains at a nonlinear unsteady creep, an influence of a stress state type, an initial anisot-ropy and damage. The whole approach takes into account five types of non-linearity (physical as well as geometrical ones) and contains several new ideas. For example, it con-siders the fracture as a process, the difference between the body and an element of the material which only deforms and fails because it is in the structure, the simplicity of some non-linear computations against the consequent lin-ear ones, the dependence of the maximum small strain in dangerous points of the body only on the material.
Professor Elsoufiev included many new solutions of nonlinear geotechnical problems to this second edition.

(Springer, 2010)



Stress Field of the Earth's Crust

Arno Zang and Ove Stephansson

Stress Field of the Earth's Crust is based on lecture notes prepared for a course offered to graduate students in the Earth sciences and engineering at University of Potsdam. In my opinion, it will undoubtedly also become a standard reference book on the desk of most scientists working with rocks, such as geophysicists, structural geologists, rock mechanics experts, as well as geotechnical and petroleum engineers.

That is because this book is concerned with what is probably the most peculiar characteristic of rock – its initial stress condition. Rock is always under a natural state of stress, primarily a result of the gravitational and tectonic forces to which it is subjected. Crustal stresses can vary regionally and locally and can reach in places considerable magnitudes, leading to natural or man-made mechanical failure. Preexisting stress distinguishes rock from most other materials and is at the core of the discipline of "Rock Mechanics", which has been developed over the last century.

Knowledge of rock stress is fundamental to understanding faulting mechanisms and earthquake triggering, to designing stable underground caverns and productive oil fields, and to improving mining methods and geothermal energy extraction, among others. Several books have been written on the subject, but none has attempted to be as all-encompassing as the one by Zang and Stephansson. The present book does not limit itself to just providing a detailed description of the known methods of measuring stress in-situ, and of the different stress fields around the globe. It first presents a detailed and thorough description of the concept of stress, the sources of in-situ stress, and rock failure criteria. These first three chapters are the very foundation of rock mechanics, and could be used as a text for an introductory course in this field. The last three chapters go beyond stress measurements, to describe stress profiles through the Earth's crust, regional stress fields, the World Stress Map, and three recent international field projects in which scientists from many countries collaborated, and in which one of the first priorities was the determination of the state of in-situ stress. These are the KTB, SAFOD, and Olkiluoto projects. The book provides excellent summaries of these major projects, the results of which are otherwise scattered over many publications. These case histories are an invaluable resource to researchers, teachers, and students in the Earth sciences.

The chapters dealing directly with stress measurements are encyclopedic. Each method listed is presented in some detail, accompanied by an exhaustive list of references, so that the reader could dig deep into any of the techniques at the level he/she chooses. The variety of stress measuring methods in practice today is divided logically into borehole- and core-based. Naturally, the more commonly accepted methods, hydrofracturing, overcoring, and borehole breakouts, are given added emphasis, but all methods are treated as equals even if their use at this time is rather rare.

PD Dr. Zang and Prof. Stephansson, who are among the top echelon of in-situ stress researchers and consultants, have produced a much needed book on the state of stress in the Earth's crust, one that complements previous texts, which were considerably more restricted in scope. The book thoroughly and convincingly integrates in-situ stress, its sources, measurement, and applications, into the fields of geophysics, geology, geomechanics, and geoengineering. It

is therefore that I enthusiastically recommend *Stress Field of the Earth's Crust*.

(Springer Netherlands, 2010)

Special Deep Foundation Package Vol I and II: Compendium Methods and Equipment, Drilling Rigs and Duty Cycle Crawler Cranes

A comprehensive guide to the use of duty-cycle crawler cranes for constructing deep foundations is now available to engineers, students and planners.

Publication of Special Deep Foundation: Compendium Methods and Equipment. Volume II: Drilling machines and hydraulic crawler cranes follows the publication last year of Volume I that focused on piling rigs*.

The methods and equipment technology used to construct deep foundations have progressed rapidly in recent years. The selection of the most appropriate method and machinery demands ever more specialized knowledge and practical experience. These two books together comprise an authoritative reference to keep engineers up to speed with the latest developments in the deep foundation industry. They provide a comprehensive overview of ground stabilisation techniques and the equipment options available.

The books are also proving themselves to be valuable in the education of engineers. Professor Mike Vorster of Virginia Tech's department of Civil & Environmental Engineering says: "I use the Liebherr Compendium to great effect in my Construction Means and Methods Class. It gives the students a unique and practical insight into the relationship between the technical challenges of construction and the equipment, used to achieve effective and economical solutions."

The books are the result of intensive collaboration between engineers, technicians, machine manufacturers and users to give the best possible guidance for the planning, design and execution of foundations. They have been edited by leading equipment manufacturer Liebherr-Werk Nenzing GmbH of Nenzing, Austria and foundations specialist BVV Spezialtiefbautechnik Vertriebs GmbH of Munich, Germany. They are published by Wiley (www.wiley.com).

Volume I covers applications of the Liebherr LRB series of piling and drilling. Volume II covers Liebherr's HS duty-cycle cranes and LB traditional rotary drilling rigs.

Each chapter discusses construction techniques and potential applications, along with the associated machine components. The specifics of each method and machine technology are examined in detail, together with technical and economic parameters. High quality photographs and technical diagrams are used extensively throughout.

Topics covered include:

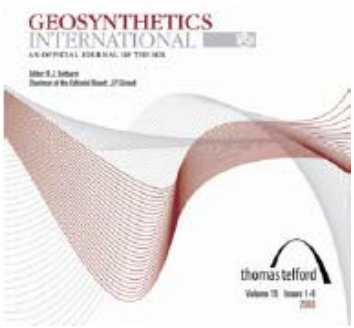
- Drilled piles
- Augered piles - Partial and full displacement augered piles
- Steel beam profiles and steel pipes in bore holes
- Sand and gravel piles, Soil exchange
- Pre-drilling
- Well drilling
- GEWI piles
- High-pressure injection
- Wet-mix pile/MIP pile
- Slurry wall
- Impact driving of steel profiles
- Deep compaction
- Impact driving of steel sheet pile profiles, steel beam profiles and steel pipes
- Impact driving of precast reinforced concrete and pre-stressed concrete driven piles
- Dynamic soil compaction.

(Ernst & Sohn A Wiley Company, 2008)

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ

www.geosyntheticssociety.org

Κυκλοφόρησε το Τεύχος No. 3, του Τόμου 25 του Newsletter της International Geosynthetics Society (Νοέμβριος 2009).



Geosynthetics International

www.thomastelford.com/journals

Κυκλοφόρησαν τα τεύχη αρ. 4, 5 και 6 του 16ου τόμου (Αύγουστος, Οκτώβριος και Δεκέμβριος 2009) του περιοδικού Geosynthetics International. Πρόσβαση μέσω της ιστοσελίδας www.icevirtuallibrary.com/content/issue/gein.

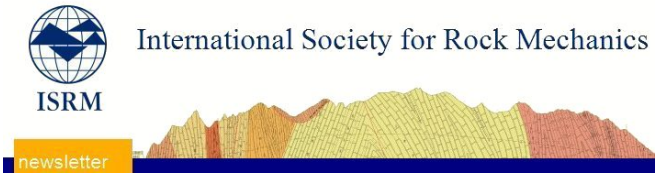
Geotextiles & Geomembranes

www.geosyntheticssociety.org/journals.htm

Κυκλοφόρησαν τα τεύχη αρ. 5 και 6 του 27ου τόμου (Οκτώβριος και Δεκέμβριος 2009) του περιοδικού Geotextiles & Geomembranes. Πρόσβαση μέσω της ιστοσελίδας www.sciencedirect.com/geotexmem/journal.

www.geoengineer.org

Κυκλοφόρησε το Τεύχος #60 του Newsletter του Geoengineer.org (Δεκέμβριος 2009) 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).



www.isrm.net/adm/newsletter

Κυκλοφόρησε το Τεύχος No. 8 - Δεκέμβριος 2009 Newsletter της International Society for Rock Mechanics.

International Journal of the Japanese Committee for Rock Mechanics (IJJCRM), quick double-blind-peer-reviewed online journal, welcomes research manuscripts that contribute to developments in the fields of Rock Mechanics and Rock Engineering. The manuscripts may be categorized into Review or Issue papers, Technical Note, or Discussion.

The researchers and the engineers who have ISRM (International Society for Rock Mechanics) membership or JCRM student membership can have a right to submit their own articles to this journal. Each article accepted will be published with a PDF format in chronological order immediately

after the review and publication processes are completed. Downloading of all the articles is completely free.

Please visit our website (http://rocknet-japan.org/journal/journal_top.html) and download the articles of interest as many as you wish.

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Πολυτεχνειούπολη Ζωγράφου
15780 ΖΩΓΡΑΦΟΥ

Τηλ. 210.7723434
Τοτ. 210.7723428
Ηλ-Δι. secretariat@hssmge.gr ,
geotech@central.ntua.gr
Ιστοσελίδα www.hssmge.org (υπό κατασκευή)

«ΤΑ ΝΕΑ ΤΗΣ ΕΕΕΕΓΜ» Εκδότης: Χρήστος Τσατσανίφος, τηλ. 210.6929484, τοτ. 210.6928137, ηλ-δι. pangaea@otenet.gr

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