Σύνθεση πολλών φωτογραφιών στο φημισμένο Giant's Causeway της Βόρειας Ιρλανδίας. Η περιστροφή της γης αποτυπώνει τα αστέρια σε κύκλους (Royal Observatory)

Αρ. 66 – ΙΟΥΝΙΟΣ 2014 - Β

ΕΛΛΗΝΙΚΗ ΕΠΙΣΤΗΜΟΝΙΚΗ ΕΤΑΙΡΕΙΑ ΕΔΑΦΟΜΗΧΑΝΙΚΗΣ & ΓΕΩΤΕΧΝΙΚΗΣ ΜΗΧΑΝΙΚΗΣ

Τα Νέα της Ε Ε Ε Ε Γ Μ

66

Π Ε Ρ Ι Ε Χ Ο Μ Ε Ν Α

ΣΠΗΛΙΟΣ ΑΣΠΡΟΥΔΑΣ

Ο Σπήλιος Ασπρούδας – σύζυγος, πατέρας, φίλος, συνάδελφος, μέντορας και ιδρυτής της Σ. ΑΣΠΡΟΥΔΑΣ & ΣΥΝΕΡΓΑΤΕΣ Ε.Ε. – έφυγε από κοντά μας την Κυριακή 18 Μαΐου 2014.

Γεννιέται στις 29 Αυγούστου 1948 στην Πάτρα. Μετά την αποφοίτησή του από το 1ο Γυμνάσιο Αρρένων Πατρών το 1967 φεύγει για σπουδές στην Αμερική με εφόδια μόνο μερικά δολλάρια και πολύ θέληση, πείσμα, και μεγάλες βλέψεις.

Με μεγάλες οικονομικές δυσκολίες φοιτά ξανά στην τελευταία τάξη του Λυκείου στο New Jersey. Γίνεται δεκτός στο West Virginia Tech απ' όπου αποφοιτά το 1971 με Bachelor of Civil Engineering με τιμητικές διακρίσεις από το American Road Builder's Assoc., διεκδικώντας συγχρόνως την ευκαιρία να ταξιδέψει σε πολλές πολιτείες της Αμερικής επισκεπτόμενος τα μεγάλης κλίμακας έργα του Υπουργείου Δημοσίων Έργων αλλά και μεγάλες ιδιωτικές εταιρείες και βιομηχανίες που εξειδικεύονταν στον τομέα της οδοποιΐας.

Από το 1971 έως το 1973 εργάζεται στο τμήμα οδοποιΐας του Υπουργείου Δημοσίων Έργων των Η.Π.Α..

Στη συνέχεια πραγματοποιεί μεταπτυχιακές σπουδές στις Αριθμητικές Μεθόδους, την Εδαφομηχανική και τις Θεμελιώσεις υπό την εποπτεία μερικών από τους πιό ονομαστούς καθηγητές του χώρου στο Virginia Polytechnic Institute and State University και το 1975 αποκτά δίπλωμα Master of Science.

Το ίδιο έτος επιστρέφει στην Ελλάδα και υπηρετεί τη στρατιωτική του θητεία. Στη συνέχεια, αναχωρεί για την πόλη Bregga της Λιβύης, με την K&S Geotechnical Cons. Eng., αναλαμβάνοντας το σχεδιασμό, την επίβλεψη και τον έλεγχο των γεωτεχνικών έργων της ESSO Standard Libya. Από το 1976 ως το 1980, συνεργάζεται με την εταιρία FRANK E. BASIL Inc. στην μελέτη και κατασκευή έργων υποδομής στη Σαουδική Αραβία και την Αίγυπτο.

Το 1980, προβλέποντας την ανάγκη υποστήριξης στον τομέα της γεωτεχνικής μηχανικής στη γοργά αναπτυσσόμενη Ελλάδα της εποχής, ιδρύει την εταιρεία Σ. ΑΣΠΡΟΥΔΑΣ και αναλαμβάνει ως τεχνικός γεωτεχνικός σύμβουλος, τον προγραμματισμό, την εκπόνηση και την αξιολόγηση γεωτεχνικών μελετών στη Σαουδική Αραβία, για λογαριασμό της εταιρίας ABA BUTAIN, OMMAR JAZZAR μέχρι το 1985.

Από το 1988 συνεργάζεται με την Ύπατη Αρμοστεία του ΟΗΕ για τους πρόσφυγες (UNHCR) για τη σύνταξη προγραμμάτων - προϋπολογισμών για την κατασκευή και συντήρηση έργων υποδομής σε χώρες της Αφρικής.

Το 1995, η εταιρία μετονομάζεται σε Σ. ΑΣΠΡΟΥΔΑΣ & ΣΥΝΕΡΓΑΤΕΣ Ε.Ε., ενώ παράλληλα, το 1998, προχωρά στην ίδρυση της εταιρίας GEOSTIRIXIS, με αντικείμενο την κατασκευή ειδικών θεμελιώσεων και αντιστηρίξεων, υποθεμελιώσεων, αντιμετώπιση καθιζήσεων κ.α.

Μέσα σε λίγα μόνο χρόνια, βασιζόμενος στην εμπειρία του ίδιου και των συνεργατών του, καταφέρνει το όνομα Σ. ΑΣΠΡΟΥΔΑΣ & ΣΥΝ. να είναι συνώνυμο της αξιοπιστίας και της ειδίκευσης στην αντιμετώπιση απαιτητικών γεωτεχνικών συνθηκών.

Ο Σπήλιος ήταν λάτρης της φύσης και της θάλασσας, και αφιέρωνε τον ελάχιστο ελεύθερο χρόνο του στην ιστιοπλοΐα με τα αγαπημένα του πρόσωπα. Αφήνει πίσω του τη γυναίκα του Σοφία Σύρκου – Αρχιτεκτονα Μηχανικό, και τις κόρες του Παναγιώτα, Πολιτικό Μηχανικό - Εδαφομηχανικό, και Ειρήνη, Αρχιτέκτονα - Πολεοδόμο, με τη βαριά κληρονομιά του ονόματός του και του έργου του, το οποίο θα συνεχίσουν με τιμή, όπως άλλωστε ήταν και το όνειρο του ίδιου.

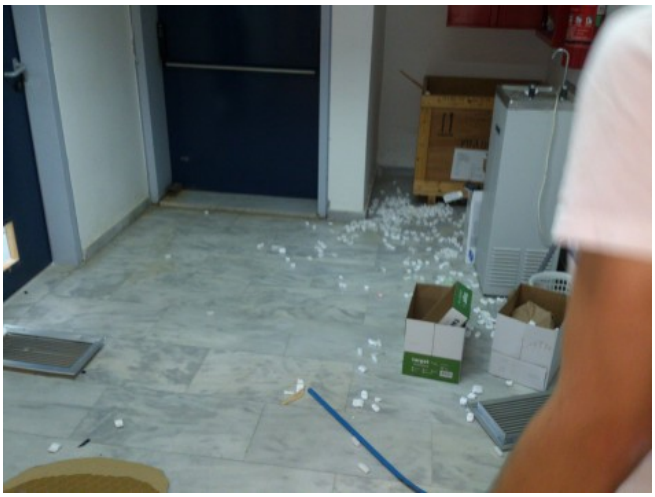
Αγαπημένε μας Σπήλιο, καλές πλεύσεις...

Νάγια Ασπρούδα

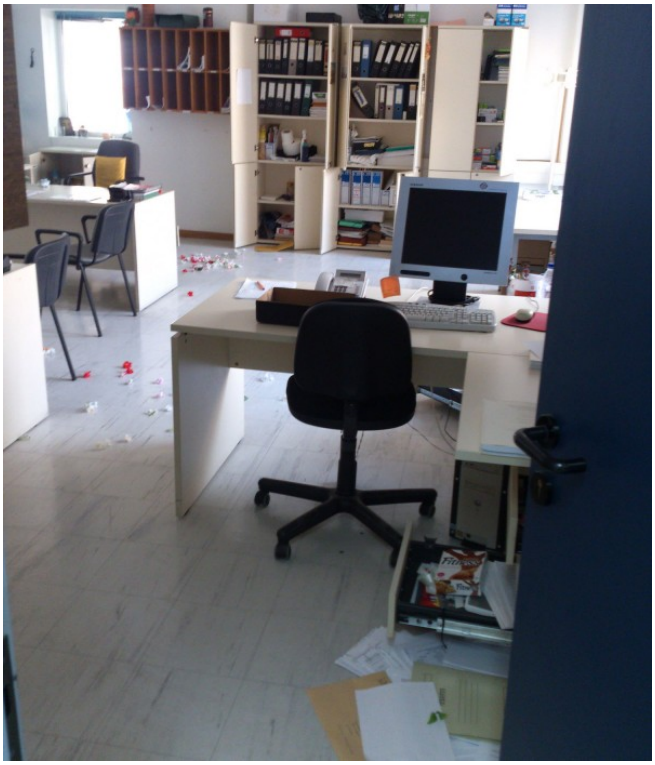
Γυαλιά καρφιά το τμήμα Γεωτεχνικής του Πολυτεχνείου – Βανδαλισμούς καταγγέλλει καθηγητής του ΕΜΠ

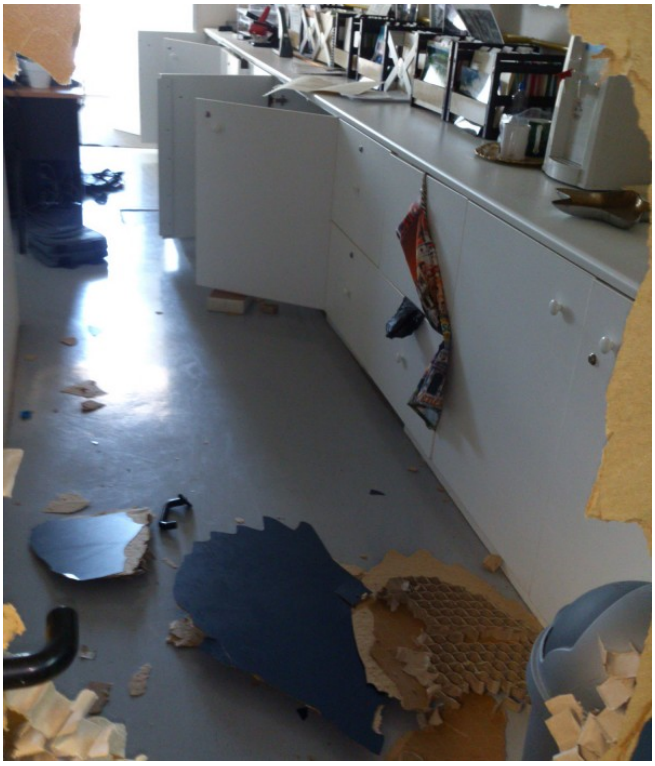
- "Πόλεμος" σε εξέλιξη στο Πολυτεχνείο
- Άγνωστοι βανδάλισαν τα ξημερώματα το τμήμα Γεωτεχνικής στη Σχολή Πολιτικών Μηχανικών
- Στη δημοσιότητα φωτογραφίες και video από τις κατεστραμμένες αίθουσες
- "Πηδάμε τα κάγκελα για να μπούμε στη σχολή! Θέλουν να μας περάσουν κλίμα τρομοκρατίας", λέει στο NewsIt καθηγητής του ΕΜΠ
- Μήνυση κατ' αγνώστων καταθέτει ο πρόεδρος της σχολής
- Κλειστό για τρίτη εβδομάδα το ΕΜΠ λόγω απεργίας των διοικητικών
- Εισαγγελική παρέμβαση για τον αποκλεισμό της εισόδου του Πολυτεχνείου

Εικόνες καταστροφής αντίκρισαν όσοι βρέθηκαν το πρωί της Τετάρτης στη τμήμα Γεωτεχνικής της Σχολής Πολιτικών Μηχανικών του Πολυτεχνείου, όπου συνεχίζεται η απεργία των διοικητικών υπαλλήλων και το εξάμηνο για τους φοιτητές κινδυνεύει να χαθεί οριστικά.



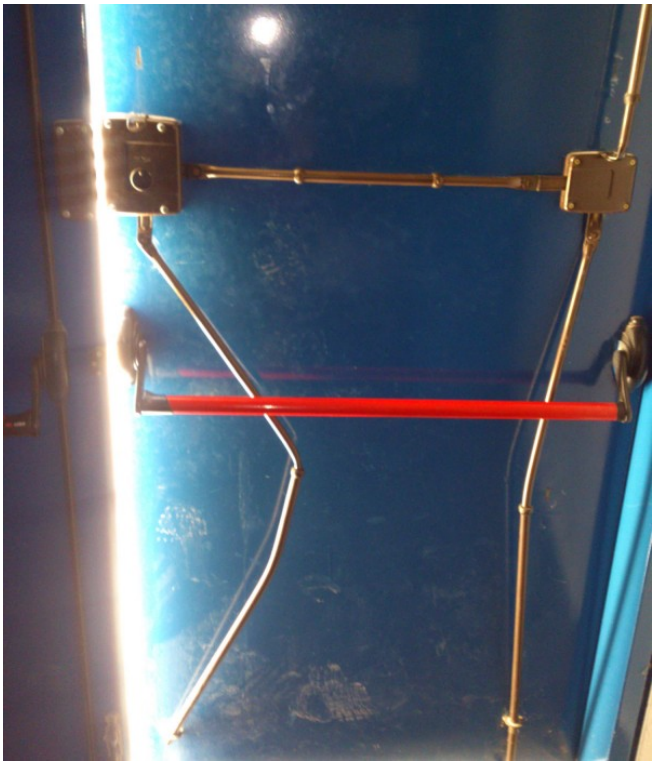
Όπως καταγγέλλει στο NewsIt ο καθηγητής του ΕΜΠ, Γιώργος Γκαζέτας, οι βανδαλισμοί έγιναν από τις 21:30 το βράδυ της Τρίτης μέχρι σήμερα το πρωί που πήγε η καθαρίστρια και αντίκρισε ένα... χάος.



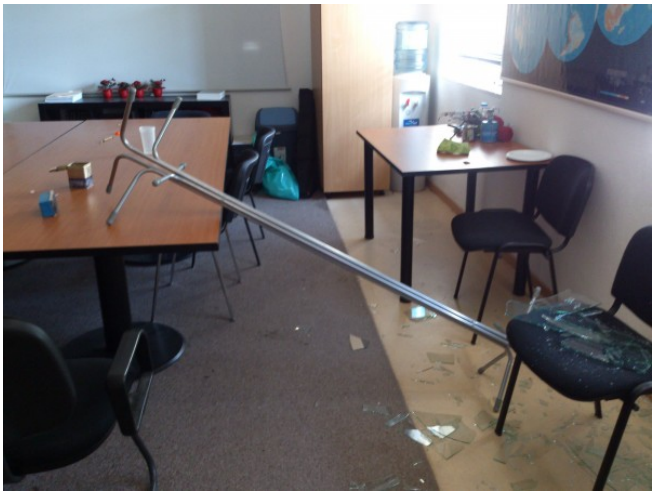


Εκείνη ήταν που ειδοποίησε τον πρύτανη και τους καθηγητές. Ο πρόεδρος της Σχολής, μάλιστα, καταθέτει μήνυση κατ' αγνώστων.

Όταν ο πρόεδρος και καθηγητές βρέθηκαν στη σχολή αντίκρισαν κατεβασμένες σιδεριές, παραβιασμένες πόρτες, κατεστραμμένους υπολογιστές και τζάμια σπασμένα. Μάλιστα, έδωσαν στη δημοσιότητα φωτογραφίες αλλά και video από τις καταστροφές.



«Για μένα, το πιο σημαντικό δεν είναι μόνο το κόστος των ζημιών αλλά το κλίμα τρομοκρατίας που θέλουν να μας περάσουν» είπε στο NewsIt ο κ. Γκαζέτας, καθηγητής του τμήματος τα τελευταία 35 χρόνια. «Είναι βαθιά αντιδημοκρατικο να απαγορεύουν σε εμένα και τους φοιτητές που θέλουμε, να μπούμε μέσα».



Ο ίδιος καταγγέλλει πως κατά τη διάρκεια της απεργίας στο ΕΜΠ, καθηγητές και φοιτητές αναγκάστηκαν να πηδήξουν κάγκελα για να μπουν στη σχολή από τις πλαϊνές εισόδους, αφού από τις κύριες που είχε απαγορευτεί.

https://www.youtube.com/watch?v=jqUa6Ba2LJ0

Ακούστε τι είπε στο NewsIt ο Γ. Γκαζέτας:
http://www.newsit.gr/default.php?pname=Article&art_id=313023&catid=3

(NewsIt, 02.07.2014)

Παράπλευρη απώλεια της διάρρηξης του κτηρίου του Τομέα Γεωτεχνικής, ήταν και το σπάσιμο του λουκέτου και της κλειδαριάς της βιβλιοθήκης με τα οικονονικά αρχεία της 4ΕΓΜ (η οποία πρόσφατα μετακινήθηκε από το πρώην γρα-φείο της 4ΕΓΜ σε διάδρομο του κτηρίου του Τομέα). Μάλλον δεν λείπει κάτι από το περιεχόμενο.

Αναφορά διάρρηξης με εκτεταμένες κλοπές υλικού και φθορές εγκαταστάσεων

2 Ιουλίου 2014

Από: Μιχάλη Καββαδά

Προς: Γιάννη Γκόλια, Κοσμήτορα της Σχολής Πολιτικών Μηχανικών ΕΜΠ

Κοιν : καθ. Κ. Σ. Σιμόπουλο, Πρύτανη ΕΜΠ
Διευθυντές Τομέων της Σχολής Πολιτικών Μηχανικών ΕΜΠ
Μέλη ΔΕΠ του Τομέα Γεωτεχνικής ΕΜΠ

Σας ενημερώνω ότι σήμερα το πρωί (2 Ιουλίου 2014), περί ώρα 9:00πμ ενημερώθηκα τηλεφωνικώς από τον Κοσμήτορα (ο οποίος μου είπε ότι ενημερώθηκε από την καθαρίστρια του κτιρίου) ότι σήμερα το πρωί η καθαρίστρια διαπίστωσε ίχνη διάρρηξης στο κτίριο Γεωτεχνικής της Σχολής Πολιτικών Μηχανικών.

Μετέβην αμέσως στο κτίριο και διαπίστωσα ότι έχει γίνει διάρρηξη με θραύση της πόρτας στο εργαστήριο του Β Υπογείου, διάρρηξη θυρών στα εργαστήρια και γραφεία του Α Υπογείου και σε αρκετά γραφεία του ισογείου (μεταξύ των οποίων και το δικό μου).

Μια αρχική αποτίμηση των ζημιών είναι ότι εκλάπησαν αρκετοί φορητοί υπολογιστές και βιντεοπροβολείς που χρησιμοποιούντο για την διενέργεια των διαλέξεων και πιθανόν και άλλα υλικά.

Ειδοποίησα αμέσως την ασφάλεια του ΕΜΠ η οποία με ενημέρωσε ότι πρέπει να μεταβώ στο Αστυνομικό Τμήμα Ζωγράφου και να καταθέσω μήνυση κατ' αγνώστων, πράγμα που προτίθεμαι να πράξω αμέσως. Δεν γνωρίζω τον τρόπο που η Σήμανση θα εισέλθει εντός του (κλειστού) ΕΜΠ, αλλά αυτό δεν είναι δική μου αρμοδιότητα.

Τέλος, σας ενημερώνω ότι λόγω της κλοπής των ανωτέρω υλικών (π.χ. εκλάπη ο δικός μου φορητός υπολογιστής και βιντεοπροβολέας που χρησιμοποιώ για τα μαθήματα, αλλά και αντίστοιχα υλικά αρκετών συναδέλφων) δεν είναι δυνατή η διενέργεια των διαλέξεων των μαθημάτων ακόμη και εάν «ανοίξει» το Ίδρυμα εφόσον δεν αντικατασταθούν αμέσως.

Με εκτίμηση,

Μ. Καββαδάς
Αναπλ. Καθηγητής ΕΜΠ
Διευθυντής του Τομέα Γεωτεχνικής

ΑΡΘΡΑ

Frozen Earth

Joseph A. Sopko and Robert R. Chamberland

ARTIFICIAL GROUND freezing to provide temporary earth support and ground water control for the construction of deep shafts has been used in the mining and civil construction industry since the late 1800s. The process of converting the pore water within a soil to ice creates a strong, impermeable material with properties similar to low strength concrete.

The applications of ground freezing can generally be divided into three different types or variations of these types: shafts, tunnels and large-scale groundwater barriers. Regardless of the application, the process is relatively standardised. A series of closed end freeze pipes, ranging in diameter from 76 to 114mm are drilled and installed around the perimeter of the proposed excavation. The pipes are drilled with a variety of site-suitable drilling methods, mud rotary, casing advancers and resonant sonic are the most common. Regardless of the method, it is necessary to keep the borehole open during the installation process of the freeze pipes.

The freeze pipes are typically steel, although current research is evaluating the feasibility of other materials. Within the steel freeze pipe, smaller diameter down pipe or feed pipe is installed as shown in Figure 1. The circulating coolant, or bine, is pumped down this inner pipe using a specially made pipe head also illustrated in Figure 1. Once each individual freeze pipe is installed it is both pressure tested and surveyed for verticality using gyroscopic survey equipment. It is imperative that reasonable alignment between adjacent pipes be maintained. Excessive spacing between pipes can extend the freezing time significantly, and in cases of very large spacing prevent freezing altogether.

The circulating brine is actually a secondary coolant which is contained in a closed loop and refrigerated in a heat exchanger that using refrigerant gases such as anhydrous ammonia as a primary refrigerant. The refrigeration plants are electrically powered and can be installed on mobile trailers or built in permanent installations for larger or long-term applications. The brine circulates through the pipe, back to the refrigeration plant in a completely closed loop. No chemicals or gases arc injected into the ground or released at ground surface. In cases where very rapid or flash freezing is required on small isolated areas, liquid nitrogen can be pumped into the freeze pipe and the nitrogen gas released directly into the atmosphere, this specialized application warrants consideration in a separate article.

The brine is cooled to temperatures of -25°C or colder and pumped at flow rates to ensure that sufficient heat transfer is occurring. It is important to note that this process is extracting heat from the ground, not injecting cold, in a similar manner as a well extracts groundwater. The heat that is extracted from the ground is expelled to the atmosphere via an evaporative condenser within the refrigeration plant.

As heat is extracted from the ground, cylinders of frozen earth form around each pile and continue to increase in size. These cylinders eventually overlap each other forming the groundwater barrier.

As the frozen mass increases in size with time, its temperature continues to decrease and a structural frozen earth barrier is formed. Frozen earth strength increases substantially when the temperature is lowered. Like concrete however, frozen soil is only strong when in a compressive stress state and exhibits very little, if any tensile strength. Because of the lack of any significant tensile strength, designers of ground freezing systems create structures that are essentially circular keeping the stresses in a totally compressive stale.

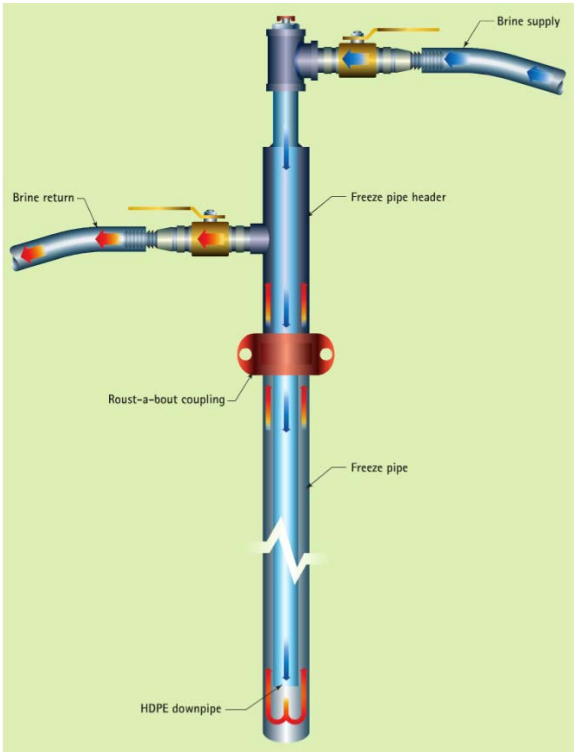
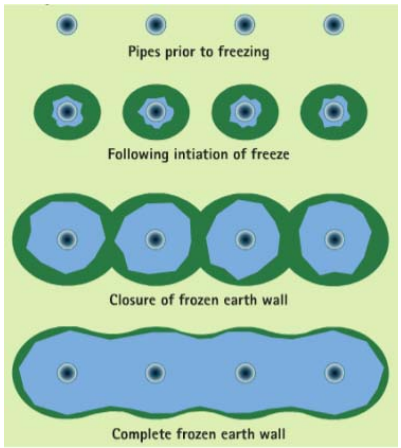
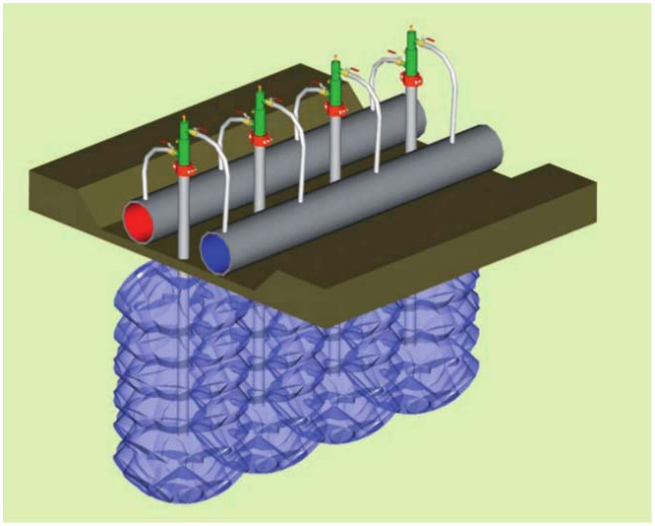


Figure 1. Typical freeze pipe header

Unfortunately, project constraints do not always allow for purely cylindrical frozen earth structures. Even elongating the structure to an ellipse doesn't always fit the project constraints. In recent years, ground freezing has been used extensively on projects in congested urban areas where straight sections of frozen walls are required. Areas between adjacent structures close lo underground subways and utility tunnels do not permit the simplicity of designing purely compression, circular frozen earth cofferdams. In such cases, the frozen wall has straight sections and tension stresses develop. Reinforced steel can be used lo accommodate the low tensile strength of frozen earth tension zones within the frozen mass.



Figures 2a. Freeze wall formation.



Figures 2b. Freeze wall

Background

The use of steel reinforcements was evaluated and studied extensively in the 1900s by researchers at Michigan Slate University, East Lansing, Michigan. The research, headed by Professor Orlando B. Andersland, Ph.D., has been well document (Andersland and Sopko. 1990). A field application of the technology was used on the Cross Town 8 Tunnel in Milwaukee, Wisconsin. Figure 3 illustrates the CT-8 frozen structures that are a series of four circular or elliptical cofferdams joined tangentially.

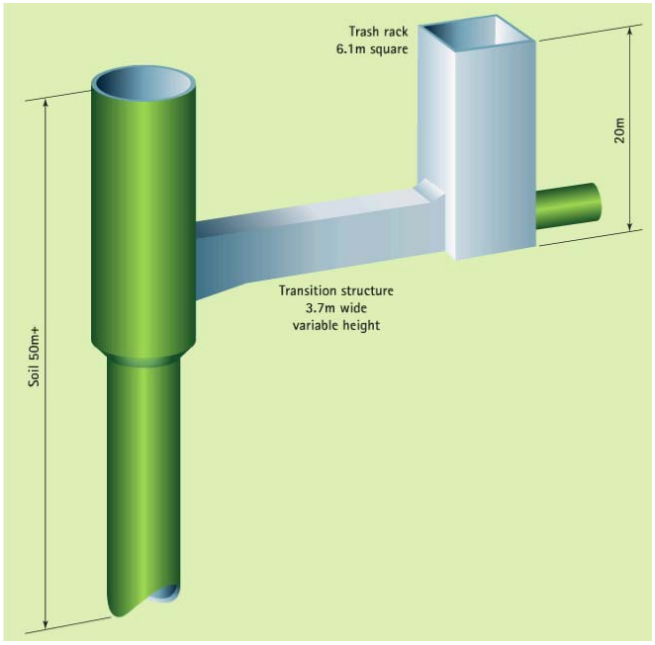


Figure 3a. CT-8 underground structures

To construct the drop shaft and ancillary structures it was necessary to mine rectangular openings between adjacent ellipses. These openings created tensile stresses which could not be supported with frozen earth only, hence the need for steel reinforcing members on each side of the opening as shown in Figure 4.

Reinforced frozen earth was used again on the North Shore 10 project in Milwaukee in 1988. NS-1O was similar in shape to CT-8. The technology was not used in the United States until 2006, once again in Milwaukee on the Harbor Siphons project.

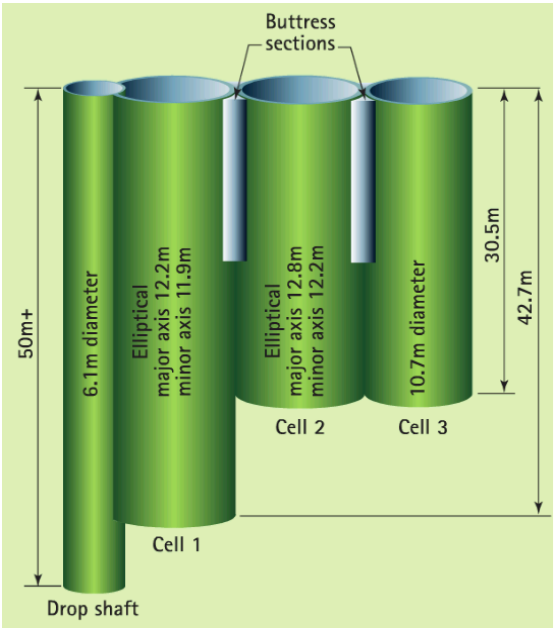


Figure 3b. CT-8 tunnel frozen structures

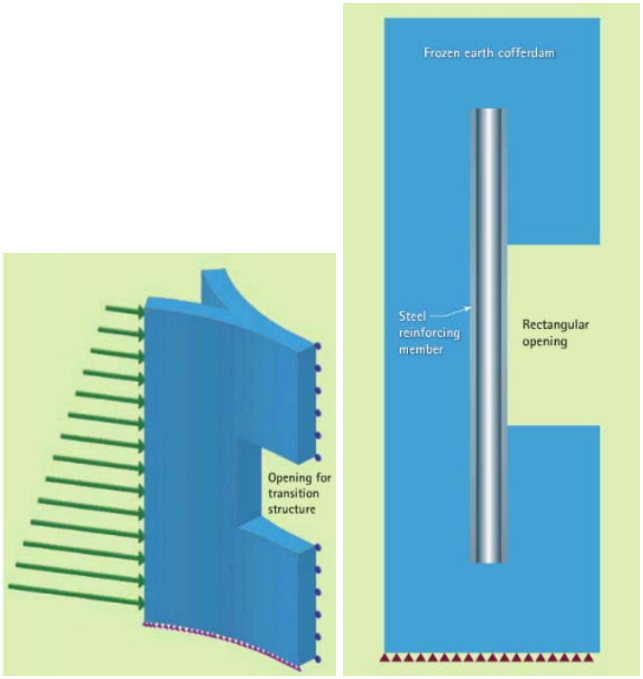


Figure 4a (left). Buttress section; and 4b (below), Steel reinforcement

In the cases of each of the three projects, the concept of tangential frozen earth cofferdams permitted the construction of elongated structures that without reinforcement would have to be constructed in a very large circular shaft. In all three cases, project site constraints prohibited a large single excavation.

The design of the reinforced frozen earth structures is more complex and described by Sopko (1990). In addition to the conventional frozen earth compression tests, tension tests and 'pullout' tests can be conducted. The tension tests are typically not needed since the tension strength is typically neglected. The 'pullout' tests are used to evaluate the strength of the frozen bond between the soil and steel reinforcing. Once the material properties are evaluated analysis can proceed using several different numerical solutions.

Current Applications

The previous work on reinforced frozen earth was a combination of laboratory testing, engineering analysis and field observation and measurement.

With the confirmation of the engineering, as well as the means and methods, there are two more advanced applications of reinforced Frozen earth currently being proposed on tunneling projects on the East Coast.

Frozen Soil Lagging

Frozen soil lagging is an approach where conventional soldier piles are drilled and installed, in the same method as used on wooden lagging systems. The only difference is that a pipe sleeve is welded onto the steel beam to allow the drilling of a freeze pipe through the sleeve deep into an impermeable subsurface stratum as shown in Figure 5.

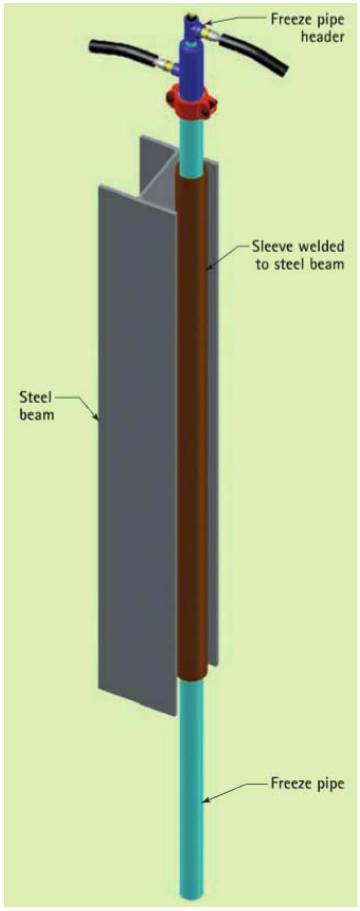


Figure 5. Frozen soil lagging

The wood lagging is replaced by a series of two to four freeze pipes arranged in small compression arches as shown in Figure 6. Each of these small arches reacts against the soldier pile that is braced across the excavation. Using this approach the frozen soil is kept entirely in compression. The advantage of this system is that the frozen soil, unlike wooden lagging provides an impermeable barrier, eliminating the need for any dewatering.

As the face of the frozen soil is excavated, it is necessary to insulate the exposed frozen earth. Typically, a layer of five to ten centimeters of polyurethane insulation is sprayed on a mesh fabric installed on the face of the frozen soil. Unlike the conventional soldier pile and wood lagging system, frozen soil is subject to long-term creep deformation. Attention must be paid to the concentrated stress zone where each individual arch reacts against the soldier piles.

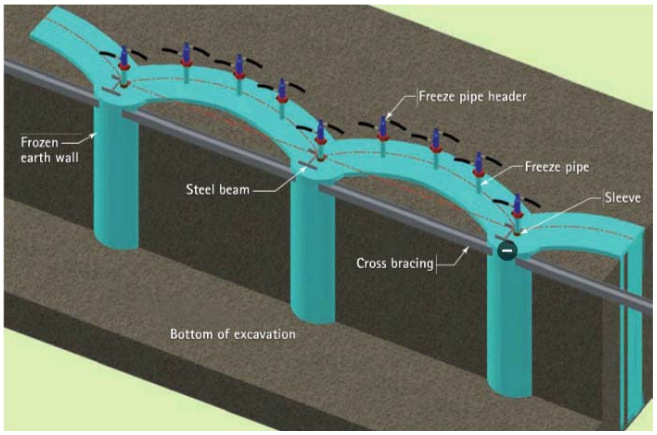


Figure 6.Compression arches

Frozen soil laboratory tests must be conducte to evaluate the creep susceptibility of the particular soil. Research has shown however, that creep deformation can be reduced significantly when the temperatures are lowered. The average design temperature for frozen earth structures is typically -10°C. The purpose of the sleeve and freeze pipe at each pile is to keep the pile temperature as cold as possible.

The circulating calcium chloride brine is -25°C or colder. Creep deformations are substantially reduced at this temperature.

Reinforced Frozen Wall

Another proposed application of reinforced frozen earth is a straight, reinforced wall. Similar to the theory behind reinforce concrete, a straight frozen earth wall is installed as shown in Figure 7.

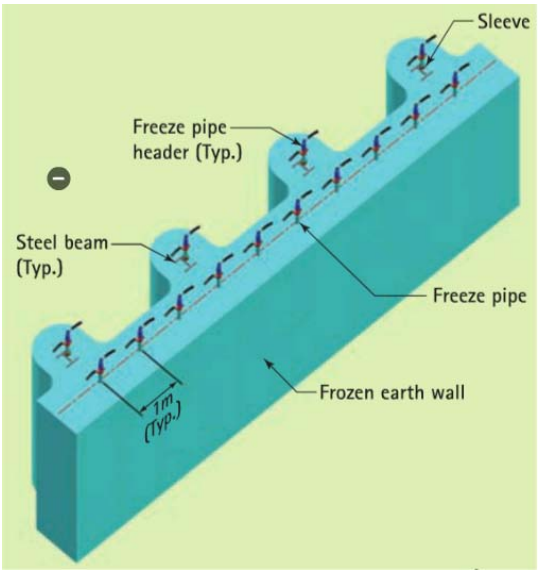


Figure 7. Reinforced frozen wall

As previously explained, frozen earth has very little or no tensile strength. For this reason, cantilevered, straight walls are not practical, as they cannot support deep excavations. The purpose of the steel reinforcing is to act just like the reinforcing steel in a concrete beam.

As with the frozen soil lagging, a sleeve is welded to a steel beam prior to installing the beam into the ground. The beam is off set from the line of freeze pipes forming the impermeable barrier as illustrated.

The frozen earth wall acts essentially as a cantilever structure, with tensile stresses developing on the side of the frozen wall opposite the excavation. The steel beam relying on the ad-freeze bond against the soil acts at a reinforcing element and provides the necessary tensile strength of the frozen wall.

As with the frozen lagging concept, installing the freeze pipe within the beam results in a very cold contact surface, significantly increasing the ad-freeze bond.

Summary

The application of the Michigan State University research to the project in Milwaukee, including the recent Harbor Siphons Tunnel permitted the construction of frozen earth structures at locations that otherwise could not be completed due to project site constraints.

The measured field performance confirmed the design technique required for reinforced frozen earth. The success of these projects has enabled Maretrench to move forward with this technology on upcoming projects in Washington, D.C. and other locations on the East Coast.

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Tunnels & Tunnelling, International Edition, January 2014, pp. 35-39.

Service for Life
(The Second Coen Tunnel)

Coen van der Vliet, ARCADIS Nederland BV, Frederik Deurinck, SA Besix NV, Remeo Lensen, ARCADIS Nederland BV, Gerrie Jonkheijm, CFE

The Second Coen Tunnel has been constructed in a close proximity of only 10 to 15m to the east of the existing Coen Tunnel. This immersed tube tunnel has to bear heavy loads during the service life. The governing design scenarios however are the transport by sea and the impact of a sunken ship. This article goes into the tunnel's service life, and covers the structural behavior of the immersed tunnel and the precautions against fire.

AN ADDITION to the transport situation, the service life also imposed requirement on the design of the Second Coen Tunnel, in this phase, the tunnel lies on a elastic support. The tunnel is loaded by soil and water and is also exposed to physical working environment risks during operation such as a dropped anchor or a sunken ship.

Beam Action

As explained in the previous article (see Tunnels International, November 2013, pp. 22-26), due to the weak foundation applied with the sand-flow method, the tunnel will not be evenly supported over its whole length.

Besides this, the profile of the canal bed, banks and dykes will cause irregular permanent loadings, while under a heavily-sailed route like the North Sea Canal, account also has to be taken of the local loading of a sunken ship.

If the tunnel is considered as a abeam on the canal bed, the uneven loading and bedding cause transverse forces and moments, with the associated deformations.

Two extremes are possible. In a stiff beam, no deformation differences arise, so the joints have to transfer large shear forces.

On the other hand, a cable would be essentially stress-free, at the cost of major deformations. Reality, as always, lies in between.

When the existing Coen Tunnel had been built, it was opted to build an intermediate solution of the stiffer type: tunnel elements with a length of 90 m without dilatation joints; so the majority of the deformations have to be taken up in the immersion joints between the elements.

In the Second Coen Tunnel, a flexible compromise was chosen: long tunnel elements, each one being divided into seven sections.

In this solution, both the immersion and segment joints serve as expansion joints.

The force distribution in this elastically supported, unevenly loaded and subdivided beam is more complex than it first appears.

The force distribution proves for example to be affected by temperature variations in the tunnel, even though these variations in the closed tunnel section are only small compared with, for example, the open approaches.

Besides the vertical bedding, account must also be taken of a longitudinal interaction (friction), and proper account has to be taken of the nonlinear stiffness of the rubber seals in the immersion joints (GINA gaskets). In order to calculate and understand the longitudinal behavior of the tunnel, a special beam action model has been used.

In this model, the segments are modeled independently as elastically supported beams.

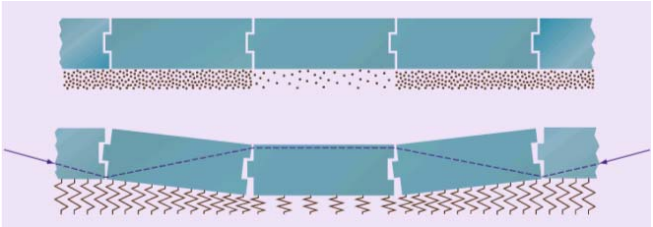


Diagram demonstrating beam action

Traditionally, a tunnel would have been considered as a chain of hinge-jointed shackles (the chain model). In reality, the segments touch each other either at the upper or the lower edge.

In the beam action model, the longitudinal segment interaction was therefore modeled eccentrically, with a very stiff no-tension-connection (the block model).

Furthermore, in the segment joints only transverse forces can be transferred. Also in the immersion joints, the eccentric contact was taken into account; the force transfer in the longitudinal direction was based on the non-linear compression stiffness of the GINA gasket.

This modeling with eccentricities is particularly necessary to determine the effect of temperature variation correctly. When, for example, a chain of hinged rods would have been used, with a local subsidence due to e.g. a weaker support or a concentrated soil load, then at that point a small negative eccentricity would be resent.

An increase in the normal force due to a rising temperature would then have led to an increase in vertical displacements, larger support reactions and thus to lower transverse forces and moments.

In reality, the longitudinal contact in the segment joint at the position of the greater subsidence takes place at the upper edge: a large positive eccentricity.

An increase in the normal force will then lift the tunnel segments, with lower support reactions and a larger shear force as a result.

This realistic modeling led to the discovery that the transverse forces and moments in the tunnel depend strongly on the temperature in the tunnel. Compared with the usual chain model, the block model used here is a better representation of reality.

To prevent differential deformations between the individual segments, both the segment and immersion joint were implemented as a hinge: rotation is more or less freely possible, but (vertical) transverse forces are transferred directly by shear keys in the walls.

The horizontal movements are restrained as well, by shear keys in the roof and floor. Particularly in the case of a sunken ship, these shear keys will have to transfer enormous shear forces.

Sunken Ships

With regard of the intensive shipping on the North Sea Canal, the tunnel had to be designed to take the loading of a sunken ship.

The client (Rijkswaterstaat, RWS) prescribes in its Guidelines for the Design of Concrete Structures that a loading of 150 kN/m^2 must be taken into account for sea-going vessels and 50 kN/m^2 for inland waterway vessels (including dynamic behavior) and also that these loads should be verified by means of a risk analysis.

The loading of a sunken ship affected the design of the concrete structure in various ways:

- The loading must be borne by the roof (roof reinforcements);
- The loading is transferred to adjacent segments by the shear keys (shear key reinforcement) to an certain extent – depending on the stiffness of the support;
- The shear key forces lead to a greater support reaction under the adjacent segment (floor reinforcement);
- The transverse force is taken up in the walls in both the loaded and the adjacent segment (wall reinforcement).

Design for loads like these is a combination of risk analysis and force distribution.

The aforementioned effects are greatest if a ship sinks directly next to an expansion joint. The longer the segments, the smaller the probability that a ship sinks directly next to a joint, but the greater are the forces if it happens.

Probability and risk

As prescribed by RWS, the loading was verified by means of a risk analysis. To determine the governing ship size, we used an inventory of all sea-going vessels that passed the Coen Tunnel in one year.

Based on these ships' characteristics (dimensions, tonnage, type of vessel), we determined for each ship the probability that the ship would sink on to the Coen Tunnel, the loading depending on the position in length and width direction and the probability distribution of this loading.

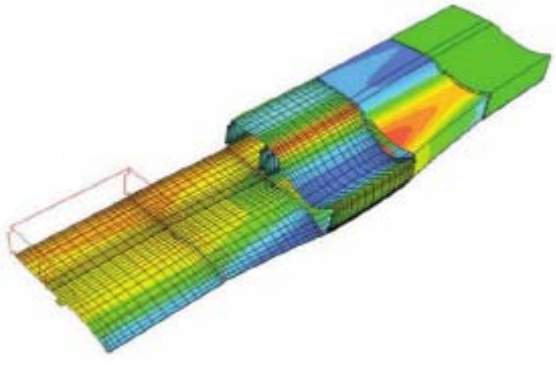
In this way, a cumulative probability distribution of the loading on the tunnel was determined, and for a probability of failure of 1 x 10^{-6} per year a representative ship and its associated loading could be determined.

This loading turned out to be only a little lower than the value prescribed by RWS, so it was decided to use the RWS value.

The structural behavior of the tunnel loaded by a sunken ship was calculated by means of a DIANA calculation, which provided insight into the distribution of the shear key forces over the four walls, the increased support reaction and the associated transverse forces.

Shear Keys

It was stated earlier that the joints have been provided with shear keys to transfer transverse forces and to prevent differential deformations. The shear keys were designed for the structural behavior as a result of the uneven loading on the tunnel and the unequal stiffness of the support.



Model calculating the effects of a sunken ship

If the forces die to a sunken ship had to be transferred entirely by the teeth, the teeth would have to be extremely strong; twice as strong as was required for the other design scenarios.

To avoid this, it was decided to provide the joints additional deformation capacity for this kind of emergency loading, by allowing the teeth to fail in a controlled way.

The waterstops have been designed to take these large deformations. In this way the tunnel still meets the requirements set out regarding accidental loads, but by means of an economic solution.

Still the teeth turned out to be the most heavily reinforced parts of the immersion elements.

Shear key reinforcement

Fire resistance for the completed tunnel structure

Another extreme situation is fire. The tunnel must resist the extreme temperatures that can arise during a hydrocarbon fire.

The temperature development inside the tunnel is defined in the RWS temperature curve, in which the temperature in the tunnel reaches 1350°C within one hour.

Two aspects of fire resistance are elucidated below: protection of the concrete structure and of the rubber waterstops.

Protection of the concrete structure

In a fire, the outer shell of the concrete on the exposed side heats up very rapidly. Concrete and steel lose their strength and stiffness from temperatures of 400 and 250°C respectively.

To prevent the structure of failing due to the high temperatures, the roof and the upper metre of the tunnel walls are protected by means of insulating board material. This can easily be applied to the tunnel formwork.

The remaining parts of the tunnel walls must be protected too, but here the solution using board material is less suitable from the point of view of construction.

Due to the positive experiences with another, previous tunnel project, the team decided to apply a large concrete cover to protect the structural concrete.

For the walls, a limestone concrete mixture was used, with a cover of 100mm on the reinforcement.

After two hours of fire according to the RWS temperature curve the critical concrete temperature of 380°C has reached a depth of approximately 70mm, leaving some 30mm of undeteriorated concrete around the reinforcement.

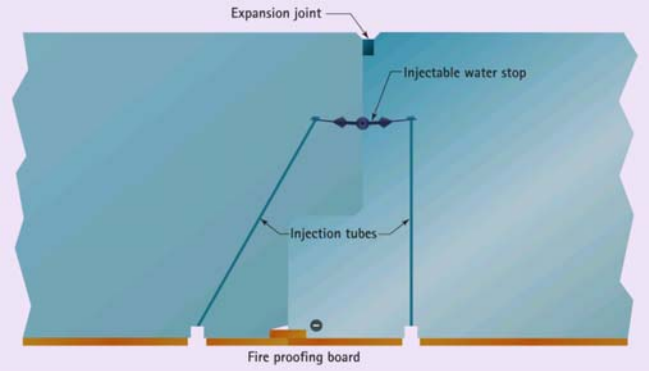
In the structural calculations undertaken, the concrete cross-section had to be reduced in order to take account of the effect of the degraded concrete on the strength of the cross section. After a fire, the degraded concrete layer must be removed and repaired.

To prevent spalling of the cover, polypropylene fibres were added to the concrete mixture - fire tests have proved that this mixture indeed prevents spalling.

Protection of the rubber seal sections

The expansion joints contain rubber waterstops. Without protection, the rubber temperature may rise rapidly when a gap is present. Temperature damage to the gaskets may cause leaks or a lower reliability of the gasket.

In contrast to the concrete surface, the rubber sections are very hard to repair as they are situated in the outer part of the wall. The client therefore demanded a maximum temprcature of 80°C after two hours of fire according to the RWS temperature curve. Traditionally, this type of joints is protected with a double layer of fire protecting board. The disadvantage of this relatively simple method is that the board material can break with differential displacements perpendicularly to the plane of the sheet material.

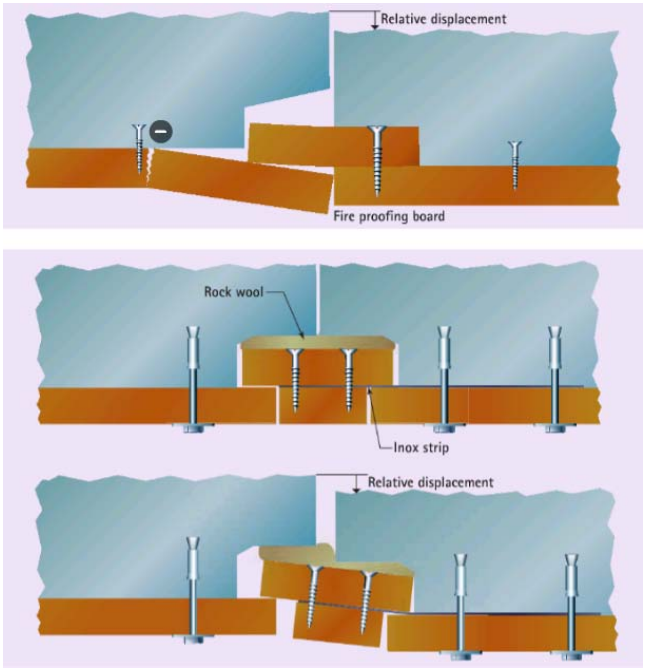


Fire protection, the traditional solution

Due to the great transverse forces in the Second Coen Tunnel, the design opted for teeth in the walls, roof and floor, rather than the traditional solution with a circumferential shear key connection.

Differential displacements in the plane of the walls are thus avoided, but displacements perpendicular to the plane can happen more or less freely, for example because of uneven loadings or an inhomogeneous support stiffness.

For the Second Coen Tunnel, a flexible joint detail was therefore designed, enabling differential displacements in all directions without actually damaging the cladding itself.

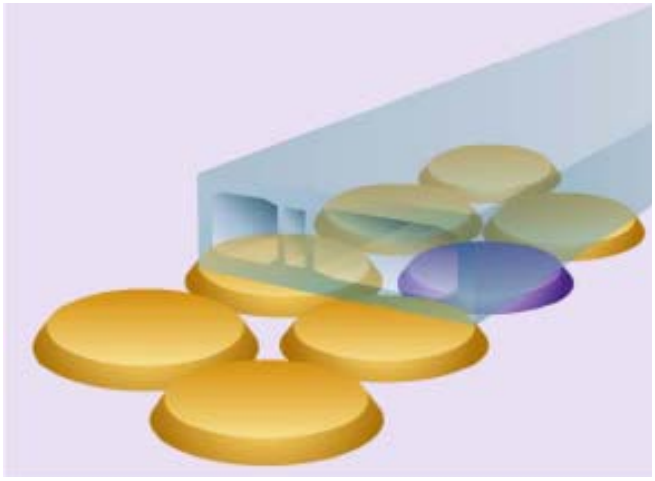


Above, top Fire Protection - cracking due to relative displacements Above, middle and bottom: Flexible action fire protection

Sand flow method

For the Dutch immersed tunnels roughly speaking three foundation types have been used: gravel beds, pile foundations and sand flow foundations.

In the sand flow method, a sand water mixture (slurry) is jetted below the tunnel, to fill the gap between the tunnel element and the bottom of the immersion trench. It is a meticulous process, in which the mixture saturation and the flow rate are important parameters for the final quality of the foundation. As the tunnel elements have only a small net weight, a relatively weak foundation is sufficient. However: this type of foundation is quite sensible for vibrations because of the possibility of liquefaction and compaction.



Sand flow pancakes'

Completion and Ongoing Renovation

In the meantime, the Second Coen Tunnel has been opened for traffic and the renovation the First Coen Tunnel is in progress.

Aerial photograph of Barendrecht construction dock

Project details

Project: Capacitteitsuitbreiding Coentunnel

Client: Rijkswaterstaat

Private partners: Design, build, maintain and finance in the context of a public-private partnership (DBFM contract) by Coentunnel Company: consortium of ARCADIS, Besix, CFE, Dredging International, Dura Vermeer, TBI Bouw and Vinci Grands Projects

Construction: Coentunel Construction, a conglomerate of the construction companies Besix, CFE Dredging International, Dura Vermeer, TBI Bouw, Vinci Construction and Croon Electrotechniek.

Handover: The realization of the Second Coen Tunnel started in 2008. The tunnel elements were immersed in the spring of 2011. The tunnel was opened for traffic in May 2013. Renovation work on the existing Coen Tunnel until summer 2014.

Tunnels & Tunnelling, International edition, January 2014, pp. 41-45.

Cutting for Stone

Josh Bradley and Clare Onal of Mott MacDonald set out the rock classification systems commonly used to inform tunneling projects in this back to basics article

TODAY THERE are three main rock classification systems commonly in use which were developed from the mid to end of the 20th Century. All aim to provide engineers and geologists with a quantitative and comparable way of describing the variable rock with which they are working.

The behaviour of rock in response to tunnel construction is determined by both the properties of the intact rock and the properties of the rock mass as a whole. Other factors such as in situ stress and groundwater also have a signifycant impact.

Properties of intact rock arc determined by the materials from which it is composed and the manner in which they are bonded together. The uniaxial compressive strength and the young's modulus of the intact rock are important, especially in weathered or heavily altered rock or in massive rock where the intact rock is the governing feature rather than the discontinuities.

Laboratory testing on samples of intact rock is usually relatively simple and inexpensive, so there is a wealth of information available on the properties of intact rock. However, such testing can be misleading. The chief issue is that samples of highly weathered or disturbed rock may not be available in the required intact volume for testing, so tests tend to focus on good samples of intact, competent rock, which are more easily collected in the field.

Tunnel stability is often dominated by the structural properties of the rock mass - the way in which blocks of intact material behave along with discontinuities such as faults, joints and bedding planes. The properties of a rock mass are difficult to test due to scale effects. Therefore, it is crucial to understand and quantify discontinuity properties such as aperture, undulation, roughness, weathering and infilling.

Unfortunately for the engineer, rock masses arc rarely homogenous, continuous or isotropic. A classification system is therefore required to take account of the inherent variability.

Application of Rock Classificatiobs through the Project Cycle

In the preliminary or feasibility stages of a project, little information on the characteristics of the rock mass is typically known. However, use of a quantifiable rock classification that is familiar to both engineers and geologists can provide important early insights into tunnelling method, tunnel shape, maximum size and stand-up time. Additionally, it can provide initial estimates of rock support and deformation characteristics. The classification, although based on information gathered from the field, is necessarily empirical and based on a large amount of data.

At the design stages, the rock mass classification can be developed as more information becomes available. Zones of material with similar geomechanical characteristics can be identified and grouped. Parameters such as in situ rock mass strength and modulus of elasticity can be estimated. Empirical estimates of support are then improved and used in conjunction with more complex methods of analysis to better understand tunnel deformation and stability within the different ground classes along the alignment.

Engineers can then develop a flexible design comprising a number of support classes to take into account the full range of ground conditions likely to be encountered.

During construction, real-time classification at the excavation face can allow engineers to continually re-assess tunnel support, allowing for a flexible and economic support solution. A simple, quantitative record of ground conditions encountered is lso obtained. This is often important in the development or improvement of construction techniques and is widely used in the settling of contractual debates.

Getting up close to the Hindhead Tunnel jace. This allowed detailed face logging and RMR assessment when required

The Development of Rock Classification Systems

The use of rock classification systems has always been closely linked to advances in tunnel construction. Schemes attempting to formalise empirical relationships in tunnel design were first developed as early as 1879.

The first descriptive characterisation of ground conditions appeared in 1942 and was developed following experiences in steel arch tunnelling through the Alps. In 1946, Karl Terzaghi became the first to publish a simple rock classification system applied to an engineering environment He understood the importance of the type and intensity of rock discontinuities over and above the rock type. Terzaghi's system was widely used, but its lack of a truly measurable classification, along with developments in modern tunnelling methods, led to the development of the systems more commonly in use today.

Classifications involving stand up time began to develop in the late 1950s, leading to the New Austrian Tunnelling Method (NATM).

Rock mechanics at this time was cutting edge; standardisation of tunnel support was uncommon and tunnelling was subsequently dangerous. The first quantitative schemes to incorporate the engineering geological character of the ground were developed in 1972 and have been developing ever since.

A variety of rock tunnelling projects today still commonly use classification systems such as Bieniawski's Rock Mass Rating, first developed in 1972 and the Q-System developed by Barton et al. in 1974. Although also developed for slopes, rock mass classification systems are primarily designed to be used in underground excavations where the excavation face can be viewed and mapped - for example drill and blast, roadheader or mechanical excavation methods.

The three classification systems most widely used today are Rock Mass Rating (RMR). the O-System and the Geological Strength Index (GSI).

Rock Mass Rating

Bieniawski developed his RMR system, also known as Geomechanics Classification, in 1972 and its latest revision was published in 1989.

The system requires an assessment of six parameters; the intact rock material's strength, rock quality designation (RQD), discontinuity spacing, discontinuity condition, groundwater condition and discontinuity orientation relative to the excavation.

Rock strength assessment is ideally based on uniaxial compressive strength testing, but there are certain circumstances which require it to be correlated from point load testing or based on field descriptions.

RQD in itself is a rock classification system, published by Don Deere in 1967, which modifies the core recovery percentage by only measuring sound pieces of core that are > 100mm in length. Although designed to be taken from rock cores, RQD can also be estimated from outcrops or excavation faces. The other required parameters can be based on a combination of field observations and measurements from mapping and borehole drilling – ideally a combination of both.

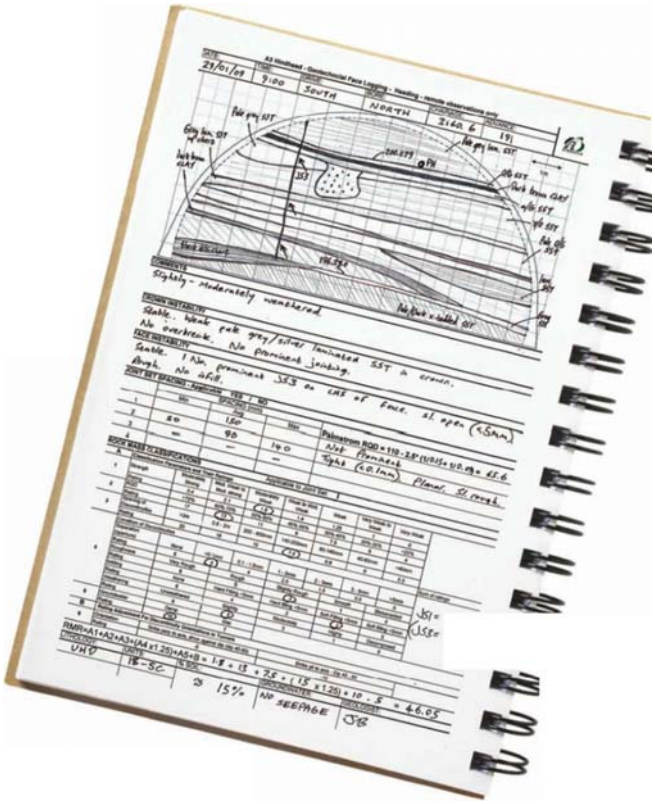


Figure 1, Geotechnical Face Log recorded during the construction of the Hindhead Tunnel. RMR was recorded following *every* advance, with the engineering geologist maintaining a safe distance from the open face

The six parameters are each given a rating, which is added together to give the final classification value. The output of RMR classification is a value between 0 (very poor rock) and 100 (very good rock), immediately providing the engineer or geologist with a sense of the relative quality of the rock mass.

The RMR can then be used to provide basic guidelines for tunnel advance length and support quantities based on a 10m span - there is no consideration of the end use of the tunnel. RMR can also be converted into a GSI rating and could provide an estimate rock mass strength and modulus of elasticity (Hock and Brown, 1997).

RMR can provide an indication of the most suitable tunnel shape and insight into the support capabilities of the shotcrete - for example, whether or not a shotcrete layer can be expected to act as an arch, or just lock together adjacent blocks (Lowson and Bieniawski, 2013).

However, RMR does not consider in situ stress, which can be very important in deep excavations where squeezing ground or rock bursting may be a problem. The number of joint sets is also not explicitly considered and this parameter can be very influential on tunnel stability. Additionally, although RQD is a major parameter, it can be difficult to determine at the tunnel facc as it was designed to be measured from drill cores.

On the whole, RMR may be more useful in weaker rock, where methods of support such as spiling, dowels, steel arches or canopy tubes are used. The RMR system was very effective during the construction of the Hindhead Tunnel and a typical classification of the tunnel facc is shown in Figure 1.

Q-System

The Rock Tunnelling Quality Index, or Q-System of rock mass classification, was developed by Barton, Lien and Lunde in 1974 and is also based on assessments of six parameters - although slightly different to those used for RMR. The six parameters are: RQD, joint set number (Jn), joint roughness number (Jr), joint alteration number (Ja), joint water reduction number (Jw), and stress reduction factor (SRF).

The first four parameters are similar to that of the RMR system. RQD and joint set number give an indication of block size, while joint roughness and joint alteration show the fractional characteristics and shear strength of the joint walls. Essentially, larger, rougher blocks are likely to be more favourable in terms of tunnel stability than smooth, clay infilled joints as the latter will have rcduced rock wall contact between blocks. Joint water reduction is a measure of water pressure and groundwater inflow, while SRF is an empirical way of considering the influence of shear zones and rock stress problems in both competent and incomepetent rock. The parameters are again given a rating, although RQD is used directly, and they are multiplied to give the classification value.

The Q-System was developed directly with the now widely accepted Norwegian Method of Tunnelling (NMT) support principle, which currently uses steel fibre reinforced shotcrete and fully grouted rock bolts as permanent support.

Empirical assessment of support quantities, taking into account both the span and the end use of the excavation, can be made using the chart shown in Figure 2. By varying the cxcavation support value, the Q-System considers a range of final uses; from temporary mine openings or water tunnels in hydropower schemes - which are unlikely to see significant access post-construction – to underground nuclear power stations or public railway stations where absolute and continuous stability is required.

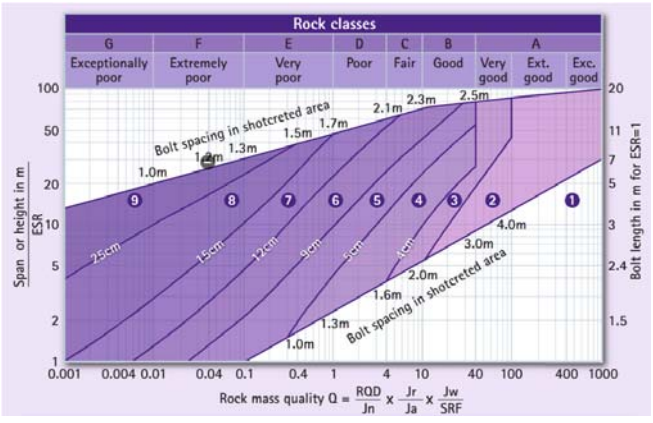


Figure 2. Permanent support recommendation based on Q and NMT (Grimstad and Barton, 1993)

Grimstad and Barton (1994) and Barton (2013) state that the large range of Q values possible - from 0.001 (exceptionally poor rock) to 1000 (exceptionally good rock) – reflects rock quality variation more readily than the linear RMR scalc. Correlation with physical parameters is probably easier to achicve bccausc of this.

Another important application of the Q-System is its ability to directly predict effective rock mass strength and depth-related phenomenon such as strain bursting, rock slabbing, swelling and squeezing.

The Q-System does not directly consider intact rock strength, although Qc (Q normalised by UCS / 100) does provide an even larger scale over eight orders of magnitude (Barton 2013). Neither does it directly consider joint orientation; it is only indirectly considered in the SRF value and is especially important in tunnels which cannot usually be designed for the most favourable orientation. Also, the joint water reduction number and the stress reduction factor can be difficult to determine with limited information or experience.

The Q-System may arguably be the superior rock classification system in deep tunnels and in cases of faulted or jointed and clay-bearing rock masses that give marked overbreak during cxcavation, due to the SRF parameter. The typically rough, irregular surface left by drill and blast excavation in this type of rock is suited to the application of fibre reinforced sholcretc and bolts. Application of the Q-System works best for 0.1<Q<40 and for tunnels with spans between 2.5m and 30m (Palmstrom and Broch, 2006).

In weaker rock, the Q-System and fibre reinforced shotcrete and are less appropriate. It is also less applicable in TBM tunnelling, although it should not be discounted. Open hard rock TBMs with bolting and shotcrcling facilities behind the drill head mean that use of the Q-System may be relevant.

Undertaking Q-System assessments of jointed surface outcrops to aid in tunnel design on a hydropower project in Shuakhevi, Georgia

Geological Strength Index

Rather than being a classification system for use during the tender and construction stages for aiding the determination of support requirements, the GSI was developed to link the parameters of the Hoek-Brown failure criterion with conditions that can be observed in the field. This provides an estimation of rock mass properties that can be used in design.

GSI can be estimated directly by combining the surface condition of the discontinuities with the structure of the rock mass. It can also be based on RMR ratings, as shown by Hoek and Brown in 1997, and therefore is closely linked with the RMR classification system.

Conclusion

The systems discussed are not the only options available. Variations of each system exist, such as slope mass rating, mining rock mass rating and QC. An additional system such, as rock structure rating or rock mass index may be relevant for specific projects. However, the wealth of case studies upon which the better known systems are based lends credibility. These systems are empirical, after all. Nothing beats years of first-hand expcrience, but for those who have not been around long enough to gain this knowledge, rock classification systems can be an essential tool in leveraging the experience of others.

The advantages of one system over another are not necessarily restricted to specific projects. A large tunnelling project will likely benefit from the use of multiple systems. Combined use of both the RMR and Q-System is often recommended, and there are benefits to this double approach. The number of joint sets and rock stress are absent from RMR, while rock strength is not directly considered by the Q-System. Recording the input parameters of both systems ensures that potentially important properties are not missed. Recording details of the individual input parameters, rather than simply assigning a value, also allows better understanding and verification of the final values - as well as providing the flexibility to take into account additional investigation at a later dale. Every year there are more tunnel case studies using both systems, increasing understanding.

A practical example of how a project can benefit from the combined use may involve the Q-System being used to establish an initial estimate of support quantities at feasibility stage, with RMR/GSI being used at a later stage as an input into finite element modelling. Finally, the Q-System can be used again during construction to record ground conditions and determine the required installation of flexible support classes.

For such an approach to be successful, sufficient information must be obtained during the early stages of a project to ensure neither system is restricted should it be required at a later stage. This, together with the variety of data sources available - from held observation of outcrops, to borehole logs and laboratory testing - highlights the importance of the tunnel designer being involved al an early stage in the process.

None of the classification systems are all-encompassing. Intact rock properties such as rock hardness, abrasiveness, durability and mineralogy are not covered, but may still be an important influence in finalising construction details and cost estimates. Similarly, separate seismic analysis is required in certain situations and modifications and further support analyses are required where squeezing ground is present.

Both Q arid RMR rely on a fixed boundary system, where, despite the parameter assessments being largely estimated, a value falling close to the classification boundary may lead to perceived excess support being installed. It is possible that the way in which recommended support types are linked with rock mass classifications niay be refined to deal with this in the future.

Advances in modelling software such as Phase2 by Rocscience mean that when the rock classifications – particularly RMR and GSl - are available it can be fast and cost-effective to confirm empirical support estimates using finite element stress analysis. However a robust classification system will remain essential, both as a starting point to the analysis and as a major input, as well as then being able lo make use oΓ the output in an effective way.

It is important lo conclude with Bieniawski's own recommendation, along with similar warnings from Hoek and Terzaghi, that rock classification systems were never intended as an ultimate solution to design problems and should be used in conjunction with - and not as a replacement for -

analytical studies, field observations, measurements and engineering judgement.

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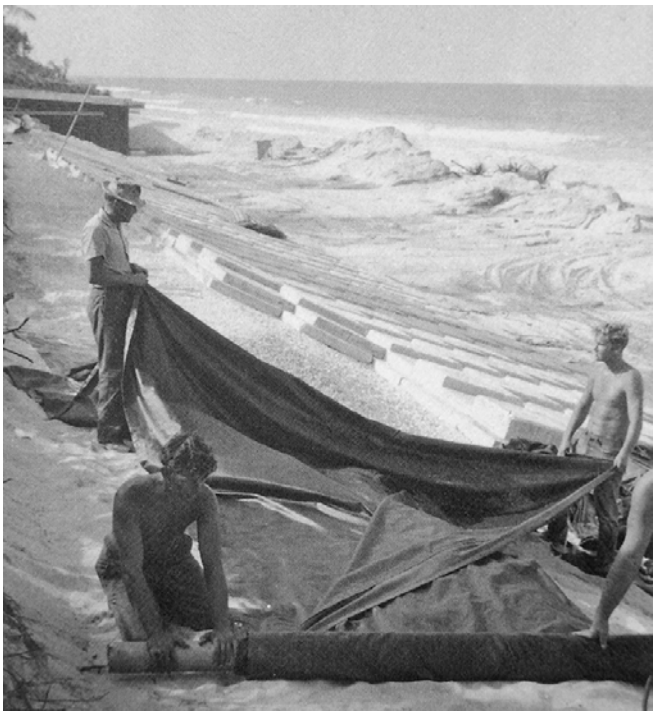
History of Geosynthetics: Filter Fabrics Emerge from a 1957 Storm

Carthage Mills

In March 2014, I published "A Brief History of Geotextiles" in Land and Water Magazine (σ.ε. δες Τεύχος 65 – Ιούνιος 2014 - A). It would take a considerably long manuscript to fully detail the research, projects, events and people who have brought forth geotextiles, let alone the larger field of geosynthetics; but a welcomed result of that small article was post-publication communication with various people in the field, including Alan Ossege of Carthage Mills. His company was essential to the earliest development and push of filter fabrics into civil engineering. Here, Carthage Mills shares its story about the beginning of geosynthetic filtration materials and design. – *Chris Kelsey, Editor, Geosynthetica*



Erosion from a Florida storm at the home of Carthage Mills' president led his company to develop, along with the University of Florida, a woven synthetic filter fabric. A stronger waterfront structure resulted and spurred continuing material advances and design expansion.

In 1957, a tropical storm caused severe beach erosion at the Florida home of the president of Carthage Mills. Subsequently, he joined forces with engineers from the Coastal Engineering Lab at the University of Florida to protect his property against future storms. Through their exchange of ideas, they developed a tough woven synthetic filter fabric with design properties that permitted water to pass through while holding back sand and particles.

The following spring (1958), a revetment of interlocking concrete blocks was constructed using the new material in place of costlier graded granular filters. This marked the first use of a filter fabric for a waterfront structure.

EARLY EDUCATION & PROJECTS

The late Robert J. Barrett accepted the challenge to head up a commercial venture to perfect and market this new concept. Barrett set out to educate the many districts of the US Army Corps of Engineers (USACE) and consulting engineers around the world on the benefits of using these new materials.

At that time, the standard practice for shoreline erosion protection was limited to articulated concrete blocks, the deployment of large sand bags, concrete and sand-filled mattresses, concrete block mattresses, membranes, gabions, and graded granular filters.

The early years, though, were discouraging. By 1960, Carthage Mills had sold only nine projects, but momentum was building. The use spread, culminating in USACE's 1962 agreement to construct a series of experimental projects to determine the overall effectiveness of Carthage Mills' fabrics and innovative methods of construction.

To test these early geotextiles under what the Corps called "the most extreme conditions possible," sites were selected along the Mississippi and St. Francis Rivers. Three years later, the Corps' official technical reports concluded that Carthage Mills' materials and recommended construction techniques as "superior" to every other method being employed by the Corps at that time.

The program was extended, additional sites were selected, and evaluations continued for another seven years.

ACCEPTANCE & THE MARKET ACCELERATES

Barrett continued his work with the Corps and continued to extend his education efforts further afield. In 1966, he presented at the International Conference on Coastal Engineering in Tokyo, Japan. The paper, "Use of Plastic Filters in Coastal Structures," was a turning point for project designer and owner attitudes.

Meanwhile, Carthage Mills was still alone in its endeavors; and as late as 1967 had the only plastic filter fabrics available on the market. By this time, Carthage Mills had published the 3rd and final version of what was the world's first "Filter Handbook," which had been utilized by engineers and contractors worldwide for the design and construction of erosion control systems such as revetments, seawalls, jetties, channel linings, breakwaters and more.

In 1972, after ten years, the USACE Waterways Experiment Station in Vicksburg, Mississippi concluded the Corps' experimental projects and evaluations. Their first comprehensive specification for filter fabrics, including test methods for these fabrics was issued. That specification is still used today in nearly the original form for percent open area, permeability, apparent opening size and gradient ratio to measure a fabric's resistance to clogging.

Carthage Mills' publication of its Filter Handbook, which saw three editions through the late 1960s, helped establish geosynthetic filtration materials in engineering designs.

The USACE reports and specification added considerable credibility to designs incorporating woven synthetic filter cloths.

More than 3500 projects in 49 states and 26 countries had used Carthage Mills' materials by 1976.

Barrett was recognized as a "father of filter fabrics," not only for his earliest work but for his interaction in additional designs, including French drains, scour protection around bridge piers, fabric-wrapped perforated pipe, and fabric-encapsulated sandcore breakwater.

NEW FRONTIERS FOR FILTER FABRICS

A major breakthrough for the use of "geotechnical fabrics" in other applications occurred in 1978 and 1979. Carthage Mills, again working with USACE, participated in the construction of a full-scale embankment test section at Pinto Pass in Mobile, Alabama. Data obtained from this study were used to develop the first effective design criteria and construction techniques for "fabric-reinforced embankments on extremely soft soils."

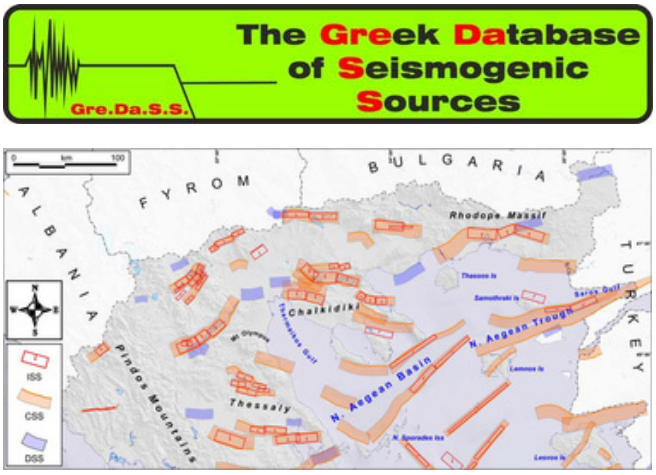
The project opened a new frontier for design engineers in the potential future uses of filter fabrics.

Those first woven filter fabrics were the forerunners of the materials that have since defined the geosynthetics field. Many of those earliest installations are still in service and engineers continue to draw from those early works and add to and expand our understanding of geosynthetics.

Carthage Mills is proud to have been a key part of the early manufacturing and education efforts for such an innovative industry. And we are proud to still be an active participant and to continue working with engineers and agencies around the world to advance infrastructure. www.carthagemills.com

(geosynthetica.net, June 19, 2014, http://www.geosynthetica.net/geosynthetics-history-filter-fabrics)

ΠΑΡΟΥΣΙΑΣΗ ΕΡΕΥΝΗΤΙΚΟΥ ΠΡΟΓΡΑΜΜΑΤΟΣ



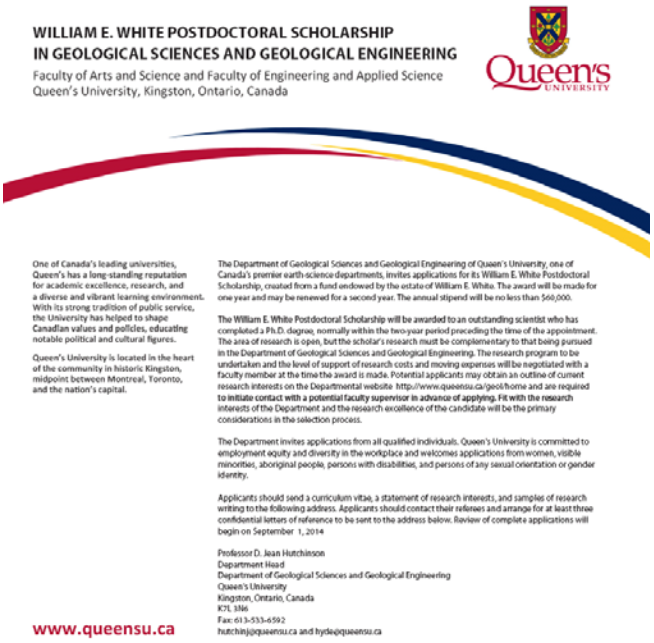
The **Gre**ek **Da**tabase of **S**eismogenic **S**ources is a project devoted to provide Greek authorities of a complete and modern tool for improving the Seismic Hazard Assessmant (SHA) of the country. It also represents a valuable source of information for scientists who want to deal with earthquake scenarios and modelling, geodynamics, active deformation and many more.

GreDaSS is an open-file, continuously updated database, that can accommodate all proposals from multi-field researchers. As a GIS-based database, consists of several layers, both graphical and metadata ones, based on the general structure of the Italian DISS (a special thank to Roberto Basili and Gianluca Valensise for providing the software and continuous assistance).

To download and navigate the contents of GreDaSS, click http://gredass.unife.it.

NEW: Download the current version of the map in A0 size from http://eqgeogr.weebly.com/uploads/8/2/8/3/8283914/gredass_poster_a0l.pdf.

ΥΠΟΤΡΟΦΙΕΣ ΓΙΑ ΓΕΩΜΗΧΑΝΙΚΟΥΣ


WILLIAM E. WHITE POSTDOCTORAL SCHOLARSHIP
IN GEOLOGICAL SCIENCES AND GEOLOGICAL ENGINEERING
Faculty of Arts and Science and Faculty of Engineering and Applied Science
Queen's University, Kingston, Ontario, Canada

Queen's UNIVERSITY

One of Canada's leading universities, Queen's has a long-standing reputation for academic excellence, research, and a diverse and vibrant learning environment. With its strong tradition of public service, the University has helped to shape Canadian values and policies, educating notable political and cultural figures.

Queen's University is located in the heart of the community in historic Kingston, midpoint between Montreal, Toronto, and the nation's capital.

The Department of Geological Sciences and Geological Engineering of Queen's University, one of Canada's premier earth-science departments, invites applications for its William E. White Postdoctoral Scholarship, created from a fund endowed by the estate of William E. White. The award will be made for one year and may be renewed for a second year. The annual stipend will be no less than $60,000.

The William E. White Postdoctoral Scholarship will be awarded to an outstanding scientist who has completed a Ph.D. degree, normally within the two-year period preceding the time of the appointment. The area of research is open, but the scholar's research must be complementary to that being pursued in the Department of Geological Sciences and Geological Engineering. The research program to be undertaken and the level of support of research costs and moving expenses will be negotiated with a faculty member at the time the award is made. Potential applicants may obtain an outline of current research interests on the Departmental website http://www.queensu.ca/geol/home and are required to initiate contact with a potential faculty supervisor in advance of applying. Fit with the research interests of the Department and the research excellence of the candidate will be the primary considerations in the selection process.

The Department invites applications from all qualified individuals. Queen's University is committed to employment equity and diversity in the workplace and welcomes applications from women, visible minorities, aboriginal people, persons with disabilities, and persons of any sexual orientation or gender identity.

Applicants should send a curriculum vitae, a statement of research interests, and samples of research writing to the following address. Applicants should contact their referees and arrange for at least three confidential letters of reference to be sent to the address below. Review of complete applications will begin on September 1, 2014

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Queen's UNIVERSITY

William E. White Postdoctoral Scholarship
in Geological Sciences and Geological Engineering
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Queen's University, Kingston, Ontario, Canada

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ΝΕΑ ΑΠΟ ΤΙΣ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ

International Society for Soil Mechanics and Geotechnical Engineering

The Innovation and Development Committee (IDC, under the chairmanship of Dimitrios Zekkos), in collaboration with Geoengineer.org, has completed the creation of a database that hosts the entire proceedings of the 18th International Conference on Soil Mechanics and Geotechnical Engineering (Paris, September 2013). It is available from http://www.issmge.org/en/resources/publications/18th-icsmge.

Both the IDC and Professor Frank wish to acknowledge Evi Palatou and Kostis Tsantilas from Geoengineer.org who did most of the work to make this a reality, and Valerie Bernhardt who provided access to the database. They would also like to extend their gratitude to the French Member Society (Comité Français de la Mécanique des Sols et des Travaux de Fondations, the organisers of the Paris Conference), to the publisher of the Proceedings (Presses de l'Ecole des ponts), and to all of the authors of the papers, for having negotiated and agreed that the copyright be retained by the authors and for the permission to publish online. The President hopes that this may be an example followed by many others from now on, in line with the policy set up by the ISSMGE under the Presidency of Jean-Louis Briaud and following the hard work by the Task Force on Copyright chaired by Rainer Massarsch and co-chaired by Bengt Fellenius (see: http://www.issmge.org/en/resources/copyright-policy).

World Wide Web of Geotechnical Engineers

About W3G

About the World Wide Web of Geotechnical Engineers (W3G)

W3G Document Library

Documents of W3G

Using/Referencing W3G Documents

Please reference properly

Currently Active W3G Projects

- WWWVL:Geotech or GVL

  World Wide Web Virtual Library of Geotechnical Engineering, WWWVL:Geotech or simply GVL as most geotechnical engineers prefer to call it.

- *i*GEM Magazine

  The *Internet* Geotechnical Engineering Magazine. It publishes magazine articles, hosts the world's first and only Geotechnical Engineering Hall of Fame, and presents timely information for geotechs such as the conference calandar and available jobs.

- EJGE the Journal

  The Electronic Journal of Geotechnical Engineering publishes high quality, peer- reviewed scientific and/or technical journal articles.

- GeotechML (GML) Project

  The Steering/Working Group on developing the standards and protocols for the interoperability of geotechnical engineering computer applications.

Geotech Server Home Page

If you want to start from the top, here is a link for you to go to the *home page* (i.e., the root directory of the server) -- here are two home pages:

- the Geotech Server's first home page (went offline at the end of 2002; use the EJGE Server instead)
- the EJGE Server's home page

ΤΕΕ ΤΕΧΝΙΚΟ ΕΠΙΜΕΛΗΤΗΡΙΟ ΕΛΛΑΔΑΣ

Κάθε πρωί στο ηλεκτρονικό ταχυδρομείο σας το "Newsletter ΤΕΕ". Απευθείας διαδικασία εγγραφής: http://lists.tee.gr/cgi-bin/mailman/listinfo/info-tee

ΠΡΟΣΕΧΕΙΣ ΕΚΔΗΛΩΣΕΙΣ ΓΕΩΤΕΧΝΙΚΟΥ ΕΝΔΙΑΦΕΡΟΝΤΟΣ ΣΤΗΝ ΕΛΛΑΔΑ

30 September - 3 October 2014, Athens, Greece
www.eetc2014athens.org

It is our pleasure to inform you that the Greek Tunnelling Society is organizing the 2nd Eastern European Tunnelling Conference in Athens on September 28 – October 1 2014 (EETC2014, Athens).

The Eastern European Tunnelling Conference is a biennial regional traveling conference. It aims to promote the sharing of knowledge, experience, skills, ideas and achievements in the design, financing and contracting, construction, operation and maintenance of tunnels and other underground facilities among the countries of Eastern Europe, on an organized basis and with agreed aims. EETC2014 aims mainly to bring together colleagues from Eastern Europe but people from the rest of the world are also welcome.

The theme of EETC2014 Athens is:

"Tunnelling in a Challenging Environment"
Making tunnelling business in difficult times

The construction of underground projects is becoming increasingly demanding as new challenges are emerging in every aspect and sector of this multidisciplinary and multivarious business. Further to the usual geological, geotechnical, structural and operational challenges, we are now facing a difficult business and financial environment, which requires the deployment of even more intelligent and effective tools and solutions.

I really do hope that the EETC2014 Athens will contribute and further facilitate the growth of the tunnelling business and will be a forum for scientific and professional collaboration.

TOPICS:

- Innovative methods for Analysis and Design
- Tunnelling in difficult ground conditions
- Conventional urban or shallow tunnelling
- Mechanized tunnelling
- Hydraulic tunnels
- Underground complexes
- Caverns for Hydropower or Storage
- Pipe jacking and microtunnelling
- Innovations in tunnelling construction technology
- Tunnels and shafts for mining
- Rehabilitation and repair
- Safety and security in tunnels and tunnelling
- Contractual and financial issues
- Education and training
- Case histories
- Underground space use
- Tunnels and monuments

5 – 7 Νοεμβρίου 2014, ΑΙΓΛΗ Ζαππείου, Αθήνα
http://www.7hcge2014.gr

Η Ελληνική Επιστημονική Εταιρεία Εδαφομηχανικής και Γεωτεχνικής Μηχανικής, στο πλαίσιο των δραστηριοτήτων της, διοργανώνει το 7ο Πανελλήνιο Συνέδριο Γεωτεχνικής Μηχανικής υπό την αιγίδα του Δήμου Αθηναίων και του Τεχνικού Επιμελητηρίου Ελλάδας. Στόχος του Συνεδρίου είναι να καταγράψει τις προόδους της γεωτεχνικής μηχανικής στην Ελλάδα του 21ου αιώνα όπως αντικατοπτρίζονται στα σημαντικά γεωτεχνικά αλλά και άλλα έργα (σιδηροδρομικά, οδοποιίας, λιμενικά, υδραυλικά, κτιριακά, περιβαλλοντικά) με σημαντικό γεωτεχνικό αντικείμενο, που έχουν μελετηθεί και κατασκευαστεί ή κατασκευάζονται, καθώς και στα αποτελέσματα της ερευνητικής δραστηριότητας των ελληνικών πολυτεχνείων και πολυτεχνικών σχολών. Επιδίωξη είναι οι εργασίες του Συνεδρίου να αναδείξουν πρωτότυπα στοιχεία συμβολής της γεωτεχνικής μηχανικής αλλά και να προβάλουν θεωρητικές και πειραματικές έρευνες σε εδαφικά, βραχώδη και ημιβραχώδη υλικά που βρήκαν ή μπορούν να βρουν εφαρμογή στην πράξη."

Θεματικές Ενότητες

1. Συμπεριφορά Εδαφών: Έρευνες Υπαίθρου και Εργαστηρίου
2. Συμπεριφορά Εδαφών: Προσομοιώματα
3. Επιφανειακές και Βαθειές Θεμελιώσεις
4. Αλληλεπίδραση Εδάφους - Κατασκευής
5. Πρανή - Κατολισθήσεις
6. Βαθειές Εκσκαφές - Αντιστηρίξεις
7. Σήραγγες
8. Βελτιώσεις Εδαφών
9. Φράγματα, Άοπλα Επιχώματα
10. Οπλισμένα Επιχώματα
11. Εφαρμογή Ευρωκωδίκων
12. Εφαρμογές Γεωσυνθετικών Υλικών
13. Εδαφοδυναμική / Τεχνική Σεισμολογία
14. Βραχομηχανική
15. Περιβαλλοντική Γεωτεχνική
16. Ενεργειακή Γεωτεχνική (energy geotechnics)
17. Πολιτιστική Κληρονομιά και Γεωτεχνική Μηχανική
18. Διδασκαλία και Μάθηση Γεωτεχνικής Μηχανικής

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

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

The 6th International Conference on Unsaturated Soils UNSAT 2014, 02 - 04 July 2014, Sydney, Australia, Adrian Russell, a.russell@unsw.edu.au

2nd International Conference on Vulnerability and Risk Analysis and Management & 6th International Symposium on Uncertainty Modelling and Analysis - Mini-Symposium Simulation-Based Structural Vulnerability Assessment and Risk Quantification in Earthquake Engineering, 13-16 July 2014, Liverpool, United Kingdom, http://www.icvram2014.org

GeoHubei 2014 International Conference Sustainable Civil Infrastructures: Innovative Technologies and Materials, July 20-22, 2014, Hubei, China http://geohubei2014.geoconf.org

ICITG 2014 Second International Conference on Information Technology in Geo-Engineering, 21-22 July 2014, Durham, UK, www.icitg.dur.ac.uk

Second European Conference on Earthquake Engineering and Seismology, 24-29 August 2014, Istanbul, Turkey www.2eceesistanbul.org

TC204 ISSMGE International Symposium on "Geotechnical Aspects of Underground Construction in Soft Ground" - IS-Seoul 2014, 25-27 August 2014, Seoul, Korea, csyoo@skku.edu

ACESD 2014 International Conference on Advances in Civil Engineering for Sustainable Development, 27-29 August 2014, Nakhon Ratchasima, Thailand, http://acesd.sut.ac.th/index.php?acesd=9c847ec878ac085f8c0c829a241d5a35

International Symposium on Geomechanics from Micro to Macro (TC105), 01 - 03 September 2014, Cambridge, United Kingdom, http://is-cambridge.eng.cam.ac.uk

International Conference on Industrial and Hazardous Waste Management "CRETE 2014", September 2nd – 5th, 2014, Chania, Crete, Greece, http://www.hwm-conferences.tuc.gr

Geosynthetics mining solutions 2014, September 8 – 11, 2014, Vancouver, Canada, http://www.geosyntheticssolutions.com

JUBILEE CONFERENCE 50th Anniversary of Danube-European Conferences on Geotechnical Engineering Geotechnics of Roads and Railways, 9 - 11 September 2014, Vienna, Austria, www.decge2014.at

IAEG XII CONGRESS Torino 2014 Engineering Geology for Society and Territory, IAEG 50th Anniversary, September 15-19, 2014, Torino, Italy, www.iaeg2014.com

1ο Πανελλήνιο Συνέδριο για την Εξόρυξη Αποβλήτων
16 Σεπτεμβρίου 2014 – Θεσσαλονίκη
http://us3.campaign-archive1.com/?u=234903e30e14c301e8f4d6547&id=7108cb488a&e=e6374bee25

Σκοπός του 1ου Πανελλήνιου Συνεδρίου Εξόρυξης Αποβλήτων είναι η ενημέρωση των Δημόσιων και Ιδιωτικών φορέων αλλά και του κοινού για την εναλλακτική πρόταση της ανάκτησης χρήσιμων υλικών, γης και ενέργειας από χώρους διάθεσης αποβλήτων μέσω της εξόρυξης και κατάλληλης επεξεργασίας αυτών. Στο πλαίσιο των εργασιών του συνεδρίου θα λάβουν χώρα παρουσιάσεις από ειδικούς επιστήμονες στα πεδία της εξόρυξης και διαχείρισης αποβλήτων, θα αναλυθούν τεχνικά και περιβαλλοντικά ζητήματα της μεθόδου καθώς και οι δυνατότητες εφαρμογής της στον Ελληνικό και Ευρωπαϊκό χώρο.

Θεματολογία Συνεδρίου

- Εξόρυξη Αποβλήτων
- Διεθνής Εμπειρία στην Εξόρυξη Αποβλήτων
- Επεξεργασία Αστικών Αποβλήτων για Ανάκτηση
- Συστήματα Διαχείρισης Αστικών Αποβλήτων
- Νέες Τεχνολογίες στη Διαχείριση Αποβλήτων
- Ενεργειακή Αξιοποίηση Αποβλήτων
- Αποκατάσταση Χώρων Διάθεσης Αποβλήτων και Ρυπασμένων Χώρων

Δικαίωμα Συμμετοχής

Το συνέδριο απευθύνεται σε δημόσιους φορείς, μέλη της επιστημονικής κοινότητας, σε επειχειρήσεις και σε Μη Κερδοσκοπικές Οργανώσεις. Η συμμετοχή στο συνέδριο είναι ΔΩΡΕΑΝ.

10th International Conference on Geosynthetics – 10ICG, Berlin, Germany, 21 – 25 September 2014 www.10icg-berlin.com

14th International Conference of the International Association for Computer Methods and Advances in Geomechanics (14IACMAG), September 22 – 25, 2014, Kyoto, Japan, www.14iacmag.org

14th World Conference of the Associated Research Centers for the Urban Underground Space (ACUUS 2014), September 24-26, 2014, Seoul, Korea http://acuus2014.com

EETC 2014 ATHENS 2nd Eastern European Tunnelling Conference, 28 September - 1 October 2014, Athens, Greece, www.eetc2014athens.org

7th Basements and Underground Structures Conference, 30 September – 1 October 2014, London, geevents@emap.com

5th International Forum on Opto-electronic Sensor-based Monitoring in Geo-engineering (5th OSMG-2014), Oct 12-14, 2014, Nanjing, China, http://www.osmg2014.com

International Congress Tunnels and Underground Space risks & opportunities, 13-15 October 2014, Lyon, France, www.congres.aftes.asso.fr/en/content/invitation

ARMS 8 - 8th ISRM Rock Mechanics Symposium, 14-16 October 2014, Sapporo, Japan www.rocknet-japan.org/ARMS8/index.htm

9th International Conference on Structural Analysis of Historic Constructions, 14 – 17 October 2014, Mexico City, Mexico, www.linkedin.com/groups/SAHC-2014-Mexico-City-3930057.S.213150607

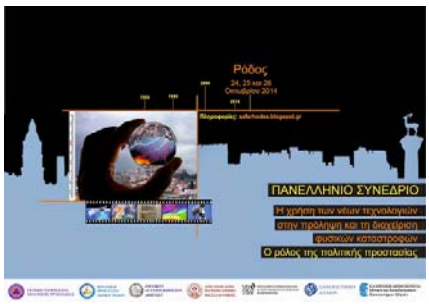
6th International Conference on Protection of Structures Against Hazards, 16-17 October 2014, Tianjin, China, http://cipremier.com/page.php?764

2nd International Conference Innovations on Bridges and Soil - Bridge Interaction IBSBI 2014, Athens, 16 - 18 October, 2014, http://ibsbi2014.ntua.gr

1st International Conference on Volcanic Landscapes (VOLAND 2014), 16 - 18 October 2014, Santorini Island, Greece, voland@heliotopos.net

1st International Conference on Discrete Fracture Network Engineering, October 19 - 22, 2014, Vancouver, British Columbia, Canada, www.dfne2014.ca

12th International Conference Underground Infrastructure of Urban Areas, 22-23th October 2014, Wroclaw, Poland, http://www.uiua2011.pwr.wroc.pl



Η χρήση νέων τεχνολογιών στην πρόληψη και τη διαχείριση φυσικών καταστροφών- Ο ρόλος της πολιτικής προστασίας
24 ÷ 26 Οκτωβρίου 2014, Ρόδος
http://saferhodes.blogspot.gr

Πανελλήνιο συνέδριο με θέμα: «Η χρήση νέων τεχνολογιών στην πρόληψη και τη διαχείριση φυσικών καταστροφών- Ο ρόλος της πολιτικής προστασίας», θα πραγματοποιηθεί από τις 24 ως τις 26 Οκτωβρίου 2014, στην πόλη της Ρόδου (ξενοδοχείο Semiramis City).

Την επιστημονική εκδήλωση συνδιοργανώνουν το Εθνικό και Καποδιστριακό Πανεπιστήμιο Αθηνών, το Εθνικό Αστεροσκοπείο Αθηνών, ο Δήμος Ρόδου, η Γενική Γραμματεία Πολιτικής Προστασίας, το Πανεπιστήμιο Αιγαίου και το Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης.

«Το συνέδριο –όπως επισημαίνεται σε ανακοίνωση- έχει ως στόχο την παρουσίαση επίκαιρων επιστημονικών ερευνών και εργασιών από ειδικούς επιστήμονες στους τομείς της πρόληψης, διαχείρισης αλλά και προστασίας τόσο του περιβάλλοντος, όσο και των πολιτών από την εμφάνιση φαινομένων έκτακτης ανάγκης όπως είναι π.χ. τα έντονα καιρικά φαινόμενα, σεισμοί, πυρκαγιές κ.ά. Στοχεύει να δημιουργήσει ένα βήμα για την ανταλλαγή ιδεών μεταξύ της επιστημονικής κοινότητας, εκπαιδευτικών, μη κυβερνητικών οργανώσεων, ενδιαφερόμενων πολιτών, καθώς και της τοπικής αυτοδιοίκησης.

Συγκεκριμένα, οι ομιλητές θα παρουσιάσουν τα αποτελέσματα της έρευνάς τους σε θέματα σχεδιασμού, πρόληψης, διαχείρισης, προστασίας οικοσυστημάτων ορεινών, αγροτικών και αστικών περιοχών, με περιβαλλοντική και πολιτιστική κληρονομιά καθώς και βιώσιμης ανάπτυξης. Έμφαση θα δοθεί στα θέματα που απασχολούν την πολιτική προστασία τόσο σε τοπικό όσο και σε εθνικό επίπεδο».

Πληροφορίες: Τηλ: 2241-361310, fax: 2241-361309, email: georodos@gmail.com, http://saferhodes.blogspot.gr

AusRock 2014
3rd Australasian Ground Control in Mining Conference - an ISRM Specialized Conference
5 – 6 November 2014, Sydney, Australia

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3rd ISRM International Young Scholars' Symposium on Rock mechanics - an ISRM Specialized Conference
8 – 11 November 2014, Xi'an, China

Contact

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E-mail: caimeifeng@ustb.edu.cn

7th International Congress on Environmental Geotechnics, 10-14 November 2014, Melbourne, Australia, www.7iceg2014.com

GEOMATE 2014 Fourth International Conference on Geotechnique, Construction Materials + Environment, 19 - 21 Nov. 2014, Brisbane, Australia, www.geomate.org

International Symposium "Geohazards" Science, Engineering & Management, 20-21 November 2014, Kathmandu, Nepal, www.ngeotechs.org/ngs/index.php/geohazards-2014

7th International Conference on Scour and Erosion (ICSE-7), 2nd – 4th December 2014, Perth, Western Australia, http://www.2014icse.com

Third Australasian Ground Control in Mining Conference 2014, Sydney, Australia, www.mining.unsw.edu.au/node/608

Proceedings of the Institution of Civil Engineers, Geotechnical Engineering, THEMED ISSUE 2015, Construction processes and installation effects, Editors: Benoît Jones, University of Warwick, UK and Stuart Haigh, University of Cambridge, UK, sarah.walker@ice.org.uk

IGS Chennai 2015 6th International Geotechnical Symposium on Disaster Mitigation in Special Geoenvironmental Conditions, January 21-23, 2015, IIT Mandras, Chennai, India, http://igschennai.in/6igschennai2015

Geosynthetics 2015, February 15 – 18, 2015, Portland, Oregon, USA, http://geosyntheticsconference.com

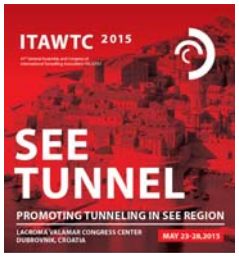
12th Australia New Zealand Conference on Geomechanics (ANZ 2015), 22-25 February 2015, Wellington, New Zealand, http://www.anz2015.com

16th African Regional Conference on Soil Mechanics and Geotechnical Engineering, April 27 to 30, 2015 in Hammamet, Tunisia, http://www.cramsg2015.org

ISP7-PRESSIO2015 27 to 30 April 2015, Hammamet, Tunisia, http://www.cramsg2015.org/isp7-pressio2015

13th ISRM International Congress on Rock Mechanics Innovations in Applied and Theoretical Rock Mechanics 10–13 May 2015, Montreal, Canada, www.isrm2015.com

Shale and Rock Mechanics as Applied to Slopes, Tunnels, Mines and Hydrocarbon Extraction, Special One day Symposium, May 12, 2015, Montreal, Quebec, Canada, www.isrm2015.com/Page/PageContent/ShaleSymposium



World Tunnel Congress 2015
and 41st ITA General Assembly
Promoting Tunnelling in South East European (SEE) Region
22 - 28 May 2015, Dubrovnik, Croatia
http://wtc15.com

Contact
ITA Croatia - Croatian Association for Tunnels and Underground Structures
Davorin KOLIC, Society President
Trnjanska 140
HR-10 000 Zagreb
Croatia
info@itacroatia.eu

83rd ICOLD Annual Meeting
June 2015, Stavanger, Norway

ISFOG 2015 3rd International Symposium on Frontiers in Offshore Geotechnics, Oslo, Norway, 10-12 June 2015, www.isfog2015.no

DMT 15 The 3rd International Conference on the Flat Dilatometer, Rome 15-17 June 2015, www.dmt15.com

ICGE 2015 International Conference in Geotechnical Engineering – Colombo-2015, 10 - 11 August 2015, Colombo, Colombo, Sri Lanka, http://www.slgs.lk/?p=564

16th European Conference on Soil Mechanics and Geotechnical Engineering "Geotechnical Engineering for Infrastructure and Development", 13 - 17 September 2015, Edinburgh, UK, www.xvi-ecsmge-2015.org.uk

Workshop on Volcanic Rocks & Soils, 24 - 25 September 2015, Isle of Ischia, Italy, www.associazionegeotecnica.it

EUROCK 2015
ISRM European Regional Symposium
64th Geomechanics Colloquy
7 – 9 October 2015, Salzburg, Austria

European Conference in Geo-Environment and Construction
GEO-ENVIRONMENT AND CONSTRUCTION

POLIS University, the Albanian Geotechnical Society and Co-PLAN are pleased to invite you to the European Conference on Geo-Environment and Construction. The conference aims to provide a comprehensive coverage of theoretical and practical insights regarding geotechnical engineering, environmental issues and construction. This initiative is supported by the International Society of Soil Mechanics and Geotechnical Engineering. Engineers, researchers and professionals from all over Europe are invited and encouraged to participate in this conference in order to submit written contributions and also to present their works.

TOPICS

The conference topics include all aspects of geo-environment and construction fields. The aim of the conference is to present achievements and on this respect, to evidence what have been the main challenges and to introduce what appropriate approaches can be used. Professional interaction and mutual experience interchange are important aspects of this event. Some of the main conference topics are:

Geotechnical Engineering and Environment

- Infrastructural geotechnical engineering
- Geotechnical engineering related to industrial areas, mining industry and power plants
- Environmental geotechnical engineering
- Irrigation system and environment
- Slope stability and their impact on environment

Construction

- Foundation engineering
- Soil mechanics
- Underground construction and deep excavations
- Impact of geotechnical phenomena in architectural design
- Geotechnical engineering of historical and cultural monuments
- New technologies in geotechnical engineering
- Seismic structural design
- Case studies
- Structural Aesthetic Design
- Coordination between academic and practice experience in construction

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Mob: +355 66 40 61 326

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E-mail: erion.bukaci@gmail.com
Mob: +355 66 20 50 007

6th International Conference on Earthquake Geotechnical Engineering, 2-4 November 2015, Christchurch, New Zealand, www.6icege.com

The 15th Asian Regional Conference on Soil Mechanics and Geotechnical Engineering, 9-13 November 2015, Fukuoka, Japan, http://www.15arc.org

15th Pan-American Conference on Soil Mechanics and Geotechnical Engineering, 15 - 18 November 2015, Buenos Aires, Argentina, http://conferencesba2015.com.ar

VIII South American Congress on Rocks Mechanics, 15 - 18 November 2015, Buenos Aires, Argentina, http://conferencesba2015.com.ar

Sixth International Conference on Deformation Characteristics of Geomaterials IS Buenos Aires 2015, November 15th to 18th 2015, www.saig.org.ar/ISDCG2015

2015 6th International Conference Recent Advances in Geotechnical Engineering and Soiul Dynamics, December 7-11, 2015, New Delhi (NCR), India, wason2009@gmail.com; wasonfeq@iitr.ernet.in, sharmamukat@gmail.com; mukutfeq@iitr.ernet.in, gvramanaiitdelhi@gmail.com, ajaycbri@gmail.com

3rd PanAmerican Regional Conference on Geosynthetics
11-14 April 2016, Miami South Beach, USA
NAGSDirector05@gmail.com

84th ICOLD Annual Meeting
May 2016, Johannesburg, South Africa

GEOSAFE: 1st International Symposium on Reducing Risks in Site Invertigation, Modelling and Construction for Rock Engineering - an ISRM Specialized Conference
25 – 27 May 2016, Xi'an, China

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NGM 2016 - The Nordic Geotechnical Meeting, 25 - 28 May 2016, Reykjavik, Iceland, www.ngm2016.com

3rd ICTG International Conference on Transportation Geotechnics
4 - 7 September 2016, Guimaraes, Portugal

The Transportation Geotechnics International Conference series began under the auspices of ISSMGE-TC 3 and was initiated in 2008 at the University of Nottingham, UK, as an International event designed to address the growing requirements of infrastructure for societies. The 2nd International Conference on Transportation Geotechnics took place in 2012, at Sapporo, Japan, under the ISSMGE-TC202 that follows the TC-3 activities for the period 2009-2013. To continue the successful of these conferences and the output of ISSMGE-TC-202, the 3rd was scheduled for 2016, at Guimarães, Portugal. Following the previous one, the challenges addressed by this conference will include a better understanding of the interactions of geotechnics on roads, rails, airports, harbours and other ground transportation infrastructure with the goal of providing safe, economic, environmental, reliable and sustainable infrastructures. The 3rd ICTG will be composed of workshops and several types of sessions, as well as a technical exhibition, to better disseminations of findings and best practices. A special attention will be paid to the publication of all the peer review papers, some of them in specialised international journals. On behalf of the organizing committee I am honoured to invite you to the 3rd ICTG in the City of Guimarães, UNESCO World Heritage (September 4-7, 2016).

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EuroGeo 6 – European Regional Conference on Geosynthetics
25 – 29 Sep 2016, Istanbul, Turkey
eguler@boun.edu.tr

6th Asian Regional Conference on Geosynthetics
November 2016, New Delhi, India
uday@cbip.org

11th International Conference on Geosynthetics (11ICG)
16 - 20 Sep 2018, Seoul South Korea
csyoo@skku.edu

ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

Άνοιξε η γη στα Τρίκαλα
Τρύπα με διάμετρο 9 μέτρα και βάθος 7 μέτρα

Ένα εντυπωσιακό αλλά και ανησυχητικό θέαμα αντίκρισαν την Κυριακή οι κάτοικοι στην περιοχή «Λιβαδάκια του Μπέη» στο βουνό Κόζιακα στα Τρίκαλα, όπου η γη άνοιξε, δημιουργώντας μία τεράστια τρύπα στο έδαφος.

Η καταβύθιση του εδάφους, η οποία δημιούργησε την τρύπα με διάμετρο 9 μέτρα και βάθος 7 μέτρα, οφείλεται σε υποχώρηση του ασβεστολιθικού υποβάθρου της περιοχής –πιθανώς μίας σπηλαίωσης που αναπτύσσεται στην περιοχή- το οποίο είναι διαβρωμένο και κατά θέσεις καρστικοποιημένο.

Πάντως, οι αρχές βρίσκονται σε ετοιμότητα, αφού ο κρατήρας έχει ανοίξει δίπλα από το μονοπάτι Ε4, από όπου περνούν συχνά ορειβάτες.

(makeleio, 14 Μαΐου 2014)

http://news247.gr/eidiseis/apisteyto_anoikse_h_gh_sta_trikala.2787098.html

I-495 bridge columns rebound more

Tilting bridge support columns along I-495 continue to inch back to vertical alignment since the removal of soil piles blamed for the roadway's closing at the Christina River, state officials reported Thursday.

Crews closed the 90,000-vehicle-a-day stretch of highway on June 2 after four sets of columns along the bridge's southern approach tipped as much as 4 degrees, causing travel lanes to tip as well. Sensors show the columns have

moved 0.26 degrees back towards vertical, or about 6.5 percent.

The Delaware Department of Transportation has tentatively blamed the dangerous movement of the bridge on a contractor's stockpiling of as much as 55,000 tons of soil on land adjacent to the span. Some of the pile crossed onto the state's right of way.

State and city officials have released little about the origins of the material or why the mass managed to go unnoticed, despite a string of Freedom of Information Act requests to agencies that apparently failed to catch the threat, or violations that would have flagged it.

Late Thursday, in response to a series of questions, the Department of Natural Resources and Environmental Control reported that "neither the city of Wilmington nor DNREC's Sediment and Stormwater Program was aware" of soil stockpiles beneath the span.

"It is astounding that no one saw that, or, clearly, people saw it but no one acted on it," said Senate Minority Whip Gregory F. Lavelle, R-Sharpley. "It's a colossal failure."

"I understand that some of the other bridges have stuff under them, vehicles, things like that, because of people taking advantage or getting lazy. But this is like not seeing Godzilla," Lavelle said. He added that the bridge shutdown and traffic snarls are "all you hear about" from constituents.

The piles are clearly visible in aerial photos from 2013, under and alongside the bridge off busy Christiana Avenue. DNREC inspectors have been active in the same area for years attempting to enforce environmental laws at a troubled industrial-scale composting plant nearby.

Keogh Contracting Co. was required to secure a sediment and erosion control permit from the city for a stockpile even a fraction of that size, under authority delegated by DNREC and reviewed by the state every three years. DNREC officials said only that the case is now considered a "potential 'no plan' violation" to be investigated by DNREC.

DelDOT has retained a geotechnical engineering consultant to independently investigate the bridge damage and report on the cause. Officials believe that pressure from the soil pile compressed and distorted soft soils and silt under the area, sending pressure in all directions and bending the deeply driven steel piles supporting the bridge.

Federal Highway Administration officials have approved $2 million in emergency aidf or work to repair the bridge and restore traffic.

DelDOT Secretary Shailen Bhatt announced a $20 million contract for around-the-clock repair on Tuesday designed to restore traffic to southbound lanes by Labor Day. The temporary repair plan is expected to allow the reopening of northbound lanes two to four weeks later, with permanent repairs to follow.

Bhatt has said that his agency is conducting an internal review to determine how officials handled citizen warnings about the threat days and weeks before the shutdown. The adequacy of DelDOT's right-of-way inspection practices also are under review.

The agency last week inspected 29 bridges more than 500 feet long with the potential for stockpiling or storage of materials underneath the spans, within the state's rights-of-way, or close enough to potentially affect the structure's stability.

Materials were found in several cases, but nothing to the extent of the dirt mountain stored along I-495. Under two bridges – along Kirkwood Highway and DuPont Road over CSX tracks – inspectors found fill and/or construction equipment stored under the bridge.

"In those two cases, we sent out another team to inspect the substructure units that were near the materials to make sure they were still plumb, and everything was safe there," said Calvin Weber, bridge maintenance engineer for DelDOT. "There was no cause for safety concerns."

The material under DuPont Road has since been relocated without DelDOT even needing to ask anyone.

"We're not exactly sure why it was removed. All I can say is, since the closure of the 495 bridge, anyone with materials stored under a state bridge structure has a heightened awareness," DelDOT spokesman Geoff Sundstrom said.

Steel cases that will be put in the ground for support have arrived at the bridge site

Vehicles are regularly parked under some of the bridges, including DART buses under I-95 and Martin Luther King Jr.

Boulevard in Wilmington. Those won't be relocated, officials said.

"Not only in Delaware but in other places, it's not unusal to park vehicles under bridge decks," Sundstrom said. "The weight of a vehicle, while heavy, is not remotely comparable to the weight of the pile beneath the I-495 bridge."

DelDOT staff are digging through archived plans and records to determine the state's right-of-way near several bridges, as well as soil conditions and foundation types for each, Sundstrom said. Where fencing is needed for security or safety reasons it will be installed or re-installed, he added.

"Many of our structures were erected years ago, and the right-of-way adjacent to them has not been reviewed for some time," he added. "We do need to know what the right-of-way for all of our bridges is, and we will ascertain that information."

Crews this week began checking the next set of state-maintained bridges – those between 200 and 500 feet in length – again with the potential for stockpiling or storage of materials underneath them, Weber said.

The state has also asked the U.S. Army Corps of Engineers to conduct similar checks of their bridges in Delaware, including the Reedy Point Bridge (Del. 9) and Summit Bridge (Del. 896).

DelDOT has said this data will be recorded as part of periodical bridge inspections from now on. The agency is also considering the use of automated monitoring technologies in the future, so that DelDOT engineers would be notified when something is amiss.

Crews at the bridge site continue to work to install ties between the pairs of damaged bridge supports. Materials for the repairs are beginning to arrive, including 4-foot-wide steel casings that will be used to create concrete shafts for the new bridge foundation.

DelDOT also announced Thursday that northbound I-495 will be reduced to one lane of traffic through July 3 between Exits 4 (Edgemoor Road) and 5 (Philadelphia Pike) for the rehabilitation of the bridge over Stoney Creek. The contractor, Mumford & Miller Concrete Inc., is reconstructing the northbound and southbound approaches, among other work. The project began in February.

(Jeff Montgomery and Melissa Nann Burke, The News Journal, June 13, 2014, http://www.delawareonline.com/story/news/traffic/2014/06/12/bridge-columns-rebound/10379757).

Contractor says dirt piles were placed at I-495 bridge

A Wilmington contractor said Wednesday his company previously placed mounds of dirt alongside I-495 that now are part of a state investigation into how support piers on a span over the Christina River shifted, forcing officials to close the bridge for emergency work.

"Only thing I can tell you right now is I feel very badly about what happened to the bridge. I have absolutely no idea what happened," Jim Thomas, the owner of Keogh Contracting Co., said by phone Wednesday.

"I'm going to cooperate 100 percent with DelDOT, and I have been since Monday when I found out about this."

Engineers for the Delaware Department of Transportation believe the mounds of dirt set alongside the leaning piers could have had a role in compacting soft soils beneath the surface. Another possibility, DelDOT says, is corrosion of the steel piling, which reaches 140 to 160 feet below the surface to anchor in bedrock.

"It's too early to tell if it's a factor," Transportation Secretary Shailen Bhatt said of the dirt mounds. "Most of the folks who took a look at this say that something of that mass, of that height and weight, could certainly have an effect on compression. That's why we want to get the dirt out of there."

DelDOT is in the early phases of determining what caused the subsurface shifting of four pairs of 50-foot-tall bridge supports, called piers.

The worst pier is 4 percent out of vertical alignment. The concrete footing upon which the piers sit, as well as the bridge deck, have also shifted. With the increased load, the structure can support its own weight but not traffic.

Bhatt said DelDOT will take action if it determines that someone is responsible, but Thomas has been responsive since officials contacted him Monday about removing the stories-high piles of dirt — part of which sit within the state's right-of-way. The agency will soon send reinforcements to speed up the process, Bhatt said.

"It would be very premature for us to assign any kind of blame right now. He has been cooperative. When we called him and asked him to come down and move his dirt, and he did that," Bhatt said.

Changes from 2012 to 2013 at the bridge site. *(Photo: Dan Garrow/The News Journal)*

Thomas would not comment Wednesday on the purpose of the dirt pile or how long it's been on site.

"I haven't had any contact with DelDOT today, and I'm really not in a position to talk about that. I'd be guessing. I just can't talk right now," Thomas said.

Transportation officials closed I-495 in both directions Monday evening at the bridge between Terminal Avenue and 12th Street. They expect it to remain closed for several weeks until the structure can be shored up and leveled. The affected segment of I-495 carries an average 90,000 vehicles a day, according to state estimates.

According to county records, the property along the southeast side of the bridge is owned by the DuPont Co. Port Contractors Inc. President Michael Evanko said his company leases the tract from DuPont, but has an agreement with Keogh for it to use the land for storage.

A major bridge on I-495 will remain closed for weeks, if not months, as officials seek a remedy for tilted piers supporting the highway's span over the Christina River.
6/4/14 DAMIAN GILETTO/The News Journal

Evanko said he couldn't provide any information about the dirt, referring questions to Thomas. However, Port Contractors is allowing Keogh to temporarily relocate the dirt at its industrial yard next door on Christiana Avenue, Evanko said.

Dump trucks continued transporting load after load of the dirt from next to the bridge to the yard Wednesday.

A check of multiple years of aerial images of Delaware, distributed through the state's Geospatial Data Exchange, show little stockpiling of material around or under the bridge in past years through 2012, although some piles appear adjacent to the span.

An image of the site for 2013 clearly shows large volumes of material along and under the edge of the northbound approach span's right side — the side to which the piers are leaning.

DelDOT and builders around the world sometimes use piled soils to "pre-load" or "pre-consolidate" soft or unstable ground prior to construction of roadways or other projects. Time and weight relentlessly pack soil particles and other underground materials downward and squash away water, providing a more reliable base.

But the same process generates changes and forces in other directions as well, potentially affecting the ground or structures nearby.

"It's a perfectly good, common-sensical assumption" that piles near the I-495 approach spans created a problem, said C. David Jamison, a retired DelDOT engineer now in private practice. "Once you start loading up soil that's not stable in one direction, you create vertical loads and horizontal loads and it makes sense that something is going to have to give."

"In this case, it's scary. Usually when stuff settles, it takes a while," Jamison added. "This sounds very fast to me."

Murad Abu-Farsakh, who holds a doctorate in geotechnical engineering from Louisiana State University and teaches there, said soil stockpiling near major bridge structures should not be taken lightly and results are difficult to predict.

"It can't be answered quickly. It takes calculations. If there are existing pilings, this might cause problems," Abu-Farsakh said.

Although pre-loading was used successfully in the building the Del. 1 toll road in the 1990s, a similar effort went awry during construction of an earlier design for the Indian River Inlet Bridge, resulting in abandonment of an initial plan and a more-than $20 million DelDOT lawsuit against contractors, settled late last year for $5.25 million.

"You couldn't just look at it and say whether the effect is going to be significant or not significant," Abu-Farsakh said. "You need to know about the subsurface conditions, how much has been added, and how close it is to the piles. It can have a significant effect on the surrounding environment."

Tilt sensors placed on the leaning bridge piers have detected negligible movement within the first 36 hours of monitoring – less than 0.02 degrees, Bhatt said. Engineers are focusing on learning more about what's happening beneath the surface, officials said.

The last bridge inspection in October 2012 found no signs of leaning piers or other deficiencies.

The structure received a sufficiency rating of 82 out of 100 — a score designed to gauge the importance of replacing the span. A bridge scoring less than 50 can be eligible for federal dollars to help fund replacement.

New Castle County records show that the DuPont Co. owns triangular-shaped parcels of land on either side of the approach span between the Christina River and Christiana Avenue.

Alma Properties LLC owns land adjacent to both of DuPont's, and along the south side of Christiana Avenue in the area of 495. Its holdings include property used by Port Contractors just west of I-495 near the Christina's southern banks, and by Peninsula Compost LLC, which in turn has as one of its partners Port Contractors.

Some of the stories-high piles of dirt under the bridge sit within the state’s right-of-way.

DuPont spokesman Terry Gooding confirmed Wednesday that DuPont's property had been leased out and then made

available by the lease-holder to Keogh, and referred questions to Thomas. Alma officials did not return calls. Port Contractors Inc. is a family-founded material- and cargo-handling business and contractor that operates in multiple locations with its base in Wilmington.

Its Wilmington ventures have included a range of activities along Christiana Avenue near the I-495 bridge, including handling of petroleum coke from the Delaware City Refinery, as well as an interest in an industrial scale composting plant nearby.

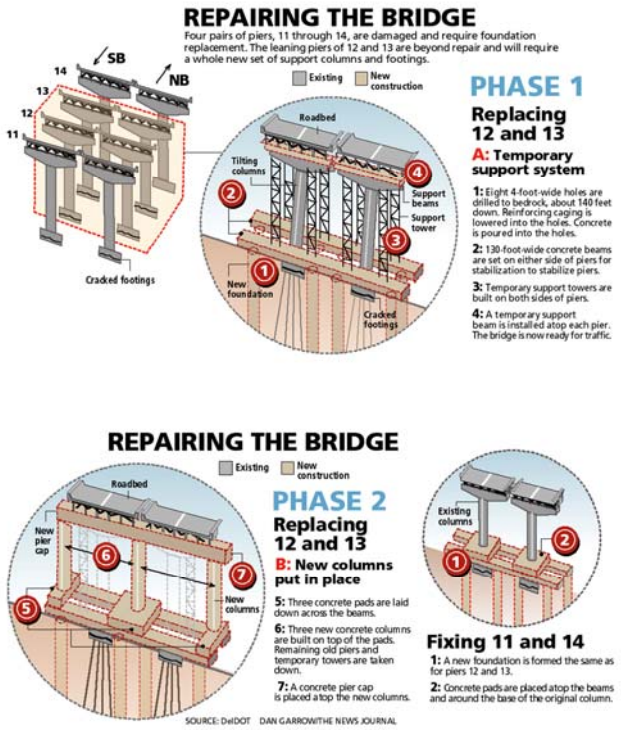
Google removed the bridge from its mapping application Wednesday, which may have helped route through-travelers around the closure, Bhatt noted.

To ease traffic congestion, DelDOT has adjusted signal timings at intersections, tweaked detour signs and is setting up a temporary signal at the Terminal Avenue exit of I-495, where northbound traffic is forced to exit.

Southbound motorists are urged to detour via I-95, although local traffic can access the highway to 12th Street.

(Melissa Nann Burke and Jeff Montgomery, The News Journal, June 12, 2014,
http://www.delawareonline.com/story/news/local/2014/06/04/contractor-says-dirt-piles-placed-bridge/9971917)

How the I-495 bridge will be repaired



http://www.delawareonline.com/story/news/local/2014/06/10/i495-bridge-repair/10309329

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΣΕΙΣΜΟΙ

Συστήματα 24ωρης ζωντανής παρακολούθησης σεισμών

Καταγραφή των σεισμών στον Ελληνικό χώρο θα βρείτε στον επόμενο σύνδεσμο:

http://www.earthquakenet.gr/index.htm

Μπορείτε να μεγενθύνετε ή να σμικρύνετε τον χάρτη της περιοχής που σας ενδιαφέρει.

Με «κλικ» στην κουκίδα που δείχνει σεισμό στο μέρος που σας ενδιαφέρει, βλέπετε όλες τις βασικές πληροφορίες για αυτό το σεισμό (ημερομηνία, θέση, ενταση, ώρα, βάθος).

Κατάσταση των τελευταίων σεισμών που συμβαίνουν σ' όλη την Γη τις τελευταίες 48 ώρες μπορείτε να βρείτε εδώ:

http://www.emsc-csem.org/Earthquake/Map/gmap.php

Σεισμός Κεφαλληνίας

Report GEER/EERI/ATC Cephalonia, Greece 2014
http://www.geerassociation.org/GEER_Post%20EQ%20Reports/Cephalonia_Greece_2014/index.html

Ευθύμης Λέκκας: νέα επικαιροποιημένη παρουσίαση με τα επιστημονικά δεδομένα από τους πρόσφατους σεισμούς στην Κεφαλονιά
http://elekkas.gr/images/stories/Frontpage/kefalonia2014/KEFALONIA_NEW.pdf

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΛΟΙΠΑ

Pedro Okalla - Οι Ισπανοί διαφημίζουν την Ελλάδα

Εκφωνήθηκε από τον ελληνιστή Πέντρο Ολάγια στην Ημερίδα Κλασσικού Πολιτισμού του Σαγούντο της Ισπανίας, με αφορμή την πρόταση κατάργησης του μαθήματος των ελληνικών στην ισπανική εκπαίδευση.

Το γύρο της Ισπανίας κάνει ένα εκπληκτικό βίντεο που φτιάχτηκε με σκοπό να αναδείξει την προσφορά του αρχαίου ελληνικού πολιτισμού στην ανθρωπότητα.

Εικόνες από τα ελληνικά νησιά, την ύπαιθρο, το ηλιοβασίλεμα, τα αρχαία Μάρμαρα που βρίσκονται διάσπαρτα στην ελληνική επικράτεια συνθέτουν αυτό το εξαιρετικό βίντεο που αποτελεί μια όμορφη ολιγόλεπτη διαφήμιση της χώρας μας.

Το κείμενο που συνοδεύει το βίντεο και το οποίο έχει κανείς την δυνατότητα να διαβάσει και στα ελληνικά επιλέγοντας την αντίστοιχη ένδειξη, κάτω δεξιά στο βίντεο.

http://loutraki1.blogspot.gr/2014/01/blog-post_2746.html
http://www.youtube.com/watch?v=U9NeWHJ3yw8

What the World Would Be Like if Engineering Didn't Exist

Are you fascinated by the world of engineering? Can you imagine a world without engineering? It might be a tougher question than you think to answer, because many people do not actually know the extent to which we rely on engineering for our world to function, and the amount of work that has gone into it by different types of engineers.

The discipline of engineering is one of the oldest in the world, arguably as old as civilization itself. The first engineers were those who developed the lever, the pulley and the inclined plane. Egyptian engineers designed and built the Pyramids, and Roman engineers conceptualized the famous aqueducts. Today, engineering covers a broad range of disciplines all devoted to keeping the "engine" of our modern civilization running — world without engineering would see disaster happen more often than not.

I have personally worked in many engineering jobs in varied fields, and some of my jobs have seen me move internationally to explore the world of engineering from a number of different countries and cultures. What I can say is this: in every role my skills have developed and expanded, with advanced technology aiding my engineering work. Gone are the days were I had to run out to a construction site and manually repair an engineering fault — now the reliance is upon technology working and managing the fault from a control room.

However, the world does not only function on advanced engineering technology. In order to fully understand the world without engineering, you need to be familiar with the current jobs that make an impact. For example, you can find electrical engineers working for companies like General Electric and Siemens who develop, test and supervise the equipment that keeps our power running. There are the mechanical engineers who physically develop and test all kinds of modern devices, from computers to recreational equipment to vehicles. Civil engineers work to maintain and improve the infrastructure of our modern cities, roads, airports and transportation networks. Environmental engineers help companies comply with environmental law, aid in the cleanup of hazardous waste and consult with corporations and governments on how to avoid environmental problems.

Engineering in Modern Life

When we think of engineering, we usually think of devices, computer software, complicated mathematics and elaborate building projects that look beautiful to the eye; a stunning piece of architecture or scientific program. But these highly specialized fields are just a distillation of a basic concept that has fueled civilization itself. Engineering has created nearly every aspect of our daily modern lives and it is more than just a skill or design — it's a fundamental way of thinking and interacting with the environment around us.

But that's only scratching the surface. In fact, without civil engineering, there would be neither cities nor landscapes to view. Take away the tallest skyscrapers like the Shanghai Tower in China, the World Trade Center and Empire State building in New York, the Dream Dubai Marina or the Petronas Tower 1 and 2 in Kuala Lumpur Malaysia, and what are you left with? Not much in the skyline anywhere. These tallest buildings have been constructed and engineered to fulfil a purpose over the years.

Without engineering, any structure more modern than a simple hut would be impossible to build. Infrastructure would be gone as there would be no roads, or vehicles to travel on them — building roads has its roots in ancient Roman engineering and is considered not only one of the touchstones of modern life, but the secret to the Roman Empire's long prosperity. Without engineering we simply would be walking along foot paths or game trails.

If you can think of any machine, device, or process that makes life simpler and more convenient for humanity, you are talking about engineering at work. Without it, civilization would barely exist as we know it today. To remove engineering would be to regress humanity back to the most basic innovation; the invention of the wheel. Without engineering, none of the Seven Wonders of the World would ever have existed and even the most basic of tools would not exist. The first forged weapon, the first spear, anything more complex than a thrown rock — all the work of the first engineers, before there was even a name for it.

We, as engineers, all play a vital role in the world actually functioning. Without these job roles being fulfilled by skilled people, the world would start to break down slowly. A world without engineering would be a world without humanity, our ability to design and create makes us unique in the natural world.

Our buildings, roads, vehicles, and technologies make us human. These engineered structures allow us to translate space, communicate across vast distances and extend the limits of our bodies. A decline in the sciences is a serious threat to our global society and the sciences are in decline: The Royal Society reports that scientific doctoral degrees have fallen by 8 percent (in proportion to total PhDs awarded) in the past decade. Meanwhile, the U.S., once a world leader in engineering and math, has seen a massive falloff in students pursuing post-graduate science degrees.

So, it is time to engineer a campaign to revive engineering. Here’s how:

#1: **Define New Frontiers**

Previous generations had oceans to cross, continents to traverse and an atmosphere to escape. Since the earliest civilizations, people around the globe have been reeled in by the great unknown, so there has been a constant excitement, urgency and determination to explore pervading our race since its earliest beginnings. Explorers have fueled advances in engineering perhaps more profoundly than any other group, from the wheel to the space shuttle.

Engineering has long been driven by the simple urge to know what else is out there: beyond the next mountain or across the sea. So, to rescue engineering, we must now define new common frontiers and mobilize a widespread sentiment that exploring them is both necessary and admirable. Where should we look to rescue engineering? The depths of the oceans, the far reaches of space and beneath the Earth's crust.

#2: **Pursue the Impossible**

Bold adventurers climb Everest simply "because it is there." They chase records of supersonic flight, try to drive faster than anyone in history, and set out to surf the biggest waves on the planet. All these endeavors require as much engineering as they do guts and each time someone proves that the impossible is indeed possible, they open up a new world of human potential — one that extends both the mental and physical limitations that stifle innovation.

This is why the ongoing Bloodhound SSC project is so important. Engineers are currently at work on a car they hope to drive faster than 1,000 mph, shattering the current land speed record and inspiring a new generation to redefine the limits of engineering achievement. The attempt is scheduled to take place in late 2015, and could very well create a new era of automotive innovation; it is innovation like this that rescues engineering.

#3: **Invest in Engineering**

When governments fail to support the sciences, as so many today are, it is the duty of private investors to fuel innovation and revive engineering. Elon Musk and Richard Branson are two shining examples of how entrepreneurs can revive a world of engineering and change it. Branson and Musk are at the forefront of private space exploration, with plans to start commercial flights to space in the near future. Musk's company, Space X, even managed to launch a shuttle and dock with the International Space Station last year. Elon is also the genius behind Tesla Motors, which is redefining the automobile industry by creating the most sustainable (and stylish) electric vehicles on the road. We need more entrepreneurs like these to keep the world of engineering running.

#4: **Challenge**

To spark the innovation needed to overcome our direst social and environmental problems, we must challenge today's minds to engineer solutions. The Bill and Melinda Gates Foundation provides a brilliant example of how this can be accomplished. They recently held a competition, with a prize of $100,000, to be awarded to someone who could invent an inexpensive and sustainable toilet capable of bringing sanitation to communities in developing nations. The result was a major step forward in the science of sanitation and new hope for a brighter future.

#5: **Inspire**

Most importantly, to avoid a world without engineering, we must continue to inspire innovation. In the first month of 2014, a NASA space shuttle, which will soon land on a comet in the hopes of discovering how life began on Earth, awoke from its energy-saving hibernation and sent a message back to Earth — "Hello world" — from 500 million miles away.

The Future World

Women, in particular, have the opportunity to set some standards with revived engineering, and I'm here today to encourage more females to explore engineering and science, and to get involved in the world of the future. Currently, in the U.K. alone, only 7 percent of females work in engineering — we need to more than triple this.

There is great progress in our world helping to increase this percentage — Jaguar Land Rover, for example, launched their 2014 apprentice campaign which is in search of 150 new recruits and state they want to build on the number of female engineers. Their brand-new initiative takes this into account and is targeted at girls that are between the ages of 10 and 14. I believe more encouragement like this is needed and will revive engineering for women of all ages.

Who knows how many people might space dive in 2016 with the real-life "Iron Man" suit being developed by hi-tech inventors Solar System Express (Sol-X), and the biotech designers over at Juxtopia LLC (JLLC)? I just hope that when this suit is finished, it's a woman in 2016 who breaks the world record — that alone could help encourage many more women into the industry.

For now, we can embrace what engineering is and the innovation that it brings. We are seeing new forms of engineering and medical devices saving lives every day — the engineering development and manufacturing of medical equipment advancing to an extent that it gives a person with an amputee the ability to walk or run again through an engineered prosthesis.

Having now seen what a world would be like without engineering, it's important to question if you would be able to cope without it. Do you appreciate it enough to help it live on? What are you doing to keep it around?

(Jenny Ann Beswick / Manufacturing Net, 5th February 2014 http://www.manufacturing.net/blogs/2014/02/what-the-world-would-be-like-if-engineering-didnt-exist)

It takes a country to raise an engineer

Engineering firms must step up when it comes to training graduates if they expect universities to do the same

Britain's bouncing back! Or so the statistics appear to indicate. The UK economy grew by nearly one per cent in the first three months of the year and is nearly back to its 2008 peak. Of course the population has also grown so we're all still poorer, plus there are fears of a London house-price bubble and the spectre of interest rate rises to worry about.

There are at least signs that manufacturing is finally making a clear recovery, growing by more than the service sector and at the fastest rate since 2010 (although given manufacturing's steeper fall during the recession we're some way off the much hoped-for rebalancing).

But with the good economic news comes the inevitable complaint that we don't have enough engineering graduates and that the ones we are producing don't have the right skills to fuel industry's needs.

Research released today by manufacturers' organization EEF shows 66 per cent of firms plan to recruit engineering graduates in the next three years, but that 80 per cent of them think universities need to prioritise making students employable and 35 per cent have recently turned to EU students, who are often seen has having better industry experience.

There is certainly a case for universities to look again to ensure their engineering courses are giving students the best opportunities, and for businesses to communicate their needs more clearly. Chairing a recent workshop for the Engineering Professors' Council on the topic of postgraduate engineering, *The Engineer* was amazed to see how little university representatives understood what engineering firms wanted from masters and PhD-level candidates.

There is also a strong argument for greater encouragement of industrial placements and sandwich years as part of undergraduate courses, and for more firms to offer such experience.

But there's also a need for employers to check their expectations and understanding of what universities are for. They are not training colleges or vocational schools but places for students to undertake deep study. They shouldn't neglect the issue of employability but they also can't be expected to train students in using specific machines and software at the expense of greater understanding of engineering princples.

Engineering firms also have to step up and take responsibility for training and skills – and indeed many are, providing placements, sponsoring students and putting their existing employees through university. But the numbers doing these things are half (or less) the numbers calling for more from higher education.

While all this is going on, the struggle continues to get more young people onto engineering courses in the first place. A new set of recommendations on careers advice in school raises the hope of some improvement in this sphere.

The approach set out by Sir John Holman in a review for the charitable Gatsby Foundation is to give schools more resources and incentives to improve career guidance provision, which is currently patchy at best – less than a quarter of students receive more than one face-to-face advice session by the time they're 18.

This approach fits with the current trend for giving schools more freedom to set their own agendas but leaves hanging the question of whether schools will take up the challenge – even with greater pressure from Ofsted and the inclusion of student destinations in league tables. And, especially if careers guidance is provided by teachers rather than dedicated advisers, it won't address the problem of stereotyping and cultural bias against engineering jobs.

(Stephen Harris, Senior reporter / the engineer, 30 April 2014, http://www.theengineer.co.uk/channels/skills-and-careers/opinion/it-takes-a-country-to-raise-an-engineer/1018485.article#ixzz30Ni3DrMM)

Απίστευτο: Θάφτηκε ζωντανή και δείτε πως κατάφερε να επιζήσει

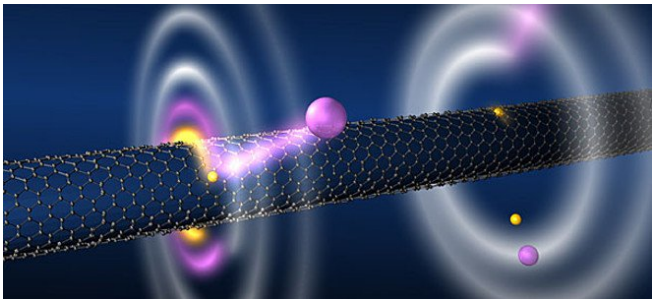
Η 34χρονη Κινέζα όπου εργαζόταν σε ένα κατασκευαστικό έργο ξαφνικά βρέθηκε θαμμένη κάτω από τόνους άμμους. Οι διασώστες προκειμένου να την εντοπίσουν αναγκάστηκαν να σκάψουν ένα ολόκληρο τούνελ και όταν κατάφεραν να την ανασύρουν έμειναν πραγματικά έκπληκτοι.

Ενώ κανείς δεν θα πίστευε ότι η γυναίκα θα ζούσε εκείνη τα κατάφερε χάρη στο σκληρό καπέλο που φορούσε, το οποίο δημιούργησε ένα μικρό κενό από που μπορούσε να αναπνεύσει τα 30 εκείνα κρίσιμα λεπτά μέχρι να την εντοπίσουν και να την απεγκλωβίσουν.

Η γυναίκα είχε πραγματικά Άγιο αφού όπως βλέπετε και στην φωτογραφία ήταν κυριολεκτικά θαμμένη κάτω από την άμμο.

(4 Μαϊου 2014, http://www.queen.gr/SYMBAINEI-STON-KOSMO/item/94507-apisteyto-thaftike-zontani-kai-deite-pos-katafere-na-epizisei#ixzz30ju265Ny)

Μεγάλη επιτυχία στην Κρήτη: Ερευνητές δημιούργησαν το πιο ισχυρό λέιζερ στον κόσμο



Ερευνητές στην Ελλάδα κατάφεραν να δημιουργήσουν ένα λέιζερ ατόμων, που είναι επτά φορές πιο ισχυρό από ό,τι είχε επιτευχθεί μέχρι σήμερα. Παγκοσμίως, περίπου δέκα ερευνητικές ομάδες ασχολούνται με τα λέιζερ ατόμων και μία από αυτές βρίσκεται στην Κρήτη, με εντυπωσιακές μάλιστα επιδόσεις σε διεθνές επίπεδο.

Οι επιστήμονες, με επικεφαλής τον, γερμανικής καταγωγής, φυσικό Βολφ φον Κλίτσινγκ και τη μεταδιδακτορική ερευνήτρια Βασιλική Μπόλπαση, του Ινστιτούτου Ηλεκτρονικής Δομής & Λέιζερ του Ιδρύματος Τεχνολογίας και Έρευνας (ΙΤΕ) στην Κρήτη, έκαναν τη σχετική δημοσίευση στο διεθνές επιστημονικό περιοδικό «New Journal of Physics».

Συμμετείχαν επίσης ο επίκουρος καθηγητής Νίκος Ευφραιμίδης του Τμήματος Εφαρμοσμένων Μαθηματικών του Πανεπιστημίου Κρήτης και ο Παύλος Κονδύλης του Κέντρου Κβαντικών Τεχνολογιών του Εθνικού Πανεπιστημίου της Σιγκαπούρης, καθώς επίσης οι Μάικλ Μορισέι και Μαρκ Μπέικερ από το ΙΤΕ και Ντάνιελ Σαχαγκούν από τη Σιγκαπούρη.

Τα λέιζερ ατόμων (ή ατομικά λέιζερ) εκπέμπουν δέσμες ύλης αντί για δέσμες φωτός. Οπως σε ένα συμβατικό οπτικό λέιζερ, η δέσμη του περιέχει φωτόνια (σωματίδια φωτός) που κινούνται με συνεκτικό τρόπο στον χώρο, με ανάλογο τρόπο σε ένα λέιζερ ατόμων η δέσμη του περιλαμβάνει εκατομμύρια άτομα. Τα λέιζερ ατόμων βρίσκονται στο αρχικό στάδιο των ερευνών και πρέπει να γίνουν ακόμη πολλά προτού βρουν πρακτικές εφαρμογές, όπως η ατομική συμβολομετρία, η ατομική λιθογραφία, η ακριβέστερη μέτρηση μαγνητικών πεδίων κ.α.

Κρίσιμος παράγων και για τους δύο τύπους λέιζερ είναι η ροή, δηλαδή ο ρυθμός εκπομπής φωτονίων ή ατόμων. Μέχρι σήμερα, η ροή των ατόμων στα λέιζερ ήταν περιορισμένη, αλλά η νέα έρευνα ξεπέρασε τα έως τώρα εμπόδια, επιτυγχάνοντας ροή επτά φορές μεγαλύτερη από ό,τι είχε επιτευχθεί μέχρι σήμερα.

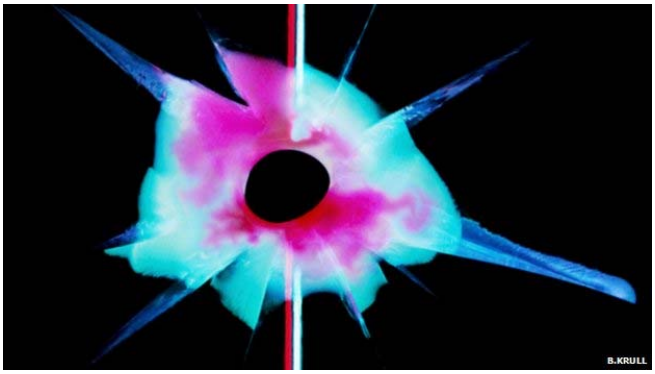
Τα ισχυρότερα μέχρι σήμερα λέιζερ ατόμων συνίστανται σε νέφη ατόμων που έχουν παγιδευτεί με μαγνητικό τρόπο και έχουν ψυχθεί σε θερμοκρασίες κοντά στο απόλυτο μηδέν (πρόκειται για τα λεγόμενα «συμπυκνώματα Μπόουζ- Αϊνστάιν»). Αυτά τα συμπυκνώματα είναι τόσο κρύα, που πολλά άτομά τους βρίσκονται στη χαμηλότερη δυνατή ενεργειακή κατάσταση, με συνέπεια να χάνουν την ατομική τους ταυτότητα και να σχηματίζουν μία ενιαία κβαντική οντότητα. Με τη βοήθεια πεδίων ραδιοσυχνοτήτων, τα εν λόγω κρύα συμπυκνώματα τελικά εκπέμπουν μια συνεκτική δέσμη ατόμων, μετατρεπόμενα έτσι σε λέιζερ.

Οι ερευνητές στο ΙΤΕ, χρησιμοποιώντας ισχυρότερα πεδία ραδιοσυχνοτήτων, πέτυχαν μια ροή 4 X 10^7 (εις την εβδόμη δύναμη) ατόμων/δευτερόλεπτο και προβλέπουν ότι στο μέλλον, εφαρμόζοντας συμπυκνώματα Μπόουζ- Αϊνστάιν με περισσότερα άτομα, θα καταφέρουν -μέσα στις επόμενες εβδομάδες- να αυξήσουν περαιτέρω την ισχύ του ατομικού λέιζερ.

Επίσης, χρησιμοποιώντας την ίδια τεχνική, για πρώτη φορά οι ερευνητές δημιούργησαν μια ισχυρή δέσμη ατόμων, που περιείχε ταυτόχρονα μια δέσμη λέιζερ ατόμων και μια πολύ κρύα δέσμη θερμικών ατόμων. Είναι η πρώτη φορά που επιτυγχάνεται μια τέτοια υβριδική δέσμη ατόμων. Η δέσμη θερμικών ατόμων, με θερμοκρασία μόλις 200 νανοκέλβιν, είναι δύο τάξεις μεγέθους πιο κρύα από οποιαδήποτε ανάλογη δέσμη ατόμων έχει επιτευχθεί μέχρι σήμερα.

(iefimerida, 09.05.2014, http://www.iefimerida.gr/node/154190#ixzz31POAa3wT)

Self-healing plastic mimics blood clotting



Healing chemicals arrive via capillaries (the red and blue vertical lines) and form a gel that seals the gap

A new plastic that "heals itself" has been designed, meaning your cracked phone screen or broken tennis racquet could mend its own wounds.

The polymer automatically patches holes 3cm wide, 100 times bigger than before.

Inspired by the human blood clotting system, it contains a network of capillaries that deliver healing chemicals to damaged areas.

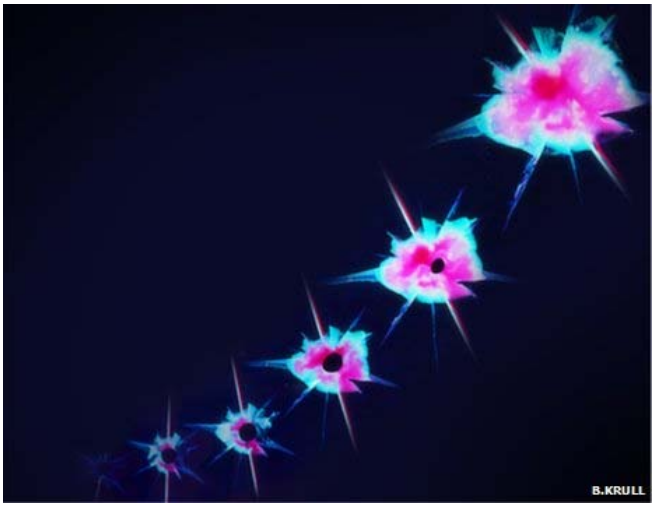
The new material, created by engineers at the University of Illinois, is described in Science journal (http://www.sciencemag.org/content/344/6184/620).

For decades scientists have dreamed of plastics that heal themselves like human skin.

Cracks in water pipes and car bonnets would seal up. Satellites could repair their own damage. Broken electronic chips in laptops and mobile phones would spontaneously sort out their own problems.

One of the first big breakthroughs came in 2001 at the University of Illinois (http://www.nature.com/nature/journal/v409/n6822/full/409794a0.html). Prof Scott White and colleagues infused a

polymer with microscopic capsules containing a liquid healing agent. When the material cracked, the chemicals were released and bridged the gaps.



A timelapse of a broken area self-healing (left to right)

More recently, concrete (http://www.bbc.com/news/science-environment-20121303), water-resistant coatings (http://www.bbc.com/news/science-environment-18998638), and even electrical circuits (http://onlinelibrary.wiley.com/doi/10.1002/adma.201102888/abstract) have been engineered with self-healing properties.

But even the best self-healing plastics and polymers can only repair small-scale damage, the Science magazine authors note.

"Although self-healing of microscopic defects has been demonstrated, the re-growth of material lost through catastrophic damage requires a regenerative-like approach," said Prof White.

To fix larger breakages, he and his team have designed a new, vascular system - inspired by the arteries and veins of the human body.

A network of channels delivers a healing agent to the site of damage.

The chemicals arrive via two separate streams. They combine to seal the gap in a two-stage reaction. Initially, they form a gel scaffold across the hole. The gel then slowly hardens into a robust, solid structure.

"We filled regions exceeding 35mm within 20 minutes, and restored mechanical function within three hours," the researchers wrote in Science.

Tests showed the material recovered about 62% of its original strength.

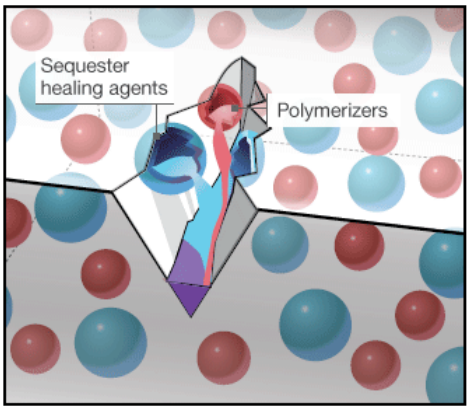
The new material paves the way for future polymers that can recover from ballistic impacts, such as bullets, bombs or rockets.

Its design was praised by engineers Zhouzhou Zhao and Prof Ellen Arruda, of the University of Michigan.

"This innovative approach enables restoration of mechanical integrity to a damage volume that is roughly 100 times the largest defect previously healed in this manner," they wrote in Science (http://www.sciencemag.org/content/344/6184/591).

Self-healing systems

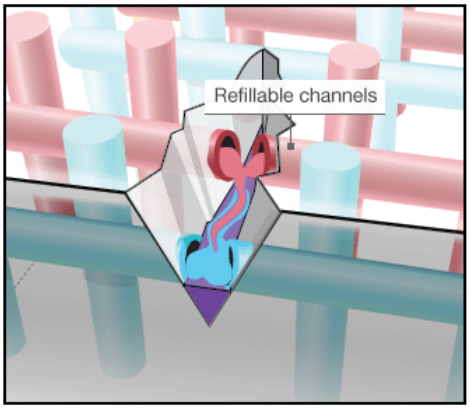
Capsule-based



Source: Janet Sinn-Hanlon, Scott White, Ben Blaiszik

Capsules containing the healing agents and other chemicals are distributed throughout the material. If a breakage occurs, the capsules release their contents casuing a chemical reaction to "heal" the breakage.

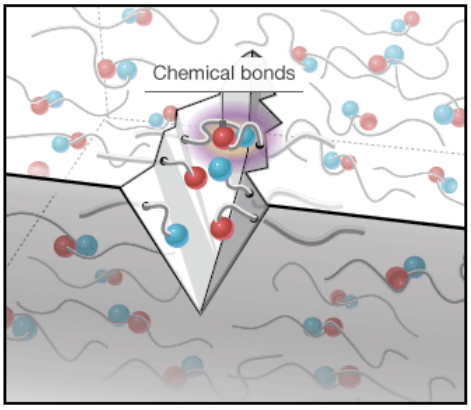
Vascular



Source: Janet Sinn-Hanlon, Scott White, Ben Blaiszik

Vascular systems use networks of refillable channels to deliver the healing agent and polymerisers to the breakage point.

Intrinsic



Source: Janet Sinn-Hanlon, Scott White, Ben Blaiszik

Intrinsic systems use the reversible nature of certain chemical bonds to incorporate healing properties directly into the material.

"Vascular systems can potentially eliminate fracture in materials by preventing small, noncritical cracks from propagating to critical sizes."

However, future materials which are "truly regenerative" will require a much more flexible repair system, the scientists admit.

"When damage is unpredictable and uncontrolled, more complex and interconnected vascular networks will be necessary to provide sufficient vascular coverage and redundancy to circumvent channel blockage," Prof White and his co-authors wrote.

While recent advances in self-healing are exciting, "the long-term performance of autonomously healed polymers has largely remained unexamined," said Prof Arruda and Mr Zhao.

"Methods are also needed to assess and monitor the potential healing ability after multiple repair events.

"Here again, elegant examples that have evolved in nature can inspire solutions."

(James Morgan, Science reporter / BBC News, 09.05.2014, http://www.bbc.com/news/science-environment-27296365)

Timescanners: Digital Scanners Explain Historic Architecture's Engineering Mysteries

Thanks to state of the art mobile laser scanners, scientists can now document the greatest architecture in history, from The Pyramids to St. Paul's Cathedral, as digital models with pinpoint accuracy. The digital representations take you inside, around and through the buildings, which means researchers can study and analyze sites without being in the field. The technology is already proving its worth – watch the trailer above to see how Petra was constructed and more!

(Andrew Galloway, 07 Jun 2014.
http://www.archdaily.com/?p=513971,
http://www.archdaily.com/513971/timescanners-digital-scanners-explain-historic-architecture-s-engineering-mysteries,
http://www.archdaily.com/tag/digital-preservation).

Ωκεανοί νερού στα έγκατα της γης

Μια νέα αμερικανική επιστημονική έρευνα κατέληξε στο συμπέρασμα ότι στα βάθη της Γης, στο στρώμα του μανδύα που βρίσκεται ανάμεσα στον φλοιό και στον πυρήνα, υπάρχουν τεράστια αποθέματα νερού, πιθανώς τριπλάσια από τον συνολικό όγκο νερού που διαθέτουν όλοι μαζί οι ωκεανοί στην επιφάνεια του πλανήτη μας. Αυτό το «ρεζερβουάρ» του νερού, που φαίνεται διαχρονικά σταθερό, βρίσκεται σε βάθος έως 700 χιλιομέτρων κάτω από την επιφάνεια, στην ενδιάμεση ζώνη ανάμεσα στον ανώτερο και στον κατώτερο μανδύα.

Οι ερευνητές εκτιμούν ότι το νερό βρίσκεται «κλειδωμένο» (μοριακά παγιδευμένο) μέσα σε γαλαζοπά πετρώματα, τους ρινγκουδίτες. Πρόκειται για ένα σχετικά σπάνιο πέτρωμα με κρυσταλλική δομή, που σχηματίζεται από ολιβίνη κάτω από πολύ υψηλές πιέσεις και θερμοκρασίες.

Υπάρχει πάρα πολύ νερό βαθιά κάτω από τα πόδια μας, αν και όχι στις γνώριμες μορφές του (υγρό νερό, πάγος, υδρατμοί), αλλά το θέμα είναι πώς το φτάνει κανείς.

Η ύπαρξη τόσο μεγάλων ποσοτήτων υπόγειου νερού, ρίχνει πιθανώς νέο φως στον αέναο υδρολογικό κύκλο της Γης, στην προέλευση των θαλασσών και στο γιατί οι ωκεανοί έχουν λίγο-πολύ διατηρήσει το μέγεθός τους εδώ και εκατομμύρια χρόνια. Μερικοί γεωλόγοι πιστεύουν ότι το νερό έφτασε στη Γη εξ ουρανού, από παγωμένους κομήτες που έπεσαν στον πλανήτη μας.

Όμως η νέα ανακάλυψη ενισχύει μια εναλλακτική πιθανότητα, να «αναδύθηκαν» σταδιακά οι ωκεανοί από τα έγκατα της πρώιμης Γης, χάρη και στη συνεχή ανακύκλωση των τεκτονικών πλακών. «Οι ενδείξεις είναι καλές ότι το νερό της Γης προήλθε από το εσωτερικό της», δήλωσε ο Τζέικομπσεν.

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Οι σεισμογράφοι

Οι Αμερικανοί ερευνητές χρησιμοποίησαν πάνω από 2.000 σεισμογράφους για να μελετήσουν τα σεισμικά κύματα που γέννησαν πάνω από 500 σεισμοί στις ΗΠΑ. Αυτά τα κύματα διαπερνούν το εσωτερικό του πλανήτη μας (ακόμη και τον πυρήνα) και έτσι αποτελούν στην ουσία το καλύτερο μέχρι σήμερα τρόπο που διαθέτουνοι γεωλόγοι για να «ακτινογραφούν» -αν και έμμεσα- τι συμβαίνει στα έγκατα της Γης.

Μετρώντας την ταχύτητα διάδοσης των υπόγειων σεισμικών κυμάτων σε διαφορετικά βάθη, οι επιστήμονες συμπέραναν την πυκνότητα και συνεπώς το είδος των πετρωμάτων που τα κύματα διέσχιζαν. Το καλά κρυμμένο νερό αποκαλύφτηκε, επειδή λόγω της παρουσίας του τα σεισμικά κύματα επιβραδύνθηκαν στο αντίστοιχο γεωλογικό στρώμα (ένα σεισμικό κύμα χρειάζεται περισσότερο χρόνο για να διαπεράσει ένα ένυδρο πέτρωμα από ό,τι ένα άνυδρο).

Οι σεισμικές αυτές παρατηρήσεις συμπληρώθηκαν από πειράματα στο εργαστήριο, από τα οποία οι ερευνητές κατέληξαν στο συμπέρασμα ότι οι ένυδροι ρινγκουδίτες σε βάθη της τάξης των 700 χλμ. είναι σαν «σφουγγάρια» που, υπό υψηλή πίεση και θερμοκρασία, λιώνουν σταδιακά και έτσι «ζουλάνε» το νερό που έχουν προηγουμένως απορροφήσει,

ωθώντας το έξω από το πέτρωμα. «Είναι ένα πέτρωμα με νερό μέσα και γύρω του, σχεδόν σαν να ιδρώνει», είπε χαρακτηριστικά ο Τζέικομπσον.

Αν και η μελέτη των σεισμικών κυμάτων από τον αμερικανό επιστήμονα αφορά το υπέδαφος μόνο των ΗΠΑ, πιστεύει ότι κάτι ανάλογο συμβαίνει σε όλο τον πλανήτη και ήδη σκοπεύει να επεκτείνει τη σεισμική μελέτη του σε άλλες χώρες επίσης. Όπως είπε, «θα έπρεπε να είμαστε ευγνώμονες γι' αυτό το βαθύ απόθεμα νερού. Αν δεν βρισκόταν εκεί, θα ήταν στην επιφάνεια της Γης και τότε μόνο οι κορυφές των βουνών θα βρίσκονταν πάνω από το νερό». Η μελέτη δημοσιεύεται στην επιθεώρηση «Science».

(Κέρδος online, 13.06.2014, http://www.kerdos.gr/%CE%B8%CE%AD%CE%BC%CE%B1%CF%84%CE%B1/99858-%CF%89%CE%BA%CE%B5%CE%B1%CE%BD%CE%BF%CE%AF-%CE%BD%CE%B5%CF%81%CE%BF%CF%8D-%CF%83%CF%84%CE%B1-%CE%AD%CE%B3%CE%BA%CE%B1%CF%84%CE%B1-%CF%84%CE%B7%CF%82-%CE%B3%CE%B7%CF%82?utm_source=KerdosNLetterApp&utm_medium=email&utm_campaign=html_newsletter)

Πορτρέτο του «μπριντγκμανίτη»
Το πρώτο δείγμα του «πιο άφθονου ορυκτού στη Γη»

Ίχνη του «μπριντγκμανίτη» κρυβόταν σε έναν μετεωρίτη που έπεσε τον 19ο αιώνα στην Αυστραλία (Πηγή: Chi Ma)

Λέγεται ότι είναι το πιο άφθονο ορυκτό στη Γη, κρύβεται όμως βαθιά στο μανδύα του πλανήτη, μακριά από τα ανθρώπινα μάτια. Το πρώτο φυσικό δείγμα του είχε περιέργως εξωγήινη προέλευση, καθώς εντοπίστηκε όχι στο υπέδαφος αλλά μέσα σε έναν αρχέγονο μετεωρίτη. Και η ανακάλυψη επέτρεψε για πρώτη φορά στους επιστήμονες να προσδιορίσουν τη δομή του και να το βαφτίσουν επίσημα: μπριντγκμανίτη.

Το κρυμμένο ορυκτό αποτελείται από μαγγάνιο, πυρίτιο και οξυγόνο ($MgSiO_3$) και ήταν γνωστό ως σήμερα ως πυριτικός περοβσκίτης, αναφέρει σε ανακοίνωσή της η Αμερικανική Ένωση Γεωφυσικής (http://blogs.agu.org/geospace/2014/06/06/earths-abundant-mineral-finally-gets-name). Η χημική σύσταση δεν ήταν αρκετή για να αναγνωριστεί ως νέο ορυκτό, αφού οι διεθνείς κανόνες απαιτούν και προσδιορισμό της κρυσταλλικής δομής.

«Τα ευρήματά μας κλείνουν ένα ενοχλητικό κενό στην ταξινομική των ορυκτών» σχολιάζει ο Όλιβερ Τσάουνερ του Πανεπιστημίου της Νεβάδα στο Λας Βέγκας.

Ο Τσάουνερ και ο συνεργάτης του Τσι Μα του Τεχνολογικού Ινστιτούτου της Καλιφόρνια (Caltech) προσπαθούσαν επί πέντε χρόνια να εντοπίσουν ένα φυσικό δείγμα του ορυκτού και να το χαρακτηρίσουν.

Οι γεωλόγοι πιστεύουν ότι ο μπριντγκμανίτης είναι ένα από τα πιο άφθονα πετρώματα της Γης, αν όχι το πλέον άφθονο. Δεν υπάρχει όμως στο φλοιό αλλά σε βάθη 670 έως 2.900 χιλιομέτρων, ανάμεσα στη μεταβατική ζώνη του μανδύα και το όριο του πυρήνα. Η μεταβατική ζώνη, η οποία ανακαλύφθηκε από τη μελέτη της διάδοσης των σεισμικών κυμάτων στο υπέδαφος, βρίσκεται ανάμεσα στον ανώτερο και τον κατώτερο μανδύα και αντιστοιχεί στο βάθος στο οποίο τα ορυκτά υφίστανται αλλαγές σε ατομικό επίπεδο λόγω της ακραίας πίεσης και θερμοκρασίας.

Δεδομένου ότι είναι αδύνατη η ανάσυρση δειγμάτων από τέτοια βάθη, οι ερευνητές αναζήτησαν ίχνη του μπριντγκμανίτη στον μετεωρίτη του Τέναμ, μια πέτρα από το διάστημα που έπεσε το 1879 στην Αυστραλία. Προηγούμενες μελέτες είχαν δείξει ότι ο εξωγήινος βράχος είχε υποστεί αλλεπάλληλες συγκρούσεις με άλλους αστεροειδείς και έφερε φλέβες ορυκτών που είχαν λιώσει από την πίεση και τη θερμοκρασία.

Μέσα σε αυτές τις φλέβες ο Δρ Μα ανακάλυψε σωματίδια μπριντγκμανίτη, μικρότερα από ένα μικρόμετρο. Όταν όμως προσπάθησε να τα μελετήσει με την τεχνική της περίθλασης ακτίνων Χ, τα πολύτιμα δείγματα καταστράφηκαν από τα ηλεκτρόνια.

Ο Μα απευθύνθηκε τότε στον Τσάουνερ, ο οποίος μελέτησε σωματίδια του ορυκτού με περίθλαση ακτίνων Χ σε σύγχροτρο. Έπειτα από πέντε χρόνια μελέτης, οι ερευνητές είχαν συγκεντρώσει πια αρκετά δεδομένα ώστε να υποβάλουν την ανακάλυψή τους για έγκριση στην αρμόδια επιτροπή της Διεθνούς Ένωσης Ορυκτολογίας.

Στις 2 Ιουνίου, ο μπριντγκμανίτης έγινε επίσημα δεκτός ως νέο ορυκτό. Οι ερευνητές το βάφτισαν προς τιμήν του φυσικού Πέρσι Μπρίντγκμαν, βραβευμένου με Νόμπελ Φυσικής το 1946 για τις μελέτες του στο σχηματισμό ορυκτών σε συνθήκες ακραίας πίεσης.

«Χαιρόμαστε που το όνομα [του Μπρίντγκμαν] δεν είχε ήδη χρησιμοποιηθεί για άλλα ορυκτά. Αυτό είναι το πιο σημαντικό» σχολίασε ο Δρ Μα.

(Newsroom ΔΟΛ, 17 Ιουν. 2014, http://news.in.gr/science-technology/article/?aid=1231327691)

Earth's most abundant mineral finally gets a name

The mineral said to be the most abundant of our planet, but found so deep within Earth's interior that scientists usually cannot observe it directly, now has a name.

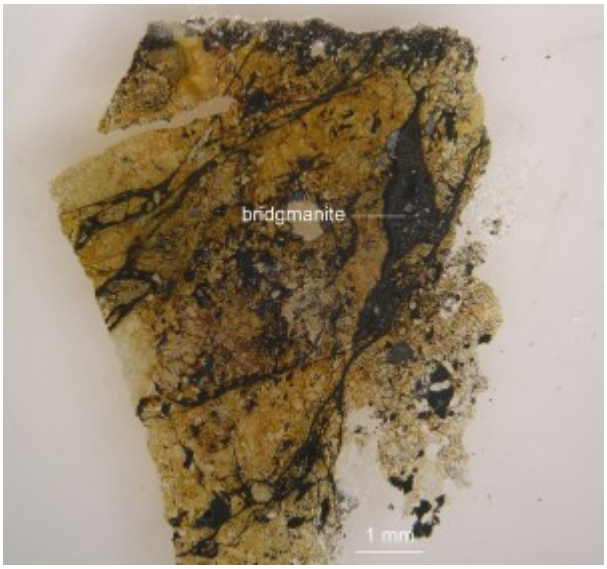
On June 2, bridgmanite was approved as the formal name for one of the Earth's most plentiful yet elusive minerals known to exist in the Earth's lower mantle. Bridgmanite, which was formerly known simply as silicate-perovskite, is named after the 1946 Nobel Prize winning physicist Percy Bridgman.

Scientists have known for decades that bridgmanite existed in the Earth's interior, but had been unable to successfully characterize a naturally occurring sample until this year.

"This [find] fills a vexing gap in the taxonomy of minerals," Oliver Tschauner, an associate research professor at the University of Nevada-Las Vegas who characterized the mineral, said in an email.

Tschauner, along with Chi Ma, a senior scientist and mineralogist at the California Institute of Technology in Pasa-

dena, Calif., have been working to chemically and structurally characterize natural silicate-perovskite ($MgSiO_3$) since 2009.



A sample of the 4.5 billion-year-old Tenham meteorite that contains submicrometer-sized crystals of bridgmanite. Scientists were only recently able to characterize and name bridgmanite, a mineral found deep within the Earth's interior that is thought to be the most abundant mineral on the planet, after analyzing samples found in the meteorite.
Credit: Chi Ma

Scientists think the mineral, suspected to be the most plentiful of the planet, exists in an interior region that extends from the bottom of the transition zone of the Earth's mantle down to the planet's core-mantle boundary, at depths between 670 and 2,900 kilometers (416 and1,802 miles). The transition zone, which scientists discovered from studying the way earthquake waves travel through the Earth, lies between the upper and lower mantle and marks the point where mineral structures undergo change at an atomic level due to increasing temperature and pressure.

The lower mantle is a place scientists can only dream of observing directly. Instead, Tschauner and Ma found submicrometer-sized crystals of the then yet-to-be-named bridgmanite in the Tenham meteorite, a space rock that fell in Queensland, Australia in 1879.

The meteorite formed 4.5 billion years ago, and has been "highly shocked," meaning it survived high-energy impacts in space. These impacts submitted the meteor to intense pressure and temperature—much like what rocks in the Earth's mantle experience, making it a likely source of bridgmanite.

"Shocked meteorites are the only accessible source of natural specimens of minerals that we know to be rock-forming in the transition zone of the Earth," said Tschauner.

To begin the hunt for bridgmanite, Ma analyzed shock-induced melt veins in the Tenham meteorite. The melt veins are structures that formed as a result of the meteor's impacts in space and often contain high pressure minerals.

Ma was able to identify a bridgmanite-like mineral under a high-resolution analytical scanning electron microscope. However, when he tried to analyze its crystal structure using electron diffraction, the structure disintegrated.

"This material is very sensitive to electron beams," Ma said, and noted that other scientists who had tried to characterize the mineral in the past had faced the same setback.

Ma then sent the samples off to Tschauner who used a different method—synchrotron X-ray diffraction—to characterize the mineral. After five years and multiple experiments using synchrotrons in Chicago and Berkeley, California, Tschauner and Ma were finally able to gather enough data to submit the mineral to the International Mineralogical Association (IMA) for official review.

In March 2014, Tschauner and Ma sent the proposal, which included information such as bridgmanite's chemical composition, crystal structure, and other physical properties, to the IMA Commission on New Minerals, Nomenclature and Classification (CNMNC), where it underwent a rigorous review.

The CNMNC has strict guidelines for naming new minerals, one of which is the requirement that the crystal structure be defined. Because Tschauner and Ma had obtained the mineral's crystal structure, it could now be approved as a new mineral.

On June 2, the CNMNC accepted the mineral and its name. They chose Bridgman as the mineral's namesake because of his contributions to the study of how materials react when they are submitted to extremely high pressures.

"We are glad no one used [Bridgman] for other minerals," said Ma, "this one is so important."

(JoAnna Wendel / GeoSpace / AGU.Blogsphere, 6 June 2014, http://blogs.agu.org/geospace/2014/06/06/earths-abundant-mineral-finally-gets-name).

Mystery of Florence's Cathedral Dome May Be Solved

Architect Massimo Ricci's theories are explored this week in a NOVA/National Geographic special

The precision of the Santa Maria del Fiore cathedral's famous dome would be difficult to re-create today, even with modern laser levels, GPS positioning devices, and specialized software.

Nearly six centuries after it was completed, the dome of Santa Maria del Fiore cathedral in Florence—a cathedral known around the world simply as *il Duomo*—remains that city's icon and greatest pride. Built without flying buttresses or freestanding scaffolding, using experimental methods that many contemporaries believed would surely fail, the 150-foot-wide (46-meter-wide) dome effectively ignited the creative explosion known as the Renaissance.

Its creator, Filippo Brunelleschi, a homely, hot-tempered goldsmith with no serious architectural training, is a hero to his fellow Florentines—and to one modern architect in particular (read more about *il Duomo* in the February 2014 issue of *National Geographic* magazine, http://ngm.nationalgeographic.com/2014/02/il-duomo/mueller-text)

Last April 15, on the 567th anniversary of Brunelleschi's death, I stood in the portal of the Florence cathedral, a few feet from his grave, as a procession in Renaissance dress entered the basilica—double ranks of halberdiers with gleaming weapons and breastplates, maidens in sweeping brocade gowns carrying wreaths of laurel and myrtle, drummers and trumpeters whose music filled the church and echoed in Brunelleschi's dome as on the day he was buried.

The procession descended into the crypt to lay the wreaths on Brunelleschi's slab. A portly gentleman in his early 70s bent down and laid his hand on the marble, his head bowed reverently, his breathing audible. No one in history has devoted himself more wholeheartedly to Brunelleschi and his memory than this man, Massimo Ricci, an architect from an ancient Florentine family who walks at the head of this memorial procession each year.

Ricci has spent much of his life trying to work out the construction techniques that Brunelleschi used to build the dome—still the largest masonry dome on Earth.

Ricci's identification with Brunelleschi has been so intense that at times he says he almost feels the great architect standing, silent and invisible, beside him.

"We've developed a special, almost spiritual relationship," Ricci says in his throaty growl. "Sometimes I'm filled with gratitude for what he accomplished, what he left us. Other times he frustrates me so much, I tell him to go to hell."

Having Brunelleschi's spirit whisper in your ear may be about the only way to know for sure how he worked. Secretive to the end, he carried many mysteries of his dome to the grave.

To this day, we don't know where he got the inspiration for the double-shell dome, the herringbone brickwork, and the other features that architects through ensuing centuries could only marvel at (explore the hidden details of Brunelleschi's daring design.)

(video)

Perhaps the most haunting mystery is the simplest of all: How did Brunelleschi and his masons position each brick, stone beam, and other structural element with such precision inside the vastly complex cathedral—a task that modern architects with their laser levels, GPS positioning devices, and CAD software would still find challenging today?

For 40 years, Ricci has tried to answer these questions in the same way that Brunelleschi did: by trial and error. He has built scale models of Brunelleschi's innovative cranes, hoists, and transport ships. He has scoured the interior and exterior of the dome for clues, mapping each iron fitting and unexplained stub of masonry and cross-referencing them against the archival documents concerning the dome's construction.

And since 1989, in a park on the south bank of the Arno River half a mile downstream from Santa Maria del Fiore, he has been building a scale model of the dome that's 33 feet (10 meters) across at its base and consists of about 500,000 bricks.

"Theoretical models are fine for grasping the dome's geometry," Ricci says, "but of limited use in understanding the problems Brunelleschi dealt with while building the dome. And that's what really matters to me: how Brunelleschi put bricks together."

In the process of putting together half a million bricks, Ricci may have solved one of Brunelleschi's biggest secrets: how a web of fixed and mobile chains was used to position each brick, beam, and block so that the eight sides of the dome would arc toward the center at the same angle.

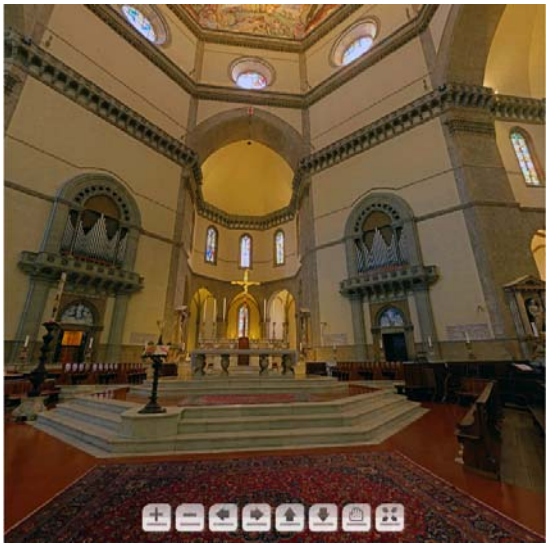
Inspired by documentary references to "the star of the cupola," Ricci started by suspending a star-shaped hub in the center of his model dome. From the eight points of this star he stretched eight chains radiating outwards and downwards to the walls of his model, attached to hooks in the walls, in the corners of the octagonal plan (similar hooks are present in the dome itself).

Next he linked these eight chains with horizontal ropes, which traced arcs along the eight sides of the octagon where the walls were rising. Seen from above, these ropes resemble the petals of a flower.

After last year's memorial procession ended, Ricci laid out for me some of the evidence for his theory of the dome's flower, which he considers to be the breakthrough in his conception of Brunelleschi's method. "In fact, Santa Maria del Fiore means Saint Mary of the Flower," Ricci notes. "And the symbol of Florence is a flower, the lily."

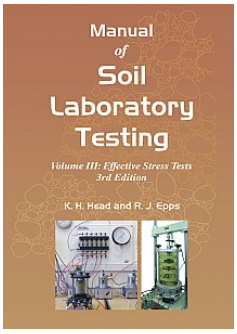
He smiles with evident satisfaction. "You see? The pieces of my theory fit together, as solidly as the duomo itself."

Explore the inner details of Brunelleschi's Dome by zooming in on this 360 image from the February 2014 digital edition of National Geographic *magazine:*



(Tom Mueller / National Geographic, February 10, 2014, HTTP://NEWS.NATIONALGEOGRAPHIC.COM/NEWS/2014/02/140210-DUOMO-FLORENCE-BRUNELLESCHI-CATHEDRAL-ARCHITECTURE/?RPTREGCTA=REG_FREE_NP&RPTREGCAMPAIGN=20131016_RW_MEMBERSHIP_R1P_INTL_OT_W)

ΝΕΕΣ ΕΚΔΟΣΕΙΣ ΣΤΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΠΙΣΤΗΜΕΣ



Manual of Soil Laboratory Testing vol III

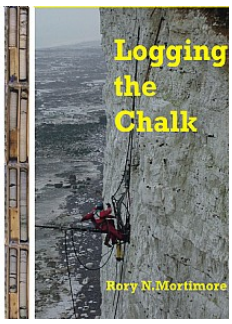
Effective Stress Tests 3rd edition

K. H. Head, R. J. Epps

This third volume completes the long-established key handbook for the laboratory testing of soils. The text covers soil testing in terms of effective stress, for which the measurement of pore water pressure is the essential feature. The principle and theory of effective stress are explained, practical applications are outlined, and the apparatus used, including its calibration and checking, is described.

The book has been updated to reflect current practice and instrumentation using electronic data capture. The first two chapters provide the theory. These are followed by a description of the apparatus and associated instrumentation for effective stress triaxial tests and then the test procedures themselves. A description of the accelerated permeability test and procedures for unconsolidated undrained and consolidated undrained triaxial compression tests using a mid-height pore pressure probe have been added, and reference to changes due to Eurocode 7 requirements for sample quality are provided as required.

(Whittles Publishing, July, 2014, 448 pages)



Logging the Chalk

Rory N. Mortimore

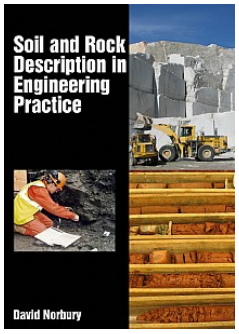
Chalk has proved to be one of the more difficult rocks to core-log as it breaks up readily during the drilling process leading to core-loss and destructuring, particularly where flints, nodular chalks and/or fractures are present. One of the greatest difficulties is the identification of chalk engineering grade which relies heavily on fracture aperture. Obtaining the correct grade to define the depth of weathering and the depth at which fractures become closed is essential whether for tunnels in London or for wind turbine piled foundations in the offshore chalks. Very few geologists and engineers have had the opportunity to study field sections in the Chalk so there is little visual appreciation of the grades or the variation to expect or even what flint bands look like. To partly overcome this difficulty, both field and core sections are illustrated in this book.

Equally important to recognising Chalk grade is the building of conceptual ground models for construction projects. This can only be achieved if the various Chalk formations, beds and marker beds can be identified from cores and then boreholes correlated using the marker beds. The Chalk stratigraphy is accordingly covered with key formations and marker beds illustrated, and the best field sections for viewing them identified.

This book is based on the standard lithostratigraphy and method of engineering description of Chalk developed over many years. Also important are over 3000 onshore and offshore chalk-cored boreholes undertaken by the author over more than 30 years. In addition, typical lithologies and weathering profiles representing the Chalk formations likely to be encountered in the various onshore and offshore construction projects are illustrated using field exposures, rotary core samples and geophysical borehole wire-line logs.

There will be geological settings where information on the Chalk is poor and unexpected lithologies and stratigraphies may be found. This book will enable geologists to work from first principles to construct a lithostratigraphy and define weathering boundaries.

(Whittles Publishing, August, 2014, 352 pages)



Soil and Rock Description in Engineering Practice

David Norbury

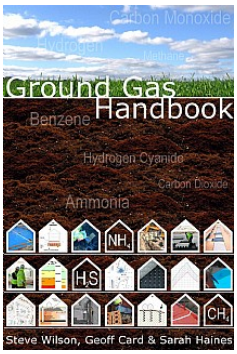
In ground investigation, the description of soils and rocks in engineering practice forms a major input to the field log. The log records the materials and strata seen in any sample, core or exposure and is a basic element of the factual information that underpins the entire understanding and interpretation of the ground conditions on site. The field log is also all that remains after the investigation is over and so has a life well beyond that of the investigation report. Practical guidance is provided for those in the field carrying out engineering geological logging of soil and rock samples and exposures. Information on the current systematic and codified approach and its use are laid out in detail to ensure the defined descriptors are used in a consistent format, rendering mistakes less likely and the necessary communication from field to design more successful.

The procedures, techniques and tips within this book are not only for young practitioners learning their craft, but are also relevant for their seniors and mentors, including responsible experts who sign off the logs and report on behalf of their company. Although they may have been involved in logging for many years they need to be aware of current practices in order to avoid costly mistakes.

Soil and Rock Description in Engineering Practice enables the practitioner to record and present features of the ground from the exposure in such a way as to convey a field presence to subsequent users of the data. This is important as the samples deteriorate quickly and are not usually inspected by any party other than the logger. Field logs therefore provide the only record of the ground that is available to the designer and contractor later in the construction process.

The procedures given are in accordance with the newly-implemented ISO, EN and BS international standards and other practice such as ASTM is also considered. The rules set out in these standards are considerably amplified by the author's 35 years experience describing natural and anthropogenic materials in the field and in teaching others to do so.

(Whittles Publishing, 304 pages)



Ground Gas Handbook

Steve Wilson, Geoff Card, Sarah Haines

With the increasing development of brownfield and landfill sites, ground gas is a common problem encountered by engineers and scientists and this book not only raises awareness of the phenomenon but also provides practical solutions to the difficulties experienced.

This vital new handbook provides practical guidance to engineers, regulators and designers about assessing ground gas risk and the design of appropriate protection measures. It includes a great deal of information that has never before been available in one volume and draws on the collective experience of the authors. The book discusses the assessment of ground gas for Part II A sites and also includes information on the assessment of vapours. Detailed information on gas generation and the analysis of gas flows in the ground are included, including the design of gas protection systems.

There are many worked examples throughout the book that help to explain the concepts and calculations that are described. It explains how to use the most recent assessment methods published by CIRICA, NHBC and BSI and highlights the differences between the various methods. The final sections cover the design and installation of gas protection systems to buildings and in ground barriers. Most importantly, it includes advice and recommendations about the validation and testing of protection systems as they are installed.

(Whittles Publishing, 192 pages)

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