An ancient moai statue guards a hillside on Easter Island

Αρ. 125 – ΑΠΡΙΛΙΟΣ 2019

ΕΛΛΗΝΙΚΗ ΕΠΙΣΤΗΜΟΝΙΚΗ ΕΤΑΙΡΕΙΑ ΕΔΑΦΟΜΗΧΑΝΙΚΗΣ & ΓΕΩΤΕΧΝΙΚΗΣ ΜΗΧΑΝΙΚΗΣ

Τα Νέα της Ε Ε Ε Ε Γ Μ

125

Πρόσκληση σε Γενική Συνέλευση της ΕΕΕΕΓΜ

Η Γενική Συνέλευση θα διεξαχθεί την Πέμπτη 2/5/2019 και ώρα 18:00 στο Αμφιθέατρο του Τμήματος Πολιτικών Μηχανικών στην Πολυτεχνειούπολη Ζωγράφου του Εθνικού Μετσόβιου Πολυτεχνείου στην Αθήνα. Εάν δεν παραστούν το ½ των μελών που έχουν εκπληρώσει τις ταμειακές τους υποχρεώσεις προς την ΕΕΕΕΓΜ, η γενική συνέλευση θα επαναληφθεί την Τετάρτη 22/5/2019 και ώρα 18:00 στον ίδιο χώρο. Εάν σε αυτήν την ημερομηνία δεν παραστούν το ¼ των μελών που έχουν εκπληρώσει τις ταμειακές τους υποχρεώσεις προς την ΕΕΕΕΓΜ, η γενική συνέλευση θα επαναληφθεί **την Τρίτη 11/6/2019 ώρα 18:00 στον ίδιο χώρο, οπότε θα διεξαχθεί με όσα μέλη της ΕΕΕΕΓΜ παραστούν και έχουν εκπληρώσει τις ταμειακές τους υποχρεώσεις προς την ΕΕΕΕΓΜ**.

Θέματα της γενικής συνέλευσης θα είναι: 1. Πεπραγμένα εκτελεστικής επιτροπής, 2. Παράταση θητείας εκτελεστικής επιτροπής μέχρι και την ολοκλήρωση του 8ου Πανελληνίου Συνεδρίου Γεωτεχνικής Μηχανικής, 3. Προκήρυξη εκλογών για νέα Εκτελεστική και Εξελεγκτική Επιτροπή, 4. Προτάσεις αλλαγής καταστατικού, και 5. Τυχόν άλλα θέματα.

Καλή Ανάσταση και καλό Πάσχα με υγεία και χαρά!

Για την Εκτελεστική Επιτροπή της ΕΕΕΕΓΜ,

Ο Γενικός Γραμματέας,
Μ. Μπαρδάνης
Δρ. Πολιτικός Μηχανικός

Π Ε Ρ Ι Ε Χ Ο Μ Ε Ν Α

Hematite on Albite with Titanite | Locality: Tormiq valley, Haramosh Mts., Skardu District, Gilgit-Baltistan, Pakistan (από Γιάννη Μεταξά).

ΑΡΘΡΑ

The Lessons of the Genoa Bridge collapse

Spanning a wide area, the bridge crosses the city of Genoa

The partial collapse of the Polcevera viaduct, better known as the Morandi Bridge, has prompted debate regarding the technical and administrative aspects of maintaining road infrastructures. We discussed it with the engineer Gabriele Camomilla, former Director of Research and Maintenance of the Società Autostrade, who coordinated the only major structural intervention performed on the bridge, carried out in the early 1990s. Interview by Lucio Garofalo

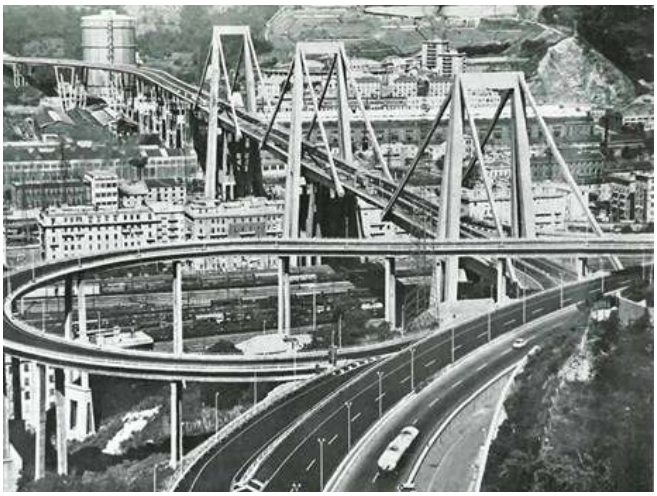
A bridge collapse inevitably has an impact on public opinion. On top of the emotional reaction, media coverage heightens sentiment and the public calls for both answers and justice. Bridges, in effect, shouldn't fall down; however, as structures that are subject to wear and stresses, they must be maintained. Unfortunately, what happened in Genoa, apart from the specific dynamics of the collapse, should not be considered an exceptional, unrepeatable event. And the problem does not exclusively affect Italy and the 60,000 bridges and viaducts it has. It is an issue for countries all around the world, where since 2000 there have been a recorded 108 collapses, either total or partial, of road and rail structures (source: Wikipedia, List of bridge and bridge failures). The collapse of the A-frame tower of the Polcevera viaduct offers an opportunity to reflect on bridge maintenance and on the materials that 50plus-year-old bridges and viaducts were built with. And it also highlights the relationship between public ownership of the structures and their management on the part of private entities.

The opinion of the engineer who oversaw major maintenance

A few years after it was opened in 1967, the Polcevera viaduct manifested a set of problems that posed no structural threat. There was a noted creep, i.e., deformation of the concrete under load, affecting the deck though limited by the box girders, so repairs to the deck were needed in order to improve planarity. In 1992, the technical monitoring group of the Società Autostrade, then a state-owned company belonging to the IRI Group, determined there to be a serious construction defect at the top of Tower 11, the first from the Genoa side and also the first to be built. To solve the problem and to make the stays replaceable in the future, a major maintenance intervention was performed using brand new materials. This structural rehabilitation project was made possible thanks both to these new materials and to the spending power of the Società Autostrade which managed most of the Italian motorway network. The project was put forward and coordinated by Gabriele Camomilla, engineer and Director of Research and Maintenance at Autostrade. We interviewed him to get his perspective on the collapse of August 14th last year and because he has long advocated a different approach to the maintenance of road infrastructures.

Mr. Camomilla, from the late 1980s to the early 1990s, you led the maintenance intervention on Tower 11 of the Polcevera viaduct, but before and after you supervised the rehabilitation of many bridges and viaducts of the Italian highway network. What are your thoughts on what happened?

"The first and foremost consideration concerns maintenance, especially of roads with high traffic flows, and generally speaking maintenance of all public works, a problem that has global impact by now. Maintenance is not an activity of secondary importance, intended as a repair due to decay; rather it is a scientific method of predicting deterioration and the preventive elimination of phenomena that lead to more serious problems. The end goal is to achieve the dual condition of maintaining the operation of the infrastructure, even if partial, and of increasing the durability of the structure or even increasing its value with respect to the original. In 1982 the method was adopted in Italy by Autostrade, and was defined as "road terotechnology", but it didn't take hold outside the highway sector for several reasons. Often technical and bureaucratic aspects criss-cross and appear as engineering issues, when they are actually more administrative in nature and regard the decision-making process. The partial collapse of the Polcevera may be an extreme example, but it is a glaring and unfortunately tragic one. But the case is not closed by saying the problem is exclusive to Italy: as I said we have to make clear that maintenance is a primary activity in technical and economic terms. I am so convinced of this that terotechnology remains one of my focuses today. That said, the Polcevera viaduct is a special case because the structure is unique, almost visionary, for the times in which it was built."



When it was first opened, the bridge was seen as one of Italy's engineering marvels of the time

What do you mean exactly?

"I mean that I find it intolerable to take aim at Riccardo Morandi, who alongside Nervi, Musmeci and others, less well-known outside Italy but of equal technical stature, have made contributions to engineering around the world. The real Achilles heel of the Polcevera viaduct is not the design, but the materials and the knowledge at the time regarding their behaviour due to fatigue and the effects of environmental agents. Morandi was almost obsessive about the bearing capacity of his design and protecting the durability of the stays, which were the basic elements of that specific static solution. With adequate maintenance, the viaduct could have been safe and continue to be considered what it had been since its opening: a masterpiece of engineering, at least when it

comes to the three large free spans. The Polcevera can be considered the forebearer of all modern cable-stayed bridges with a harp design. When, in order to demonstrate the limits of the statics Morandi used, some cite the collapse of several spans of the Maracaibo viaduct (a structure in Venezuela that he also designed), which shared a similar static design as the Polcevera. But they forget that a V pylon, without stays, was struck by a 36,000tonne oil tanker that was navigating almost at cruising speed. Few structures would have withstood such a stress."

When you refer to problems regarding materials, are you talking about the stays or the concrete utilised for the structural elements?

"Both. As regards the concrete, which several newspapers erroneously defined as low quality, we have to remember that in the 1960s no criteria existed such as exposure classes and durability, which came about in the 1980s. Not even shrinkage-compensating concrete was a known concept, by the way invented by another Italian, Professor Mario Collepardi, a world-renowned figure in the field of materials. Then we have the development of additives, which several Italian companies export around the world that make it possible to obtain mixes with exposure classes and elastic modules that were previously unthinkable. What's more, these materials were used for the maintenance of the V pylons of the section left intact after the collapse to protect the outermost reinforcements damaged by carbonatation of the covering. Today, there are also cathodic systems of protecting reinforcements that can guarantee rehabilitations and offer unprecedented guarantees of durability. Morandi in any case was vigilant about the deterioration of the structure and had thought of protecting the 352 strands that compose the bearing part of the stays with prestressed concrete. He wanted to prevent them from cracking over time due to the constant combined stresses from the flow of traffic and other agents like wind and thermal expansion. The concrete used at the time, which contained no additives and was subject to localised deterioration from carbonatation, soon began to appear, first as cracks and then actual detaching of small elements, none of which diminished its bearing capacity. Morandi brought this up at an international congress in 1979, making his position clear that it was necessary to intervene on the protective casing of the stay cables. Instead, the dense protective sheathing of the stays has protected the core of the internal steel superbly. Because of its crack-proof thickness, much thicker than that of normal concrete covers, the cover did not permit direct inspection, which meant that other sophisticated systems of control had to be devised. The same thinking we use about the knowledge of then versus now also goes for the steel used for the cable stays: today's stays have ultimate tensile strengths and elastic modules far superior than those considered the best at the time for that particular use. Moreover, today they are also covered with polyethylene sheathing and filled with anti-corrosion lubricants that protect them; above all, they are not subject to certain types of stress corrosion cracking, not a known phenomenon at the time."

When you were Research and Maintenance Director of Autostrade, Tower 11 underwent major works. What was the reason for that?

"As I said, we were constantly monitoring the bridge. The biggest challenge was to inspect the top of the saddles of the masts and the stays, distanced 45m from the road bed and which had no system for scaling them, unlike today; so in order to perform an up-close inspection, we used the first telescopic platforms available at the time. By detaching a thin layer of concrete on Tower 11 that seemed more porous than the rest, we determined that the integrity of the North stay on the Genoa side had been compromised during casting of covering at the time of construction. Near the saddle at the top of the mast, the cables were not spaced well, instead bundled together and not fully covered by the concrete. This meant they were in contact with the air and had undergone corrosion due to the dissolution of about 30% of the cables. When analysing the recent collapse, it's important to keep in mind that the stay cables were in any case stressed for less than half of their ultimate tensile strength, which provided a considerable margin of safety and made it possible to intervene with caution, but without blocking traffic, except during some of the more delicate phases. The deck, conversely, could be easily inspected via special passages, not a common solution for the time and a design detail that does honour to Morandi."

The original repairs were carried out on Tower 11 due to problems with spacing of the cables and the modifications alleviated the problem

What was the nature of the maintenance project?

"We ruled out demolition, an idea I was extremely opposed to because it was too complex and risky for the removal of the prestressed stays running over the railway yard. There was also the traffic problem: we could only close the bridge to traffic at night and for very short periods. For the project definition, we sought out the highest experts of the time, because at the time there was no consolidated knowledge regarding the calculation of cables of cable-stayed bridges. It was Francesco Pisani, Morandi's calculation engineer, who came up with the solution. From the viewpoint of statics, it was a tough challenge because if we had interrupted the load-bearing function of a single stay, even briefly, this would have triggered transversal actions by the other three, which would then have caused the deck to rotate, in turn leading to the torsion and rotation of the saddle, and resulting in the collapse of the entire span – probably similar dynamics of the August 14th collapse. The project consisted of a gradual transfer of the load of the inner original cables onto the outer new cables covered with a new polyethylene resin that had been experimented on more recent cable-stayed bridges. The cables were developed by Alga, a Milan-based company that no longer operates in Italy, but in China, where it has supplied special systems for over 900 bridges along the Beijing – Shanghai high-speed rail line. The project phases are too complex to be detailed in an interview, but can be summarised as the installation of a system of outer cables that gradually replaced the existing ones, and that only at the end of the intervention received all the load of the original. It was a very innovative technique, later presented at an international convention, which restored, and even increased, the static efficiency of the structure, apparently in an excellent condition still today. I am not absolutely certain, but I think it is the type of intervention envisioned for the collapsed A-frame towers."

Why was no intervention immediately performed on the stays of the other masts?

"Of course we made very careful checks, making traditional carbonatation tests with phenolphthalein as well as a defect detection. To this, we added tests on outer deformation and other types of traditional sensors that then proved insufficient for evaluating stability since they supplied tons of unprocessable data related to the movement of traffic, which in this type of structure are collected for the continuous transfer from one side of the towers to the other. Other more sophisticated sensors were used for periodic measurements, initially every six months and then less frequently since there was no sign of bearing defects in the main cables. These were sensors that aided the reflected waves of the magnetic flow induced in the cable bundle; an increase would have meant potential reduction of the resistance of the stays. This was a deductive system, however, in that the analysis of the signal involved complex activities. We switched systems, still deductive, like the modal analysis that was not very selective at the time. On the basis of all the evaluations, we concluded that no intervention was necessary and we decided to add outer steel plates onto Tower 10, still visible today. Injections to saturate the voids were made to seal some of the surface disintegration of the concrete protection, which could not be treated at that height and in the part below the stay. However, no anomalies were noted on the cables."

Removing the bridge safely poses a major challenge for demolition experts

So, what in your opinion caused the collapse of the span with Tower 9?

"Hard to be certain. The experts appointed by the judiciary are still analysing the data available. My conjecture, based on an in-depth knowledge of the viaduct, is that there were concomitant causes that manifested themselves all at the same time, leading to a collapse that could not be predetermined. Essentially, it's a situation similar to what economists call the "black swan", that is, unforeseeable circumstances that permanently change the conditions of the market. Mind you, intervention on Tower 9 should have taken place sooner, but it seems the concessionaire was focused on the regular maintenance imposed by new regulations, a factor hardly acknowledged now. A delay in starting works can be one of the contributing causes; there was some generalised cortical deterioration of the concrete, even though I believe that it had no effect on the bearing capacity or on the protective concrete casing of the stay cables. The only problem determined recently was the anomaly on the prestressed reinforcement ties, which were not load-bearing. At any rate, the letters to the Ministry of Infrastructure requesting approval of the project prove that the concessionaire was eager for the project to be started. So I think we have to consider other factors, in particular unusual anomalies not detected by the instruments, and also the fact that there were many lightning strikes in that area."

That theory has been totally excluded by some. Bridges don't collapse because they are struck by lightning. What do you mean by unusual anomalies?

"I did not say that lightning was the primary cause; I spoke of a potential concomitant cause. The website Lightningmaps.org records lightning strikes all over the world; apparently between 9 and 10am on August 14th, two hours prior to the collapse, two lightning strikes hit the bridge. Lightning can create electromagnetic fields of incredible power also in the area adjacent to where it strikes. I have spoken with a physicist, an expert in electromagnetism, who explained that in these conditions magnetostriction may occur: the steel, stressed by the strong electromagnetic field, can undergo a molecular change in crystallisation that significantly increases its fragility and even make it vibrate uncontrollably, thereby reducing its resistance. We can't rule out that a lightning strike may have contributed to making even a few strands of a stay cable give way. What I mean by unusual anomaly are the micro-cracks that form in the hot-drawn martensitic steels of the cables; these micro-cracks can develop over time without exhibiting the striction that occurs in normal exfoliation corrosion. The development of the cracks is caused by the high stress the cables undergo; due to this, a phenomenon called stress corrosion cracking, it is not easily detected in its initial phase, but can cause a sudden brittle fracture. If some strands were actually subject to these conditions, the lightning, causing striction and intense vibrations, may have caused the bearing cables of only one stay to break. That would have triggered phenomena of instability enough to imbalance the box girder held symmetrically by the four stays. The unbalancing would have first led to the collapse of the course spans which prevented the torsion generated by the dissymmetry in the bearing capacity of the cables, and then the collapse of the tall A-frame towers, followed by that of the caisson deck, collapsed by the weight of the masts because they no longer had the support of the collapsed stays. This theory, if established by the analysis of the broken steel cables of the stays, is not enough to exclude other causes and, of course, legal responsibilities, but could offer one more element for understanding the technical reasons for the sudden collapse. Among the possible unusual causes there might be another that is easier to understand: a lorry carrying a very heavy load may have lost its cargo, with the load hitting a structurally crucial point, such as the area where the stay cables are attached to the deck. The impact energy of such a load, created by its mass and the square of the speed of the vehicle, could have been devastating enough to break the anchorage, initiating the sequence of collapse that I described. The effects of these types of dynamic loads are always much more disruptive than those considered in the design"

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http://adm.worldhighways.com/categories/road-highway-structures/features/the-lessons-of-the-genoa-bridge-collapse/

Value Engineering

Scott W. Cullen, MRICS
Hanscomb Consulting

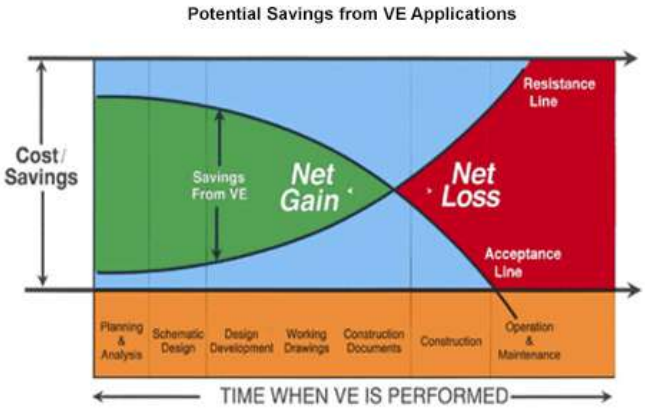
INTRODUCTION

Value Engineering is a conscious and explicit set of disciplined procedures designed to seek out optimum value for both initial and long-term investment. First utilized in the manufacturing industry during World War II, it has been widely used in the construction industry for many years.

Value Engineering (VE) is not a design/peer review or a cost-cutting exercise. VE is a creative, organized effort, which analyzes the requirements of a project for the purpose of achieving the essential functions at the lowest total costs (capital, staffing, energy, maintenance) over the life of the project. Through a group investigation, using experienced, multi-disciplinary teams, value and economy are improved through the study of alternate design concepts, materials, and methods without compromising the functional and value objectives of the client.

The Society of American Value Engineers (SAVE) was formed in 1959 as a professional society dedicated to the advancement of VE through a better understanding of the principles, methods, and concepts involved. Now known as SAVE International, SAVE has grown to over 1,500 members and currently has over 350 active Certified Value Specialists (CVS) in the U.S. Requirements for registration as a CVS were developed by SAVE at the request of the U.S. General Services Administration in the early 1970's.

VE can be applied at any point in a project, even in construction. However, typically the earlier it is applied the higher the return on the time and effort invested. The three main stages of a project and VE's application are described below.



PLANNING

At the Planning stage of development, there are additional benefits to be derived from a Value Engineering Workshop. An independent team can:

- Review the program
- Perform a functional analysis of the facility
- Obtain the owner/users definition of value
- Define the key criteria and objectives for the project
- Verify/validate the proposed program
- Review master plan utility options (e.g. Central Utility Plant versus individual systems)
- Offer alternative solutions (square footage needs per function, adjacency solutions, etc.)
- Verify if the budget is adequate for the developed program

The benefits are tremendous.

- Any changes to the program at this stage have very little if any impact on schedule and A/E time and redesign costs.
- The project will be developed with fewer changes, redesigns, and a greater understanding by all parties of what the final function and space allocations will be.
- An independent team can bring a fresh outside view of alternate solutions from other similar projects.

DESIGN

This is the stage that most VE participants are used to becoming involved, when the design has at least made it to the schematic stage. Most government agencies require at least one VE session at the design stage on projects over a certain $ size. The primary tool available to the VE team is the Workshop—typically a 40-hour session (or less for smaller or less complex projects).

The Workshop is an opportunity to bring the design team and client together to review the proposed design solutions, the cost estimate, and proposed implementation schedule and approach, with a view to implementing the best value for the money. The definition of what is good value on any particular project will change from client to client and project to project.

METHODOLOGY AND APPROACH

During the actual Workshop portion of the VE study, the five-step Job Plan is followed, as prescribed by SAVE International:

The VE Job Plan follows five key steps:

1. Information Phase
2. Speculation (Creative) Phase
3. Evaluation (Analysis) Phase
4. Development Phase (Value Management Proposals)
5. Presentation Phase (Report/Oral Presentation)

These five key steps are described as follows:

1. Information Phase

At the beginning of the VE Study, it is important to:

- Understand the background and decisions that have influenced the development of the design through a formal design presentation by the design A/E.
- Analyze the key functional issues governing the project. The functions of any facility or system are the controlling elements in the overall VE approach. This procedure forces the participants to think in terms of function, and the cost and impacts associated with that function.
- Define Owner's objectives and key criteria governing the project.
- Determine Owner's definition of Value.

2. Speculation (Creative) Phase

This step in the VE study involves the listing of creative ideas.

- The VE Team thinks of as many ways as possible to provide the necessary function within the project areas at a lesser initial or Life-Cycle Cost which represent improved value to the client.

- Judgment of the ideas is prohibited.
- The VE Team is looking for quantity and association of ideas, which will be screened in the next phase of the study.
- Many of the ideas brought forth in the creative phase are a result of work done in the function analysis. This list may include ideas that can be further evaluated and used in the design.

3. Evaluation (Analysis) Phase

In this phase of the Project, the VE Team, together with the Client and/or Users,

- Defines the criteria to be used for evaluation.
- Analyses and judges the ideas resulting from the creative session. Ideas found to be impractical or not worthy of additional study are discarded. Those ideas that represent the greatest potential for cost savings and value improvement are developed further. A weighted evaluation is applied in some cases to account for impacts other than costs (such as schedule impacts, aesthetics, etc.).

4. Development Phase

During the development phase of the VE study, many of the ideas are expanded into workable solutions. The development consists of:

- Description of the recommended design change.
- Descriptive evaluation of the advantages and disadvantages of the proposed recommendation.
- Cost comparison and LCC calculations.
- Each recommendation is presented with a brief narrative to compare the original design method to the proposed change.
- Sketches and design calculations, where appropriate, are also included in this part of the study.

5. Presentation Phase

The last phase of the VE Study is the presentation of the recommendations in the form of a written report. A briefing/oral presentation of results is made to the Client and Users, as well as the Design Team representatives. The recommendations, the rationale that went into the development of each proposal, and a summary of key cost impacts are presented at that time so that a decision can be made as to which Value Management proposals will be accepted for implementation and incorporation into the design documents.

In addition to the monetary benefits, a VE Workshop provides a valuable opportunity for key project participants to come together, then step aside and view the project from a different perspective. The VE process therefore produces the following benefits:

- Opportunity to explore all possible alternatives
- Forces project participants to address "value" and "function"
- Helps clarify project objectives
- Identifies and prioritizes Client's value objectives
- Implements accepted proposals into design
- Provides feedback on results of the study

CONSTRUCTION

During this phase value engineering is still possible through the use of Value Engineering Change Proposals (VECP). Contractors can be provided monetary incentives to propose solutions that offer enhanced value to the owner, and share in the financial benefits realized. Clearly the owner must consider contractor-generated proposals very carefully, from a life-cycle perspective and a liability perspective. The A/E team must be brought in to the decision-making process to agree to the proposed change as not having any negative impact on the overall design and building function. The evaluation of a VECP is treated similarly to any change order during construction, with issues such as schedule and productivity impacts being considered along with the perceived cost savings generated.

CONCLUSION

In the final analysis, Value Engineering is not only beneficial, but essential because:

- The functionality of the project is often improved as well as producing tremendous savings, both initial and Life-Cycle Cost.
- A "second look" at the design produced by the architect and engineers gives the assurance that all reasonable alternatives have been explored.
- Cost estimates and scope statements are checked thoroughly assuring that nothing has been omitted or underestimated.
- Assures that the best value will be obtained over the life of the building.

ADDITIONAL RESOURCES

- *Techniques of Value Analysis and Engineering*, 3rd ed. by L.D. Miles. New York, NY: McGraw-Hill, 1972.
- *"The Dread of VE: Understanding Why It's Not Used More"* in *Value World* by Scot McClintock. Vol. 11, No. 4, Jan./Feb./Mar. 1989, pp. 12-14.
- *Value Engineering: Practical Applications for Design, Construction, Maintenance, & Operations* by Alphonse J. Dell'Isola. Kingston, MA: R.S. Means Company, Inc., 1999.
- *Value Engineering Theory, Revised Edition* by Donald E. Parker. Washington, DC: The Lawrence D. Miles Value Foundation, 1995.
- *Value: Its Measurement, Design, and Management* by M. Larry Shillito and David J. De Marle. New York, NY: John Wiley & Sons, Inc., 1992.
- *Value Management Practice* by Michel Thiry. Sylva, NC: Project Management Institute, 1997.

Value engineering in building design and construction

Historical development of terms

Value engineering is based on a methodology developed by Lawrence Miles, who worked for the General Electric Company in the USA during the Second World War. Because of the war, there were shortages of materials and certain finished products. However, manufacturing was running at maximum capacity, and ideas where needed to expand production.

Miles was responsible for purchasing raw materials for the General Electric Company and realised if he was unable to obtain one particular material, then it was necessary to obtain a replacement material which performed the same function.

This 'value engineering' began with a creative, team-based approach which allowed the generation of alternatives to the existing solution. Because the General Electric Company were manufacturers, the term 'engineering' was seen as being more appropriate at that time, than 'management'.

Later in the 20th century, value engineering started to spread cross the world, but because of differences between the mentality and behaviour of American companies compared to European companies, value engineering, as developed in the USA had to undergo some modification.

The European Community's SPRINT programme (Strategic Programme for Innovation and Technology) adopted 'value management' as the official term. It described the same philosophical concept but in terms that were more in keeping with European management styles. The term 'value management' was also applied as a broad, high-order description which encompassed all value techniques, whether applied at a strategic or tactical level.

Commonly used value techniques are now be defined as:

- Value Management (VM). The full range of value techniques available. This is a higher order title and is not linked to a particular project stage at which value techniques may be applied.
- Value Planning (VP). Value techniques applied during the planning phases of a project.
- Value Engineering (VE). Value techniques applied during the design or 'engineering' phases of a project.
- Value Analysis (VA). Value techniques applied retrospectively to completed projects to analyse or audit the project's performance.

Methodology

Value engineering is used to solve problems and identify and eliminate unwanted costs, while improving function and quality. The aim is to increase the value of products, satisfying the product's performance requirements at the lowest possible cost. In construction this involves considering the availability of materials, construction methods, transportation issues, site limitations or restrictions, planning and organisation, costs, profits and so on. Benefits that can be delivered include a reduction in life cycle costs, improvement in quality, reduction of environmental impacts,and so on.

Value engineering should start at project inception where the benefits can be greatest, however the contractor may also have a significant contribution to make as long as the changes required to the contract do not affect the timescales, completion dates or incur additional costs that outweigh the savings on offer.

Value engineering involves:

- Identifying the main elements of a product, service or project.
- Analysing the functions of those elements.
- Developing alternative solutions for delivering those functions.
- Assessing the alternative solutions.
- Allocating costs to the alternative solutions.
- Developing in more detail the alternatives with the highest likelihood of success.

Value engineering is an exercise that involves most of the project team as the project develops. It is about taking a wider view and looking at the selection of materials, plant, equipment and processes to see if a more cost-effective solution exists that will achieve the same project objectives.

The "results accelerators" originally proposed by Miles still act a useful guides to value engineering. Key to this is remembering the relationship between cost and value – value is function divided by cost. Concentration on the function of the project or product will avoid mere cost cutting.

Result accelerators:

- Avoid generalities.
- Get all available costs.
- Use information from the best source.
- Blast, create and refine.
- Be creative.
- Identify and overcome road blocks.
- Use industry experts.
- Price key tolerances.
- Use standard products.
- Use (and pay for) expert advice.
- Use specialists processes.

The project manager must take a pro-active role in both giving direction and leadership in the value engineering process, but must also ensure that time and effort is not wasted and does not have a detrimental effect on the progress of the project.

The text in this article is adapted from Manuals 1, 4 and 7 of "Common Learning Outcomes for European Managers in Construction" developed within the scope of the LdV program, project number: 2009-1-PL1-LEO05-05016 published in 2008. It is reproduced here in a modified form with the kind permission of the Chartered Institute of Building--CIOB.

The good and the bad of value engineering

Almost everyone in the healthcare design and construction industry has faced the problem of the over-budget project (often the result of having too many wants and too small a wallet). The most common solution is to "value engineer." But what does that really mean? Too often the focus of value engineering is on cost cutting alone. True value engineering, however, is not simply a matter of cutting costs, but rather giving careful consideration to all options, always with the project's goals in mind.

As an architect and a contractor who specialize in healthcare projects, we can attest to the fact that value engineering has become a standard practice for almost all healthcare projects today. Often, as we've indicated, this is at the expense of the project's quality. But it doesn't have to be this way. A well-planned and well-executed value-engineering process can improve a project without sacrificing its essential integrity.

VALUE ENGINEERING DEFINED

By definition, the aim of value engineering is to help the owner improve efficiency and decrease operating costs. In the construction industry, however, its most common purpose is to bring over-budget construction projects back within budget. In the book *Quality in the Constructed Project*, the American Society of Civil Engineers states, "Value engineering of a design focuses on potential cost saving…where the usual value engineering question is 'Is there money to be saved?'" However, simply reducing cost at the expense of quality is not value engineering but merely cost cutting.

The Society of American Value Engineers International (SAVE International) defines value engineering as a "function-oriented, systematic, team approach to provide value in a product, system, or service." The definition further explains that while the process is often "focused on cost reduction, other improvements such as customer-perceived quality and performance are also paramount in the value equation."

Value engineering is, in short, a systematic, organized approach to obtaining optimum value for each dollar spent. Another definition of value management is "a disciplined effort to analyze the functional requirements of a project for the purpose of achieving the essential functions at the lowest total cost (capital, operating, and maintenance) over the life of the project." When applied to construction, the analysis must be performed within the standards and criteria established by the owner. Through a system of investigation using trained, multidisciplinary teams, both value and owner requirements are improved by one of the following:

- Eliminating or modifying elements not essential to required functions.
- Adding elements that achieve required functions that have not as yet been attained.
- Changing elements to improve quality or performance to meet more desired levels established by the owner/user.

Construction and design professionals use value engineering throughout the design process to regulate the costs on a project budget. Larry Miles, considered by many to be the father of value engineering, introduced this process nearly 60 years ago. When Miles developed the analytical field of value analysis for General Electric after the Second World War, he identified two elements of the value equation—function and cost—and balanced them against one another. As Miles approached the problem of enhancing value, his objective of value analysis was to identify all elements of function and cost, and to express their mutual interdependency so that an informed decision could be made between the two. His equation was:

Value = Function/Cost

in which:

Function = the specific work that a design/item must perform.
Cost = the life-cycle cost of the product.
Value = the most cost-effective way to reliably accomplish a function that will meet the user's needs, desires, and expectations.

In other words, an item that maximizes function with a minimal cost is of greater value than an item of lesser function with the same cost. Conversely, an item that serves little or no function but has a high cost is considered to be of little or no value.

According to Miles, value engineering is basically "a creative, organized approach whose objective is to optimize cost and/or performance of a facility or system." The intended purpose is to improve the value obtained by an owner sponsoring a constructed project.

DESIGN AND CONSTRUCTION APPLICATIONS

The use of value engineering in the typical hospital construction project has been used sporadically, usually (as we've already indicated) when the design team encounters a budget problem. On many projects, value-engineering exercises involve bringing the project design team together quickly to "fix" the problem and reduce costs. Often the owner, designer, and contractor have so much invested in their disciplines that the flexibility and open-mindedness required to achieve true value engineering is not achieved. Costs may be reduced, usually not to a great extent, but often with a reduction in quality and value.

An example of this is a hospital project currently under construction outside Denver. The project budget began at $50 million. During schematic design, the owner chose to benchmark other newly completed hospital facilities in the Denver area and found deficiencies in his project's space program. To maintain the hospital's competitive edge, management chose to increase the project's scope and budget. At the completion of schematic design, the budget was increased by almost 10% to cover these changes. At the end of design development, however, the project's budget was over by $2.6 million. The next obvious move was value engineering. Unfortunately, it was too late.

Over the course of several weeks, the team (including the owner) evaluated ways to reduce cost. Everything became fair game, and no stone was left unturned. The contractor did a remarkable job of disassembling the project and putting it back together, using the same square footage while removing more than $2 million from the job. Although the exercise did preserve the overall design, value was lost.

For example, all landscaping, water features, irrigation, and even a proposed labyrinth were omitted from the project. A glass canopy at the main entry was changed to acrylic. Products originally specified to be LEED®-certifiable were either downgraded or removed, eliminating the facility's option of becoming LEED-certified.

To achieve true value engineering, the effort should involve looking beyond a simple reduction in cost or achieving the project budget. Simply achieving the budget numbers does not mean that optimum value is achieved. This can be achieved (with the owner's approval) by:

- Providing more building scope for the same budget.
- Providing the same building scope for a reduced budget.

- Providing less building scope for an even more reduced budget.

Today, most healthcare building projects are handled by a team of professionals. Typically, the owner goes through an architectural selection process to commission the design team. This includes selecting architecture and engineering (A/E) professionals. Some owners rely on the assistance of a program manager to represent them in this process. Once the A/E team is in place, early selection of a general contractor and/or construction management consultant helps round out the project team.

Once a project begins, a space program has been identified, a list of project requirements (defining scope and function) has been developed, and a budget (defining cost) has been set. As the design team moves through the various phases of the project (particularly schematic design and design development), the construction team reviews the design and prepares preliminary statements of probable cost. The project team then evaluates the design and cost against the initial project scope and budget. This monitoring process, continued throughout each phase, gives the team and the owner a clear indication as to how well the project is tracking according to budget.

When value engineering comes into play, it should be to obtain the optimum functional balance among construction costs, user requirements, and life-cycle costs. Conducted in this manner, it should produce savings in:

- Initial capital construction costs, without detriment to costs of operations and maintenance and/or income, and
- Predicted follow-on costs, such as facility staffing, operations, and maintenance.

VALUE-ENGINEERING EXERCISES

In value-engineering exercises, the construction professional often provides cost-reduction ideas, with the owner and design team then evaluating those ideas. This *may* result in lower costs but may not provide much value, because the ideas and input of *all* team members have not been considered in the process.

On a recent hospital renovation project in California, for example, the budget estimates provided by the contractor were slightly over budget. Rather than conduct a formal value-engineering process, the contractor was asked to submit to the project team value-engineering suggestions for bringing the project back on budget. While a format such as this may or may not achieve its goal, the value-engineering effort would in any case not be maximized, because of failure to use the combined brainpower and creativeness of the entire project team. Specifically, the designers, engineers, users, facilities representatives, and owner were not asked for *their* ideas. As a result, many *potential* cost savings or value-producing ideas were undoubtedly left out of the process.

TEAMWORK

The basic premise behind the formal value-engineering process is teamwork—embracing the idea that two (or more) heads are better than one and that there can always be a different (and perhaps better) approach to satisfying a particular need than the first thing that comes to mind. Value-engineering teams are typically made up of a certified value specialist (CVS), owner's representatives, designers and consultants, the construction team, a cost estimator, building management staff, and third-party (independent) reviewers. Teams that include members of each of these groups are formed and facilitated by the CVS. Often, the formal value-engineering process occurs in a three- to five-day structured workshop, although it can be shorter or longer, depending on the type and complexity of the project. The workshops typically go through five phases:

1. Information gathering—an initial briefing by the project team to develop an understanding of the project requirements and design, the status of the budget and schedule, and constraints.
2. Functional analysis—examination of the project's functional requirements within budgetary limitations, to enhance understanding of why the project is being built and what the final result should be.
3. Creativity/brainstorming—developing and listing ideas and options for value engineering, keeping in mind the functional requirements of the project.
4. Analysis—expanding the creative ideas into workable solutions, evaluating their impacts and costs, and ranking them in terms of cost, feasibility, and value received.
5. Recommendation—presentation of the value-engineering proposals, expected savings, and value results in a formal report.

During the functional analysis phase, the team views the project functionally in three ways to help them better analyze and study options:

Basic function: That which is essential to the performance of a user function or the function describing the primary utilitarian characteristic of a product or design to fulfill a user requirement. A key defining question: "Can this function be eliminated and still satisfy the user?"

Required secondary function: Any function that must be achieved to meet codes, standards, or owner requirements. For example, the basic function of a hospital is to treat patients. A fire-protection sys-tem is not required to treat patients but is required for the project.

Secondary function: That which, if it is removed from the design, still allows both the basic and required secondary functions to be met. For example, leveling earth under slab is a secondary function. The basic function of slab is to support load. Leveling is not required to support the load.

During the creative/brainstorming phase, teams review the project items and answer the following questions for each item:

- What is it?
- What does it cost?
- What does it do (i.e., why is it required)?
- What is it worth?
- What else would do the job?
- What would that cost?

The key to success of value-engineering analysis is developing a more precise and appropriate definition of value. The owner is responsible for defining the quality level of a project. The designer is responsible for producing a design that meets those expectations or requirements. Most of the time, owners tend to define only the lower limit of those expectations. Designers often exceed those minimums, believing that better quality always equals better value, but this isn't always the better approach. Better quality usually comes at an increased cost and is not usually on a linear relationship with value. It's possible that a one-level increase in quality could come at a two- to three-level increase in cost. This is why the owner must establish what constitutes value.

On the Denver project mentioned above, which was over budget, value engineering identified a less expensive exterior

skin material (plaster) that could be substituted for brick (primary exterior material) on interim exterior walls that were identified as future expansion zones. Unfortunately, those very walls faced a major highway and represented the first impression people driving toward the campus would receive. How does one place a value on aesthetics? After discussions among the design team, contractor, and owner, they compromised on a solution: using a combination of brick and plaster.

For a project that is within budget, the value-engineering emphasis should focus on improving value in terms of operations, flexibility, expandability, life cycle, and quality. For a project over budget, the focus should be on reducing project costs *without* eroding value. If a substantial cost reduction is required (more than 10%), the value-engineering exercise should focus on reconsidering the owner's objectives.

A POSITIVE CASE HISTORY

During a large hospital addition and renovation project in California a few years ago, the client required that value-engineering exercises be conducted during schematic design and design development, regardless of the budget estimates. Members of the design team, the owner, the owner's project management team, facilities representatives, user group representatives, and select, independent outside reviewers were brought together for a two-day work session. A cost-management professional with extensive experience in value engineering led the session.

The first day was spent reviewing the design, followed by individual work-group sessions focusing on various components of the project. First cost was not the main consideration. Improved function, better life-cycle costs, good durability, and ease of maintenance, among other factors, were also studied. At the conclusion of the work sessions, the group's ideas were gathered and presented to the combined group for review. Some ideas were considered not feasible and removed, while the remaining ones were submitted for further study and pricing. The ideas ranged from a study of revised structural framing systems, to changing exterior skin designs from stucco to precast panels, to mechanical system design alternatives, to alternative glazing plans that might improve mechanical efficiency.

With the help of the team, the cost management professional prepared a report summarizing the ideas and identifying their respective advantages and disadvantages, and their impacts on first cost and life-cycle costs. The final report was presented to the owner for selection of value-engineering items to be incorporated into the project. The list of items far exceeded the required value-engineering target and provided real options to increase the value of the project, sometimes individually at additional cost but at an overall reduced project cost.

Many value-engineering sessions were scheduled at regularly planned design intervals that coincided with normal review and approval processes. Unfortunately, however, many good value-engineering suggestions offered at these stages were not used because they came too late in the process to be incorporated into the design.

CONCLUSION

The benefit of a well-run value-engineering process to the owner will be a better, more cost-efficient project that meets his or her needs and objectives. The process can also have substantial benefits for the design and construction team, including fostering a teamwork approach to solving problems, reducing design team expenses by requiring fewer redesigns, allowing a more efficient construction process, and producing in the end a truly satisfied customer.

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See more at: http://www.healthcaredesignmagazine.com/architecture/good-and-bad-value-engineering/#sthash.NFF4qyrx.dpuf

ΝΕΑ ΑΠΟ ΤΙΣ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ

ΕΛΛΗΝΙΚΟΣ ΣΥΝΔΕΣΜΟΣ ΓΕΩΣΥΝΘΕΤΙΚΩΝ ΥΛΙΚΩΝ
HELLENIC GEOSYNTHETICS SOCIETY (HGS)

Στις 29 Μαρτίου 2019, πραγματοποιήθηκε η τακτική εκλογική Γενική Συνέλευση (Γ.Σ.) του Ελληνικού Συνδέσμου Γεωσυνθετικών Υλικών.

Συζητήθηκαν τα παρακάτω θέματα:

- Εγγραφές Νέων Μελών.
- Συνδρομές Παλαιότερων Μελών.
- Πεπραγμένα - Οικονομικός Απολογισμός.
- Δραστηριότητες Ελληνικού και σχέση με τον Διεθνή Σύνδεσμο Γεωσυνθετικών Υλικών (IGS).
- Συμμετοχή του Συνδέσμου και των μελών του στο επόμενο 8ο ΠΑΝΕΛΛΗΝΙΟ ΣΥΝΕΔΡΙΟ ΓΕΩΤΕΧΝΙΚΗΣ ΜΗΧΑΝΙΚΗΣ, Νοέμβριος 2019. Υποβολή περιλήψεων έως 15 Μαρτίου 2019. Χρειάζονται 8-10 διαφορετικά άρθρα για να υπάρχει στο συνέδριο ειδική συνεδρία.
- Εκλογή νέου Διοικητικού Συμβουλίου για την περίοδο 2019-2022.
- Εκλογή νέας Εξελεγκτικής Επιτροπής για την περίοδο 2019-2022.

Εκλέχθηκαν ως μέλη της εφορευτικής επιτροπής για την διεξαγωγή της εκλογικής διαδικασίας οι Γ. Φίκιρης (Πρόεδρος) και Α. Ρίτσος (Γραμματέας).

Προ της Γ. Σ. και έως την Παρασκευή 8 Μαρτίου 2019, σύμφωνα με το άρθρο 15 του Καταστατικού του Συλλόγου, είχαν δηλώσει υποψηφιότητα τα κάτωθι μέλη:

Για το Δ.Σ.: Γιώργος Αθανασόπουλος, Αλέξανδρος Δρουδάκης, Στέλλα Καραβασίλη, Αναστάσιος Κολλιός, Ιωάννης Μάρκου, Απόστολος Ρίτσος, Χρήστος Στρατάκος, Νικόλαος Τσάτσος, Γιάννης Φίκιρης.

Για την Εξελεγκτική Επιτροπή: Γιάννης Ζευγώλης, Αλέξανδρος Τσιτόπουλος, Γιάννης Ψιμής.

Κατόπιν φανερής ψηφοφορίας (παρ. 7, άρθρο 8 καταστατικού) εκλέχθηκαν για την επόμενη περίοδο - τριετία 2019 – 2022, οι κάτωθι:

(1) Διοικητικό Συμβούλιο Δ.Σ.:

Νικόλαος Τσάτσος (13 ψήφοι) - **Απόστολος Ρίτσος** (13 ψήφοι) - **Ιωάννης Μάρκου** (12 ψήφοι) - **Αναστάσιος Κολλιός** (11 ψήφοι) - **Χρήστος Στρατάκος** (11 ψήφοι) - **Γιάννης Φίκιρης** (11 ψήφοι) - **Στέλλα Καραβασίλη** (9 ψήφοι)

(2) Αναπληρωματικά Μέλη Δ.Σ.:

Γιώργος Αθανασόπουλος (6 ψήφοι) - **Αλέξανδρος Δρουδάκης** (4 ψήφοι)

(3) Εξελεγκτική Επιτροπή:

Γιάννης Ζευγώλης (12 ψήφοι) - **Γιάννης Ψιμής** (12 ψήφοι) - **Αλέξανδρος Τσιτόπουλος** (11 ψήφοι)

Αμέσως μετά την Γενική Συνέλευση συνεδρίασαν τα νεοεκλεγέντα μέλη του Διοικητικού Συμβουλίου και συγκροτήθηκαν σε σώμα με την ακόλουθη σύνθεση:

Νέα Σύνθεση Δ.Σ. περιόδου 2019 - 2022

Πρόεδρος: Κολλιός Αναστάσιος

Αναπληρωτής Πρόεδρος: Μάρκου Ιωάννης

Υπεύθυνος Οικονομικών: Τσάτσος Νικόλαος

Γραμματέας: Καραβασίλη Στέλλα

Μέλος: Φίκιρης Ιωάννης

Μέλος: Στρατάκος Χρήστος

Μέλος: Ρίτσος Απόστολος

Αναπληρωματικά Μέλη: Γιώργος Αθανασόπουλος, Αλέξανδρος Δρουδάκης

ISRM International Society for Rock Mechanics and Rock Engineering

BIM for underground infrastructure design

In recent times, digitalization of the construction sector in its widest definition represents a revolutionary trend in the architecture, engineering and construction industry which improves the way we design, construct & operate buildings and infrastructure projects. These trends result in productivity rise, project risk mitigation and consequentially higher quality end products.

Digital enablement of infrastructure can be delivered by the application of Building Information Modelling (BIM), Digital Engineering, Asset Information Modelling or Virtual Design and Construction. BIM is the digital representation of a physical and functional characteristic of a building, piece of infrastructure or even environment. BIM serves as a shared knowledge resource for information about an asset throughout its lifecycle—supporting decision making—from strategic appraisal and planning, design and construction to operation, maintenance and renewal.

New technologies are driving us to constantly improve our workflows, our products and everything we do. We will need to adopt the development of BIM standards and guidelines and tightly connect with software developers in order to develop powerful tools for the most challenging operations. There is a growing need in the construction industry for BIM-ready graduates and to build a consensus on BIM education

across various organisations and universities. We need to put effort into BIM education to represent the process of acquiring the necessary knowledge and the required skills to generate BIM deliverables and satisfy their respective requirements. Exploring these challenges of BIM education can be achieved through the ITACET Tunnelling 4.0 Course or various institutions providing remedial solutions. Bridging the gap between tertiary BIM education outcomes and workplace performance requirements is just the beginning of a large turning wheel of the so-called digital engineering process.

Jurij Karlovsek – Animateur ITA Working Group 22: Information Modelling in Tunnelling

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

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

WGC Opening Symposium 2019, 02-03 May 2019, London, Canada, www.eng.uwo.ca/wgc

WTC2019 Tunnels and Underground Cities: Engineering and Innovation meet Archaeology, Architecture and Art and ITA - AITES General Assembly and World Tunnel Congress, 3-9 May 2019, Naples, Italy, www.wtc2019.com

3rd Meeting of EWG Dams and Earthquakes an International Symposium, May 6-8, 2019, Lisbon, Portugal, http://ewg2019.lnec.pt

8th International Symposium on Geomechanics, May 6 to 10, 2019, Bucaramanga, Colombia, http://petroleos.uis.edu.co/eisi/grupo/simposiogeomecanica/#views/gm1/inicio

2019 Rock Dynamics Summit in Okinawa, 7-11 May 2019, Okinawa, Japan, www.2019rds.org

International Conference on Silk-roads Disaster Risk Reduction and Sustainable Development, May 11-12, Beijing, China, www.sidrr.com

4th Joint International Symposium on Deformation Monitoring (JISDM), 15 to 17 May, 2019, Athens, Greece, www.jisdm2019.survey.ntua.gr

TRANSOILCOLD 2019 Transportation Soil Engineering in Cold Regions, 20 –23 May 2019, St. Petersburg, Russia, http://conf-geotech.wixsite.com/transoilcold2019

ΕΓΕ2019 - 15th International Congress of the Geological Society of Greece, 22-24 May 2019, Athens, Greece, www.gsg2019.gr

International Course on GEOTECHNICAL and STRUCTURAL MONITORING, 27-31 May 2019, Rome, Italy, www.geotechnicalmonitoring.eu

L'Associazione Geotecnica Italiana e il Politecnico di Torino organizzano International Workshop on Complex Formations: Characterization and Case Studies che si terrà presso il Politecnico di Torino il prossimo 30 maggio 2019.

L'evento è dedicato ai materiali eterogenei con struttura a "blocco in matrice", come i bimrocks, i bimsoils, le miscele terreno-roccia.

I relatori introdurranno aspetti sperimentali e di modellazione numerica e casi studio.

For more information please contact: agi@associazionegeotecnica.it.

Underground Construction Prague 2019, June 3–5, 2019, Prague, Czech Republic, www.ucprague.com

6-7 June 2019, Saint Petersburg, Russia
http://tc207ssi.org

Location: The House of Architects, Bolshaya Morskaya Street 52, Saint Petersburg, Russia

Organizer: TC 207 ISSMGE & Institute "Georeconstruction" (Saint Petersburg)
Contact person: Eugene Dubinin
Address: Institute "Georeconstruction", St Petersburg, Russia
Email: georeconstruction@gmail.com
Website: http://tc207ssi.org
Email: lisyuk@gmail.com

ICOLD 2019 Annual Meeting/Symposium, June 9-14, Ottawa, Canada, www.icold-cigb2019.ca

7th International Conference on Bituminous Mixtures and Pavements, 12-14 June 2019, Thessaloniki, Greece http://iconfbmp.civil.auth.gr

VII ICEGE ROMA 2019 - International Conference on Earthquake Geotechnical Engineering, 17 - 20 June 2019, Rome, Italy, www.7icege.com

ICONHIC2019 - 2nd International Conference on Natural Hazards and Infrastructure, 23-26 June 2019, Chania, Crete Island, Greece, https://iconhic.com/2019/conference

COMPDYN 2019 7th International Conference on Computational Methods in Structural Dynamics and Earthquake Engineering, 24-26 June 2019, Crete, Greece, www.compdyn.org

IS-GLASGOW 2019 - 7th International Symposium on Deformation Characteristics of Geomaterials, 26 - 29 June 2019, Glasgow, Scotland, UK, https://is-glasgow2019.org.uk

cmn 2019 -Congress on Numerical Methods in Engineering, July 1 - 3, 2019, Guimarães, Portugal, www.cmn2019.pt

International conference on clay science and technology, Meeting of the European Clay Groups Association (ECGA) jointly with the 56th annual meeting of The Clay Minerals Society (CMS) and the 6th Mediterranean Clay Meeting (MCM), 1 – 5 July 2019, Paris, France, https://euroclay2019.sciencesconf.org

7th Asia-Pacific Conference on Unsaturated Soils, August 23~25, 2019, Nagoya, Japan, www.jiban.or.jp/e/activities/events/20190823-25-seventh-asia-pacific-conference-on-unsaturated-soils

The 17th European Conference on Soil Mechanics and Geotechnical Engineering, 1st - 6th September 2019, Reykjavik Iceland, www.ecsmge-2019.com

NORDIC GROUTING SYMPOSIUM 2019

September 2-3, 2019, Helsinki, Finland
https://www.ril.fi/en/events/nordic-grouting-symposium-2019.html

The Finnish Tunnelling Association (FTA) and the Finnish Association of Civil Engineers (RIL) have the pleasure to invite you to the 9th Nordic Grouting Symposium that will be held on 2 and 3 September 2019 at hotel Hilton Airport in Helsinki. This symposium gathers Nordic experts to exchange experiences and discuss the latest development and achievement in the field of rock grouting. We hereby ask our Nordic colleagues to present papers at NGS 2019 - submit your abstract today!

Themes for the Symposium

- Recent development – equipment, materials, software, analysis, regulations, directives
- Case studies – in Nordic countries and internationally
- Grouting strategy
- Groutability/grout penetration/grout pressure
- Research activities – theses, testing
- Future trends, ideas and innovations
- Rock investigations for grouting design
- Rock modelling for grouting, grout penetration models

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4ο Πανελλήνιο Συνέδριο Αντισεισμικής Μηχανικής & Τεχνικής Σεισμολογίας, Αθήνα, 5 – 7 Σεπτεμβρίου 2019, https://conv.eltam.org

SECED 2019 Conference Earthquake risk and engineering towards a resilient world, 9-10 September 2019, Greenwich, London, U.K., www.seced.org.uk/2019

15th International Benchmark Workshop on Numerical Analysis of Dams, 9th - 11th September 2019, Milano, Italy, www.eko.polimi.it/index.php/icold-bw2019

3rd International Conference "Challenges in Geotechnical Engineering" CGE-2019, 10-09-2019 - 13-09-2019, Zielona Gora, Poland, www.cgeconf.com

International Symposium on SPH and other particle-based continuum methods and their applications in geomechanics
11-13 September 2019, Vienna, Austria
https://sph-vienna.com

Analysis and design in civil engineering is much dominated by the mesh-based numerical methods such as FEM. This dominance is being rivaled by the meshfree methods for problems with free surface flow, large deformation and discontinuous deformation. The first meshfree method is SPH (Smooth Particle Hydrodynamics. The last decades saw rapid development of numerous meshless methods, e.g. MPM (Material Particle Method), XFEM, PFEM (Particle Finite Element Method). Geomechanics with complex material behavior and problem setting offers an excellent playground for meshfree methods.

This workshop brings together scientists, software developers and engineers to take stock of the state-of-the-art of meshfree methods, assess their potential for geomechanics problems and look into future development trends. Although the workshop focuses on SPH and other particle based continuum methods and their application in geomechanics, other innovative numerical methods and applications are equally welcome

This workshop offers an excellent opportunity to interact with top researchers in an informal setting. Topics of interest include innovative numerical methods, fundamentals, code development, computational efficiency, benchmarking, advanced constitutive models, applications and case studies.

Contact

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14th ISRM International Congress, 13-18 September 2019, Iguassu Falls, Brazil, www.isrm2019.com

International Symposium on Geotechnical aspects of Heritage Structures
September 16-18, 2019, IIT Madras, Chennai, India
www.igschennai.in/ISGHS2019

The preservation of historic sites is one of the most challenging problems facing modern civilisation. It involves several factors belonging to different fields of engineering and architecture. Therefore it is challenging to find appropriate holistic intervention techniques and standard design approaches. In this regard, the central theme of the symposium revolves around geotechnical aspects of heritage structures focusing on issues ranging from geological and geotechnical challenges in historical sites to geohazard assessment and geotechnical interventions towards rehabilitation.

A three-day Symposium on Geotechnical Aspects of Heritage Structures (SGHS 2019) is organised by National Centre for Safety of Heritage Structure of IIT Madras (NCSHS-IITM) and IGS-Chennai Chapter in collaboration with IGS-Trichy Chapter and Anna University under the aegis of Technical Committee (TC301) of International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE).

Symposium Themes

Geological and geotechnical challenges in historical sites

Emphasis will be on the geological and geotechnical conditions of various historical sites, including subterranean and rock-cut sites, in India and abroad.

Diagnostics of distress

Identification of the nature and extent of distress in heritage structures without compromising their heritage value is a major challenge. Non-destructive testing procedures (e.g., GPR, Tomography, MASW, etc.) are generally adopted, but in some cases, invasive tests are also carried out as diagnostic investigations. The symposium will deliberate on the state-of-the-art practice and recent developments.

Heritage geotechnics

Identification of types of foundations, materials used and associated problems will be discussed under this theme.

Geohazards and heritage

Several ancient structures have recently been lost to geohazards such as earthquakes, cloudbursts and slope failures, which pose a serious challenge in the preservation of these sites. Risk assessment, strategies and remedial measures against such natural disasters will be one of the major themes of this symposium.

Geotechnical Safety assessment

Identification of failure mechanisms in foundations, retaining structures and subterranean structures, and new methodologies for deterministic and probabilistic safety assessment will be addressed within this theme.

Numerical modelling strategies

Recent advances in numerical modelling of the substructure, foundation soil, and soil-structure interaction as part of the safety assessment of historical sites and structures will be addressed within this theme.

Geotechnical interventions towards rehabilitation

Recent innovative solutions and techniques for rehabilitation to address geotechnical distress in historical foundations, earth-retaining structures or subterranean structures and their design basis will be discussed under this theme.

Case studies on Historical sites

The symposium will also be a platform to discuss important case studies that are significantly instructive either due to the challenging geotechnical distresses encountered or the pioneering solutions developed or adopted to ensure safety and preservation of the historical sites

For more information, write to

Dr Subhadeep Banerjee,
Organising Secretary
Geotechnical Engineering Division
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Chennai 600036 INDIA
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12th Asian Regional Conference of IAEG, 21 ~ 27 September 2019, Jeju Island, Republic of Korea (South Korea), www.iaegarc12.org

1st MYGEC 1st Mediterranean Young Geotechnical Engineers Conference, Double Events – MYGEC & EYGEC, 23-24th September, 2019, Bodrum, Muğla, Turkey, http://mygec2019.org

27th EYGEC 27th European Young Geotechnical Engineers Conference, Double Events – MYGEC & EYGEC, 26-27th September, 2019, Bodrum, Muğla, Turkey, http://eygec2019.org

3rd ICTITG International Conference on Information Technology in Geo-Engineering, Sep. 29-02 Oct., 2019, Guimarães, Portugal, www.3rd-icitg2019.civil.uminho.pt

11th ICOLD European Club Symposium, 2 - 4 October 2019, Chania Crete – Greece, www.eurcold2019.com

4ο Πανελλήνιο Συνέδριο Αντισεισμικής Μηχανικής και Τεχνικής Σεισμολογίας *20 Χρόνια Μετά...*, Αθήνα, 4-6 Οκτωβρίου, 2019, www.eltam.org

XVII African Regional Conference on Soil Mechanics and Geotechnical Engineering 07-10 October 2019, Cape Town, South Africa, www.arc2019.org

2019 AYGE 7th African Young Geotechnical Engineers Conference, 6 October 2019, Cape Town, South Africa, www.arc2019.org/ayge-landing

HYDRO 2019 Concept to closure: practical steps, 14-16 October 2019, Porto, Portugal, www.hydropower-dams.com/hydro-2019

Developing Resilient Cities of the Future through the Integration of Tunneling and Underground Space Use
15-17 October 2019, Nigeria
events@tunnellingnigeria.org

11ème Édition des Journées Africaines de la Géotechnique
21-24 Octobre 2019, Niamey, Niger
http://ctgaafrique.org/niamey-niger-ville-hote-de-11eme-edition-journees-africaines-de-geotechnique

Conformément aux résolutions prises lors de l'Assemblée Générale du 24 octobre 2018 à Abidjan en Côte d'Ivoire, le Niger abritera cette année la 11ème édition des Journées Africaines de la Géotechnique (JAG 2019), co-organisée par la Comité Transnational de Géotechniciens d'Afrique (CTGA) et l'Association des Laboratoires du Bâtiment et des Travaux Publics (ALBTP) sous le thème : ***"Géotechnique et efficience économique des stratégies de développement en Afrique inter-tropicale".***

Email: emk2cm@Yahoo.fr

XVI Asian Regional Conference on Soil Mechanics and Geotechnical Engineering, 21 - 25 October 2019, Taipei, China www.16arc.org

4th Regional Symposium on Landslides in the Adriatic-Balkan Region – ReSyLAB 2019 - 9th Scientific and Expert Conference GEO-EXPO 2019 23rd to 25th of October 2019, Sarajevo, Bosnia and Herzegovina, www.geotehnika.ba/ReSyLAB_&_GEO-EXPO_2019.html

8ο Πανελλήνιο Συνέδριο Γεωτεχνικής Μηχανικής, 6 – 8 Νοεμβρίου 2019, Αθήνα, Ελλάς, www.8hcge2019.gr

2019 GEOMEAST International Congress & Exhibition, 10-14 November 2019, Cairo, Egypt, www.geomeast2019.org

The 8th International Symposium on Roller Compacted Concrete (RCC) Dams, Nov. 11th – 12th, 2019, Kunming, China, chincold-en@vip.126.com, http://www.chincold.org.cn

8th International Geotechnical Symposium
13-15 November 2019, Istanbul, Turkey
www.geoteknik2019.org/en/

Turkish Chamber of Civil Engineers Istanbul Branch invites all civil engineers to the 8th International Geotechnical Symposium. Our goal is to provide an international stage for the discussion and evaluation of the scientific and technological developments, knowledge, know-how, and daily increasing and diversifying experiences within geotechnical specialty considering both scientific and professional perspectives. With the scientific platform we intend to establish, our aim is to foster stronger communication and interaction, to discuss possible alleys of contribution and to identify the subjects that would enable a more active cooperation between the academy and the industry. Today's constant need for innovation necessitates the alignment of the academy-industry cooperation around the focus of research and design.

Towards these goals, the selections of the invited lecturers, symposium topics, and acceptance of papers will be done with utmost care. No effort will be spared towards the realization of a synergetic and efficient symposium setting. However, it is the active and interactive contribution of a large audience and the scientific and technical quality of the papers that determine the actual accomplishment of a symposium.

Geotechnical Symposiums are favored by our colleagues for their high standards and scientific contents. The 8th International Geotechnical Symposium is organized with the same sensibilities and intends to set the bar ever higher. We invite you to contribute to this exciting and productive event and to benefit from the professional opportunities provided.

TOPICS

- Soil Characteristic and Behavior
- Foundation Engineering
- Soil Structure Interaction
- Geotechnical Earthquake Engineering
- Ground Improvement
- Deep Excavations And Support Systems
- Earth Structures, Slopes And Landslides
- Marine And Transportation Structures
- Geoenvironmental Engineering And Energy Geotechnics

CONTACT

ORGANIZING ORGANIZATION
UCTEA Turkish Chamber of Civil Engineers İstanbul Branch
Mumhane Cad. No: 21 Karaköy/İstanbul
Phone: (0212) 293 20 00 (pbx) - **Fax:** (0212) 232 09 12

http://www.facebook.com/imoistanbulsube
http://twitter.com/imoistanbulsube
http://www.youtube.com/user/imoistanbulsube
https://www.instagram.com/imoistanbul

SYMPOSIUM ORGANIZING COMMITTEE

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XVI Panamerican Conference on Soil Mechanics and Geotechnical Engineering, 18-22 November 2019, Cancun, Quintana Roo, Mexico, http://panamerican2019mexico.com/panamerican

GEOTEC HANOI 2019 The 4th International Conference on Geotechnics for Sustainable Infrastructure Development, November 28 – 29, 2019, Hanoi, Vietnam, https://geotechn.vn

4th International Conference on Ground Improvement and Ground Control (ICGI2019): Infrastructure Development and Natural Hazards Mitigation
1-3 December 2019, Luxor, Egypt
https://icgi2019-ets.org/page/p/Welcome-ICGI

The Technical Committee of Ground Improvement (TC 211 – ISSMGE) under the auspices of the International Society for Soil Mechanics & Geotechnical Engineering (ISSMGE) and The Egyptian Geotechnical Society (EGS) will be hosting the INTERNATIONAL CONFERENCE ON GROUND IMPROVEMENT AND GROUND CONTROL (ICGI2019): INFRASTRUCTURE DEVELOPMENT AND NATURAL HAZARDS MITIGATION. The Conference is also supported by the ASCE Geo-Institute, the International Geosynthetics Society (IGS) and the University of Tanta.

The International Conference on Ground Improvement and Ground Control (ICGI2019) is the premier event on the ground improvement and geomechanics, and was established in 2009 to promote research in these rapidly evolving areas of mechanics and techniques, and serve as a forum to discuss the latest findings/developments and exchange new ideas. The first in the series of ICGI was held in Singapore in 2009; the second conference was held in Wollongong (Australia) in 2012 and the third conference was held in Hangzhou (China) from 27th – 29th Oct. 2017. The fourth ICGI is to be held in Luxor (Egypt) from 1st – 3rd December 2019.

In Egypt, the rapid economic booming has stimulated the development of infrastructure, which calls for ground improvement as large construction projects must encompass soft and weak ground throughout Egypt.

Numerous Keynote Lectures, State of the Art presentations, Heritage Lecture, Theme Lectures and other Technical Papers will contribute to three days of scientific and technical discourse followed by a very attractive Nile Cruise Program encompassing the unique and scenic heritage history of Pharonic Egypt between Luxor and Aswan.

The Conference will be aimed at promoting the latest ground improvement concepts and applications predominantly in the fields of the Infrastructure Development and Natural Hazards Mitigation. Following the earlier successful conferences in Singapore, Australia and China, this Conference will act as a platform for disseminating the most recent research developments and field advances to the geotechnical community around the globe. It is expected to be the biggest Ground Improvement conference to be held in this region

Conference Themes

The Conference will consider papers in the following themes:

1. Soft Soil Consolidation
2. Sand and Gravel Piles, Stone Columns and Rigid Inclusions
3. Geosynthetics Reinforcement
4. Compaction and Vibroflotation
5. Grouting and Chemical Stabilization
6. Electro-kinetic, Electro-osmotic, Bio-engineering, Thermal and Explosion-based Techniques
7. Methods of Preventing Soil Erosion, Scour and Internal Piping
8. Ground Control in Underground and Surface Mine Excavations
9. Methods of Stabilization of Landslides and Mass Movement
10. Surface and Sub-surface Drainage
11. Stabilization of Fractured and Jointed Rock mass
12. Ports and Land Reclamation
13. Contaminated Soil Remediation
14. Transport Infrastructure

For further information, please contact the ICGI Conference Secretariat: secretariat@icgi2019-ets.org

YSRM2019 - The 5th ISRM Young Scholars' Symposium on Rock Mechanics and REIF2019 - International Symposium on Rock Engineering for Innovative Future - Future Initiative for Rock Mechanics and Rock Engineering - Collaboration between Young and Skilled Researchers/Engineers – 1-4 December 2019, Okinawa, Japan, www.ecpro.co.jp/ysrm2019/index.html

ETS Conference and Exhibition 2019
4-5 December 2019, Luxor – Egypt
https://icgi2019-ets.org/page/p/Welcome-ETS

The Egyptian Tunnelling Society (ETS) under the auspices of ITA, Ministry of Transportation and National Authority for Tunnels (NAT) cordially invites you to participate with us the

ETS Conference and Exhibition 2019, 4-5 December 2019, Luxor – Egypt.

The event that will explore the latest innovations, trends and advances in all areas of underground structures, from project layout to design to construction and operation and maintenance. The event will serve as a forum to discuss the latest findings, developments, applications; lessons learnt and exchange new ideas in different underground structures industry.

In Egypt, the rapid economic booming has stimulated the development of transportation and roadways infrastructures, which calls for the implementation of many tunnelling projects throughout Egypt. The recent greater Cairo underground metro lines projects and the new challenging tunnels under Suez Canal to the Sinai Peninsula connecting Asia and Africa in addition to the mega projects for utility tunnels are examples of recent and current tunnelling activities in Egypt.

It is tentative to host many principal Keynote Lecturers, State of the Art presentations, Heritage Lecture and Theme Lectures. The technical papers will contribute to two days of scientific and technical discourse followed by a beautiful Nile Cruise Program encompassing the unique and scenic heritage history of Pharaonic Egypt between Luxor and Aswan.

Luxor history stretches back more than four thousand years. The city contains some valuable historical heritages including approximately one-third of the world's monuments. Therefore, Luxor has frequently been characterised as the "world's greatest open-air museum." Immediately opposite, across the River Nile, lie the monuments, temples, and tombs of the West Bank Necropolis, which includes the Valley of the Kings and Valley of the Queens.

Therefore, please save the dates in your calendar and follow our updates by email and on the event website. We promise to strive hard to make the conference a successful and memorable experience for all.

Conference Themes

The Conference will consider papers in the following themes

1. Geological, geophysical and geotechnical modern aspects for underground projects.
2. Planning, feasibility studies and design of underground structures.
3. Innovations in tunnels design methods.
4. Case studies, challenges and innovative technologies of tunnelling.
5. Advances and innovations in computational methods for underground structures.
6. Innovations in instrumentations and monitoring systems for underground structures.
7. Tunnels rehabilitation, upgrading and operation and maintenance.
8. Risk analysis and management of underground projects.
9. Environmental aspects of tunnels projects.
10. Modern Electromechanical systems for roadway, railway and metro tunnels.

ETS Secretariat

Telephone: +20-100-514-7992
Email: Info@icgi2019-ets.org

ISOG 2019
December 5 - 6, 2019
IIT Bhubaneswar
First Indian Symposium on Offshore Geotechnics
(An International Symposium)

December 5-6, 2019, IIT Bhubaneswar, Odisha, India
https://sites.google.com/iitbbs.ac.in/isog2019/home

Overview

The School of Infrastructure of Indian Institute of Technology Bhubaneswar (IIT-BBS) and Institute of Engineering and Ocean Technology (IEOT), ONGC are jointly organising the symposium on Offshore Geotechnics in India. The first symposium, ISOG 2019 will be held in Indian Institute of Technology Bhubaneswar, India on 5-6 December, 2019 under the aegis of technical committee, TC 209 of International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) and Indian Geotechnical Society (IGS), Bhubaneswar Chapter. The symposium will focus on recent advances in offshore geotechnology recognizing the role of geotechnical engineering in the field of renewable energy and oil and gas industries. The symposium will cover various aspects pertaining to offshore geotechnics, such as offshore site investigation, soil characterization, geotechnics related to offshore renewable energy converters, offshore foundations and anchoring systems, pipelines, and deep sea explorations. The objectives of ISOG 2019 is to create a broad platform where educationist, researchers, practicing engineers, entrepreneurs could promote policy changes that support the development of design guideline, awareness and interaction. The symposium also aims at promoting international cooperation and industry-academia interaction. The eminent international and Indian experts from institutions and industries will deliver expert lectures. The symposium will be beneficial to academicians, researchers, professionals from various public and private sector offshore industries, universities and research organisations.

Themes

- Offshore Site Investigation
- Soil Characterization
- Offshore Geohazards
- Geotechnics related to Offshore Renewable Energy Converter
- Offshore Foundations and Anchoring Systems
- Pipelines
- Case Studies
- Deep Sea Exploration

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International Conference on
Case Histories & Soil Properties
5 - 6 December 2019

www.iccs2019.org

To accommodate the rapidly expanding economy in many parts of the world, a large number of geotechnical infrastructure projects are ongoing in many countries worldwide. These include the development of airports and sea ports, the construction of mass rapid transit lines and high speed rail lines as well as the development of underground large caverns. For these projects, large amount of soil and rock data are generated and proper soil/rock characterization would help to enhance the safety and reducing cost of these large projects. Instrumentation plays a key role to compare the measured ground responses against design assumptions and calculations. Necessary remedial action may be necessary should the measured and predicted ground responses differ substantially. These case studies indeed provide valuable means for the improvement of design know-how and lessons learnt for subsequent similar development.

In view of the above, the Geotechnical Society of Singapore is organizing an International Conference on Case Histories & Soil Properties to be held in Singapore from 5 to 6 December 2019 to facilitate discussions and interactions among geotechnical researchers and practicing engineers on the above mentioned important issues.

For enquiries, please contact ICCS19 Secretariat if you require any assistance.

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ICCS19 Secretariat
Geotechnical Society of Singapore
1 Liang Seah Street #02-11
Singapore 189022

15th International Conference on Geotechnical Engineering, and 9th Asian Young Geotechnical Engineers Conference, 05 ÷ 07-12-2019, Lahore, Pakistan, http://www.pges-pak.org

ITA-AITES WTC 2020
15 - 21 May 2020
Kuala Lumpur, Malaysia

World Tunnel Congress 2020
15th – 21st May 2020, Kuala Lumpur, Malaysia
wtc2020@iem.org.my

The Institution of Engineers, Malaysia (IEM) warmly welcomes you to the ITA-AITES World Tunnel Congress (WTC) 2020 and 46th General Assembly in Malaysia which will be held from 15th - 21st May 2020 at the prominent Kuala Lumpur Convention Centre (KLCC).

With the theme "Innovation and Sustainable Underground Serving Global Connectivity", WTC 2020 will indeed be the world's leading tunnelling event that will explore the latest innovations, trends and advances in all areas of tunnelling, i.e. from tunnel project development to both design and construction, as well as to tunnel service life cycle strategies, in a sustainable manner.

WTC 2020 will feature multiple technical paper presentations, along with tunnelling training courses, poster presentations, the ITA-AITES General Assembly, technical visits to ongoing tunnelling projects in Malaysia, and interesting exhibitions and shows by companies from all over the world presenting their latest tunnelling solutions, innovations and technologies. Along with plenteous opportunities for networking, delegates will have many occasions to learn and share new and exciting developments, and socialise with colleagues and leading experts from all over the world and at the same time conclude successful commercial deals.

We invite you to experience our warm Malaysian hospitality and enjoy the multitude of entertainment, cultural, culinary and leisure activities offered in one of the world's most vibrant and value for money shopping destination. You can always find the most updated information on www.wtc2020.my.

Theme

The theme of the World Tunnel Congress 2020 has conscientiously been chosen to timely reflect the innovation achievements in the efforts of ITA-AITES in promoting the use of tunnels and underground space for the benefits of public, environment and sustainable development for the past almost half century since its establishment in 1974.

Growing numbers of underground innovations claim to hold the key to unlock the door to a 'smarter urban connectivity'. More often than not, these innovations are being embedded into highly complex underground projects that aim to minimise environmental hazards, to save energy, to increase the functional diversity of the urban structure, to reduce the need of local transportation, to make services more easily accessible to residents, and to protect the urban landscape and culture for sustainable urban development. Malaysia's advantage in gaining a significant share of this engineering feat lies in its existing strengths in underground infrastructure, innovative environment and strong history and political will to tackle sustainability challenges. The innovative and unique SMART tunnel, the first of its kind dual-purpose tunnel in the world is the best example of Malaysian own development. This example became known worldwide as an effective solution to optimise expenditures to solve multiple problems. The tunnel is expected to prevent billions of dollars of possible flood damage and costs from traffic congestion in Kuala Lumpur's city centre. It is listed as one of the top 10 world's greatest tunnels by CNN. SMART project won the British Construction Industry International Award in 2008 and received the UN Habitat Scroll of Honour Award in 2011 for its innovative and unique management of storm water and peak hour traffic.

"When we judge by the progress in the use of underground space in Malaysia the progress has been remarkable. This is an indication of the fact that Malaysian professionals have not only learned from the training, but most important, have developed their own expertise to come up with ingenious underground solutions to their problems." cited by Prof. Tarcisio B. Celestino, the President of ITA.

"INNOVATION AND SUSTAINABLE UNDERGROUND SERVING GLOBAL CONNECTIVITY" is more than a slogan for ITA-AITES and its members, it is a challenge and commitment to contribute to sustainable development. It is our great honoured to share with the global tunnelling fraternity the Malaysian's little success story in innovative tunnelling and underground solutions. The encouragement of the innovation and sustainable development in the organisation of WTC, and the technical presentations, is a key theme. We would be delighted if we inspire a whole new generation's interest in the work and achievements of ITA-AITES.

Session Topics

Growing numbers of underground innovations claimed to hold the key to unlock the door to a 'smarter urban connectivity'. More often than not, these innovations were being embedded into highly complex underground projects that aim to minimise environmental hazards, to save energy, to increase the functional diversity of the urban structure, to reduce the need of local transportation, to make services more easily accessible to residents, and to protect the urban landscape as well as culture for sustainable urban development.

This Congress aims at providing a forum for practising professionals – engineers, consultants, contractors, technologists, researchers, academicians, manufacturers and suppliers to share their experiences, research, studies and views so as to contribute to the advancement of Innovation and Sustainable Underground Serving Global Connectivity. A wide range of high quality scientific and technical papers of international or regional significance on tunnelling and underground space development is expected on, but not limited to, the following topics.

1. Innovation in tunnels and tunnelling technology
2. Innovation in rock support and water proofing technology
3. Sustainable and strategic use of underground space
4. Environment sustainability in underground construction
5. Urban dewatering and flood control with underground tunnels
6. Planning, design and construction of tunnels and underground structures
7. Risk, health and safety, contractual practices and project management of underground construction
8. Instrumentation and monitoring in underground construction
9. Conventional tunnelling, sprayed concrete use, drill and blast excavation
10. Mechanised tunnelling and excavation (hard rock, soft rock and soil)
11. Site investigation and ground characterisation
12. Geological and geotechnical aspects in underground construction
13. Stability assessment and ground stabilisation in underground construction
14. Operation, repair and maintenance of tunnels and underground structures
15. Design and installation of mechanical and electrical systems for underground structures
16. Information modelling in tunnelling and underground space development
17. Projects and case histories
18. Others (e.g. economics of tunnels and use of underground space, life cycle asset management, etc.)

Find us here

WTC 2020
Wisma IEM, Jalan Selangor, P.O. Box 224 Jalan Sultan
wtc2020@iem.org.my

14th Baltic Sea Geotechnical Conference 2020
25 ÷ 27 May 2020, Helsinki, Finland
www.ril.fi/en/events/bsgc-2020.html

Organiser: Finnish Geotechnical Society
Contact person: Leena Korkiala-Tanttu
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Email: ville.raassakka@ril.fi

Nordic Geotechnical Meeting
25-27 May 2020, Helsinki, Finland
www.ril.fi/en/events/ngm-2020.html

Contact person: Prof. Leena Korkiala-Tanttu
Address: SGY-Finnish Geotechnical Society,
Phone: +358-(0)50 312 4775
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EUROCK 2020 Hard Rock Excavation and Support, 13-19 June 2020, Trondheim, Norway, www.eurock2020.com

DFI Deep Mixing 2020
15 to 17 June 2020, TBD, Gdansk, Poland

Organizer: Deep Foundations Institute
Contact person: Theresa Engler
Address: 326 Lafayette Avenue, Hawthorne, NJ 07506, USA
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Fax: 19734234031
Email: tengler@dfi.org
Website: http://www.dfi.org
Email: staff@dfi.org

XIII International Symposium on Landslides Landslides and Sustainable Development

June 15th – 19th 2020, Cartagena, Colombia

www.scg.org.co/xiii-isl/

In association with the Joint Technical Committee on Natural Slopes and Landslides (JTC1) and the Federation of International Geo-engineering Societies: ISSMGE, ISRM and IAEG (FedIGS), the Colombian Geotechnical Society-CGS cordially invites the international geotechnical community to participate in the XIII International Symposium on Landslides-XIII ISL, which will be held from June 15 to 19 - 2020 in the city of Cartagena-Colombia.

Our invitation extends to all those colleagues interested in presenting articles, and in a very special way to invite students and professors of universities and research centers, and to the representatives of industry and research for the installation of stands to display software, equipment and geotechnical services. In addition to the program of the Symposium to be held at the venue of the event, technical visits will be organized to selected landslide sites and structures of geotechnical interest, in the surroundings of Medellín and Bogotá cities, both located in the Andean region. It is planned to make these visits during the week of June 22 to 26. Finally, we invite you to enjoy our tourist attractions and the hospitality of our people.

The International Symposium on Landslides has a long and successful history that has brought geoscientists and other interested people together for four decades around the common theme of landslides. The symposium started in 1972 in Kyoto, Japan followed by a successful series of symposiums, leading to the most recent editions in Xi'an, China (X ISL 2008), in Alberta, Canada (XI ISL 2011), and in Napoli, Italy (XII ISL 2016). The XIII ISL is designed as the meeting point for engineers, geologists, geoscientists, planners, economist and decision makers on the common topic of landslides and their impact on society and environment.

Objectives

The theme of the symposium will be: *Landslides and sustainable development.*

The symposium objectives are:

- Present and discuss recent advances in the identification and analysis of the factors associated with weather, seismic-tectonic and volcanic activity and human activities that trigger landslides.
- Exchange and discuss case histories and risk management oriented towards sustainable development in resilient societies.
- Know and communicate the recent advances in the state of the knowledge on the topics of the symposium.

Topics

1. Weather and landslides.
2. Landslides and seismo-tectonic and volcanic activity.
3. Landslides and Human Activities.
4. Effects of landslides with emphasis on infrastructure and sustainable development.
5. Landslides: Risk Assessment and Management

Contact

Colombian Geotechnical Society www.scg.org.co
ORGANIZING COMMITTEE CONTACT isl2020@scg.org.co

GEE2020 International Conference on Geotechnical Engineering Education 2020, June 24-25, 2020, Athens, Greece, www.erasmus.gr/microsites/1168

E-UNSAT 2020 4th European Conference on Unsaturated Soils - Unsaturated Horizons, 24-06-2020 ÷ 26-06-2020, Lisbon, Portugal, https://eunsat2020.tecnico.ulisboa.pt

Geotechnical Aspects of Underground Construction in Soft Ground

29 June to 01 July 2020, Cambridge, United Kingdom

Organiser: University of Cambridge
Contact person: Dr Mohammed Elshafie
Address: Laing O'Rourke Centre, Department of Engineering, Cambridge University
Phone: +44(0) 1223 332780
Email: me254@cam.ac.uk

16th International Conference of the International Association for Computer Methods and Advances in Geomechanics – IACMAG

29-06-2020 ÷ 03-07-2020, Torino, Italy

The 16th International Conference of the International Association for Computer Methods and Advances in Geomechanics (15IACMAG) will be held in Turin, Italy, 29 June - 4 July 2020. The aim of the conference is to give an up-to-date picture of the broad research field of computational geomechanics. Contributions from experts around the world will cover a wide range of research topics in geomechanics.

Pre-conference courses will also be held in Milan and Grenoble.

Contact Information

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4th International Symposium on Frontiers in Offshore Geotechnics
16 – 19 August 2020, Austin, United States
www.isfog2020.org

Contact person: Phil Watson
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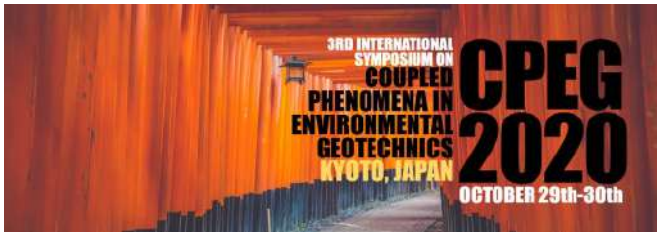
EUROGEO WARSAW 2020 7th European Geosynthetics Congress, 6-9 September 2020, Warsaw, Poland, www.eurogeo7.org

37th General Assembly
of the European Seismological Commission
6 to 11 September 2020, Corfu, Greece
www.esc-web.org

6th International Conference on Geotechnical and Geophysical Site Characterization "Toward synergy at site characterisation", 7 ÷ 11 September, Budapest, Hungary, www.isc6-budapest.com



3rd International Symposium on Coupled Phenomena in Environmental Geotechnics
October 29th – 30th, 2020, Kyoto, Japan
https://cpeg2020.org

CPEG2020 is organized under the auspices of the Technical Committee TC215 (Environmental Geotechnics) of ISSMGE, and follows the very successful first two CPEG symposiums held in Torino (Italy) in 2013, and in Leeds (UK) in 2017.

CPEG2020 will be hosted in conjunction with the Japanese Geotechnical Society (JGS) and Kyoto University, and it will be followed by the 'Fifth World Landslide Forum' from November 2nd, making this a great opportunity to join both ISSMGE events in the Ancient Capital of Japan.

As we polish the details of the symposium, we will update the CPEG2020 website with further information, including keynote speakers, detailed symposium themes, and key dates. Please, keep the address of this site (www.cpeg2020.org) among your bookmarks for updated information.

5TH World Landslide Forum Implementation and Monitoring the USDR-ICL Sendai Partnerships 2015-2015, 2-6 November 2020, Kyoto, Japan, http://wlf5.iplhq.org

EUROCK 2021
the ISRM European Rock Mechanics Symposium
1-6 June 2021, Torino, Italy

UNSAT2022
8th International Conference on Unsaturated Soils
June or September 2022, Milos island, Greece

ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

Surveying Crossrail's tunnels from space

Using satellite radar, a team of engineers was able to monitor how Crossrails tunnelling impacted the buildings above. Andrew Wade reports.

The subterranean world beneath London is some of the most heavily tunnelled of any major city. From Bazalgette's sewer system to the ever-evolving Tube network, the UK's capital has for centuries plumbed its depths to provide all manner of utilities for the populace. With recent projects such as Crossrail and the Thames Tideway Tunnel adding yet more complexity underground, the need to assess the impact of tunnelling on surface structures has never been greater.

At the University of Bath, Dr Giorgia Giardinahas been employing a new technique that uses satellite imagery to monitor surface building deformation, verifying the method by way of the Crossrail tunnels.

Combined with traditional monitoring techniques, it's a breakthrough that could provide engineers with a more accurate and comprehensive tool for assessing the impact of subterranean construction. The technology –known as InSAR (Interferometric synthetic aperture radar) –has evolved over the past decade with the launch of X-band satellite constellations such as the Italian Space Agency's COSMO-SkyMed.

"Civilian X-band satellites are characterised by improved spatial resolution together with a reduced revisit time, varying from a couple of weeks down to a few days," said Dr Giardina (below), lead researcher on the project and lecturer at Bath's department of architecture and civil engineering.

"The high-resolution of the COSMO-SkyMed X-band SAR data results in an improvement of 320 per cent and 550 per cent with respect to (the longer-serving) RADARSAT-1 and ENVISAT data C-band satellites. The X-band wavelength also enables unprecedented accuracy of the order of millimetres in the InSAR monitoring of ground and structural deformations in urban areas.

"Second-generation satellites were expected to provide more accurate data and a short-term monitoring of natural and man-induced hazards, like earthquakes, landslides and glacier movements. What was not clear until the actual processing of ground deformation data in urban areas was the full extent of the X-band satellite potential for structural engineering applications and in particular in integration with damage assessment tools. We are filling the gaps between two branches of electrical and structural engineering previously unexplored."

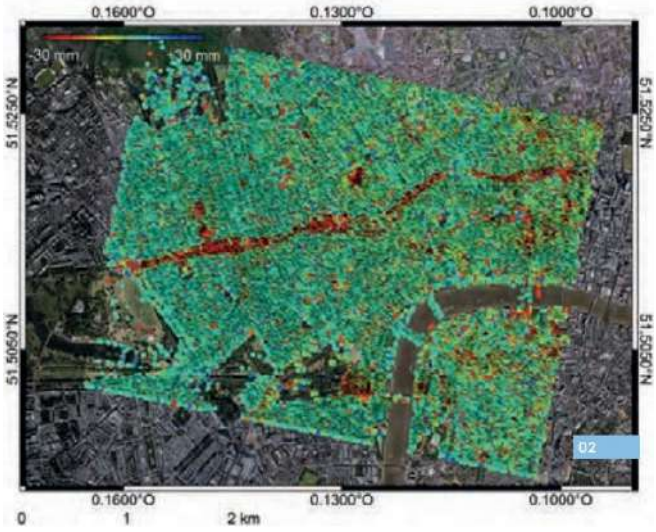
Anyone working in central London during the Crossrail tunnelling will likely have seen teams of engineers using geodetic prisms and manual levelling points to monitor building displacement. In Soho and other areas particularly vulnerable to damage, total stations were deployed that can monitor up to 100 levelling prisms on surrounding buildings, providing constant observation while the tunnel boring machines carved their way under the city.

However, for the majority of buildings above large-scale tunnelling projects, only a few points can be monitored constantly. Integrating InSAR with ground-based levelling allows virtually every point on every building to be observed, providing much more insight than just using traditional techniques on their own.

"During the Crossrail project, several commercial companies provided satellite-based monitoring, comparing them to ground-based data to prove the high quality of satellite measurements," Dr Giardina told The Engineer. "In our study, an initial comparison with ground-based data was only used as a validation of the InSAR measurements.

"InSAR data was then integrated to structural assessment procedures to prove the higher spatial resolution of satellite measurements with respect to the ground-based measurements, which were typically available for the buildings located along the Crossrail route, and also the additional insight –enabled by the use of InSAR data –on soil structure interaction mechanisms. In both, ground-based measurements would not have been sufficient to obtain the same results."

To assess the expected impact of ground movements on existing structures, an estimate of the shape and magnitude of these movements must first be made. This requires information on the source of ground movement, such as whether it was caused by underground construction or a landslide. The features of the source must also be considered. With tunnelling, for example, one needs to know whether cut-and-cover or bored tunnels were used. Lastly, the soil type plays a key role, as anyone who has dug through London's mix of clay, chalk and alluvium can attest.



The shape and magnitude of the deformations affecting a building are also influenced by the characteristics of the building itself, including its dimensions, weight and stiffness. This soil-structure effect is typically not accounted for in damage prediction, potentially leading to an inaccurate damage

assessment. Using InSAR, Dr Giardina and her team were able to accurately determine how buildings and soil were interacting with each other.

In terms of out and out precision, the sub-millimetre accuracy of InSAR compares quite favourably to 3D prism technology, though is not quite in the same league as precise levelling techniques that can measure changes of fractions of millimetres. Current satellite revisit times mean that InSAR cannot provide real-time monitoring, though future constellation expansions could go some way to addressing that.

Nonetheless, the radar technique can provide high-resolution imagery day and night, independent of weather conditions. Another advantage is the fact that it is not susceptible to some of the more bizarre –though not necessarily infrequent –earth-based interference, such as vandalism and fouling from pigeons. Interestingly, the InSAR technique can also be retrospectively applied using older satellite data, allowing structural engineers to evaluate the response of buildings which were not part of an original monitoring plan.

"The high spatial resolution and accuracy of InSAR monitoring makes it already comparable to ground-based techniques, with the advantage of reduced costs, large area mapping and retrospective application," Dr Giardina explained.

"The current satellite revisit time of a few days only allows near real-time monitoring, while ground-based techniques can provide real-time measurements. Future satellite constellations are expected to fill this gap between InSAR and ground-based monitoring by shortening the revisit time even further, potentially offering a substitute for ground-based techniques."

Although the use of satellites for structural monitoring is in its early days, the Bath team is hopeful that its research and the success of the Crossrail project could help give the technology wider recognition across the industry.

Longer term, Dr Giardina hopes to develop a type of early warning system that could be deployed over large urban areas, where huge amounts of InSAR data could alert engineers to problems much more rapidly. This would require some level of automation whereby relevant measurements were filtered from the millions of data points collected.

"Thanks to their higher resolution and reduced revisit time, second-generation satellites, like the X-band satellites used in this study, can provide millions of monitoring points for a single city," said Dr Giardina. "This huge amount of data is a limiting factor to its effective use. An automatic tool able to detect the most significant measurements would reduce the number of points to be analysed from millions to thousands, allowing data analysts to focus only on the most relevant areas."

(Andrew Wade / theengineer, 11th April 2019, https://www.theengineer.co.uk/crossrail-space-radar/?cmpid=tenews_7930004&utm_medium=email&utm_source=newsletter&utm_campaign=tenews&adg=25D5594B-61A5-4477-9BBF-F97F87829407)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΣΕΙΣΜΟΙ

California's Eerie 'Earthquake Pause' Is Unprecedented

The San Andreas Fault runs through the Carrizo Plain in California.

It's a little too quiet in California, seismically speaking.

The state is experiencing a century-long lull in large, ground-rupturing earthquakes, temblors that actually offset the earth at the surface. The 7.9-magnitude Great San Francisco Earthquake of 1906 was a ground-rupturing quake; photographs taken in its aftermath show roads and fences with new bends and twists.

Now, new research finds that this 100-year earthquake gap is very unlikely to be a statistical fluke. Instead, something geological is probably causing the peaceful period.

"We're unusually quiet," said study co-author Glenn Biasi, a geophysicist at the U.S. Geological Survey (USGS) in Pasadena, California. "The biggest faults and the faults carrying most of the slip have not ponied up."

Eerily quiet

Slip refers to the movement of strike-slip faults, which are prone to produce ground ruptures if they're large enough. That's because strike-slip faults feature two chunks of crust moving alongside each other in opposite directions, like two trains passing each other on a set of north-south tracks. After a strike-slip quake, the surface can be shifted. The centerline of the highway, for example, could stop abruptly and pick up again a foot to the left.

In a 2014 conference in Alaska, David Jackson, a professor emeritus at the University of California, Berkeley, noted that the Golden State hadn't seen one of these quakes since 1918. That century-long gap looked improbable when compared to previous quake patterns in the state. In his talk, memorably titled, "Did Someone Forget to Pay the Earthquake Bill?", Jackson wondered if something was wrong with scientists' data on historical earthquakes.

That's where Biasi and his co-author, USGS paleoseismologist Katherine Scharer, came in. The two are experts on long-ago earthquakes and knew that they could figure out whether the seemingly weird gap was just a fluke in the data.

The pair analyzed seismic records going back 1,000 years from 12 sites on five branches of California's major fault system: The northern San Andreas Fault, the Hayward Fault, the southern San Andreas Fault, the San Jacinto Fault and the southernmost San Andreas Fault. The system spans from well north of San Francisco all the way to the border with Mexico.

Shaky future?

By comparing time gaps in ground-rupturing activity at all the faults in two different data sets, the researchers found that the likelihood of all five branches quieting down for a century all at once just by chance was slim to none. In fact, the researchers put the likelihood at 0.3 percent that the quiet period is just a quirk of statistics.

Sometimes, a single branch could be relatively quiet, the researchers found, but all of them quieting down at once for 100 years was unprecedented.

"We do not think it's happened in the previous thousand years," Biasi told Live Science. The team reported its findings Wednesday (April 3) in the journal Seismological Research Letters (https://pubs.geoscienceworld.org/ssa/srl/article-abstract/569793/the-current-unlikely-earthquake-hiatus-at?redirectedFrom=fulltext).

The findings could have implications for the future. The average number of ground-rupturing earthquakes per century is about three or four, Biasi told Live Science. This century has had zero, so a good bet is that the next century will be busier.

"Six would be reasonable and has a precedent," Biasi said.

That precedent is the 1800s. Between 1800 and 1900, California experienced six ground-rupturing quakes. Then, between 1900 and 1918, the state experienced two more, the 1906 quake and a magnitude-6.7 temblor on the San Jacinto Fault in southern California.

That doesn't mean that a huge quake is necessarily imminent, Biasi said, just that the statistical dice are loaded in favor of a number of ground-rupturing quakes. And ground-rupturing earthquakes are not California's only concern. The Bay Area's 1989 Loma Prieta quake, for example, killed 63 people but was not a ground-rupturing temblor. Neither was the 1994 Northridge earthquake, which killed 57 people in the San Fernando Valley. Quakes don't have to rupture the ground to be dangerous.

Nevertheless, understanding why the hiatus is happening could help clarify the future threat to California. Unfortunately, Biasi said, scientists aren't yet sure how to explain the lull. One possibility, he said, is that above-average activity of the late 1800s and early 1900s "wrung the system out," releasing seismic tension all at once. The faults might just need more time to build up stress before breaking again.

Another possibility, he said, is that there's something synchronizing the activity across these five major faults. What that would be, though, remains a mystery. Researchers will need to experiment with computer models that simulate earthquakes to determine what factors calm California down — and which ones make the state shudder.

(Stephanie Pappas, Live Science Contributor / LIVESCIENCE, April 5, 2019, https://www.livescience.com/65163-california-earthquake-pause-uncanny.html?utm_source=notification)

Every three minutes, an earthquake strikes in California

A comprehensive new catalog that factors in "hidden" quakes is helping scientists better understand the planet's tectonic activity.

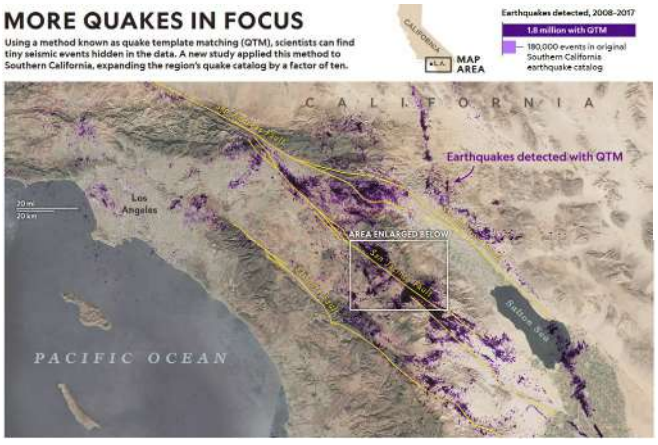
Cars lie smashed by the collapsed Interstate 5 connector just hours after California's Northridge earthquake in the winter of 1994. While most of the quakes cataloged in the latest study are too small for humans to feel, researchers are hoping these tiny temblors can help decipher the physics behind earthquakes of all sizes.

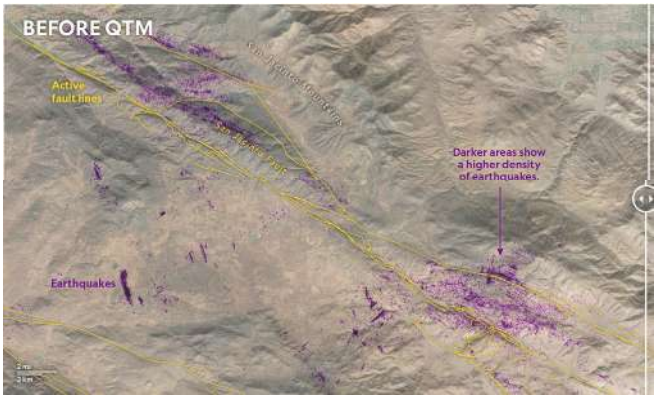
By the time you finish reading this article, two earthquakes will likely have rippled through Southern California.

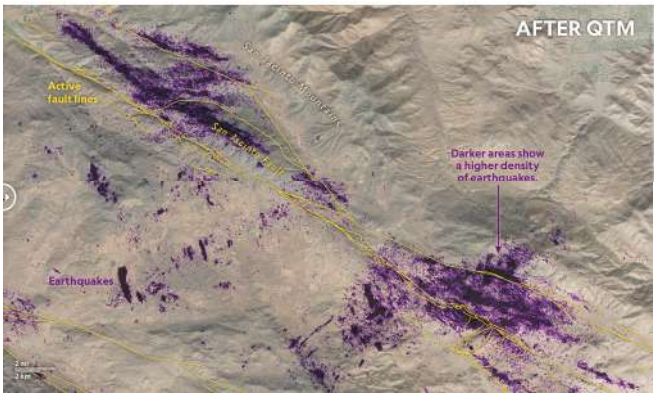
This estimate comes from a new study, published today in *Science*, that dug through seismic data between 2008 and 2017 and found that Southern California experienced a startling 1.81 million temblors during that decade. That's an order of magnitude more than previously documented, with an earthquake striking roughly every three minutes (https://science.sciencemag.org/content/early/2019/04/17/science.aaw6888).

Of course, the vast majority of these quakes are so weak they are imperceptible to humans. But this updated earthquake catalog, the most complete yet compiled, promises to help scientists better understand the basic physics behind earthquakes big and small.

"With seismology, we pretty much have to sit around and wait for events to occur in order to collect data," says study author Zachary Ross of the California Institute of Technology. Since large earthquakes are rare, cataloging the tiniest of quakes provides the researchers with a vast untapped dataset that will now allow them to dig deeper and better study the patterns and relationships between events.







"It's kind of like having a better telescope to see stars and planets in space more clearly; sharpening our view of the Earth, in this case," adds David Shelly of the U.S. Geological Survey, who was not involved with the work.

A powerful idea

Earthquakes in California are not uncommon. The region is locked in a slow-motion tectonic collision, as the Pacific plate grinds its northwesterly path against the North American plate. These built-up tensions are occasionally released in ground-rattling quakes.

It's also not exactly news that little earthquakes are much more common than big ones. That idea was first proposed in the mid 1900s by seismologists Charles Francis Richter—of the Richter magnitude scale—and Beno Gutenberg, who observed that earthquake frequency increases by roughly 10 times with each unit decrease in quake magnitude.

"It's not surprising that teeny tiny earthquakes are popping off all the time. We just haven't been able to see them before," says Susan Hough of the USGS, who was not on the study team.

The trick is the remarkable sensitivity of modern seismometers, which pick up all manner of rattles and roars—the crash of ocean waves, the rumble of automobile traffic, and perhaps even the occasional boisterous crowd. On the lower end, telling what's an earthquake and what's just noise is far from easy.

"We are now talking about events that are all the way down at the noise floor of these very sensitive instruments," Ross says.

For nearly a decade and a half, scientists have been experimenting with a method known as template matching to tease the two apart. When earthquakes initiate in nearly the same spot underground, they produce similar looking squiggles on a seismograph. Changes in magnitude may cause them to

stretch up or down, Ross explains, "but the actual wiggles on the thing look almost identical."

Researchers can exploit this property to find tiny earthquakes, using a catalog of larger known quakes as a guide. Scientists previously applied this concept to small regions or short periods of time, but until now, no one had attempted template matching for such a long period across such a large region.

The scientists used data collected by the Southern California Seismic Network, a joint project between Caltech and the USGS, that monitors activity from the Mexico border north to San Luis Obispo and Big Pine. The organization faithfully collects seismic information from hundreds of stations around the clock, using computer algorithms to identify earthquakes. Then, professional seismic analysts review the data.

"They're looking for everything from the very largest to the very smallest event," Ross says. The verified data is then compiled into a catalog for the public.

The previous catalog for 2008 to 2017 for Southern California contained 180,000 earthquakes and was nearly complete for events greater than magnitude 1.7. But using template matching backed by supercomputing power, the new catalog expands that number to 1.81 million events and is nearly complete for quakes as small as magnitude 0.3.

"It was a heck of a lot of computational work that they did," says Suzan van der Lee of Northwestern University, who was not involved in the study. Beyond the potential for this new pool of earthquake info in California, she sees setting up the infrastructure, both hardware and software, as an important facet of the work. "Now others don't have to invent that same wheel."

The language of temblors

Ross and his colleagues have already spotted some intriguing patterns in the data, such as quake clustering. If earthquake clusters are like sentences, the tiny earthquakes are the vowels. Without them, you might be able to pick out a word here or there, but it's tough to figure out if the letters form complete phrases. In this way, many past earthquakes seem like random, unrelated background events.

But add in the vowels, and suddenly a whole geologic syntax emerges.

"In our new catalog, a lot of that randomness is really actually clusters," Ross says. "These are not isolated events." While he cautions that there are still some seemingly unconnected quakes, "I think it's going to have an impact in how we think about the evolution of these sequences."

Some large events also seem to have much more widespread influence than previously thought. This is particularly evident when looking at the magnitude 7.2 Baja California quake that gripped the region in the spring of 2010. A series of aftershocks followed, some shaking just over a hundred miles away. But in the new dataset, the researchers found that the aftershocks actually extended nearly twice as far, lighting up seismographs across Southern California some 170 miles from the earthquake epicenter.

Seismologist Meghan Miller of the Australian National University found this to be the most exciting piece of the work, "just being able to see how much of an effect that large earthquake had on all of Southern California seismicity."

These earthquakes are also important for mapping faults in three dimensions throughout the region. For instance, the tiny quakes along the Coyote Creek fault revealed that, although the fault may seem linear at the surface, it's actually curved at depth. Understanding such intricacies of the fractures deep inside Earth helps scientists construct more realistic models of their movements and links to other nearby faults.

"We use little earthquakes to illuminate active faults, and the more earthquakes you have, the better job you can do," Hough says.

Earthquake siblings

The work does have its limits. For one, template matching requires a large enough catalog of past earthquakes in any given region. "That has actually some pretty fundamental implications for this work," Ross says.

It's a problem for using the method on the San Andreas fault, a fracture that runs nearly the length of California and poses some of the greatest geologic hazards to the region. Large sections don't host such small earthquakes.

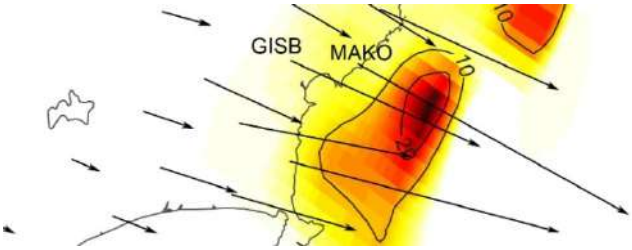
For areas like the U.S. Midwest, van der Lee says, template matching is also a challenge since earthquake monitoring is scarce and quakes are relatively infrequent. Without past quake templates, many true earthquake signals are left out of the data. Even so, she notes, some of these rumbles may have similar features to known quakes. She likens these signals to identical twins and their other siblings. The identical twins are the signals included in this new catalog, but they will still have things in common with their other siblings, which means it might be possible to figure out how to include those siblings in the data.

One solution to the lack of templates, Ross says, will likely be the use of artificial intelligence, which has already started to transform many scientific disciplines, from our understanding of biological life to the search for other worlds. Until then, however, this new coterie of quakes is plenty to keep scientists busy.

"It's just a really rich catalog," Shelly says. "I think it is going to be a really exciting dataset that people will comb over for years and decades to come."

(Maya Wei-Haas / NATIONAL GEOGRAPHIC, April 18, 2019, https://www.nationalgeographic.com/science/2019/04/every-three-minutes-one-earthquake-california/?cmpid=org=ngp::mc=crm-email::src=ngp::cmp=editorial::add=Science_20190424::rid=1084349954)

Slow-slip event off the coast of Gisborne: plate movement equivalent to a magnitude 7.0 earthquake, New Zealand



GNS scientists are monitoring a slow-slip event near Gisborne, off the east coast of North Island, New Zealand. This is an update on this event since it started

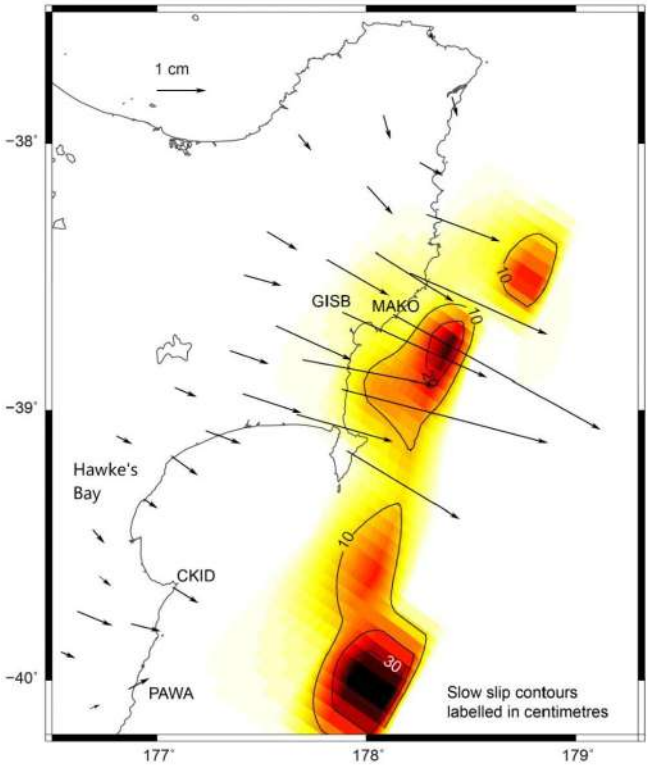
registering in late March 2019.

Slow-slip events are also known as "silent" earthquake. These events are undetectable by both humans and seismograph network. They move faults over weeks to months instead of within seconds like the earthquakes that you typically think of.

The event has been happening for around a month now and GNS scientists measured the largest amount of eastward movement during the first week of the event. The slow-slip has continued at a slower, but steady rate since then.

"This slow-slip event is now as large as the biggest previous slow-slip event GeoNet recorded off Gisborne in March 2010. So far, the plate movement that has occurred in this event is equivalent to a magnitude 7.0 earthquake," GNS Science Geophysicist Laura Wallace said.

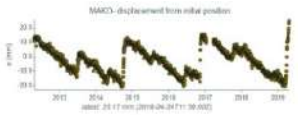
Scientists used displacement data from GeoNet GPS sites on the earth's surface to figure out how much movement has occurred on the Hikurangi Subduction Zone below the eastern North Island. This reveals that this slow-slip event has involved up to 20 cm (7.8 inches) of movement on the Hikurangi plate boundary offshore of Gisborne, and possibly even more offshore Hawke's Bay, as you can see from the below slip model.



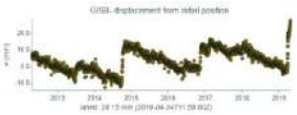
Slow-slip model - black arrows show horizontal displacement of GPS sites over the last month, and the colors represent estimated slow slip movement along the Hikurangi subduction plate boundary.

The below graphs, from GeoNet, show the east component of the GPS site positions over the last several years. On these images, the GPS site MAKO (located just north of Gisborne) has undergone the largest displacement in this event, with over 4 cm (1.6 inches) of movement. Another GPS site close to Gisborne (GISB) also moved approximately 3 cm (1.2 inches) to the east.

"We've also noticed in the last week that some of our southern Hawke's Bay GPS sites, such as at Cape Kidnappers and Pawanui, have been picking up movement and are joining in on this slow-slip event. This suggests that the rupture of this slow-slip event is propagating south now too. Propagation of slow slip events from offshore Gisborne into the Hawkes Bay region was also observed in 2016," Wallace said.



MAKO GPS site showing eastward displacement 26/4/19



GISB GPS site showing eastward displacement 26/4/19

"Scientists can use displacement data from GeoNet GPS sites on the earth's surface to figure out how much movement has occurred on the Hikurangi Subduction Zone below the eastern North Island."

"Our scientists have been anticipating this slow-slip event, as our slow-slip record has shown regular events every 1 - 2 years, and much larger events every 4 - 6 years. Fortunately, our scientists currently have seafloor instruments deployed in this area that will give better insights into what has happened offshore," Wallace added.

Wallace also said that New Zealand is on a very active tectonic plate boundary. She reminded everyone to help keep their family safe by having an earthquake plan.

"Know what you should do in the event of a large earthquake, be sure to Drop, Cover and Hold. If you are near the coast and you feel a Long OR Strong earthquake, get to higher ground once the shaking has stopped in case a tsunami was generated."

(Grace Nona / THE WATCHERS, April 29, 2019, https://watchers.news/2019/04/29/slow-slip-event-off-the-coast-of-gisborne-new-zealand/?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+adorraeli%2FtsEq+%28The+Watchers+-+watching+the+world+evolve+and+transform%29)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΓΕΩΛΟΓΙΑ

The Volcano of Santorini

Ένας πολύ ενδιαφέρων ιστότοπος για το ηφαίστειο της Σαντορίνης.

https://staridasgeo.maps.arcgis.com/apps/MapJournal/index.html?appid=007b8ebcbfe34bfabf17c486b2445637

Rugged 'mountains' taller than Everest lurk deep inside Earth

Revealed by powerful earthquakes, the subterranean structures offer exciting new clues to why our planet is a chemical oddball.

Shadows dance across the Himalaya mountain range in a picture taken by an astronaut on the International Space Station.

RIGHT NOW, YOU could be unknowingly standing on top of a mountain.

Though it sounds like a fantastical feature of Jules Verne's *Journey to The Center of the Earth,* subterranean mountains are real, albeit different from any novelist's envisaged landscape. This strange range is part of the layered structure of our planet, rippling along a geologic boundary some 410 miles down. It contains tremendous peaks, with some that may tower even higher than the mighty Mount Everest.

Now, scientists have got their best look yet at these subsurface mountains using the seismic waves from multiple big earthquakes. Published recently in *Science*, their analysis suggests that the peaks are not just tall, but surprisingly rugged—a discovery that could provide clues to why Earth is a chemical oddball in our solar system.

"Because we've been able to observe so much already, people think we've made most of the first-order discoveries and that everything else is adding details to the fundamental discoveries," says Christine Houser, a global seismologist at the Earth-Life Science Institute at Tokyo Institute of Technology.

But as this study shows, "we're still capable of making fundamental discoveries of the interior of our own planet."

Yogurt Earth

Earth's mantle makes up around 84 percent of our planet's bulk and works like a geologic recycling center. Its slow convection drives the steady march of plate tectonics, which sends slabs plummeting into its depths. Meanwhile, rising magma bursts free at the surface, bringing up a fresh supply of minerals.

"Almost everything about how life has evolved kind of relies on this fluxing of elements from the surface," says Elizabeth Day, a deep-earth seismologist at Imperial College London who was not part of this work. "We need slabs to sink down, and volcanoes to erupt, and all these sorts of things to support the cycles that we have on Earth."

But just how much our mantle flows and mixes remains unknown. Think about it like a yogurt cup with fruit on the bottom; how well has convection stirred the sweet jelly up through the tangy dairy product?

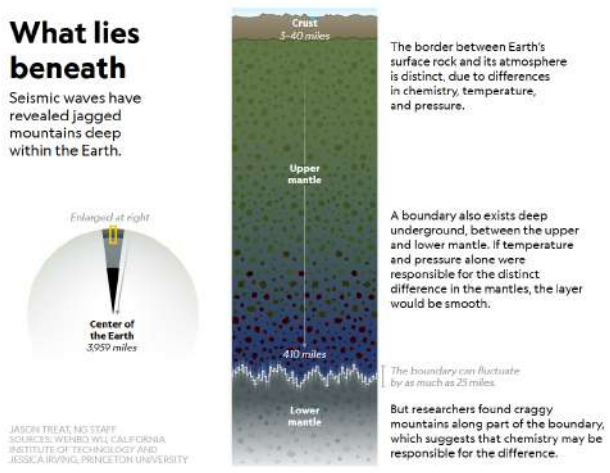
This is an important question, because compared to other rocky bodies in our solar system, Earth appears to be missing some elements. For instance, chondrites are stony meteorites that scientists think may be remnants of ancient planetary formation. If so, they should be similar in composition to Earth rocks. But in contrast to chondrites, Earth's upper mantle has a relatively low amount of silicon compared to its magnesium.

Planetary ultrasound

That's where deep mixing may come into play. Some of the "missing" elements, like iron, could be relegated to the planet's core, but it's not clear where others might be hiding. Part of the problem is it's tough to figure out what lies miles beneath our feet.

Previous work using earthquake waves showed that these seismic signals dance around the boundary 410 miles deep in ways that suggest the rocks below are denser than those above. Other hints come from the chemistry of volcanic rocks, remnants of once melted mantle, and rare hunks of mantle brought to the surface.

The picture that has emerged is far different from the standard yellow and red layers seen in most Earth diagrams; much of the upper mantle likely sparkles with vibrant green olivine, while more dark rosy garnets mixed with blue minerals twinkle above the boundary 410 miles down, and earth-toned bridgmanite sits below.



Most scientists agree that the changes in density are from physical rearrangements of elements into different crystal structures, similar to graphite turning to diamond at high pressure and temperatures, explains study leader Wenbo Wu, who conducted the work as a Ph.D. student at Princeton University. But there could be chemical differences, as well.

"Maybe our understanding of what Earth is made of is hampered by the few samples we have of what the mantle is like," says Jackie Caplan-Auerbach, a seismologist at Washington University.

To peer into Earth's innards for this latest work, Wu and his colleagues turned to the reverberations from really big earthquakes. Wu, who is now a post-doc at California Institute of Technology, likens the process to light reflecting off a mirror. If that mirror is perfectly flat, the light reflects cleanly. But add some bumps and curves to the mirrored surface, and those returning rays will scatter.

A vault of early Earth

These big earthquakes dug up some surprising information: Some regions of the boundary where the deep mountains reside are remarkably rugged, with towering crags rising from the flanks of the subterranean peaks. While it's hard to give the exact heights of the rough regions, Wu says, their presence points to some kind of chemical differences in the mantle.

The authors suggest that the ruggedness could be a graveyard for rocky slabs that descended from the surface at subduction zones, where one tectonic plate gets shoved beneath another. As a slab sinks down, pieces eventually break free and continue their slide into the deep. But, it seems, some may get hung up 410 miles down, and the piling up of these slabs might be what creates the rough, craggy part of the boundary zone.

That, in turn, would point to regions where the mantle isn't mixing. Other boundary regions appear smooth and thus are perhaps mixing much more freely, hinting that, on the whole, the mantle has regions of deep mixing and zones that are slower to intertwine.

What's more, the work hints that Earth's "missing" elements may lurk under these rugged areas. As Houser explains, some zones of the lower mantle may have resisted mixing since Earth's early years, keeping some chemical components trapped in the depths. The trick is that it's tough to say exactly how long these features have been around.

"The picture we saw now, it doesn't mean it's the same as many million years ago," Wu says.

Still, it's a tantalizing clue, as Houser writes in a *News and Views* article accompanying the study. While parts of the mantle are certainly in an active churn, "it appears that the lower mantle is also a vault—preserving relic of the time when Earth emerged from dust to become a card-carrying planet."

(Maya Wei-Haas / National Geographic, March 25, 2019, https://www.nationalgeographic.com/science/2019/03/rugged-mountains-taller-everest-lurk-deep-inside-earth/?cmpid=org=ngp::mc=crm-email::src=ngp::cmp=editorial::add=Science_20190403::rid=1084349954)

Inferring Earth's discontinuous chemical layering from the 660-kilometer boundary topography

Wenbo Wu, Sidao Ni, Jessica C. E. Irving

Science 15 Feb 2019:
Vol. 363, Issue 6428, pp. 736-740
DOI: 10.1126/science.aav0822

Inferring blocked mantle convection

The boundaries between rocks with different physical properties in Earth's interior come from either a change in crystal structure or a change in chemical composition. Wu *et al.* examined the roughness of the boundary between Earth's upper and lower mantle, thought to form from a change in mineral structure (see the Perspective by Houser). To their surprise, in some locations, the boundary has small-scale roughness that requires some chemical difference above and below the boundary. This observation provides evidence of partially blocked mantle circulation that leads to some chemical differences between the upper and lower mantle.

Science, this issue p. 736; see also p. 696

Abstract

Topography, or depth variation, of certain interfaces in the solid Earth can provide important insights into the dynamics of our planet interior. Although the intermediate- and long-range topographic variation of the 660-kilometer boundary between Earth's upper and lower mantle is well studied, small-scale measurements are far more challenging. We found a surprising amount of topography at short length scale along the 660-kilometer boundary in certain regions using scattered *P'P'* seismic waves. Our observations required chemical layering in regions with high short-scale roughness. By contrast, we did not see such small-scale topography along the 410-kilometer boundary in the upper mantle. Our findings support the concept of partially blocked or imperfect circulation between the upper and lower mantle.

https://science.sciencemag.org/content/363/6428/736

Earth's rugged lower mantle

Christine Houser

Science 15 Feb 2019:
Vol. 363, Issue 6428, pp. 696-697
DOI: 10.1126/science.aaw4601

Summary

To know a planet is to know its boundaries, where rapid changes in state and/or composition occur. The rock-atmosphere boundary is the one we surface dwellers are most familiar with, but other boundaries lie hidden deep within Earth; for example, the crust-mantle boundary is a change from more silicon-rich rock to denser, more magnesium-rich rock. The transport of heat and rock between the upper and lower mantle largely determines the evolution of our planet, but little is known about this boundary at small scales. On page 736 of this issue, Wu *et al.* (*1*) report seismic-array data that suggest the existence of 1- to 3-km ripples along the top of the lower mantle. Such a structure can only be maintained across boundaries with distinct chemistry, indicating that portions of the lower mantle may contain distinct relics from the planet's earliest history.

https://science.sciencemag.org/content/363/6428/696?intcmp=trendmd-sci

Photos reveal our restless planet

Lava spews out of a fissure in the Virunga mountains in the Democratic Republic of the Congo. The Virunga chain is part of the East African Rift Valley system, which marks the boundary between two plates: the Nubian plate to the west and the Somalian plate to the east. The rift valley is a classic example of a divergent plate boundary.

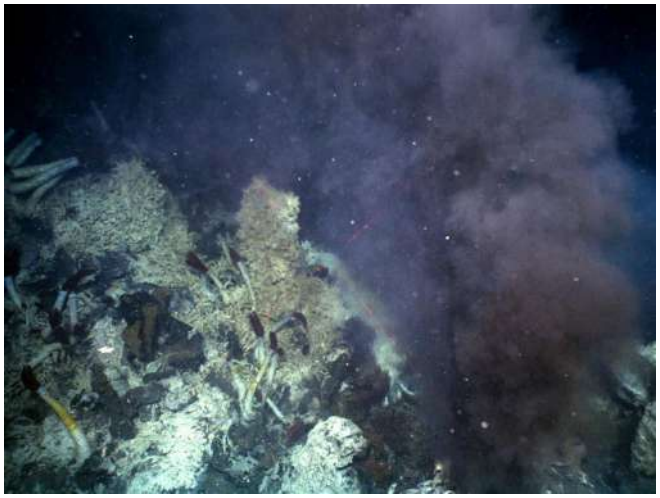
A river of molten lava flows through a channel in hardened lava after an eruption at Mount Etna in Sicily, Italy. Mount Etna, one of Europe's most active volcanoes, was created by the subduction of part of the northward-moving African plate beneath the Eurasian plate.

Hikers walk in the shadow of cliffs in Iceland's Thingvellir National Park. The divergent Mid-Atlantic Ridge rises above sea level at Thingvellir, with the North American plate to the west and the Eurasian plate to the east.

Offset streams cut into the Carrizo Plain along the San Andreas Fault in California. The fault, which runs more than 700 miles (1,100 kilometers), is the boundary between the Pacific and North American tectonic plates. The stretch of the fault that runs through Carrizo Plain is very well defined because the land is arid and the fault has not been significantly eroded.

Raplee Ridge, part of the Monument Upwarp in southeastern Utah, is a long, narrow, folded anticline that formed about 70 million to 50 million years ago.

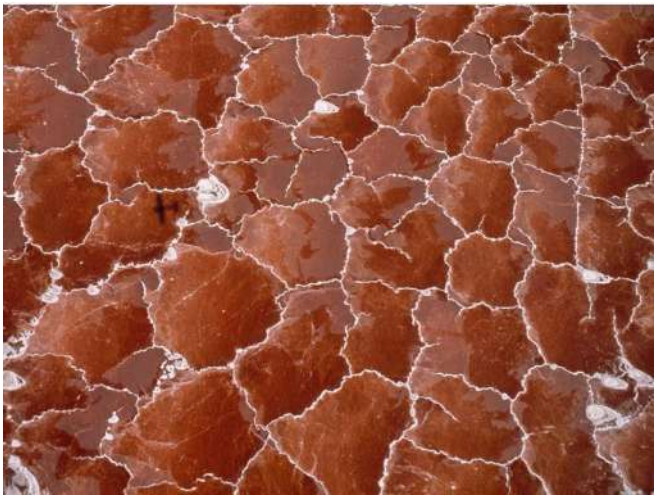
An eelpout fish swims near tubeworms at the Mid-Atlantic Ridge in the Atlantic Ocean. The Mid-Atlantic Ridge is an example of a divergent plate boundary and is an area where new seafloor is being created.



A cloud of hydrothermal fluids streams from a black smoker, or mineral chimney, along the Mid-Ocean Ridge off the west coast of Mexico. Black smokers are common to spreading zones in plate boundaries. Chimneys are made of lead, iron, manganese, and zinc sulfides, through which spew superheated ocean water. They also harbor exotic life-forms, far below the reach of sunlight.

Sunrise warms the icy southern end of the Andes during a rare break in the weather in Chile's Torres del Paine National Park. The Andes Mountains, which span the entire western coast of South America, formed when the Nazca plate subducted under the South American plate.

Sulfur, salt, and other minerals color the crater of Dallol volcano, part of the Danakil Depression in Ethiopia. At 157 feet (48 meters) below sea level, Dallol is Earth's lowest land volcano.



An airplane casts a shadow over the red waters of Lake Natron in Tanzania, part of the East African Rift Valley. The water's red hue is due to algae that live on salts spewed from nearby volcanoes. The East African Rift Valley system begins in northern Syria and extends across East Africa into Mozambique.

In the Persian Gulf, two tectonic plates collide. The Arabian plate (lower left) is running up on the Eurasian plate (upper right). The Persian Gulf (top) and the Gulf of Oman (bottom) were once the site of a rift, a place where two plates pull

apart from each other, and the Indian Ocean filled in the widening gap between the two plates. However, the process then reversed, and about 20 million years ago, the gulf began to close up. The collision of the two continental plates gives Iran its mountainous terrain.

A mosque dominates the farming villages of Adi Caieh, Eritrea. Rift escarpments in the distance, now heavily eroded, once adjoined the Arabian Peninsula before the Red Sea opened. The escarpments shifted when the continental crust moved west, as the Red Sea formed in stop-start action during a 30-million-year period.

(https://www.nationalgeographic.com/science/2019/04/every-three-minutes-one-earthquake-california/#/1282.jpg)

'That Can't Be Real!' Deep-Sea Explorers Find Trippy, Rainbow-Colored Wonderland

Hydrothermal fluid bubbles upward, gets trapped by a mineral ledge, and spills up and over the edge.

Deep in the Gulf of California, scientists have discovered a fantastical expanse of hydrothermal vents, full of crystallized gases, glimmering pools of piping-hot fluids and rainbow-hued life-forms.

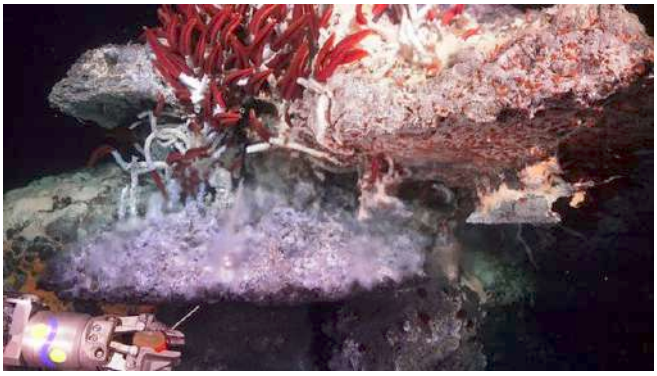
Punctuating it all are towering structures made of minerals from the vents, looming as tall as 75 feet (23 meters). A decade ago, scientists visiting this spot saw nothing unusual; this psychedelic seascape seems to have built up around an increase in hydrothermal venting — spots in the seafloor where mineral-laden and superhot water jets out — in the last 10 years.

"Astonishing is not strong enough of a word," said Mandy Joye, a marine biologist at the University of Georgia, who led the team that discovered the vents.

Shocking discovery

Joye and her colleagues were studying microbial mats in the Guaymas Basin in the central Gulf of California late last year when they conducted an autonomous vehicle survey nearby, looking for interesting sites to explore on their next research expedition.

"We saw a lot of really interesting topography, which made me scratch my head," Joye said. Chemical traces in the water also suggested there might be hydrothermal vents nearby.



The ROV SuBastian measures temperature near a hydrothermal vent as tube worms wave.

In February, the team launched another expedition, sending autonomous vehicles equipped with high-definition cameras into the deep from the decks of the Schmidt Ocean Institute's research vessel, Falkor. Nearly 6,000 feet (1,800 m) below the surface, they saw the vents that were carpeted with microbes, marine worms and species they didn't recognize.

"It was a shock, to put it mildly," Joye told Live Science. "I think my jaw literally hit the floor."

Unreal environment

The team had discovered a hydrothermal vent site that hadn't existed in 2008. Most likely, Joye said, new vents have opened since then, or the rate of hydrothermal fluid flow has increased. The dissolved minerals and metals in the fluid react with seawater to create huge "pagodas," some as thick as 49 feet (15 m) in diameter and many rising 33 feet (10 m) above the seafloor.

In some places, the fluid flow created ledges, or flanges, that trap pools of the sulfide- and methane-rich fluid underneath. The pools refract light, creating a silvery, mirror-like effect, Joye said. In some pools, the team saw delicate mineral precipitates a few inches long that looked like feathers. No one knows what they are, Joye said.

"It was just a constant barrage of, 'You have got to be kidding me — that can't be real,'" she said.

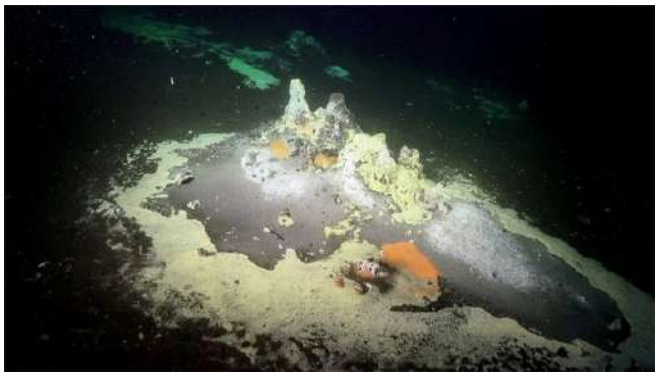
Among the other surprises at the site were bizarre methane hydrates — natural gas bubbles trapped in a crystalline framework of ice. The methane hydrates at these vents, though, looked strangely irregular, with almost a melted appearance, Joye said.

The researchers don't yet know why the features looked like that. It could be the high pressure and extreme temperatures

at the site, Joye said. The ocean water is just 35.6 degrees Fahrenheit (2 degrees Celsius), while the hydrothermal fluids are a toasty 690.8 F (366 C). Or there may be impurities in the methane gas that cause the strange shapes.

Mystery life

Among the other mysteries at the vent site is the proliferation of life carpeting the hot towers of mineral-rich water spewing from the vents. Some were recognizable, like the *Riftia* tube worms that harbor sulfur-eating symbiotic bacteria. Others were totally new to science. The towers are home to rainbow-colored mats of microbes, Joye said, ranging from pink to orange to white to yellow to purple.



Mats of yellow and orange microbes color the seafloor at the vent site, which is in the Guaymas Basin of the Gulf of California.

"I've never seen a purple microbial mat, ever, anywhere," Joye said. The researchers are now using genetic sequencing to study the microbes and to learn whether temperature, water chemistry or some other factor determines their color.

The researchers are also delving deeper into the composition of the hydrothermal fluid, which they've already found to be rich in manganese and iron. Finally, Joye said, the team's virologist is studying the viruses that infect the microbes at the site.

"These kinds of things don't happen very often," Joye said. "I'm just counting the days until I can go back."

(Stephanie Pappas, Live Science Contributor, April 8, 2019, https://www.livescience.com/65173-bizarre-hydrothermal-vent-discovered.html?utm_source=notification)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΠΕΡΙΒΑΛΛΟΝ

This tech tells cities when floods are coming– and what they will destroy

Flood Concern can help cities model flood damage and prepare better flood responses. It's one of the winners of Fast Company's 2019 World Changing Ideas Awards.

Several years ago, one of the eventual founders of One Concern nearly died in a tragic flood. Today, the company specializes in using artificial intelligence to predict how natural disasters are unfolding in real time on a city-block-level basis, in order to help disaster responders save as many lives as possible.

As *Fast Company* wrote in November 2018:

"In 2014, Stanford student structural engineer Ahmad Wani was visiting family in his native Kashmir when a catastrophic flood struck. The rising waters stranded him and his family for seven days without food or water, during which they watched their neighbor's home collapse, killing everyone inside.

After this horrifying experience, Wani was struck by just how disorganized the emergency response was. "There is no science behind how people should be rescued," he says. "Disaster response is really random."

To fix that, One Concern debuted Flood Concern in late 2018. It creates map-based visualizations of where water surges may hit hardest, up to five days ahead of an impending storm. For cities, that includes not just time-lapse breakdowns of how the water will rise, how fast it could move, and what direction it will be flowing, but also what structures will get swamped or washed away, and how differing mitigation efforts–from levy building to dam releases–will impact each scenario. It's the winner of Fast Company's 2019 World Changing Ideas Awards in the AI and Data category.

So far, Flood Concern has been retroactively tested against events like Hurricane Harvey to show that it could have predicted what areas would be most impacted well ahead of the storm. The company, which was founded in Silicon Valley in 2015, started with one of that region's pressing threats: earthquakes. It's since earned contracts with cities like San Francisco, Los Angeles, and Cupertino, as well as private insurance companies.

Either way, a live field test is imminent as extreme weather events become more common. According to the National Centers for Environmental Information, the U.S. has experienced 241 severe weather events with damages exceeding $1 billion. In 2019, the World Economic Forum's Global Risks Report ranked extreme weather like floods and storms its number one most pressing concern.

One Concern's first offering, dubbed Seismic Concern, takes existing information from satellite images and building permits to figure out what kind of ground structures are built on, and what might happen if they started shaking. If a big one hits, the program can extrapolate from the epicenter to suggest the likeliest places for destruction, and then adjust as more data from things like 911 calls and social media gets factored in.

Flood Concern works similarly, but with a more dynamic set of variables. It includes soil saturation and building stability estimates but also how topography will affect potential runoff. Then it adds in factors like National Weather Service forecasts and U.S. Geological Survey data about nearby river or tidal flows to create a model that adjusts as the situation changes. "We look at how things change over space and time," says One Concern cofounder and CTO Nicole Hu.

That allows emergency crews to figure out ahead of time what roads may still passable, and plan evacuation routes accordingly. The company can also overlay maps with existing demographic data to highlight what areas of a city might be especially in danger if people there don't evacuate. It can also pinpoint crucial infrastructure like water tanks, electric plants, and hospitals that will need protecting–and run if/then hypotheticals about how to do that.

So far, the state of Arizona has signed on as a public partner. One Concern remains in discussion with other cities and is working with international development groups for how to affordably apply its services in developing countries. It's also building another simulator, this time for wildfires. "For too long, we have only focused on how we can use technology to make things more convenient," Hu says. "We want to bring innovative tech into the space to help [people] make better decisions, to help make those life-saving decisions."

(Ben Paynter / Fast Company, 04.08.19, https://www.fastcompany.com/90328015/this-tech-tells-cities-when-floods-are-coming-and-what-they-will-destroy)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΛΟΙΠΑ

Leaning Tower of South Street Seaport Caused By Developer's Cost-Cutting, Lawsuit Says

Rendering of 161 Maiden Lane

A 670-foot, 58-story luxury condo project that is among the city's tallest waterfront towers is leaning three inches north because of a faulty foundation, according to recently filed court documents.

The embarrassing snafu at 161 Maiden Lane deals another blow to a high-profile seaport project that has attracted deep-pocketed buyers for its floor-to-ceiling views, but has been beset by problems.

The project's original contractor, Pizzarotti, has accused developer Fortis Property Group of skimping on the building's foundation system, electing to go with a cheaper but less reliable method, according to a lawsuit filed last month in state Supreme Court. Instead of driving support piles down into bedrock, the suit charges, Fortis allegedly chose to use "soil improvement" methods to shore up the construction site; Pizzarotti began building on this foundation, only to notice the building begin to "exhibit a noticeable leaning condition."

The complaint further contends that the building, which has already topped out, is still moving and that due to safety issues, "the work on this project should not proceed any further" until the building's condition is evaluated.

As part of the lawsuit, Pizzarotti sought to break free of its contract obligations on the project, as well as recover money owed for unpaid work and cost overruns.

Fortis has fought back, saying that the "alignment issue" was created by the contractor failing to properly pour the concrete slabs and account for the settling of the foundation. A spokesman for the company said the issue will be corrected with the planned installation of a "slightly redesigned" curtain wall.

"This lawsuit is patently false from start to finish and nothing more than simple defamation and a desperate attempt by a failing general contractor to divert attention from the fact it defaulted on yet another New York City project," added the Fortis spokesperson, in a statement.

A lawyer for Pizzarotti did not immediately respond to a request for comment.

The Fortis spokesman declined to comment on when the "misalignment" was discovered but said that recent surveys reflect no further movement of the building. The company said it terminated the contract with Pizzarotti this month, and plans to continue with construction. (Ironically, a rendering of 161 Maiden Lane is still featured on the Pizzarotti website.) The project was originally projected to be completed in spring 2018. The company has not provided an updated completion date.

In September, the Commercial Observer reported that 72 of the building's 98 units were under contract. The anticipated sell-out value of the building is more than $275 million. Among the early buyers were Million Dollar Listing star and Douglas Elliman broker Fredrik Eklund, who was reportedly in contract for a $4.6 million duplex. Units in the building range from $1.2 million for a one-bedroom to $7.5 million for a penthouse, according to Streeteasy.

Construction safety has been an issue at the site. In 2017, a construction worker whose harness was not attached fell 29 stories to his death. The tragic accident resulted in a four-month construction delay.

To date, there have been 17 violations at the site, six of which are still open, according to the Department of Buildings' database. A DOB spokesperson told Gothamist there are currently no active stop work orders at the project.

Back in 2016, when construction began, the developer was sued for trademark violation over its then name, 1 Seaport. The development is now known as Seaport Residences.

(Elizabeth Kim / Gothamist News on Apr 3, 2019, http://gothamist.com/2019/04/03/seaport_tower_maiden_lane.php)

This Map Shows What the World Would Look Like if Pangea Still Existed

Most of us remember learning about Pangea in elementary school, the giant continent from which all our modern-day continents originally broke off. Well, this amazing map shows us what the world would look like if Pangea was still a reality.

Once upon a time, around 335 million years ago, there was a supercontinent called Pangea. In other words, all the land in the world was one giant mass surrounded by ocean. However, approximately 175 million years ago, this landmass began to break down, eventually forming the seven continents

we have today. But what would the world look like now had that split never happened?

Artist and designer Massimo Pietrobon created the answer with his incredible map entitled *Pangea Politica,* which illustrates the world as it would be if our modern-day countries were all still sitting on one continent.

The result is a planet where the most unlikely pairs become neighbours – Antarctica and Australia, Russia and North America, Africa and the United States. Every country is connected, which makes the idea of conflict a lot more difficult to comprehend. This layout is not only cool to look at, but also a reminder of the fluidity of borders at a time when we need this message most.

In Pietrobon's own words: 'Joining the world into one piece of land represents a return to unity with the planet and within the human race, in spite of the divisions that make our rulers quite comfortable.'

(India Irving, Social Media Editor / culturetrip, 2 February 2018, https://theculturetrip.com/africa/articles/this-map-shows-what-the-world-would-look-like-if-pangea-still-existed/?utm_source=facebook&utm_medium=social&utm_campaign=link_pangea-existed)

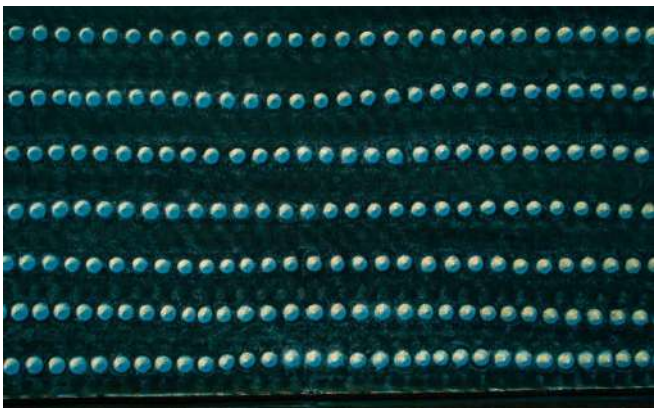
(από τον συνάδελφο και μέλος της ΕΕΕΕΓΜ Γιώργο Κοσσένα)

The Strange Beauty of Salt Mines

Although salt is abundant here on Earth, it still requires extraction from stone deposits or salty waters. The process of mining that salt can produce interesting landscapes, including deep, stable caverns, multicolored pools of water, and geometric carvings. Some of these locations have even become tourist destinations, serving as concert halls, museums, and health spas. Collected here are images of salt mines and evaporation ponds across the world, above and below ground.

Multicolored walls of a salt mine located 1,380 feet (420 meters) underground, near the town of Soligorsk, south of Minsk, Belarus. Parts of this mine have been converted into a speleotherapy clinic for treatment of respiratory illnesses such as asthma and bronchitis.

People work with the salt piles in the evaporation zone of a salt lake in Gaotai County in northwest China's Gansu province, on October 31, 2018. This mine has a history dating back more than 2,000 years. Barcroft Media via Getty



An aerial view of salt piles at sunset in Samut Sakhon province, Thailand.

Terraces for salt production stand in the Salt Valley of Anana, near Alava, Spain, on July 17, 2015. The valley has natural brine springs that have been used by humans to produce salt since prehistory.

Natural brine flows along a canal as salt covers the ground in the Salt Valley of Anana on July 17, 2015.

A worker collects salt from terraces in Anana, Spain, on July 17, 2015. Anana produces in a traditional way, by natural evaporation, creating *fleur de sel* crystals.

An inside view of the Salina Turda salt mine on August 8, 2017. This former salt mine in Romania was operational for nearly a thousand years, now converted to a tourist destination and therapy center.

A salt harvester takes his collection to a boat for transportation in Lake Retba, Senegal, in July 2015.

A view of Salineras de Maras, the salt pans nestled in a canyon of the Sacred Valley of the Incas, in the Cuzco region of Peru.

Salineras de Maras, located at an altitude of 3,500 meters, near Cuzco, in Peru's Andes, photographed on July 22, 2017.

Soccer goals stand inside a huge chamber in a former salt mine, at a depth of 985 feet (300 meters), near Soledar, Ukraine.

Alan Taylor, Apr 3, 2019

(Marianna Ianovska / Shutterstock, https://www.theatlantic.com/photo/2019/04/photos-strange-beauty-salt-mines/586417/)

ΝΕΕΣ ΕΚΔΟΣΕΙΣ ΣΤΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΠΙΣΤΗΜΕΣ

Calcul des fondations superficielles et profondes

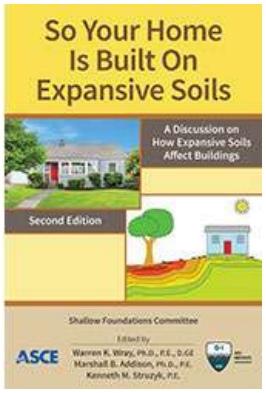
Roger FRANK, Fahd CUIRA et Sébastien BURLON

Cet ouvrage expose les méthodes géotechniques de dimensionnement des fondations, notamment celles introduites dans la pratique française par l'approche aux états limites formalisée par l'Eurocode 7 sur le « Calcul géotechnique » et ses deux normes d'application nationale (l'une pour les fondations superfi cielles, l'autre pour les fondations profondes). Ces deux normes ont notamment modifi é les règles de calcul de la capacité portante des fondations, par rapport aux textes réglementaires précédents (Fascicule 62-Titre V du CCTG et DTU 13.12 et 13.2). Le présent ouvrage tient compte des différentes évolutions. Par ailleurs, une place plus importante est laissée aux méthodes numériques, qui se sont largement développées ces vingt dernières années, ainsi qu'aux concepts de l'interaction sol-structure pertinents pour le dimensionnement rationnel des fondations superficielles et profondes.

Le chapitre 1 est une introduction aux concepts des calculs aux états limites, appliqués au dimensionnement des fondations. Les chapitres 2 et 3 traitent respectivement du calcul des fondations superficielles et du calcul des fondations profondes. Le chapitre 4 regroupe un certain nombre d'éléments de l'interaction sol-structure communs à tous les types de fondations : les déplacements admissibles des structures, ainsi que les couplages sol-structure.

Cet ouvrage devrait être utile tant aux étudiants qu'aux praticiens dans les bureaux d'études, les entreprises et les administrations.

(Press des Ponts, 2018)



So Your Home Is Built on Expansive Soils: A Discussion on How Expansive Soils Affect Buildings, Second Edition

Shallow Foundations Committee; edited by W. K. Wray, M. B. Addison and K. M. Struzyk

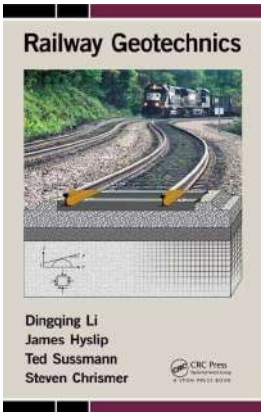
Prepared by the Shallow Foundations Committee of the Geo-Institute of the American Society of Civil Engineers. *So Your Home is built on Expansive Soils,* Second Edition, is written for the layperson in clear, easy-to-understand terms to assist homeowners in understanding why some soils and conditions lead to problematic shrinking and swelling. Both the nature of the soil behavior and how buildings respond are addressed. This comprehensively updated report discusses the difference between cosmetic damage and structural damage resulting from soil shrinkage or heave movement and provides information on both prevention and mitigation of damage.

Topics include definition and characteristics of expansive soils; building foundation types; causes of interior and exterior cracks; climate, vegetation, and landscape irrigation; homeowner maintenance; lot drainage and foundation performance; and prevention and mitigation techniques. Numerous new photographs and updated diagrams and figures illustrate key points.

Also included is a section of frequently asked questions by individuals who have or are building homes on expansive soils.

This book will be of interest to homeowners, as well as construction industry professionals and engineering practitioners.

(American Society of Civil Engineers, 2019, https://sp360.asce.org/PersonifyEbusiness/Merchandise/Product-Details/productId/257380380)



Railway Geotechnics

D. Li, J. Hyslip, T. Sussmann and S. Chrismer

Railway Geotechnics is written by four colleagues who studied at the University of Massachusetts, Amherst, in an academic program advised by Professor Ernest T. Selig. Our collective time at the university spanned over a decade, during which we were individually inspired by Professor Selig to work on and further advance the subject of railway geotechnology, which he pioneered and developed into a rigorous field of study. Since graduation, the aggregate of our professional experience includes railway operations, consulting, research, and education.

The field of railway geotechnology was in its infancy when we were in our early careers. Because the engineering behavior

of track substructure was not well understood up to that point, perspectives on the causes and cures of substructure instability were often informed by anecdote rather than by verifiable fact. Mystique surrounded the subject in the absence of critical thinking, often resulting in costly applications of remedial methods that did not address the root causes of track substructure problems.

Advancing the field of railway geotechnology by the writing of this book is a natural step for each of us in our careers. The book continues the work Track Geotechnology and Substructure Management by Selig and Waters (1994) and provides an update to this field of study so that current railway engineers and managers have easier access to new and emerging best practices.

During years of writing and discussions, we each had moments that challenged some of our beliefs while we debated the merits of emerging technology and practices. The goal of this book is to provide a better understanding track substructure in order to enable more effective design, construction, maintenance, and management of railway track so as to ensure the vitality of rail transportation. We hope that this work will prove useful to current railway engineers and managers as well as college students pursuing careers in the field of railway engineering.

(CRC Press, 2017)

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ

https://www.issmge.org/filemanager/article/624/ISSMGE_BULLETIN_2019_APR_FINAL.pdf

Κυκλοφόρησε το Τεύχος No. 2 του Τόμου 13 (Απριλίου 2019) του ISSMGE Bulletin της International Society for Soil Mechanics and Geotechnical Engineering με τα παρακάτω περιεχόμενα:

Research highlights

- University of Southampton

Case study

- An innovation method of assessing the capacity of existing wharf piles, Australia

TC corner

- Development of TC305

Conference reports

- The 17th National Soil Mechanics and Geotechnical Engineering Conference, Turkey, 2018
- The 1st Symposium on Geotechnical engineering and the dams "problems and solutions", Iraqi

Hot news – SPH Vienna 2019

Event Diary

Corporate Associates

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https://www.itacet.org/sites/default/files/Newsletter%2330.pdf

Κυκλοφόρησε το Τεύχος #30 (Απριλίου 2019) του ITACET Foundation Newsletter με τα παρακάτω περιεχόμενα:

Editorial

Training session reports

- UNDERGROUND SPACE USE AND TUNNEL PROJECT MANAGEMENT
- OPERATION AND MAINTENANCE OF HYDRO TUNNELS

Forthcoming sessions

- TUNNELLING 4.0: INFORMATION TECHNOLOGY FOR THE DESIGN, CONSTRUCTION AND MAINTENANCE OF UNDERGROUND WORKS
- WTC2019: COMMUNICATION AND STAKEHOLDER ENGAGEMENT

Other events in preparation

- Nigeria: **"Introduction to tunnelling – From design to construction"** - October 2019
- Malaysia: (WTC2020) – **"Innovations in Tunnelling – Geotechnical Engineering and Project Management"** - 15-16 May 2020
- India: **"Structural use of fibre reinforced concrete in precast segments"** - Date to be confirmed
- Chili: **"Mechanized tunnelling in shafts"** - Date to be confirmed
- Colombia: **"Mechanized Tunnelling" - Date to be confirmed**
- **Mexico: "Underground Urban Facilities"** - Date to be confirmed
- Thailand: **"Risk Management in Underground Hydropower Works"** - Date to be confirmed

Foundation scholarship recipients

- FORMER FOUNDATION SCHOLARSHIP RECIPIENT INITIATES YOUNG MEMBERS GROUP IN INDIA
- ANOTHER SCHOLARSHIP RECIPIENT GRADUATES!
- UPDATE FROM OUR SCHOLARSHIP RECIPIENT IN FRANCE

Other news

- NEW HEAD OFFICE FOR THE FOUNDATION!

Κυκλοφόρησε το IGS Newsletter της International Geosynthetics Society με τα παρακάτω περιεχόμενα:

IGS NEWSLETTER – Spring 2019

Helping the world understand the appropriate value and use of geosynthetics

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ACIGS International Speakers Series
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General Assembly of the French Chapter of the IGS
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Calendar of Events

READ MORE AT GEOSYNTHETICSSOCIETY.ORG

https://www.sciencedirect.com/journal/geotextiles-and-geomembranes/vol/47/issue/2

Κυκλοφόρησε το Τεύχος 2 του Τόμου 47 (Απριλίου 2109) του Geotextiles and Geomembranes της International Geosynthetics Society με τα παρακάτω περιεχόμενα:

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Failure mechanisms of geocell walls and junctions, Yang Liu, An Deng, Mark Jaksa, Pages 104-120

Effect of surcharge loading rate and mobilized load ratio on the performance of vacuum–surcharge preloading with PVDs, Jun Wang, Ziyang Gao, Hongtao Fu, Guangya Ding, ... Changxin Shi, Pages 121-127

Strength enhancement of geotextile-reinforced carbonate sand, Saeed Goodarzi, Habib Shahnazari, Pages 128-139

Discussion on 'Required unfactored geosynthetic strength of three-dimensional reinforced soil structures comprised of cohesive backfills' by Y. Chen et al., (2018), S. Utili, Pages 140-141

Experimental investigation of the effect of airgaps in preventing desiccation of bentonite in geosynthetic clay liners exposed to high temperatures, Bowei Yu, Abbas El-Zein, Pages 142-153

Scale effect on the behavior of geocell-reinforced soil, Gh Tavakoli Mehrjardi, R. Behrad, S.N. Moghaddas Tafreshi, Pages 154-163

Closure to "Required unfactored geosynthetic strength of three-dimensional reinforced soil structures comprised of cohesive backfills" by Y. Chen et al., Yanbo Chen, Yufeng Gao, Shangchuan Yang, Fei Zhang, Pages 164-165

Laboratory tests of electro-osmotic consolidation combined with vacuum preloading on kaolinite using electrokinetic geosynthetics, Lin Zhang, Liming Hu, Pages 166-176

Horizontal stiffness evaluation of geogrid-stabilized aggregate using shear wave transducers, Yong-Hoon Byun, Erol Tutumluer, Bin Feng, Joon Han Kim, Mark H. Wayne, Pages 177-186

A case study on utilizing geotextile tubes for tailings dams construction in China, Yonghao Yang, Zuoan Wei, Guansen Cao, Yan Yang, ... Ting Lu, Pages 187-192

On the shear failure mode of granular column embedded unit cells subjected to static and cyclic shear loads, Cihan Cengiz, Ismail Emrah Kilic, Erol Guler, Pages 193-202

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