Εθνικό Μετσόβιο Πολυτεχνείο, Κτίριο Γκίνη
20 Απριλίου 1958
(από αριστερά) Αντωνίου – Καθ. Ιωάννης Χατσόπουλος – Καθ. Karl Terzaghi – Καθ. Δημοσθένης Πίππας – Καθ. Αντώνιος Λοΐζος

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& ΓΕΩΤΕΧΝΙΚΗΣ
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Τα Νέα της Ε Ε Ε Ε Γ Μ

168

2 ottobre 1883, Karl von Terzaghi

"Unfortunately, soils are made by nature and not by man, and the products of nature are always complex… As soon as we pass from steel and concrete to earth, the omnipotence of theory ceases to exist. Natural soil is never uniform. Its properties change from point to point while our knowledge of its properties are limited to those few spots at which the samples have been collected. In soil mechanics the accuracy of computed results never exceeds that of a crude estimate, and the principal function of theory consists in teaching us what and how to observe in the field."

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Π Ε Ρ Ι Ε Χ Ο Μ Ε Ν Α

Folding in interbedded mudstones, siltstones and sandstones near Foinikounta

ΑΡΘΡΑ

Geotechnical Monitoring of Deep Shoring Adjacent to Train Infrastructure

Jakub Szary

Project Background

The Gilmore Place development site is located in Burnaby, British Columbia, Canada and consists of a rectangular lot, 28,328 m2 (7 acre) in area, with an above-grade train station and caisson supported guideway system bisecting the site diagonally from the southwest to the northeast. The project consists of two phases and will incorporate the existing train infrastructure into the final design of the structure. Once complete, the project will be home to the tallest tower in Western Canada standing at 64-storeys or 216 m (709 ft).

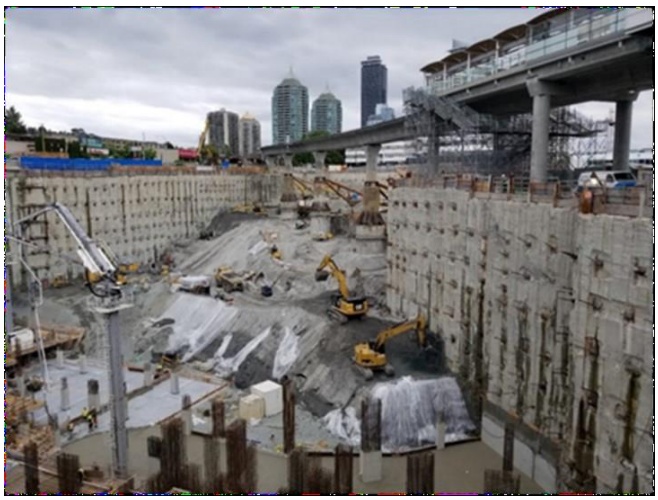

Fig. 1. Construction site, May 2021

A perimeter secant pile cut-off wall was designed and constructed to a depth of up to 37 m (121 ft) below ground surface and consisted of 1.0 m (3.3 ft) diameter drilled piles spaced 750 mm (2.5 ft) on-center, tied back with soil anchors. Each pile was filled with concrete with a specified strength of 10 MPa (1450 psi) at 28 days, with every 4th pile reinforced with a W610 steel section. Due to the excavation extending below the bottom of the existing guideway supporting caissons, additional secant piles and a bracing/jacking system was also designed to support 3 free-standing guideway piers and to enable jacking of the piers if excessive movements occur during construction.

Instrumentation & Monitoring Plan

A robust, automated instrumentation program was designed and implemented in coordination with the design team to monitor various shoring elements and train infrastructure in real time, and to provide immediate alerts (via text message and email) to the design team and stakeholders if values exceed predetermined thresholds. All instruments were connected to an Automatic Data Acquisition System (ADAS) to collect data remotely. Data was recorded in approximately 1-hour intervals and presented on a privately accessible website made available to the project team.

- An automated motorized total station (AMTS) was included in the monitoring program to provide 3D displacements at locations of monitoring prisms throughout the site.
- Tiltmeters were installed on each station and guideway supporting pier within the project limits.
- In-place inclinometers (IPI's) were installed in 17 pile locations adjacent to the train station and guideway piers. to measure lateral soil movements.
- Vibrating wire strain gauges and load cells were utilized to monitor the bracing elements supporting the 3 free-standing piers.

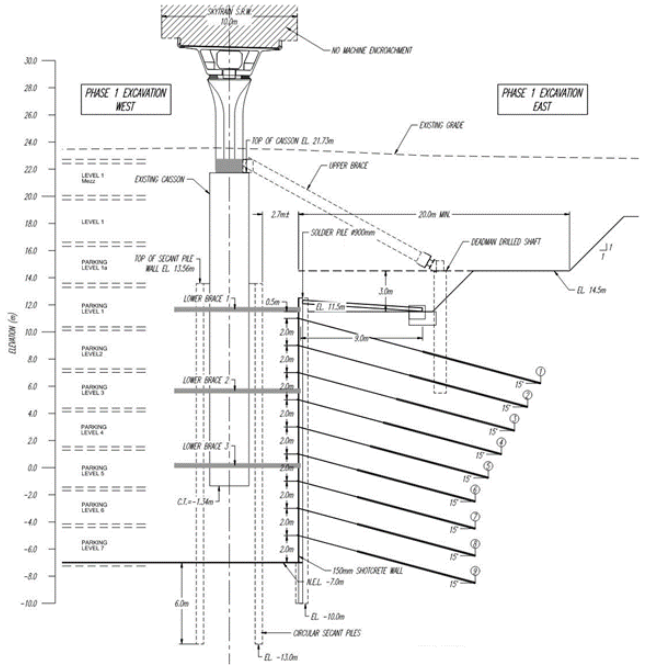

Fig. 2. Typical monitoring plan elevation view indicating the locations of load cells, tiltmeters, AMTS targets, and extensometers.

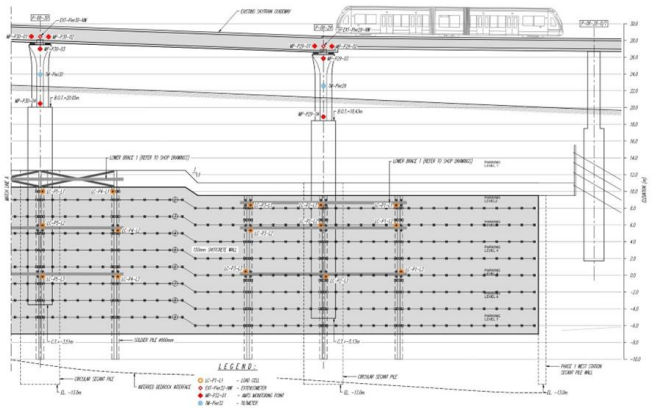

Fig. 3. Typical monitoring plan elevation view indicating the locations of load cells, tiltmeters, AMTS targets, and extensometers.

Baseline Monitoring

The AMTS, tiltmeters, and extensometers were installed in the spring of 2019 and allowed for a baseline monitoring period of approximately 1 year prior to the start of major excavation work. The data indicated consistent diurnal and seasonal fluctuations in all three data sets. Extensometer data indicated increases of the structural expansion joint distance during colder periods of the year, suggesting contraction of the guideway section pair.

During the warmer months of the year, the expansion joint

distance was noted to decrease, suggesting expansion of the guideway sections. Displacements of ± 11 mm (0.43 inch) were observed over the course of the baseline monitoring period and were strongly correlated with temperature changes.

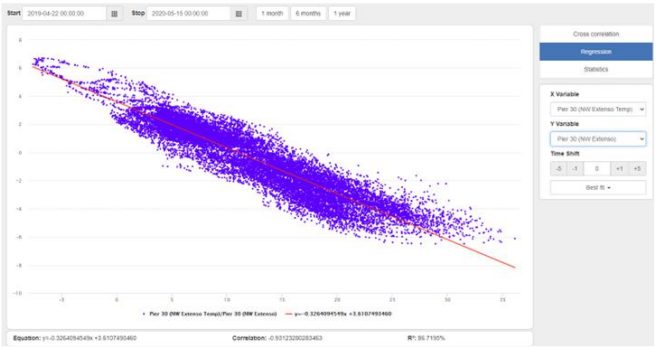

Fig. 4. Temperature correlation for Pier 30 northwest extensometer

The baseline monitoring data was critical in understanding the behavior of the train infrastructure prior to commencement of excavation work. The observed movements were observed in multiple (independent) sensors and were strongly correlated with temperature. After review of the baseline data, thresholds were increased to allow for diurnal and seasonal temperature variations in the data and an additional set of thresholds were established where temperature-corrected data was used. Data viewed as a 24-hour rolling average provided a means to reduce diurnal effects when interpreting data.

Construction Monitoring

Remote monitoring continuously recorded data during excavation and construction work. Coordination was required with the construction team to install inclinometers, load cells, strain gauges, and additional AMTS monitoring prisms as excavation and shoring work advanced. Inclinometer installations required piles to be completed with casings installed in W-beam webbings by the piling contractor. Load cell installation required coordination with the geotechnical representative and was completed during anchor testing. Load cells were also used to confirm anchor testing results in the field. Strain gauge installation required welding and was coordinated during construction of steel members throughout the site.

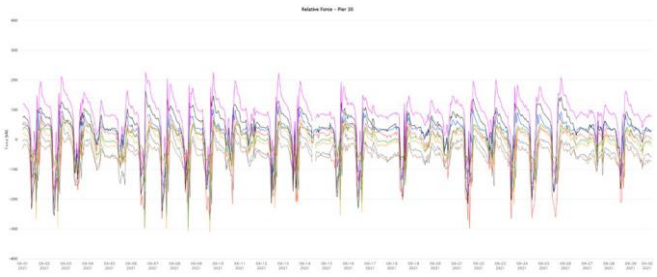

Fig.5. Pier 30 strain gauge data (September, 2021)

Diurnal and seasonal effects continued to be observed as additional instrumentation was installed. These effects were particularly apparent in the larger, steel bracing members of the 3 free-standing piers. Loading varied by up to 400 kN (90 kip) daily due to thermal contraction and expansion of the pipe braces. Thermal fluctuations were observable in load cell data. Anchor loads varied by approximately 10 kN (2 kip) daily. Inclinometer sensors experienced more stable temperature conditions due to being located below grade and better insulated from diurnal and seasonal temperature fluctuations. However, inclinometers located within the free-standing piers exhibited daily movements of 3 mm (0.12 inch) due to greater temperature exposure.

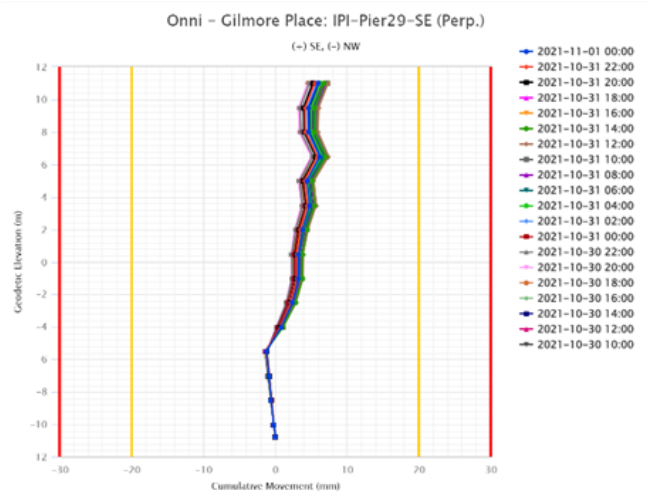

Fig. 6. Perpendicular inclinometer movements over 24 hours for location IPI-Pier29-SE

The primary challenge relating to the remote monitoring system is line of site considerations with the AMTS system (To function correctly, the AMTS requires un-obstructed view of monitoring targets and reference prisms). Other challenges included contractor damage to equipment.

Phase 1 shoring and excavation work was completed in December 2021. Guideway movements were limited to 15 mm (0.6 inch) and within the Level 1 threshold of ± 25 mm (1 inch). No noticeable trends were observed in the load cell data, indicating good anchor performance. Inclinometer data also indicated minimal movements within the shoring wall adjacent to the bracing structure and was within the Level 1 threshold.

Brace Removal

Building construction adjacent to the 3 free-standing piers continued into January 2022.

It followed a bracing removal sequence developed by the design team. A reinforced concrete wall was constructed around the secant piles of each free-standing pier and was locked-in with parkade slabs as construction advanced, transferring loading from the bracing elements to the building structure as bracing elements were removed. The consultant team hypothesized that slab pours coincidentally occurred at inopportune times such that the pier's position was locked-in during contraction of the bracing elements caused by diurnal thermal movements.

The monitoring system was remotely reconfigured to allow for more frequent AMTS and strain gauge data collection during jacking. The remote monitoring system successfully monitored movements of the pier and stress levels in the bracing elements during jacking.

Conclusions

The remote instrumentation program employed during this project proved to be a reliable system for monitoring shoring and train infrastructure elements. The system was able to accurately monitor movements, loads, and strain, providing the project team with critical data regarding the performance of the shoring system and train infrastructure in real time. Diurnal and seasonal movements were able to be quantified during the baseline monitoring period and were strongly correlated with temperature changes. Thermal effects continued

to be observed during construction. Daily load changes of 400 kN (90 kip) were observed in the steel bracing elements supporting 3 free-standing piers within the excavation. Anchor loads varied by approximately 10 kN (2 kip) daily. The system was able to be reconfigured during pier jacking operations to provide critical data at more frequent intervals.

The system continues to monitor shoring and train infrastructure elements, and is expected to remain in place for several years during excavation and shoring works for Phase 2 of the development.

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Building damage assessment using the simple beam method - Part 1

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Tunnelling invariably causes ground movements which have an impact on buildings along the tunnel route. Standard methods of estimating the potential damage to buildings have been in use since the 1970's. In the case of masonry load-bearing walls the level of damage may be estimated by predicting the maximum tensile strain and comparing it to limiting values established from case studies and full-scale testing of masonry walls. The maximum tensile strain is estimated by imposing the greenfield deflection ratio on the building modelled as a simple rectangular section beam with a centrally-applied point load, and this is known as the 'simple beam method'. This method is reviewed in this article and several corrections and clarifications are proposed. The corrections make a significant difference to the calculation of maximum strains in a building, which were underestimated in the standard approach.

It is necessary, and in many countries it is a legal or planning requirement, to assess buildings along the route of a tunnel for the risk of damage due to tunnelling settlements (e.g. for CTRL see Moss & Bowers, 2006, for Crossrail see Crossrail, 2008). This will usually follow a staged process. At each stage buildings are classified into one of six damage categories, from 0 to 5, as shown in Table 1, first proposed by Burland et al. (1977). Categories 0, 1 and 2 are aesthetic damage, 3 and 4 are serviceability damage, and 5 is the most severe category where stability of the building will be affected, and it may collapse.

At the preliminary stage ('Stage 1') very simple methods are used to conservatively assess the risk of settlement damage to all the buildings, with the aim that many of them can be ruled out as being at low risk. The remaining buildings will proceed to a second stage ('Stage 2'), where they will be analysed in more detail, again hoping that many more of them will be moved to the low risk category. Any remaining buildings will proceed to a third, more detailed stage ('Stage 3'). Sensitive structures, high rise buildings and heritage buildings will usually go straight to the third stage (Rankin, 1988). Only Stage 1 and 2 will be discussed in this article.

Building damage up to category 2 can be caused by a variety of environmental phenomena, such as shrinkage, thermal effects on the structure itself, natural movements of the ground due to rising or lowering groundwater, rainfall, drought or tree root suctions. This means that identification of the cause of any category 1 or 2 damage is difficult and could be a combination of causes, whereas category 3 damage is almost certain to be associated with ground movements due to tunnelling if they are occurring at that time.

Therefore, the division between category 2 and 3 is important (Burland, 2001). It is also the threshold beyond which repair work starts to become expensive.

Table 1: Classification system for visible damage to building walls (based on Burland et al., 1977; Rankin, 1988; Boscardin & Cording, 1989; Burland,2001).

Category of damage	Normal degree of severity	Description of typical damage (ease of repair is in bold) and typical crack width	Limiting tensile strain ε_{lim} (%)
0	Negligible	Hairline cracks < 0.1mm wide.	
1	Very slight	**Fine cracks that are easily treated during normal redecoration.** Damage generally restricted to internal wall finishes. Close inspection may reveal some cracks in external brickwork or masonry. Typical cracks < 1mm.	
2	Slight	**Cracks easily filled. Redecoration probably required. Recurrent cracks can be masked by suitable linings.** Cracks may be visible externally and **some repainting may be required to ensure weathertightness.** Doors and windows may stick slightly. Typical cracks < 5mm.	
3	Moderate	**The cracks require some opening up and can be patched by a mason. Repointing of external brickwork and possibly a small amount of brickwork to be replaced.** Doors and windows sticking. Service pipes may fracture. Weather-tightness often impaired. Typical cracks 5-15mm or several cracks > 3mm.	
4	Severe	**Extensive repair work involving breaking-out and replacing sections of walls, especially over doors and windows.** Windows and door frames distorted, floor sloping noticeably. Walls leaning or bulging noticeably, some loss of bearing in beams. Service pipes disrupted. Typical cracks 15-25m m, but also depends on the number of cracks.	
5	Very sever	**This requires a major repair job involving partial or complete rebuilding.** Beams lose bearing, walls lean badly and require shoring. Windows broken with distortion. Danger of instability. Typical cracks > 25mm, but depends on the number of cracks.	

Stage 1 assessment

For Stage 1 assessment two criteria are used, the predicted greenfield maximum slope and maximum settlement of the ground surface at the location of each building. If the maximum slope is less than 1/500 and the maximum settlement is less than 10 mm, then the building has negligible risk of any damage (Rankin, 1988)

It is straightforward, for a given tunnel alignment, to plot contours of surface settlement either side of the tunnel. At this stage of design, settlement estimates are usually based on a Gaussian curve (Peck, 1969), that has the following equation:

$$S = S_{max}\exp\left(\frac{-y^2}{2i^2}\right)$$

Equation 1

where S is the settlement at transverse offset *y*, S_{max} is the maximum settlement above the tunnel centreline (i.e. at $y = 0$), and *i* is the trough width, which is the transverse distance from the centreline to the point of inflexion of the Gaussian curve.

Knowing the geology, depth and diameter of the tunnel we can estimate the value of maximum settlement S_{max}, and trough width *i*. The transverse offset *y* from the tunnel centreline to any settlement contour value *S* may be found by rearranging Equation 1 to obtain the following expression:

$$y = \sqrt{2i^2.\ln\left(\frac{S_{max}}{S}\right)}$$

Equation 2

Equation 1 can also be differentiated to obtain an equation for slope 0 at any offset distance *y*:

$$\theta = \frac{dS}{dy} = -\frac{y}{i^2}S_{max}\exp\left(\frac{-y^2}{2i^2}\right)$$

Equation 3

Equation 3 can only be solved for *y* iteratively, which can be achieved using a solver or 'goal seek' function in a spreadsheet.

Equation 2 and Equation 3 can be used to define limits either side of the tunnel on a set of plans of the alignment. All buildings that are outside both limits can then be excluded from further analysis. The remaining buildings will be taken forward to Stage 2 assessment.

Stage 2 assessment

In this stage, each building is conservatively assumed to deform to the greenfield settlement profile at the level of the foundations, as shown in Figure 1 for an arbitrary building shown in grey shading. The values of settlement are just an example. Between the points of inflexion the building is bending in a sagging mode, and outside them the building is bending in a hogging mode.

The two parts of the building, of lengths L_{hog} and L_{sag}, are treated separately and these are known as 'partitions'. In the hogging partition a straight line is drawn from a point on the settlement trough at the edge of the building to the point of inflexion. The maximum vertical distance between this line and the settlement trough is the deflection Δ^{GF}_{hog}. This deflection divided by the length of the building in the hogging zone L_{hog} is the hogging deflection ratio. The same procedure is applied to the sagging partition to find the sagging deflection ratio. Note that a long building that spans beyond both points of inflexion may have two hogging zones and therefore two values of hogging deflection ratio will need to be calculated.

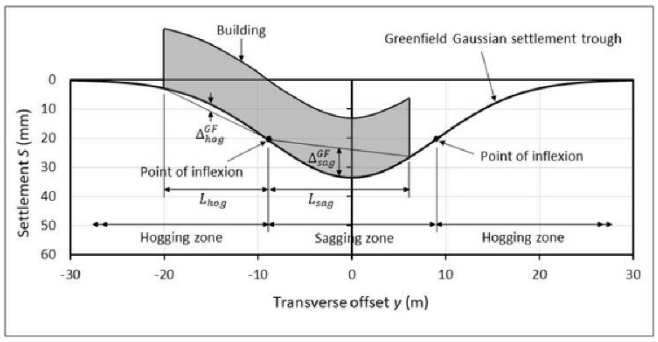

Figure 1: Idealisation of building deformation and definition of deflection ratio (vertical scale much exaggerated).

The next step is to impose these deflection ratios onto the building. Burland & Wroth (1974) first proposed this should be done by modelling the building as a simple beam under the action of a point load. This will not give the exact deformation mode of the building, but this is only intended to be an approximate method.

Figure 2 shows how a bearing-wall building can be idealised as a beam representing the load-bearing façade in bending and shear deformation according to the method of Burland & Wroth (1974), and Figure 3 shows the simply-supported beam with a point load applied at the midspan.

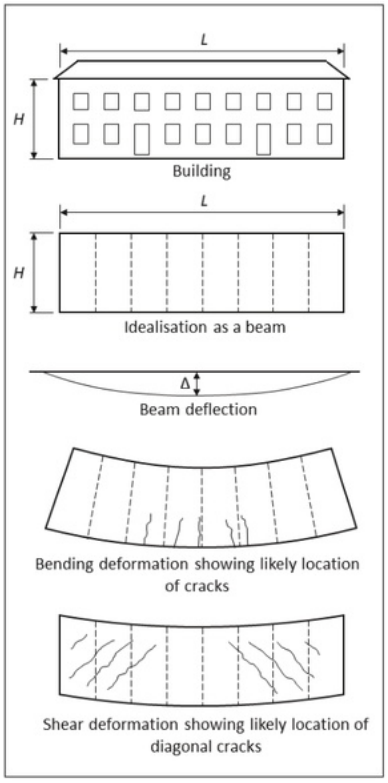

Figure 2: Idealisation of a bearing-wall building façade as a beam (Burland & Wroth, 1974).

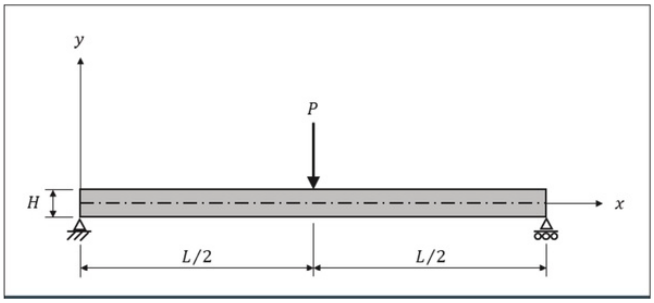

Figure 3: Simply-supported beam with a point load applied at the midspan.

The midspan deflection of a centrally-loaded simply-supported beam including both bending and shear deflection was given by the following equation in Burland & Wroth (1974), which they attributed to Timoshenko (1957):

$$\Delta = \frac{PL^3}{48EI}\left(1 + \frac{18EI}{L^2HG}\right)$$

Equation 4

where Δ is the midspan deflection, *P* is a centrally-applied line load (c. f. Figure 3), *L* is the length of the beam and equal to either L_{hog} or L_{sag}, *E* is the Young's modulus, *I* is the second moment of area, *H* is the height of the beam, and *G* is the shear modulus.

The first term in Equation 4 represents deflection due to bending and the second term represents deflection due to shear. Burland & Wroth (1974) stated that Equation 4 was per unit width of the façade. The original equation from Timoshenko (1940) is shown below, and it can be seen that Burland and Wroth substituted the height *H* for the area *A*.

$$\Delta = \frac{PL^3}{48EI}\left(1 + \frac{18EI}{L^2AG}\right)$$

Equation 5

To consider a beam of unit width, not only should the cross-sectional area *A* in Equation 5 be taken as equal to the height *H,* but the second moment of area *I* and the line load *P* must also be per unit width. Whether a unit width is used for *A, I* and *P*, or whether the actual width of the wall is used to calculate *A, I* and *P*, will not affect the results, as long as a consistent approach is taken. This becomes important when structures more complicated than a single wall are considered.

Another issue with the deflection equation (Equation 4 or Equation 5) is that it does not calculate shear deflection correctly, because it assumes that simple beam theory (also known as 'Euler-Bernoulli') can also be applied to shear deflection. However, this will not be accurate because the 'shear area', the effective area of a section participating in the shear deformation, is not equal to the cross-section area (e.g. Bhatt, 1999: pp.275-279). This effect is largely to do with warping caused by the parabolic shear stress distribution, as shown in Figure 4, which means that plane sections do not remain plane.

A review of a large number of studies of shear deflection by Kaneko (1975) found that shear deflection should be significantly lower than predicted using Equation 4 or Equation 5. The impact of this on building damage assessments was first noticed by Netzel (2009) in his PhD thesis, but has not been widely publicised.

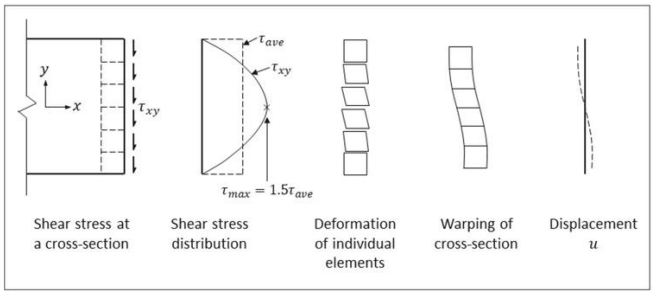

Figure 4: Shear warping in a rectangular cross-section-beam (based on Bhatt, 1999).

The midspan deflection of a simply-supported beam with a centrally-applied point load was given by Gere & Timoshenko (1991: p.69 4) as:

$$\Delta = \frac{PL^3}{48EI}\left(1 + \frac{12f_sEI}{GAL^2}\right)$$

Equation 6

where f_s is the 'form factor for shear', which is solely a property of the cross-section dimensions of the beam.

The original deflection equation (Equation 4 or Equation 5) contains the assumption that deflection may be calculated by integrating shear strains along the centroid. Therefore, the form factor for shear is effectively assumed to be equal to the ratio of maximum shear stress at the centroid to average shear stress, which is 1.5. Ignoring warping across the width, Gere & Timoshenko (1991) used the unit load method to demonstrate that form factor is exactly 1.2, and Bhatt (1999) used a different method where errors between linear and cubic shear displacements were minimised and also found it to be 1.2. Using more sophisticated three-dimensional closed form solutions and finite element analysis, Renton (1991), Schramm et al. (1994), Pilkey (2003) and Iyer (2005) have all found that form factor for shear should be approximately 1.2 for rectangular beams when the width of the beam $b < H$.

Since most load-bearing walls may be idealised as rectangular beams with $b < H$.f_s = 1.2 can be used and Equation 6 may be rewritten as:

$$\Delta = \frac{PL^3}{48EI}\left(1 + \frac{72EI}{5GAL^2}\right)$$

Equation 7

The shear deflection will be20% lower in Equation 7 compared to Equation 4 or Equation 5, and as we will see, this means that the maximum tensile strains will be larger. Equation 7 and the equations to follow that are based on it will henceforth be referred to as the 'corrected equations'.

For masonry bearing-wall structures, a masonry façade perpendicular to the tunnel alignment can be considered to act as a single plane strain rectangular section of length L_{hog} or L_{sag}, height H and of unit width. Note that we are ignoring the effect of openings in the façade, such as windows and doors. This is an unconservative assumption because openings will cause stress concentrations where cracks are more likely to initiate and propagate from.

Expressions for maximum bending strain and maximum diagonal strain may be derived to replace *P* in Equation 7. In this way we can obtain expressions for these maximum strains in terms of deflection ratio.

The midspan bending moment M is given by:

$$M = \frac{PL}{4}$$

Equation 8

The extreme fibre bending stress σ_{bmax} is given by:

$$\sigma_{bmax} = \frac{Md}{I}$$

Equation 9

where d is the vertical distance from the neutral axis to the extreme fibre in tension.

Substituting Equation 8 into Equation 9 gives:

$$\sigma_{bmax} = \frac{PLd}{4I}$$

Equation 10

Therefore, the extreme fibre bending strain e_{bmax} may be given by:

$$\varepsilon_{bmax} = \frac{\sigma_{bmax}}{E} = \frac{PLd}{4EI}$$

Equation 11

Rearranging Equation 11 for P gives:

$$P = \frac{4EI}{Ld}\varepsilon_{bmax}$$

Equation 12

Substituting Equation 12 into Equation 7 gives:

$$\Delta = \frac{L^2}{12d}\left[1 + \frac{72EI}{5L^2AG}\right]\varepsilon_{bmax}$$

Equation 13

We want to calculate e_{bmax} from the deflection ratio Δ / L we have already determined earlier, so rearranging Equation 13 gives:

$$\varepsilon_{bmax} = \frac{\Delta/L}{\frac{L}{12d}\left[1 + \frac{72EI}{5L^2AG}\right]}$$

Equation 14

Now to calculate the maximum diagonal tensile strain ε_{bmax} we first need an expression relating it to the simply-supported rectangular beam under point load. The shear strain is related to the shear force by the following expression:

$$\gamma_{xy} = \frac{\alpha V}{AG}$$

where γ_{xy} is the shear strain, α is the ratio of maximum shear stress to average shear stress, which for a rectangular section is 1.5 (c.f. Figure 4), V is the shear force, where $V=P/2$, A is the cross-sectional area, where $A=bH$, and G is the shear modulus.

Substituting for V and α in Equation 15 gives:

$$\gamma_{xy} = \frac{3P}{4AG}$$

Equation 16

Figure 5 defines diagonal extension, which we will call Δd. A rectangular element with sides of length dx and dy is deformed into a rhomboid by the action of shear stresses on the sides τ_{xy} and τ_{yx}, where because of equilibrium $\tau_{xy} = \tau_{yx}$. Angles and deformations are assumed to be small and are greatly exaggerated in the figure. The length of the sides of the element do not change as we are considering pure shear.

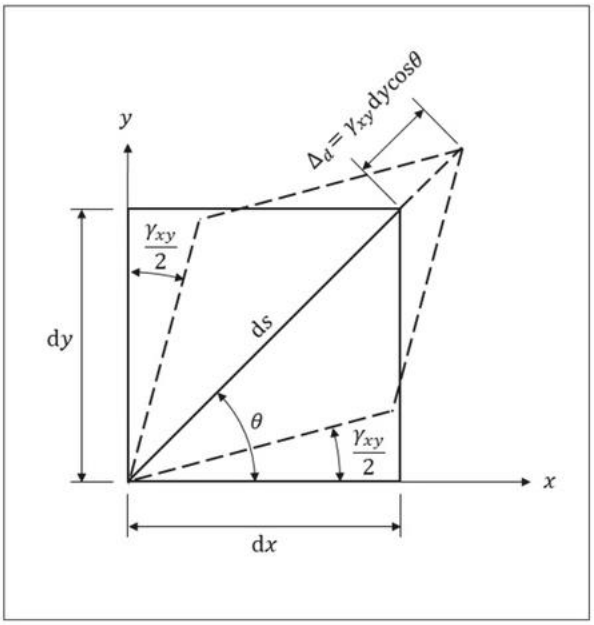

Figure 5: Definition of diagonal extension caused by shear strain

To get the maximum diagonal tensile strain ε_{bmax} we use the following equation:

$$\varepsilon_{dmax} = \frac{\Delta_d}{\mathrm{ds}} = \frac{\gamma_{xy}\mathrm{dycos}\theta}{\mathrm{ds}}$$

Equation 17

Now $dy/ds = sin\theta$, therefore:

$$\varepsilon_{dmax} = \gamma_{xy}\sin\theta\cos\theta$$

Equation 18

We also know that the direction θ of the maximum diagonal tensile strain is 45°, because shear stresses $\tau_{xy} = \tau_{yx}$. Thus:

$$\varepsilon_{dmax} = \frac{\gamma_{xy}}{2}$$

Equation 19

And Equation 16 becomes:

$$\varepsilon_{dmax} = \frac{3P}{8AG}$$

Equation 20

Rearranging Equation 20 for *P* gives:

$$P = \frac{8AG}{3}\varepsilon_{dmax}$$

Equation 21

Substituting Equation 21 into Equation 7 gives:

$$\Delta = \frac{AGL^3}{18EI}\left[1 + \frac{72EI}{5L^2AG}\right]\varepsilon_{dmax}$$

Equation 22

Similarly to the bending strain we want to calculate the maximum diagonal tensile strain ε_{dmax} from the deflection ratio we have already determined earlier, so simplifying and rearranging Equation 22 gives:

$$\varepsilon_{dmax} = \frac{\Delta/L}{\left[\frac{AGL^2}{18EI} + \frac{4}{5}\right]}$$

Equation 23

In the sagging zone, the building's neutral axis can be assumed to be at mid-height, i.e. *d=H/2.* Also, assuming plane strain, such that cross-sectional area *A* = H and the second moment of area is also per unit width, we get the following expression for second moment of area:

$$I_{sag} = \frac{H^3}{12}$$

Equation 24

In the hogging zone, the building's neutral axis is usually conservatively assumed to be at the foundation level, i.e. *d = H,* because the ground-structure interface and the stiffness of the foundations may provide restraint (Burland & Wroth, 1974). Netzel (2009) pointed out that this is physically impossible because the compressive stress becomes infinite, but for materials strong in compression but weak in tension (e.g. masonry, plain concrete or fibre-reinforced concrete at low dosages), the compression zone can become very small and the neutral axis can be very close to the extreme fibre. Therefore, though physically impossible, as a geometric approximation it is reasonable. Using the parallel axis theorem, this gives:

$$I_{hog} = \frac{H^3}{3}$$

Equation 25

So now, from the hogging and sagging greenfield deflection ratios, the maximum bending strain and the maximum diagonal strain in the building in hogging or sagging can be calculated. Remember that the neutral axis position is assumed to be different in each case, which affects the value of second moment of area *I* and the distance from the neutral axis to the extreme fibred. The principle of superposition is now employed to add in the effect of horizontal strain to obtain a resultant bending strain and a resultant diagonal strain.

An expression for horizontal strain may be derived from the Gaussian settlement trough equation:

$$\varepsilon_h = \left(\frac{-S_{max}}{z_0 - z}\right) \cdot \exp\left(\frac{-y^2}{2i^2}\right) \cdot \left[1 - \frac{y^2}{i^2}\right]$$

Equation 26

For Stage 2 assessment, it is usual practice to use the average horizontal strains under the building's foundation in the hogging and sagging zones, i.e. along L_{hog} and L_{sag}. This was justified by Mair et al. (1996a and 1996b) by arguing that these greenfield horizontal strains are applied to the building, where they are added to tensile strains generated by shear and bending, and the precise location of these strains is unknown. They also argued that the method is effectively empirical and predicts building damage satisfactorily, also bearing in mind that the horizontal strain induced in the building is in many cases considerably less than the greenfield horizontal strain in the ground. Therefore, Equation 26 should be used at, say, 1 m intervals within the hogging or sagging zone to calculate horizontal strains, which are then averaged within each zone to obtain the average values of horizontal strain.

Since the maximum extreme fibre bending strain acts in the same direction as the horizontal axial strain, the resultant extreme fibre tensile strain ε_{br} is simply given by:

$$\varepsilon_{br} = \varepsilon_{bmax} + \varepsilon_h$$

Equation 27

The resultant diagonal tensile strain ε_{dr} needs to be found using Mohr's circle of strain, because the maximum diagonal tensile strain and the horizontal strain are not in the same direction and the direction and magnitude of the resultant principal strain is therefore unknown.

Two systems of strain are superposed:

1. The horizontal (axial) strain ε_h. This is in the beam's *x* axis direction, therefore we can say that $\varepsilon_x = \varepsilon_h$. In this system this is the major principal strain, so $\gamma_{xy} = 0$ and using Hooke's Law we also have $\varepsilon_y = -\nu\varepsilon_h$.

2. The maximum diagonal tensile strain $\varepsilon_{dmax.}$ This is at 45° to the beam's *x* axis. This system is in pure shear, so the major principal strain is ε_{dmax} and the minor principal strain is $-\varepsilon d_{max}$. This system can be represented by a shear strain $\gamma_{xy} = 2\varepsilon_{dmax}$.

The simplest way of solving this is to use the principal strain equation for plane strain (e.g. Gere & Timoshenko, 1991: p.438), which is:

$$\varepsilon_{1,2} = \frac{\varepsilon_x + \varepsilon_y}{2} \pm \sqrt{\left(\frac{\varepsilon_x - \varepsilon_y}{2}\right)^2 + \left(\frac{\gamma_{xy}}{2}\right)^2}$$

Equation 28

Since the diagonal strain is pure shear and the horizontal (axial) strain is a principal strain (i.e. with no shear strain), we can say that $\varepsilon_x = \varepsilon_h$, $\varepsilon_y = -\nu\varepsilon_h$ and $\gamma_{xy} / 2 = \varepsilon_{dmax}$, and insert these into Equation 28 such that:

$$\varepsilon_{dr} = \frac{\varepsilon_h(1-\nu)}{2} + \sqrt{\left(\frac{\varepsilon_h(1+\nu)}{2}\right)^2 + (\varepsilon_{dmax})^2}$$

Equation 29

The maximum tensile value of either the resultant bending strain ε_{br} from Equation 27 or the resultant diagonal strain ε_{dr} from Equation 28 will be used to determine the damage category for the building. The maximum diagonal strain ε_{dmax} and the maximum bending strain ε_{bmax} are not considered in combination with each other because they occur at different locations. The maximum shear strain occurs close to the mid-height of a rectangular beam and is zero at the extreme fibre (c.f. Figure 4), whereas the maximum bending strain occurs

at the extreme fibre.

Summary

The main aim of this article was to publicise the shear deflection error first noticed by Netzel (2009). The derivation of the simple beam equations, which has never been published in full, contains hidden assumptions that have been explained in this article, providing clarity to those who use them.

In the next issue, Part 2 will compare the corrected simple beam equations with those of Burland & Wroth (1974), and then will investigate some of the assumptions that need to be made when using this method, such as the length of the building in the hogging zone, and the effect of differences in whole-body tilt between hogging and sagging partitions.@

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Building damage assessment using the simple beam method – Part 2

Dr Benoft Jones, Managing Director, Inbye Engineering, and Dr Giorgia Giardina, Assistant Professor, Delft University of Technology

In Part 1 the simple beam method equations were derived and several corrections and clarifications were made. In this second part, we will compare the corrected simple beam equations with the original equations from Burland & Wroth (1974). Then we will investigate some of the assumptions that need to be made when using this method, such as the length of the building in the hogging zone, and the effect of differences in whole-body tilt between hogging and sagging partitions.

Comparison of corrected equations with Burland & Wroth (1974)

By setting either $\varepsilon_{bmax} = \varepsilon_{lim}$ or $\varepsilon_{dmax} = \varepsilon_{lim}$ we can plot equations 14 and 23 from Part 1 against L/H, as Burland & Wroth (1974) did. This is shown in Figure 1 for hogging and Figure 2 for sagging. Note that these do not include the interaction with horizontal strain and are not the resultant tensile strains, but they do give us an idea of where bending or diagonal strains are more important. The equations are reproduced here for convenience:

$$\varepsilon_{bmax} = \frac{\Delta/L}{\frac{L}{12d}\left[1+\frac{72EI}{5L^2AG}\right]}$$

Equation 1

$$\varepsilon_{dmax} = \frac{\Delta/L}{\left[\frac{AGL^2}{18EI}+\frac{4}{5}\right]}$$

Equation 2

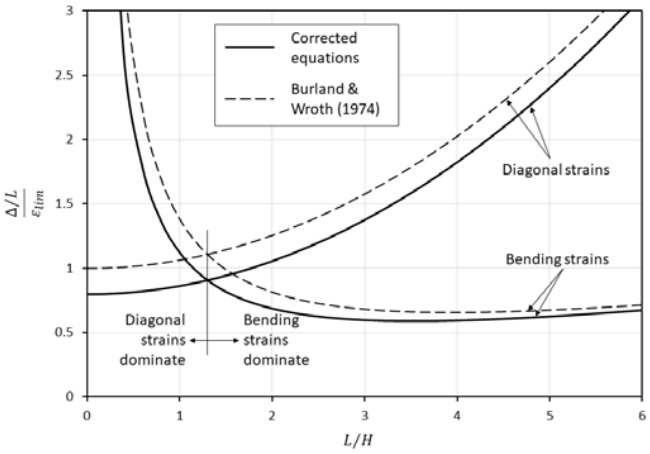

Figure 1: Relationship between $(\Delta/L)/\varepsilon_{lim}$ and L/H for buildings modelled as isotropic rectangular cross-section beams in hogging with the neutral axis at foundation level.

Figure 1 shows that the corrected equation for hogging gives lower values of $(\Delta/L)/\varepsilon_{lim}$ at all values of L/H and for both bending strains and diagonal strains. This is because at the same deflection ratio Δ/L the corrected equations will give higher values of ε_{bmax} and ε_{dmax}, demonstrating that the original equations underpredict maximum bending and diagonal strains. Figure 1 also shows that the corrected equations do not change the point (at exactly L/H=1.3) where diagonal strains cease to dominate and bending strains begin to dominate.

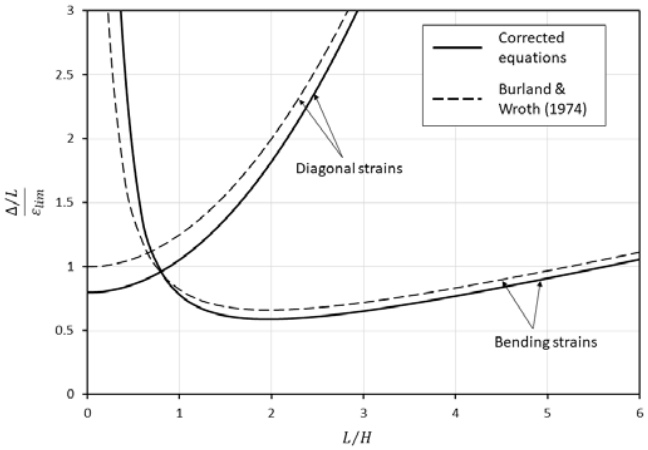

Figure 2: Relationship between $(\Delta/L)/\varepsilon_{lim}$ and L/H for buildings modelled as isotropic rectangular cross-section beams in sagging with the neutral axis at mid-height.

Figure 2 shows that the corrected equation for sagging gives lower values of $(\Delta/L)/\varepsilon_{lim}$ at all values of L/H and for both bending strains and diagonal strains. This was also the case for hogging, but here the difference is much more marked. The points at which diagonal strains cease to dominate and bending strains begin to dominate are not at the same value of L/H.

Length of building in the hogging zone

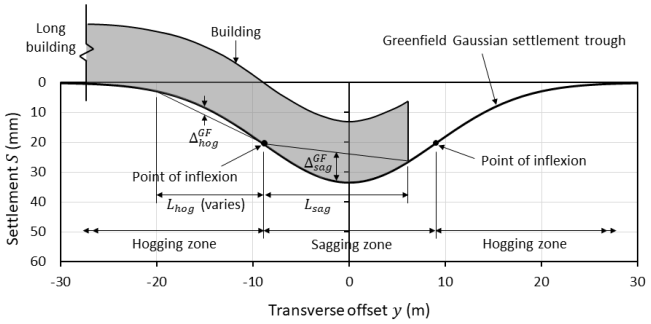

Figure 3: Idealisation of building deformation and definition of deflection ratio (vertical scale much exaggerated).

Referring to Figure 3, let us now consider a building that extends a long way from the point of inflexion. Mair et al. (1996) recommended cutting off the deflection ratio calculation at a transverse offset of ±2.5i, presumably to avoid deflection ratio being made smaller by considering a long building with a significant portion of its length far away from the tunnel, experiencing relatively little settlement. However, Netzel (2009) noted that considering the length of the building beyond the cut-off point can result in a significantly higher deflection ratio. There is also the effect of a longer building length L, which can increase the maximum bending tensile strain in Equation 1. In a numerical example he showed that the maximum bending tensile strain may be increased by 75%.

If we do an example calculation for a settlement trough with volume loss of 1.5%, and trough width i of 9m, for a long building, the deflection ratio calculation can be visualised graphically as shown in Figure 4.

We can use these values of deflection ratio to calculate strains. As an example we will consider a long masonry wall extending at least 5i offset from the tunnel centreline, with height H of 5.5m and Poisson's ratio v of 0.3 (giving an E/G ratio of 2.6). Since L/H is large, we know that the resultant

bending strain will be larger than the resultant diagonal strain. The calculation of bending strains is shown in Table 1.

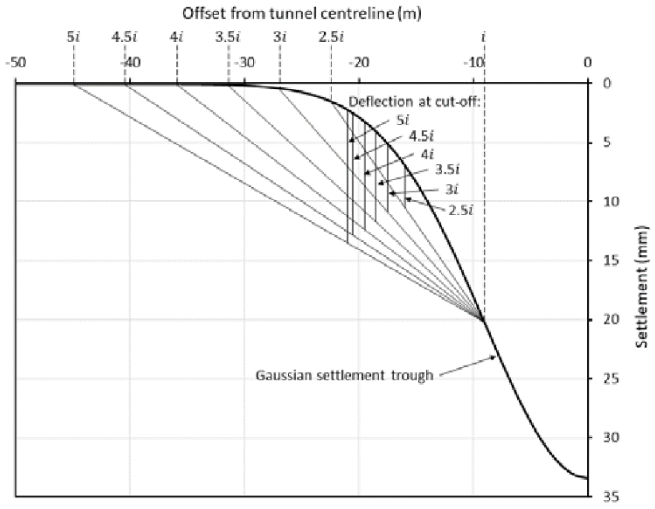

Figure 4: Deflection ratio with the building length cut off at various transverse offsets from the tunnel centreline.

Table 1: Example calculation of hogging deflection ratio with different cut-off distances.

Building length cut-off value (m)	Deflection ratio	Maximum bending tensile strain ε_{bmax} (Equation 1)	Average horizontal strain along L_{hog}	Resultant bending strain ε_{br}
2.5*i*	0.00026958	0.0429 %	0.0581 %	0.1010 %
3*i*	0.00032373	0.0548 %	0.0503 %	0.1051 %
3.5*i*	0.00034231	0.0575 %	0.0418 %	0.0994 %
4*i*	0.00034060	0.0549 %	0.0390 %	0.0938 %
4.5*i*	0.00032934	0.0500 %	0.0302 %	0.0802 %
5*i*	0.00031451	0.0446 %	0.0265 %	0.0711 %

Table 1 shows that maximum bending tensile strain may be significantly larger if we consider a longer building, as was shown by Netzel (2009). However, if we go on to calculate the resultant bending strain using the average horizontal strain along the hogging length of the building, which is standard practice, then using the 2.5*i* cut-off is a reasonable assumption, because longer building lengths result in a smaller average value of horizontal strain.

Note also that in Figure 4 the maximum deflection occurs at approximately the midpoint of L_{hog} when the length is 2.5*i*, but this becomes less and less true as L_{hog} increases beyond that. This means that the simple beam method, which assumes that the deformation of a building is similar to a beam loaded by a centrally-applied point load, would cease to provide a good approximation of strains. Therefore, a cut-off of 2.5 or 3*i* is a sensible compromise.

Differences in whole-body tilt at the point of inflexion

The point of inflexion is used as a partition boundary, with the hogging and sagging partitions on each side being considered separately in the simple beam method. As shown in Figure 1 in Part 1 and in Figure 3 here, we then assume that whole-body tilt of the building partition (the straight line drawn from one end of the partition to the other) does not induce strains and we only calculate strains from the deformation relative to that tilt (i.e. the deflection ratio). There are two extreme cases of this, as defined by Netzel (2009), and shown in Figure 5 and Figure 6. When the building ends near the tunnel centreline, then the difference in whole-body tilt between the hogging and sagging partitions is very small if the cut-off is taken at 2.5*i*. But when the building ends at the second point of inflexion as shown in Figure 6, the difference in whole-body tilt between the two partitions can be very large. By partitioning the building, we are allowing it to hinge at the first point of inflexion without inducing any bending or shear strains, which is not what happens in reality.

Netzel (2009) used finite element modelling to show that partitioning a building where there is a less than 15% difference in tilt between partitions (Figure 5) is valid, but where the tilt changes by more than 15% (Figure 6) partitioning will result in significant errors in predictions of bending moments and shear forces. Unfortunately the impact on resultant strains and damage categories was not calculated, but it seems clear that we should consider replacing the simple beam method with numerical models in these situations. They need not be complex and could be greenfield settlements imposed on a string of beam elements.

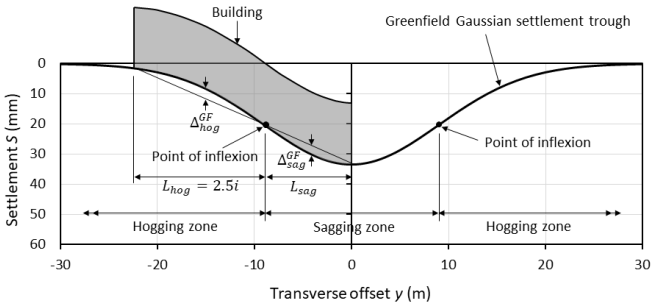

Figure 5: Building ending at the tunnel centreline.

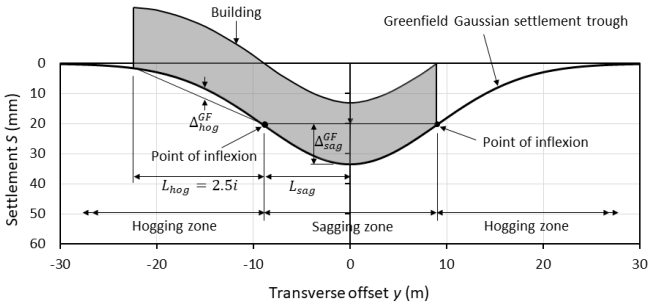

Figure 6: Building ending at the point of inflexion.

In fact, using simple numerical models may be a much better way of undertaking generic stage 2 assessments. They would only have a small number of elements and runtimes would be virtually instantaneous. It may even be quicker than spending the time programming spreadsheets to run the simple beam method. Comparisons between numerical models and the simple beam method, particularly with asymmetric deflections where the angular distortion at one end of a partition is significantly different to the other, show that the simple beam method can in some cases be highly inaccurate (Netzel, 2009).

Summary

The simple beam method equations with the correct form factor for shear result in higher diagonal and bending tensile strains than the equations proposed by Burland & Wroth (1974).

The simple beam method has been used for at least 46 years with apparent success, and some may say that this is sufficient empirical proof of its usefulness. However, it is really only measured tensile strains that have been calibrated against crack widths – the prediction of the tensile strains using the simple beam method has not been widely validated. One exception is the comparison of predictions made by Mair & Taylor (2001) with actual strains measured in the foundations of Elizabeth House in London by Standing (2001), which found good agreement. However, the assumptions about the frame structure behaviour used in the simple beam method were quite arbitrary and other, just as reasonable, assumptions could have been made that would have led to different results.

The simple beam method must be used carefully. In particular, where the difference in tilt between partitions is more than 15%, it may not be applicable. Also, where the deflections within a partition are asymmetric, the deformation behaviour diverges from the assumption of a simple beam with a centrally-applied point load and the calculated strains will be less accurate.

The length of the building in the hogging zone can be cut-off at either 2.5*i* or 3*i* without introducing significant error.

It should always be remembered that the simple beam method is, at best, very approximate. The concept was always to provide a means of predicting strains so that buildings considered to be at risk could be analysed in more detail in a Stage 3 assessment. Nowadays, on large urban tunnelling projects, it is common practice to perform a generic Stage 2 assessment using the methodology proposed by Harris & Franzius (2006) rather than analysing individual buildings. It is likely that using simple numerical models for this purpose may not be more time-consuming than the simple beam method and will be more accurate.

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How BIM and digital twins can transform construction

Some argue that digital twins are an extension of BIM, others that they are separate. Andy Brown gets deep into the data to explore the relationship between the two and how it might develop in the future.

Just as those not familiar with construction might assume that a tracked and a wheeled excavator or a rigid and articulated truck are pretty much the same, so someone might assume that BIM (Building information modelling) and digital twins are the same.

Digital twins and BIM require organised and standardised data. (Photo: Shutterstock)

After all, they both involve the generation and management of digital data taken from a real-life structure – the digital information of a building or a network of pipes, for example.

They are not the same, although some of the confusion that can surround them, says Mike Turpin, Technology Director at Priestland Consulting and technical advisor for the Centre for Digital Built Britain, is down to a lack of clear definitions.

What is a digital twin?

Turpin says that BIM is "very well defined," but the issue with digital twins is that, even though there are some principles that have been published around the concept, exactly what a digital twin is, "is open to interpretation."

Turpin adds that, "What you've got now is digital twin programmes and projects by various companies. Some of them are effectively just BIM. Some of them are saying, 'let's use the models, let's put a few extra bits of technology in, let's do stuff a little bit better.' I call it BIM plus – in effect, it's adding that little bit extra.

"Then you've got the other end of the spectrum on digital twins, and this usually comes more from the asset owners that approach a digital twin as: what do we want it to do? We need a system that does X, Y, and Z.

"We need to effectively build a data core, organise our data, make sure it's accessible, make sure we've got links between it, but effectively that digital twin has to have an outcome and a driver for why it's existing."

Mark Enzer, Vice Chair, Digital Twin Hub, and strategic advisor at Mott MacDonald, agrees that there is not one accepted definition for digital twins, but doesn't see this as a major issue. "At the moment we are in the phase where there are loads of definitions that people have come up with and those definitions are vying for supremacy… I'm not sure that having a one sentence definition really does it justice.

"I think being able to describe digital twins well is more useful to the industry than just having a single sentence definition."

Regarding the description of what a digital twin is, Enzer says, "The bit where there seems to be consensus on digital twins, is the idea of having a two-way connection between the physical world and the digital world." What is key with a digital twin, though, is that it can enable smarter decisions to be made.

"You can get data from the physical world moving into the digital world and, in the digital world, we can do something useful with the data," adds Enzer.

"We can make sense of it, we can interpret it and we can understand the physical world better, which then means that we can generate these insights, make better decisions."

The role of BIM in digital twins

Without BIM, there would be no possibility of digital twins. BIM organises and standardises data in such a way to make digital twins a possibility.

Regarding BIM and digital twins, Linda Wade, CEO and co-founder of technology company Spinview, says, "We think of them as two sides of the same smart coin. One supports the design, plan and build of a structure – the other connects and manages the building to the people and assets within it.

"A digital twin focuses on the interaction of people with built environments whereas BIM is used for visualisation in design and construction rather than operations and maintenance. The digital twin is generally the representation of a building as digital data."

Enzer says that one of the most vital things that BIM has done is to highlight the importance of information management, and what can be done when the right information is readily available to all stakeholders.

"BIM shows that information really matters and needs to be managed, and that information should be managed through the whole life cycle of assets. Effectively what we are talking about for digital twins is information management. BIM has really laid the foundation," he comments.

Why digital twins are important

The unbelievably intelligent people that who developed BIM not only laid these foundations but also had an eye on what could come next, says Enzer. "BIM has established a fantastic foundation in information management and we can build on that foundation.

"To give credit to some of the people who originally thought about BIM, they did anticipate this, right at the beginning, they did imagine that you could keep making connections and you could go beyond an information model for an individual building."

It has been established that BIM is the foundation of digital twins and that digital twins are not as well defined as BIM – there is some debate as to what exactly constitutes a digital twin.

Leaving this aside for now, the purpose of digital twins seems clear: to provide updated digital information about an asset to enable better decision making.

One of the aims of digital twins that may not be so common at the moment is for them to be used as predictive models.

For example, a digital twin of a sports stadium could be run as a model to predict how much energy it will use in the next five years, or even simulate what would need to happen to expand capacity and extend one of the stands.

A digital twin not only looks like the building, it behaves like the building, responding to operational conditions and building occupancy to, ideally, produce an invaluable operational asset.

"Simulation allows facility managers the chance to plan changes and adjustments backed by data to see how they'll effect the workplace or building performance," says Wade from Spinview.

"Management through digital twins can refer to space management, asset management and workforce management all governed using data. The digital twin is the living breathing building made digital."

Realising the potential of digital twins

Being able to have an accurate simulation of a physical asset is no easy feat, though, as it means every aspect must be digitised. "If you want a link to all kinds of sensor data and monitoring, and occupancy and heat and CO2 levels and that kind of information, then it is still quite a way off for a lot of people," says Turpin.

He adds that these digital twins would have great value, but are perhaps some way off for most in construction.

"That kind of digital twin is, for me, still a bit of an ambition. How do you realistically fit hundreds or thousands of sensors across a network? How do you power them – is 4G or 5G signal good enough? Do you link it back another way? How do you deal with that data, who supplies it? What about the cost?"

As Turpin points out, there are legitimate questions to be asked about the implementation of digital twins.

However, there is no doubt that they have massive potential to transform the efficiency of the whole life cycle of construction – digital twins provide a benefit during construction but arguably an even bigger one following construction.

Being able to monitor, in real time, how an asset is operating and model how it might operate in the future is invaluable for the asset owners.

It is due to this that Enzer says the push for digital twins will come from 'downstream'. "I think the drive is likely to come from the client organisations because there's a whole life cycle after construction where these digital twins will be useful," he says.

"I suspect that client organisations will start asking for them. We already see that, it's already happening because the biggest value comes downstream."

As well as being able to provide digital simulations of a real-life physical asset, such as a stadium, or a bridge or an office building, the next step for digital twins is for them to connect to each other.

"The concept of digital twins goes beyond individual buildings," says Wade. "Where BIM typically focuses on a single building, a digital twin can encompass multiple interconnected buildings or communities to simulate how things will look and interact in a huge range of different scenarios."

Building smart cities

The concept of digital twins that are connected to each other ties into the concept of so-called smart cities.

These are places where data is gathered and used to manage assets, resources and services efficiently. In short, the data is used to improve operations across the city.

Digital twins could lead to an increase in 'smart cities'. (Photo: AdobeStock)

"One of the things we want to try and facilitate is having connections between digital twins. If you've got a digital twin of your building and I've got a digital twin of my building and there's a digital twin of the transport system, let's get the digital twins to talk to each other," says Enzer.

"Those connections between digital twins end up being really useful in a smart city and actually it becomes almost like a foundational infrastructure for the smart city."

Such smart cities with connected digital twins may well be where the sector is headed, but it won't become commonplace for many years, if not decades.

For the here and now, perhaps we shouldn't get too worried about the specific definition of what a digital twin is – a digital twin for a hospital or a nuclear power station will have very different requirements.

"As long as it's providing help and benefit, if this digital twin is really basic, and this one's complicated and technically advanced, does it matter that you call them the same thing, even though one's far superior to the other?" says Turpin.

"We had the same issue with BIM at the start when people were saying, 'I'm doing a 3D model and that's BIM' and other people said, 'no, you've got to be following a standard'. There were different levels of BIM."

However the future of digital twins develops, the number one thing required for them to work is to have organised data – those working on BIM and implementing it into their systems are, even if they don't know it, playing a vital role with the development of digital twins.

(Andy Brown / construction TECHNOLOGY, 18 October 2022, https://www.constructiontechnology.media/news/how-bim-and-digital-twins-can-transform-construction/8023953.article?utm)

ΝΕΑ ΑΠΟ ΤΙΣ ΕΛΛΗΝΙΚΕΣ ΚΑΙ ΔΙΕΘΝΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΝΩΣΕΙΣ

International Society for Soil Mechanics and Geotechnical Engineering

ISSMGE News & Information Circular October 2022

www.issmge.org/news/issmge-news-and-information-circular-October-2022

1. PRESIDENTIAL REPORT JUNE 2022

The President of the ISSMGE, Dr Marc Ballouz, has prepared a short video report on his activities during June 2022, available from https://www.youtube.com/watch?v=FGZLafq77Ow.

2. ISSMGE INTERACTIVE TECHNICAL TALKS: A NEW EDUCATIONAL INITIATIVE BY THE PRESIDENT OF ISSMGE

The President of ISSMGE Dr. Marc Ballouz has launched a new educational initiative titled ISSMGE Interactive Technical Talks (IITT). It represents a series of technical talks to bring together geo professionals from around the world, young and renowned, from both the academia and the industry, to discuss a certain subject of geotechnical engineering. For more information and to view the first episode please go to https://www.issmge.org/news/issmge-interactive-technical-talks-a-new-educational-initiative-by-the-president-of-issmge.

3. ISSMGE BULLETIN

The latest edition of the ISSMGE Bulletin (Volume 16, Issue 4, August 2022) is available from the website.

4. ISSMGE FOUNDATION

The next deadline for receipt of applications for awards from the ISSMGE Foundation is the 31st January 2023. Click **here** for further information on the ISSMGE Foundation.

5. CONFERENCES

For a listing of all ISSMGE and ISSMGE supported conferences, and full information on all events, including deadlines, please go to the Events page at https://www.issmge.org/events. However, for updated information concerning possible changes due to the coronavirus outbreak (ie. postponements, cancellations, change of deadlines, etc), please refer to that specific events website.

As might be expected, many events have been rescheduled and we update the Events page whenever we are advised of changes.

The following are events that have been added or amended since the previous Circular:

ISSMGE EVENTS

NATIONAL WORKSHOP ON TRANSPORTATION GEOMECHANICS AND GROUND IMPROVEMENT - 24-11-2022 - 25-11-2022 Novotel Sydney on Darling Harbour, Pyrmont, English; Organiser: The Transport Research Centre (TRC), University of Technology Sydney (UTS); Contact person: Van Le ; Address: University of Technology Sydney; Email: van.le@uts.edu.au; Website: https://events.humanitix.com/trc22workshop

9TH INTERNATIONAL CONGRESS ON ENVIRONMENTAL GEOTECHNICS - 25-06-2023 - 28-06-2023 Chania, Crete, Greece; Language: English; Organiser: Chair: Dimitrios Zekkos, University of California at Berkeley; Contact person: Dr. Rallis Kourkoulis, Email:rallisko@grid-engineers.com; Website: https://iceg2023.org; Email: zekkos@berkeley.edu

CHARLES-AUGUSTIN COULOMB : A GEOTECHNICAL TRIBUTE - 25-09-2023 - 26-09-2023 Paris, France; Language: English; Organiser: CFMS (French Committee for Sols Mechanics and Geotechnical Engineering; Contact person: CFMS Insavalor; Address: 66, Boulevard Niels Bohr; Phone: +33 (0)4 72 43 64 23; Email: cfms.secretariat@geotechnique.org; Website : https://www.cfms-sols.org/organisees-par-le-cfms/charles-augustin-coulomb-geotechnical-tribute

Results of the 20th International Geotechnical Conference in Sydney (Australia)

Askar Zhussupbekov, TC305, 01-10-2022

May 1-5, 2022 hosted the 20th International Geotechnical Conference in Sydney (Australia). 1338 participants took part in the work of this international scientific forum, including 503 in online mode and 836 in offline mode from 76 countries of the world. On May 4 in Sydney (Australia) was held a technical section on TC 305 - Geotechnical infrastructure of megacities and new capitals, which is under the patronage of the Kazakhstan Geotechnical Society and Geotechnical Institute under the L.N. Gumilyov Eurasian National University.

Delegation of ENU in 20 ICSMGE

Five speakers from India, South Korea, Romania, Japan and Kazakhstan took part in the T 305 section. An order of 50 participants from this section of 20 ICSMGE was present (Photo 1).

The moderator of this section was Professor of the Department of Construction, Director of the Geotechnical Institute, Chairman of the Technical Committee TC 305 (ISSMGE), Prof. A.Zh. Zhussupbekov.

Moderator of TC 305 session Prof. Askar Zhussupbekov

Report of ISSMGE Vice-President for Asia, Professor of Incheon National University, Prof. Eun Chul Shin was dedicated to the Time capsul project in the experience of geotechnical achievements in South Korea.

The presentation of Prof. A. Boominathan of the Indian Institute of Technology (Chennai) was dedicated to the impact of explosive springs on the destruction of old buildings and constructions on neighboring facilities and the environment.

Group photo with Vice-President Elect of ISSMGE for Asia Prof. Keh-Jian Shou (from left to right: Shakeyev Zh. (Consul of the Republic of Kazakhstan in Australia), Kalizhanov M.U. (General Consul of the Republic of Kazakhstan in Australia), Prof. Askar Zhussupbekov, Dr. Fuchen Teng)

Professor Y. Iwasaki (Geo-Research Institute, Japan) presented his report on geotechnical studies of cranes, buildings and structures caused by an incorrect decision of geologists in the study of mechanical properties of foundations. At the same time there was an international geotechnical exhibition, which was also represented by the Geotechnical Institute of the L.N. Gumilyov Eurasian National University. The Consulate General of Kazakhstan in Australia provided technical support to the organization of the exhibition of the L.N. Gumilyov Eurasian National University.

Group photo with delegation from CTGS (Taiwan) and Czech and Slovak Geotechnical Society

Group photo with Past President of ASCE Prof. Jean-Louis Briaud (USA) and Mr. Nikolai Oleinik General Director of Len TISIZ Ltd (Russia)

Group photo with Kyrgyzstan, Korean and Uzbekistan delegations

On May 5, sections TC 208 and sections CAPG were held, where geotechnical scientists from the L.N. Gumilyov ENU: Prof. A.Zh.Zhussupbekov, Ph.Dr. A. Omarov, Ph.Dr. I. Zhumadilov, doctoral student A. Buranbayeva and Prof. I. Drozdova, SPBGASU (Russia) made a report on the topic related to the strengthening of the soil overburden of the railway in Nur-Sultan.

Also a joint report on the topic of comparing the results of experimental and numerical studies of the work of hurricane piles LRT was performed by the L.N. Gumilyov ENU team (authors Prof. A. Zhussupbekov, Dr. Ph. N. Shakirova, Ph.D. A. Omarov, PhD student A. Buranbayeva. At the closing ceremony of the 20th ICSMGE it was announced that the venue for the next meeting of the ISSMGE Board and the ISSMGE Council of delegates from 90 countries of the world will be the city of Nur-Sultan at the ENU base, which will take place on May 14-18, 2023 in the city of Nur-Sultan before the 17th Asian Regional Geotechnical Conference.

Awarding Ceremony of ISSMGE Board (2017-2022)

Plenary Session of 20 ICSMGE

It was also reported that the venue for the 21st ICSMGE will be Vienna (Austria) in 2026. On May 5, a technical tour of the construction sites of the metro in Sydney was held with the participation of doctoral students of the Department of Civil Engineering of ENU (Elena Bragar and Askar Yessentayev) with the scientific director Prof. Askar Zhussupbekov.

On May 6, the ENU delegates Gumilyov and scholars from Uzbekistan, Kyrgyzstan, Singapore, and Indonesia were invited to visit the University of Technology in Sydney (UTS).

Technical visit of geotechnical laboratories of UTS

Professor A. Zhussupbekov read a lecture to scholars and students of UTS and foreign specialists on the topic, dedicated to megaprojects and mega-assemblies in difficult soil conditions of Kazakhstan. At the closing ceremony of the technical seminar at UTS Secretary General 17ARC Dr.Ph. A. Sarsembayeva invited Australian scientists and doctoral students to participate in the work of 17ARC (August 2023) in Nur-Sultan (Kazakhstan). Professor UTS Buddhima Indraratna led the L.N. Gumilyov ENU delegation and a foreign students to the UTS laboratory.

Group photo with Prof. Buddhima Indraratna (UTS)

It should be noted that two doctoral students of the L.N. Gumilyov Eurasian National University (Elena Bragar and Askar Yessentaev) went on an internship after 20 ICSMGEs (45 days) at the University of Adelaide (Australia) at the invitation of Professor Mark Jaksa (Chairman of the Program Committee 20 ICSMGE).

Head of the Kazakh delegation Prof. A.Zh. Zhussupbekov expresses gratitude to the members of the L.N. Gumilyov ENU delegation (Dr. N. Alibekova, Dr. A. Sarsembayeva and PhD Students: A. Montayeva, A. Zhankina, B. Abdrakhmanova, A. Yessentayev, E. Bragar), as well as a scientists from Uzbekistan (Prof. F. Ikramov, Prof. M. Yakubov, Prof. A. Khasanov and Associate Professor Z. Khasanov from Samarkand State Architectural and Construction Institute), Secretary General of the Kyrgyz Geotechnical Association Dr.Ph. G. Kadyralieva, member of the Belarusian Geotechnical Association T. Tronda for the preparation and organization of the International Exhibition 17ARC in Sydney at the time 20 ICSMGE. Kazakhstan

Geotechnical Society and Geotechnical Institute express recognition of the administration the L.N. Gumilyov Eurasian National University, ISSMGE and the Organizing Committee 20 ICSMGE for the support of the Kazakh delegation in the work of 20 ICSMGE (Australia), deep thanks for General Consulate of Kazakhstan in Sydney Kalizhanov M.U. (General Consul of the Republic of Kazakhstan in Australia), Shakeyev Zh. (Consul of the Republic of Kazakhstan in Australia) and special thanks to "MeRAY Studio" for providing with costumes in Kazakh national style.

SYDNEY ICSMGE 2022
A GEOTECHNICAL DISCOVERY DOWN UNDER

Certificate of Attendance

This is to certify that

Prof Askar Zhussupbekov

has attended

ICSMGE 2022: INTERNATIONAL CONFERENCE ON SOIL MECHANICS AND GEOTECHNICAL ENGINEERING

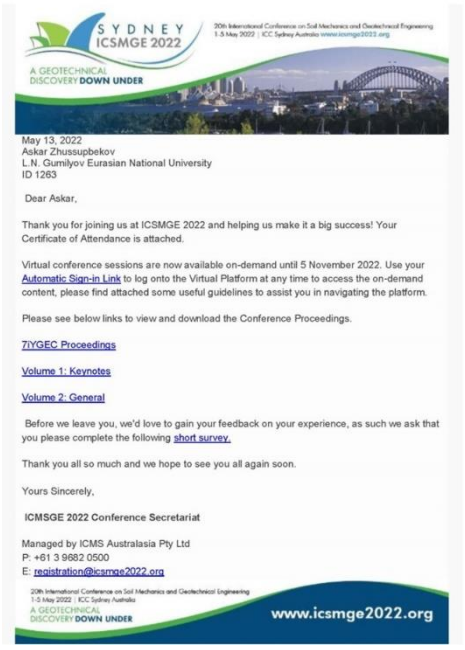
held from

Sunday, May 1, 2022 - Thursday, May 5, 2022

Prof John Carter, Conference Chair
Mr Graham Scholey, Conference Co-Chair
Prof Mark Jaksa, Scientific Program Chair

www.icsmge2022.org

Certificate of Attendance



SYDNEY ICSMGE 2022
A GEOTECHNICAL DISCOVERY DOWN UNDER

May 13, 2022
Askar Zhussupbekov
L.N. Gumilyov Eurasian National University
ID 1263

Dear Askar,

Thank you for joining us at ICSMGE 2022 and helping us make it a big success! Your Certificate of Attendance is attached.

Virtual conference sessions are now available on-demand until 5 November 2022. Use your Automatic Sign-in Link to log onto the Virtual Platform at any time to access the on-demand content, please find attached some useful guidelines to assist you in navigating the platform.

Please see below links to view and download the Conference Proceedings.

7iYGEC Proceedings

Volume 1: Keynotes

Volume 2: General

Before we leave you, we'd love to gain your feedback on your experience, as such we ask that you please complete the following short survey.

Thank you all so much and we hope to see you all again soon.

Yours Sincerely,

ICMSGE 2022 Conference Secretariat

Managed by ICMS Australasia Pty Ltd
P: +61 3 9682 0500
E: registration@icsmge2022.org

www.icsmge2022.org

Appreciation letter from Organizing Committee of 20ICSMGE

Extension of Abstract Submission Deadline for the 11th International Conference on Scour and Erosion (ICSE-11) Denmark 2023

Shinji Sassa, TC213, 05-10-2022

The abstract submission deadline for the 11th International Conference on Scour and Erosion (ICSE-11) has been extended to 20 October 2022: https://icse11.org/abstract-submission.

TC218 Meeting Minute - July 2022

Giulia Lugli, TC218, 11-10-2022

To download the file, please click on the link below:

https://www.mygeoworld.com/file/139881/tc218-meeting-minute-july-2022

Next conference call will be on **Wednesday Oct 12th, 2022 12 PM (UTC)**.

If anyone wishes to join TC218 Committee, please feel free to contact:

Shahriar Mirmirani - smirmirani@recocanada.com - TC218 Secretary
Giulia Lugli - g.lugli@maccaferri.com - TC218 Chairman

TC218 Participation to the ISSMGE Time Capsule 2022

Giulia Lugli, TC218, 11-10-2022

TC218 contribution to ISSMGE Time Capsule Project was decided to be a video regarding the Past, Present and future of our industry/field.

A video, 11 minutes long, was prepared and sent to ICSMGE Conference organizers.

The video can be found by clicking on the link shown on the TC218 main webpage

https://www.issmge.org/committees/technical-committees/applications/reinforced-fill-structures

The video was presented during the ICSMGE Conference in Sydney, May 2022.

2nd ISSMGE TC217 Online Seminar Series: 1st Seminar on 20th October 2022

Siau Chen Chian, TC217, 15-10-2022

Following the success of the first seminar series last year, the executive committee of TC217 is hosting a 2nd series of land reclamation online seminars. The details of the 1st seminar is provided below.

Seminar Programme:

Title: Adaptation of Deep Cement Method in Tung Chung East Reclamation

Speaker: Henry KT Cheung, Sustainable Lantau Office, Civil Engineering and Development Dept, HKSAR

Time: 7pm (GMT+8h)

Registration link: https://us06web.zoom.us/webinar/register/WN_sjkUrGDHRY6JOIlv9HkRXg

Attendees of the full series of 5 seminars would be provided a certificate of attendance from the ISSMGE TC217 Chair as a gesture of appreciation of support to the seminars.

We look forward to receiving your registration and meeting you in the seminar.

Sincerely,
A/Prof Darren Chian
Secretary, TC217 Land Reclamation

Special Issue on Reinforced Fill Structures by ISSMGE TC218 published!

ISSMGE IT Administrator, General, 20-10-2022

We are pleased to announce the Special Issue #2 of Volume #7 of the International Journal of Geoengineering Case Histories, an official Journal of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE).

This Special Issue of the ISSMGE International Journal of Geoengineering Case Histories presents six well-documented case studies combining different reinforced fill structures in terms of application (simple walls, slopes, railway and highway embankments, bridge abutments, back-to-back walls, and arch bridges), environment (including urban), backfill (including marginal soils), facing type (masonry blocks, wrapped, welded wire mesh, and precast concrete panels), and reinforcement material (geogrids, polymeric straps, steel ladders and meshes). Different design method approaches and a wide range of wall heights appear in the case studies presented. Thus, most reinforced fill structure types are well-represented in this Special Issue, covering many companies and systems, both well-established and newer, providing a good representation of the market.

Papers published in this refereed journal are freely available in color and are accompanied by databases that include the electronic data presented in the paper as well as additional figures (as necessary). The locations of the case histories are also positioned in the IJGCH Geographic Database.

Click the links below to download and read the papers of the latest issue of the journal and access the digital data.

Papers published in this journal are downloaded many thousands of times. Please consider the International Journal of Geoengineering Case Histories for the publication of well-documented case histories.

Paper Title: Editorial, pp. i-iii
Authors: Ivan P. Damians, Giulia Lugli
Click to download

Paper Title: The Introduction of MSE Wall Elements into the BIM Technology: The S7 Skomielna Biala Chabowka Project of an MSE Abutment in Poland, pp. 112
Authors: Fabrizia Trovato, Giulia Lugli, Giacinto Intrevado
Click to download

Paper Title: The D4R7 Reinforced Soil Retaining Walls in Bratislava, Slovakia, pp. 13-33
Authors: Elena Gil, Carlos Serrano, Carlos Pereira, Pedro Osso, Juan Lima, Ivan P. Damians
Click to download

Paper Title: Drainage Reinforced Geocomposite for Marginal and Cohesive Slopes and Walls, pp. 3448
Authors: Nicola Brusa, Patrick Naughton, Pietro Rimoldi
Click to download

Paper Title: Vertical Expansion of Residential Land Using Reinforced Earth Walls Case Study of Cerro Artola, pp. 4961
Authors: Sergi Conesa, Félix Enrique González
Click to download

Paper Title: Segmental Retaining Wall Reinforced with Geogrids, in New Hospital Works (Salamanca, Spain), pp. 62-71
Authors: Marco Tomás Rodríguez Martínez, Patricia Amo Sanz
Click to download

Paper Title: Masonry Arch Bridges with Reinforced Soil Spandrel Walls, pp. 7282
Authors: Colin JFP Jones, Chiado Doulala-Rigby
Click to download

About the journal and this announcement

The ISSMGE International Journal of Geoengineering Case Histories is an official journal of the International Society for Soil Mechanics and Geotechnical Engineering, focusing on the publication of well- documented case histories.

The truly open-source mission of the journal is funded annually by companies and organizations that have an action-based commitment to the advancement of the geoengineering profession. These organizations are acknowledged on our website and in every single paper of the journal. More information on our funding program can be found here. Send us an email if you are interested in being part of this unique publication.

IJGCH is proudly funded by Shamsher Prakash Foundation, Dar Group, Geosyntec Consultants, ConeTec and ENGEO. Our sponsors make possible the circulation of the journal to thousands of readers at no cost.

Call for Nomination for the 3rd John Burland Lecture

Michele Calvello, TC306, 24-10-2022

Announcement

The ISSMGE and the Technical Committee TC306 on Geoengineering Education have established the John Burland Lecture in recognition of Professor Burland's outstanding impact on Geotechnical Engineering Education. Starting in 1987 with his landmark Nash Lecture at the 9th ECSMFE in Dublin, The teaching of soil mechanics: a personal view, Professor Burland consistently distilled his thoughts on education in papers that influenced many instructors and authors of later papers on geotechnical education. Moreover, he has created quality online educational materials, short videos that present masterfully fundamental geotechnical concepts.

As stated in the letter addressed by TC306 to the ISSMGE President and Board proposing the establishment of an ISSMGE TC306 Honour Lecture:

The John Burland lecturers should have left traces of their contributions to the teaching of geotechnical engineering education, public body of work, either published or publicly available. The producers of educational material with evidence of wide use by others clearly belong in this category, e.g. authors of influential textbooks.

The lecture is to be given at the opening plenary session of the International Conference on Geotechnical Engineering Education (GEE) organized by TC306 every four years and will then be available online as an ISSMGE webinar. The

1st John Burland Lecture was delivered by Professor John Atkinson at the conference Shaping the Future of Geotechnical Education held in Belo Horizonte, Brazil, in 2016, and the 2nd John Burland Lecture was delivered by Professor Mark Jaksa at the conference Geotechnical Engineering Education 2020, streamed from Athens, Greece. The 3rd Lecture will be given at GEE 2025 (location to be established).

Nominations for the 3rd John Burland Lecture should be made through the TC306 members and/or National Societies to the selection committee (see procedures below) chaired by David Airey. A **letter substantiating the nomination and a CV of the nominee** (including list of publications) should be sent to Professor David Airey (david.airey@sydney.edu.au) and to the secretary of TC306 Professor Michele Calvello (michele.calvello@gmail.com) **by December 17, 2022**.

Procedures established by TC306 Meeting (combined E-mail/Online), April 9-15, 2021

All members of TC306 and all national SSMGEs can submit nomination packages, consisting of (i) a letter substantiating the suitability of the nominee as described in the announcement of the call for nomination and (ii) a CV of the nominee. National Societies can nominate one of their members (the more support the better, e.g. not only from the national society but also from its education committee, if it happens to have one). Members of TC306 can nominate any suitable candidate (member of the ISSMGE). A selection committee is formed by the three latest John Burland Lecturers. If one of the three is not available, he/she is replaced by a past chair [1]. The task of the selection committee is to choose three nominations; TC306 members then choose the next John Burland Lecturer by voting among these three nominations.

Excerpt from Guidelines for ISSMGE Technical Committees and ISSMGE Honour Lectures (reviewed October 2022)

The TC recommends the name of the ISSMGE Honour Lecturer. In that process, the TC shall consider at least three alternative candidates. All TC members can propose candidates. The TC members shall then rank the candidates. All nominated TC members shall have the opportunity to vote remotely*, with a minimum 2-week election period. The selected candidate shall have the support of at least 50% of the TC members.

The Lecturer shall be a member of the ISSMGE and be recognised as a national or international expert within the field of the topic. This would normally mean that the Lecturer has published several papers, books, or other publications on the topic. Alternatively, the Lecturer may have made a recent major contribution to the Topic.

The selection criteria shall not include nationality of the Lecturer, i.e., a Lecturer may come from the same country or continent as the previous Lecturer. There are no requirements as to education or position. Practicing engineers and persons from academia are equally eligible.

The TC Chair shall first inform the ISSMGE President and the TOC the name of the selected Lecturer. If there is some disagreement with the proposed Lecturer, one or several alternative candidates should be proposed to the TC Chair. If an agreement cannot be reached, the TC chair should make the final decision in consultation with the Chair of the TOC.

* The ADoodle system (https://adoodle.org/) is recommend. All the TC members with right to vote need to be included in the voting email-list. The TOC chair shall be included as an observer.

[1] Because no past chair was available for the selection committee for the 3rd John Burland Lecturer, the committee consists of the 1st and the 2nd John Burland Lecturers and the vice chair of TC306.

2nd ISSMGE TC217 Online Seminar Series: 2nd Seminar on 10th November 2022

Siau Chen Chian, TC217, 27-10-2022

Following the success of the first seminar series last year, the executive committee of TC217 is hosting a 2nd series of land reclamation online seminars. The details of the 2nd seminar of the series are provided below.

Seminar Programme:

Title: Geotechnical Issues in Japanese Land Reclamation Projects and Marine Soil Characterization

Speaker: Professor Yoichi Watabe, Hokkaido University, Sapporo, Japan

Time: 7pm (GMT+8h)

Registration link: https://us06web.zoom.us/webinar/register/WN_rbbzGOTiTI-TD66DgQYHFw

Attendees of the full series of 5 seminars would be provided a certificate of attendance from the ISSMGE TC217 Chair as a gesture of appreciation of support to the seminars.

We look forward to receiving your registration and meeting you in the seminar.

Sincerely,
A/Prof Darren Chian
Secretary, TC217 Land Reclamation

ISRM International Society for Rock Mechanics and Rock Engineering

News
https://www.isrm.net

ISRM Council Meeting, 16 October 2022: News Release

The ISRM held its 2022 Council meeting on 16 October in Asunción, Paraguay, in conjunction with the Latin American Rock Mechanics Symposium LARMS2022 and 2022 ISRM International Symposium. 45 National Groups were represented at the Council, which was also attended by the Board members, the Past President Eda Quadros and observers from the National Groups. The annual Board meeting and the Commission meetings took place before the Council.

Membership of the ISRM

The ISRM has an all-time record of 8911 individual members and 174 corporate members, belonging to 58 National Groups. The National Group of Sri Lanka was approved in the Board meeting.

2024 ISRM International Symposium will be in New Delhi, India

The National Group of India presented an excellent proposal to host the 2024 ISRM International Symposium in New Delhi. Being the only application received for this year, the Council approved it by acclamation.

Korea to host the 16th ISRM International Congress on Rock Mechanics in 2027

Three National Groups presented excellent proposals to host the 16th ISRM International Congress on Rock Mechanics in Beijing, China, in Christchurch, New Zealand and in Seoul, Korea. The Council selected the Korean proposal. The Congress will take place 17-23 October 2017.

Derek Martin, from Canada, will receive the 9th Müller Award

The Müller Award is the most prestigious award of the ISRM, made once every four years at the ISRM Congress, in recognition of distinguished contributions to the profession of rock mechanics and rock engineering. Four nominations were received: Derek Martin from Canada, Manchao He from China, Marc Panet from France and Nielen van der Merwe from South Africa. Prof. Derek Martin was selected by the Council to receive the award. He will deliver the Müller Lecture during the 16th ISRM International Congress in Salzburg, Austria, in October 2023.

ISRM Award winners were announced

Rocha medal 2023: The Rocha Award Committee selected the winner of the Rocha Medal 2021 and two runners-up.

Winner: Jun Zhao, from China, with the thesis "Study on time-dependent failure mechanism and long-term stability of hard rock in deep buried tunnel" presented at the Northeastern University, China.

Runner-up: Rupesh Verma, from India, with the thesis "A combined theoretical-experimental-numerical approach to characterization and modelling of rock fracture and rock burst" presented at the University of Adelaide, Australia.

Runner-up: Cyrille Couture, from Canada, with the thesis "Mechanical characterization of porous sandstones in true triaxial conditions: diffuse and localized deformation, effect of anisotropy" presented at the Université Grenoble Alpes, France.

John Hudson Rock Engineering Award 2022: This award is conferred on individual or corporate members of the ISRM in recognition of achievements in engineering practice and was given to Dr Christine Detournay, USA.

Science Achievement Award 2022: This award recognizes outstanding contributions to science and technology in the field of rock mechanics and rock engineering, and was conferred on Prof. Jean Sulem, nominated by the NG France.

Young Rock Engineer Award 2022: This award acknowledges excellence in the field of rock engineering by ISRM members who are in early stages of their career and was conferred on Dr Yota Togashi, nominated by the NG Japan.

ISRM Board meeting held on 14-15 October

The ISRM Board met in a physical meeting from the first time since the end of the Covid-19 pandemic prior to the Council meeting. However, four Board members could not travel and the meeting was also attended by them by videoconference. A detailed discussion on the past activities took place and decisions were taken for future activities.

10th ISRM Young Members' Seminar 2022-10-21

The ISRM Young Members' Seminar (YMS) Series is a new ISRM Young Members Group initiative. It consists of a series of virtual events to provide a global platform for ISRM young members to share knowledge, experiences, and ideas. More details on the YMS are available on this page.

The 10th ISRM Young Members' Seminar will take place on 27 October at 13h00 UTC, with speakers from Spain and Canada:

- Application of recent fracture mechanics criteria to notched rock fracture analysis - Dr Jon Just Urratia (Sener Enginería Systems, Spain)

- Differentiating cratering mechanisms in rock blasting based on geomechanical characterization - Dr Jonathan Aubertin (Université du Québec, Canada)

You can join using the Zoom link created for each Seminar and participate in the question and answers period. The Seminars will also be live-streamed to the ISRM YM's YouTube channel, where they will be stored. **Click here to download the flyer**.

Stay tuned for details on the next edition from the YMS organising committee.

Sevda Dehkhoda
Chair of the ISRM Young Members Committee

Derek Martin, from Canada, will receive the 9th Müller Award 2022-10-22

The Müller Award is the most prestigious award of the ISRM, made once every four years at the ISRM Congress, in recognition of distinguished contributions to the profession of rock mechanics and rock engineering. Four nominations were received for the 9th Müller Award: Derek Martin from Canada, Manchao He from China, Marc Panet from France and Nielen van der Merwe from South Africa.

Prof. Derek Martin was selected by the IRSM Council, at its meetind in Asunción, Paraguay, on 16 October, to receive the award. He will deliver the Müller Lecture during the 16th ISRM International Congress in Salzburg, Austria, in October 2023.

Winners of the ISRM awards were announced 2022-10-23

Science Achievement Award 2022

This award recognizes outstanding contributions to science and technology in the field of rock mechanics and rock engineering, and was conferred on Prof. Jean Sulem, nominated by the NG France.

John Hudson Rock Engineering Award 2022

This award Is conferred on individual or corporate members of the ISRM in recognition of achievements in engineering practice and was conferred on Dr Christine Detournay, USA.

Young Rock Engineer Award 2022

This award acknowledges excellence in the field of rock engineering by ISRM members who are in early stages of their career and was conferred on Dr Yota Togashi, nominated by the NG Japan.

Rocha medal 2023

The Rocha medal is awarded annually for an outstanding

doctoral thesis. The Rocha Award Committee selected the winner of the Rocha Medal 2023 and two runners-up. The winner will deliver the Rocha Lecture during the 16th ISRM International Congress in Salzburg, Austria, in October 2023.

- Winner: Jun Zhao, from China, with the thesis "Study on time-dependent failure mechanism and long-term stability of hard rock in deep buried tunnel" presented at the Northeastern University, China.
- Runner-up: Rupesh Verma, from India, with the thesis "A combined theoretical-experimental-numerical approach to characterization and modelling of rock fracture and rock burst" presented at the University of Adelaide, Australia.
- Runner-up: Cyrille Couture, from Canada, with the thesis "Mechanical characterization of porous sandstones in true triaxial conditions: diffuse and localized deformation, effect of anisotropy" presented at the Université Grenoble Alpes, France.

Venue of the 2027 ISRM International Congress and of the 2024 International Symposium decided by the Council 2022-10-24

Three National Groups presented excellent proposals to host the 16th ISRM International Congress on Rock Mechanics in Beijing, China, in Christchurch, New Zealand and in Seoul, Korea. The Council selected the Korean proposal. The Congress will take place 17-23 October 2027.

The National Group of India presented an excellent proposal to host the 2024 ISRM International Symposium in New Delhi. Being the only application received for this year, the Council approved it by acclamation.

ASSOCIATION INTERNATIONALE DES TUNNELS ET DE L'ESPACE SOUTERRAIN
ITA
AITES
INTERNATIONAL TUNNELLING AND UNDERGROUND SPACE ASSOCIATION

Scooped by ITA-AITES #77, 11 October 2022

Philippines-Japan strengthens partnership on construction, operation & maintenance of road and tunnel infrastructure

Taiwan is transforming unused metro stations into underground vertical farms

HS2 Chiltern tunnel – 'Florence' and 'Cecilia' reach 4 mile point at Chalfont St Giles | UK

First underground station of Pune Metro to be ready next month | India

China's Longest Trunk Highway Tunnel Starts Roof Casting in Jiangsu

LTA's large diameter EPBM contract awarded in Singapore

Korea builds underground physics laboratory to look into mysteries of universe

Undersea expressway tunnel in north China built

Tunnelling Begins on Vancouver's Broadway Subway Project - Canada

New underground project pioneers renewable energy storage | Switzerland

Scooped by ITA-AITES #78, 25 October 2022

The Spanish government reactivates the tunnel project to link Morocco with Spain

Fehmarnbelt Tunnel - part of sustainably connected Europe - Denmark

Cross River Rail's digital twin revolution | Australia

Uttar Pradesh: RRTS sees first tunnel breakthrough | India

hyperTunnel unveils underground structure built entirely by robots | UK

Montreal's REM bores tunnel under sensitive airport lands | Canada

First underground metro: Work finally starts in Dec | Bangladesh

Finland to store nuclear waste underground through new system

Tunnel operation | China

Malaysia-China joint train project sees another breakthrough | Malaysia

Building the world's deepest underground laboratory | China

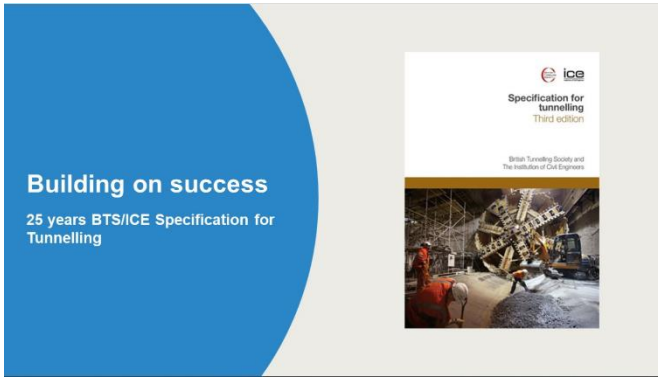
Stop repairing Tobin Bridge, replace it with a tunnel | United States of America

BRITISH TUNNELLING SOCIETY

BTS/ICE Specification for Tunnelling 4th Edn : Collaborating for sustainability

Speakers: Christoph Eberle

11th October 2022 (as a part of BTS Conference 2022)



https://www.youtube.com/watch?v=Rk0UMVfynIA

Additional Austroads technical specifications for bridgeworks released

Austroads has delivered eight new technical specifications detailing guidance on earthworks and bearings associated with bridgeworks.

"This addition to the series of Austroads technical specifications represents essential access to guidelines for bridge construction for both industry and jurisdictions" said Ross Guppy Transport Infrastructure Program Manager at Austroads. "These documents will provide guidance that allows for clarity and consistency in every aspect of bridge construction."

- ATS 5110: Earthworks for Bridgeworks
- ATS 5120: Construction of Reinforced Soil Structures
- ATS 5140: Post-Tensioned Ground Anchors
- ATS 5510: Supply of Plain Elastomeric Bearings
- ATS 5520: Supply of Laminated Elastomeric Bearings
- ATS 5530: Supply of Pot Bearings
- ATS 5540: Supply of Spherical Bearings
- ATS 5570: Installation of Bridge Bearings

Read more

INTERNATIONAL ASSOCIATION FOR ENGINEERING GEOLOGY AND THE ENVIRONMENT

Final results of the new elected IAEG Officers 2023-2026

President: Vassillis Marinos
Secretary General: Faquan Wu
Treasurer: Jean Alain Fleurisson
Vice Presidents for Asia: Ranjan Kumar Dahal & YongSeok SEO
Vice President for Africa: Moshood Niyi TIJANI
Vice President for Australasia: Anthony Bowden
Vice President for Latin America: Víctor Manuel Hernández Madrigal
Vice President for North America: Julien Cohen-Waeber
Vice Presidents for Europe: Helen Reeves & Janusz Wasowski

Congratulations to the new elected board members!

Thank you so much for your involvements and supports!

ΔΙΑΚΡΙΣΕΙΣ ΕΛΛΗΝΩΝ ΓΕΩΤΕΧΝΙΚΩΝ ΜΗΧΑΝΙΚΩΝ & ΓΕΩΕΠΙΣΤΗΜΟΝΩΝ

Βασίλης Μαρίνος
Πρόεδρος της
International Association of Engineering Geology

Ο Δρ. Βασίλης Μαρίνος, Επίκουρος Καθηγητής στον Τομέα Γεωτεχνικής Μηχανικής της Σχολής Πολιτικών Μηχανικών του Εθνικού Μετσοβίου Πολυτεχνείου εξελέγη Πρόεδρος της International Association of Engineering Geology.

Θερμά συγχαρητήρια!

ΠΡΟΣΕΧΕΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΚΔΗΛΩΣΕΙΣ

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

2022 GEOASIA7 - 7th Asian Regional Conference on International Geosynthetics Society, October 31 – November 4, 2022, Taipei, Taiwan, www.geoasia7.org

ATC 2023 18th Australasian Tunnelling Conference 2023 Trends and Transitions in Tunnelling, November 5 - November 8, Auckland, New Zealand, https://atc2023.com

cGts - 50th jubilee Annual conference GEOTECHNICAL ENGINEERING AROUND US AFTER 50 YEARS, 14th and 15th November 2022, Brno, Czech Republic, www.cgts.cz/en

CouFrac 2022 - 3rd International Conference on Coupled Processes in Fractured Geological Media: Observation, Modeling, and Application, November 14-16, 2022, Berkeley, California, USA, https://coufrac2022.org

Piling & Ground Improvement Conference 2022, November 16-18, 2022, Sydney, Australia, https://events.american-tradeshow.com/pilingconference2022

Transport Research Centre

National Workshop on Transportation Geomechanics and Ground Improvement
24 November 2022, Sydney, Australia
https://events.humanitix.com/trc22workshop

The Transport Research Centre (TRC), University of Technology Sydney (UTS) is delighted to welcome you all to attend the **National Workshop on Transportation Geomechanics and Ground Improvement to be held at Novotel Sydney on Darling Harbour on 24 November 2022**.

Closed: TRC calls for applications for young geotechnical engineers to be considered for the award of an ISSMGE "Bright Spark" lecture at the workshop. For more information, visit Applications for Bright Spark Award.

Workshop Chair: Distinguished Prof Buddhima Indraratna

Email: Buddhima.Indraratna@uts.edu.au Mobile: 0400.213.046

Technical Program Coordinator: Dr Trung Ngo (for all technical enquiries)

Email: Trung.Ngo@uts.edu.au Mobile: 0413.469.521

If you have any enquiries about registering or our event in general, please do not hesitate to contact Ms Van Le at Van.Le@uts.edu.au

AUSROCK Conference 2022, 6th Australasian Ground Control in Mining Conference –an ISRM Regional Symposium, 29 November – 1 December 2022, Melbourne, Australia, www.ausimm.com/conferences-and-events/ausrock/

16th ICGE 2022 – 16th International Conference on Geotechnical Engineering, Lahore, Pakistan, 8-9 December, 2022, https://16icge.uet.edu.pk/

#GROUT22 6th International Conference on Grouting and Deep Mixing, January 15-18, 2023, New Orleans, USA, https://www.dfi.org/grout2022

ATA GEOSYNTHETICS CONFERENCE, Feb. 5-8, 2023, Kansas City, MO USA, https://geosyntheticsconference.com

4th African Regional Conference on Geosynthetics – Geosynthetics in Sustainable Infrastructures and Mega Projects, 20-23 February 2023, Cairo, Egypt, www.geoafrica2023.org

International Conference on Advances in Structural and Geotechnical Engineering (ICASGE'23)
6 - 9 March 2023, Hurghada, Egypt
https://icasge.conferences.ekb.eg

The International Conference on Advances in Structural and Geotechnical Engineering "ICASGE" is organized in Hurghada, Egypt in March 2023 by the Structural Engineering Department, Faculty of Engineering, Tanta University, Egypt. The conference is the Fifth in series to be organized after the great success of the previous conferences ICASGE'15, ICASGE'17, ICASGE'19 and ICASGE'21 held in Hurghada, Egypt.

The aim of the conference is to provide a forum for researchers and professionals from various fields related to the theory of structures, soil mechanics and foundation engineering, reinforced concrete constructions, properties and testing of materials, environmental engineering, steel constructions, construction management, etc..., to exchange and discuss the latest findings and experiences. The Conference program

includes invited keynote lectures that are delivered by national and international speakers. The program includes also a number of oral presentations that are presented in parallel sessions.

Conference Topics

- Computational Geomechanics
- Soil Behavior and Modeling
- Soil Improvement
- Problematic Soils
- Geosynthetics
- Geothermal Energy
- Underground Constructions
- Environmental Geotechnics
- Seismic Geotechnics
- Slope Stability
- Rock Mechanic
- Offshore Geotechnics
- Soil-structure Interactions
- Structural Stability
- Steel and Composite Structures
- Cold-formed structures
- High-strength and other steels
- Dynamics and vibration
- Fatigue and fracture
- Innovative Structural Conservation, Repair and Strengthening
- Reinforced Concrete Design and Codes
- Rehabilitation and Strengthening of buildings and structures
- Sustainable and Green Construction Materials
- Durability and Life Prediction of Structures
- Structural Health Monitoring
- Fabrication and construction
- Innovative structures
- Construction Planning and Scheduling
- Safety, Quality and Environmental Management

Contact Us

E-mail address: icasge@unv.tanta.edu.eg

ASIA 2023, 14 - 16 March 2023, Kuala Lumpur, Malaysia, www.hydropower-dams.com/asia-2023

3rd International Conference TMM_CH "Transdisciplinary Multispectral Modelling and Cooperation for the Preservation of Cultural Heritage: Recapturing the World in Conflict through Culture, promoting mutual understanding and Peace", 20-23 March 2023, Athens, Greece, www.tmm-ch.com

Conference on Foundation Decarbonization and Re-use, March 21-23, 2023, Amsterdam, Netherlands, www.dfi.org/2023-conference-on-foundation-decarbonization-reuse

88th ICOLD Annual Meeting & Symposium on Sustainable Development of Dams and River Basins, April 2023, New Delhi, India, https://www.icold2020.org

Rocscience International Conference 2023 Synergy in Geotechnical Engineering, April 24-26, 2023, Toronto, Canada, www.rocscience.com/events/rocscience-international-conference-2023

UNSAT 2023 - 8th International Conference on Unsaturated Soils, 2-5 May 2023, Milos island, Greece, www.unsat2023.org

World Tunnel Congress 2023 Expanding Underground Knowledge & Passion to Make a Positive Impact on the World, 12 - 18 May 2023, Athens, Greece, https://wtc2023.gr

NROCK2022 - The IV Nordic Symposium on Rock Mechanics and Rock Engineering, 24 – 25 May 2023, Reykjavic, Iceland, www.nrock2023.com

Underground Construction Prague 2023, May 29 – 31, 2023, Prague, Czech Republic, www.ucprague.com

17DECGE Danube – European Conference on Geotechnical Engineering, 7-9 June 2023, Bucharest, Romania, https://17decge.ro

SuperPile'23 Piling Design & Construction Conference, June 7-9, 2023, Atlanta, USA, www.dfi.org/superpile2023

3rd JTC1 Workshop on "Impact of global changes on landslide risk",7 – 10 June 2023, Oslo, Norway, https://jtc1-2023.com

ICOLD Annual Meeting 2023
12th to 15th June 2023 in Gothenburg, Sweden
https://icold-cigb2023.se

On behalf of the International Commission of Large Dams/ Commission Internationale des Grands Barrages (ICOLD/ CIGB), it is an honor for me to invite our 104 National Committees to send delegates and their accompanying persons to the 91st Annual Meeting of ICOLD. The meeting will be held in from the 12th to 15th June 2023 in Gothenburg, Sweden.

This 91st Annual Meeting of ICOLD will be hosted by the National Committee of Sweden, SwedCOLD, who have been preparing for several years now. Several excellent Study Tours will be offered before and after the meeting along with our usual ICOLD exclusive Cultural Evening and Technical Excursion. SwedCOLD is also hosting a special symposium as part of ICOLD 2023 themed Management for Safe Dams. The purpose of this symposium is to share information from case studies, technologies, and innovations to increase the safety of dams and levees along with their associated benefits, per-

fectly fitting with the essential commitment of ICOLD to Dam Safety.

I am convinced that the ICOLD 2023 Organizing Committee, led by Maria Bartsch, President of SwedCOLD and former Vice-President of ICOLD, and Anders Isander, Chairman of the Organizing Committee will arrange a wonderful event and a friendly and inclusive reunion of the ICOLD family.

The year 2022 saw dramatic droughts across the northern hemisphere, devastating floods in South Africa and Pakistan, and a global energy crisis compounded by the war in Ukraine. In our changing world, ICOLD must be a key player in offering solutions to climate change adaptation and energy transition. We, dam and reservoir professionals, must pledge to play our full part in the process. Our annual meetings and congresses are milestones in our efforts to achieve these goals.

So, I warmly encourage our ICOLD family and friends to gather for ICOLD 2023 in Gothenburg as we continue the work to meet our mission in setting standards and guidelines to ensure that dams and levees are built and operated safely, efficiently, economically, and are environmentally sustainable and socially equitable. I invite representatives from all 104 ICOLD National Committees to participate in this meeting as we endeavour to meet the challenges of the 21st century in the development and management of the world's water and hydropower resources and to be part of the solution to the crisis that the planet is going through.

SYMPOSIUM THEMES

Management for Safe Dams

T1 - Safety Management of Dams and Levees
T2 - Surveillance and condition monitoring
T3 - Analysis, modelling and decision making
T4 - Rehabilitation and dam safety measures
T5 - Climate & environmental adaptation
T6 - Innovation

SHORT COURSES

Short Course 1: Concrete Dam Modelling

Short Course 2: Static liquefaction of Tailings

Short Course 3: Risk assessment – Current state of practice for tailing dams

Short Course 4: Fundamental Tailings Dam Safety & ICOLD Bulletin 194

SWEDCOLD WORKSHOPS

Workshop 1 – Defect detection in embankment dams

Workshop 2 – Rock engineering issues

Workshop 3 – Best Practices for Tailings Dam Breach Analysis

Workshop 4 – Operational safety of dams and reservoirs

Workshop 5 – Environmental adaptation of dams

Workshop 6 – Capacity Building

Workshop 7 – Strategies and adaptation to a changing climate

Conference Secretariat

Sweden Meetx has been contracted to manage the conference secretariat. If you have any questions or need any further information you are most welcome to contact:

Contact
Email: icold2023@meetx.se
Telephone: +46317088690

9th International Congress on Environmental Geotechnics Highlighting the role of Environmental Geotechnics in Addressing Global Grand Challenges, 25-28 June 2023, Chania, Crete island, Greece, www.iceg2022.org

DFHM8 TORINO 2023 8th International Conference on Debris Flow Hazard Mitigation, 26-29 June 2023, Torino, Italy, http://dfhm8.polito.it

NUMGE 2023 - Numerical Methods in Geotechnical Engineering 2023, 26 - 28 June 2023 Imperial College London, UK, www.imperial.ac.uk/numerical-methods-in-geotechnical-engineering

The Fourth International Conference and Exhibition on
Water Storage and Hydropower Development for Africa
10-12 July 2023, Lake Victoria, Uganda
www.hydropower-dams.com

MISSION

The objective of the regional conferences for AFRICA, co-hosted by Aqua~Media International and ICOLD, in collaboration with the governments of the host countries, is to bring together a group of experts from all parts of the world to focus on issues of specific interest for Africa, in the field of water storage and hydropower development.

Typically, participants include high-level representatives of ministries and utilities, private development groups, consulting practices, international and regional development banks, contractors, and equipment suppliers.

Themes begin with project identification and planning, progress through to financing, design, environmental protection, social aspects, and then construction, operation, maintenance and refurbishment.

Cross-border collaboration for transboundary schemes, challenging sites and climate resilience, as well as capacity building and training, are topics that always feature high on the agenda.

AFRICA 2023 will be the fourth conference and exhibition in this series. The first took place in Addis Ababa, Ethiopia, in 2013, under the auspices of the African Union, with a keynote address from the Commissioner for Energy and Industry. The second was held in Marrakech, Morocco in 2017, under the

High Patronage of HE King Mohammed VI. AFRICA 2019 moved south to Windhoek, Namibia, and had strong participation from NamPower, the Global Water Partnership - Southern Africa, and the Southern African Power Pool. The World Bank, African Development Bank, and the African Union, have all contributed much to the programmes.

CONFERENCE SESSIONS

Session 1: Planning of hydro and water resources development schemes
Session 2: Civil works - Design and construction
Session 3: HYPOSO project developments in Uganda and Cameroon
Session 4: Finance, project structuring and legal issues
Session 5: Transboundary projects
Session 6: Operation and maintenance
Session 7: Materials for dams
Session 8: Hydropower equipment and powerplant safety
Session 9: Work of IEA's Technical Collaboration Programme
Session 10: Dam safety
Session 11: Reservoir operation and hydrology
Session 12: The Ruzizi III regional hydropower project
Session 13: Dam safety in the Nile river basin
Session 14: Climate change and resilience planning
Session 15: Dam monitoring
Session 16: Hybrid renewable energy systems
Session 17: Small hydropower-I
Session 18: Uprating and refurbishment – I
Session 19: Environmental and social aspects – I
Session 20: Small hydropower- II
Session 21: Uprating and refurbishment – II
Session 22: Environmental and social aspects – II
Session 23: Capacity building
Session 24: Spillway safety, operation and innovation
Session 25: Sedimentation management

CONTACT DETAILS

Africa 2023 Secretariat, Event Management Services (EMS)
• email: africa2023@ems-ltd.org • Tel: +44 1225 258 013

S3: Slopes, Support and Stabilization Conference, August 8-10, 2023, Boston, USA, www.dfi.org/s32023

17ARC 17th Asian Regional Geotechnical Engineering Conference, 14-18 August 2023, Nur-Sultan, Kazakhstan, https://17arc.org

ISMLG 2023 – 4th International Symposium on Machine Learning & Big Data in Geoscience, 29 August - 1 September 2023, University College Cork, Ireland, www.ismlg2023.com

IS-PORTO 2023 8th International Symposium on Deformation Characteristics of Geomaterials, 3rd - 6th September 2023, Porto, Portugal, www.fe.up.pt/is-porto2023

12th ICOLD European Club Symposium
"Role of dams and reservoirs in a successful energy transition"
5 to 8 September 2023, Interlakes, Switzerland
www.ecsymposium2023.ch

The Swiss Committee on Dams is happy to invite you to the **12th ICOLD European Club Symposium**, which will be held from the **5th to the 8th of September 2023** in Interlaken.

Joining us will be a great opportunity to participate in the festivities around the 75th anniversary of the Swiss Committee on Dams, founded in 1948.Today, new and unexpected challenges arise for Europe's large array of existing dams, and fresh perspectives on the development of new projects for supporting Europe's energy transition have emerged.

These new challenges are at the core of the themes proposed for development during the Symposium.

The 75th anniversary of the Swiss Committee on Dams will give an excellent opportunity to not only draw from the retrospective of Switzerland's extensive history of dam development, but to also reveal perspectives on the new role of dams for a safer energy transition. This will be particularly commemorated in the Swiss Day sessions.

A series of workshops in various domains of dam design and safety will be proposed prior to the Symposium.

A field visit to the construction site of the new Spitallamm double curvature arch dam will give a flavour of the challenges related to the construction of a new structure at the foot of an existing one. We are eager to meet you in Interlaken in 2023!

Theme A - Dams and reservoirs for hydropower in Europe

- Opportunity for energy generation and storage
- Large-scale storage reservoirs
- Pumped storage reservoirs
- New energy potential (PV, ...)
- Efficiency increase of existing schemes

Theme B - Dams and reservoirs for climate change adaptation in Europe

- Balancing extreme hydrological conditions (floods, droughts)
- Protection against floods
- Protection against other natural hazards (mass movements, glacier lake outburst floods, ...)
- Irrigation and water supply
- Multipurpose dams

Theme C - Impact mitigation of dams and reservoirs in Europe

- Environmental flows
- Sediment continuum
- Fish passage
- Hydropeaking
- Greenhouse gas emissions

Theme D - How to deal with ageing dams in Europe

- Dam safety
- Upgrade and refurbishment
- Extension and renewal
- Incorporating new purposes
- Decommissioning

Contact

Andrea Balestra, Secretary of the Swiss Committee on Dams, swissdams@lombardi.group

SUT OSIG 9th International Conference "Innovative Geotechnologies for Energy Transition", 12-14 September 2023, London, UK, www.osig2023.com, www.sut.org

SAHC 2023 13th International Conference on Structural Analysis of Historical Constructions "Heritage conservation across boundaries", 12-15 September 2023, Kyoto, Japan, https://sahc2023.org/

XII ICG - 12th International Conference on Geosynthetics, September 18 – 22, 2023, Rome, Italy, www.12icg-roma.org

Charles-Augustin COULOMB : A geotechnical tribute
25 – 26 September 2023, Paris, France
www.cfms-sols.org/organisees-par-le-cfms/charles-augustin-coulomb-geotechnical-tribute

In 1773, Charles Augustin COULOMB submitted to the Academy of Sciences his memoir entitled "Essay on an application of the rules of maximis and minimis to some problems of Statics relating to Architecture".

This text is considered to be the foundation in geotechnics of subsequent work on the stability of slopes, pressures on retaining walls, bearing capacity of foundations, etc.

In order to pay tribute to the contributions of Coulomb in geotechnics and to celebrate the 250th anniversary of the publication of his memoir, the French Committee for Soil Mechanics and Geotechnical Engineering (CFMS) is organizing an international symposium intended to highlight the various contributions of Coulomb's theory to geotechnics. It will give the opportunity to French and European experts to testify to the importance of the legacy of Coulomb's work in today's geotechnics, including in its most recent developments.

During the symposium the annual honorary lecture "Coulomb Lecture" will be presented by Professor Robertson. This two-day symposium is placed under the patronage of the Academy of Sciences, the Academy of Technologies, the International Society of Soil Mechanics and Geotechnical Engineering (ISSMGE) and has received the support of the National Federation of Public Works (FNTP).

Register here: https://www.ecolloque.com/coulomb2023/en/new/

SEG23 Symposium on Energy Geotechnics, 3-5 October 2023, Delft, The Netherlands, https://seg23.dryfta.com

28th European Young Geotechnical Engineers Conference and Geogames
04 – 07 October 2023, Moscow, Russia

Organiser: Russian Society for Soil Mechanics, Geotechnics and Foundation Engineering

Contact person: PhD Ivan Luzin
Address: NR MSUCE, 26 Yaroslavskoye shosse
Phone: +7-495-287-4914 (2384)
Email: youngburo@gmail.com

2023 15th ISRM Congress, International Congress in Rock Mechanics Challenges in Rock Mechanics and Rock Engineering, 9÷14 October 2023, Salzburg, Austria, https://www.isrm2023.info/en/

New Ideas for Proven Resources
16-18 October 2023, Edinburgh, Scotland
www.hydropower-dams.com/hydro-2023

HYDRO 2023 MISSION

As always, the main aim of bringing together the global hydro-power community is to exchange practical experience, learn of new technical developments (of which there are plenty), encourage best practice, and together play a role in advancing hydro development in the parts of the world that need it most.

Besides new schemes, emphasis is also placed on maximizing the value of existing hydro assets, by timely refurbishment, upgrading and improving operational efficiency.

These annual events are probably the most truly international conferences devoted specifically to hydropower, and normally we welcome at least 1200 delegates from more than 70 countries.

We will focus on potential and development plans, the changing roles of hydropower, adapting to new challenges, ensuring safety and operational efficiency, and environmental protection, among many other topics.

A major technical exhibition will run alongside the conference, showcasing the state-of-the-art of hydro technology and engineering, with many products and services on display.

We encourage young engineers and students to attend, and student registration rates will be available on request. The AMI Hydropower Foundation will consider assisting some delegates from less developed countries, or those facing economic challenges, to attend, by supporting registration and accommodation costs. See: https://www.hydropower-dams.com/foundation

THEMES

- Facilitating Future Hydro Development
- Financial, Legal and Contractual Aspects
- Environment
- Social Aspects
- Safety and Risk
- Hydro Equipment
- Civil Works
- Hydro in Synergy with other Renewables
- Electrical Engineering
- Small, Mini and Micro Hydro
- Capacity Building Issues
- Co-Located Events and Collaboration

Contact

HYDRO 2023, Hydropower & Dams, PO Box 285, Wallington, Surrey SM6 6AN, UK
Email: hydro2023@hydropower-dams.com

ACUUS SINGAPORE 2023 18th Conference of the Associated Research Centers for the Urban Underground Space "Underground Space – the Next Frontier", 1 - 4 Nov 2023, Singapore, www.acuus2023.com

6th World Landslide Forum "Landslides Science for sustainaible development", 14 to 17 November 2023, Florence, Italy, https://wlf6.org

CREST 2023 – 2nd Construction Resources for Environmentally Sustainable Technologies, November 20-22, 2023, Fukuoka, Japan, https://www.ic-crest.com

GEOTEC HANOI 2023 The 5th International Conference on Geotechnics for Sustainable Infrastructure Development, December 14-15, 2023 - Hanoi, Vietnam, https://geotechn.vn

World Tunnel Congress 2024 19 to 25, April, 2024, Shenzhen, China, www.wtc2024.cn

8th International Conference on Earthquake Geotechnical Engineering (8ICEGE), 7-10 May, 2024 Osaka, Japan, https://confit.atlas.jp/guide/event/icege8/top?lang=en

ECSMGE 24 XVIII European Conference on Soil Mechanics and Geotechnical Engineering, 26-30 August 2024, Lisbon, Portugal, www.ecsmge-2024.com

PANAMGEO CHILE 2024 17th Pan-American Conference on Soil Mechanics and Geotechnical Engineering, 12 – 17 November 2024, La Serena, Chile, https://panamgeochile2024.cl

21st International Conference on Soil Mechanics and Geotechnical Engineering

14 – 19 June 2026, Vienna, Austria

Organisers:

Austrian Geotechnical Society and Austrian Society for Geomechanics

Contact person: Prof. Helmut F. Schweiger

Email: helmut.schweiger@tugraz.at

ΕΝΔΙΑΦΕΡΟΝΤΑ ΓΕΩΤΕΧΝΙΚΑ ΝΕΑ

Shuiliandong: an example of a landslide triggered by underground coal mining

I've written extensively about landslides triggered by mining activities, including failures in mine waste (most notably tailings dam collapses) and failures in rock slopes. I've written rather less about surface landslides triggered by subsidence from subterranean mining, even though this can be a substantial problem. In a paper published in the journal *Landslides* (Ma *et al.* 2022), such an example is featured, associated with deep coal mining at Shuiliandong, located in Shaanxi Province in China. Infuriatingly, the paper provides little detail on the actual location (this happens repeatedly), but I have tracked it down. The mine itself is located at 35.049, 108.032.

The mine, which is still active, extracts about 1.35 million tonnes of coal per year from a seam about 340 m below the surface. Ma *et al.* (2022) report that it has triggered extensive subsidence, including large fissures. A village located above the mine workings has been so badly damaged that it has been forced to relocate.

The authors highlight one landslide in particular, located 35.052, 107.997. The image below, from Google Earth, shows the landslide shortly after failure – the image was collected in 2015:-

The mining-induced landslide close to Shuiliandong in China. Google Earth image collected in 2015.

This is a large failure – 529 m long and 504 m wide according to Ma *et al.* (2022), with an average depth of about 37 m. Note the toe of the landslide extending down the valley. The volume is about 3 million cubic metres.

Ma *et al.* (2022) have simulated the formation of this landslide. The suggest that the failure was preceded by extensive ground fissuring as the subsidence bowl developed. This led to extensive fracturing at the toe of the slope, which in turn initiated failure. They also suggest that the fissuring and ground deformation may have created preferential pathways for the passage of water through the ground, allowing failure to develop.

It is notable that the image above shows other areas of deformation in the slope, indicating the mining-induced slope instability may continue to be a problem at Shuiliandong.

The capacity for deep mining to trigger slope instability has been known for well over a century – examples from South Wales are well documented for example. That such disruption can occur now is disappointing.

Reference

Ma, S., Qiu, H., Yang, D. *et al.* 2022. Surface multi-hazard effect of underground coal mining. *Landslides*. https://doi.org/10.1007/s10346-022-01961-0

(Dave Petley / THE LANDSLIDE BLOG, 3 October 2022, https://blogs.agu.org/landslideblog/2022/10/03/shuiliandong)

hyperTunnel Unveils Underground Structure Built Entirely by Robots

hyperTunnel, the British technology company innovating underground construction, has revealed the world's first entirely robot-constructed underground structure, built at its R&D facility in the North Hampshire Downs.

hyperTunnel's completely new automated construction method is designed to build tunnels more than 10 times faster and at half the cost of conventional methods. The approach is significantly friendlier to the environment and will use sustainable materials such as low-carbon concrete. Without any human needing to enter the structure during construction, the hyperTunnel method could transform safety in the tunneling industry.

Using swarm construction methods according to a digital twin of the tunnel, a fleet of 'hyperBot' robots enters the ground via an arch of HDPE pipes. Once inside, the robots 3D-print the tunnel shell by deploying construction material directly into the ground. The 6 meter-long, 2 meter-high and 2 meter-wide Peak XV 'pedestrian-scale' tunnel has been delivered as part of a project for Network Rail and revealed at the British Tunnelling Society Conference & Exhibition in London (Oct. 11-12).

The Network Rail project has been demonstrating the hyperTunnel process, investigating the technologies that are key to low-disruption tunnel repairs for the UK's regional railway infrastructure, which includes approximately 650 Victorian age tunnels.

David Castlo, Network Technical Head (Mining and Tunnels) at Network Rail, said: "Our large portfolio of Victorian tunnels requires increasing levels of work to meet the needs of the

railway network. However, we want to reduce the level of disruption to our passengers so we are constantly searching for new approaches to enlarging or repairing tunnels that reduce the length of time a tunnel will be closed to trains. Peak XV moves us a step closer to that goal and, crucially, with a method that reduces workforce safety risk."

Steve Jordan, co-CEO and co-Founder of hyperTunnel, said: "To unveil our first large scale demonstration tunnel is a big step, not only for hyperTunnel, but for the tunneling and construction industries which are eagerly anticipating the readiness of our approach to use, as appropriate, in their global projects. While using robots exclusively to build underground structures is dramatically different, the contributing technologies, such as digital twins, robotics, 3D printing and digital underground surveying, supported by AI and VR, are all well-proven in other industries. In fact, the hyperTunnel in-situ method is all about de-risking construction projects."

Earlier this year, hyperTunnel received funding of 1.88 million Euros from the European Innovation Council (EIC) Accelerator scheme, Europe's flagship innovation program. The company also received a financial investment from VINCI, a global leader in concessions, energy and construction businesses.

(TBM Staff, October 19, 2022, https://tunnelingonline.com/hypertunnel-unveils-underground-structure-built-entirely-by-bobots)

https://www.youtube.com/watch?v=U3_cVWAjkY4&feature=emb_imp_woyt

(pbctoday, October 24, 2022, https://www.pbctoday.co.uk/news/digital-construction/digital-twins/worlds-first-tunnel-built-by-robots-unveiled-by-hypertunnel/117436)

Arel University's Building Collapsed in Küçükçekmece

As a result of an ongoing foundation excavation in Küçükçekmece, Istanbul and the collapse of the façade retaining walls made accordingly, the three-storey building of Arel University suffered great damage. The main building of the university also sustained serious damage.

Serious security measures were taken in the region after the collapse that occurred as a result of the failure of the bored piles and the anchors, which are the horizontal supporting elements connected to it, which were projected as a bearing structure at the housing construction site in Sefaköy Gültepe Neighborhood, to carry the load they were exposed to. People living in 6 apartments with 1 dormitory and 128 apartments around the construction site, which are thought to be affected by the incident, were also evacuated.

Kaan Enes Yıldız, who lives in the region, said: "We were at home in the evening, and suddenly there was a sound. We thought the earthquake was happening. Everyone rushed to the balcony. We looked out. There was a rush here. There is a restaurant here. People came out of there first, they noticed it. They said run from the construction side and evacuate the area. We were very shaken, very close. Construction has existed for a long time. We were constantly hearing the voices of this construction. There have been many warnings by the people living nearby. But nothing happened. The buses arrived. Three hotels were arranged, they took people there. Our house has not been evacuated, but there are crackling sounds. There are still voices."

Technical Evaluation

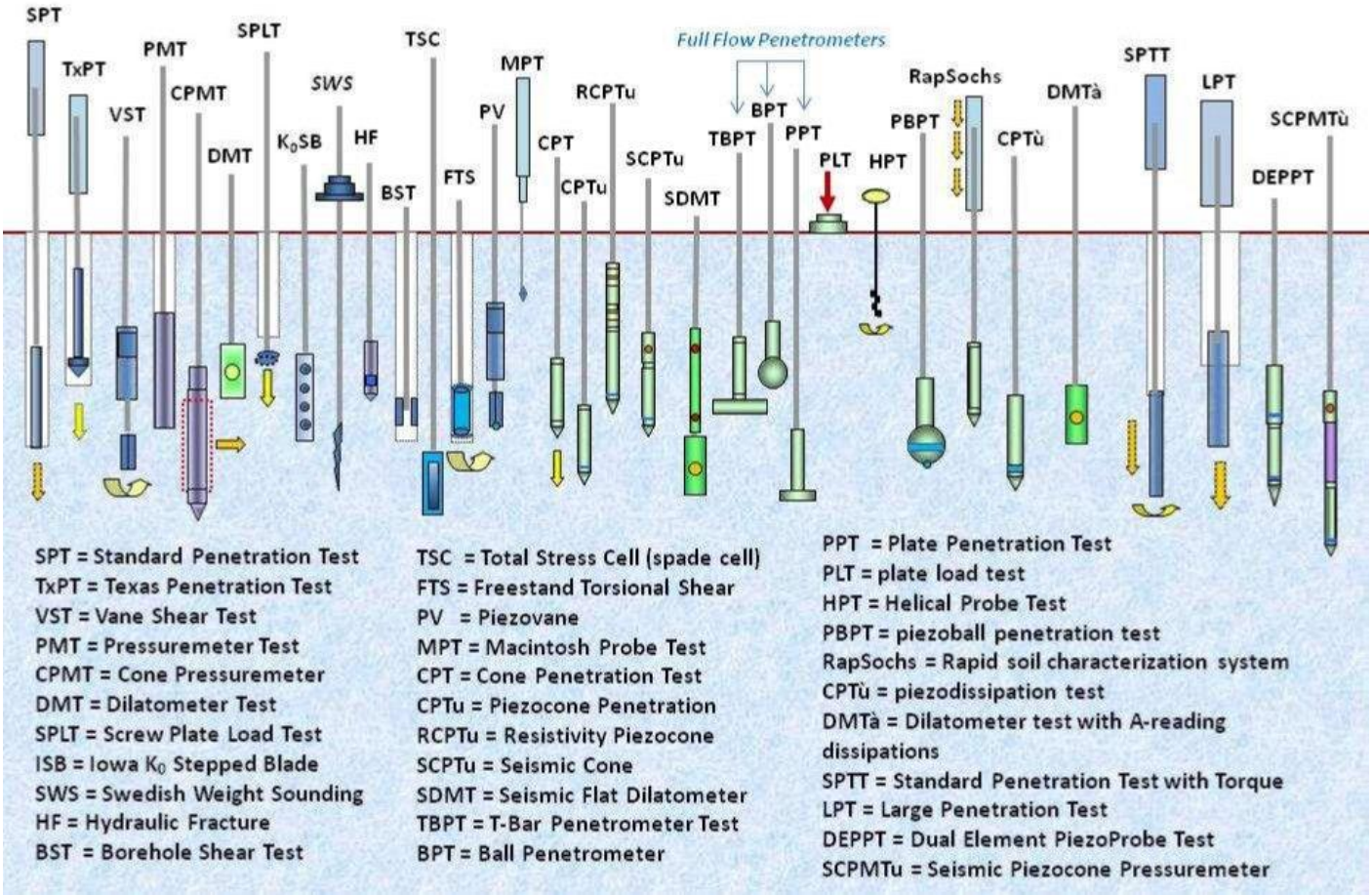
As in every project, the geological and geotechnical survey research studies to be carried out before the production and project of such deep shoring systems are of great importance. It is an undeniable requirement that the basic research drilling studies, geophysical studies and subsequent laboratory experiments to be carried out are carried out in accordance with the technical standards and that they represent the project area in order to obtain the most realistic results. However, the installation of deformation monitoring instruments such as inclinometers and surface reflectors in deep shoring systems is very important for checking project limits on site during implementation.

In addition, it is of vital importance for such projects that horizontal support productions are carried out within the framework of the relevant technical specifications and that

load tests are carried out periodically in line with the maximum capacity. Another important issue is that there may be difficulties encountered in modeling such projects in cities where there is intensive construction. It is often not possible to know how much engineering services the surrounding structures receive and to reach the technical base of these projects. In this case, it can take projects away from being realistic and cause such large-scale events to occur.

(YERALTI HABER, 24 October 2022, https://www.yeraltiha-ber.com/haber/kucukcekmecede-arel-universitesinin-binasi-coktu-2950)

Geotechnical field tests



Geotechnical field tests are of utmost importance for geotechnical engineers. When properly executed and used with wisdom, along with proper laboratory data complementing them, they provide excellent information to assess the ground conditions for your projects. This is an excellent graphic summary depicting different geotechnical field tests, made by Dr. Paul Mayne.

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΣΕΙΣΜΟΙ & ΑΝΤΙΣΕΙΣΜΙΚΗ ΜΗΧΑΝΙΚΗ

How Japan Is Building Disaster-Proof Skyscrapers

With Japan's susceptibility to severe earthquakes and the growing threat of more powerful storms, engineers and architects have pushed the boundaries of technology and design to create resilient, increasingly disaster-proof buildings.

https://www.youtube.com/watch?v=c5X8OK1V2_c

Ποιες περιοχές στην Ελλάδα βρίσκονται στο «κόκκινο» στην περίπτωση ενός τσουνάμι

Η προετοιμασία της Ελλάδας εάν ένα τσουνάμι χτυπήσει τις ακτές της - Οι «κόκκινες» περιοχές και οι περιπτώσεις όπου οι πολίτες δεν πρέπει να περιμένουν το «112» για να απομακρυνθούν, σύμφωνα με τον ερευνητή σεισμολόγο Δρ Γεράσιμος Παπαδόπουλος

Οι **χώρες της Μεσογείου** συνεργάζονται και προετοιμάζονται για το ενδεχόμενο ενός ισχυρού σεισμού που θα προκαλέσει **τσουνάμι** και θα πλήξει παράκτιες περιοχές τους, με πιθανότερο σενάριο ότι αυτό θα ξεκινήσει από την Ελλάδα.

Η Ελλάδα έχει την υψηλότερη σεισμικότητα σε όλη τη Μεσόγειο, κατά μήκος του περίφημου Ελληνικού Τόξου -ξεκινάει από τα νησιά του Ιονίου διασχίζει τον βυθό του **Νοτίου Ιονίου** έξω από την **Πελοπόννησο** και περνώντας νοτίως της Κρήτης καταλήγει στη Ρόδο- και για αυτό είναι απολύτως υπαρκτό το ενδεχόμενο γένεσης τσουνάμι μετά από ισχυρό υποθαλάσσιο ή παράκτιο σεισμό. Λόγω της σπανιότητας του φαινομένου για πολλά χρόνια υπήρχε αμηχανία σε ό,τι αφορά την προετοιμασία αντιμετώπισης του, ωστόσο, πλέον τόσο σε εθνικό, όσο και σε διεθνές επίπεδο, μέσα από τη συμμετοχή της Ελλάδας στη Διακυβερνητική Ομάδα Συντονισμού της UNESCO, έχουν καταρτιστεί τυποποιημένα πρωτόκολλα άμεσων ενεργειών, ενώ γίνονται ασκήσεις ετοιμότητας και δράσεις επιμόρφωσης των πολιτών.

UNESCO Παρίσι Δεκέμβριος 2018 συνεδρίαση Ομάδας NEAMTWS υπό την προεδρία Γεράσιμου Παπαδόπουλου

Μάλιστα, όπως εξήγησε ο ερευνητής σεισμολόγος και επιστημονικός συνεργάτης της UNESCO **Δρ Γεράσιμος Παπαδόπουλος**, σε συνέντευξη που παραχώρησε στο Αθηναϊκό/ Μακεδονικό Πρακτορείο Ειδήσεων, στο περιθώριο των εργασιών του συνεδρίου για τις Νέες Τεχνολογίες στην Πολιτική Προστασία «SafeThessaloniki 2022», στον σεισμό των 7 Ρίχτερ την 30η Οκτωβρίου 2020, στη Σάμο, για πρώτη φορά σε **ευρωπαϊκό επίπεδο ενεργοποιήθηκε** η Υπηρεσία Επικοινωνιών Εκτάκτου Ανάγκης (Ειδοποιήσεις Συστήματος Συναγερμού Πολιτών μέσω του 112) και σήμερα το εθνικό κέντρο που παρακολουθεί και προειδοποιεί την Πολιτεία για τον κίνδυνο τσουνάμι κινητοποιείται βάσει αυστηρού πρωτοκόλλου, το οποίο προβλέπει συγκεκριμένες ενέργειες εντός χρονικού διαστήματος έως 10 λεπτών από την καταγραφή της σεισμικής δόνησης.

«Οι "κόκκινες" σεισμογενείς περιοχές στην Ελλάδα»

Σε ό,τι αφορά τις σεισμογενείς περιοχές στην Ελλάδα και τις ακτές όπου είναι υψηλότερος ο κίνδυνος παραγωγής τσουνάμι ο σεισμολόγος διευκρίνισε: «Σε όλη τη Μεσόγειο έχουμε, κατά μήκος του Ελληνικού Τόξου, την υψηλότερη σεισμικότητα, η οποία είναι και υποθαλάσσια, άρα είναι αυτονόητο και το γνωρίζουμε και από τα επιστημονικά δεδομένα, ότι εκεί ακριβώς έχουμε τον μεγαλύτερο κίνδυνο για την παραγωγή τσουνάμι. Το τσουνάμι διαδίδεται πολύ γρήγορα, δε "σβήνει" εύκολα και απειλεί παράκτιες περιοχές σε μεγάλες αποστάσεις, αυτή είναι η ιδιαιτερότητα του φαινομένου. Μετά έχουμε μια άλλη περιοχή με **πολύ υψηλό κίνδυνο, τον Κορινθιακό Κόλπο**. Επίσης έχει πολύ υψηλή σεισμικότητα, όμως με τη διαφορά ότι πρόκειται για κλειστό κόλπο και δεν μπορεί, ακόμη και μεγάλο τσουνάμι, να βγει προς τα έξω και να απειλήσει άλλες περιοχές. Έπειτα, έχουμε μικρότερο κίνδυνο σε περιοχές όπως τα **Δωδεκάνησα** και γενικότερα το **Ανατολικό Αιγαίο**, η **Λέσβος**, η **Χίος**».

Λιγότερο πιθανό, βάσει των **δεδομένων σεισμικότητας**, είναι το ενδεχόμενο να φτάσει στην Ελλάδα τσουνάμι που θα ξεκινήσει από άλλες χώρες της Μεσογείου. Αντιθέτως, άλλες χώρες όπως το Ισραήλ και η Ιταλία προετοιμάζονται συστηματικά για ένα τσουνάμι που θα μπορούσε να ξεκινήσει από

το Ελληνικό Τόξο.

«Από γειτονικές χώρες απειλούμαστε ελάχιστα από την Ιταλία. Δεν υπάρχει καταγεγραμμένος μεγάλος σεισμός που να προκάλεσε τσουνάμι και να ήλθε στη δική μας πλευρά. Δεν έχουν τόσο υψηλή σεισμικότητα όσο εμείς, παρόλα αυτά στα σενάριά μας λαμβάνουμε υπόψη κι αυτό το ενδεχόμενο. Αντιθέτως στην Ιταλία φοβούνται πάρα πολύ τα τσουνάμι που μπορεί να ξεκινήσουν από την Ελλάδα κι έχουν κάνει πολλές έρευνες για αυτό το θέμα. Το ίδιο οι Ισραηλινοί. Έχουμε κάνει κοινές ασκήσεις με τους Ισραηλινούς, φοβούνται πάρα πολύ τα τσουνάμι που μπορεί να δημιουργηθούν για παράδειγμα κατά μήκος της Κρήτης, ή της Ρόδου και σε 45 λεπτά, το πολύ σε μία ώρα, θα έχουν φτάσει στο Ισραήλ», επισήμανε ο κ. Παπαδόπουλος.

UNESCO Παρίσι Ιούνιος 2017 βράβευση για την Πιστοποίηση του Ελληνικού Κέντρου Προειδοποίησης για Τσουνάμι

«Στη Μεσόγειο ένα μεγάλο τσουνάμι μπορεί να χτυπήσει 10-15 χώρες»

Μπορούμε να είμαστε προετοιμασμένοι για την πιθανή γένεση τσουνάμι μετά από ισχυρό υποθαλάσσιο ή παράκτιο σεισμό; «Βεβαίως μπορούμε», απάντησε ο κ. Παπαδόπουλος, σημειώνοντας ότι στην προετοιμασία της ελληνικής Πολιτείας αλλά και συνολικά των χωρών της Μεσογείου, μέσα από τη Διακυβερνητική Ομάδα Συντονισμού για το Σύστημα Έγκαιρης Προειδοποίησης και Μετριασμού του Τσουνάμι στον Βορειοανατολικό Ατλαντικό, τη Μεσόγειο και τις συνδεδεμένες θάλασσες (ICG/NEAMTWS) της Διακυβερνητικής Ωκεανογραφικής Επιτροπής της UNESCO (IOC-UNESCO), καθοριστικό ρόλο διαδραμάτισε ο σεισμός και το τσουνάμι του Ινδικού Ωκεανού του 2004 και οι τεράστιες ανθρώπινες απώλειες και καταστροφές στις 14 χώρες που επηρέασε.

«Για το τσουνάμι κάναμε πολύ σημαντικά βήματα, ακριβώς επειδή υπήρξε η επιταγή της συνεργασίας των κρατών. Υστερούμε, παρά το ότι έχουν γίνει πρόοδοι στα τεχνολογικά συστήματα, στη διαλειτουργικότητα, δηλαδή στο πώς συνεργάζονται μεταξύ τους οι υπηρεσίες. Το τσουνάμι δεν έχει σύνορα. Στη Μεσόγειο ένα μεγάλο τσουνάμι μπορεί να χτυπήσει 10-15 χώρες. Αυτό σημαίνει ότι οι χώρες πρέπει να συνεργαστούν μεταξύ τους. Πολλές φορές βρίσκονται σε εμπόλεμη κατάσταση, ή δεν έχουν καλές σχέσεις, άλλοτε δεν έχουν το ίδιο τεχνολογικό επίπεδο, δεν έχουν το ίδιο πολιτιστικό επίπεδο, άρα χρειαζόμασταν έναν καταλύτη να φέρνει κοντά τις χώρες κι αυτός είναι η UNESCO», επισήμανε ο κ. Παπαδόπουλος.

Σήμερα ο πάροχος υπηρεσιών τσουνάμι (TSPs) της Ομάδας ICG/NEAMTWS υποστηρίζεται τεχνικά από πέντε εθνικά κέντρα, αυτά της **Πορτογαλίας**, της **Γαλλίας**, της **Ιταλίας**, της **Ελλάδας** και της **Τουρκίας**. Σημαντικότατη πρόκληση είναι η εξασφάλιση γρήγορων και αξιόπιστων μεταδόσεων προειδοποιήσεων για τσουνάμι, τις οποίες σύμφωνα με τα πρωτόκολλα που έχουν συμφωνηθεί στην UNESCO, τα πέντε κέντρα στέλνουν με τρεις τρόπους ταυτόχρονα (email, fax και GTS) και μετά οι υπηρεσίες πολιτικής προστασίας πρέπει να χρησιμοποιούν εξίσου αξιόπιστα συστήματα, για να πάει προς τα κάτω το μήνυμα.

«Η διεθνής πρωτοπορία της Ελλάδας»

Τα πέντε κέντρα της Ομάδας ICG/NEAMTWS συνεργάζονται μεταξύ τους και έχουν καταρτιστεί συγκεκριμένα πρωτόκολλα ενεργειών, από τα οποία δεν μπορεί κανείς να αποκλίνει. *«Μόλις γίνει ένας σεισμός ύποπτος για τη γένεση τσουνάμι, δηλαδή μεγέθους άνω των 6, υποθαλάσσιος και επιφανειακός, αμέσως οργανώνεται ένα μήνυμα προειδοποίησης για τσουνάμι. Τα Αστεροσκοπεία της Αθήνας , της Ρώμης κ.ο.κ. στέλνουν στην Πολιτική Προστασία της χώρας τους εντός 8 έως 10 λεπτών αυτό το μήνυμα και η Πολιτική Προστασία κοιτάει πώς αυτό πάει προς τα κάτω, προς τις απειλούμενες περιοχές. Για πολλά χρόνια υπήρχε μία αμηχανία στο θέμα αυτό, δηλαδή τι μπορούμε να κάνουμε πρακτικά, δεδομένου ότι ειδικά εδώ στη Μεσόγειο το περιθώριο αντίδρασης για να προστατευθεί ο γενικός πληθυσμός είναι πολύ περιορισμένος, συχνά μόνο λίγα λεπτά»,* σημείωσε ο κ. Παπαδόπουλος.

Σημείωσε δε, ότι τον Φεβρουάριο του 2020, όταν ο ίδιος είχε κληθεί στη συζήτηση στην αρμόδια επιτροπή της Βουλής για τον νέο νόμο πολιτικής προστασίας, που ψηφίστηκε και ισχύει τώρα, είχε θέσει το θέμα της προετοιμασίας της ελληνικής πολιτείας για το ενδεχόμενο τσουνάμι: «Προσέξετε το αυτό, μία φορά θα χρειαστεί η χώρα. Τότε πρέπει να είμαστε έτοιμοι», είχε πει στην παρέμβασή του και λίγους μήνες αργότερα, τον Οκτώβριο του 2020 στον μεγάλο σεισμό της Σάμου «για πρώτη φορά όχι μόνο στην Ελλάδα , αλλά συνολικά στον ευρωπαϊκό χώρο και στη Μεσόγειο χρησιμοποιήθηκε το 112».

«Το θεωρώ πολύ σημαντικό βήμα παρά τα μειονεκτήματα που παρατηρήθηκαν. Πρωτοπορήσαμε οι Έλληνες σε αυτό, υπάρχει τρόπος να βελτιωθεί ακόμη περισσότερο το σύστημα -είμαι βέβαιος - έτσι ώστε η επιστημονική και τεχνολογική πρόοδος που μας δίνει τη δυνατότητα μέσα σε 10 λεπτά να στείλουμε την προειδοποίηση, να γίνει ακόμη καλύτερη από επιχειρησιακή άποψη πλέον», πρόσθεσε.

«Πότε οι πολίτες δεν πρέπει να περιμένουν το 112 και απαιτείται άμεση εκκένωση»

Σε πιο άμεσο κίνδυνο στην περίπτωση γένεσης τσουνάμι βρίσκονται οι παράκτιες περιοχές που βρίσκονται κοντά στο επίκεντρο της σεισμικής δόνησης. Εκεί, όσοι βρίσκονται κοντά σε ακτές και αισθανθούν το σεισμό θα πρέπει να απομακρυνθούν άμεσα, χωρίς να περιμένουν οποιουδήποτε είδους ενημέρωση και άρα θα πρέπει να είναι προετοιμασμένοι να το κάνουν, μέσα από επιμορφωτικές δράσεις, σε περιοχές υψηλού κινδύνου.

«Η πιο δύσκολη περίπτωση γενικώς αφορά τις παράκτιες περιοχές που βρίσκονται πιο κοντά στην εστία του σεισμού που παράγει το τσουνάμι. Αυτό το είδαμε στη Σάμο το 2020. Στη Βόρεια Σάμο το πρώτο κύμα έφτασε μόνο σε 4 λεπτά. Πώς το ξέρουμε; Δεν είχαμε όργανα αλλά βίντεο και τα αξιοποιήσαμε για πρώτη φορά σε σχετική μελέτη μας. Καταγράφηκαν από αξιόπιστες κάμερες. Σε τέσσερα λεπτά έφτασαν τα κύματα. Εκεί το σύστημα δυστυχώς δε νομίζω ότι προλαβαίνει να δώσει προειδοποίηση. Εκεί επεμβαίνει αυτό που λέγεται ενημέρωση, πληροφόρηση και εκπαίδευση του πληθυσμού. Η βασική οδηγία λέει: "Μόλις αισθανθείτε σεισμό σε παράκτια περιοχή, απομακρύνεστε αμέσως στα ενδότερα. Δεν προλαβαίνετε να ακούσετε προειδοποίηση, δεν περιμένετε να πάρετε μήνυμα από το 112, ή να πληροφορηθείτε από τα ΜΜΕ τι ακριβώς συμβαίνει. Αμέσως, ακαριαία, διότι το κύμα φτάνει αστραπιαία". Αυτό είναι πολύ σημαντικό και θέλει πολύ μεγάλη προσπάθεια και σε έναν άλλον τομέα, την επιμόρφωση, εκπαίδευση, ενημέρωση. Θέλει εκπαίδευση και των ίδιων των στελεχών , των σωμάτων και των υπηρεσιών», εξήγησε ο κ. Παπαδόπουλος.

Όπως διευκρίνισε, στη **Σάμο** μετά και την εμπειρία του 2020

οι δύο δήμοι προχώρησαν σε σειρά ενεργειών: «Ανέθεσαν μία μελέτη στο Πανεπιστήμιο Αθηνών -συμμετείχαμε και συμβάλλαμε κι εμείς- για τον κίνδυνο του σεισμού και του τσουνάμι, όπου χαρτογραφήθηκε για πρώτη φορά ο βαθμός κινδύνου στις ακτογραμμές του νησιού. Δεν είναι ο ίδιος παντού, εξαρτάται και από τη μορφολογία των ακτών. Για παράδειγμα, είναι δομημένη μια παράκτια ζώνη, είναι επίπεδη η μορφολογία και ένα ενδεχόμενο τσουνάμι μπορεί με πολύ μεγάλη ευκολία να προχωρήσει μέσα στην ξηρά; Υπάρχουν απότομες πλαγιές άρα δεν ευνοείται η αναρρίχηση του τσουνάμι; Όλα αυτά ελήφθησαν υπόψη και δόθηκε μια χαρτογράφηση στις ακτές του νησιού για πρώτη φορά. Επίσης ήδη έχει κάνει ο Δήμος Σάμου κάποιες προσπάθειες να υπάρξει περισσότερη ενημέρωση του πληθυσμού στο θέμα αυτό, όπως έχουν γίνει και σε άλλα νησιά, στη Ρόδο, την Κω, την Κρήτη, όπου έχουμε κάνει και ασκήσεις. Σε παγκόσμιο επίπεδο, ο ΟΗΕ έχει από το 2016 θεσπίσει την 5η Νοεμβρίου εκάστου έτους ως ημέρα ενημέρωσης για το τσουνάμι. Οι προσπάθειες συνεχίζονται και εντείνονται».

Πηγή: ΑΠΕ-ΜΠΕ

(ΠΡΩΤΟ ΘΕΜΑ, 6 Οκτωβρίου 2022, https://www.protothema.gr/environment/article/1292696/poies-periohes-stin-ellada-vriskodai-sto-kokkino-stin-periptosi-enos-tsounami)

ΕΝΔΙΑΦΕΡΟΝΤΑ - ΠΕΡΙΒΑΛΛΟΝ

Peak District: Frozen 'fish eye' forms on rock

Mr Pugh spotted something a bit fishy while out to capture the sunrise

A frost formation on a rock, resembling a fish eye, has been spotted by an unsuspecting photographer.

Leigh Pugh was hoping to get a picture of the sunrise in the Derbyshire Peak District when he got the feeling he was being watched.

He posted his picture of the frozen puddle on social media where many users said the rock resembled a fish's - or even a dragon's - head.

The 51-year-old said he was "just in the right place at the right time."

Mr Pugh spotted the bizarre formation last week on Stanton Moor Edge, near Birchover.

He said it was too cloudy to capture the sunrise but just as he was heading off he noticed something a bit fishy.

Mr Pugh said he could not believe how lifelike it was

"As I turned around to head back I noticed it looking at me - I couldn't believe how lifelike it was with the thick layer of frost," he said.

"So my disappointment of the sunrise was made worth it with this fantastic discovery."

Mr Pugh, from Darley Dale, said he had never seen anything like it before, adding he does not expect to ever again.

"Just the right place at the right time I suppose," he added.

(Amy Phipps / BBC News, 28 January 2022, https://www.bbc.com/news/uk-england-derbyshire-60168209)

Απολιθωμένο δάσος της Λέσβου και καλδέρα της Σαντορίνης στα 100 πρώτα μνημεία παγκόσμιας γεωλογικής κληρονομιάς

Ανάμεσα στα 100 πρώτα μνημεία που αξιολογήθηκαν από διεθνή επιτροπή

Το απολιθωμένο δάσος της Λέσβου και η ηφαιστειακή καλδέρα της Σαντορίνης είναι ανάμεσα στα πρώτα 100 μνημεία παγκόσμιας γεωλογικής κληρονομιάς που αξιολογήθηκαν από διεθνή επιτροπή.

Η Διεθνής Ένωση Γεωλογικών Επιστημών σε συνεργασία με την UNESCO ανέλαβε την πρωτοβουλία διαμόρφωσης καταλόγου με τις κορυφαίες περιοχές γεωλογικού ενδιαφέροντος σε όλο τον κόσμο.

Σε αυτό το πλαίσιο, η Διεθνής Επιτροπή Γεωλογικής Κληρονομιάς (IUGS-IGC) ανέλαβε την καταγραφή και αξιολόγηση για την ανάδειξη των πρώτων 100 μνημείων γεωλογικής κληρονομιάς. Ως τέτοιο μνημείο, σύμφωνα με την επιτροπή, ορίζεται μία περιοχή που φέρει γεωλογικά στοιχεία ή και γεωλογικές διεργασίες διεθνούς επιστημονικής εμβέλειας, που χρησιμοποιείται ως σημείο αναφοράς ή έχει συνεισφέρει καθοριστικά στην ανάπτυξη των γεωεπιστημών στο πέρασμα του χρόνου.

Το Μουσείο Φυσικής Ιστορίας Απολιθωμένου Δάσους Λέσβου υπέβαλε τον φάκελο της υποψηφιότητας, που προετοιμάστηκε από τον καθηγητή Ν. Ζούρο (Πανεπιστήμιο Αιγαίου), τον καθηγητή Ν. Σουλακέλλη (Πανεπιστήμιο Αιγαίου), και τους δρ. Η. Βαλιάκο και Κ. Μπεντάνα.

Για την καλδέρα της Σαντορίνης, δήμος Θήρας συναποφάσισε την κατάθεση φακέλου υποψηφιότητας σε συνεργασία με επιστημονική ομάδα που αποτελείται από την αναπληρώτρια καθηγήτρια Π. Νομικού (Εθνικό και Καποδιστριακό Πανεπιστήμιο Αθηνών). τον δρ. Χ. Φασουλά (Μουσείο Φυσικής Ιστορίας Πανεπιστημίου Κρήτης) και τον καθηγητή Ν. Ζούρο (Πανεπιστήμιο Αιγαίου).

Τα πρώτα 100 Μνημεία Γεωλογικής Κληρονομιάς της IUGS θα τιμηθούν σε ειδική εκδήλωση που διοργανώνεται με την ευ-

καιρία της συμπλήρωσης 60 ετών από την ίδρυση της Διεθνούς Ένωσης Γεωλογικών Επιστημών σε συνεργασία με την UNESCO και το Παγκόσμιο Δίκτυο Γεωπάρκων. Η εκδήλωση θα πραγματοποιηθεί στη Ζουμαία στην Ισπανία στις 25-28 Οκτωβρίου.

(lifo, 6.10.2022, https://www.lifo.gr/now/greece/apolitho-meno-dasos-tis-lesboy-kai-kaldera-tis-santorinis-sta-100-prota-mnimeia)

Trio of yellow, blue and green lakes in Ethiopia stuns in striking satellite image

All three lakes used to be part of the same ancient body of water.

A satellite image of Lake Shala (blue), Lake Abijatta (green) and Lake Langano (yellow) in Ethiopia. The striking image was captured by the Landsat 8 satellite on March 29. (Image credit: Joshua Stevens/Landsat 8/NASA Earth Observatory)

A trio of technicolor lakes in Ethiopia, each one a different color from the others, is visible in stunning detail in a satellite image recently released by NASA. The unusual colors are the result of numerous factors, including water chemistry, depth and inhabiting wildlife.

The three lakes are Lake Shala, which has a deep blue hue; Lake Abijatta, which is green in color; and Lake Langano, which has a sandy-yellow hue similar to the surrounding land. The lakes are located in Ethiopia's Great Rift Valley, around 124 miles (200 kilometers) south of the capital, Addis Ababa.

The Landsat 8 satellite, which is co-owned by NASA and the U.S. Geological Survey, snapped the striking real-color image months ago using the onboard Operational Land Imager. The image was released online Oct. 7 by NASA's Earth Observatory (opens in new tab).

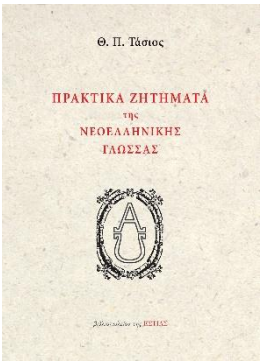
Lake Shala, which is around 7.5 miles (12 km) long and 17.4 miles (28 km) across at its widest point, is the deepest of the three lakes, with a maximum depth of 873 feet (266 meters), which makes the water appear a deep blue color from above. The lake has numerous vents on its bottom that pump sulfur into the water. As a result, the lake is highly alkaline, meaning it has a very high pH. Despite the extreme conditions, the lake contains a large number of small crustaceans and microorganisms that support large flocks of visiting flamingos and pelicans, according to Earth Observatory.

Lake Abijatta, which is around 10.6 miles (17 km) long and 9.3 miles (15 km) wide, is the shallowest of the three lakes, with a maximum depth of 46 feet (14 m). As a result, Abijatta is the most variable of the pictured lakes; within the last 50 years, the lake has lost around one-third of its area, according to Earth Observatory. Lake Abijatta's green color is most likely due to a bloom of phytoplankton on its surface.

Lake Langano, which is around 11.2 miles (18 km) long and 9.9 miles (16 km) across, is fed mostly by streams to the east. The lake's yellow color comes from brown sediment that is transported from nearby mountains by the rivers that feed it. Langano is a popular destination for beachgoers because it is the only lake in the region not inhabited by parasitic worms that transmit a potentially fatal disease known as schistosomiasis, according to Earth Observatory.

(Harry Baker / LIVESCIENCE, 13 October 2022, https://www.livescience.com/trio-of-multicolored-lakes-ethiopia?utm_campaign=368B3745-DDE0-4A69-A2E8-62503D85375D)

ΝΕΕΣ ΕΚΔΟΣΕΙΣ ΣΤΙΣ ΓΕΩΤΕΧΝΙΚΕΣ ΕΠΙΣΤΗΜΕΣ



Πρακτικά Ζητήματα της Νεοελληνικής Γλώσσας

Θ.Π. Τάσιος

"Η χρήση του αγαθού της γλώσσας είναι τόσο γενική και τόσο "αυτό-ματη", όσο ίσως είναι κι η ανάσα. Κι όπως δεν σκεπτόμαστε πόσο πολύ-τιμη είναι η περίπλοκη φυσιολογία της Αναπνοής, άλλο τόσο δεν μας απασχολεί το πόσο θεμελιώδης για την ύπαρξή-μας είναι η Γλώσσα.

Όμως, χάρις στους ακάματους Γλωσσολόγους μας, διατίθενται τοσο πολλές και βαθειές γνώσεις γι' αυτήν, ώστε μπορούμε κι εμείς να απολαύσομε ένα μέρος απ' αυτή τη γνώση.

Εμείς οι απλοί Χρήστες της γλώσσας έχομε κι ένα πρόσθετο πρακτικό ενδιαφέρον: αφενός είμαστε καλλιεργητές της γλώσσας (στον καθημερινό, τον επιστημονικό και τον καλλι-τεχνικό λόγο), αφετέρου πολύ συχνά έχομε ειδικές εκφραστι-κές ανάγκες, τις οποίες θέλομε και να τις περιγράφομε.

Σκέφθηκα λοιπόν να συμμερισθώ μαζί-σας τις δικές-μου γλωσσικές αντιλήψεις, όπως τις διδάχθηκα απ' τους ειδικούς, αλλά κι όπως τις απόχτησα από πείρα πολύχρονη.

Επομένως, το βιβλίο αυτό έχει κυριότατα πρακτικούς σκοπούς - λέει όμως και τον πόνο μου: για παράδειγμα, δεν αντέχω άλλο να με βάζουνε να γράφω "κατά νουν", ενώ εγώ σωστά διαβάζω "κατα νούν"..."

(Εκδόσεις ΕΣΤΙΑ, 2022)

ΗΛΕΚΤΡΟΝΙΚΑ ΠΕΡΙΟΔΙΚΑ

www.issmge.org/publications/issmge-bulletin/vol-16-issue-5-october-20220

Κυκλοφόρησε το Τεύχος 5, του Τόμου 16 Οκτωβρίου 2022 του ISSMGE Bulletin με τα ακόλουθα περιεχόμενα:

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The 3rd International Conference on Geotechnical Engineering, Iraq
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International Journal of Geoengineering Case Histories
An official journal of the International Society for Soil Mechanics and Geotechnical Engineering
www.geocasehistoriesjournal.org/pub/issue/view/49

Κυκλοφόρησε το Τεύχος 49 του International Journal of Geoengineering Case Histories με τα ακόλουθα περιεχόμενα:

- 40 Years of Full-scale Infrastructure Testing at a National Geotechnical Experimentation Site: Clay Site, Jean-Louis Briaud
- 40 Years of Full-Scale Infrastructure Testing at a National Geotechnical Experimentation Site: Sand Site, Jean-Louis Briaud
- Asynchronous Mobilization of Shear Resistance in Slope Failures, Elena Zabolotnii, Norbert Ruebin Morgenstern, Gordon Ward Wilson
- Liquefaction Ejecta Case Histories for 2010-11 Canterbury Earthquakes, Zorana Mijic, Jonathan D. Bray, Sjoerd van Ballegooy

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International Geosynthetics Society

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

IGS NEWSLETTER – October 2022

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www.geosyntheticssociety.org/newsletters

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www.icevirtuallibrary.com/toc/jgein/29/5

Κυκλοφόρησε το Τεύχος 5 του Τόμου 29 (Οκτωβρίου 2022) του Geosynthetics International της International Geosynthetics Society με τα ακόλουθα περιεχόμενα:

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www.sciencedirect.com/journal/geotextiles-and-geomembranes/vol/50/issue/5

Κυκλοφόρησε το Τεύχος 5 του Τόμου 50 (Οκτωβρίου 2022) του Geotextiles and Geomembranes της International Geosynthetics Society με τα ακόλουθα περιεχόμενα:

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