theGeotechnica

February 2015| Issue 37

Is Britain ready for winter?

With the recent government announcement of £2.3bn planned expenditure on more than 1400 flood defence projects, theGeotechnica asks if Britain is ready for another bout of wet, cold and icy conditions

Chemical Oxygen Demand: The Future?

Testing and commonly used reagent potassium dichromate

Keeping on the right side of Health & Safely Law

The importance of training and competence

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NEXT COURSE DATES: 18th - 20th March 2015
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IOSH Avoiding Danger from Underground Services

This one day geotechnically focussed health and safety course follows the requirements and guidance set out within HSG47 and includes the four chapters; identifying and managing the dangers; planning the work; detecting, identifying and marking and safe excavation. Important aspects include the use of real examples from the geotechnical industry and delivery by chartered advisors who are from within the industry.

NEXT COURSE DATES: 13th March 2015
24th April 2015

Safe Working on Geotechnical Sites

This one day geotechnically focussed health and safety course has been developed by industry specialists as a foundation to site safety for all personnel involved in projects in the drilling and geotechnical industry. Its aim is to impart the core safety skills required of those working on geotechnical sites by building on their existing specialist technical skills and making it relevant to their place of work.

NEXT COURSE DATES: 13th February 2015
9th April 2015

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Welcome

Welcome to the 37th Edition of **theGeotechnica** - the UK's fastest growing online geotechnically focussed e-magazine.

This month, once again, we have a fantastic line-up of insightful and informative articles that make for a must-read.

The first article of this month's issue comes from Hazel Davidson of Derwentside Environmental Testing Services. This month Hazel discusses the chemical oxygen demand test and one of the reagents commonly used within it - potassium dichromate.

Writing our second article for this month is Julian Lovell, Managing Director at the Equipe Group. This month Julian discusses Health and Safety Law, and how appropriate training and competence testing can help ensure that your site operatives stay on the right side of it.

The third article comes from Calum Spires of the Equipe Group. This month is the first in a series of articles from Calum that will take a look back at previous Geotechnica events in the build-up to this year's event in July. This month Calum takes a look at the inaugural event - Geotechnica 2009.

Our fourth article this month is also our cover article, and comes from Jeff Laverack of Holmes Media, on behalf of geotechnical specialists Maccaferri.

With the recent government announcement of £2.3bn planned expenditure on more than 1400 flood defence projects, theGeotechnica examines some of the products and techniques developed by geotechnical engineers Maccaferri, which could help provide protection against future severe weather events.

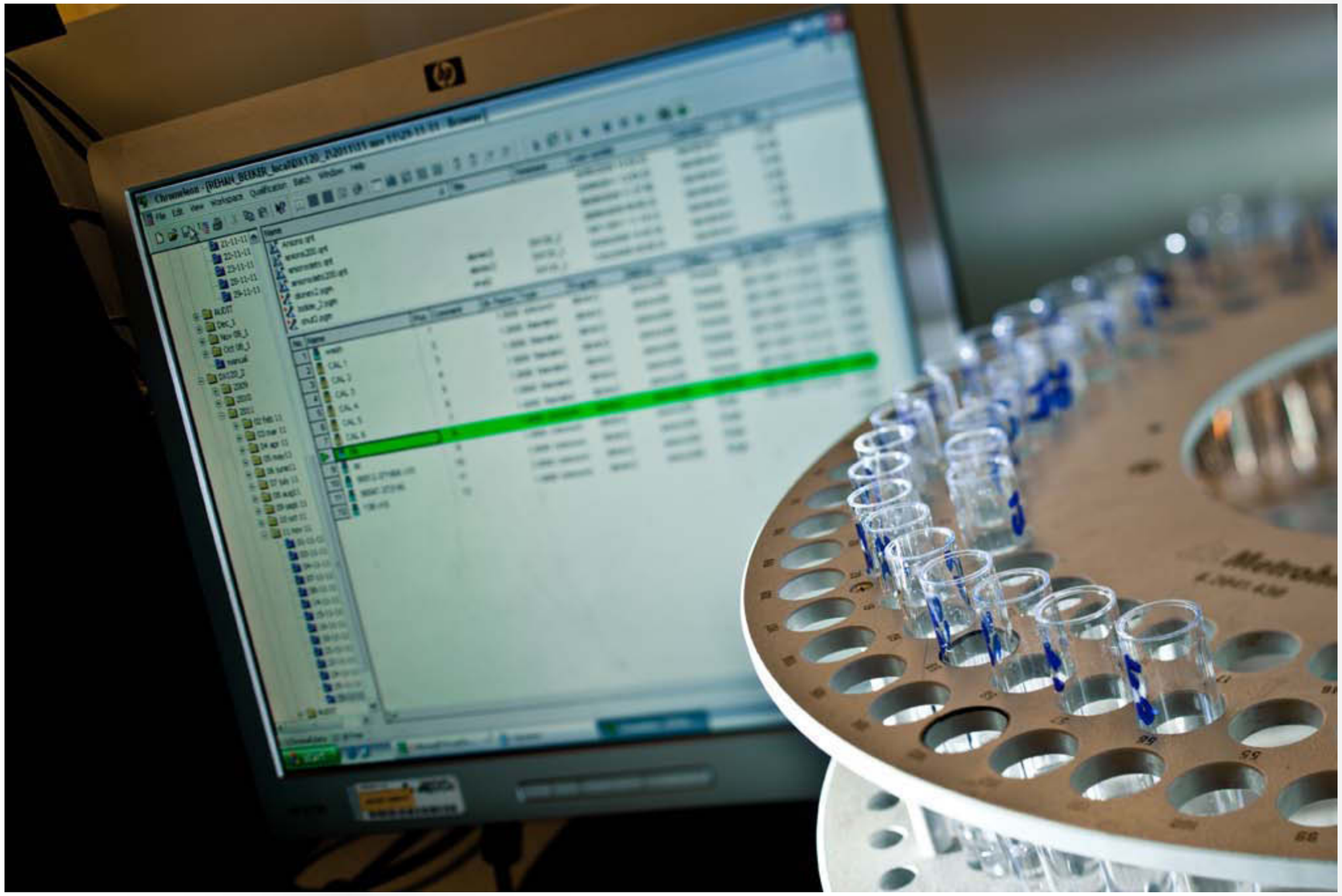
As with every new edition of the magazine, the Editorial Team here at **theGeotechnica** will be on the lookout for even more new, original and interesting content from all corners of the sector, and would actively encourage all readers to come forward with any appropriate and relevant content - whether it be a small news item or a detailed case study of works recently completed or being undertaken. If this content is media rich and interactive, then all the better. We are looking to increase the already large readership of the magazine through better social media integration and promotion, as well as improving content month on month.

Finally, for any content that is submitted we will ensure that an advertising space, proportionate to the quality of content provided, is reserved should you wish to place an advert in that single edition of the magazine. We hope you enjoy this month's edition of the magazine and are inspired to contribute your own content for the coming editions of **theGeotechnica**.

Editorial Team,
theGeotechnica

CHEMICAL OXYGEN DEMAND: THE FUTURE?

Writing for **theGeotechnica** *this month is Hazel Davidson of* Derwentside Environmental Testing Services. *This month Hazel discusses the chemical oxygen demand test and one of the reagents commonly used within it - potassium dichromate.*



Chemical Oxygen Demand (COD) is one of the most commonly performed tests on most types of environmental water samples, e.g. surface water, ground water, leachates, and effluents. It measures the oxygen requirement of a water sample, and samples with high microbiological content or significant levels of organic compounds, e.g. TPH, tannic/humic acids, alcohols will give high COD levels.

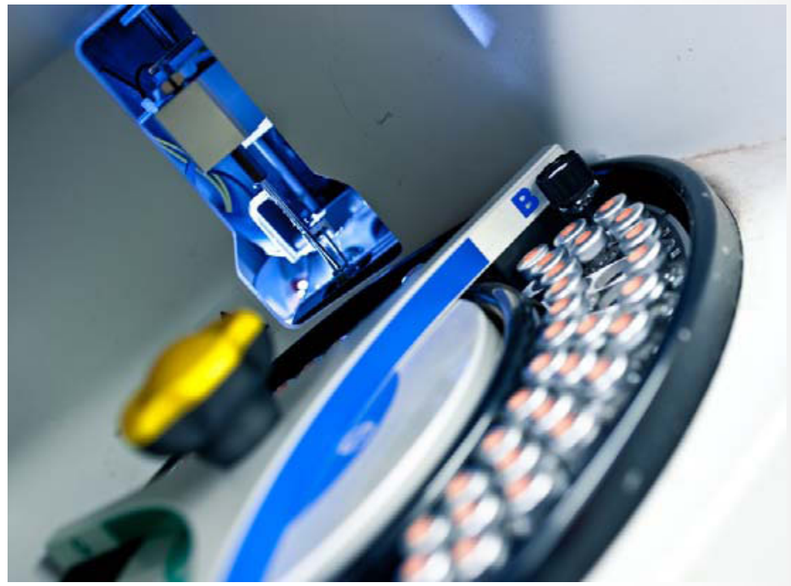
Laboratories generally perform the determination of COD using prepared kits (Hach and Dr Lange are popular suppliers), where the reagents are pre-weighed into testing vials, and the analyst has only to measure the water into the tube, replace the stopper, mix, incubate on a hot block for a defined period of time, and then measure the colour intensity using a spectrophotometer. This is a reliable and robust method, and has been used by laboratories for many years.

One of the reagents used in the reaction is potassium dichromate ($K_2Cr_2O_2$), an orange crystalline compound which is an oxidising agent and highly toxic. It is acutely and chronically harmful to health, corrosive, carcinogenic and causing dermatitis, with an LD_{50} (causing death of 50% of a population) of 25 mg/kg. It used to be the reagent used in the old police breathalyser – the dichromate crystals turn green in the presence of alcohol.

"It is acutely and chronically harmful to health, corrosive, carcinogenic and causing dermatitis..."

This reagent has now come under the scrutiny of REACH (Registration, Evaluation, Authorisation and restriction of Chemicals), which is an EU regulation taken into UK law in 2007, although implementation is phased over 11 years. It applies to all manufacturers or importers handling over 1 tonne of a chemical per year, who will have to register and submit a dossier to the European Chemicals Agency (ECHA). The regulation states that a company will not be able to manufacture or import a substance within the EU, or import an article that intentionally releases a substance, unless the substance has been registered. In addition, some substances have been given an outright ban, and potassium dichromate is one of this

"In addition, some substances have been given an outright ban, and potassium dichromate is one of this group, and this will become effective in 2015."



group, and this will become effective in 2015.

Although the REACH regulations do not usually apply to laboratories, as the quantities they handle fall below the REACH stipulations, it will become far more difficult (if not impossible) for them to source the kits/reagents that they need. Manufacturers, suppliers and laboratories are evaluating different options to overcome this problem, and these include:

"Manufacturers, suppliers and laboratories are evaluating different options to overcome this problem..."

1. BOD (biochemical oxygen demand) – this is commonly used in conjunction with COD, but will always give lower value, as it does not measure oxygen demand in the same way, and also it takes 5 days to perform. It is subject to much greater levels of uncertainty than COD, largely due to the difficulties in measuring the biological component and possible interference from nitrogenous compounds.

2. TOC (total organic carbon) – this method involves an analyser utilising heat and oxygen, UV light, chemical oxidants or a combination of these. It will break down all organic material in the sample, and therefore will provide a different value than COD (or BOD), and may include material that would not have an oxygen demand in the same way. However, it will not include nitrogenous material, which may cause problems with BOD, but TOC is not usually considered to be an equivalent to either COD or BOD.

3. DOC (dissolved organic carbon) – this utilises a similar method as TOC, but is performed on a filtered sample, so will not include particulate matter or micro-organisms. Again, there is no direct correlation.

4. New technology (1) – an estimate of the BOD can be measured by fluorescence measurements of tryptophan like compounds (an essential amino acid associates with microbial activity in faecal material). This test can be performed in real time, not waiting for five days, but again, will give an under estimate compared with COD.

5. New technology(2) – a more promising development is instrumentation which measure COD in a different way, using a titanium dioxide sensor (an example is the PeCOD by Camlab), which does not use aggressive reagents and takes about 10 minutes per sample. The unit is quite small and can be used in the field, but the main drawback is that with the existing kits, laboratories can analyse up to 100 samples per hour, but this new system will only allow 6 samples per hour. Labs would have to buy multiple units, and costs to the engineers/consultants would therefore increase.

6. Source the kits from suppliers outside Europe. This is probably the most viable option at the moment, as labs only import small quantities, but if potassium dichromate is banned entirely, then this would not be feasible.

It is therefore apparent that this problem will not be resolved easily. At the moment, several organisations have submitted appeals to the EU, in order to prevent an outright ban, or at least allow more time for evaluation and the development of other methods, but the outcome is not yet known. The bad news is that however this is resolved, it is likely to result in increased costs to the procurers of laboratory data. ■

"At the moment, several organisations have submitted appeals to the EU, in order to prevent an outright ban, or at least allow more time for evaluation and the development of other methods..."

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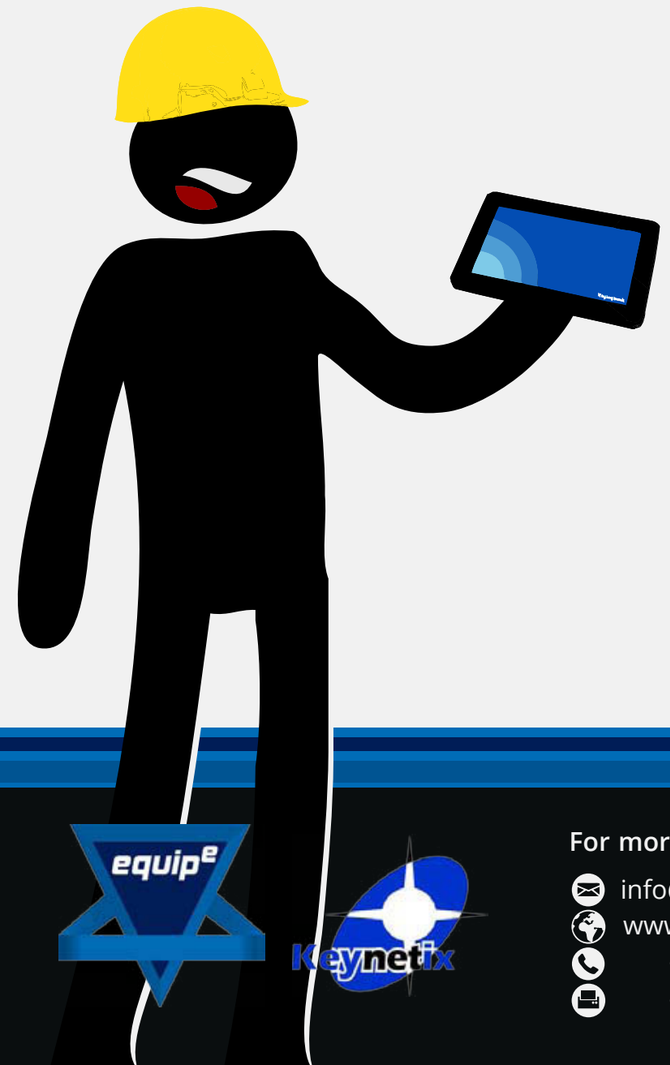

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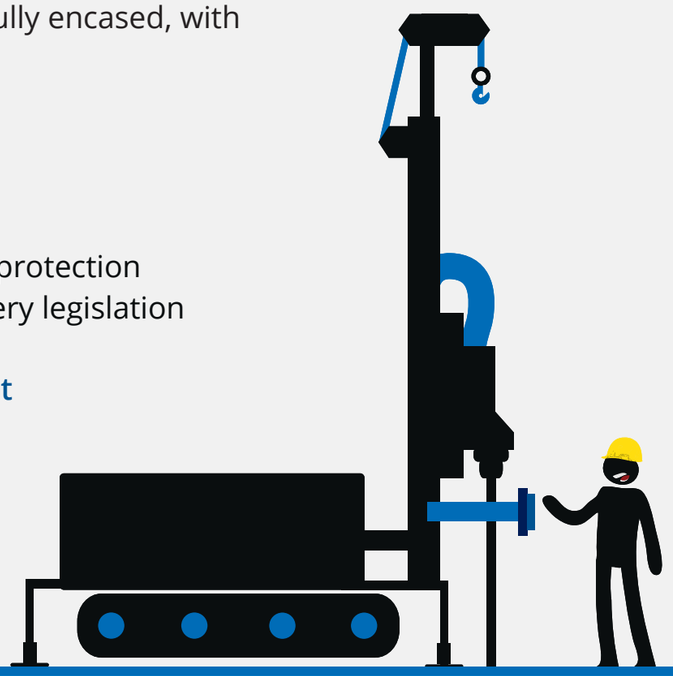

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KEEPING ON THE RIGHT SIDE OF HEALTH AND SAFETY LAW

TRAINING AND COMPETENCE

Writing for **theGeotechnica** *this month is Julian Lovell, Managing Director at the Equipe Group. This month Julian discusses Health and Safety Law, and how appropriate training and competence testing can help ensure that your site operatives stay on the right side of it.*

The Legislation

The Health and Safety at Work Act, 1974 requires employers to provide whatever information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the health and safety at work of their employees. This is expanded by the Management of Health and Safety at Work Regulations, 1999, which identify situations where health and safety training is particularly important, e.g. when people start work, on exposure to new or increased risks and where existing skills may have become rusty or need updating. The Construction Design and Management Regulations (CDM) provides guidance on how an employer should assess training needs and highlights that it is an ongoing process and may need to take account of other health and safety legislation e.g. confined space.

There is also very sound commercial reasons why training should be carried out as trained staff will carry out their work more effectively, efficiently as well as adopting a better culture to health and safety. It is important that training should be relevant to the individual and the work activity and environment where they will be working. It is equally as important that employers training budgets and schemes are not solely driven by health and safety requirements but also include vocational training packages to ensure their staff can work competently as well as safely.

Training must be provided for all levels within an organisation:

- Directors
- Managers
- Supervisors
- Operatives and Workers

"The Health and Safety Executive (HSE) and legislation requires that individuals are not only trained to carry out their duties or work activity but competent to do so. They recognise that training alone does not make an individual competent."

The Health and Safety Executive (HSE) and legislation requires that individuals are not only trained to carry out their duties or work activity but competent to do so. They recognise that training alone does not make an individual competent. HSE suggest that a competent individual must have:

• Sufficient knowledge of the specific tasks to be undertaken and the risks which the work will entail; and
• Sufficient experience and ability to carry out their duties in relation to the project; to recognise their limitations and take appropriate action in order to prevent harm to those carrying out construction work, or those affected by the work

Assessing Competence

Training is one part of the competence of an individual. Competence can be assessed through on the job qualifications such as National Vocational Qualifications (S/NVQs). These are competency based qualifications obtained by providing evidence against criteria established within National Occupational Standards. Professionally qualified people in the geotechnical industry e.g. geologists, geotechnical engineers, scientists may still be required to hold an NVQ if they cannot prove their competence in other ways such as Chartership or ROGEP.

"These are competency based qualifications obtained by providing evidence against criteria established within National Occupational Standards."

"Competence is not solely training, is definitely not an armful of paper qualifications but a combination of skills, knowledge, training and experience."

Competence is not solely training, is definitely not an armful of paper qualifications but a combination of skills, knowledge, training and experience.

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Speakers: Dr Simon Hughes - TerraDat, Kim Beesley - European Geophysical Services

NEXT SEMINAR DATE: 2nd June 2015

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Advanced Laboratory Testing Awareness - £150 + VAT

Laboratory testing has progressed in recent years due to developments of computerised measurements and advances in the acquisition of data. Advances in electronics have also enabled the measurement of small changes in stress and strain both in and around the sample. This seminar will provide perspectives of these advances through the eyes of the practicing Designers, Engineers and manufacturers.

NEXT SEMINAR DATE: 28th May 2015

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An essential comprehensive training course and refresher for geotechnical and geo-environmental practitioners involved in Cone Penetration Testing for Onshore and Offshore Geotechnics. The course is devoted to raising awareness of current test procedures, advances, data derived from the tests and the importance of quality control.

Speakers: Dr John Powell - GEOLABS Ltd, Tom Lunne

NEXT SEMINAR DATE: 23rd - 24th June 2015

Sponsored by IN SITU SITE INVESTIGATION

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The British Drilling Association (BDA) have developed an audit scheme which satisfies the requirement of BS 22475-2 and allows clients and employers to assess the ongoing competence of the drill crew. Further information is available on the BDA website http://www.britishdrillingassociation.co.uk/BDA-Audit

Note

The CSCS scheme is partially linked to NVQs and/or professional qualifications but was principally established to ensure those working on construction sites have a basic understanding of health, safety and the environment (see AGS guidance on CSCS cards). CSCS is not a competence scheme. CSCS cards will be explained in more detail in the March 2014 issue of theGeotechnica.

New Entrants

For new entrants to the industry, it is imperative that employers assess the level of competence of the individual and develop training packages for the role that individual will take. Most graduate courses include little or no industry related health and safety training. Valuable experience can be gained by exposing the individuals to site work but companies must not rely solely on on-the-job training. New entrants to drilling and field operations should receive entry level training specific to the plant or equipment to be used. This would be expected to include who to listen to, where to stand, where not to put your hands, what to watch etc. Choosing suitable mentors and mentoring of individuals is also an important source and method of training.

"Choosing suitable mentors and mentoring of individuals is also an important source and method of training."

It is suggested that the following formal courses should be included as part of a new entrants training package:

• Basic Site Safety (minimum one day i.e. Equipe/RPA IOSH Working Safely on

geotechnical sites or similar)
- Manual Handling
- Asbestos Awareness
- Avoidance of services including CAT & Genny
- Emergency First Aid at Work (EFAW)
- Driving at Work

Operatives and Workers

All site operatives and workers should have attended the new entrants training package and any additional training needs assessed by the employer.

"All professionally qualified site staff should undergo annual safety training..."

All professionally qualified site staff should undergo annual safety training as well as any specialist training required for specific project requirements, upskilling or change of role. Employers still have a duty of care and legal obligation to ensure that after training, these individuals are competent to carry out their roles.

The competence of other site operatives such as the drill crew and field technicians can be assessed through NVQs. NVQs are industry specific and are assessed by occupationally competent and qualified NVQ Assessors. Land Drilling NVQs are available for the drill crew which should comprise a Lead Driller holding a Level 2 NVQ Diploma Land Drilling – Lead Driller and a Second Man holding a Level 2 NVQ Diploma Land Drilling – Drilling Support Operative.

All site operatives and workers on construction sites must also hold a valid CSCS card applicable to their work activity e.g. Blue Skilled Worker Card – Land Drilling Lead Driller Ground Investigation Rotary, Supervisor.

Plant operatives such as JCB, tele-handler, dumper drivers should also have NVQs for the specific plant they are operating and also hold a valid CPCS card.

Supervisors

Most supervisors on geotechnical sites are graduates or professionally qualified people but as stated above this alone does not constitute that the individual is a competent supervisor. A Lead Driller will also be expected to act as a supervisor on some projects. New entrants to the industry will generally not be competent to act as supervisors as they will lack sufficient experience, knowledge and leadership skills. It should also be recognised that not all individuals, whether new entrants or not, will possess the skills to be able to act as a competent supervisor.

"It should also be recognised that not all individuals, whether new entrants or not, will possess the skills to be able to act as a competent supervisor."

Industry related supervisor's training courses are provided in-house by some of the larger companies and the Equipe/ RPA developed IOSH Safe Supervision of Geotechnical Sites course is available to those where suitable in-house courses are not available. If employers choose to send staff on generic supervisor's courses such as the CITB SSSTS then supplementary training must be provided to cover the geotechnical aspects and hazards of their work.

NVQs are also available as a suitable route to prove or obtain competence for supervisors. Level 3 NVQ Diploma Occupational Site Supervision (Construction) is currently the most appropriate qualification. BDA are currently working with CITB and industry specialists Equipe to develop an occupational Level 3 qualification for drillers.

Directors and Managers

It is generally accepted that the roles and responsibilities of a Director and Manager are similar across sectors and competence again is based upon experience, skills and knowledge. It is therefore acceptable for Directors and Managers to attend generic training for these roles such as the CITB SMSTS, IOSH Managing Safely for Senior Executives, IOSH Directing Safely. If industry specific training is identified by the employer during the training needs analysis then suitable trainers must be identified and the training completed.

The Association of Geotechnical and Geo-Environmental Specialists (AGS) has developed a Health and Safety Training Standard for the geotechnical industry which is available on their website www.ags.org.uk

CPD Approved Courses for Geotechnical Academy Alumni

Specifying Site Investigations
This one day course will look at the various methods available to carry out intrusive and non intrusive investigation. Whilst the course will concentrate on geotechnical methods some geo-environmental methods will be briefly discussed. The course will look at the aims of SI and categorise the various stages in an investigation.

Soil Description Workshop
From 2007 new European Standards have started replacing the British Standards (Codes) under which investigations in the UK have been carried out. UK working practice will have to change to meet these new requirements but few practitioners are aware of the changes or the timetable. The workshop will comprise a series of lectures on the changes, and lectures on soil description followed by practical sessions describing soil samples.

Rock Description Workshop
From 2007 new European Standards have started replacing the British Standards (Codes) under which investigations in the UK have been carried out. UK working practice will have to change to meet these new requirements but few practitioners are aware of the changes or the timetable. The workshop will comprise a series of lectures on the changes, and lectures on rock description followed by practical sessions describing rock and compiling mechanical logs of rock core.

In Situ Testing
The course will cover both the theory and the practice of various In Situ Testing techniques used on typical geotechnical projects. In addition the courses will consider the effect that Eurocodes will have on the UK's current practice. This course provides an overview of in situ tests used in common practice and some of the more specialist tests together with their advantages and limitations.

Field Instrumentation and Monitoring
The course comprises a comprehensive one day appreciation of the complete process involved in Instrumentation and Monitoring in the geotechnical environment. The course provides an overview of the current guidance documents and their requirements. The course will consider the design of both individual installations and the installation of suites of instruments in the wider site contex.

Geotechnical Foundation Design
This one day course will provide a general overview of foundation design. It will include an assessment of the use and choice of shallow foundations and piles. It will cover the derivation of bearing capacity formula and their use. Exercises will be carried out to calculate the working loads and settlement of simple foundations. The methods used to calculate these will be in accordance with those described in Eurocode.

Safe Working on Geotechnical Sites
This one day course is developed by industry specialists within RPA Safety Services and Equipe Training as a foundation to site safety. Its aim is to impart the core safety skills required of those working on geotechnical sites by building on their existing specialist technical skills. After attending the course, candidates should be able to identify hazards on site, understand basic safety legislation, participate fully and confidently in site safety consultation and manage priority risks to a sufficient standard.

IOSH Avoiding Danger from Underground Services
Partnering with RPA Safety Services once again, Equipe provide another IOSH certified health and safety course. This one day course is aimed at anybody involved in specifying, instructing, managing, supervising or actually breaking ground and really addresses the problems and risks related to underground services, which may be encountered during both planning and execution of geotechnical projects.

IOSH Safe Supervision of Geotechnical Sites
Equipe has partnered with RPA Safety Services, an independent occupational health and safety specialist, to provide a unique IOSH certified course for the Drilling and Geotechnics industry. The three day course is certified by IOSH, is specifically focussed on the geotechnical industry and provides a totally unique and relevant Health and Safety course for managers and supervisors.

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GEOTECHNICA 2009 A RETROSPECTIVE

Writing for **theGeotechnica** *this month is Calum Spires of the Equipe Group. This month is the first in a series of articles from Calum that will take a look back at previous Geotechnica events in the build-up to this year's event in July. This month Calum takes a look at the inaugural event - Geotechnica 2009.*

In mid-2009 the UK was in the midst of its deepest recession since the 1930's and the economy could to be said to be in dire straits. The geotechnical and land drilling industries were certainly no exception to this downturn in fortunes. However despite the suffering economy and sparse workload, a new geotechnically-focussed trade show, conference and exhibition would not be denied.

The brain-child of Equipe Training Limited's directors Julian Lovell, Keith Spires and Peter Reading, Geotechnica was introduced to the industry in August 2009. Based within the premises of The Upton Estate, just outside of Banbury in Oxfordshire, the rural setting for Geotechnica was perfect for a more relaxed and natural exhibition that would help plant the seeds for a more prosperous and collaborative geotechnical sector.

When asked about what the initial vision for Geotechnica was as we build towards 2015's event, Managing Director of Equipe Julian Lovell emphasised the need for development and growth within the sector as one of the main driving decisions behind the decision to create Geotechnica: "We envisioned a geotechnical trade show, conference and exhibition run by the industry, for the industry. We wanted to help develop communication, promotion, networking and learning within the sector to help us through the poor economic climate."

Operations Director Keith Spires agreed, whilst also citing the need for a more relatable and open platform for discussion and interaction for all levels of the industry:

"There were other exhibitions out there, but we really wanted to create a different show – a more grass-roots, personal, every-man exhibition…"

"There were other exhibitions out there, but we really wanted to create a different show – a more grass-roots, personal, every-man exhibition that focussed more on collaboration between actual people – contractors, clients, suppliers and others – rather than simply a display of products and machinery seemingly more about machismo than content."

Mr Lovell continued: "In early 2009, we looked at what the Geofluid show in Piacenza, Italy had become; the hive of activity, the regular innovation and the admirable collaboration between specialists, all aiming to move the industries catered to along in a forward trajectory. We were told that Geofluid had come an especially long way in 20 years, and although it may now be a huge multinational, 4 day event – it actually started in marquees in a field. Perhaps we took that information slightly too literally, however the premise really resonated with us."

As the late-summer of 2009 rolled around, the planning was completed, the marquees were erected and the first Geotechnica took place on Thursday the 27th and Friday the 28th of August. With sponsorship support secured from long-time collaborators and supporters of Equipe – Geotechnical Engineering and Geotechnical Observations, the event opened to around 400 visitors, along with 56 exhibitors, and was received with widespread enthusiasm and acclaim. The open-plan nature of the marquees encouraged movement and communication from visitor to exhibitor, client to contractor and supplier to buyer – this premise is still evident in Geotechnica today.

The simple act of talking to one another was something the Julian felt was crucial to stabilising the industry during the recession: "We felt that the main thing lacking in the geotechnical industry was communication – we needed to encourage growth through collaboration: What can we

"We felt that the main thing lacking in the geotechnical industry was communication…"

do better? Where are we lacking? What innovations are being developed to help our businesses prosper? What projects are coming up that I can be involved in?

"To answer all of these questions, we need to talk, we need to communicate – we need to network. If there isn't an easily accessible platform to display innovation and to discuss improving practices and standards, how can we move forward? That's what Geotechnica was established to be about."

"That is what Geotechnica is still about." Keith said. "The people that came to Geotechnica in 2009, and still come every year, are there for a variety of reasons. Whether they're there to discover the next new innovation to increase productiveness on site, whether there's an advancement in a certain laboratory test that is just being developed, whether they're actively seeking a contractor for a tricky new job – we wanted to create a platform to answer all of those queries and questions easily and instantly."

"Along with the issue of a lack of communication, there was also an increasing need for the knowledge-base of the industry to be increased."

Along with the issue of a lack of communication, there was also an increasing need for the knowledge-base of the industry to be increased. A way in which Geotechnica 2009 tackled this issue was to include a Technical Conference to the event that covered a range of topics.

On the first day of the event the conference featured talks on upcoming major projects from Paul Ebbutt of London Underground, Dr Ursula Lawrence at Crossrail and Mike Groves from Thames Water, amongst others, that gave a backdrop to what the post-recession geotechnical and drilling markets would look like. Trade Associations and Geotechnical Bodies were also promoted and discussed, with Stephen Booth from the British Geological Survey, Neil Smith from the AGS (The Association of Geotechnical and Geoenvironmental Specialists) and Brian Stringer, then Secretary of the British Drilling Association, all invited to speak about the role that their respective bodies had to play in aiding member companies in their growth.

Innovation and improving future practices were the focal point of the second day's conference talks. Andrew Milne of Geotechnical Engineering spoke about the possible death of the cable percussion rig, Roger Chandler of Keynetix discussed AGS 4 and how it would affect systems and business, whilst Wesley Wray of Boart Longyear introduced conference visitors to rota-sonic drilling. The session's speakers all talked about the recent innovations that were improving on-site work, whilst Tom Phillips of RPA Safety Services and Asger Eriksen of Zetica discussed the need to improve on-site safety and reducing risk. Finally Huw Williams of Loopmaster discussed the use of ground source energy and Kevin Bottomley of Geothermal Supplies questioned the best practices for installation of closed loop systems.

At the time, some of these talks were ground-breaking and served their purpose perfectly – people left Geotechnica communicating more than ever – leading to discussions on the values of different types of drilling and what could be done to get the best out of

"Innovation and progress were the buzzwords that helped kick-start the industry back into life as the economy began to show signs of growth in the UK."

each discipline. Innovation and progress were the buzzwords that helped kick-start the industry back into life as the economy began to show signs of growth in the UK.

Julian Lovell summarised the conference succinctly, whilst

emphasising its importance at the time: "The geotechnical conference has taken on a life of its own in recent years at Geotechnica and has debatably become slightly more 'technical'. In 2009 we used the conference to introduce a lot of ideas and principles to the geotechnical public – promotion of new innovations, new projects and better practices, including increasing health and safety knowledge. In the years since we have built on these principles in more depth and technicality – but 2009's line-up paved the way for that to happen."

Technical demonstrations of Geotechnical Engineering's award winning Slope Climbing Rigs and Archway Engineering's new track-mounted Cable Percussion rig were also key features of the event – the rural setting presenting the perfect opportunity to demonstrate the capabilities of the rigs in full flow.

Overall the 2009 event wasn't the largest, but it was ground-breaking and trend setting for geotechnically-focussed exhibitions in the UK. It put the focus on participation and collaboration from all stakeholders in the sector – something which the Equipe Group have built on in its wake by promoting four key principles for all future Geotechnica events, namely these: Communicate. Promote. Network. Learn. ■

FLOOD PREVENTION AND EROSION PROTECTION: IS BRITAIN READY FOR WINTER?

With the recent government announcement of £2.3bn planned expenditure on more than 1400 flood defence projects, **theGeotechnica** *examines some of the products and techniques developed by geotechnical engineers Maccaferri, which could help provide protection against future severe weather events.*

The succession of huge winter storms that battered the UK during December and January 2013/4 wreaked havoc in towns and villages throughout the country, resulting in severe flooding, transport disruption and coastal devastation.

A year down the line, the question is: "Are we ready for whatever this winter may throw at us?"

According to the Meteorological Office reports, the initial weather impacts of December 2013 were mainly due to strong winds across the north of the country. As the sequence of storms developed and the heavy rainfall totals accumulated the focus of concern shifted in January 2014, from strong winds to flooding, especially in the large river catchment areas of the Severn and Thames.

Rivers, swollen by the equivalent of several weeks of rain falling over a matter of hours, broke their banks causing widespread flooding.

"So rapidly were the rises in water levels that old river management systems were quickly overwhelmed with nearby properties, land and infrastructure badly affected."

So rapidly were the rises in water levels that old river management systems were quickly overwhelmed with nearby properties, land and infrastructure badly affected.

In coastal areas high spring tides and large waves whipped up by gale force winds combined to cause severe damage and flooding, particularly to west facing shorelines.

"A year on, and £2.3bn of public money is being invested in flood defence schemes which is hoped will prevent an estimated £30bn of damage."

A year on, and £2.3bn of public money is being invested in flood defence schemes which is hoped will prevent an estimated £30bn of damage.

With the building of strong protective embankments and erosion prevention systems now crucial priorities, the civil engineering industry has its work cut out to address these construction challenges.

One company whose origins are in the development of innovative erosion protection and watercourse management products is Oxford based Maccaferri, part of the Italian industrial Group, Officine Maccaferri.

Best known for the ubiquitous wire mesh Gabion Basket system, the company is a world leader in environmental engineering solutions with expertise in flood prevention, erosion control and river training, coastal protection, and other related disciplines. Gabions, normally used to build retaining walls, actually started life as mattress-like wire cages

which were filled with clean stone and placed on river beds to prevent erosion. They took the name of the Italian River Reno in which they were first used in 1893 and have been known as "Reno Mattresses" ever since.

Since then the company has devised creative and cost efficient solutions to a variety of water related engineering challenges. Here we take a look at a couple of examples.

St Andrew's Scotland

Erosion of the coastal sand dunes on which the famous St Andrews golf links in Fife are built risked the ongoing viability of the course. As the dunes were designated a site of special scientific interest [SSSI], Fife Council and St Andrews required a robust yet environmentally sensitive solution that would arrest the erosion of the dunes and prevent further retreat of the nearby River Eden estuary, without damaging their environmental integrity.

"Fife Council and St Andrews required a robust yet environmentally sensitive solution that would arrest the erosion of the dunes and prevent further retreat of the nearby River Eden estuary..."

A combined "hard and soft" solution was devised by HR Wallingford, comprising a 0.5m deep Reno Mattress revetment covering the inter-tidal zone with a 0.5m-2.0m high Gabion wave-wall at the crest.

Indigenous sand was placed

over the revetment mattress, effectively hiding the structure beneath a new beach area. The revetment mattresses were installed on top of a high performance filtration geotextile to prevent loss of sand particles through the mattress during high tide conditions and periods of heavy wave action. The area soon colonised with natural beach grasses.

A Reno Mattress® is a rectangular, basket enclosure structure with a large footprint area and a small thickness, made from double twist hexagonal wire mesh. The Mattress is filled with stone on site to create a flexible, permeable and monolithic structure to be used for river and canal bank protection works.

FlexMac® DT Emergency hydraulic protection

Hand placed sand bags are probably the most recognised and basic tool for emergency flood prevention for homes and commercial properties. They are slow to fill and install and extremely labour intensive. New from Maccaferri is a Gabion derived system which offers fast assembly, deployment and mechanical fill using locally available materials.

The system, FlexMac® DT is a modular structure made from double twisted, heavily galvanised wire mesh panels, reinforced with vertical steel bars and lined with a geotextile membrane.

The geotextile lining allows the FlexMac DT to be filled with locally available bulk materials such as sand, general fill or similar.

FlexMac DT is supplied ready assembled but folded to allow easy handling on site. The unit opens to form three rectangular cells nominally 0.5m cube, which can be connected to form linear runs of any required length.

"The open base of the FlexMac DT cells also means that the units can be removed by lifting, allowing the fill to discharge, then folded away and retained for future use."

The open base of the FlexMac DT cells also means that the units can be removed by lifting, allowing the fill to discharge, then folded away and retained for future use.

Their simplicity makes them ideal for temporary flood protection, embankment repair and rapid-response, inundation-prevention wherever they are required.

To deploy and assemble a single FlexMac DT unit requires only two – three people and 20-30 seconds. Using conventional hand placed sand bags, it is estimated that it would take thirty people three hours to construct a 10.0m long embankment. Using FlexMac DT, five people could construct a 60.0m long embankment in the same three hour period.

Software

To help engineers model and assess how changes to channel profile and surface characteristics affect crucial flow patterns in rivers, streams and other watercourses, Maccaferri also has a free software package available.

The "Macra 1" software package is simple and straightforward to operate and allows users to calculate flow depths in rivers and watercourses and see how altering the channel profile or modifying surface characteristics, such as by adding vegetation or applying protective measures, can affect watercourse performance, instantaneously. ■

Maccaferri's innovative FlexMac DT flood protection systems comprise Gabion-derived twisted wire cages lined with geotextile and filled with locally sourced sand.

Maccaferri Gabions and Reno Mattresses were used to reinforce vulnerable beach and dune areas adjacent the world famous St Andrews links golf course in Scotland.

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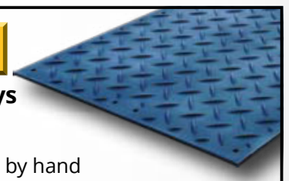

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