

GEOTECHNICAL COURSE DATES:
 Rock Description
 7th December

GEOTECHNICAL COURSE DATES:
 Geotechnical Foundation
 Design - 14th December
 Soil Description
 30th November

H&S COURSE DATES:
 Avoiding Danger from
 Underground Services
 29th Nov' 2012 + 8th Feb' 2013
 Safe Supervision of
 Geotechnical Sites:
 3rd - 5th Dec' 2012

WANT TO ADVERTISE IN THE GEOTECHNICA?

1. Select advert size. (Full, Quarter Page, Directory Entry)
2. Select timescale. (1, 3, 6 or 12 Months)
3. Format your artwork. (Adobe PDF, .jpg or .png)
4. Send your artwork to us. (magazine@geotechnica.co.uk, or contact us on 01295 670990)

Standard Rate	Member's Rate	3 Months	6 Months	12 Months
£550	£500	POA	POA	POA
£310	£280	POA	POA	POA
£160	£145	POA	POA	POA
£90	£75	POA	POA	POA

2012 Advertising Rates (€) - All members will benefit from discounted rates.

the Geotechnica

EQUIPE GROUP
 01295 670990
 www.equipgroup.com



READY TO DIG DEEP?

New HSE Regulations unveiled that could cost the unprepared

Also included:

- Geotechnica 2013 - Press Release
- Eurocode 7 Update.
- Collaboration key to success in Qatar
- Insitu Density investigation
- The benefits of speciated mercury analysis

Issue No.
16
 November 2012

Contents

- Site Investigation
- Soil and Rock Testing
- Borehole Drilling
- Engineering Consultancy



Geotechnical Engineering
Telephone: 01452 527743 Email: geotech@geoeng.co.uk
Fax: 01452 770314 Web: www.geoeng.co.uk
Built On Trust

EQUIPE GROUP

Equipe Training

- Courses (Health and Safety, Geotechnical, Drilling Plant)
- Drilling Training
- Seminars
- Qualifications (NVOs)

Equipe Geosolutions

- KeyLogbook

Geotechnica (UK and Middle East)

Drilling Services

- SPT Calibrations
- LOLER And PUWER Inspections

theGeotechnica Magazine

Supervisory and Consultancy Services

- Drilling Specialists
- Consultancy and Advisory
- Health and Safety Advice



For more information on the services offered by the Equipe Group, contact us on:

@ www.equipegroup.com
+44 (0)1295 670990
+44 (0)1295 678232

9 Cover Article: [Ready To Dig Deep?](#)

Tom Phillips of RPA Safety Services reveals new HSE regulations that may have serious repercussions for your company.



11 [Collaboration: The key to creating solid foundations for future growth](#)

The Equipe Group and Gulf Laboratories examine the current boom in the geotechnical market in Qatar, and how collaboration between companies in the UK and the Gulf Region may be the key to the works success.



15 [Eurocode - The Latest Developments](#)

Dr John Powell and Professor David Norbury explain the latest developments for Eurocode 7.

19 [Geotechnica 2013 - Press Release](#)

A press release regarding a change of venue for the UK's Largest Geotechnical Trade Show and Exhibition - Geotechnica.



23 [Can We Rely On Insitu Density?](#)

Peter Reading of the Equipe Group examines methods of measuring insitu density and the new technologies available to you.



29 [The Benefits of Speciated Mercury Analysis in Soils](#)

Writing on behalf of DETS, Hazel Davidson discusses the benefits of speciated mercury analysis in soils.



33 [Directory](#)

Welcome

Welcome to the November 2012 issue of **theGeotechnica**, the 16th edition of the industry's leading exclusively online concept emagazine. Last month we delivered a press release regarding last week's successful Geotechnica ME - this month we have news on the UK's Largest Geotechnical Trade Show and Exhibition - Geotechnica 2013.

In addition, this month the content is even more interesting and thought-provoking, particularly our featured cover article on new HSE regulations being rolled out. Highly valued and regular **theGeotechnica** contributor Tom Phillips examines the new regulations and sends a warning to all companies that are not prepared for them. Health and Safety is a burning issue within our

"...here at theGeotechnica we are determined to raise the alarm and make people aware of the importance of the correct health and safety practices that should be in place on your sites."

industry, and here at theGeotechnica we are determined to raise the alarm and make people aware of the importance of the correct health and safety practices that should be in place on your sites.

Tom's article is not the only must-read section of this month's magazine. On page 13 we have a joint contribution from Dr John Powell of Geolabs Limited and Professor David Norbury of

clear.solutions[®]
international ltd

Manufacture for supply to the global drilling market

- Environmentally friendly drilling fluids
- Grouts and sealants including geothermal grouts, bentonite pellets and granules
- Drilling fluid mixing/recycling systems and high pressure mud pumps
- Hard rock drilling tools and accessories
- Technical support and training



Drilling products for the future

T: +44 (0) 1939 235 754
F: +44 (0) 1939 232 399
E: info@drilling-products.com
www.drilling-products.com

Sussex University and David Norbury Limited. This month sees another Eurocode update, and we have asked Dr Powell and Professor Norbury to explain what the updates mean to all of us.



"The press release details the change of venue for the highly popular event, with the Warwickshire Exhibition Centre being chosen to host the event in 2013."

On page 17 we have the press release from the Equipe Group regarding Geotechnica 2013. The press release details the change of venue for the highly popular event, with the Warwickshire Exhibition Centre being chosen to host the event in 2013. The article also has details of how to book your place at the event, as well as how to get in touch if you wish to become a sponsor of the prestigious event.

Elsewhere we have an offering from Peter Reading of the Equipe Group regarding the many methods of measuring insitu density and the new technologies available to carry out the testing. Finally we have another valued contribution from Hazel Davidson of DETS. This month Hazel examines the benefits of speciated mercury analysis in soils.

"We also have new entries into the Directory and Jobs sections, with positions available at Geotechnical Engineering as well as Gardline Geosciences."

We also have new entries into the Directory and Jobs sections, with positions available at Geotechnical Engineering as well as Gardline Geo-

sciences.

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 even the slightest bit of 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.

Once again, for any content that is submitted we will provide free advertising space, proportionate to the quality of content provided, for that single edition of the magazine. From then on, if you have submitted content, you will receive a discount on all further advertisements placed within **theGeotechnica**.

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





TURBULENT FLOW TRANSITION

I feel compelled to respond to matters raised in Chris Wallace's article on Permeability Testing in Issue 15 of the Geo-

"I am delighted to see that Chris Wallace drew attention to the transition from laminar flow to transitional and ultimately to fully turbulent flow..."

technica. In particular, I am delighted to see that Chris Wallace drew attention to the transition from laminar flow to transitional and ultimately to

fully turbulent flow and to the consequence for measured flow capacity of permeable media. In particular he makes the point that "Reported permeability's are always for the laminar, not turbulent, flow." and demonstrates graphically that "permeability reduces" in the non-laminar regions. The essential point I would like to make is that flow conditions in the field are not always laminar and may indeed be fully turbulent.

In the introductory paragraph of his article, Chris Wallace refers to areas where permeability values are used and specifically refers to landfill sealing

layers (both basal and capping) and to drainage layers. Landfill commonly includes drainage layers of clean coarse gravel – typically either 40-20mm stone

"These may be installed on slopes of 1:3 and are commonly assumed for design purposes to flow under a hydraulic gradient of 1:3."

or 20-10mm stone. These may be installed on slopes of 1:3 and are commonly assumed for design purposes to flow under a hydraulic gradient of 1:3. Whether or not that occurs in practice will depend on wheth-

er or not the limiting cases assumed for design purposes actually occur. However, what is beyond doubt is that at such an hydraulic gradient the flow within such a drainage layer will be fully turbulent. Therefore a values for permeability determined in the laminar flow range will be an overestimate of the flow capacity and may well be "unsafe".

In his article, Chris Wallace makes specific reference to the Highways Agency HA41/90 permeameter. The illustrative material in the HA describes use of the permeameter at hydraulic gradients of less – in some cases much less – than

"The hydraulic gradients may be two orders of magnitude lower than encountered in high flow drainage layers..."

0.01. The hydraulic gradients may be two orders of magnitude lower than encountered in high flow drainage layers – with the consequential effect on apparent permeability.

The in-plane flow capacity of geocomposite drainage materials is routinely measured, in accordance with European and US Standards, at hydraulic gradients which ensure flow is in the transitional or turbulent range. They are as a result measured under the flow regime that may be expected to occur in service. Geocomposite drainage layers 10 – 20mm thick are routinely shown to have flow capacities in excess of layers of drainage stone 300mm – 500mm thick – and this is without any adjustment for the fact that the capacity of the gravel is assessed on the basis of laminar flow.

The transition to turbulent flow in granular drainage layers has been recognised for a long time – but it is perhaps not as widely recognised as it should be in design using very high permeability materials. I would welcome the opportunity to draw the attention of your readership to this issue and, if you were to consider it appropriate, to other aspects of ground engineering where geosynthetics present different challenges – and different opportunities.

David Young
Group Engineer of ABG Envi-

ronmental Geosynthetics and Secretary of the UK Chapter of the International Geosynthetic Society

CHRIS WALLACE RESPONSE

Coming from a predominantly laboratory-based background, I am very pleased that an obviously knowledgeable engineer has shed some light on how permeability values from the laboratory are used in practice.

"David Young's considerations regarding turbulent flow in the field are valuable insights into conditions we typically try to avoid in the laboratory."

David Young's considerations regarding turbulent flow in the field are valuable insights into conditions we typically try to avoid in the laboratory. Depending on the flow rate required being achievable, it could be possible to test samples in the laboratory under the turbulent conditions expected at higher hydraulic gradients. Although this method would not give the 'standard' laminar flow permeability normally reported, it could give realistic permeability measurements that would match the true behaviour of the placed material in the field.

Chris Wallace
Technical Manager at Geolabs Limited

READY TO DIG DEEP?

Writing for *theGeotechnica* once again is Tom Phillips of [RPA Safety Services](#). This month Tom discusses new regulations being put in place by the HSE that are likely to have extensive repercussions across the industry if we are not made aware of them.

Described variously as 'a blank cheque from industry to compensate the HSE for cuts in its departmental budget' to 'another tool in the enforcement box which inspectors can use to encourage compliance', new regulations mean failure to ensure you comply with safety laws could mean charges of £124 per hour.

"From 1 October 2012... the HSE has a duty to recover its costs for carrying out its regulatory functions..."

From 1 October 2012, under regulations 23 to 25 of The Health and Safety (Fees) Regulations 2012, the HSE has a duty to recover its costs for carrying out its regulatory functions from those found to be in material breach of health and safety law. A material breach is when, in the opinion of the HSE inspector, there is or has been a contravention of health and safety law that requires them to issue notice in writing of that opinion, to the duty holder.

The HSE may then recover its costs by charging a fee for the

time and effort it spends on helping you to put the matter right, investigating and taking enforcement action.

The Fee for Intervention (FFI) is only a concern for those businesses who are breaking health and safety laws. FFI does not apply to either self-employed people who only put themselves at risk, or to employees. Those who comply with their legal obligations will continue to pay nothing.

"The fee charged will be calculated by the hour incurred, multiplied by the FFI, which at the moment stands at £124."

The fee charged will be calculated by the hour incurred, multiplied by the FFI, which at the moment stands at £124. Chargeable time includes all work that is needed to identify a material breach and all work to ensure that the breach is remedied. It includes any investigation or enforcement action, up to the point where HSE's intervention, in relation to the material breach, has



Unsatisfactory guarding on a rotary rig.

been concluded or a prosecution is started.

So what is to be the likely impact of such charging?

Talking to one of our new clients recently, who was found to be in material breach of three key areas of the Control of Substances Hazardous Health Regulations last year, they estimated the following hours were spent by the HSE in their case:

- Inspectors initial visit 6 hours
- Issuance of prohibition and improvement notices 3 hours
- HSE time taken meeting with client 4 hours



No winch guarding - does not conform to PUWER regulations.

• Recording conclusions and inspection, investigation and enforcement information

• Reviewing investigations to ensure progress and appropriate lines of enquiry are followed

• Charges incurred by third parties used by the HSE, such as expert advice, testing laboratories etc.

"These fees are chargeable in addition to any fines imposed by courts and cannot be claimed back from insurance."

These fees are chargeable in addition to any fines imposed by courts and cannot be claimed back from insurance. There will also be the remedial costs of rectifying the breach, which the duty holder will have to pay.

Many critics of the scheme have expressed concerns that the HSE may now issue notices of a material breach, where informal guidance would normally have been given, or that inspectors will go on 'fishing expeditions' - thus allowing the

opportunity to charge for services. In effect that the scheme is a blank cheque book!

But HSE inspectors must apply their existing enforcement decision-making framework when deciding if a breach is material. The Enforcement Policy Statement and the HSE's Enforcement Management Model (examples of these can be found on the HSE website) set out examples of when a 'material breach' might occur.

"The scheme has however been broadly welcomed, by safety experts, union bodies and safety pressure groups alike."

The scheme has however been broadly welcomed, by safety experts, union bodies and safety pressure groups alike. The regulations are a result of the Government's "Good Health and Safety, Good for Everyone" policy, which intends to shift the cost of health and safety regulation from the tax-payer, to businesses and organisations that break the law. ■



COLLABORATION: THE KEY TO CREATING SOLID FOUNDATIONS FOR FUTURE GROWTH

Following on from the successful debut of Geotechnica ME in Qatar last week, in this month's edition of the Geotechnica, the [Equipe Group](#) and [Gulf Laboratories](#) have looked into the current geotechnical working climate in the Middle East and specifically Qatar. They have particularly examined the need for collaboration between UK based companies and companies based in the Gulf region to ensure that the work carried out in Qatar is of the highest standard.

Qatar's construction and infrastructure climate is set to get even hotter from 2013 which could place catastrophic strains on the construction sector and their specialists. Prior to any major construction project, ground investigations are carried out to develop a comprehensive understanding of the ground and groundwater

conditions in order to plan the construction, choose the best solutions and design any foundations required for the intended structure or development. Good quality geotechnical work is essential for any construction project to be successfully completed on time and within budget. Workload has been steadily increasing for these

specialist companies but the unprecedented planned future growth for Qatar could lead to existing companies being overstretched and underperforming and leading to unforeseen construction problems and delays.

In 2011 Ashghal, the Public Works Authority, announced \$11bn of spend for infrastruc-



Geotechnica ME: A busy Geotechnical Conference hall.

ously unseen in the country. Qatar will spend in the region of \$70bn on hundreds of new projects to prepare for 2022 including nine new stadia, the new Doha Port project, new malls, improvements to hotel and guest accommodation and yet more improvements to the infrastructure networks.

The \$35bn Qatar Integrated Railways Project currently comprises Doha Metro Network; an east coast rail link; a high-speed link between the new Doha International Airport, Doha City Centre and Bahrain via the planned Qatar-Bahrain Friendship Bridge; a freight rail link and the GCC rail network. The majority of these projects are scheduled for completion by 2020 which relies on ground investigation and pre-construction works being completed in the next two to three years. Tenders have already been sent out for ground investigation works and construction on the Doha Metro and tunnel boring is suggested to be commencing at the beginning of 2013.

Geotechnica, Equipe's flagship

"The event involved over 40 companies from the UK and the Gulf region and successfully brought the disparate parts of the industry together to discuss opportunities and ways forward."

Geotechnical Conference and Trade Show, has just successfully been run in Qatar to provide a focus on strengthening geotechnical practice, understanding and opportunity. The event involved over 40 companies from the UK and the Gulf region and successfully brought the disparate parts of the industry together to discuss opportunities and ways forward. Geotechnica ME was a great advertisement for the geotechnical and drilling industry but also provided valuable market intelligence and highlighted the massive potential for growth in this market.

Andrew Slate, General Manager of local ground investigation company Gulf Laboratories has been working in the Gulf

Gulf Laboratories carrying out GI for works in Qatar.



“Mr Slate added that “The current level of resources and geotechnical specialists in Qatar will struggle to cope with the anticipated workload...”

region for over 15 years and stated that “The current number of tenders and projects in the pipeline will saturate the geotechnical market, but it is difficult to predict the level of additional resources that will be required as we have no definite start dates for many projects”. Mr Slate added that

“The current level of resources and geotechnical specialists in Qatar will struggle to cope with the anticipated workload and if not controlled will lead to many projects being completed late and over budget. There is also an increased likelihood that companies who have lower standards will benefit alongside companies like Gulf Laboratories. Companies will have to look outside of the region to gain the necessary resources to deliver the projects to the quality required.”

Qatar will not only see an un-

precedented number of prestigious projects but these projects are also becoming larger, more complex and generally more challenging. This will require the geotechnical specialists to become more flexible,

“Many of the projects will require new techniques, new plant and equipment and a higher level of skilled personnel.”

efficient and innovative. Many of the projects will require new techniques, new plant and equipment and a higher level of skilled personnel. Companies, like Gulf Laboratories, have been increasing their resources and capabilities in line with the growth of the region and the changing requirements from their clients but many others are happy to do what they have always done.

The ground investigation and geotechnical sector relies upon professionally qualified staff such as geotechnical engineers and engineering geologists to manage projects, provide technical guidance and complete geotechnical design. The sector also relies on site staff such as technicians drillers and labourers who are often not formally trained and often possess few or no qualifications.

When the market is buoyant, a level of quality control is possible through site supervision using the professionally qualified staff, however, during market downturns and recessions, costs are cut and unfortunately all too often so are corners. This often results in supervisory staff either being excluded from

site works or not being allowed to spend sufficient time on site to provide effective quality control. In lean times it is also the training budget which is first to be cut and therefore it is inevitable that performance and quality is reduced. Exactly the same results are seen when the market becomes oversaturated with projects and the geotechnical companies start to overtrade. At these times there are simply not enough experienced and competent staff to carry out the work.

“Countries such as the UK, US and Australia have implemented training and competency programmes for their professional staff...”

Countries such as the UK, US and Australia have implemented training and competency programmes for their professional staff and vocational training and competency for site staff to ease this problem. The programmes require staff to have reached a minimum level of competency and this is often written into job descriptions and contract specifications. The competency of the individual is assessed by experts in their field, often from industry rather than academia, taking into account experience, skills and job knowledge. The schemes are driven by the industry sectors and supported by national bodies and are a positive drive to promote best practice, training and ability to do the job. These schemes act as an aid to balance performance and quality in both quiet and busy periods. During the quiet times only the staff meeting the minimum lev-

“Currently, there are no such schemes across the Gulf Region and therefore professional qualifications have to be taken at face value...”

els of competency are kept in work and during busy periods, staff have to be trained to meet those minimum levels of competency.

Currently, there are no such schemes across the Gulf Region and therefore professional qualifications have to be taken at face value and the quality of site staff is dependent upon the standards of the individual companies. Julian Lovell, Managing Director of UK based Equipe Training said that “As in all walks of life, some people will want to do a good job and others will just want to do the minimum to get paid. Training will always be secondary for some companies but only through properly certified schemes will the better companies be recognised”

So if Qatar is heading for boom times, how are the geotechnical specialists going to cope and how is the quality of the staff and their output going to be controlled?

The Qatar based geotechnical industry will not only have a shortage of specialist plant and equipment but also a skills shortage and skills gap with its specialist staff. The plant and equipment shortage is somewhat simpler to solve as new projects will justify new purchases and plant. Timescales may still be a challenge but this can be managed. The skills

shortage is more difficult to solve as there is currently not a global surplus of geotechnical specialists. However, the skills gap is the hardest problem to solve because even if the region can find the specialists, those available may still not have the right skills for the particular projects.

The solution has to involve significantly increased levels of training but due to the likely short lead in times to these projects, Qatar based companies will have to seriously consider collaboration with overseas organisations which already have staff with the necessary skills

“Collaboration with overseas organisations and specialists will not only provide the necessary experience but also the flexibility...”

and experience. Collaboration with overseas organisations and specialists will not only provide the necessary experience but also the flexibility and should also help to promote innovation. UK based companies are well placed to offer such expertise and the economic climate makes it that much more tempting. This combined with the very strong links to the west and UK/European Standards makes it a viable opportunity for those who are prepared to commit. It is likely that as with major construction projects, the geotechnical projects will see more joint ventures and consortia. Only through collaboration will Qatar be able to deliver its projects in the timescales and to the standards it aspires to. ■

EUROCODE 7

THE LATEST DEVELOPMENTS

In recent weeks there have been new developments in the issuing of supporting standards for Eurocode 7 – Cone Penetration and the six permeability test standards. This month in *theGeotechnica* we have asked Dr John Powell of [Geolabs Limited](#) and Professor David Norbury of [Sussex University](#) / [David Norbury Limited](#) to give an update to our readers about what the developments mean for the geotechnical community at large.

After much delay, approval has recently been given for the publication of BS EN ISO 22476-1:2012: Geotechnical investigation and testing — Field testing: — Part 1 Electrical cone and piezocone penetration test.

When published this will lead to the withdrawal of Clause 3.1 of BS 1377-9:1990 and also changes to BS 5930:1999+A2:2010; mainly to Clauses within 26.3 where any mention to the aforementioned clause in BS 1377-9:1990 or to the 'International Reference test Procedure' will have to be deleted and replaced by EN ISO

"This document will change the specifications for CPT/CPTU testing based on the use the results will be used for."

22476-1:2012. This document will change the specifications for CPT/CPTU testing based on the use the results will be used for.

BSI has recently published the six parts of BS EN ISO 22282:2012 on Geohydraulic testing – commonly referred to as field permeability tests in

UK parlance. The coverage of these standards is briefly summarised below; readers will find that these standards do not introduce any significant changes to the test procedures in the field or in the interpreta-

"Those executing any of these tests can start using these standards immediately..."

tion and reporting. Those executing any of these tests can start using these standards immediately, and their use will become mandatory by the middle of May 2013.

Part 1: General rules (BS EN ISO 22282-1:2012)

The context of carrying out geohydraulic (or permeability) testing is outlined in this standard. The primary context of this work is reported as follows: "The EU water directive requires the member states to increase activities that protect groundwater and fresh surface water both quantitatively and qualitatively. At the same time, society requires more water and thus more construction projects below groundwater level in even deeper waters. In

addition, the sea level may rise as a result of climate change. This contradiction requires engineers working on construction projects below groundwater level to make more reliable predictions on the effects of such structures on the groundwater conditions".

This can partly be achieved by better assessment of the permeability of the ground by in situ tests as required in EN 1997-1:2004 and more specifically in EN 1997-2:2007, where the requirements are set out as: (1) Groundwater investigations shall provide all relevant information on groundwater needed for geotechnical design and construction.

(2) Groundwater investigations should provide, when appropriate, information on:

- the depth, thickness, extent and permeability of water-bearing strata in the ground, and joint systems in rock;
- the elevation of the groundwater surface or piezometric surface of aquifers and their variation over time and actual groundwater levels including possible extreme levels and their periods of recurrence;
- the pore water pressure distribution;

- the chemical composition and temperature of groundwater.

(3) The information obtained should be sufficient to assess the following aspects, where relevant:

- the scope for and nature of groundwater lowering work;
- possible harmful effects of the groundwater on excavations or on slopes (e.g. risk of hydraulic failure, excessive seepage pressure or erosion);
- any measures necessary to protect the structure (e.g. water proofing, drainage and measures against aggressive water);
- effects of groundwater lowering, desiccation, impounding, etc. on the surroundings;
- the capacity of the ground to absorb water injected during construction work;

- whether it is possible to use local groundwater, given its chemical constitution, for construction purposes

"The set of six European standards covers a wide range of tests and Part 1 covers common aspects such as the apparatus and what it will include..."

The set of six European standards covers a wide range of tests and Part 1 covers common aspects such as the apparatus and what it will include; it discusses the Planning of geohydraulic investigations in general terms and what shall be done; it covers requirements for test preparation and gives general guidance on applicability of the various tests for dif-

ferent ground permeabilities.

Part 2: Water permeability tests in a borehole using open systems (BS EN ISO 22282-2:2012)

Coverage of this standard includes flow rate, variable head **"The requirements include execution of tests in stable and non-stable soil and rock below the groundwater surface and in unsaturated conditions..."**

and constant head tests. The requirements include execution of tests in stable and non-stable soil and rock below the groundwater surface and in unsaturated conditions.



Geolabs perform a wide range of geotechnical tests on soils, aggregates and rocks, many of them UKAS accredited, including:

- Stress Path with piezo benders & local strain
- Effective & Total Stress Triaxial Testing
- Triaxial, Rowe Cell & Horizontal Permeability
- Large and Small Direct Shear & Ringshear
- Hydraulic, CRS & Incremental Consolidation
- UCS, Young's Modulus & Poisson's Ratio
- Classification (PSD, LL&PL, compaction etc)
- Custom research & development projects

Geolabs Limited

Bucknalls Lane, Garston, Watford

Hertfordshire, WD25 9XX

Tel: +44 (0)1923 892 190

email: admin@geolabs.co.uk

The test procedures are essentially the same as those currently used in UK practice with one difference; a procedure for correcting the head/ time when the line is curved is provided.

Part 3: Water pressure tests in rock (BS EN ISO 22282-3:2012)

The use of pressure injection or pump-out tests between packers in rock can be used to determine:

- the hydraulic properties of the rock mass, which are mainly governed by discontinuities;
- the absorption capacity of the rock mass;
- the tightness of the rock mass;
- the effectiveness of grouting;
- the geomechanical behaviour, e.g. hydrofracturing,

hydrojacking

Again the test procedures are essentially the same as in current UK use; one difference is the provision of a rate of change criterion for considering a test stage to be complete.

Part 4: Pumping tests (BS EN ISO 22282-4:2012)

The pumping test procedures are essentially the same as those already in use in the UK.

Part 5: Infiltrometer tests (BS EN ISO 22282-5:2012)

those already in use in the UK. The coverage of the standard includes:

- Determining the discharge rate for the pumping test
- Arranging the disposal of discharge water
- Executing and equipping the well including: Design of the test well, Installation procedure, Preparation of the well
- Executing and equipping the piezometers
- Execution of the test including Pre-pumping monitoring, Preliminary pumping phase, Pumping test, Post-pumping monitoring
- Interruptions in pumping
- Decommissioning

those already in use in the UK. The coverage of the standard includes:

- Determining the discharge rate for the pumping test
- Arranging the disposal of discharge water
- Executing and equipping the well including: Design of the test well, Installation procedure, Preparation of the well
- Executing and equipping the piezometers
- Execution of the test including Pre-pumping monitoring, Preliminary pumping phase, Pumping test, Post-pumping monitoring
- Interruptions in pumping
- Decommissioning

Part 6: Water permeability tests in a borehole using closed systems (BS EN ISO 22282-6:2012)

"This is a simple test for determining the permeability coefficient but the test covered here is not in common use in the UK..."

This is a simple test for determining the permeability coefficient but the test covered here is not in common use in the UK where the test more commonly used is the soakaway test carried out in trial pits. The test covered in this standard utilises rings of at least 200 mm pushed at least 50 mm below the test horizon. Open or closed (pressurised) systems are covered and tests can be carried out in saturated or unsaturated soils, with a saturation procedure included.

Part 6: Water permeability tests in a borehole using closed systems (BS EN ISO 22282-6:2012)

The test covered here is the pressurised slug test which is not in common use in the UK. The test is used to determine the local water permeability in low permeability soils and rocks (<10⁻⁸ m/s) below and above groundwater level. It can also be used to determine the transmissivity T and the storage coefficient S. The test is carried out using packers to isolate the relevant test section.

The test covered here is the pressurised slug test which is not in common use in the UK. The test is used to determine the local water permeability in low permeability soils and rocks (<10⁻⁸ m/s) below and above groundwater level. It can also be used to determine the transmissivity T and the storage coefficient S. The test is carried out using packers to isolate the relevant test section.

"It can also be used to determine the transmissivity T and the storage coefficient S. The test is carried out using packers to isolate the relevant test section."

above groundwater level. It can also be used to determine the transmissivity T and the storage coefficient S. The test is carried out using packers to isolate the relevant test section.

"The tests given in these standards are currently covered in BS 5930:1999 (Clauses 25.4, 25.5, 27 and 28) which is currently being revised in order to remove conflicting material."

The tests given in these standards are currently covered in BS 5930:1999 (Clauses 25.4, 25.5, 27 and 28) which is currently being revised in order to remove conflicting material. In the meantime, it is stated in the standards that 'where conflict arises between these documents then the provisions of BS EN ISO 22282:2012 take precedence. Any conflicting parts of BS 5930:1999 should now be considered as withdrawn.'



For Sale

Sonic 450-24 Drilling Rig (2011)

Cat C7 Engine (429 hours)

Sonicor 50K Head (77 hours)

CE Certified, Full Tooling

£435,000 + VAT

GEOCUBE Thermal Response Test kit

Details found on www.precisiongeothermal.com

Price £9750 ovno

Contact:

Andrew : andrew@coresource.co.uk

Feroze : fmv@coresource.co.uk

PBA Natural Cavities and Mining Cavities Databases

- >47,000 cavity records
- National coverage
- Specialist historical archive research



- Geohazard mapping and modelling
- Land instability risk assessments
- Bespoke investigations and solutions
- Ground stabilisation schemes and validation testing

For further information contact: Clive Edmonds or Asmi Desai

- ✉ cedmonds@peterbrett.com
- ✉ adesai@peterbrett.com

🌐 www.peterbrett.com



STRUCTURAL SOILS LTD

DRILLING FOREMAN/SUPERINTENDENT - BRISTOL

Structural Soils Ltd, along with the geosciences division of RSK Group plc, is one of the largest site investigation contractors in the UK. We are looking for an experienced foreman to manage and develop a fleet of SI drilling rigs throughout our nationwide offices. You must be able to demonstrate extensive knowledge and practical experience of rotary drilling including wireline and be NVQ qualified with an understanding of cable percussion and dynamic sampling.

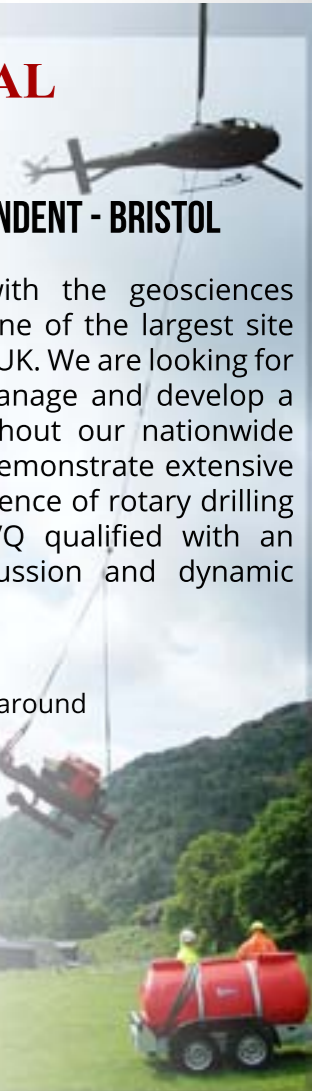
Also recruiting:

- Cable percussion driller based around Hemel Hempstead.
- NRSWA trained operatives for Hemel Hempstead and Bristol.

For more information and to apply please call:

Sarah Murphy,
Deputy HR Manager

on 0117 3004295
or email smurphy@rsk.co.uk





BIGGER, BETTER, BOLDER GEOTECHNICA 2013



Geotechnica
2013 
www.geotechnica.co.uk

It is with great pleasure that we are able to announce the return of The UK's Largest Geotechnical Trade Show and Exhibition in 2013. Celebrating its fifth **"Geotechnica 2013 will take place on the 10th and 11th of July at a NEW venue."**

birthday, Geotechnica 2013 will take place on the **10th and 11th of July** at a NEW venue.

For the past 4 years Geotechnica has taken place within the grounds of the Upton Estate in between Banbury and Stratford-upon-Avon. However in 2013 Geotechnica will move

to bigger and better equipped premises due to the increasing growth and interest shown **"That venue is the Warwickshire Exhibition Centre, situated just off the B4455 (Fosse Way)..."**

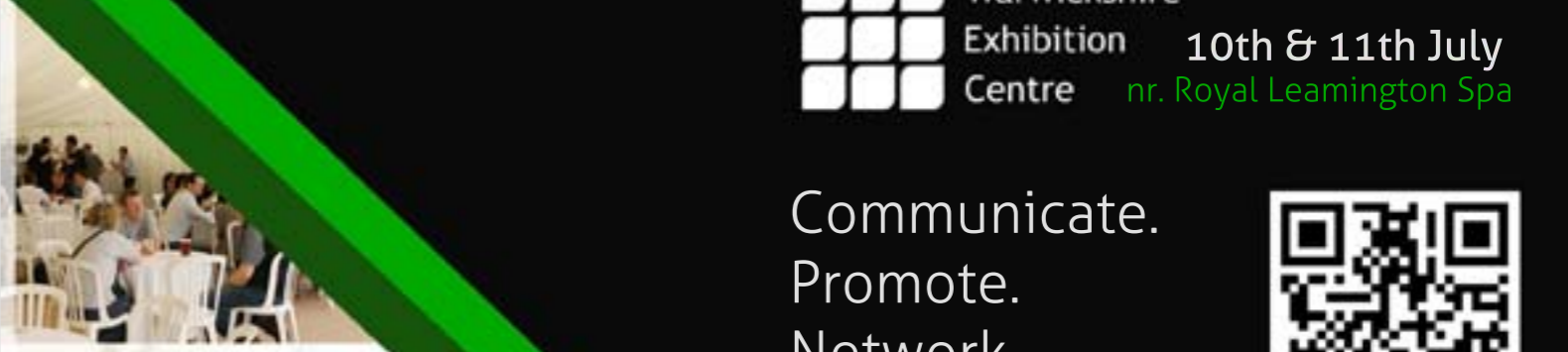
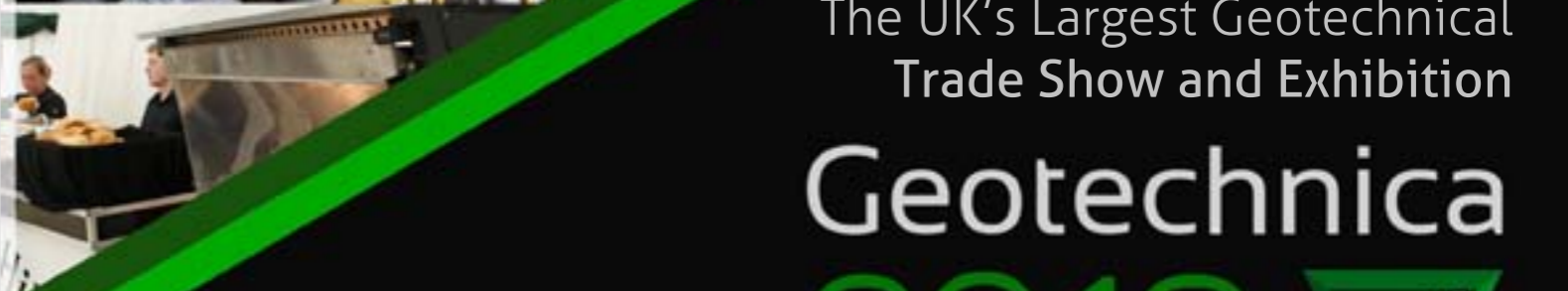
in the event. That venue is the **Warwickshire Exhibition Centre**, situated just off the B4455 (Fosse Way) and just 5 minutes outside of Royal Leamington Spa.

Managed by Meridienne Exhibitions Limited, the WEC's facilities suit an event such as Geotechnica down to the ground. Set on a 100 acre site and boasting a 2000-square metre event hall, as well as 3 and a half acres of outdoor event space, the venue has the capacity to see Geotechnica grow and blossom in 2013.

Julian Lovell, Managing Director of the Equipe Group, Geotechnica's organisers, explained the change of venue to the Geotechnica: "The opportunity to move Geotechnica to the Warwickshire Exhibition Centre was one that was too good to pass up. With the unpredictable nature of British summer-time weather we felt the time was right to move the event

"This, coupled with the very pleasing increase in interest in the event has meant that we require a greater capacity to accommodate even more exhibitors and visitors."

indoors. This, coupled with the very pleasing increase in interest in the event has meant that we require a greater capacity to accommodate even more exhibitors and visitors."



The UK's Largest Geotechnical
Trade Show and Exhibition

Geotechnica
2013 
www.geotechnica.co.uk

 Warwickshire
Exhibition Centre 10th & 11th July
nr. Royal Leamington Spa

Communicate.
Promote.
Network.
Learn.





The WEC has its own dedicated catering area, as well as an external presentation suite that the Conference portion of Geo-

"The size of the venue also allows for the use of shell schemes to be used by any/all indoor exhibitors."

technica will be held inside. The size of the venue also allows for the use of shell schemes to be used by any/all indoor exhibitors. The outdoor space is also extremely favourable, with an increased number of outdoor exhibition plots likely to be available for Geotechnica 2013 compared to 2012.

Speaking of the facilities, Operations Director Keith Spire explained: "The facilities that the venue can offer us are exceptional. Not only is the location idyllic and the space flexible, but the balance between indoor and outdoor space is spot on."

"The move from marquees to dedicated facilities takes the event into new realms of professionalism..."

The move from marquees to dedicated facilities takes the event into new realms of pro-

fessionalism, and it is a very appropriate reflection of the success and transformation Geotechnica has undertaken in the five years since its conception in 2009. It is perhaps unsurprising that the Equipe Group are confident that 2013 can deliver the biggest and best geotechnically focussed Trade Show and Exhibition that the UK has seen.

"We are confident that this move of venue will not only be a step in the right direction for Geotechnica, but will also see the event continue to grow and prosper." ■

Bookings are now being taken for Geotechnica 2013, with Early-Bird rates available until early next year. To ensure your

company's presence at the event is secure, visit www.geotechnica.co.uk for more details on the event, as well as how to register and book your attendance at the event.

If you are interested in becoming a Sponsor for Geotechnica 2013, please get in contact with the event organisers via the details below:

info@geotechnica.co.uk

Or call the Equipe Group on: 01295 670990

Warwickshire Exhibition Centre:
The Fosse,
Fosse Way,
Leamington Spa,
Warwickshire,
CV31 1XN



KeyLogbook®

developed by Equipe Geosolutions and Keynetix

KeyLogbook® revolutionises the way site data is captured, recorded and transmitted. Drillers and engineers no longer need to keep re-entering the same data over and over again thus reducing errors and making the whole process simpler, faster, smarter, greener and more efficient. The system records all site data at source and transmits it direct from site saving time and money from the outset.



KeyLogbook is available in both Fully-Rugged and Semi-Rugged Solutions



- Confidence that **all data is complete**
- AGS data available **immediately**.
- **Accurate** financial control.
- **Quicker and more efficient** turnaround of logs and data.
- **Quicker scheduling** of laboratory testing.
- Easier to **maintain chain of custody**.
- **No delays** due to re-scheduling or re-drilling.
- Enables **rapid informed decisions**.



For more information, or to purchase KeyLogbook, please contact Equipe Geosolutions on:

✉ info@equipegeosolutions.co.uk
www.equipegroup.com
01295 670990
01295 678232



State of the art digital logging system for drilling professionals.

Geotechnical Observations

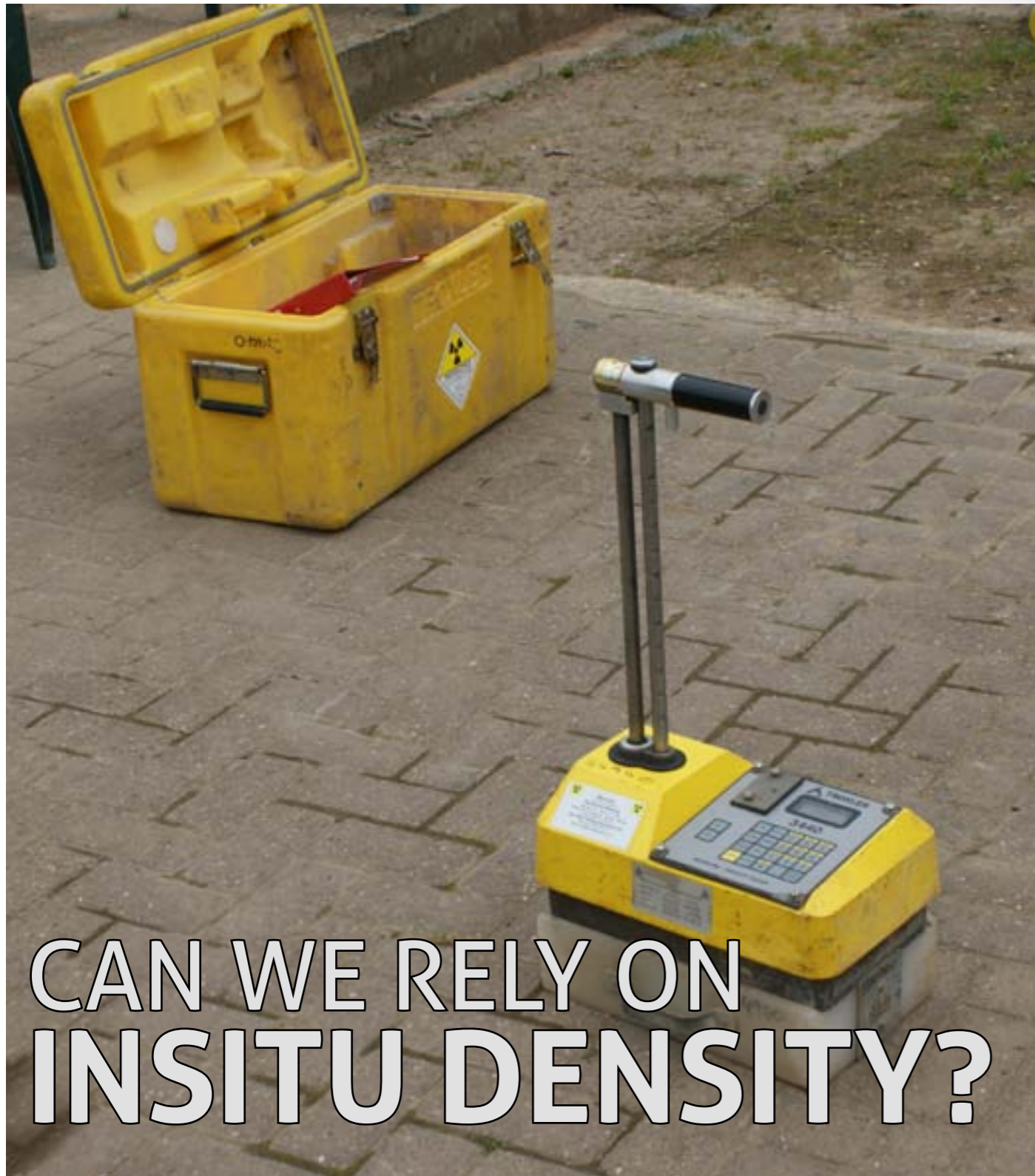
Bespoke Monitoring Solutions



- Inclinometers
- Extensometers
- Piezometers
- Shape Arrays
- Dataloggers
- Interpretation

The Peter Vaughan Building
9 Avro Way Brooklands
Weybridge Surrey
KT13 0YF
tel +44 (0)1932 352040
fax +44 (0)1932 356375
info@geo-observations.com
www.geo-observations.com

Our approach is characterised by quality and driven by understanding



CAN WE RELY ON INSITU DENSITY?

With new technologies readily available in the geotechnical market, **Pete Reading** of the [Equipe Group](#) writes for *theGeotechnica* investigating new methods of measuring insitu density.

Most earthworks carried out on site require the determination of the compacted soil density or bulk density. There are numerous methods which can be used and are often specified; but how reliable are they?

Probably the most popular method is sand replacement. This test is carried out by digging a hole into the formation and all of the soil removed is retained for weighing at the laboratory. The resultant hole volume is then determined by

pouring dry single sized medium sand into the hole through a pouring cylinder. This enables the volume to be obtained. By weighing the sand remaining from a fixed amount, a simple mass over volume calculation enables the bulk density to be

“This all sounds very simple and in theory it is, however the practice is not quite so straightforward.”

derived. This all sounds very simple and in theory it is, however the practice is not quite so straightforward. The test can be conducted in any soil although there may be stability problems in granular soils and there is also a risk that gravel will be plucked from the hole wall disturbing the surrounding soils.

This test is carried out on site so all the constraints of weather and site conditions come into play. Anyone who has tried to do this test will know that it requires meticulous working to ensure all the material dug from the hole is retained and saved to take to the laboratory for weighing. In addition the sand used to fill the hole must be kept dry which is not always

“However the greatest errors occur when trying to form the hole, as this requires digging without disturbing the surrounding ground.”

that easy to achieve. However the greatest errors occur when trying to form the hole, as this requires digging without disturbing the surrounding ground. This can be very difficult to achieve because the action of digging almost invariably requires pressure on the wall of the hole which compresses the surrounding soil. The hole becomes enlarged by this action and thus the volume measured is increased. The re-



sultant density is therefore reduced.

To obtain dry density it is necessary to take samples for moisture content determinations - these results will not be available until the following day, by which time if the results indicate that the material is outside the required specification it starts to become onerous to rectify the situation on site. Overall although this test is common it is subject to errors and results are not delivered quickly.

We could use the core cutter method of density testing, this uses a short 100mm diameter metal tube, with a preformed cutting edge, which is driven into the formation. When at the required depth the mould containing soil is dug out, trimmed and sealed ready for transport to the laboratory. Once at the laboratory the sample weight is obtained and dimensions measured to enable the density to be calculated. If the results are needed quickly then a separate sample is often used to obtain the moisture content. The main limitation of this test is that it is only suitable for fine grained soils. Soils containing gravel will be disturbed during driving making it unsuit-

“Driving is often carried out using a drive hammer which, unless kept perfectly vertical, can cause the mould to tilt which will alter the density of the soil.”

able in coarser grained soils. There is also a risk that even in fine grained soils disturbance will occur. Driving is often carried out using a drive hammer which, unless kept perfectly vertical, can cause the mould to tilt which will alter the density of the soil. There is also a risk of the operator being overzealous and over driving the tube - this will compact the sample

“Eurocode 7 requires a sample of quality class 1 or 2 for the determination of density...”

and increase density. Eurocode 7 requires a sample of quality class 1 or 2 for the determination of density, because this is a driven sample it requires the sample to be driven with just a few blows or pushed into the ground in a single smooth action. This is difficult to achieve using hand tools. It is therefore difficult to be certain that the sample has been obtained



in a compliant way.

Commonly used today are nuclear Density Gauges. These were derived from early pioneering work in the 1950's and use a radioactive source (usually Caesium 137 and or Americium 241 / Beryllium). Gauges work either by using direct transmission of radioactive particles or by measuring backscatter.

“Using direct transmission the retractable rod is lowered into the mat through a pre-formed hole. The source emits radiation, which then interacts with electrons in the material...”

Using direct transmission the retractable rod is lowered into the mat through a pre-formed hole. The source emits radiation, which then interacts with electrons in the material and loses and scatters the energy. Radiation that loses sufficient

“The denser the material, the higher the probability of interaction and the lower the detector count.”

energy or is scattered away from the detector is not counted. The denser the material, the higher the probability of interaction and the lower the detector count. Therefore, the detector count is inversely proportional to material density.

Backscatter: The retractable rod is lowered so that it is level with the detector but still within the instrument. The source emits radiation, which then interacts with electrons in the material and both loses energy and scatters the energy. Radiation that is scattered towards the detector is counted. The denser the material, the higher the probability that radiation will be redirected towards the detector. Therefore, the detector count is proportional to the density.

“There has been much debate over the accuracy of tests conducted using these gauges and even more over the safety issues of transporting and using a nuclear source.”

In both cases the gauge needs to be calibrated for the material being tested. There has been much debate over the accuracy of tests conducted using these gauges and even more over the safety issues of transporting and using a nuclear source. Firstly much of the inaccuracies measured can be eliminated by good calibration controls it is essential that each instrument is calibrated for the particular material type being tested. This requires a controlled sample to be taken and compacted to the required density in a density box. This sample should be kept in controlled conditions to enable the density to be checked at regular intervals. Each gauge must be separately calibrated for the material to be tested. By doing this the gauge accuracy is greatly increased.

However this does not get away from the fact that the gauge uses a nuclear source and therefore requires stringent controls for storage, transport and use. The HSE has produced guidelines which must be adhered to for these instruments (HSE Information sheet – Ionising radiation information sheet 3) available as a free download from the HSE website. This requires a Radiation Protection Advisor to be appointed. The technicians using the equipment must be trained in its operation, transportation and emergency procedures.

The beauty of the gauge is that it will give results of density and moisture content instantly. **“The test is relatively quick to perform. Often the gauge will incorporate a GPS so this suits most earthworks operations with positions easily identified.”**

taneously. The test is relatively quick to perform. Often the gauge will incorporate a GPS so this suits most earthworks operations with positions easily identified. If results fall outside the required parameters the contractor can deal with the defective zones with less disruption to the works. Even so, there have been many disputes with results being contested.

“These inaccuracies together with the obvious risks have resulted in several test methods being adopted to give a more balanced assessment.”

These inaccuracies together with the obvious risks have resulted in several test methods being adopted to give a more balanced assessment.

The management of the devices and responsibility placed on the contractor carrying out the test is definitely onerous not to mention the difficulties of disposal when the equipment reaches the end of its useful life. As one engineer said “there are an awful lot of older gauges out there”.

Due to the inherent risks and



the emotive use of nuclear material, we have seen the emergence of non-nuclear density gauges perhaps these will provide both the accuracy and peace of mind engineers are looking for?

Non-nuclear devices use advanced electrical impedance. The equipment looks and is operated in a similar way to the nuclear gauge and requires the same level of calibration in order to provide repeatable and accurate results. However it does not require the stringent controls of storage, transportation and use demanded by the use of nuclear gauges. The de-

vice was designed in the United States and was initially used for determining the density of asphaltic materials, which has since been extended to include moisture content and density for soils. Recent work by the US Army Engineer Research and Development Centre has shown that the results obtained are very consistent. This was done by running a series of controlled tests using several methods commonly used to determine moisture content and density.

These gauges are starting to emerge in the UK, but it will probably take some

"theGeotechnica understands that ASTM will shortly be including this as an accepted method for the determination of field moisture content and density determinations."

time before they become widely used as always there is some scepticism that they will produce sufficiently accurate results. However, we should not ignore all of the tried and trust-

ed methods, as some seem to be wanting.

It would seem at least worth putting this non-nuclear density gauge on the list of acceptable methods. theGeotechnica understands that ASTM will shortly be including this as an accepted method for the determination of field moisture content and density determinations. ■

If you have an opinion or would

like to add to this discussion please send your comments to us here at theGeotechnica.

For more information on non-nuclear gauges contact Jonathan Sides, Director of JR Technical Services UK Limited, the sole authorised TransTech Systems inc distributor for the UK and Ireland.

Tel: 0191 2855977
Mob 07831 800112
Email: jon.sides@jrts.co.uk

Box Calibration v NDM/SDG/SRD - Chalk (Class 6P)

Box	Bulk Density (Mg/m ³)				Moisture Content (%)				Dry Density (Mg/m ³)			
	BOX	SDG	NDM	SRD	BOX	SDG	NDM	SRD	BOX	SDG	NDM	SRD
1	1.935	1.964	1.989	1.919	22.1	22.9	21.5	22.1	1.585	1.598	1.637	1.572
2	1.901	1.955	1.929	1.871	20.8	21.9	19.8	20.8	1.538	1.604	1.61	1.549
3	1.920	1.974	1.946	1.879	20.4	22.1	19.1	20.4	1.595	1.618	1.635	1.561
4	1.967	1.993	2.042	1.901	21.1	21.6	18.6	21.1	1.624	1.639	1.727	1.570
Mean	1.929	1.974	1.972	1.884	20.8	21.9	19.2	20.8	1.586	1.620	1.657	1.560
Corrections	N/A	N/A	0.978198	N/A	N/A	N/A	1.083478	N/A	N/A	0.978605	N/A	N/A

Upcoming Courses - Autumn/Winter

provided by Equip Training

29th November 2012 & 8th February 2013

IOSH Avoiding Danger from Underground Services

3rd - 5th December 2012 & 13th - 15th February 2013

IOSH Safe Supervision of Geotechnical Sites



14th December 2012

Geotechnical Foundation Design



30th November 2012

Soil Description Workshop

7th December 2012

Rock Description Workshop



A Comprehensive Drill Design and Supply Company

SUPPLING AND HIRING FOR MINING AND EXPLORATION

Drill Rods, Casing, Corebarrels, Drilling Equipment, Site Investigation Equipment, Drill Bits, Drilling Rigs and Pumps

Sole UK Agents for Berretta and Geotool



Drillwell Ltd, Unit 3, Rotherham Close, Killamarsh, Sheffield, S21 2JU

Tel: 0114 2487333
Fax: 0114 2487997
www.drillwell.co.uk

DRILLWELL LTD

To book your place, please contact Equip Training:

✉ info@equipetraining.co.uk
@ www.equipetraining.co.uk
☎ 01295 670990
☎ 01295 678232

Supported by



Writing for *theGeotechnica* once more is Hazel Davidson, formerly of Alcontrol, but now of [Derwentside Environmental Testing Services](#). This month, Hazel explores the benefits of speciated mercury analysis in soils.

Mercury is recognised as one of the most toxic contaminants found on sites, and is proven to cause 'significant possibility of significant harm' for human health. The toxic effects, though, depend very much on the form in which it exists in the soil.

Occurrence

Mercury is found naturally as the ore, cinnabar (mercuric sulphide, HgS), and was used extensively in the recovery of gold and silver, alkaline batteries, dental amalgams, paints, pharmaceuticals, thermometers and

"Over the last 40 years the usage has decreased, due to disposal or toxicity problems..."

agriculture. Over the last 40 years the usage has decreased, due to disposal or toxicity problems, but the chemical element will remain indefinitely in the environment, and although it may be converted to various forms over time, it will never disappear.

It can exist as one of three forms: elemental, inorganic, or organic.

Elemental is the metallic, silvery form, normally liquid at room temperature; inorganic salts are the most soluble and can be mercuric or mercurous; and organic forms exist usually as monomethylmercury compounds with the standard formula CH₃HgX.

Toxicity

"Elemental and organic mercury are most toxic due to their ability to volatilise..."

Elemental and organic mercury are most toxic due to their ability to volatilise, and the inhaled vapour is easily absorbed by the body. The Tolerable Daily Intake (TDI) for elemental is 0.06 ug/kg of body weight per day, and for organic the TDI is 0.23 ug/kg of body weight per day.

The brain and Central Nervous System are the organs most affected by both these forms, with symptoms ranging from slurred speech, loss of motor control, impaired cognitive skills, damage to hearing and vision, and in extreme cases insanity, paralysis, coma and death.

Inorganic mercury, particularly as mercuric salts, is easily absorbed by ingestion into the body, and affects the kidneys rather than the CNS, causing potential kidney failure. The TDI for inorganic mercury is 2 ug/kg of body weight per day. The most famous incident of mercury poisoning was in the Minamata Bay area of Japan in the 1950s, where fish contamination from industrial waste effluent was the cause.

Soil Guideline Values

The Environment Agency published Science Report SCO



THE BENEFITS OF SPECIATED MERCURY ANALYSIS IN SOILS

Land Use	SGV mg/kg dry weight	SGV mg/kg dry weight	SGV mg/kg dry weight
	Elemental Hg	Inorganic Hg	Methyl (organic) Hg
Residential	1	170	11
Allotment	26*	80	8
Commercial	26*	3600	410

50021 in 2009, entitled Soil Guideline Values for Mercury in Soil, providing extensive background information and guideline values relating to the three forms of mercury.

The soil matrix is assumed to be a sandy loam with a TOC value of 6%.

***The SGV is capped at the saturation limit as only the inhalation route is a risk**

SGVs for the three chemical forms of mercury differ significantly from each other for two reasons:

- Human toxicology differs for

each of the three main forms, with elemental mercury and methylmercury being the most toxic by inhalation and oral routes respectively.

- Elemental mercury and monomethylmercury forms are much more volatile than inorganic mercury and therefore vapour inhalation is more likely to contribute to exposure.

Consideration should also be given to the soil matrix and conditions, as elemental mercury is much more stable in the

presence of sulphide species under strongly reducing conditions, and where peaty, sewage contaminated or flooded soils are present, increased methylation may occur (conversion from inorganic to organic mercury).

Mercury Analysis

When soils are submitted to the laboratory, most clients request total mercury as part of a metals suite. This is performed on a dried and crushed soil, followed by acid digestion with concentrated nitric and hy-

drochloric acid, and then analysis by ICP (Inductively Coupled Plasma emission spectroscopy).

“Most clients do not realise that the aggressive preparation for this method will probably lose most elemental and organic mercury species.”

Most clients do not realise that the aggressive preparation for this method will probably lose most elemental and organic mercury species.

Speciated mercury analysis is performed on the wet, as received soils, so no losses are likely due to the preparative procedures.

- **Inorganic Mercury (II) and Methyl Mercury**

Extraction of samples follows

the USEPA Method 3200 guidelines for “Mercury species fractionation and quantification by microwave assisted extraction”. Samples are homogenised and taken through a two-step microwave extraction procedure to take both the extractable and non-extractable mercury (semi and non-mobile) compounds into solution. The use of microwave extraction in sealed vessels prevents the loss of any of the more volatile

“Then the extracted species are separated by HPLC, oxidised to break down the organic complexes...”

mercury components. Then the extracted species are separated by HPLC, oxidised to break down the organic complexes, followed by treatment with a reducing agent and analysis by

“All stages are performed on a continuous ‘on-line’ setup directly linked to an atomic fluorescence detector.”

atomic fluorescence spectroscopy. All stages are performed on a continuous ‘on-line’ setup directly linked to an atomic fluorescence detector. Quantification is performed by comparison to a specifically generated calibration curve.

- **Elemental Mercury**

Samples are again tested on an as-received base. Samples are purged with argon, the elemental mercury is collected on a silica-gold vapour trap, and the collected elemental mercury analysed by atomic fluorescence spectroscopy. Quantification is performed by comparison to a specifically generated



Hg PSA Speciating Analyser

calibration curve.

Risk assessment and disposal. If only total analysis is performed, risk assessors (or the regulators) may assume the worst case scenario that all the mercury present exists as elemental or organic. This means all soils with a value greater than 1 mg/kg will need disposal as contaminated soils, if they are not being remediated on site. The costs for this may be as high as £80 per tonne (without the landfill tax), and this can easily mount up to tens of thousands of pounds for several lorry loads of waste soil.

If speciated mercury is performed, thus proving that it is present as inorganic, then val-

ues of up to 170 mg/kg may be acceptable and remain on site, depending on the particular site, end use and risk assess-

“Even if the soil is removed, it may not be classified as hazardous as in Scenario 1, and therefore the gate price at landfill will be lower.”

ment. Even if the soil is removed, it may not be classified as hazardous as in Scenario 1, and therefore the gate price at landfill will be lower.

Summary

The toxicity of mercury depends upon the form in which it exists, and information with

respect to this is very helpful for consultants performing risk assessments. In addition, due to the differing Soil Guideline Values for the different forms, speciation can also help to save on costs for disposal or remediation. ■

Reference

Soil Guideline Values for mercury in soil - Science Report SC050021 / Mercury SGV – Environment Agency

DETS (Derwentside Environmental Testing Services) is an independent analytical laboratory, established in 1999, providing a wide range of environmental analyses and was one of the first laboratories to offer speciated mercury testing. DETS are recognised as a centre of excellence for asbestos testing, are accredited to ISO 17025 and MCERTS for the majority of analyses, and are also accredited for sampling.

DETS – dependable data, dependable delivery

Tel: 01207 582333
Email: info@dets.co.uk
www.dets.co.uk



Hg Cinnabar

Directory

WANT
TO
ADVERTISE
IN

THE GEOTECHNICA?

Advert Size	Standard Rate	Member's Rate	3 Months	6 Months	12 Months
Full Page	£550	£500	POA	POA	POA
Half Page	£310	£280	POA	POA	POA
Quarter Page	£160	£145	POA	POA	POA
Directory	£30	£25	POA	POA	POA

All adverts placed by Drilling Academy™ members will benefit from discounted rates.

2012 Advertising Rates (£) - All rates are given excluding VAT.

1. Select your advert size.
(Full, Half, Quarter Page, Directory Entry)
2. Select timescale.
(1, 3, 6 or 12 Months)
3. Format your artwork.
(Adobe PDF, .jpg or .png)
4. Send your artwork to us.
(magazine@geotechnica.co.uk,
or contact us on 01295 670990)

borehole surveying software

GEOMEM

24 John Huband Drive, Birkhill, Angus, DD2 5RY
United Kingdom
Tel: 01382 329 011 **Fax:** 01382 230 256
Email: tech@geomem.com

consultants

GROUND TECHNOLOGY

Ground Technology Services, Maple Road, Kings
Lynn, Norfolk, PE34 3AF
Tel: 01553 817657 **Fax:** 01553 817658
Email: mail@groundtechnology.co.uk

drilling contractors

APEX DRILLING SERVICES

Sturmi Way, Bridgend, CF33 6BZ
Tel: 01656 749149
Email: thomas.martin@apex-drilling.com

BOREHOLE SOLUTION SITE INVESTIGATION

13 Great North Road, Buckden, St Neots,
Cambridgeshire, PE19 5XJ
Tel: 01480 812457 **Mob:** 07969 715655
Email: boreholesolutions@gmail.com

CONCEPT

Unit 8 Warple Mews, Warple Way, London
W3 0RF
Tel: 020 8811 2880 **Fax:** 020 8811 2881
Email: si@conceptconsultants.co.uk

DYNAMIC SAMPLING UK

37 Kingsway Industrial Park, Kingsway Park
Close, Derby, Derbyshire, DE22 3FP
Tel: 01332 224466 **Mob:** 07836 365533
Email: info@dynamicsampling.co.uk



Dynamic Sampling UK Ltd
Geo-Environmental Drilling Specialists
Window Sampling - Probing - Handheld
Rotary Coring, Augering and
Rotary Percussive Drilling
Cable Percussion
In situ Testing
All crews qualified to NVQ, PTS,
LUL, EUSR and CSCS
Tel: 01332 224466 / 07836365533
www.dynamic-sampling.co.uk

GEOTECHNICAL ENGINEERING

Centurion House, Olympus Business Park,
Quedgeley, Gloucester, GL2 4NF
Tel: 01452 527743 **Fax:** 01452 729314
Email: geotech@geoeng.co.uk

RGI GEOTECHNICAL INVESTIGATION

Unit 37, Longfield Road, Sydenham Industrial
Estate, Leamington Spa, Warwickshire, CV31
1XB
Tel/Fax: 01926 886329 **Mob:** 07748871546
Email: rgi10@aol.com

TERRA FIRMA GROUND INVESTIGATION

Rowan Tree Farm, Blackwell Hall Lane, Ley Hill,
Buckinghamshire, HP5 1UN
Tel: 01494 791110 **Fax:** 01494 791108
Email: enquiries@terrafirmagi.co.uk

drilling equipment

DRILLWELL

Unit 3, Rotherham Close, Killamarsh, Sheffield,
S21 2JU
Tel: 0114 248 7833 **Fax:** 0114 2487997
Email: sales@drillwell.co.uk

field instrumentation

CONCEPT

Unit 8 Warple Mews, Warple Way, London
W3 0RF
Tel: 020 8811 2880 **Fax:** 020 8811 2881
Email: si@conceptconsultants.co.uk

GEOTECHNICAL OBSERVATIONS

The Peter Vaughan Building, 9 Avro Way,
Brooklands, Weybridge, Surrey KT13 0YF
Tel: 01932 352040 **Fax:** 01932 356375
Email: info@geo-observations.com

geophysics

EUROPEAN GEOPHYSICAL SERVICES

22 Sansaw Business Park, Hadnall, Shrewsbury,
Shropshire SY4 4AS
Tel: 01939 210 710 **Fax:** 01939 210 532
Email: europaegophys@europeangeophysical.com

TERRADAT

Unit 1, Link Trade Park, Penarth Road, Cardiff,
CF11 8TQ
Tel: 08707 303050 **Fax:** 08707 303051
Email: web@terradat.co.uk

geotechnical software

KEYNETX LTD

Systems Park, Moons Park, Burnt Meadow Road,
Redditch, Worcestershire, B98 9PA
Tel: 01527 68888 **Fax:** 01527 62880
Email: sales@keynetix.com

geotechnical specialists

GEOTECHNICAL ENGINEERING

Centurion House, Olympus Business Park,
Quedgeley, Gloucester, GL2 4NF
Tel: 01452 527743 **Fax:** 01452 729314
Email: geotech@geoeng.co.uk

GEOTECHNICAL OBSERVATIONS

The Peter Vaughan Building, 9 Avro Way,
Brooklands, Weybridge, Surrey KT13 0YF
Tel: 01932 352040 **Fax:** 01932 356375
Email: info@geo-observations.com

health and safety

EB SAFETY

Tel: 01926 642465 **Mob:** 07881858271
Email: ebetts@ebsafety.co.uk



Emma J Betts: BSc(Hons) MSc GradIOSH
Health & Safety Consultant

01926 642465 e.betts@ebsafety.co.uk 07881 858271
www.ebsafety.co.uk

laboratory services

ALCONTROL Laboratories

Units 7 & 8 Hawarden Business Park, Manor Road, Hawarden, Deeside, Flintshire CH5 3US
Tel: 01244 528 700 **Fax:** 01244 528 701
Email: hawarden.sales@alcontrol.com

CONCEPT

Unit 8 Warple Mews, Warple Way, London W3 0RF
Tel: 020 8811 2880 **Fax:** 020 8811 2881
Email: si@conceptconsultants.co.uk

GEOLABS

Bucknalls Lane, Garston, Watford, Hertfordshire, WD25 9XX
Tel: 01923 892 190 **Fax:** 01923 892 191
Email: admin@geolabs.co.uk

K4 SOILS LABORATORY

Unit 8, Olds Close, Watford, Hertfordshire, WD18 9RU
Tel: 01923 711288 **Fax:** 01923 711311
Email: office@k4soils.com

site investigation

CONCEPT

Unit 8 Warple Mews, Warple Way, London W3 0RF
Tel: 020 8811 2880 **Fax:** 020 8811 2881
Email: si@conceptconsultants.co.uk

training and education

EQUIPE GROUP

The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxford, OX15 6HU
Tel: 01295 670990 **Fax:** 01295 678232
Email: info@equipegroup.com



Geotechnical Engineering Ltd is a long-established ground investigation specialist, employing some 125 people from its base in Gloucester. We have our own drilling rigs and drillers, laboratory and field technicians, geotechnical and geo-environmental engineers. We offer a full range of services to a wide variety of Clients throughout the UK.

We believe that further opportunities are now opening up for us in several of our markets, and are intending to recruit additional senior staff to the following roles:

COMMERCIAL MANAGER

To head up a team of estimators, assessing and pricing ground investigation contracts throughout the UK. Should have 10 to 15 years minimum experience in the industry, including a solid grounding in tendering and contract managing.

SENIOR CONTRACTS MANAGER

To take responsibility for large and/or complex ground investigations, working with other Managers, staff and sub-contractors. Should have at least 8 years experience in the industry, including significant contract management.

2 no. HIGHLY EXPERIENCED (ROTARY) DRILLERS

To bring additional skills and experience to the drilling team, and to mentor, develop and set an example to more junior drilling staff. Should have at least 10 years varied ground investigation drilling experience, mostly on rotary and multi-purpose rigs.

GEOTECHNICAL CONSULTANT

To bring technical and managerial skills to a relatively young team of geotechnical and geo-environmental engineers, and to help to develop their full potential. Should have at least 15 years experience in both technical and commercial areas, and preferably be chartered with an MSc.

PRINCIPAL GEOTECHNICAL ENGINEER

To further strengthen this young team of engineers (above), both technically and commercially. Should have at least 10 years experience, an MSc, and be working towards charterhip.

interested?

www.geoeng.co.uk

Please email your CV to andrew.milne@geoeng.co.uk

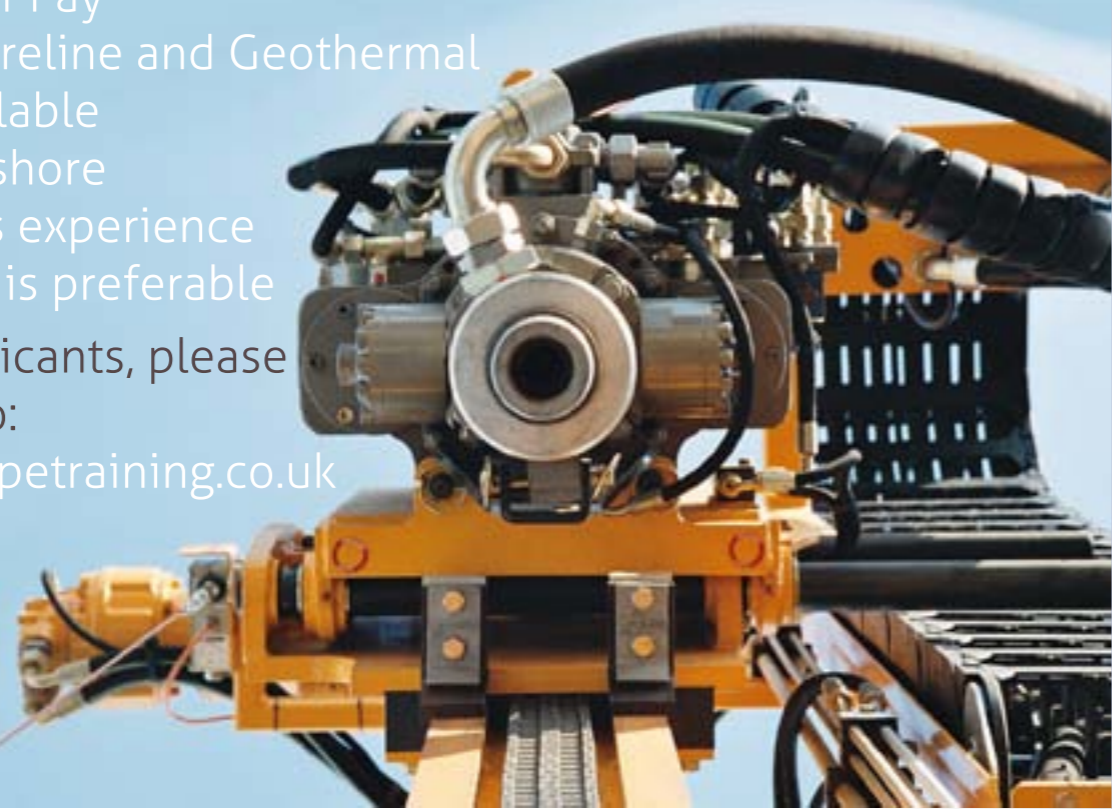
Rotary Drillers

We have vacancies available for experienced Lead Rotary Drillers, both in the UK and Worldwide.

- Excellent Rates of Pay
- Conventional, Wireline and Geothermal positions all available
- Onshore and Offshore
- Minimum 5 Years experience and NVQ Level 2 is preferable

All interested applicants, please forward your CV to:

keith.spires@equipetraining.co.uk



Gardline Geosciences is an established and highly respected independent marine geotechnical investigation company and part of the Gardline Group of Companies.

Gardline Geosciences performs marine rotary drilling with wireline tools and seabed CPT's from its own in house fleet of vessels as well as vessels of opportunity in water depths that range from the nearshore to 2000 metres. Our operations are worldwide, with prestigious projects for major oil and gas clients having recently been completed in the Antarctic; South America; off the Grand Banks of Canada as well as the North Sea.

Due to our increasing workloads we are currently seeking to recruit engineering geologists / geotechnical engineers at all levels to help plan; specify and supervise marine seabed investigations. Core skills required Include logging of soil and rock to British and European Standards; a working knowledge of cone penetration testing; laboratory strength and classification testing and the preparation of factual/interpretative reports.

Salary is negotiable depending on experience and all positions carry an attractive offshore allowance.

Reply with a CV to:
Brian Georgious
Gardline Geosciences
1 Hewett Park, Hewett Road
Gapton Hall Industrial Estate
Great Yarmouth, Norfolk
NR31 0NN

Or email to:
brian.georgious@gardline.co.uk

 **Gardline**
Engineering Geologists/
Geotechnical Engineers
£ Negotiable



theGeotechnica



Driving our industry forward...

Equipe Group
The Paddocks, Home Farm Drive
The Upton Estate
Banbury, OX15 6HU

Find us online:



Equipe Group



@EquipeGroup



Equipe Training Ltd

