Geotechnical Courses

Soil Description Workshop
5th April 2016, 5th May 2016
Rock Description Workshop
10th March 2016, 6th May 2016
Geo Foundation Design
6th April 2016

Health & Safety Courses

IOSH Safe Supervision (3 Day)
16th - 18th March 2016
IOSH Avoiding Danger (1 Day)
19th February 2016
IOSH Working Safely (1 Day)
8th April 2016

Geotechnical Courses

In Situ Testing
22nd March 2016
31st May 2016
Geotech' Lab Testing Awareness
1st March 2016
10th May 2016

Other Events

Geotechnica 2016
6th & 7th July 2016
@ Brunel University, London

theGeotechnica

February 2016 | Issue 47

The dangers of striking gas

A note from the HSE regarding the growing concern about striking gas during drilling and piling works

Aarsleff's Soft Drink Piling

Piling firm Aarsleff discuss their recent works on a water tank storage area

Quality Data Production - The SPT

Geotechnical Engineering explain the importance of SPT Calibrations

UXO and Ground Investigation

1st Line Defence reveal the issue of unexploded ordnance

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Contents

Welcome

Welcome to the 47th Edition of **theGeotechnica** - the UK's fastest growing online geotechnically focussed e-magazine.

The opening article of this month's issue comes from Debbie Darling of Jooce Marketing & PR on behalf of Aarsleff. This month Debbie reveals details of Aarsleff's recent work on a water tank storage area for one of the UK's most successful producer of fruit juice drinks.

Next up is Liz Withington, Senior Manager at Geotechnical Engineering Ltd. This month Liz takes a look at SPT Calibrations and explains the importance of the testing to obtain quality data.

Following on from Liz is Phil Baptie, Research & Reports Manager at 1st Line Defence Ltd. In this contribution Phil discusses the issue of unexploded ordnance in ground investigation works.

Our final contribution is also our cover article and is a note for circulation via drilling & piling trade organisations regarding the dangers of gas strikes during drilling and piling works from the HSE.

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

SOFT DRINKS MANUFACTURER GETS PRECAST SOLUTION WITH AARSLEFF PILES

Writing for theGeotechnica this month is Debbie Darling of Jooce Marketing & PR on behalf of Aarsleff. This month Debbie reveals details of Aarsleff's recent work on a water tank storage area for one of the UK's most successful producer of fruit juice drinks.

Aarsleff, one of the UK's leading contractors of driven precast piles, has successfully completed foundation works on a water tank storage area for the UK's most successful producer of fruit juice drinks and Europe's largest dedicated juice manufacturer.

"Works were awarded to Aarsleff by main contractor SC Forecourts Ltd..."

Works were awarded to Aarsleff by main contractor SC Forecourts Ltd, Taunton and despite industry demand causing a 1-week delay in the start of piling they were completed mid-August 2015, which was still within the contract period. Within this period Aarsleff was also able to achieve the requested design changes, as the client increased the scope of works and increased pile numbers. Whilst the project was in progress, changing ground conditions allowed Aarsleff to reduce pile lengths from 31m to 29m, providing the customer with a more cost-effective solution. This was achieved through open communication with the engineer.

On completion of works and speaking about project Clive Williams, Project Engineer, Refresco Gerber said: "Job complete. Your boys did a good job and worked really hard. Crew were polite, good to talk to and worked well with very stringent CDM co-ordinator.

Specifically works saw Aarsleff install 106no. 300-mm square precast concrete piles to 29-metre depth and to 500kN. Aarsleff's own Juntann rig was used for the install.

"Specifically works saw Aarsleff install 106no. 300-mm square precast concrete piles to 29-metre depth and to 500kN. Aarsleff's own Juntann rig was used for the install."

Speaking about the project, Nathan Sale, Contracts Engineer, Aarsleff said: "This was an interesting project complicated by a delay in being able to start due to industry demand, however, despite the delay, we were able to complete the work to schedule. Working with the client we were even able to implement design changes, which saved the client money." ■

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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.

IOSH Working Safely (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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HOW DO YOU KNOW THAT YOU HAVE QUALITY DATA?

Writing for theGeotechnica this month is Liz Withington, Senior Manager at Geotechnical Engineering Ltd. This month Liz takes a look at SPT Calibrations and explains the importance of the testing to obtain quality data.

"When you pay too little, you sometimes lose everything, because the thing you bought was incapable of doing the thing it was bought to do". John Ruskin

To operate as a competent and trusted ground investigation contractor there are many "behind the scenes" procedures that need to happen to provide safe and reliable equipment to site to ensure that you, the Client, or you the Consultant, receives the quality data that reduces your risk.

Amongst these many procedures is the checking and calibration of the "SPT" hammer. The Standard Penetration Test, the SPT, is carried out in primarily cohesionless soils to determine its strength and deformation properties. The test is carried out to EN ISO 22476-3, and involves the dropping of a 63.5kg mass hammer onto a drive head from a height of 760mm. The number of blows (*N*) necessary to achieve 300mm penetration of the sampler is the penetration resistance.

"The Standard Penetration Test, the SPT, is carried out in primarily cohesionless soils to determine its strength and deformation properties."

"Energy loss occurs in the SPT hammer due to friction on the hammer shaft or on the impact with the hammer drive..."

When the SPT *N* results are to be used for foundation design or comparison of results the actual energy delivered by the hammer drive weight onto the drive rods below is required. The value is known as the Energy Ratio (Er). Energy loss

occurs in the SPT hammer due to friction on the hammer shaft or on the impact with the hammer drive, and so the Er percentage of each individual hammer is required to be tested under the standard.

The measurement of the Er transmitted to the drive rods can be made using an instrumented section of rod positioned a specific distance below the point where the hammer impacts the drive head. This instrumented section of rod is capable of measuring the vertical acceleration and the axial deformation induced in the rod, and requires a datalogger. From these measurements a calculation is carried out to provide the Er as a percentage.

The Equipe Group are the only independent provider of SPT Calibrations and have been carrying out the tests both on working geotechnical sites, and also in our own test holes at our offices since 2008. Using their state of the art SPT Analyzer+, Equipe provide calibrations and certification compliant to the requirements of the British Standards; BS EN ISO 22476-3 for Standard Penetration Tests and BS EN ISO 22476-2 for Dynamic Probing. Equipe's experienced engineers can set up the equipment and provide instant analysis to the site staff. Tests can be performed in holes as shallow as 6m and are carried out typically using 10 blows.

Over the Christmas shutdown Geotechnical Engineering Ltd annually takes the opportunity to ensure that all of our equipment is safe and calibrated. Our SPT hammers have all been checked and calibrated and are ready to be used on our many geotechnical ground investigations throughout the UK. Digital copies of the SPT hammer certificates are readily available for our Clients if required.

To get in touch and book your own SPT hammers and dynamic sampling rigs in for calibration, get in touch with the Equipe Group, either via the website contact form found here, via info@equipegroup.com or call us on +44 (01)1295 670990. ■

UNEXPLODED ORDNANCE AND GROUND INVESTIGATION

Writing for theGeotechnica this month is Phil Baptie, Research & Reports Manager at 1st Line Defence Ltd. In this contribution Phil discusses the issue of unexploded ordnance in ground investigation works.

The legacy of Unexploded Ordnance (UXO) contamination in the UK is becoming an increasingly prevalent issue, with more 'brownfield' urban sites and former MoD land being developed, and increased insurance and health and safety legislation and concerns. Invariably, where the possibility of encountering UXO has not been considered, it can often lead to delays and increased costs, especially during site investigation and groundwork stages, as well as significant health and safety issues. In most cases, these issues can be avoided if UXO risk assessments are undertaken and if appropriate risk management procedures are carried out at the initial stages or during planning. Recent bomb finds in London and Coventry have highlighted that UXO discovery is becoming a more regular occurrence (see images to right).

Clients have a legal duty under CDM2015 regulations to provide designers and contractors with project specific health and safety information needed to identify hazards and risks associated with design and construction work. The possibility of encountering UXO falls within the category of a potentially significant risk, and should be addressed as early as possible in the lifecycle of a project. More information can be found in CIRIA C681 Unexploded Ordnance, A Guide for the Construction Industry.

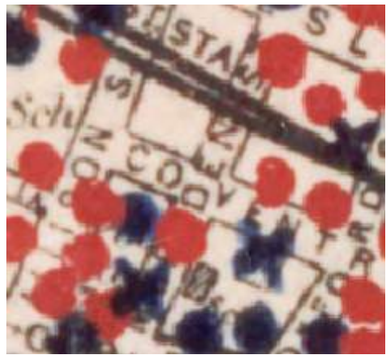
"The possibility of encountering UXO falls within the category of a potentially significant risk, and should be addressed as early as possible in the lifecycle of a project."

Background to UXO Risk in the UK

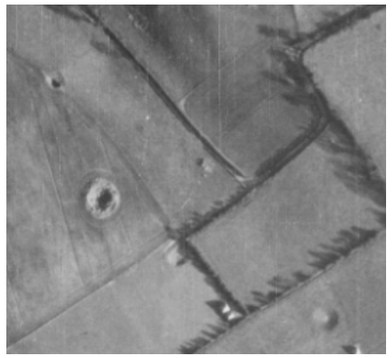
For projects being undertaken in the UK, there are two main potential sources of UXO contamination. The first is from German air-delivered ordnance from WWI and WWII which failed to function as designed and remain buried and undetected. The second is as a result of current and historic military use and occupation – training areas, ranges, airfields, defensive positions, camps etc.

A total of around 75,000 tons of bombs was dropped on Britain during WWII, and it is commonly estimated that 10% of weapons deployed failed to function as designed. Even with the extraordinary efforts of the military's bomb disposal units in defusing and making safe the bombs which were observed and reported during and after the war, there is still a high percentage of devices unaccounted for in our towns, cities and rural areas. The bombs can range from high explosives of varying calibres to incendiary devices. They can be encountered at just below surface, and have been recovered at depths in excess of 12m.

For areas of previous



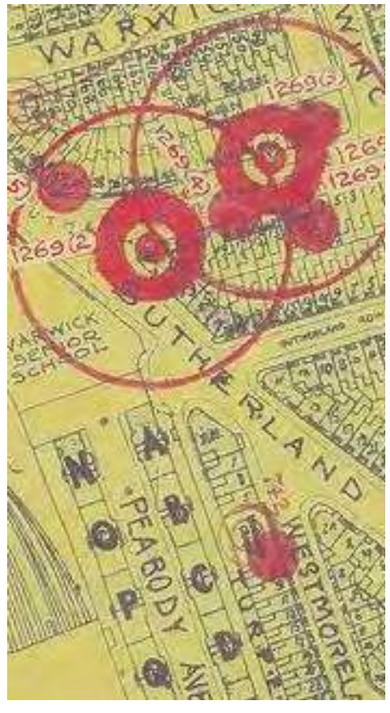
Bomb census mapping.

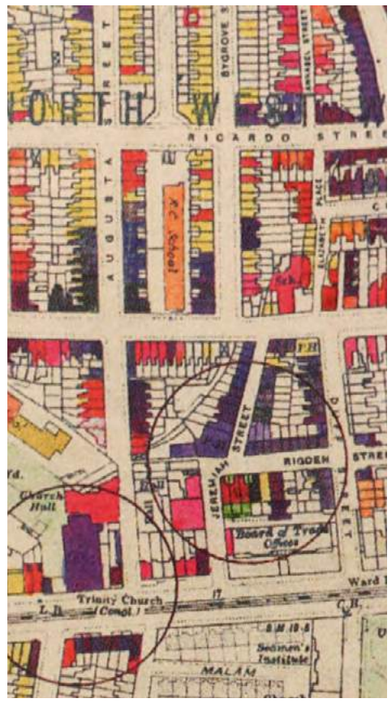


Historical aerial photography.

Major targets: Oil infrastructure.

Major targets: Rail infrastructure.





It should be noted that the majority of construction projects across the UK as a whole will be at a low or negligible risk of encountering UXO. However, the risk or lack thereof is not always evident without undertaking specific historical research. It is generally recommended that all sites are screened at an initial stage by undertaking a Preliminary UXO Risk Assessment to try and ascertain whether any additional, more detailed, research is required or whether the risk can be discounted at that point. A Preliminary Assessment should take into account factors such as site history, land use, historic or current military use/ occupation, bomb density, proximity to bombing targets, frequency of access and groundcover, as well as what is being planned on the site.

“However, the risk or lack thereof is not always evident without undertaking specific historical research.”

“These basic assessments can be undertaken by a developer/land owner, but it is more common for the task to be given to a UXO Contractor...”

These basic assessments can be undertaken by a developer/ land owner, but it is more common for the task to be given to a UXO Contractor, as specialist knowledge and datasets not available in the public domain are often vital. 1st Line Defence produce Express Preliminary UXO studies for any site in the UK. They take around a day to complete and are written by graduate researchers, making them entirely bespoke to each development using the datasets and information available to us in-house. In most cases, it will be possible to discount or assess a ‘minimal’ risk and confirm a recommendation of ‘no further action’.

If more research is required to fully qualify any potential risk, a Detailed UXO Risk Assessment will be recommended. This assessment will access and check any available relevant external information from local and national archives such as written bomb incident records, bomb census mapping, Luftwaffe target maps, damage mapping, historical mapping and WWII-era aerial photography. For military related sites, specific records such as operational log books, war diaries, site plans, clearance records etc. will also be accessed.

“For military related sites, specific records such as operational log books, war diaries, site plans, clearance records etc. will also be accessed.”

The Detailed Assessments present, analyse and summarise this data and if a viable risk is identified, risk mitigation measures will be recommended depending on the scope of works. ■

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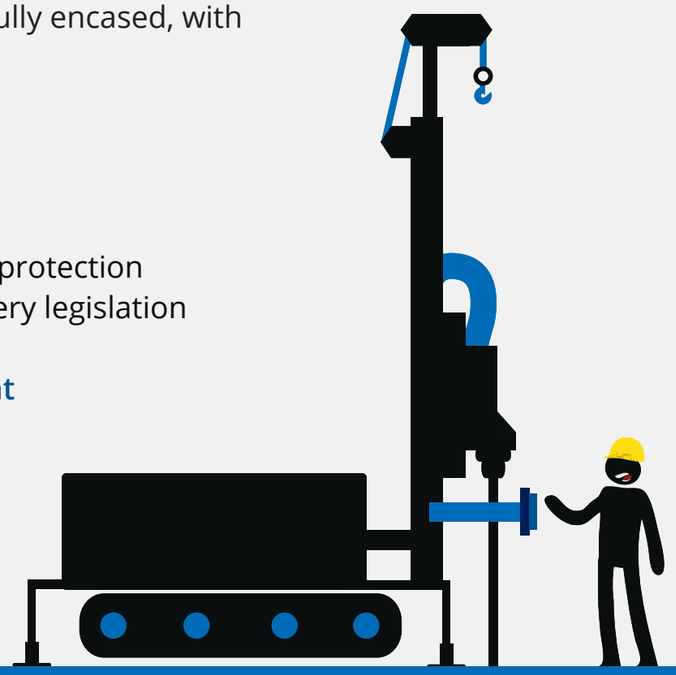

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GAS STRIKES DURING DRILLING & PILING

The following contribution to this month's issue of theGeotechnica is a note for circulation via drilling & piling trade organisations regarding the dangers of gas strikes during drilling and piling works from the HSE.

The HSE has asked the drilling and piling industry to consider the issue of ground gas emissions during intrusive geotechnical survey, deep foundation construction and other construction works. There is concern that flammable, toxic or asphyxiant gas can be released from the ground during drilling or piling operations and could lead to fire and explosion or other dangerous situations and that some parts of the industry have yet to appreciate the issue and do not plan their work to minimise risk from ground gas.

"This note has a dual purpose – it is a reminder that the type of incidents described can occur – and also a request for information and case studies…"

This note has a dual purpose – it is a reminder that the type of incidents described can occur – and also a request for information and case studies from members so that more detailed guidance can be compiled and published by the industry.

There are several sources for gas released during intrusive drilling or piling works including:

- Piped gas
  - o pipe struck during drilling
  - o existing small leak trapped underground
- Biogenic gas from strata with high organic content
- Coal / Mine gas:
  - o Gas in abandoned workings
  - o Gas evolved due to underground heating (spontaneous combustion).
  - o Gas diffusing from unworked coal
- Deep oil bearing strata via e.g. unplugged borehole

Flow rates and duration from a strike are affected by several variables including:

- Size of reservoir
- Reservoir pressure
- Rate of recharging
- Number of escape pathways
- Proximity of other escape pathways
- Changes in water table – hydrostatic pump effect
- Change in atmospheric pressure – pressure balance effect

"Aside from a direct strike on a piped gas main, other sources of ground gas tend to pose a problem where the reservoir is overlain by impervious strata…"

Aside from a direct strike on a piped gas main, other sources

of ground gas tend to pose a problem where the reservoir is overlain by impervious strata such that gas is trapped underground at a pressure that need be only slightly above atmospheric pressure for emissions to occur.

A release of gas from the ground can be difficult to assess and control even in open air. If the event occurs during drilling or piling in a confined space – such as in a cellar, basement or tunnel – escape can be difficult and earliest warning by gas detector alarm may be the only way of ensuring the safety of the rig crew and other workers. It can take detailed laboratory analysis and assessment just to determine the likely source of a ground gas release.

“Recent publicised incidents have tended to involve work near to former coal mines where air flush drilling has displaced toxic carbon monoxide…”

Recent publicised incidents have tended to involve work near to former coal mines where air flush drilling has displaced toxic carbon monoxide which has tracked underground into nearby housing. In 2012 the Coal Authority published detailed guidance on: ‘Managing the risk from hazardous gases when drilling or piling near coal’. This can be downloaded free from:

https://www.gov.uk/government/publications/guidance-on-managing-the-risk-of-hazardous-gases

“Fire and explosion has occurred and gas emission has been known to continue for weeks or months.”

Current concern includes drilling or piling through impervious strata into high organic content strata that may be underlain by porous rock which is able to act as a reservoir. Fire and explosion has occurred and gas emission has been known to continue for weeks or months.

All intrusive drilling and piling work must be preceded by information collection, assessment and selection of equipment and systems of work suited to the situation, ie:

- Desk study of area to be drilled including geology
- Services location
- Coal Authority permission if drilling on their land or into their assets
- Gas monitoring for flammable, toxic & asphyxiant gas where gas strike is possible during drilling/piling (including methane / CO2 / CO and oxygen level)
- Rig suitable for flammable zone may give option to continue or withdraw
- Rig not suitable for flammable zone means abandon rig and rethink
- A plan will be needed for monitoring any strike and a design for gas handling / dispersion / collection
- Time critical projects warrant greater contingency planning for potential issues

Existing Coal Authority guidance is detailed but does not apply to all the scenarios described above. Further guidance could assist with planning intrusive works.

“Members will need to decide how much further guidance is needed and to what degree of detail.”

Members will need to decide how much further guidance is needed and to what degree of detail. The HSE would like the drilling and piling industry to assist by providing information to your trade organisation about your experience and practices you use to deal with these issues. Only from this information can the industry determine if this is a significant and likely risk and if it is then we should help to determine appropriate industry guidance. ■

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