AGS Magazine
the official magazine of the Association of Geotechnical and Geoenvironmental Specialists

November / December 2017

LABORATORY PROFICIENCY TESTING

GEOLABS' Director John Masters provides an examination of the importance of proficiency testing for UK geotechnical laboratories

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Concerning main river floodplain boreholes and temporary trial pits

Chair's Foreword

I am pleased to be able to introduce the first edition of the AGS Magazine. Our aim is to provide quality content that is interesting and stimulating to AGS members and for the geotechnical and geoenvironmental community. All credit should go to the people that have helped produce the magazine, which is not for profit and freely available via the AGS website.

This issue closely follows our successful Data Conference, held at the National Motorcycle Museum in Birmingham, which will be the venue for Members' Day on Wednesday 11th April 2018.

One of the key aims of the AGS is to promote and improve standards within our industry and John Masters' article on proficiency testing explains how important this exercise is in enabling laboratories to demonstrate their technical competence. We eagerly await the results of the most recent scheme, which are to be published in the near future.

We intend to publish regular articles such as the standards update and a summary of the most popular AGS documents. In addition we are looking at having some themed editions, which will concentrate on a particular relevant topic.

As always, we are indebted to the efforts of those who give their time and considerable expertise for free to contribute to the seven AGS working groups; safety, geotechnical, contaminated land, loss prevention, laboratories, data management and business practice. You are welcome to get involved with these groups, subject to being a member of the AGS.

We would be interested in your feedback on this first edition and our future plans. Please contact AGS@ags.og.uk if you have any comments.

Neil Parry
AGS Chair

ABOUT THE AGS

The Association of Geotechnical and Geoenvironmental Specialists (AGS) is a non-profit making trade association established to improve the profile and quality of geotechnical and geoenvironmental engineering. The membership comprises of UK organisations and individuals having a common interest in the business of ground investigation, geotechnics, geoenvironmental engineering, engineering geology, geochemistry, hydrogeology, and other related disciplines.

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If you have a news story or event which you'd like to tell our editorial team about, please contact the AGS on 020 8658 8212 or ags@ags.org.uk. Please note that articles should act as opinion pieces and not directly advertise a company. The AGS is under no obligation to feature articles and events received.

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Inside this month's issue

News in Short

Save the Date: AGS Members' Day

The Association of Geotechnical and Geoenvironmental Specialists annual Members' Day event is taking place on Wednesday 11th April 2018 at the National Motorcycle Museum in Birmingham.

This full day conference will feature presentations from the AGS' Working Group Leaders and a number of industry guest speakers.

Members' Day is free for AGS Members' to attend*.

For further information and sponsorship opportunities please contact ags@ags.org.uk

*terms and conditions apply

The top three AGS publications for November 2017

1. Guide to Good Practice in Writing Ground Reports
2. Site Investigation Asbestos Risk Assessment Ver 2.4
3. Guidance for Safe Intrusive Investigation of Contaminated Land

To download the publications for free; click here.

Loss Prevention Alert 64

ENVIRONMENT AGENCY, STANDARD RULES SR2015 NO 36 – "INSTALLING AND USING SITE INVESTIGATION BOREHOLES AND TEMPORARY TRIAL PITS WITHIN A MAIN RIVER FLOODPLAIN FOR A PERIOD OF UP TO 4 WEEKS"

This standard rules permit was implemented with no introduction in 2015 and appears at first glance to require any boreholes with monitoring wells remaining in place for longer than 4 weeks, drilled within a flood plain of a main river to be completed under a standard rules environmental permit. (This is not related to works covered by a flood defence consent which relates to works undertaken within 8–16m of a non-tidal or tidal river (or flood defence structure or culvert) respectively.)

However, given that this would be exceedingly onerous and would effectively apply to most site investigation boreholes, especially drilled in London and other UK riverside cities, AGS has questioned the applicability and validity of this SR Permit with the Environment Agency to obtain clarification.

> **"... AGS has questioned the applicability and validity of this SR Permit with the Environment Agency to obtain clarification.**

Feedback from the flood protection team has indicated that this permit ONLY applies to boreholes drilled as part of a 'flood risk activity' within a flood plain. Such an activity is one which is likely to divert or obstruct floodwaters, to damage any river control works or to affect drainage. (A full definition of Flood Risk Activities is defined in the Flood Risk Regulations 2009, see www.gov.uk).

It does not apply to similar works for ground investigation for potential development projects.

However, good practice in line with the key concern of the EA raised by this SR permit relates to control of arisings, such that 'all excavated material shall be returned to the place they were removed from or removed from the flood plain entirely'.

> **"It does not apply to similar works for ground investigation for potential development projects.**

This Loss Prevention Alert is, of necessity, generic and is not intended to be a complete or comprehensive statement of the law, nor does it constitute legal or specialist advice. It is intended only to highlight issues that may be of interest to AGS members. Neither the writer, nor AGS, assumes any responsibility for any loss which may arise from accessing, or reliance on the material and disclaims all liability accordingly. Professional advice should be taken before applying the content of the alert to particular circumstances.

Further information and advice is available through the AGS Legal Helpline.

Details of this helpline can be found on Page 34 of this month's magazine.

Alert prepared by
Jo Strange
Technical Director
Card Geotechnics Ltd

Explaining Laboratory Proficiency Testing

Proficiency Testing and Interlaboratory Comparison schemes are an invaluable tool for laboratories to assure the quality of their test and calibration results. Often seen as simply a necessity to satisfy an accrediting body, the benefits of participation in Proficiency Testing and Interlaboratory Comparison schemes are greatly underrated.

The ILAC publication 'Benefits for Laboratories participating in Proficiency Testing Programs' highlights that *'the basic purpose of proficiency testing is to assess performance of laboratories for their conduct of specific test, measurements or calibrations. Many laboratories operate in isolation from other laboratories and do not have ongoing opportunities to compare their data with others. Without such opportunities there are risks that a laboratory's data may have errors, biases or significant differences compared to similar laboratories.*

> **“ Without such opportunities there are risks that a laboratory's data may have errors, biases or significant differences...**

Proficiency Testing provides an opportunity to undertake such comparisons and to have an independent appraisal of the laboratory's data compared to reference values (or other performance criteria) or to the performance of similar laboratories. The results from such participation provide laboratory managers with either a confirmation that the laboratory's performance is satisfactory or an alert that investigation of potential problems within the laboratory is required'.

As defined, Proficiency Testing (PT) is generally run by an independent third party and allows laboratories to objectively monitor the reliability of their test results by the use of standardised

test materials. However, Interlaboratory comparisons (ILC's), when performed in accordance with ISO/IEC 17043:2010, require the measurement or test of test items in predetermined conditions by two or more laboratories.

> **“ All laboratories accredited to ISO/IEC 17025(E) : 2005 are required to have procedures in place to monitor the validity of test results...**

All laboratories accredited to ISO/IEC 17025(E) : 2005 are required to have procedures in place to monitor the validity of test results (and calibrations) undertaken.

Clause 5.9.1 of ISO/IEC 17025(E) : 2005 states that:

'The laboratory shall have quality control procedures for monitoring the validity of tests and calibrations undertaken.... This monitoring shall be planned and reviewed and may include, but shall not be limited to;

a) Use of certified reference materials

b) Participation on interlaboratory comparison or proficiency testing programmes

c) Replicate testing

d) Retesting of retained items...'

Whilst ISO/IEC 17025(E) does not stipulate a mandatory requirement for accredited laboratories to participate in Proficiency Testing, it recommends that laboratories participate in quality assurance schemes such as Interlaboratory Comparison or Proficiency Testing.

However, Accrediting Bodies (UKAS for the United Kingdom) ARE required to ensure that 'its accredited laboratories participate in proficiency testing or other comparison programs, where available and appropriate, and that corrective actions are carried out when necessary'(clause 7.15.3 of ISO/IEC 17011:2004).

> **“ Accrediting Bodies (UKAS for the United Kingdom) ARE required to ensure that 'its accredited laboratories participate in proficiency testing or other comparison programs...**

The UKAS policy on Proficiency Testing is specified within UKAS Technical Publication TPS47 – UKAS Policy on Participation in Proficiency Testing, which states that:

'4.1 all accredited laboratories shall participate in PT/ILCs where such schemes are available and relevant to their scope of accreditation'.

In August 2013, AGS produced a Position Paper (http://www.ags.org.uk/item/laboratory-proficiency-testing/), in which the AGS highlighted the necessity for Proficiency Testing to promote best practice and improve professional standards in the geotechnical & geo-environmental laboratory community.

> **“ The 2017 scheme report will be issued once data from all of the participants has been received...**

Geolabs Limited has been running a Proficiency and Interlaboratory Comparison Testing Scheme (PICTS) since 2005. The Scheme is run every other year although there have been some years where 'mini-schemes' have also been run to accommodate certain specific tests and requirements.

The 2017 Scheme was limited to UK laboratories only, initially for 16 BS1377 geotechnical and chemical tests. A further 8 tests were requested for inclusion, but only 4 attracted sufficient interest to be included. Therefore 20 tests were included in the 2017 scheme.

51 laboratories fully participated in the 2017 Scheme. Each participating laboratory was provided with a unique Participant ID, known only to them to maintain confidentiality at all times.

Four types of standardised material were used in the Scheme, from sandy silty clay to very sandy gravel, all prepared from documented procedures before being sent to participating laboratories.

When all participant test data is received, each participating laboratory is provided with a report with tabular and/or graphical reporting formats, and statistical analysis of each test with the Participant ID being their unique laboratory number.

The 2017 scheme report will be issued once data from all of the participants has been received, collated and analysed. It is envisaged that the report will be issued to all participants, UKAS and to Ground Engineering magazine by end November.

Participation in Proficiency Testing and Interlaboratory Comparison schemes is not just an accreditation requirement, it is essential for any laboratory looking to demonstrate technical competence and to provide confidence in the quality, reliability and integrity of the test data they produce.

Article contributed by
John Masters
Director
GEOLABS Ltd

Figure 1.
Site investigation.

PCBs: What are they?
And which suite do I need for my ground investigation?

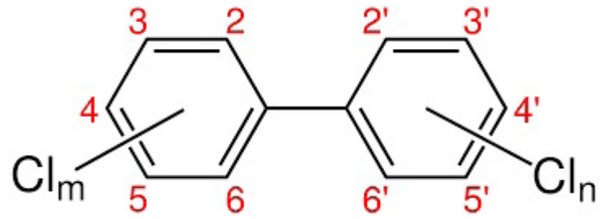
TerraTek are new members of the AGS and this month their Senior Chemistry Supervisor, David Bowen writes about PCB's to provide important advice for our readers.

Poly-Chlorinated Biphenyls (PCBs) are evironmental contaminants that were common in the 1930's until the 1980's. PCBs were often used in insulation, coolants, paints and flame retardant substances due to their low flamability and stability. However, they were fazed out due to 18 of their congeners being deemed significantly hazardous.

There are 209 Poly-Chlorinated Biphenyl (PCB) congeners, named in simple terms using BZ numbers, ranging from BZ#1 (2-Chlorobiphenyl) to BZ#209 (2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl).

Of these 209 congeners however, only the EC7 and WHO12 congeners are routinely tested for by commercial environmental testing laboratories. So why only these 18 congeners (one congener, BZ#118, appears in both suites) you may ask? And what about the other 191? Furthermore, which of these PCB suites would be the most suitable for your site investigation?

Figure 2.
PCB structrure



Poly-Chlorinated Biphenyls (PCBs) are Biphenyl organic compounds, $C_{12}H_{10}$, with the hydrogen atom substituted by a Chlorine atom. There can be from one to ten substituted atoms, $C_{12}H_{10}$-*n*Cl*n* (where n= 1 to 10). Depending on the number and position of the Chlorine atom/s around the Biphenyl, denotes which congener the PCB is, and named accordingly.

Commercial production of PCB mixes (e.g. Aroclors) began in the early 1930's up until the 1970-80's when they were phased out due to environmental concerns. PCBs are particularly useful for their electrical insulation properties, low flammability, and stability. Subsequently, they were used in transformer oils, coolants, paints, and flame retardants, to name just a few. Unfortunately, also due to these properties, they pose a significant risk to the environment, and were classified as one of the initial 12 Persistent Organic Pollutants (POPs) under the Stockholm convention [1]. According to the European Food Safety Agency (EFSA) [2] however, only 130 of the 209 PCB congeners have been reported in commercial Aroclor mixes and environmental samples.

> **“ Unfortunately, also due to these properties, they pose a significant risk to the environment...**

PCBs can be sub-divided into two categories; the coplanar and non-coplaner congeners.

The co-planer congeners either have a single or no Chlorine atoms substituted for a Hydrogen in the ortho position (figure 2. A single or no Cl in position 2, 2', 6 or 6') on the phenyl rings. They are dioxin like in character, there are twelve of them, and are recognised by the World Health Organisation (WHO) as being used to determine Toxicity Equivalent Factors (TEFs) in relation to the most toxic dioxin 2,3,7,8-Tertrachlorodibenzo-p-dioxin (TCDD). Health risks include reproductive and developmental toxicity, and / or immune suppression. [3]

> **“ ... even if a negative result for the WHO-12 PCBs is received, the site could still potentially contain a significant amount of the non-dioxin-like congeners.**

The non-coplaner congeners have more than one Chlorine atom substituted for a Hydrogen in the ortho position on the phenyl rings. These congeners are considered to be less toxic, as they do not bind to the aryl hydrocarbon receptor which causes the health effects associated with the dioxin like PCBs. However, they are still toxic, and have shown to elicit neurological, endocrine and immunological effects, and are 4% more abundant in soil and 5% more in food, than the dioxin-like PCBs. [3]

So which PCB suite would you select for a site investigation?

A WHO-12 PCB suite is used to monitor the TEFs of dioxin-like-PCB compounds for a site investigation of human health risk assessments. If a site analysis was

Figure 3.
WAC test for Landfill disposal.

restricted to only the WHO-12 PCBs however, it is worth remembering that they are less abundant in the environment than the non-dioxin-like PCBs, and only make up by weight <4% of the commercial Aroclor mixtures produced. Therefore, even if a negative result for the WHO-12 PCBs is received, the site could still potentially contain a significant amount of the non-dioxin-like congeners.

> **“ Subsequently, this became the recommended suite by the European Union Community Bureau of Reference for monitoring PCBs...**

The PCB 7 suite was initially selected by the International Council for the Exploration of the Sea (ICES) as a PCB screen for monitoring biota and sediment samples, and became a mandatory requirement of the OSPAR Co-ordinated Environmental Monitoring Programme (CEMP). [4] Subsequently, this became the recommended suite by the European Union Community Bureau of Reference for monitoring PCBs, and was also specified and a limit assigned in the UKs Landfill Directive for Waste Acceptance Criteria.

These seven PCBs were selected as indicators as they make up ~20% by weight of PCBs in commercial mixtures [3], they have a wide chlorination range, and one dioxin-like congener is included (BZ118). They are more likely to be found in environmental samples and at higher concentrations compared to the WHO-12.

To cover all the PCBs present, an Aroclor matching total PCB suite could be performed. This covers all PCBs present and are quantified against the nearest matching Aroclor standard, although does not identify individual congeners and LODs are very high compared to the PCB7 and WHO12 screens.

So which suite should you select? Ultimately, the historical use of the site and the subsequent risk assessment of it would dictate the choice. Regardless of this however, the advantages of requesting a PCB-7 and a WHO-12 together cannot be underestimated in providing a full indication of the PCB contamination present at trace levels if any. Alternatively, if only a PCB-7 suite was requested, and the dioxin-like-congener (BZ#118) was found, an additional WHO-12 PCB test would be advantageous in assisting in the risk assessment process.

Figure 4.
A PCB 7 suite is routinely requested for sites containing Electrical sub-stations and transformers.

References:

1. Stockholm Convention, http://chm.pops.int/TheConvention/ThePOPs/The12InitialPOPs/tabid/296/Default.aspx

2. European Food Safety Authority, ‘Results of the monitoring of non dioxin-like PCBs in food and feed’, EFSA Journal 2010, 8, 1701; http://www.efsa.europa.eu/en/efsajournal/doc/1701.pdf

3. RSC, Environmental Chemistry Group, Bulletin, January 2014

4. ICES, Techniques in Marine Environmental Sciences, Determination of PCBs in Sediment and Biota, No.53, July 2013

Article contributed by
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Senior Chemistry Supervisor
TerraTek

AGS Geotechnical Data Conference 2017 Review

It has been 25 years since the launch of the AGS Data Format, a standard format for the transfer of geotechnical data across the industry, and to celebrate this milestone, the AGS organised a conference to celebrate the past success of the format and to encourage change and improvement going forward.

It was fantastic to see such a large crowd there, and at times, it felt like there was standing room only. It was also great to see so many of our customers at the event but for those who were unable to attend we have included our highlights below.

Roger Chandler, Managing Director of Keynetix, introduced the conference and covered the difference between being a Disrupter or the one being Disrupted. The focus was on how the gap in adoption of new technology between the geotechnics and IT industries provide lots of opportunity to improve our industry using existing technology.

Whilst automation appears to scare most people, we are now living in an age where computers are designing and printing bridges and cars are being driven around without a driver, but yet the AGS Data Format has stayed the same. With IT changing so much over the last few years is it time that the AGS data Format catches up?

The rest of the conference was split into four sessions:

1. Client View
2. International
3. Case Studies
4. BIM

Client View

Tony Daly gave an excellent summary of research work conducted by Highways England and what the Agency was doing with the data once they had it stored in HAGDMS. The inclusion rate has increased since the last AGS conference but was still at only 38% of Geotechnical information they hold is in AGS format and it was felt if the HE had an online viewer to see the data then a greater emphasis would be given to ensuring collection of the data with the report.

> **“ The inclusion rate has increased since the last AGS conference but was still at only 38% of Geotechnical information they hold is in AGS format...**

Roselyn Carol of NGI talked about the challenges they had had with different departments not adopting AGS together which had made it difficult to transfer data from one to another. Although they had experienced challenges, they have really leapt forward now with standardising their data format with the managing of 60 years of archived data.

The session was wrapped up by Shawn Sismondi of Tideway Central who promoted the benefits of sharing data between organisations on the tunnelling work that is about to start on Thames Tideway.

International

Rodney Hutchinson of KGA New Zealand kicked off the International section talking about “How out of adversity, good things

can happen?" following the massive earthquakes over in Christchurch, New Zealand. This was a game changer for the local industry and a decision was made to unify the data from all of the ground investigation data and upload it to a national database. This allowed AGS data to be adopted completely and it's great to see that this initiative has been a massive success.

> **"You'll also be able to download AGS Data directly from the map by highlighting the area of interest, something to look out for going forward.**

Rory McCully of ARUP Netherlands continued in this vein. They had experienced a similar series of earthquakes back in the 1980's and 1990's and had no ground investigation records which led them to discover work had been duplicated. The Netherlands now have a national database which can be accessed universally. They have also taken this one step further and have created an AI algorithm to process CPT data.

Case Studies

Callum Irving of TSP Projects, Paul Chaplin of Central Alliance, Russell Jordon of RPS and Paul McMann of Fugro, Ian Joyce of Bentley and Rae Watney of WSP then headed up the Case Study sections. They covered a range of real life examples of the cycle of AGS data being delivered 'together', the importance of communication between supplier and receiver, BIM being a 'process' not a 'product', automation, and how to stop engineers becoming robots.

BIM

Next up was the BIM section, which was kicked off by Gary Morin of Keynetix. He talked about the features that will be launched soon as a result of the BIM for Subsurface project: BGS Connect – via HoleBASE SI which will give access to new mapping layers from the BGS, which is set to become a powerful tool when doing a desk study as you can currently only access PDF logs. You'll also be able to download AGS Data directly from the map by highlighting the area of interest, something to look out for going forward.

Gary Baker of National Geoscience Data Centre continued the BIM section with how they are developing a private store of data and was asking companies to donate their data to enable them to do this. This created one of the biggest discussions of the day over "Who will own the data?" and "How do we get clients to agree to sharing this data with the BGS?". Watch this space for further developments.

Article contributed by
Roger Chandler
Managing Director
Keynetix
Member of AGS Data Mangement Working Group

Q & A with...

Chris Swainston

BSc. (Hons), PGCE, CGeol, FGS

Job Title:
Principal Geo-environmental Engineer

Company:
Geotechnics Limited

Brief Biography:
I am currently the principal geo-environmental engineer for Geotechnics Limited based in Coventry. I have been in the industry for over 20 years now with specialisms in contaminated land, asbestos and site investigation.

I am a member of the AGS contaminated land working group, BGS contaminated land group, SoBRA, and chair the BSI EH/4 soil quality committee, responsible for (amongst other standards) BS10175. I am a chartered geologist as well as being a CGeol/CSci scrutineer and mentor. I have undertaken many interesting investigations over the years including Buncefield Oil Depot, Prospect Park, the Millennium Site and Sandridge to name but a few. Current duties at Geotechnics include responsibility for ISO9001, ISO14001 (qualified auditor) and in-house training.

What or who inspired you to join the geotechnical industry?

To be honest I didn't even know you could do what I have actually done as a geologist when I joined the industry back in 1994. I had some vague information from Portsmouth Polytechnic (as they then were) when the third year were used as guinea pigs for some of the materials that became parts of the first ever environmental geology degree, so I guess it would be that.

> **"I didn't even know you could do what I have actually done as a geologist when I joined the industry...**

What does a typical day entail?

I am not sure there is a typical day in this industry, and certainly not in my position given the many hats I wear. I could be out on site observing and recording, organising a project, sampling for a client, training, project managing, invoicing, writing reports, ISO14001 auditing, advising clients and staff regarding waste, asbestos and environmental issues. About the only typical thing is the morning e-mail triage.

> **"I am not sure there is a typical day in this industry, and certainly not in my position given the many hats I wear.**

Are there any projects which you're particularly proud to have been a part of?

I am not sure proud is the word exactly, but it was very interesting to be part of the Millennium Site team, working in London is so different from the rest of the UK and big projects always have their own unique challenges.

Buncefield was surreal as I was there 3 days after it was put out and it was like

walking into a black and white movie with ash covering everything around you and all the people evacuated, the lack of colour and sound was almost scary.

Sandridge was the first part 2A and I was heavily involved in the water sampling for the project over several years. More recently, digging in Shakespeare's back garden to determine the depth of the made ground as part of the Nash House museum redevelopment was one job I certainly like having on my CV.

What are the most challenging aspects of your role?

The most challenging aspects of my role are probably the odd nature of the questions you are sometimes asked.

> **“ The most challenging aspects of my role are probably the odd nature of the questions you are sometimes asked.**

As the environmental, asbestos and waste in-house go-to-guy, I can get all sorts of questions.

For example: what are the possible effects of drilling rigs on spawning salmon in Scotland (probably very little); how to tell the difference between a water and common vole (tail to body ratio); what is the difference between a waste characterisation and a WAC (both are required for disposal to landfill); and why these things make a difference to how we need to undertake our site investigations.

What AGS Working Group(s) are you a Member of and what are your current focuses?

I am currently a member of the Contaminated Land Working Group, but I have also recently been liaising with the lab group regarding updating of some of the AGS guidance on sampling in response to changes in ISO guidance.

This is probably going to lead to the re-formation of the sampling sub-group that created many of the original documents. This is my current focus along with a potential update of the AGS cover systems guidance, which I covered in more detail in a presentation at the recent EXPO conference.

I was also previously the liaison with the AGS Data Format Group in regards to environmental aspects of the format during the production of the AGS 3.1 extension and chair of the asbestos sub-group.

What do you enjoy most about being an AGS Member?

Meeting and interacting with fellow professionals to promote good practice through the production of authoritative guidance for the industry. A lot of the conferences are also very good.

> **“ The AGS is vital to keep everyone in the industry in the loop regarding changes to standards, good practice, legal issues and guidance.**

What do you find beneficial about being an AGS Member?

Being able to be a part of this activity.

Why do you feel the AGS is important to the industry?

The AGS is vital to keep everyone in the industry in the loop regarding changes to standards, good practice, legal issues and guidance. It also helps to provide a mechanism for the industry to get together, share and promote good practice.

What changes would you like to see implemented in the geotechnical industry?

Oddly I would like to see day rate become standard, meterage can be somewhat self-defeating when what you really need as an environmental specialist is to have a very close and good look at what is happening on challenging sites, where you can be frequently starting and stopping and may have to adjust to ever changing circumstances and contamination issues.

> **“ I would like to see day rate become standard, meterage can be somewhat self-defeating...**

You represented the AGS at the Contamination Expo conference in September at ExCeL. What did your presentation outline and what did spectators learn?

My presentation outlined the contention that an update of the cover systems document (co-produced by AGS, BRE, NHBC and written by RSK back in 2004) was a good idea or not.

Basically the presentation outlined the history of the document, its key points, a summary of its use over time, suggestions in terms of what could be done with the document and asking the audience if they knew about it, if it was still being used, what should be done, what could be done and if it had a place in modern remediation assessment.

My argument is that it may still have a function in relation to sustainability and could also be well used as an option for low levels of asbestos contamination.

Whilst this is not necessarily sufficient to argue for a wholesale re-write of the whole document, it may be sufficient for the AGS to consider producing an update showing how it may still be used effectively in certain circumstances.

I have fed the comments and responses back from this and other presentations to the AGSCLWG and we hope to be in a position to produce this new document shortly.

AGS Guide to...

GROUND INVESTIGATION REPORTS

The publication of recent British Standards has introduced new terms and requirements for reporting ground investigations. In particular these standards have introduced "Ground Investigation Reports" (GIR) and "Geotechnical Design Reports" (GDR). This paper seeks to clarify the definitions of a GIR and GDR and to put them into context with the more commonly and historically produced Factual and Interpretative Reports in UK ground investigation practice.

Recommendations for reports on ground investigations are now spread through a number of documents [British Codes such as BS5930 and British Standards such as BS EN 1997, the UK Specification for Ground Investigation and a number of others]. Although they do not contradict each other, it is difficult to compare requirements and definitions across documents. This Guide presents extracts from the relevant sections of these various documents to provide a single source clarifying the definitions and requirements of each type of ground investigation report and how they interact. Each report is briefly described below, with a summary presented at Table 1 at the end of the Guide.

Desk Study (and Field Reconnaissance) Report

BS EN 1997-2 clause 2.1.1 (6) states that available information and documents should be evaluated in a Desk Study before designing the investigation programme. Clause 2.2.1 (7) gives examples of what can be used in preparing the Desk Study report. BS EN 1997-2 clause 6.2 includes an indicative listing of the requirements of a Field Reconnaissance. Further guidance is also given in BS 5930:1999 and 2015.

Factual Report

Factual Reports have historically been produced by the specialist ground investigation contractor. These reports are discussed in BS5930 and the UK's Specification for ground investigation. BS5930 uses the term "Descriptive" which is synonymous with "Factual". The UK Specification for GI gives the requirements of the report as follows:

The factual information to be reported shall comprise:

(a) a statement on the purpose and rationale of the investigation,
(b) a description of the work carried out, including reference to the specification and standards adopted and any deviations from them,
(c) exploratory hole logs, including details of any instruments installed,
(d) measurements, observations and test results (where separate from other exploratory holes),
(e) laboratory test results,
(f) monitoring data,
(g) site location plan,
(h) detailed site plan showing all exploratory hole locations,
(i) a single copy of the photographic volume.

Information additional to the above can be specified for a Factual Report in the Schedule of Site Specific Requirements (S1.21: Reporting (Specification Section 16) Particular restrictions/relaxations) but the important aspect of this type of report is that other than production of exploratory logs derived from field logs there is no engineering interpretation of the factual information. Therefore, a typical Factual Report does not represent a GIR because it does not include any "evaluation".

By including items (c) and (d), the factual report, incorporates the information that is included in the "Field Report" referred to in BS 5930:1999 & 2015 and BS EN 1997. However, a BS EN 1997 compliant 'Field Report' within the GIR must be signed off by a Responsible Expert as defined in BS 22475-2: 2011, such as an individual on the ROGEP register.

Interpretative Report

The Interpretative Report takes the factual data from the Factual Report and using engineering interpretation provides a set of parameters for geotechnical design of structures and defines the ground and groundwater conditions. BS5930:1999 indicates that the "engineering interpretation" gives outline recommendations, e.g. a typical bearing capacity for spread footings & associated settlement estimate.

> **"Interpretative Reports are often produced by the Consulting Engineer/Designer but can also be produced by a specialist geotechnical contractor...**

Presentation of the information within an Interpretative Report can include a range of methods to display the information such as calculations, graphical plots, tables, contour plots, fence diagrams, cross sections, long sections etc.

Interpretative Reports are often produced by the Consulting Engineer/Designer but can also be produced by a specialist geotechnical contractor who employs individuals with suitable experience and competency. The Interpretative Report usually contains a preliminary statement on the ground conditions to assist preliminary design. An Interpretative Report can include all of the aspects of the GIR but is often an early sub-set within the GDR. An Interpretative Report falls short of a GDR as it will not include a full appreciation of the design criteria, including the construction process, serviceability and

maintenance for the lifetime of the structure.

The UK Specification for Ground Investigation (2006) does not refer specifically to an Interpretative Report, its default wording is in terms of GIR/GDR. However, the interpretative report sub-set of the GDR can be specified through the appropriate elements of the Schedule of Site Specific Requirements (S1.21).

> **The UK Specification for Ground Investigation (2006) does not refer specifically to an Interpretative Report, its default wording is in terms of GIR/GDR.**

Ground Investigation Report (GIR)

Definition

The clearest definition for the GIR is provided in Section 6 of BS EN 1997-2:2007 (provided below) and is also stated in Section 3.4 of BS EN 1997-1:2004 +A1:2013

Section 6 Ground Investigation Report

6.1 General requirements

1. *P The results of a geotechnical investigation shall be compiled in the Ground Investigation Report which shall form a part of the Geotechnical Design Report.*
2. *P The Ground Investigation Report shall consist of the following:*
   – a presentation of all appropriate geotechnical information including geological features and relevant data;
   – a geotechnical evaluation of the information, stating the assumptions made in the interpretation of the test results.
3. *The information may be presented as one report or as separate parts.*
4. *The Ground Investigation Report may include derived values.*
5. *The Ground Investigation Report shall state known limitations of the results, if appropriate.*
6. *The Ground Investigation Report should propose necessary further field and laboratory investigations, with comments justifying the need for this further work. Such proposals should be accompanied by a detailed programme for the further investigations to be carried out.*

Derived and Characteristic Values (Ground Conditions)

BS EN 1997-1 and BS EN 1997-2 discuss derived, characteristic and design values. These documents explain the process of determining design values for the geotechnical parameters from; basic laboratory and/or field test measurements, the application of any correlations to produce derived values of test results and, the selection of characteristic values to which partial factors are applied.

The requirements of the GIR introduce the potential use of derived values within a ground investigation report which are also an essential step within a Geotechnical Design Report (see below). A derived value is defined in BS EN 1997-2 as *the value of a geotechnical parameter obtained from test results by theory, correlation or empiricism.* An example would be the shear strength obtained through correlation with a qc value measured in a cone penetration test.

> **Correlations may also use a theoretical relationship to link a geotechnical parameter with a test result.**

Correlations may also use a theoretical relationship to link a geotechnical parameter with a test result. For example, obtaining a value of the angle of shearing resistance q_c from pressuremeter test results or from plasticity index. Characteristic values should be presented in the GDR and are the values to which appropriate partial factors are applied to give a design value for a particular limit state. BS5930 includes a section on "parameter evaluation and derivation", which includes items which are generally additional to the traditional factual reporting requirements.

Geotechnical Design Report (GDR)

Unlike previous UK Codes, BS EN 1997-1 requires that assumptions, data, calculations and results of the verification of safety and serviceability shall be recorded in a GDR, relevant parts of which shall be provided to the client. The level of detail of GDRs will vary greatly, depending on the structure and

> **The level of detail of GDRs will vary greatly, depending on the structure and type of design.**

type of design. BS EN 1997–1 further states that:

The two most important parts of the GDR are:

1. *the Ground Investigation Report;*
2. *a plan for any requisite supervision and monitoring during and after construction.*

Clause 2.8 of BS EN 1997–1 details the requirements of a GDR as:

1. The assumptions, data, methods of calculation and results of the verification of safety and serviceability shall be recorded in the Geotechnical Design Report.
2. The level of detail of the Geotechnical Design Reports will vary greatly, depending on the type of design. For simple designs, a single sheet may be sufficient.
3. The Geotechnical Design Report should normally include the following items, with cross reference to the Ground Investigation Report (see 3.4) and to other documents, which contain more detail:
– a description of the site and surroundings;
– a description of the ground conditions;
– a description of the proposed construction, including actions;
– design values of soil and rock properties, including justification, as appropriate;
– statements on the codes and standards applied;
– statements on the suitability of the site with respect to the proposed construction and the level of acceptable risks;
– geotechnical design calculations and drawings;
– foundation design recommendations;
– a note of items to be checked during construction or requiring maintenance or monitoring.

“ The Geotechnical Design Report shall include a plan of supervision and monitoring, as appropriate.

4. The Geotechnical Design Report shall include a plan of supervision and monitoring, as appropriate. Items, which require checking during construction or, which require maintenance after construction shall be clearly identified. When the required checks have been carried out during construction, they shall be recorded in an addendum to the Report.
5. In relation to supervision and monitoring the Geotechnical Design Report should state:
– the purpose of each set of observations or measurements;
– the parts of the structure, which are to be monitored and the locations at which observations are to be made;
– the frequency with which readings are to be taken;
– the ways in which the results are to be evaluated;
– the range of values within which the results are to be expected;
– the period of time for which monitoring is to continue after construction is complete;
– the parties responsible for making measurements and observations, for interpreting the results obtained and for maintaining the instruments.
6. An extract from the Geotechnical Design Report, containing the supervision, monitoring and maintenance requirements for the completed structure, shall be provided to the owner/client.

“ Currently, the GDR does not need to be signed off by a Responsible Expert as defined in BS 22475–2:2011.

Currently, the GDR does not need to be signed off by a Responsible Expert as defined in BS 22475–2:2011. BS5930:2015 states that the GDR should provide all parties with the information needed to assess the suitability of various options and the design of the works.

Geotechnical Baseline Report (GBR)

As defined in BS5930:2015, the GBR should

Report Type	Ref	Site description, scope, rules of engagement	Historical Search	Walkover	Field Results	Lab Results	Ground Conditions/ Parameters	Derived Values	Characteristic Values	Design Values	Design calculations, drawings and recommendations	Supervision, monitoring and maintenance requirements	Comments
Desk Study Report	BS, BS15, EC7, UK Spec	●	●	○									
Factual Report	BS, EC7	●	○	○	●	●							
Field Report	BS, BS15 EC7, UK Spec	●		○	●			○ (EC7 only)					Sign off by responsible person/ Responsible Expert (BS15) required to comply with EC7
Interpretative Report	BS	●	○	○	○	○	●	○			○		
GIR	BS15, EC7, UK spec	●	●	●	●	●	●	●					GIR can be in separate parts or a single report
GDR	EC7, UK Spec	●	●	●	●	●	●	●	●	●	●	●	
GBR	BS15	●					●						To be agreed with contracted parties and risk allocation defined.
GFR	BS15												Contents as specified or to BS8002 and BS8004

Key
○ optional requirement
● mandatory requirement

BS – BS5930:1999+A2:2010, Code of Practice for Site investigation (Withdrawn).

BS15 – BS5930:2015 Code of practice for ground investigations

UK Spec– UK Specification for Ground Investigation, 2nd Ed, Site Investigation Steering Group ICE,2006

EC7– BS EN 1997–1:2004+A1:2013 Eurocode 7. Geotechnical design. General rules./ BS EN 1997–2:2007 Eurocode 7. Geotechnical design. Ground investigation and testing. (including UK National Annexes to EC7)

set out the geology, soil and rock profiles and groundwater conditions assumed in the contract for consideration in compensation events. It should be agreed between all parties to the contract before construction works commence with liability agreed for any deviation from the identified conditions This may include the factual elements from the GIR.

> **“ ... the GBR should set out the geology, soil and rock profiles and groundwater conditions assumed in the contract...**

Geotechnical Feedback Report (GFR)

A GFR should be prepared where required. Typically, it would include topics detailed in codes of practice such as BS8002 and BS8004 or as specified in the contract. The Client should be made aware of the importance of submitting a GFR alongside as–built Drawings etc. as required by CDM 2015.

Summary

The table above provides a summary of the report definitions and nominal contents under the various sets of UK standards.

References and Further Reading

Bond, A and Harris, A. Decoding Eurocode 7. 2008.

British Standards Institution. BS 5930:1999+A2:2010. Code of practice for site investigation (Withdrawn).

British Standards Institution. BS 22475–2:2011. Geotechnical investigation and testing. Sampling methods and groundwater measurements. Qualification criteria for enterprises and personnel.

British Standards Institution. BS 5930:2015. Code of practice for ground investigations.

British Standards Institution. BS 8002:2015. Code of practice for earth retaining structures.

British Standards Institution : BS 8004:2015. Code of practice for foundations.

British Standards Institution. BS EN 1997–1:2004+A1:2013. Eurocode 7. Geotechnical design. Part 1 General rules.

British Standards Institution. NA to BS EN 1997–1:2004+A1:2013 UK National Annex to Eurocode 7. Geotechnical design. Part 1 General rules.

British Standards Institution. BS EN 1997–2:2007 Eurocode 7. Geotechnical design. Part 2 Ground investigation and testing.

British Standards Institution. NA to BS EN 1997–2:2007 UK National Annex to Eurocode 7. Geotechnical design. Part 2 Ground investigation and testing.

Department of Communities and Local Government. A Designers' Simple Guide to BS EN 1997. 2007

Driscoll, R, Scott, P and Powell, J. EC7 – implications for UK practice. CIRIA Report C641. 2008

Institute of Civil Engineers. Site Investigation Steering Group. UK Specification for Ground Investigation, 2nd Ed, 2006.

Contaminated Land Overview

The AGS Contaminated Land Working Group, led by Vivien Dent (above, RSK) met on 11th October in London for their final meeting of the year. The group are currently focusing their efforts on three primary issues.

1. Waste Classification in Soils – A Practitioner's Guide

The Group feel there is uncertainty as to how to assess soils from construction sites. By producing the AGS stance on waste classification of soils, a unified approach across the industry can be adopted.

The Working Group have created an initial draft document which is currently being circulated for comment.

2. Possible updates to the AGS Cover System Document

As the AGS/BRE/NHBC cover system document is over 13 years old, it is no longer used as much as it was. The Contaminated Land Working Group therefore feel that updates are required to bring the cover system up to date with current practices.

> **"By producing the AGS stance on waste classification of soils, a unified approach across the industry can be adopted.**

After reviewing the results of a questionnaire which was issued to Local Authorities, the Working Group have decided to compile a guidance note with updates, to make the document relevant once again. This will be a major focus for the Group in 2018.

3. Guidelines to Good Practice in Geoenvironmental Ground Investigation

Where the standard of ground investigation varies greatly, the AGS would like to promote best practice and raise the standard of ground investigation where needed.

The Contaminated Land Working Group have therefore drafted a document to allow members to see where improvements can be made in relation to their own work. This draft document will be ready for circulation in due course.

If you wish to attend AGS Contaminated Land Working Group meetings, please contact the AGS Secretariat by emailing ags@ags.org.uk.

Laboratories Overview

The final AGS Laboratories Working Group meeting of the year took place on 17th October 2017 in London and the Laboratories Leader, Dimitris Xirouchakis of Structural Soils (above), has provided an update on the top three current issues the Laboratories Working Group are discussing.

1. Incorporation of the published EN and ISO standards to BS 1377, update of the chemical test methods in BS 1377 and the addition of rock testing methods to BS

Soil test methods in BS 1377:1990 are being replaced by the equivalent BS EN 17892 series. Despite the similarities, small differences exist and AGS members need to educate themselves and their clients, as the new tests will eventually appear in project specifications in the UK and potentially abroad, e.g. Middle East. Furthermore, any practical or nominal updates to BS 1377 will increase its applicability. The group believe the AGS need to adapt fast to the new technical standards being published.

> **"The group believe the AGS need to adapt fast to the new technical standards being published....**

2. Raise the profile and training and certification of laboratory technicians in geotechnical laboratories

This issue is important to the group as any effort to formalise the on-the-job training received by site and laboratory technicians, as is the case for engineers and geologists, will improve the services offered.

The training can be improved by offering or supporting online training by partnering with other professional organisations or universities.

3. To increase participation in the Laboratories Working Group

Member participation of Laboratories Working Group meetings has waned recently even though many AGS member companies have laboratories. Testing services are an important component to AGS activities and strong participation to the Laboratory Working Group should reflect that.

If you wish to attend AGS Laboratories Working Group meetings, please contact the AGS Secretariat by emailing ags@ags.org.uk.

UK LED GEOENVIRONMENTAL STANDARDS				
STANDARD	**TEST**	**SUPERSEDED/WILL SUPERSEDE**	**STATUS**	**PUBLICATION DATE**
BS ISO 18504: 2017	Soil quality – Sustainable remediation	New standard	Published	N/A
BS PD ISO TR 19588:2017	Soil quality – Background information and guidance on environmental cyanide analysis	New standard	Published	N/A
ISO STANDARDS ON SOIL & SITE ASSESSMENT				
STANDARD	**TEST**	**SUPERSEDED/WILL SUPERSEDE**	**STATUS**	**PUBLICATION DATE**
(BS) (EN) ISO DIS 11504	Impact of soil contaminated with petroleum hydrocarbons	ISO 11504:2012	Proceeding to publication	2018
BS EN ISO DIS 15175 (REVISION)	Soil & groundwater protection	BS EN ISO 15175:2011 (ISO 2004)	Final draft international standard in preparation	2018
BS ISO 15176 (REVISION)	Re-use of excavated soil and soil materials	BS ISO 15176:2002	Draft International Standard expected by end of 2017.	2019
BS ISO 15799 (REVISION)	Ecotoxicological characterization of soil & soil materials	BS ISO 15799:2003	Draft international standard issued for comment 5th October 2017.	2018
ISO 15800 (REVISION)	Human exposure	ISO 15800:2003	Revision initiated.	2019
ISO 16133	Design of monitoring programmes [for soil quality]	BS EN ISO 16133:2011	Committee Draft comment period ended 24 May 2017.	2019
BS ISO DIS 7924	Bioavailability of metals in soil to humans	BS DD ISO TS 17924:2008	To proceed to publication	2018
BS ISO 18512	Guidance on long & short-term storage of samples	BS ISO 18512:2007	May be revised – decision pending.	2020
BS ISO 18400-104	Soil quality – Sampling - Strategies	BS ISO 10381:2002	Final draft international standard in preparation	2019
BS ISO 18400-202	Soil quality – sampling – Preliminary Investigations	New standard	Final draft international standard in preparation	2019
ISO 18400 - 203	Soil quality – sampling – Potentially contaminated sites	ISO 10381-5:2005	Final draft international standard in preparation	2019
BS ISO 18400-205	Soil quality – sampling – natural sites etc.	ISO 10381-4:2003	Final draft international standard in preparation	2019
BS EN ISO 19258 (REVISION)	Determination of background values	BS EN ISO 19258:2011 (ISO 2005)	To proceed to Final Draft International Standard/ publication	2019
CD 21365	Conceptual site models for potentially contaminated sites	New Standard	Comment resolution/drafting panel meeting to be held in November	2020
GEOTECHNICAL LABORATORY TESTING BS EN ISO 17892				
STANDARD	**TEST**	**SUPERSEDED/WILL SUPERSEDE**	**STATUS**	**PUBLICATION DATE**
BS EN ISO 17892-1	Moisture/Water content	BS 1377-2, clause 3.2	Published	N/A
BS EN ISO 17892-2	Bulk density	BS 1377-2, clauses 7.2, 7.3 and 7.4	Published	N/A
BS EN ISO 17892-3	Particle density	BS 1377-2, clause 8.3	Published	N/A
BS EN ISO 17892-4	Particle size distribution	BS 1377-2, clause 9	Published	N/A
BS EN ISO 17892-5	Incremental oedometer	BS1377-5, Clause 3	Published	N/A
BS EN ISO 17892-6	Fall cone	No BS equivalent	Published	N/A
BS EN ISO 17892-7	UCS test	BS1377-7, Clause 5	At Final vote	Mid 2018
BS EN ISO 17892-8	UU triaxial test	BS1377-7, Clause 7	At Final vote	Mid 2018
BS EN ISO 17892-9	CID, CIU and CAU tests	BS1377-8 (replaced in its entirety)	Final vote imminent	Mid 2018
BS EN ISO 17892-10	Shear-box and ring-shear	BS1377-7, Clauses 4, 5 and 6	Parallel Enquiry imminent	Mid 2019
BS EN ISO 17892-11	Permeability tests	BS1377-5, Clause 5 and BS1377-6, Clause 5	Parallel Enquiry imminent	Mid 2019
BS EN ISO 17892-12	Plasticity Index tests	BS1377-2, Clauses 4 and 5	Preparing for Final vote	Late 2018

Training Courses

CIRIA LACL Courses

Asbestos from soil awareness – UKATA APPROVED

This course will provide ground workers and other site operatives to deal with asbestos from soil in a safe, cost effective and legal way. The training is based on CIRIA new report C765 Asbestos in soil and made ground – good practice site guide and could be considered as 'information, instruction and training' or 'awareness training' to satisfy Regulation 10 of Control of Asbestos Regulation 2012 (CAR 2012).

- 6 December 2017 – Newcastle

https://www.ciria.org/CIRIA/Navigation/Events/Event_Display.aspx?EventKey=E17311

Training for non-licensed work for asbestos in the ground

This course is aimed at ground workers and other site operatives who manage and disturb asbestos contaminated soil (ACS) directly as part of their work (including site investigation, ground investigation etc). The training will be counted as 'additional training' required for non-licensed work by providing guidance in identification of asbestos contaminated materials and what to do with planned and unplanned discovery of asbestos on site.

- 7 December 2017 – Newcastle

https://www.ciria.org/CIRIA/Navigation/Events/Event_Display.aspx?EventKey=E17312

CL:AIRE Courses

CAR-SOIL

This course provides participants with a very detailed understanding of the requirements of the Control of Asbestos Regulations 2012, Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry guidance (CAR-SOIL).

- 11th December 2017 (Half day) Edinburgh
- 16th January 2018 (Full Day) London
- 27th February 2018 (Full Day) Birmingham
- 20th March 2018 (Full Day) Manchester

To book a place go to the link: https://www.claire.co.uk/commerce/112352-asbestos-in-soil-and-construction-demolition-materials-training

Asbestos Awareness & Non Licensable Work Training

CL:AIRE is currently delivering in house CAR-SOIL, Asbestos Awareness & Non Licensable Work training for groundworkers for those companies that wish to upskill their work force in working with asbestos in soil, construction and demolition materials in a cost effective way. In addition, for those who may only have a small number of staff who need training, do get in touch and CL:AIRE would be happy to try and bring companies together to make the training more cost effective by providing training in your region.

If this is of interest, please enquire through the CL:AIRE Help desk and specify which course you are interested in, the location and any specific requirements you have: https://www.claire.co.uk/help-desk

Verification of Gas Protection Systems

This full day course provides participants with a very detailed theoretical and practical understanding of the requirements for verifying the installation of gas protection systems.

It is an essential introductory learning package for environmental and construction professionals engaged in gas protection verification. The main focus is verifying gas membranes but it will also cover venting systems. It will also cover what to consider when specifying integrity testing or checking that correct testing procedures are followed on site.

- 19th December 2017 Doncaster

To book a place go to the link: https://www.claire.co.uk/commerce/112374-gas-protection

How to become a Member of the AGS

AGS Members all share a commitment to quality in the geotechnical and geoenvironmental industry. This has become widely recognised by clients, governmental bodies and other associations that touch issues to do with the ground.

We welcome both companies and individuals who want to be recognised for their quality of practice to join our growing membership of **over 130 Members**. We shape our industry, continually **improve practice** and **collaborate on issues that affect us all;** from clients, all the way through to the people who use the land and the buildings we help develop.

To become a Member of the AGS, please visit http://www.ags.org.uk/about/become-a-member and submit your application online. Please note that **all membership applications are reviewed by the Membership Committee** 6 weeks in advance of each quarterly Senate meeting.

The deadline for the next round of completed applications is **11th January 2018**.

AGS Chemical and Legal Helplines

All Members of the Association of Geotechnical and Geoenvironmental Specialists are entitled to **free chemical and contractual advice** through the use of Loss Prevention Committee Members, Marquis & Lord and BLM Solicitors.

For advice on chemical safety and best practice, Marquis & Lord will provide **30 minutes of free advice** to all AGS Members.

Additionally, if you're an AGS Member and are looking for legal advice, please speak to Michael Salau, Guy Lane or Zita Mansi at BLM Solicitors where the **first 15 minutes of legal advice will be free of charge**.

CHEMICAL SAFETY HELPLINE

Marquis & Lord
Tel: 0800 083 4610
www.marquisandlord.com

LEGAL HELPLINE

BLM Solicitors
Telephone: 020 7638 2811
www.blmlaw.com

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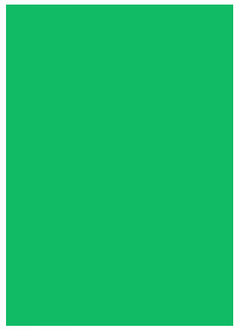

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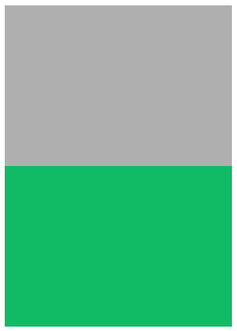

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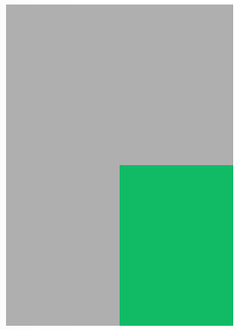

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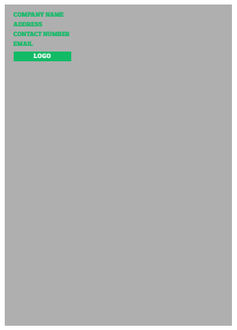

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