



**NATIONAL SECTOR SCHEMES**

**QUALITY MANAGEMENT FOR GEOTHERMAL DRILLING**

**FOR**

**LAND DRILLING – GEOTHERMAL DRILLING**

**SCHEME 29A**

**SECTOR SCHEME DOCUMENT (SSD)**

**FOR**

**LAND DRILLING – GEOTHERMAL DRILLING**

Published by the Sector Scheme Advisory Committee for Land Drilling  
Geothermal Drilling – (SSAC-LD-GD)

Endorsed for publication by the Chairman of SSAC-LD-GD

Name .....

Date ....

# DOCUMENT CONTROL

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# **COMPOSITION OF THE SECTOR SCHEME ADVISORY COMMITTEE, EXCLUSION OF LIABILITY AND SELECTION OF CERTIFICATION BODY**

## **COMPOSITION OF SECTOR SCHEME ADVISORY COMMITTEE**

### **a) Active Committee**

#### **OFFICERS OF COMMITTEE**

**Professor Barry Clarke (University of Leeds / ICE) - Chairman**

**Brian Stringer (British Drilling Association Ltd. - BDA) – Secretariat**

**John Grainger (John M. Grainger Ltd.) – Consultant/Facilitator LD-SAS**

**NQA – Certification Body (CB), representing the NHSS Certification Body Group**

**United Kingdom Accreditation Services (UKAS) – Accreditation Body**

#### **REPRESENTATIVE ORGANIZATIONS (Companies, Trade Associations, etc.)**

**Arup**

**BEAMA Domestic Heat Pump Association**

**British Drilling Association Ltd.(BDA)**

**Buro Happold Ltd.**

**Department of Energy & Climate Change (DECC)**

**Drillcorp Ltd.**

**E M Drilling Ltd.**

**EON Sustainable Energy**

**Environment Agency**

**Forkers Renewables Energy Ltd.**

**Geocore Site Investigations Ltd.**

**Geothermal International Ltd.**

**Geothermal Supplies Ltd.**

**Ground Forum (GF)**

**Ground Source Heat Pump Association (GSHPA)**

**Heat Pump Association (HPA)**

**Highways Agency**

**Ice Energy Ltd.**  
**John Noad (Building Environment) Ltd.**

**Land Securities plc**

**Loop Master (Europe) Ltd.**

**Magpie Environmental Drilling Ltd.**

**Mimer Energy Ltd.**

**Neo Energy Ltd.**

**Penwith Housing Association**

**Raeburn Drilling & Geotechnical Ltd.**

**Van Elle Ltd.**

**Well Drillers Association**

**W J Groundwater Ltd.**

b) Corresponding Members (via above organizations)  
To be inserted at a future committee review date.

## **EXCLUSION OF LIABILITY**

The Sector Scheme Advisory Committee for Land Drilling – Geothermal Drilling

- 1 Have and accept no liability whatsoever for any failure of any system or systems assessed under this Sector Scheme Document (SSD) or for the quality, fitness for purpose, or safety of any product or service which is the subject of such assessment.
- 2 Do not provide any representation or warranty as to any aspect of any such system, product or service, and
- 3 Hereby expressly exclude all and any liability or responsibility (however alleged to arise) for or in connection with the provision of any service or product or any use of any product, all and any such liability or responsibility attaching exclusively to the producer (or user as the case may be) thereof.

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complete document must be copied without alteration, addition or deletion.

## **SELECTION OF CERTIFICATION BODY**

It is important to note that due to the specific requirements for assessor competence required by this Sector Scheme a technical expert may be appointed by the Sector Scheme Advisory Committee to assist UKAS in the assessment of Certification Bodies (CB) as described in Appendix G.

Prospective companies seeking registration under this scheme should ensure that they engage a Certification Body specifically accredited to assess against the requirements of this SSD. Advice for organizations acceptance is contained in Appendix H.

Specifiers, consultants, engineers etc. that require confirmation of compliance with the Contract Specification in respect of the supply of products/materials should confirm the current status of the quality management system certificate issuer and that specific reference is made to this Sector Scheme. (See Appendix K)

## **IMPLEMENTATION**

### **ISSUE UKAS 1**

The scheme will be fully implemented within twelve months after its publication by UKAS 01 October 2011 on its web site.

It will be a mandatory requirement for suppliers contracted to client organizations to comply with the scheme within their contractual document. Separately the document will be called up in specific contracts as necessary so it will also be a mandatory requirement for other such contracts.

This deferral in implementation is intended to allow new applicant companies and certification bodies' sufficient time to comply with the interpretation given in this document.

## **GUIDE TO DOCUMENT (Organizations, Certification Bodies, Auditors and Clients)**

The document covers groups involved in the land drilling sector assessment scheme and detailed below are the sections/appendices which are specifically relevant to the different groups;

1. Organizations looking to obtain certification – To be found throughout the document and, Appendices A, B, C1, C2, C3, D, E, H, J1, J2 and K2.
2. Certifying Bodies and Auditors looking to assess organizations – To be found throughout the document and Appendices G1, G2, H, J1, J2, J3 and K1.
3. Clients looking to use document/sector scheme in contracts – To be found throughout the document and Appendices J1, J2, J3, K1, K2 and L.

## INTRODUCTION

1. National Sector Schemes (NSS) are bespoke quality management schemes that have been developed, as a partnership, by all sides of the industry to interpret BS EN ISO 9001:2008 as it applies to a particular activity/industry within the United Kingdom. This Sector Scheme may be adopted by other client bodies.
2. Separate technical advisory committees for each activity within the sector provide advice to UKAS and expert representation is drawn from all sides of industry. Each sector scheme technical advisory committee interprets BS EN ISO 9001:2008 in relation to the requirements of their particular activity and comes to a consensus on the minimum levels of workmanship, services, products, testing, and the training and competency of operatives needed to meet specification requirements as well as auditor qualification and requirements in respect of EMS and other management systems. The details are contained in the individual Sector Scheme Documents (SSD).
3. The individual technical advisory committees are overseen by the Sector Scheme Liaison Group. This group provides a forum for discussion on the effectiveness of the Sector Schemes and co-ordinates developments so that they can be uniformly taken forward by each of the technical advisory committees. It is also the venue where dialogue with UKAS and the certification bodies on the application of the schemes takes place.
4. Sector Schemes together with BS EN ISO 9001:2008 are designed to:
  - Provide an industry benchmark
  - Ensure that all processes are planned
  - Provide a basis for continuous improvement
  - Focus on quality as an objective
  - Reduce costs for client and contractor
  - Provide and maintain a properly trained and competent workforce
  - Involve all sides of industry in scheme ownership within a partnership framework
  - Ensure that Certification Bodies use auditors with technical knowledge and experience of the sector concerned
  - Promote confidence in quality management systems through provision of a robust transparent system
5. This Sector Scheme Document (SSD) relates to the quality management system requirements for land drilling specifically related to the installation of geothermal boreholes (referred to as Geothermal Drilling). It sets out to identify a common interpretation of BS EN ISO 9001:2008 for Organizations and Certification Bodies engaged in the Sector.
6. In using this Sector Scheme users shall use best practice in specifying any other Sector Scheme e.g. National Highways Sector Schemes, as appropriate to the nature of the work

being undertaken. Furthermore where there is another NSS in place it must be adopted and is also adopted by a number of other organizations.

7. The SSD is a live document with the Sector Scheme Advisory Committee for Land Drilling – Geothermal Drilling meeting at least once a year to develop it as appropriate. It is an aspiration of the Advisory Committee to extend the range and hence the of land drilling schemes within the geotechnical sector documents which it is proposed will be part of the suite of SSD 24A to 29A inclusive. SSD 29A has been developed to include other relevant Land Drilling applications in the future so these applications can be added without significant change to the existing document structure. Those using the document should always ensure that they have the current version of the document by contacting any of the Certification Bodies in Appendix F, UKAS or the secretary of the scheme at the address below.
8. The Secretary of the Committee shall maintain a list of registered Organizations and copies may be obtained from the Secretary at the address below or Lantra.

The Secretary  
Sector Scheme Advisory Committee for Land Drilling  
c/o British Drilling Association  
“Wayside”  
London End  
Upper Boddington  
Daventry  
Northamptonshire, NN11 6DP

Tel 01327 264622

Fax 01327 264623

E-mail: [office@britishdrillingassociation.co.uk](mailto:office@britishdrillingassociation.co.uk)

Web Site: [www.britishdrillingassociation.co.uk](http://www.britishdrillingassociation.co.uk)

Any observations or complaints relating to this SSD should be addressed to any of the certification bodies listed or directly to UKAS as detailed in Appendices J1, J2 and J3.

# INTERPRETATION OF BS EN ISO 9001:2008

## 1. SCOPE AND APPLICATION

### 1.1 SCOPE

- 1.1.1 This SSD describes the quality management system requirements to be established by Organizations providing Land Drilling – Geothermal Drilling. This document interprets the requirements of British Standard BS EN ISO 9001:2008 and should be read in conjunction with that Standard.
- 1.1.2 Works will include all the associated processes required for the above land drilling in geothermal drilling covering drilling boreholes;
- Closed loop systems including installation, flow & pressure testing, thermal response testing, headworks, etc.
  - Open loop systems including installation, acidisation, pumping testing, headworks, etc.
  - Access to and protection of the works (and environment), inspection at all stages of the work, etc.
- 1.1.3 The management and operating systems to be looked into will incorporate the following areas:
- Enquiry and Award
  - Operational Organization
  - Site Safety – Method Statements, Risk assessments and Induction
  - Field Work
  - Operatives Training and Experience
  - Management Systems
  - Plant & Equipment Resources to perform operation
  - Financial Closure – Invoices related to original quotation
  - Customer Satisfaction

### 1.2 GEOTHERMAL DRILLING CATEGORY AND SUB CATEGORY

The Land Drilling activities in Geothermal Drilling will be separated into Category and sub-divided into Sub Category capacity to cover a number of land drilling activities in geothermal drilling. Detailed below are the category and sub category:

CATEGORY	SUB CATEGORY	CODE
CLOSED LOOP (Drilling & Installation)	Up to 100m depth	GD/CLS/DIB
CLOSED LOOP (Drilling & Installation)	Greater than 100m depth	GD/CLD/DIB
PRESSURE & FLOW TESTING	Closed Loop	GD/CL/PFT
THERMAL RESPONSE TESTING	Closed Loop	GD/CL/TRT
HEADWORKS INSTALLATION	Closed Loop	GD/CL/H
OPEN LOOP (Drilling & Installation)	Any Depth	GD/OL/DIB
ACIDISATION	Open Loop	GD/OL/AC
PUMPING TEST	Open Loop	GD/OL/PT
HEADWORKS INSTALLATION	Open Loop	GD/OL/H

#### Notes

1. The Code is an abbreviation/identifier of the Category and Sub Category.
2. The Scheme does not cover the design of a ground heat exchanger i.e. how many boreholes, their depth and spacing. Design is a specialist activity and shall be performed

- by a suitably qualified and competent person who shall then provide a specification / contract to the certified geothermal drilling organization.
3. The Scheme does not include geophysical logging which is a separate activity and not normally performed by a certified geothermal drilling organization.

For detailed information on the scope and application of the scheme, reference should be made to Appendix G2.

## **2. NORMATIVE REFERENCE**

The following normative documents contain provisions which constitute provisions of BS ISO 9001 Quality management Systems - Requirements;

- BS EN ISO 9000:2005 Quality Management Systems – Fundamentals and Vocabulary
- BS EN ISO 9004:2009 Managing for the sustained success of an organization. A quality management approach

### 3. TERMS AND DEFINITIONS

#### 3.1 Definitions

For the purpose of this Sector Scheme Document the following definitions shall apply.

Where tasks are to be performed by a person e.g. Auditor, CDM Co-ordinator, Project Manager, etc., an individual may have the capacity and knowledge to perform multiple tasks.

Section 6.2.2 of this document defines/give guidance to qualifications and relevant experience for the various people involved in or associated with Geothermal Drilling.

Accreditation	Accreditation is the formal recognition by an accreditation authority to the technical and organizational competence of a conformity assessment body (e.g. a certification body or a testing laboratory) to carry out a specific service in accordance to the standards and technical regulations as described in their scope of accreditation.
Acidisation	Development technique used in chalk boreholes to improve the yield of a well. An acid, commonly hydrochloric acid, is introduced into the borehole which reacts with the carbonate within the formation, as well as any drilling slurry remaining in the borehole. The aim being to clear out, and possibly open up any local fissures, present in the formation in order to improve flow to the well.
Auditor	Person with the demonstrated personal attributes and competence to conduct an audit" (definition given in ISO 9000:2005)
Certification	Certification is the procedure by which a third party gives written assurance that a product, process, system or person conforms to specified requirements.
Certified	Certified is the written assurance from a third party that a product, process, system or person conforms to specified requirements
Certificate of Registration	A certificate issued by a UKAS accredited Certification Body certifying that the holder operates a Quality Management System complying with BS EN ISO 9001:2008 and this SSD. The Certificate will state the category (ies) of work that the holder is competent to supply.
CDM Co-Ordinator	Role responsible for compliance with CDM Regulations 2007 defined within the CDM Regulations 2007 as: <ul style="list-style-type: none"> <li>a) advise and assist the client with their duties;</li> <li>b) notify details of the project to HSE;</li> <li>c) co-ordinate health and safety aspects of design work and co-operate with others involved with the project;</li> <li>d) facilitate good communication between the client, designers and contractors;</li> </ul>

	<ul style="list-style-type: none"> <li>e) liaise with the principal contractor regarding ongoing design work;</li> <li>f) identify, collect and pass on pre-construction information; and</li> <li>g) prepare/update the health and safety file.</li> </ul>
CDM Regulations	Construction (Design and Management) Regulations 2007 that cover all aspects of health and safety management and welfare provision.
Client	<p>A person who in the course or furtherance of a business:</p> <ul style="list-style-type: none"> <li>a) Seeks or accepts the services of another which may be used in the carrying out of a project for him: or</li> <li>b) Carries out a project himself.</li> </ul> <p>Taken from CDM Regulations 2007.</p>
Closed Loop	Closed Loop is the drilling of a borehole and the installation of a ground heat exchanger and pipe loop with associated backfill which is used to either extract or discharge energy to the earth in the form of low temperature heat to provide heating or cooling to a buildings via a ground source heat pump.
Completion Report	Completion Report is prepared by the organization for the client as a professional report giving full details of the works completed and materials used; their location, co-ordinates and depth, and to include the Driller's Daily Log which shall also be transcribed into a standard and well-presented format.
Contractor	<p>Any person (including a Client, Principal Contractor or other person referred to in the CDM Regulations) who, in the course or furtherance of a business, carries out or manages construction work.</p> <p>Taken from CDM Regulations 2007</p>
Contract/Project Manager (Engineer/Supervisor)	The suitably qualified person named in the Organization's Quality Plan as having the responsibility, training and experience to supervise land drilling in geothermal drilling works (including drilling, installation, grouting and testing of geothermal loop installed) to meet the requirements of the Contract Specification
Contract Documentation	Contract Documentation consists of a number of documents that detail an agreement between two or a number of parties and sets out their obligations for the duration of that contract. It will contain the Contract itself, works information such as Specification, system performance expectations, Preconstruction Health and Safety Plan (CDM Regulations) and any other documents that are deemed required to deliver the works.
Design Engineer	Competent professional person who produces specification – see GSHPA for guidance.
Driller's Daily Log	Driller's Daily Log is a daily report produced by the Lead Driller which includes details on depths, soil/rock description, flush medium, casing depths, water strikes, loop installation, backfilling, etc.

Drilling Manager	The suitably qualified person named in the Organization's Quality Plan responsible for meeting the drilling requirements and the Health and Safety and Contract Specification reporting to the Project Manager. They should have at three years relevant experience (supported by company CV) and are responsible for co-ordinating the site works with the Principal Contractor and ensuring the works comply with the design specifications
Driller (Drilling Support Operative)	BDA Audited and NVQ Level 2 Driller qualified person supporting the drilling and installation operations and reporting to the Lead Driller. This person should have relevant experience and knowledge to enable them to work safely with the Lead Driller in the drilling of the boreholes and installation of the vertical ground loops and associated backfilling
Geothermal Drilling	<p>Geothermal Drilling is a specialist activity to install geothermal closed loops into the ground or construct water wells/boreholes for extraction/discharge of ground water (open loops) as part of installation of a Ground Source Heat Pumps system.</p> <p>Geothermal Drilling and subsequent loop installation provides an installation which is capable of enhancing the ground heat characteristics to provides a method of heating buildings using a natural renewable heat resource, the ground.</p> <p>When used within this document Geothermal Drilling is consider as the drilling and installation of heat exchanger to depths of up to 400m and termed elsewhere as shallow geothermal drilling.</p>
Ground Loop Fabricator	A suitably qualified person involved in on site ground loop fabrication and must hold evidence of competence having attended appropriate training and be able to demonstrate an understanding of the importance of protection, preparation, clamping, fusion/butt welding, cleanliness and accuracy by certified trainer.
Headworks	Headworks are the interconnecting runs of pipework and manifolds from the top of the boreholes back to the plant room or adjacent to the building.
Lantra	Lantra – the sector skills council for land based industry and awarding body. Lantra operate the schedule of suppliers indicated in Clause 4.1 and 7.2.3 and Appendix H 1.3 of this document.
Lead Driller	BDA Audited NVQ Level 2 Land Drilling Lead Driller qualified operative with suitable experience in charge of onsite drilling operations reporting to the Drilling Manager/Project Manager. This person or persons should be identified in the project health and safety plan and is/are responsible for the safe and efficient operation of the drilling rig/s and personnel, ensuring the boreholes are drilled to the design specified depths, correct handling and installation of vertical ground loops, backfilling of the boreholes, pressure testing the installed ground loop, recording and reporting in accordance with the Organization's QA procedure and having knowledge of the Organization's and site specific health and safety procedures and protocols.
Open Loop	Open Loop is the construction of one or more water wells for the purpose of the abstraction of groundwater which is passed through

	a heat exchanger for the purpose of heating or cooling buildings. Depleted heated or cooled water is either rejection back to the ground via an injection well or discharged to drain or other controlled water source. Permission and licensing is required from Environment Agency for open loop projects.
Organization	The business responsible for carrying out any of the Category / Sub-Category activities listed in 1.2.  Organization spelling with a 'z' rather than 's' is in accordance with BS EN ISO 9001:2008.  Note - BS 22475-2 uses the word enterprise for organization.
Principal Contractor	The managing contractor. <u>This can be the Drilling Contractor</u>  Duty of principal contractors appointed by the client is to properly plan, manage and co-ordinate work during the construction phase in order to ensure that the risks are properly controlled. Principal contractors must also comply with the duties placed on all contractors under CDM Regulations.
Project Manager	The suitably qualified person/s named in the Organization's Quality Plan as having the responsibility, training competency and experience to supervise and manage the contract for the geothermal drilling works (including drilling, installation, grouting, butt or electro fusion, pressure testing and flushing of geothermal loop installed) to meet the requirements of the Contract Specification. This person is responsible for delivering the project to meet the contract budget and programme. Should be the holder of CSCS black card.
Quality Manager	A suitably qualified person in the organization/enterprise responsible for ensuring that work is carried out in accordance with the Quality Plan
Quality Management System	The Organization's structure, responsibilities, procedures, processes and resources for implementing Quality Management.
Quality Manual	The document which describes the quality management system procedures and outlines the structure of the documentation used in the quality management system
Quality Plan	The document setting out the specific quality practices, resources and sequence of activities relevant to the project (See Appendix A).
Quality Policy	The overall quality intentions and direction of an organization as regards quality as formally expressed by top management
Safety Manager	The person responsible in the organization for implementing the organization's health and safety policy and commitment.
"shall"	"Used to indicate a requirement strictly to be followed in order to conform to the standard and from which no deviation is permitted. (See ISO Directives Part 3:1997, Annex E)" (reference "guidance on terminology used in ISO 9001:2008 and ISO 9004:2009".)
"should"	Should when used in management system standards, is used to

	denote a recommendation, as opposed to a requirement by “shall”
Site Supervisor	A suitably qualified person directly supervising on site work activities and responsible for ensuring that people undertaking work on site are aware of their specific roles and responsibilities and are complying with all Health and Safety requirements. This role can be undertaken by a specified person the Project Manager, Drilling Manager or Lead Driller who have undertaken as a minimum a two day Site Safety Supervisors Course (IOSH or CITB)
Specification	Details issue by the Client which form the technical requirements for the Contract.
Subcontractor	An organization or individual providing services(s) or material(s) to the Organization. Where the subcontractor is employed to provide drilling services to the organization that subcontractor is required contractually to comply with the standard and specification laid out within this document. Any subcontractor providing services to the organization that comprise any of the category / sub category activities listed in 1.2 shall hold Scheme 29A certification for that activity / activities.
Well Development	The process of improving the yield/performance of a well by means of physical or chemical process. Typically carried out post construction, techniques may include; air-lifting, surging or acidisation.

### 3.2 Abbreviations

ASHRAE	American Association of Heating, Refrigeration and Air-Conditioning Engineers
BEAMA	British Electrotechnical and Allied Manufacturers Association
BGS	British Geological Survey
CB	Certification Body
CDM	Construction Design Management Regulations
CGD	Certified GeoExchange Designer
CITB	Construction Industry Training Board
CPCS	Construction Plant Competence Scheme
CSCS	Construction Skills Certification Scheme
CS/CITB	Construction Skills / Construction Industry Training Board
DECC	Department of Energy and Climate Change
EA/SEPA	Environment Agency/Scottish Environmental Protection Agency
GSHPA	Ground Source Heat Pump Association

GF	Ground Forum
HA	Highways Agency
HPA	Heat Pump Association
HSE	Health and Safety Executive
ICE (CofC)	Institution of Civil Engineers (Conditions of Contracts)
IGSHPA	International Ground Source Heat Pump Association
IOSH	Institution of Occupational Health and Safety
JCT	Joint Contract Tribunal, Minor Works Building Contract
LOLER	Lifting Operations and Lifting Equipment Regulations
MCS	Microgeneration Certification Scheme
NEBOSH	National Examination Board in Occupational Safety and Health
NEC	New Engineering and Construction Contracts
NSS	National Sector Scheme
OFGEM	Office of Gas and Electricity Markets
PPE	Personal Protective Equipment
PUWER	Provision and Use of Work Equipment Regulations
RPE	Respiratory Protective Equipment
S/NVQ	Scottish/National Vocational Qualification
SSAC-LD-GD	Sector Scheme Advisory Committee for Land Drilling – Geothermal Drilling
SSD	Sector Scheme Document
UKAS	United Kingdom Accreditation Service or any equivalent International Accreditation Forum (IAF) Multi-Lateral Agreement (MLA) signatory with a scope which includes this sector scheme.
WDA	Well Drillers Association

## Note for Section 4 to 8

Paragraph numbers in sections 4 to 8 below refer to the relevant paragraph numbers of BS EN ISO 9001:2008. Where the term “No specific interpretation” is used in this Sector Scheme Document the requirements are as stated in BS EN ISO 9001:2008 without further qualification.

The interpretations given are to assist in the clarification of the BS EN ISO 9000:2005 text for the relevant activity, no inference should be made that BS EN ISO 9001:2008 requirements are diluted or deleted because of this interpretation.

Various appendices are cross referred to in the text. These form an essential part of the interpretative process for this sector scheme (particular attention should be given to Appendix B2 and C2 and G2).

<b>4</b>	<b>Quality Management System Requirements</b>
<b>4.1</b>	<b>General Requirements</b>
	<p>The Organization shall operate a quality management system to BS EN ISO 9001:2008 and this schedule.</p> <p>The Organization shall notify and provide evidence of their Certificate of Registration to this scheme to the Schedule of suppliers via Lantra (Lantra House, Stoneleigh Park, Kenilworth, Nr Coventry, CV8 2LG) immediately following confirmation from the Certification Body and thereafter annually in April. In addition the organization shall provide details of a focal point for the organization including their title/position.</p>
<b>4.2</b>	<b>Documentation Requirements</b>
<b>4.2.1</b>	<b>General</b>
	<p>Quality Plans shall be required for all contracts. When specified in the contract documents or requested, the Organization shall submit a Quality Plan or alternative document as defined in the Contract Specification for acceptance or approval by the Client, as appropriate, prior to commencement of work (See Appendix A).</p> <p>The relevant quality plan and standard operating procedures shall be available to site operatives and shall be read and signed by each site operative.</p>
<b>4.2.2</b>	<b>Quality Manual</b>
	The manual shall specifically include information on Land Drilling – Geothermal Drilling.
<b>4.2.3</b>	<b>Control of Documents</b>
(i)	<p>As part of the Organization’s procedures for document control, the following documents are typically required to be controlled:</p> <ol style="list-style-type: none"> <li>1. Correspondence</li> <li>2. Enquiry/Tender and Quotation</li> <li>3. Contract documentation and Client Order</li> <li>4. Pre-Construction Information - Client drawings, service drawings, risk assessment records, etc.</li> <li>5. Quality Plan (including H&amp;S and risk assessment by organization). Method statement for controlling the works to include health and safety, and environmental requirements.</li> </ol>

	<ol style="list-style-type: none"> <li>6. Instructions to Drilling Operatives and other relevant site staff</li> <li>7. Calibration and maintenance records of plant and equipment (including testing equipment e.g. Loop Pressure Tests).</li> <li>8. Driller's Daily Log including testing records</li> <li>9. Completion Report</li> <li>10. Relevant plant and equipment list</li> <li>11. Operatives training records</li> <li>12. Plant and Equipment maintenance service records</li> <li>13. Purchase records</li> <li>14. Sales Invoice</li> <li>15. Client Satisfaction questionnaire response</li> </ol>
(ii)	The Organization shall have procedures in place to ensure that the latest versions of relevant Standards and Documents are always accessible (See Appendix B).
<b>4.2.4</b>	<b>Control of Records</b>
4.2.4.1	<p>In addition to the Organization's own quality records, the following contract/project specific records shall typically be kept:</p> <ol style="list-style-type: none"> <li>1. Client specification</li> <li>2. Client risk assessment</li> <li>3. Purchase Order</li> <li>4. Contract Review Records</li> <li>5. Quality Plan (including H&amp;S and risk assessment by organization)</li> <li>6. Instructions to the Personnel</li> <li>7. Calibration and verification records</li> <li>8. Daily Lead Drillers Records including Testing Records (issued to the client the following day)</li> <li>9. Operatives Training on Projects</li> <li>10. Complaints and Customer Satisfaction.</li> <li>11. Reasons for work stoppages / delays</li> <li>12. Any other relevant data specific to the contract/project i.e. scaffolding platform, access routes, underground services, etc.</li> </ol> <p>Some control records on contracts/projects will be the same documents/records required for the individual module/category assessment.</p>
4.2.4.2	The Organization shall keep all records for a minimum period of six years. This period shall be included in the Quality Plan.

<b>5</b>	<b>Management Responsibility</b>
<b>5.1</b>	<b>Management Commitment</b>
	Top management shall be able to provide evidence of its commitment to

	<p>a) Compliance with best practice for land drilling – geothermal drilling;</p> <p>b) The health, safety and wellbeing of its personnel;</p> <p>c) The effective management of its environmental performance; and</p> <p>d) Customer expectations. Including expectations regarding the above.</p> <p>The organization shall demonstrate this commitment by implementation of formal policies.</p> <p>The formal policies shall cover: health and safety, site welfare, drugs and alcohol, road safety, anti-discrimination, environmental performance, waste management, low carbon, etc.</p> <p>Management shall document within the quality manual a statement on its commitment to welfare and health &amp; safety. The organization shall be able to demonstrate compliance with HSE, CDM and BDA codes of practice and guidance as part of this commitment.</p> <p>The organization shall have a Health &amp; Safety policy statement conforming to that required by HSE in its guidance and model document.</p> <p>The organization shall have a detailed Health &amp; Safety policy document covering all arrangement for safety.</p> <p>The organization shall be able to demonstrate a site welfare policy conforming to CDM requirements.</p> <p>The organization shall be able to demonstrate a drugs and alcohol policy with company procedures.</p> <p>The organization shall be able to demonstrate a road safety policy for its staff.</p> <p>The organization shall be able to demonstrate a religion, race, equal opportunities and age discrimination policy conforming to all applicable legislation.</p> <p>The organization shall be able to demonstrate a facilities plan which shall include office, workshop and yard risk assessments conforming to good practice and HSE guidance e. g. disposal of waste oils in workshop.</p> <p>The organization shall be able to demonstrate satisfactory trade references by third parties suitable to provide to new customers and suppliers.</p> <p>The organization shall be able to demonstrate an Environment policy statement which shall include reference to EA guidance on “Environmental good practice guide for ground source heating and cooling”.</p> <p>The organization shall be able to demonstrate a Waste Management policy in accordance with Environmental Protection Act 1990.</p> <p>The organization shall be able to demonstrate a Low Carbon Policy conforming to guidance issued by the Carbon Trust or other similar government advisory authorities.</p> <p>The organization shall be able to demonstrate a commitment to GSHPA’s Vertical Borehole Standards.</p> <p>Note</p> <ol style="list-style-type: none"> <li>1. For the above, attention is drawn to the reference and associated documents contained in Appendix B, in particular: GSHPA’s Vertical Borehole Standard; codes of practice and guidance published by the HSE and BDA; the provisions of CDM; the EA’s “Environmental good practice guide for ground source heating and cooling”.</li> </ol>
<b>5.2</b>	<b>Customer Focus</b>
	<p>Processes for determining customer requirements shall consider the interests of the Client and the product end users and shall be mindful of the Client’s interaction with the end users. This will include processes to minimise disruption.</p>

<b>5.3</b>	<b>Quality Policy</b>
	The organization's quality policy statement shall include a statement of commitment to this Land Drilling Geothermal Drilling Sector Scheme.
<b>5.4</b>	<b>Planning</b>
5.4.1	Quality objectives
	The quality objectives shall include a commitment to meet Customer and Client requirements with respect to Land Drilling – Geothermal Drilling. The Organization shall identify and set targets for improvements in land drilling activities.
5.4.2	Quality management system planning
	No specific interpretation
<b>5.5</b>	<b>Responsibility, Authority and Communication</b>
5.5.1	Responsibility and authority
	Top management shall ensure that responsibilities and authorities are consistent with the definitions in Section 3 of this SSD.
5.5.2	Management representative.
	No specific interpretation
5.5.3	Internal communication
	No specific interpretation
<b>5.6</b>	<b>Management Review</b>
5.6.1	General
	The Organization shall review the quality management system at least once a year to ensure its continuing suitability and effectiveness to conform to this Land Drilling Geothermal Drilling Sector Scheme.
5.6.2	Review Input
	No specific interpretation
5.6.3	Review Output
	No specific interpretation
<b>6</b>	<b>Resources Management</b>
<b>6.1</b>	<b>Provision of Resources</b>

	The Organization shall be able to demonstrate that it has sufficient financial resource and financial management to honour all its commitments to customers and suppliers e.g. most recent company accounts.
<b>6.2</b>	<b>Human Resources</b>
6.2.1	General
	<p>The training and assessment of operatives required by this scheme is aimed primarily at technical competence for Land Drilling – Geothermal Drilling of operatives.</p> <p>The Organization shall have procedures in place to ensure that newly employed personnel are taken through a relevant induction process in line with their role and responsibilities.</p> <p>The Organization shall establish, maintain and implement procedures for the training and use of qualified Operatives in accordance with this SSD.</p> <p>The education, training, competency, skills, qualification and experience of Land Drilling Operatives required by this Sector Scheme is aimed primarily at technical and safety competence of those personnel involved with the implementation of Land Drilling.</p> <p>Although this Sector Scheme provides awareness of the need to carry out work in a safe manner it remains the sole responsibility of the Organization to determine and implement safe systems of work.</p>
6.2.1.1	Organizational Structure
	The organization shall maintain an organizational chart which identifies the names and titles of personnel.
6.2.2	Competence, Awareness and Training
6.2.2.1	<u>Drilling Operatives (Lead Driller and Driller)</u>
6.2.2.1.1	Competency
	<p>Lead Driller Operatives shall be assessed to NVQ Land Drilling Level 2 for;</p> <p>Lead Driller – Geothermal Drilling</p> <p>Lead Drillers engaged on open loop drilling shall also hold relevant NVQ endorsements, either;</p> <p>Lead Driller – Water Well Cable Percussion</p> <p>Or</p> <p>Lead Driller – Water Well Rotary</p> <p>Drilling Operatives shall be assessed to NVQ Land Drilling Level 2, for details of NVQ Level 2 - see Appendix C1.</p> <p>The Organization shall have no less than 100% of its Lead Drillers and no less than 100% of its Drillers holding NVQ Land Drilling Level 2 qualification and BDA Audited (see 6.2.2.1.3 (iii)). The remainder shall be in the process of obtaining the NVQ (see 6.2.2.1.2)</p> <p>The Lead Driller shall have suitable experience and is in charge of onsite drilling operations reporting to the Drilling Manager/Project Manager. This person or persons should be identified in the project health and safety plan and is/are responsible for the</p>

	<p>safe and efficient operation of the drilling rig/s and personnel.</p> <p>The Lead Driller is to ensure:</p> <ol style="list-style-type: none"> <li>a) Boreholes are drilled to the design specified depths;</li> <li>b) That ground loops are stored, handled and installed correctly;</li> <li>c) That the boreholes are correctly backfilled;</li> <li>d) Installed loops are flow and pressure tested;</li> <li>e) Installation of casing and screen;</li> <li>f) Installation of gravel pack;</li> <li>g) Installation of bentonite seal and grouting;</li> <li>h) Flushing of water well;</li> </ol> <p>The Lead Driller shall provide accurate records, recording information on the drilling, installation and testing of the vertical ground loops in accordance with the Organizations QA procedures.</p> <p>The Lead Driller shall have knowledge of the Organization's Health and Safety Procedures and of site specific requirement, and be responsible to ensure that the work is undertaken by himself and the drillers in accordance with those procedures and protocols.</p> <p>The Drillers shall be experience and capable of assisting the Lead Driller in the operation of the drilling rig and associated ancillary equipment, handling, storage and preparation of the ground loop. They shall be aware of their responsibility in associated with the Organization's QA and Health and Safety procedures.</p> <p>If the Lead Driller is acting in the capacity of a site supervisor see 6.2.2.5.</p>
6.2.2.1.2	Awareness and Training
	<p>All drilling operatives will be required to be NVQ Land Drilling registered within two months of commencing employment and to be undergoing NVQ assessment within six months of starting employment.</p> <p><i>Note: To assist the training element with companies without the internal infrastructure to train Lead Drillers the Land Drilling apprenticeship scheme exists for external training (see Appendix C2).</i></p>
6.2.2.1.3	Registration
(i)	<p>Operatives are required to be registered under the scheme appropriate to the client commissioning the land drilling in geothermal drilling works.</p> <p>All operatives shall be required to carry a CSCS card that is valid for activities to be undertaken</p>
(ii)	<p>CSCS Registration Cards</p> <p>A CSCS Card is issued to Land Drilling Operatives in three categories, provided they have satisfied the CSCS conditions of issue - these three categories and conditions of issue are:</p> <ol style="list-style-type: none"> <li>a) Trainee – A CSCS Trainee Card (red) is issued to an operative, without experience, who is working towards an NVQ Level 2 in Land Drilling. In order to obtain the CSCS Trainee Card, the trainee shall register for the NVQ, sit and pass the approved CSCS/CITB Health &amp; Safety Touch Screen Test and undertake the approved NVQ profiling exercise.</li> </ol>

	<p>An operative holding a CSCS Trainee Card has three years in which to obtain their NVQ and their full CSCS Card, failure to do so will result in the withdrawal of the Trainee Card.</p> <p>b) Experienced Workers Card (red) – Workers with experience in the industry qualify for a CSCS Experienced Workers card, provided they are registered for an NVQ Level 2 in Land Drilling, have sat and passed the approved CSCS/CITB Health &amp; Safety Touch Screen Test, have undertaken the approved NVQ Profiling exercise and their application for a CSCS Card is endorsed by their employer.</p> <p>CSCS Experienced Workers Cards are valid for a period of one year during which time the operative must achieve their NVQ Level 2 in Land Drilling - failure to do so will result in non-renewal of the Experienced Workers Card.</p> <p>c) Full CSCS Card (Land Drilling) (blue) – The Skilled Worker CSCS Card is awarded to operatives who have completed their NVQ Level 2 in Land Drilling. It is valid for a period of 5 years. The card is renewed at the end of this period by sitting and passing the CSCS/CITB Health &amp; Safety Touch Screen Test.</p> <p>All Land Drilling operatives shall hold CSCS blue skilled Land Drilling card (see c above), unless under training or awaiting upgrading of their Experienced Worker card.</p> <p>For details of all categories of CSCS cards consult <a href="http://www.cscs.uk.com">www.cscs.uk.com</a></p>
(iii)	<p><b>Audited Land Drilling Operatives</b></p> <ol style="list-style-type: none"> <li>1. All drilling operatives - Lead Drillers and Drillers (Drilling Support Operatives) - employed on the Contract shall hold a valid and current Audit card of competence applicable to the work and specific drilling operation on which they are engaged in geothermal drilling, as issued by the British Drilling Association Limited under its BDA Audit or an equivalent body in a State of the European Union.</li> <li>2. All drilling operatives (Lead Drillers and Drillers) employed on the contract shall hold a valid and current CSCS blue skilled (Land Drilling) card as issued by Construction Skills Certification Scheme Limited or an equivalent body in a State of the European Union.</li> <li>3. Drilling Operatives shall carry a personal audit card at all times whilst working at contract/project sites. This card will include an identification photograph and endorsement/s for the work being undertaken. The card will have an expiry date and is renewable annually following a successful re-audit</li> </ol> <p><u>Notes</u></p> <ul style="list-style-type: none"> <li>• With regard to clause 1, this covers the NVQ requirement as operatives are only admitted to BDA Audit after having provided evidence that they are already NVQ qualified.</li> <li>• With regard to clause 1, the words "applicable to the work and specific drilling operation" can be further defined for specific contracts. The BDA Audit card endorsements for a <u>Lead Driller in geothermal drilling</u> is the following: <ul style="list-style-type: none"> <li>- Geothermal Drilling</li> </ul> Lead Drillers engaged on open loop drilling shall also hold endorsement, either: <ul style="list-style-type: none"> <li>- Water Well Cable Percussion or</li> <li>- Water Well Rotary</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>• Please note that a <u>Driller</u> (who supports the drilling operation and was previously termed secondman) does not have any drilling discipline endorsements on his/her card. Neither the NVQ nor BDA Audit processes, at this stage, assess or endorse them for specific works.</li> <li>• With regard to clause 2, the BDA Audit does in fact require proof of this for anyone applying for BDA Audit status and thereafter on each 12 month on site Audit. But it's possible that an individual's CSCS card may have expired between audits, so this is why this clause exists.</li> </ul>
6.2.2.2	<u>Plant Operatives</u>
	All Plant Operatives shall hold evidence of competence certified by assessment of plant training certificates, CPCS cards etc. relevant to the plant that is operated e.g. dumper, excavator, tele-handler, etc. Where a piece of plant is a CPCS category, the plant operative shall hold a CPCS card.
6.2.2.3	<u>Site Technicians</u>
	<p>The Site Technicians shall have sufficient initial and continuing professional development to show competence in there specialities. This does not have a minimum time period, as it is an outcome that is measured.</p> <p>Site technicians will be suitably qualified and experienced persons holding appropriate CSCS card valid (minimum blue) for their activities</p> <p><i>Note: It would be unusual however for anyone with less than <u>two</u> to three years' experience involved with the implementation of land drilling works in geothermal drilling to have attained the breadth and depth of experience required.</i></p>
6.2.2.4	<u>Other Site Operatives</u>
	<p>Other Site Operatives shall have sufficient initial and continuing professional development to show competence. This does not have a minimum time period, as it is an outcome that is measured.</p> <p>They shall be required to carry a CSCS (minimum blue or white) card that is valid for activities to be undertaken.</p>
6.2.2.5	<u>Site Supervisor</u>
	<p>A Site Supervisor will be a suitably qualified and experienced person directly supervising on site work activities and responsible for ensuring that people undertaking work on site are aware of their specific roles and responsibilities and are complying with all Health and Safety requirements.</p> <p>A part-time site supervisor role may be fulfilled by a specified person e.g. Project Manager, Drilling Manager or Lead Driller who have undertaken as a minimum a two day Site Safety Supervisors Course (IOSH or CITB Construction Skills) and a CSCS minimum blue card.</p> <p>A full-time site supervisor shall hold the appropriate NVQ supervisor qualification and a CSCS gold supervisor card.</p> <p><i>Note: It would be unusual however for anyone with less than <u>two</u> years' experience of involvement in supervising the implementation of land drilling works in geothermal drilling to have attained the breadth and depth of experience required.</i></p>

6.2.2.6	<u>Drilling Manager</u>
	<p>The person named in the Organization's Quality Plan responsible for meeting the drilling requirements and the Health and Safety and Contract Specification reporting to the Project Manager. The person should have at three years relevant experience (supported by company CV) and is responsible for co-ordinating the site works with the Client/Principal Contractor and ensuring the works comply with the design specifications</p> <p>The Drilling Manager shall have a working knowledge of the relevant parts of the Contract Specification that are applicable to the work being undertaken.</p> <p>Shall be required to carry a CSCS (minimum blue) card that is valid for activities to be undertaken.</p> <p><i>Note: It would be unusual however for anyone with less than two or three years' experience of involvement in managing the implementation of land drilling works in geothermal drilling to have attained the breadth and depth of experience required.</i></p>
6.2.2.7	<u>Project Manager</u>
	<p>The suitably professionally qualified person/s named in the Organization's Quality Plan as having the responsibility, training competency and experience to supervise and manage the contract for the geothermal drilling works (including drilling, installation, grouting, butt or electro fusion, pressure testing and flushing of geothermal loop installed) to meet the requirements of the Contract Specification. For larger projects e.g. commercial sector the Project Manager would be a permanent position and expected to be of degree level. For smaller projects e.g. domestic sector the role of Project Manager may be performed by the Site Supervisor.</p> <p>The Project Managers shall have a working knowledge of the relevant parts of the Contract Specification that are applicable to the work being undertaken.</p> <p>Shall be required to carry a CSCS (minimum gold) card that is valid for activities to be undertaken.</p> <p><i>Note: It would be unusual however for anyone with less than <u>two</u> years experience of involvement in managing the implementation of land drilling works in geothermal drilling to have attained the breadth and depth of experience required.</i></p>
6.2.2.8	<u>Safety Manager</u>
	<p>The Safety Manager shall have sufficient initial and continuing professional development to show competence. This does not have a minimum time period, as it is an outcome that is measured and shall be identified in the method statement.</p> <p>The Safety Manager shall have attained NEBOSH (National General Certificate in Occupational Health &amp; Safety) qualification.</p> <p>Shall be required to carry a CSCS (minimum gold) card that is valid for activities to be undertaken.</p> <p><i>Note: It would be unusual however for anyone with less than <u>three</u> years experience in ground works industry to have attained the breadth and depth of experience required.</i></p>
6.2.2.9	Ground Loop Fabricators
	All persons involved in on site ground loop fabrication must hold evidence of competence having attended appropriate training and be able to demonstrate an understanding of the

	<p>importance of protection, preparation, clamping, fusion/butt welding, cleanliness and accuracy by certified trainer.</p> <p>They will hold appropriate CSCS (blue) cards or equivalent and follow a continuing professional development to show competence and should undergo repeat training at least every two years.</p>
6.2.2.10	Design Engineer
	A competent professionally qualified person named in the Organization's Qualify plan as having responsibility and required knowledge and experience for carrying out feasibility assessments, design and contract specification for simple or complex geothermal ground source systems to comply with the requirements of the project. (See GSHPA vertical borehole standards).
<b>6.2.3</b>	Approved Registration Bodies
	A list of the bodies accredited to assess NVQ Level 2 (Land Drilling) is available from Construction Skills. All operatives undertaking and or completing an NVQ in pursuance of this scheme must be registered with the approved registration body.
<b>6.2.4</b>	Record of Practical Experience
	<p>The Organization shall create and maintain a validated Record of Practical Experience for each land drilling operative he employs. The record shall include full details of the manner in which the individual has obtained practical experience i.e. dates, types of land drilling worked, duties performed etc.</p> <p>Land Drilling Operatives under training shall at all times be "directly" supervised by a suitably experienced NVQ/audited Lead Driller.</p>
<b>6.2.5</b>	Unqualified Personnel
	No more than 25% of an organization's Drilling Operatives' workforce employed on geothermal drilling shall be under training and unqualified. For small scale operations of three rigs or less there shall be no more than two trainee Lead Drillers or trainee Drillers (Drilling Support Operatives) in total - each rig being run by a qualified and audited Lead Driller.
<b>6.3</b>	<b>Infrastructure</b>
6.3.1	Insurances
	<p>Management shall ensure that they have insurance cover for the organization's activities, as appropriate e.g.;</p> <ul style="list-style-type: none"> <li>• Employers Liability cover at contract value (usually at least £5 million)</li> <li>• Public Liability cover at contract value (usually at least £2 million)</li> <li>• Data Protection/Contents/Business Disruption Insurance</li> <li>• Environmental Cover</li> <li>• All Vehicle and Plant Insurance</li> </ul>
6.3.2	Plant and Equipment

	<p>The Organization shall maintain a list of all plant and equipment owned by the company. This list shall include valid and current PUWER and LOLER certificates for all boring and drilling rigs.</p> <p>The Organization shall ensure that all necessary access, plant, services and equipment are available and maintained, and that the work environment is monitored to enable the land drilling works to be carried out effectively.</p>
6.3.3	Fire Prevention
	The Organization shall provide evidence of documented fire risk assessment and fire safety procedures for all buildings plant and equipment conforming to best practice in fire prevention e.g. fire brigade guidance.
6.4	<b>Work Environment</b>
	No specific interpretation

<b>7</b>	<b>Planning and Product Realization</b>
<b>7.1</b>	<b>Planning of Product Realization</b>
(i)	The Quality Plan shall as a minimum address the topics listed in Appendix A of this schedule.
(ii)	The Quality Plan may be largely standard document as indicted in Appendix A of this schedule supplemented by contract specific information.
(iii)	<p>The Quality Plan should not be considered in isolation. An integrated approach should be taken which links the Quality Plan, Environmental Plan, Sustainability Plan, the Health and Safety Plan, Risk Management etc. together. Management of the service as a whole is reliant on quality and hence the contract and the quality element cannot be separated, as one cannot function without the other.</p> <p>NOTE:- The Quality Plan describes the management strategy that sets clear and sustainable performance objectives, delegates' responsibility and establishes lines of communication. The objective being to manage the various management schemes within an overall management scheme within an organization.</p>
(iv)	The Organization shall, in order to reduce the need for waste disposal, minimise the generation and environmental impacts of wastes arising during the contracted works and shall maximise opportunities for the re-use and recovery of waste. The Organization shall document its arrangements for the identification, segregation, handling, storage and disposal of the different types of wastes arising from the contracted works.
<b>7.2</b>	<b>Customer Related Processes</b>
7.2.1	Determination of Requirements Related to the Product
	No specific interpretation
7.2.2	Review of Requirements Relating to the Product

(i)	The processes for review and determination of requirements shall require the Organization to verify with the Client that the order placed meets the technical requirements included in the Client's Contract Specification.
(ii)	Matters of a significant nature which arise during the determination and review of requirements shall be considered during the management review and incorporated as necessary into the quality management system.
7.2.3	Client Communication
(i)	The Organization shall have a process in place to notify Lantra of its registration status in respect of this NSS, within 14 days of gaining registration to this scheme and thereafter annually in April.
(ii)	The client needs to be informed about the products, that is, they require detailed information as appropriate regarding materials, components, manufacturing details etc. for purpose of: <ul style="list-style-type: none"> <li>a) As-built records for maintenance/health and safety requirements</li> <li>b) For their own monitoring of the effectiveness/performance of the product.</li> </ul> The Quality Plan shall identify what and when relevant information is passed on to the customer or their agent.
(iii)	The Organization shall establish, maintain and implement a process for reporting to the Client any unexpected conditions or factors encountered that may affect the land drilling activities, and work with the Client to mitigate such conditions or factors. Examples of unexpected ground conditions would be buried services, ground contamination, ground gas emission, artesian water, amongst others.
(iv)	The Organization shall establish, maintain and implement procedures to inform the Client of the proposed and actual source of supply of all materials used in operations and installations.
<b>7.3</b>	<b>Design and Development</b>
	Design and development may address all associated processes required for the land drilling works including but not limited to access for the works and protection of the works and environment.  NOTE;- Design of the ground heat exchanger (borehole positions, depth, spacing, backfill) is not part of the scheme but absolutely crucial to the sustained performance of a ground heat pump system.
7.3.1	Design and Development Planning
	No specific interpretation
7.3.2	Design and Development Inputs
	No specific interpretation
7.3.3	Design and Development Outputs
	No specific interpretation

7.3.4	Design and Development Review
	No specific interpretation
7.3.5	Design and Development Verification
	No specific interpretation
7.3.6	Design and Development Validation
	No specific interpretation
7.3.7	Control of Design and Development Changes
	No specific interpretation
<b>7.4</b>	<b>Purchasing</b>
7.4.1	Purchasing process
	The Organization shall maintain records to demonstrate that all materials, suppliers and sub-contractors conform to the Contract Specification.
7.4.2	Purchasing information
	Drilling equipment is purchased to ISO 3551-1; ISO 3552-1; ISO 10097-1 and BS879 amongst others. Drilling rigs shall be CE certified; conform to the requirements of BS EN 791 and in addition meet the HSE requirements of preventing access to rotating parts e. g. by rotary head and drill string guarding or protective devices approved by HSE. Installation materials conform to GSHPA Vertical Borehole Standards.
7.4.3	Verification of purchased product
	No specific interpretation
<b>7.5</b>	<b>Production and Service Provision</b>
7.5.1	Control of Production and Service Provision
7.5.1.1	The Organization shall identify and plan supply and installation processes .Example of conditions, which shall be controlled include: <ul style="list-style-type: none"> <li>a) Specification for the plant, equipment (where applicable) and materials (including installations).</li> <li>b) Plant, equipment (where applicable) and material product data sheets.</li> <li>c) Plant, equipment (where applicable) and material safety data sheets including COSHH assessments.</li> <li>d) Plant, equipment (where applicable) and material certificates of conformity.</li> </ul>
7.5.1.2	The Organization shall produce method statements and risk assessments for the land drilling works typically including the following: <ul style="list-style-type: none"> <li>a) Access to the site for land drilling works</li> <li>b) Site Classification i.e. Red, Yellow or Green (refer to BDA document Guidance for Site Intrusive Activities)</li> <li>c) All services information (both underground and above ground)</li> <li>d) Any past usage of the site which may require specific level of PPE to be</li> </ul>

	<p>used/made available during works</p> <p>e) Materials identification, delivery, storage and disposal</p> <p>f) Identification of the requirements of third parties that effect or are affected by the land drilling works, e.g. utility companies, the public, Coal Authority, the Environment Agency etc.</p>
7.5.1.3	The Organization shall make available for the land drilling activities the type of plant and equipment identified in the method statements. All plant and equipment shall be properly maintained and maintenance records kept and are PUWER/LOLER compliant.
7.5.1.4	The Organization shall establish, maintain and implement procedures for the inspection and monitoring of the land drilling activities. Records of the inspection and monitoring shall be maintained.
7.5.1.5	The Organization shall undertake a review of the land drilling activities and the application and inspection records to confirm compliance with the Contract Specification.
7.5.2	Validation of Processes for Production and Service Provision
	Works orders, risk assessments and Geothermal Drilling Quality Plans for the installation of Geothermal Drilling shall be signed by the Project Manager and retained for number of years. They will also be submitted to the Client if requested.
7.5.3	Identification and traceability
	The Organization shall establish, maintain and implement documented procedures to ensure the identification and traceability of land drilling plant equipment and materials respectively.
7.5.4	Client Property
	The quality management system shall include a procedure where materials are supplied by the Client. For example, installation equipment.
7.5.5	Preservation of Product
	The Organization shall establish, maintain and implement documented procedures for the appropriate handling, storage and packaging of land drilling plant, equipment and materials, including transportation where applicable.
<b>7.6</b>	<b>Control of Monitoring and Measuring Devices</b>
7.6.1	The Organization shall establish and maintain a register of the devices/equipment used in land drilling works. Guidance is given in Appendix E. For instance calibration certification on pumps, gauges, etc.
7.6.2	Where no standard exists, insitu testing, sampling and installation devices/equipment shall be calibrated in accordance with the manufacturer's instructions and as a minimum annually.

<b>8</b>	<b>Measurement, Analysis and Improvement</b>
<b>8.1</b>	<b>General</b>
	No specific interpretation.
<b>8.2</b>	<b>Monitoring and Measurement</b>
8.2.1	Client Satisfaction
	Shall include customer feedback forms.
8.2.2	Internal Audits
	Internal audits of the quality management system against this SSD shall include at least two visits a year to specific works sites to check land drilling activities (Where the organization does not have contracts which provide continuous working throughout a full year, visits shall be conducted on a pro-rata basis, but at least one visit per contract must be made). Internal auditors shall have a working knowledge of land drilling activities. Internal audits shall be carried out by the nominated quality manager, internal audit team, external consultant, etc. plus recorded as evidence documentation and filed (See Appendix G and G1).
8.2.3	Monitoring and Measurement of Processes
	This includes the ongoing impact of land drilling on other works.
8.2.4	Monitoring and Measurement of Product
	Shall include hole depth measurement, pump certification, gauges certification, etc.
<b>8.3</b>	<b>Control of Non-conforming Product</b>
	Any materials and/or work not conforming to the Contract Specification shall either be reworked to conform or must formally be accepted in writing by the Client, the materials and/or work shall otherwise be considered to be rejected. Examples would be re-drilling and installations.
<b>8.4</b>	<b>Analysis of Data</b>
	This would include drillers' instruction and drillers' logs.
<b>8.5</b>	<b>Improvement</b>
8.5.1	Continual improvement
	The corrective and preventative action processes shall include analysis of incidents and occurrences on contracts/projects. This would include near misses. The analysis shall include a record of the past two years accidents statistics.
8.5.2	Corrective action
	No specific interpretation
8.5.3	Preventive action

No specific interpretation
----------------------------

## APPENDIX A: REQUIREMENTS FOR QUALITY PLANS

The Quality Plan shall include the following items as a minimum.

### 1. General Requirements

- 1.1 Definition of the product/service to be provided.
- 1.2 The structure of the Organization describing the line of command and stating the names of the Organization's Manager responsible for the contracted work.
- 1.3 Identification of the relevant parts of the Organization's quality manual relevant to the product or service being provided.\*
- 1.4 The control of personnel selection including special requirements for skilled personnel e.g. staff training.
- 1.5 The control of plant, equipment and materials.
- 1.6 The Client's nominated Quality Manager, project manager and/or other representatives through whom communication is to be made throughout the contract.
- 1.7 Confirmation that work undertaken by sub-contractors is integrated into the Organizations quality plan.

### 2. Contract Specific Information

- 2.1 Names of the staff involved with the contract including the Contract Manager/Project Manager, Site Supervisor, Lead Driller(s) and Driller(s). Contact details for these staff.

- 2.2 Details of the contract specific equipment to be used and any certification required to be issued to the Client.
  - 2.3 Name and contact details of Client contact(s).
  - 2.4 Details of the communications required between the Organization's staff and the Client or any other relevant party for example Liaison with the Police, the Highway Authority, adjoining landowners and other organizations or individuals as appropriate.
  - 2.5 Work programme and details of deliverables including method statements.
  - 2.6 Receipt, examination and submission to Client of certificates of registration and test results and origins of materials used.
  - 2.7 Storage, handling and application of materials.
  - 2.8 Details and control of Quality records.\*
  - 2.9 Control of non-conforming product.\*
  - 2.10 Risk assessments\*
  - 2.11 Environment Management Plan\*
- \* Copies of the Organization's general procedures covering these items shall be made available for examination by the Client's representative when requested.

## **APPENDIX B: REFERENCE AND ASSOCIATED DOCUMENTS (BIBLIOGRAPHY)**

NOTE - The listing is not comprehensive; other documents may be required to fulfil the requirements of the contract. Organizations shall ensure that they have a working knowledge of and access to all the documents including amendments unless stated otherwise in the specification

Organizations shall ensure they are working to current reference or associated documents appropriate to work in their sector.

### **1 LEGISLATION (Consist of Acts and Regulation)**

#### **Acts**

The Health & Safety at Work etc. Act 1974 (HASWA)

The Control of Pollution 1974

The Water Resources Act 1991

The Environment Act 1995

The Environmental Protection Act 1990 (E.P.A.)

The Water Act (2003)

## **Regulations**

The Lifting Operations and Lifting Equipment Regulations 1998 (LOLER)

The Provision and Use of Work Equipment Regulations. Approved Code of Practice 1998 as amended 2002 (PUWER)

The Construction (Design and Management) Regulations 2007 (CDM)

The Control of Substances Hazardous to Health 2002 (COSHH) Regulations

The Health & Safety (First Aid) Regulations 1981

The Construction (Head Protection) Regulation 1989

The Personnel Protective Equipment at Work Regulations 1992

The Workplace (Health, Safety and Welfare) Regulations 1992

The Reporting of Injuries, Diseases and Dangerous Occurrence Regulations 1995 (RIDDOR)

The Management of Health & Safety at Work Regulation 1999 (MHSWR)

The Control of Lead at Work Regulations 2002

The Control of Asbestos Regulations 2006

The Environmental Permitting Regulations 2010

## **2 STANDARDS (Technical and Quality Management)**

### **BS Standards**

BS 5930 (latest issue) Code of practice for site investigations (as amended 2009 and 2010)

BS EN ISO 14686 (latest issue) Hydrometric Determinations. Pumping Test for water wells. Considerations and guidelines for design, performance and use.

BS EN ISO/IEC 17025 (latest issue) General requirements for the competence of testing and calibration laboratories

BS EN ISO 22475-1 (latest issue) Geotechnical investigation and testing

BS EN ISO 9000 (latest issue) Quality Management Systems – Fundamentals and Vocabulary

BS EN ISO 9001 (latest issue) Quality Management System – Requirements

BS EN ISO 9004 (latest issue) Quality Management Systems – Guidelines for Performance Improvements

## **3 INDUSTRY STANDARDS / CODES OF PRACTICE**

### **Association of Geotechnical and Geoenvironmental Specialists (AGS)**

- a) A Client's Guide to Desk Studies

### **British Drilling Association (BDA)**

- a) BDA Health & Safety Manual for Land Drilling: A Code of Safe Drilling Practice (2002)
- b) Guidance for the Safe Operation of Cable Percussion Rigs and Equipment (2005)
- c) BDA Guidance Notes for the Protection of Persons from Rotating Parts and Ejected or Falling Materials – involved in the Drilling Process (2000)
- d) Guidance for Safe Intrusive Activities on Contaminated or Potentially Contaminated Land (2008)

### **Environment Agency (EA)**

- a) Environmental good practice guide for ground source heating and cooling
- b) Ground source heating and cooling – Position Statement. March 2011
- c) Groundwater Protection Principles and Practice (GP3)
- d) Piling into Contaminated Land
- e) Water Supply Boreholes Construction and Headworks: Guide to Good Practice

### **British Geological Survey (BGS)**

- a) BGS – GeoReports – Vertical Loop Ground Source Heat Pump

### **Ground Source Heat Pump Association (GSHPA)**

- a) GSHPA – Closed loop vertical borehole – design, installation & materials

### **Microgeneration Certification Scheme (MCS)**

- a) MCS 001 – Installer certification scheme requirements
- b) MIS 3005 – Requirements for contractors undertaking the supply, design, installation, set to work commissioning and handover of microgeneration heat pump systems

## **4 HEALTH AND SAFETY EXECUTIVE**

As specified e.g. [www.hse.gov.uk](http://www.hse.gov.uk)

Health and Safety Policy Statement <http://www.hse.gov.uk/business/policy-statement.pdf>

## **5 CONTRACT SPECIFICATIONS AND DOCUMENTATION**

As specified e. g. JCT, NCE, ICE (CofC), etc.

## 6 SPECIFIC CLIENT CONTRACT SPECIFICATIONS/DOCUMENTS

Where a client uses its own form of contract/specification then it must conform to contract legislation and be in alignment with geothermal drilling best practice/specifications.

## 7 OTHER

- a) Carbon Trust [www.carbontrust.co.uk](http://www.carbontrust.co.uk)

Note: The list of standards and documents includes those that are date specific, however, the Organization shall have procedures in place to ensure that the latest versions are always available (See Clause 4.2.3)

# APPENDIX C1: COMPETENCIES OF LAND DRILLING- GEOTHERMAL DRILLING OPERATIVES WORKFORCE AND COMPETENCIES OF SECTOR CERTIFICATION COMPANIES

## COMPETENCY LEVELS – NVQ

The workforce competencies for operatives performing land drilling is that they obtain NVQ Level 2 Land Drilling as a lead driller in the relevant discipline that the module/category of operation is being performed.

The NVQ assessment requires the lead drillers to cover a number of mandatory units and some optional units and the NVQ certificate, after attainment, will indicate the discipline/s the lead driller has been assessed to NVQ Level 2.

NOTE: REFERENCE NUMBERS BELOW ARE FROM NVQ MAGENTA SCHEME. NUMBERS HAVE CHANGED FOR NVQ DIPLOMA (QCF)

## LAND DRILLING NVQ LEVEL 2 REQUIREMENTS (QUA765) – LEAD DRILLER

### Mandatory Units:

- Health and Safety – Touch Screen Test

- VR01 (H/103/3681) Conform to General Workplace Safety
- VR02 (K/103/6209) Conform to Efficient Work Practices
- VR270 (D/103/6210) Contribute to the Specified Drilling Programme Endorsement
  - Land Drilling
- VR360L (H/103/6211) Establish Work Area Protection and Safety Endorsement
  - Land Drilling
- VR238L (K/103/6212) Drill Holes to Drilling Specification

Endorsements (one or more of)

- **Lead Driller – Geothermal Drilling (required for all Lead Drillers whether closed or open loop drilling)**
  - **Lead Driller – Water Well Cable Percussion (required for cable percussion Lead Drillers on open loop)**
  - **Lead Driller – Water Well Rotary (required for rotary Lead Drillers on open loop)**
- VR271 (M/103/6213) Provide for and Maintain the Security of the Work and Environment Surrounding the Drilling Area

#### **Optional Units (Plus ONE of the following)**

- VR172L (T/103/6214) Reinstate Ground Conditions Endorsement
  - Land Drilling
- VR299L (A/103/6215) Plant or Machinery Operator Maintenance Endorsement
  - Land Drilling
- VR400L (F/103/6216) Operate Specialised Powered Tools and Equipment Endorsement (one of)
  - Generators
  - Pumps
  - Pedestrian Operated Plant or Machines
  - Mixer
  - Compressors
  - Self Powered Tools
- VR401L (J/103/6217) Set out Secondary Dimensional Work Control Endorsement (three of)
  - Lines
  - Levels
  - Depths
  - Areas

- Heights
- Angles
- VR402L (L103/6218) Slinging and Signalling the Movement of Loads  
Endorsement
  - Land Drilling

## **LAND DRILLING NVQ LEVEL 2 REQUIREMENTS (QUA765) – DRILLER SUPPORT OPERATIVE**

### **Mandatory Units**

- Health and Safety – Touch Screen Test
- VR01 (H/103/3681) Conform to General Workspace Safety
- VR02 (K/1036209) Conform to Efficient Work Practice
- VR270 (D/103/6210) Contribute to the Specified Drilling Programme  
Endorsement
  - Land Drilling
- VR360L (H/103/6211) Establish Works Area Protection Safety  
Endorsement
  - Land Drilling
- VR299L (A/103/6215) Plant or Machinery Operator Maintenance  
Endorsement
  - Land Drilling

### **Optional Units (Plus ONE of the following)**

- D11 (R/104/0397) Receive and Organise Material and Equipment for the Drilling Activity
- VR400L (F/103/6216) Operate Specialised Powered Tools and Equipment

Endorsement (one off)

- Generators
- Pumps
- Pedestrian Operated Plant or Machines
- Mixers
- Compressor
- Self Powered Tools
- VR410L (J/103/6217) Set out Secondary Dimensional Work Control  
Endorsement (three off)
  - Lines
  - Levels
  - Depths
  - Areas
  - Heights
  - Angles
- VR402L (L/103/6218) Slinging and Signalling the Movement of Loads

## **APPENDIX C2: TRAINING AND HEALTH AND SAFETY – LAND DRILLING APPRENTICESHIP SCHEME**

### **Training Regulatory Requirements for Safety**

The Health and Safety at Work, etc. Act 1974 states, “It shall be the duty of every employer to ensure ... the provision of such information, instruction, **training** and supervision as is necessary to ensure, so far as is reasonably practicable, the health and safety at work of his employees”.

More specifically, Regulation 13 of the Management of Health and Safety at Work Regulations requires employees to be provided with “adequate health and safety training on their being recruited to the employer’s undertaking.

The Construction (Design and Management) Regulations 2007 state, “Every contractor shall provide every worker ... with any information and **training** which he needs for the particular work to be carried out safely and without risk to health”

Training is therefore a mandatory legal requirement for health and safety.

Evidence that every employee has undergone health and safety training is a requirement of this scheme.

### **Training and Competence**

Training is often confused with competence. A worker may have attended training but is not necessarily competent. Competence is defined as having the knowledge, skill, aptitude, experience and attitude to perform tasks. Competence has to be demonstrated and assessed according to National Occupational Standards for each category of worker. Proof of competence is required on an ongoing basis as methods, equipment and work practices will change.

Training should be ongoing to ensure that workers are updated and remain competent. Inspection for current competence should be conducted on a regular basis.

Evidence that every employee has been assessed for competence by a third party according to national occupational standards is a requirement of this scheme.

Training records are required of recent origin as is proof of current competence.

### **Lead Driller Training**

The organization shall provide proof that Lead Drillers have undergone structured and formal training prior to their appointment such as the Land Drilling Apprenticeship Scheme or equivalent.

Evidence of ongoing training for Lead Drillers shall be provided.

### **Land Drilling Apprenticeship (Lead Drillers)**

The 2-year Apprenticeship Scheme is designed to take a company employee, who is beginning his drilling career, through to the award of the National Vocational Qualification (NVQ) in Land Drilling, level 2, as a Lead Driller.

This is achieved by a mix of formal off-the-job training and supervised on-the-job training at employer level, followed by NVQ assessment. All components of the training have been intensively identified and documented so that apprentices gain full exposure on a nationally agreed basis to all the knowledge and skills that a Lead Driller should possess.

The Scheme is owned by Construction Skills and forms part of their apprenticeship programme for the specialist trades known as SAPs. It is supported by grants to eligible employers. BDA is the Training Provider whereby it carries out all the administration of the scheme, organises all off-the-job training, monitors with Construction Skills the on-the-job training, and arranges the NVQ assessment to take place.

### **Land Drilling Apprenticeship Scheme Content**

There are 3 components:

#### **1. Off-the-job training**

As a minimum the apprentice will attend over 22 days of external training courses over the 2 years (mainly within the first 18 months). This training has several modules covering amongst others:

- Induction
- Health, Safety & Environment
- Geology
- Drilling Applications & Methods
- Site Management
- Drilling & Grouting

- Ground Investigation
- Anchoring
- Geothermal Drilling (Under Development)

The courses, organised by the BDA, are at varying locations, including visits to manufacturing facilities and sites.

## **2. On-the-job training**

This is the employer's responsibility to arrange, and document that it has been provided according to the schedule laid down by the scheme.

The BDA provides the training record / schedule, which lists all the items and components that must be delivered by a responsible person of the employer.

At intervals, the BDA and Construction Skills will inspect the training record / schedule for each apprentice, which has to be signed and dated by both the apprentice and the employer's representative for each of its elements.

## **3. NVQ Assessment**

Training is not assessment. The NVQ Assessor will be looking for evidence that the apprentice can demonstrate competence. Part of competence is knowledge so the off-the-job training and on-the-job training will provide much needed evidence for the assessor.

In addition, the assessor will need to have witnessed evidence that the apprentice can actually perform and show practical skill.

# **APPENDIX C3: TRAINING AND HEALTH AND SAFETY – LAND DRILLING OPERATIVES UPSKILLING**

It is important in all disciplines that continuous professional development (CPD) is undertaken by individuals in maintaining skill awareness and increasing skills.

A number of areas to maintain skill awareness are detailed below;

1. BDA Audit – The re-assessment of BDA Audit Land Drilling skills re-done every year.
2. One Day First Aid – The course is required to be conducted every 2 years.
3. CSCS Card – The card is renewed at five yearly intervals and the Health and Safety Touch Screen Test re-taken as a condition of renewal. (See appendix K2 for card colours relevance.)

A number of courses can be taken to develop skills;

1. Mud Course – This course is one day, given by a number of organizations.
2. NVQ Level 2 for other disciplines – The individual may be qualified only in geothermal drilling. However there is no reason for not having training & development to achieve other disciplines for instance drilling and grouting, anchoring, etc.
3. Health & Safety and Site Supervision – Some of the courses under this area are becoming compulsory if the individual is required to be allowed to be in a certain operational role.
4. GeoTrainet Training – European organization who focus on training and courses for Designers and Drillers in Ground Source Heat Pump Sector
5. General – Individual companies offer courses which are not a requirement. However they may enhance the skill of individuals.

## APPENDIX C4: COMPETENCIES OF OTHER PERSONNEL INVOLVED IN LAND DRILLING-GEOTHERMAL DRILLING WORKFORCE AND COMPETENCIES OF SECTOR CERTIFICATION COMPANIES

Detailed description of personnel are given in Section 6.2 and a summary a guideline summary of qualifications is given below:

CLAUSE	TITLE	QUALIFICATION	CSCS CARD COLOUR
6.2.2.1	Drilling Operatives	BDA Audit & NVQ Level 2	Blue
6.2.2.2	Plant Operatives	Specific Plant Training & CPCS & Assessment	(CPCS Red and Blue)
6.2.2.3	Site Technicians	Competency in specialism	Minimum Blue
6.2.2.4	Other Site Operatives	Show competency and professional development	Minimum Blue or White
6.2.2.5	Site Supervisor – part-time	2 days Site Supervisors Course (IOSH or CITB) & minimum of 2 years relevant experience	Minimum Blue
6.2.2.5	Site Supervisors – full-time	NVQ Level 3 Minimum of 2 years relevant experience	Gold
6.2.2.6	Drilling Manager	Minimum 3 years relevant Experience	Minimum Blue
6.2.2.7	Project Manager	Minimum of 2 years relevant experience	Minimum Gold
6.2.2.8	Safety Manager	Attained NEBOSH qualification	Minimum Gold
6.2.2.9	Ground Loop Fabricators	Relevant experience by certified trainer	Blue or equivalent



## APPENDIX E: GUIDANCE FOR CALIBRATION AND INSPECTION OF TESTING, MONITORING AND MEASURING DEVICES

### Guidance Register for Testing, Monitoring and Measuring Devices

Equipment & Unique Reference Number	Equipment Specification	Calibration/ Inspection Control	Calibration/ Inspection Frequency	Date of Calibration/ Inspection	Date Next Calibration/ Inspection Due.	Calibration/ Inspection Certificate Ref.
Pressure Gauges	Glycerine filled. Should not be rated more than 100% above expected system pressure	External Traceable Calibration. UKAS approved testing facility	Annually (or after overload or damage)	dd/mm/yy	dd/mm/yy	Ref
Flowmeters	Mechanical readout with digital option backup. Readings download facility	External. Traceable Calibration. UKAS approved testing facility	Annually (or after overload or damage)	dd/mm/yy	dd/mm/yy	Ref
Mud Balance	Built in level indicator. Measurement accuracy should be within +/- 0.1 lbm/gal (+/- 0.01 g/cm <sup>3</sup> ).	Visual Inspection with Written Record	Each new site and at least every 20 tests	dd/mm/yy	dd/mm/yy	Ref
Tapes used for Measuring		Visual Inspection with Written Record	Daily (replace are required)	n/a	n/a	n/a
Dip Meter		Visual Inspection with Written Record	Daily (replace are required)	n/a	n/a	n/a
Pressure Transducers / Level Logger		Visual Inspection with Written Record	Each new site and at least every 20 tests	dd/mm/yy	dd/mm/yy	Ref
In situ water quality probes		Visual Inspection with Written Record	Each new site and at least every 20 tests	dd/mm/yy	dd/mm/yy	Ref

'In house' calibrations to be in accordance with procedure(s) described in the equipment's operating manual. Separate records to be kept on method(s) used and results of calibration.

All Calibrations (other than 'in house') shall be certified by calibration laboratories providing traceability in accordance with the requirements of BS EN ISO/IEC 17025 wherever possible / practical.

## Note

1. The table is only intended as an example of a list of calibration and maintenance requirements for monitoring and measuring devices. A full list of all equipment used by the Organization should be compiled in this way and the timescales stated are to be based upon the Standards employed and described in their quality manual.
2. Visual daily checks shall be carried out on site to confirm that the equipment is working correctly and is not damaged. Records of the daily checks shall be kept.
3. If in-house calibration equipment is used for the calibration it shall not be used for any other purpose and it shall itself be calibrated by a UKAS accredited laboratory that can provide traceability in accordance with the requirements of BS EN ISO/IEC 17025.
4. Records of all equipment in use, their calibration status and calibration or verification checks undertaken shall be established and maintained.
5. Re-calibration will be mandatory if:
  - (i) The item has failed in service and the problem cannot be easily rectified.
  - (ii) There is evidence of recent physical damage that could affect its accuracy.
  - (iii) The equipment has been overloaded or excessive pressure applied.
6. Where reasonably practicable equipment that requires calibration shall be labelled or marked in such a way as to show the calibration renewal date.
7. Unserviceable equipment shall be labelled/marked in such a way to show it should not be used and kept in a place separate to other equipment.

## **APPENDIX F: CERTIFICATION BODIES ACCREDITED FOR LAND DRILLING-GEOTHERMAL DRILLING SECTOR ACCESSMENT SCHEME COMPANIES**

Information on certification bodies accredited against this scheme can be found on the UKAS website [www.ukas.com](http://www.ukas.com) To identify the certification bodies on the website:

- place the cursor onto 'about accreditation ' in the top menu bar
- move down to 'accredited bodies'
- move down to "Accredited Bodies" in the grey box' and left click on this to take you to the list of Accredited Bodies schedules
- move down to Certification Body Schedules and left click to take you to the list of certification schedules
- move cursor down past 'key abbreviations' to 'search within the schedules' - click on 'search UKAS"
- move cursor to "Certification Bodies" in the "Search Within" box and left click type in "highway sector scheme no XX" including the double inverted commons for example " "highway sector scheme no 19A" "
- left click "search"

This should then list the certification bodies who are accredited to the scheme and their details can be found by clicking on the appropriate links.

### **NOTES:**

1. Certification Bodies interested in being accredited by UKAS for this Sector Scheme should contact UKAS.
2. Organizations currently registered to ISO 9001 with an UKAS (or equivalent) accredited certification body that does hold registration to this NHSS may wish to consider the following option. Continuing to be registered with their existing Certification Body but having the interpretation of the NHSS carried out by and in conjunction with an UKAS accredited certification body for this scheme."
3. Advice on the current accreditation status of certification bodies to assess against this document (NHSS XX) can also be sought from UKAS (Tel 0208 917 8400)

# APPENDIX G1: THE ROLE OF THE CERTIFICATION BODY AND AUDITOR QUALIFICATIONS/COMPETENCIES

## 1. Role of Certification Bodies

- 1.1. The independent assessment of conformity of Organizations to the requirements of BS EN ISO9001:2008 and the additional requirements required by this SSD relies upon the assessment expertise, competence and capability of accredited certification bodies.
- 1.2. The Certification Body role is to ensure, through assessment, that Organizations have management systems in place which address the enhanced BS EN ISO9001:2008 requirements detailed in this SSD.

## 2. Certification Body Accreditation

- 2.1. To ensure consistency and to demonstrate independent capability Certification Bodies are required to be accredited against the requirements of ISO 17021 by the United Kingdom Accreditation Service (UKAS) or an equivalent International Accreditation Forum (IAF) member for assessment and registration of BS EN ISO9001:2008 quality management systems interpreted in accordance with this SSD.

## 3. Assessor and Assessment Team Competence

- 3.1 The Certification Body must be able to demonstrate to UKAS that it possesses and can maintain the necessary assessor experience and technical understanding of the Land Drilling in Geothermal Drilling covered in the scope of this Sector Scheme. These assessment areas include, but shall not be limited to the following:
  - 3.1.1 Knowledge, understanding and application of this SSD
  - 3.1.2 Knowledge of operations in the Land Drilling industry, including the methods and techniques sufficient to understand the processes employed and the controls necessary to ensure delivery of the Land Drilling Geothermal Drilling requirements. Typically this would include knowledge of Land Drilling plant, equipment plus handling/transportation/storage, insitu testing, industry safety standards, Standards and drilling reporting. (Communication of this knowledge to auditing teams will be determined by the Certification Body and will be audited by UKAS).
  - 3.1.3 Maintaining demonstrable appropriate background, capable of reading and understanding Geothermal Drilling specifications and drawings, including knowledge of closed and open loop.
  - 3.1.4 Is able to demonstrate that they have ongoing suitable health and safety training which shall include detailed knowledge of the risks involved in the Land Drilling Geothermal Drilling.
- 3.2 The Certification Body must also ensure that assessors have sufficient knowledge of health & safety requirements related to working on all Land Drilling sites and environments including highways, contaminated sites, confined spaces, at height, railways, quarries, past mining and present mining. This list is not exhaustive and land drilling can take place in any location.
- 3.3 Guidance to Certification Bodies on assessor competence related to this Sector Scheme is given in the Certification Body guidance document – National Highway

Sector Scheme Accreditation, Registration and Assessment Guidance for Certification Bodies.

- 3.4 The Certification Body is responsible for ensuring that the assessment teams possess demonstrable expertise in the assessment areas detailed above as they relate to the scope of client activities under assessment.
- 3.5 Minimum assessor qualifications and competence for assessment of this Land Drilling in Geothermal Drilling Sector Scheme, which may reside in a single individual, or in an assessment team are as follows:
  - 3.5.1 International Register of Certificated Auditors (IRCA) Registered ISO9001:2008 Lead Auditor qualification or Certification Body equivalent and demonstrable expertise in leading assessment teams.
  - 3.5.2 Assessment experience obtained from assessments of appropriately similar activities within the construction, Civil engineering and building industries.
  - 3.5.3 Have technical assessment competence in Land Drilling Geothermal Drilling activities.
  - 3.5.4 Have knowledge, understanding and application of this SSD
  - 3.5.5 Have knowledge of operations in the Land Drilling industry, including the methods and techniques sufficient to understand the processes employed and the controls necessary to ensure delivery of the Land Drilling Geothermal Drilling requirements. Typically this would include knowledge of Land Drilling plant, equipment, plus handling/transportation/storage, insitu testing, industry safety standards, Standards and drilling reporting. (Conveyance of this knowledge to auditing teams will be determined by the Certification Body and will be audited by UKAS).
  - 3.5.6 Is able to demonstrate that they have ongoing suitable health and safety training which shall include detailed knowledge of the risks involved in the Land Drilling Geothermal Drilling.

#### **4. Conduct of Assessments.**

- 4.1. Certification Bodies shall ensure that an adequate proportion of the initial and continuing assessment duration is devoted to assessing operational activities at sites and locations where land drilling activities covered by the scope of this Sector Scheme are being undertaken.
- 4.2. Certification Bodies shall make every endeavour to ensure that during a three year certification cycle there is evidence of assessment of all execution activities covered by the Organization's scope of registration. Certification bodies shall undertake surveillance visits at intervals of not greater than one year.

#### **5. Format and Content of Registration Certificates.**

- 5.1. Certificates of registration issued by Certification Bodies, which include within the scope of registration reference to compliance with this Sector Scheme, shall be in a format and contain the content detailed in Appendix K1 of this SSD.
- 5.2. The Land Drilling Geothermal Drilling Sector Scheme Logo shall be included in any

Certificate of Registration which has this Sector Scheme detailed in the Scope of Registration. The logo shall only be used and applied in the manner detailed in any conditions of use which may be published from time to time.

## **6. National Highway Sector Schemes Schedule of Suppliers.**

- 6.1. Certification Bodies shall monitor the National Highway Sector Schemes Schedule of Suppliers posted at [www.scheduleofsuppliers.com](http://www.scheduleofsuppliers.com) to ensure equivalence between their clients registered to this Sector Scheme and the listed Organizations.
- 6.2. Certification Bodies shall provide to National Highway Sector Schemes Schedule of Suppliers administrator at Lantra Awards details of registered Organizations whose scope of registration against this Sector Scheme has ceased to be applicable within 10 working days of that situation occurring.
- 6.3. Certification Bodies shall audit the Organization to ensure that Lantra and scheme secretary have been notified by the Organization of their NSS registration. (See 4.1(i))

## **7. Reporting on Sector Scheme Performance.**

- 7.1. Each Certification Body accredited for this Sector Scheme shall provide to the Secretary of the SSAC-LD-GD a summary report which includes as a minimum:
  - a) observations and comments on the implementation and assessment findings related to the Sector Scheme including any omissions or deficiencies in its scope.
  - b) recommendations for improving/clarifying the SSD
  - c) feedback on deficiencies against contract documentation
  - d) a list of Organizations whose scope of registration includes this Sector Scheme for comparison against the Schedule of Suppliers
- 7.2. The report shall be provided at or in the month before each National Highway Sector Scheme Liaison Committee meeting, so that it may be considered during the Group Sessions of the Liaison meeting.
- 7.3. Certification Bodies shall ensure they are all represented by at least one nominated individual (who will represent all Certification Bodies) at Sector Scheme Advisory Committee. This does not preclude other Certification Bodies from attending, as appropriate

## **APPENDIX G2: GUIDANCE TO CERTIFICATION BODY AUDITORS AND 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> PARTY AUDITORS**

### **Section 1 - General Information**

The certification body group (reporting to the Highways Liaison Committee) has proposed that an e-learning programme for assessors based on the information provided by the individual National Highway Sector Scheme Committees should be made available to third party assessors to enable them to have a fuller appreciation of the particular activities involved in highway construction and maintenance. The information contained in this appendix has been collated by the NHSS committee to provide CB assessors with the background information that is considered appropriate for carrying out an assessment against BS EN ISO 9001:2008 and these SSD. During the development of the Appendices it was realised that this information would also provide useful guidance for first and second party auditors of the system. It is hoped that it will be possible in the near future for access to the e-learning programme to be available to all assessors and auditors; information on this development will be made available through revision issues of the relevant NHSS document posted on the UKAS web-site.

### **Section 2 - Requirements**

Note 1: This section of the guidance is divided in three parts namely 2A, 2B & 2C.

#### **2A General background to the Land Drilling in Geothermal Drilling Sector Scheme.**

- i) The reasons for development of the Sector Schemes and this scheme in particular, and for CB assessors, examples of where its absence has caused concern/problems.

This is normally contained in the introduction to the scheme, in this instance the scheme SSD 29A was initially developed by SSAC-LD-GD, see page 6.

- ii) To whom the scheme applies. See Scope on page 11 of this document.

- iii) Contact details of those that can offer scheme specific assistance can be obtained from the Secretary of SSAC-LD-GD.

- iv) Land Drilling in Geothermal Drilling is a specialist activity and forms a major part of ground source heat pump system installation. Ground Source Heat Pumps (GSHPs) are electrically powered machines, installed in a building, which extract low-grade heat contained within the ground and convert this heat (through refrigerator technology) to usable heat for space heating / hot water. The same technology may be used to cool buildings in which case heat is rejected into the ground.

The low-grade heat within the ground (soil, rock, and groundwater) or surface water features (ponds, lakes etc.) is mainly derived from the earth's surface being constantly warmed by solar radiation to depths of approximately 200 metres. Depending on location and depth it may also be increased by the earth's natural heat arising from its inner core. Across the UK, the temperature of the ground to 200 metres depth is in the range 9° – 15° centigrade.

The low-grade heat is accessed by means of a Ground Heat Exchanger (GHE), either closed loop or open loop. A closed loop system is circulation of a thermal transfer fluid

through pipes installed in the ground (or surface water features) to the GSHP and back to the underground pipe system to pick up more heat. Closed loop systems are either installed in shallow horizontal trenches (where land surface space permits) or in boreholes / intrusive insertion to depth. An open loop system (which is less common) is extraction of groundwater (essentially a waterwell) to a GSHP and return of this groundwater to the ground via a discharge well, watercourse, water feature etc.

Geothermal drilling is carried out using specialist drilling plant and equipment to depths of up to 400 metres.

v) Contracts for Land Drilling in Geothermal Drilling may be awarded by both public and private clients, either directly or as a sub contract. Range of clients can include Local Authorities, Public Bodies, Major Contractors, Developers, M & E Contractors, Housing Associations, Ground Source Heat Pump Installers, Domestic Clients etc. A range of contracts are used including JCT, NCE, ICE (CofC), etc. Where a client uses its own form of contract/specification then it must conform to contract legislation and be in alignment with geothermal drilling best practice/specifications.

vi) Land Drilling in Geothermal Drilling uses a variety of drilling and sampling methods according to nature of the ground and environment to be investigated e.g. soil, rock, contaminated ground, etc.

v) Definitions and terminology which are particular to the scheme. (See section 3 of the SSD.)

vi) Land Drilling in Geothermal Drilling employs a range of individual competencies see Appendix C. Assessors should also be aware of training and competency assessment requirements available from bodies such as Construction Skills who should be able to assist.

vii) Reference documentation applicable to the sector scheme are listed in Section 2 and Appendix B of this SSD.

(viii) Knowledge of relevant European and British Standards together with particular knowledge of industry guidance documents is particularly important for Land Drilling in Geothermal Drilling. See Section 2 and Appendix B of this SSD. Assessors should be fully familiar with these standards.

(ix) There are several Land Drilling disciplines. Other sector schemes will be developed for other disciplines i.e. Ground Improvement, Ground Investigation, etc.

**2B Summary of how the scheme interprets section 4 to 8 of BS EN ISO 9001:2008 with commentary.**

There is a need to provide commentary on those Clauses of BS EN ISO 9001 in Sections 4 to 8 where interpretation has been provided in this document, namely for clauses 4.1; 4.2.1; 4.2.3; 4.2.4; 5.1; 5.2; 5.3; 5.6.1; 6.2.1; 6.2.2; 7.1; 7.2.2; 7.2.3; 7.3; 7.4; 7.5.1; 7.5.2; 7.5.3; 7.5.4; 7.5.5; 7.6; 8.2.2; 8.2.3; 8.3; 8.5.1.

4. Quality Management System	Interpretation Y/N	Comment
4.1	Y	Check annually by the CB Auditors and other Auditors. Check Schedule of Suppliers website to ensure registration

		is current.
4.2		
4.2.1	Y	Check Quality Plan is in place and complies with 7.1. If necessary obtain a copy of the plan as evidence.
4.2.2	Y	Seek evidence
4.2.3	Y	Ensure that all required specific documents are in place. Seek evidence.
4.2.4	Y	Ensure that all required contract/project specific documents are in place. Seek evidence.
5. Management Responsibility		
5.1	Y	Check policy document
5.2	Y	Ensure customer feedback documents are in place on completion of the contract.
5.3	Y	Ensure objectives are covered in quality plan and/or policies
5.4		
5.4.1	N	
5.4.2	N	
5.5		
5.5.1	Y	Ensure there is an organization plan which covers responsibility/authority in accordance with the requirements of the SSD. Seek evidence. Ensure that personnel with contract specific responsibilities and authorities have been identified and are recorded. Seek evidence.
5.5.2	N	Ensure that the organization management have appointed a member with the appropriate responsibility and authorities. Seek evidence.
5.5.3	N	Check internal communication processes have been established.
5.6		
5.6.1	Y	Review copy of annual (or six monthly) management review. Ensure this contains reference to the relevant sector scheme.
5.6.2	N	
5.6.3	N	Seek evidence that the output and actions are considered by top management at regular intervals
6. Resource Management		
6.1	N	Ensure contract/tender review is in place
6.2		
6.2.1	Y	Review copies of training certificates, CSCS skill cards, NVQ Qualifications, BDA Audit Cards (or equivalent) and forward looking training plans. Ensure that these are in accordance with the requirements of the sector scheme documents.

6.2.2	Y	See Appendices C, and D
6.3	Y	Ensure that all required specific documents are in place. Seek evidence.
6.4	N	In process audit. Checks to include environmental condition records, plant maintenance sheets, access equipment certification and induction records.
7. Planning and Product Realisation		
7.1	Y	See Appendix A, Seek evidence.
7.2		
7.2.1	N	Ensure that the organization has determined all necessary specified statutory and regulatory requirements for contract compliance e.g. Health & Safety, etc. This may include supplementary services such as waste collection and disposal, recycling, equipment inspection, licensing driving requirements, environments issues, etc.
7.2.2	Y	Ensure contract tender review is in place with an appropriate timescale and assessment of availability of resources.
7.2.3	Y	Check effectiveness of communication arrangements.
7.3	Y	Ensure contract/tender review is in place.
7.3.1		
7.3.2		
7.3.3		
7.3.4		
7.3.5		
7.3.6		
7.3.7		
7.4		
7.4.1	Y	Ensure or seek evidence that records are in place.
7.4.2	Y	Seek evidence that purchasing requests are adequate.
7.4.3	Y	Seek evidence that documents are in place.
7.5		
7.5.1	Y	Check as part of in process audit
7.5.2	Y	Seek evidence
7.5.3	Y	Cover during procedure review and seek evidence that records are in place.
7.5.4	Y	Seek evidence that records are in place.
7.5.5	Y	Cover during procedure review.
7.6	Y	See Appendix E
8. Measurement, Analysis and Improvement		
8.1	N	Review copy of annual management

		review. Ensure this contains continuous improvements to the relevant sector scheme.
8.2		
8.2.1	N	Seek evidence, that organization is meeting customer requirements.
8.2.2	Y	Check internal audits are being carried out.
8.2.3	Y	Check processes are achieving planned results
8.2.4	Y	Check that monitoring and measuring process documentation has been implemented in line with the current contract specification. Seek evidence.
8.3	Y	Ensure processes are in place and have been implemented in line with contract specification.
8.4	N	Check analysis of data has provided information to demonstrate effectiveness of QMS and evaluation of continued improvement.
8.5		
8.5.1	Y	Check effectiveness of continual improvement.
8.5.2	N	Seek evidence that documented procedures are in place and operational.
8.5.3	N	Seek evidence that documented procedures are in place and operational.

2C – Overview of this LD-GD-SAS in terms of industry requirements and working practices.

In addition to an assessor/auditor having a general appreciation of the requirements and processes required by BS EN ISO 9001:2008, a CB assessor or internal auditor should be aware of the following when completing an audit:-

- C1 - Safe Working Practices
- C2 - Training, Qualifications and Assessment of Competence of Individuals
- C3 - Maintain Plant and Equipment
- C4 - Public Protection
- C5 - Environment
- C6 - Testing/Inspection/Workmanship
- C7 - Health and Safety
- C8 – Specific Application / Category / Sub Category Requirements

C1 – Safe Working Practices

- (ii) Correct Personal Protective Equipment worn and available according to Green, Yellow and Red Site Classification (refer to BDA document Guidance for 'Safe Intrusive Activities on Contaminated or Potentially Contaminated Land' (2008)).
- (iii) Rigs and equipment conform to all Standards (BS/ISO) particularly BS 791, BS 879, ISO 3551-1, ISO 3352-1, ISO 10097-1, BS EN ISO 22475-1, etc. and conforms to legal regulations e. g. PUWER and LOLER.

- (iv) Technicians/operatives to be fully aware of their H&S obligations.
- (v) Must be able to read and understand their job sheet, etc and understand English (written and spoken).
- (vi) Method Statements/work procedures.
- (vii) Risk Assessment.
- (viii) CSCS, BDA Audit and CPCS cards (see appendix K2).
- (ix) Drivers are qualified relevant to the transport.
- (x) Site visit to establish that industry safe working practices are in operation according to BDA Health & Safety Manual.
- (xi) Awareness of relevant H&S requirements as applicable to Land Drilling e.g. PUWER, LOLER, Working at Height, COSHH, Coal Authority requirements etc.
- (xii) Aware of current best practice for instance traffic management measures, welfare facilities requirement, noise at work, etc including site arrangements.

#### C2 - Training, Qualifications and Assessment of Competence of Individuals

- (i) Have appropriate training certificates
- (ii) Have been assessed as competent within their scope of works and hold the relevant skill cards e.g. scheme specific assessment/N/SVQ Land Drilling, CPCS, BDA Audit.
- (iii) Been inducted on specific equipment (by employer) or if under training is supervised by a qualified person.
- (iv) Aware of and understand the relevant requirements of this LD-GD-SAS.
- (v) Aware of and understand the provisions for implementation of training in SSD 29A.
- (vi) Been inducted on site specific H&S issues. (Daily if necessary).

#### C3 - Maintain Plant and Equipment

- (i) Organization is aware of and complying with LOLER and PUWER requirements.
- (ii) Maintenance checklists are available and have been completed on a daily basis

#### C4 - Public Protection

- (i) Operative/supervisor is aware of need to protect public during Land Drilling operations
- (ii) Operative/supervisor has been trained to carry out a visual site risk assessment to ensure that the public will not be put at risk during Land Drilling operations.

- (iii) Operatives/supervisors have identification e. g. CSCS, CPCS, BDA Audit cards.
- (iv) The Organization(company) has a complaints procedure in place

*(Note: Public in this instance includes personnel employed by the customer/client)*

#### C5 - Environment

- (i) Auditors should be sufficiently competent to make specific observations on the effectiveness of the Organization's provisions in respect of the environment and in particular management of waste and its reduction.
- (ii) Organizations should have policies for protection of water courses, ground pollution, oil spillages/leaks/dips, dust suppression, noise levels, etc.
- (iii) Organizations should have policy to reinstate access routes and working area to a required mutually agreed (level) and best industry practice.

#### C6 - Inspection/ Testing/Workmanship

- (i) Auditors should be aware of the importance of conformance to GSHPA Standards and EA Good Practice Guide.
- (ii) All rigs shall have LOLER inspection certificates that are current and valid.
- (iii) All lifting accessories shall have LOLER inspection certificates that are current and valid.
- (iv) All Testing, Monitoring and Measuring devices shall be inspected and calibrated according to Appendix E and this shall be recorded.

#### C7 - Health and Safety

- (i) Auditors should be aware of the Health and Safety at Work etc Act 1974 and associated Health and Safety Legislation, such as CDM, LOLER and PUWER regulations, as it applies to this Land Drilling sector scheme.
- (ii) Auditors should be aware of best industry safety guidance mainly contained within BDA published documents or others, see Appendix B.
- (iii) Organization should have a relevant site specific Health & Safety Plan. The auditor should check for quality and relevance.

#### C8 – Specific Land Drilling in Geothermal Drilling – Category / Sub-category Requirements

This section covers in detail the auditing for Land Drilling in Geothermal Drilling according to each category and sub category requested for certification. Part 1 is the initial assessment and lists the category and sub category and the information required by the auditor, Part 2 is surveillance audits and recertification (every three years) of certification.

### **PART 1 - INITIAL ASSESSMENT**

#### **Table of Category and Technical Sub Category**

The category and sub category covered under the land drilling in geothermal drilling national sector scheme are detailed below:

<b>CATEGORY</b>	<b>SUB CATEGORY</b>	<b>CODE</b>
CLOSED LOOP (Drilling & Installation)	Up to 100m depth	GD/CLS/DIB
CLOSED LOOP (Drilling & Installation)	Greater than 100m depth	GD/CLD/DIB
PRESSURE & FLOW TESTING	Closed Loop	GD/CL/PFT
THERMAL RESPONSE TESTING	Closed Loop	GD/CL/TRT
HEADWORKS INSTALLATION	Closed Loop	GD/CL/H
OPEN LOOP (Drilling & Installation)	Any Depth	GD/OL/DIB
ACIDISATION	Open Loop	GD/OL/AC
PUMPING TEST	Open Loop	GD/OL/PT
HEADWORKS INSTALLATION	Open Loop	GD/OL/H

### **Application of Certification Guidance**

The auditor will require to see visual evidence at the organizations premises and sites to support the request for certification of the organization to the individual category and sub category.

This evidence will be based around the documents and records (detailed below) on a number of projects which have been performed in the category and sub category applying for certification plus list and physical (visual) evidence of rigs and equipment used in performing the site work. The auditor will visit a minimum of one active site at which operations are being performed to the category and sub category being applied for certification.

The organization may apply for one or a number of category and sub category to be assessed for certification.

If the organization is successful in meeting the scheme requirements to the auditor's satisfaction, then auditor makes recommendation for certification. The actual certification decision and award of certification is made by a Decision Maker, who is independent of the audit process, following a review of the audit report.

### **Information Required by Auditor for Category / Sub Category Assessment**

Detailed below is the information (in bold) required for assessment and guidance (in italics) of this information that the auditor requires to inspect. All information will be treated in confidence between the auditor and organization.

#### **A. General (for all Category / Sub Category)**

##### **A1. Correspondence**

*A1. Evidence in a project file either hard copy and/or electronic that correspondence from and to the client exists in an organization form, from and to the client. Some examples of this detail is that daily drillers logs exist which are fully compliant with information required by standards and contract requirements and have been issued to client in required timescale.*

##### **A2. Enquiry/Tender and Quotation**

*A2. Evidence that an enquiry/tender has been received from the client and that a clear, relevant quotation has been returned with conditions (either from client at issue of enquiry and/or issued*

*by organization with quotation).*

**A3. Contract Documentation and/or Client Order**

*A3. Evidence of contract documentation and/or purchase order in the project file.*

**A4. Pre-Construction Information - Client drawings, service drawings, risk assessment, etc.**

*A4. Evidence that client drawing/borehole location plans, service drawings and risk assessment have been received and recorded. The risk assessment should identify the expected hazards, assess the hazards level and the measures required to reduce/eliminate risk.*

**A5. Quality Plan (including H&S and risk assessment by organization)**

*A5. A Quality Plan for the project which documents that the organization has taken account of the hazards and risks on the site. The plan shall include as a minimum the requirements of Appendix A together with method statements and operating procedures relevant to the Land Drilling activity of the project.*

**A6. Instruction to Operatives**

*A6. This is in addition to information above and is focused on the drilling instructions for the performance of the technical requirements of the Land Drilling operation i.e. Ground Heat Exchanger, etc.*

**A7. List and Physical Evidence of Rigs and Equipment**

*A7. List of rigs and equipment is required together with auditor checking site operations against this list.*

**A8. Calibration and Maintenance Records (including test equipment)**

*A8. The organization must maintain calibration and maintenance records for rigs, plant, drilling and testing equipment. These records shall be according to the manufacturers and/or industry regulatory requirements for the module/category being assessed. Examples of this are, Calibration certificates on pumps and gauges, LOLER certificates on lifting equipment, etc. Reference should be made to Appendix E for guidance on testing equipment.*

**A9. Daily Drilling Records (including Test Records)**

*A9. Copies on project file of daily drillers records which are fully compliant with requirements and standards/specification plus any test records performed. The information on the daily records should be the same quality, format and level of compliance according to the standards used in the industry, see Appendix B .Most important presently are EA, GSHPA, etc. guidance.*

**A10. Operatives Qualification and Training**

*A10. Evidence of competence is required for the organization personnel. This is should be in form of qualification where available e.g. NVQ Land Drilling Level 2 for drilling operatives and training records. See Section 6.2.2 for full details of requirements. For supervisory and technical personnel there shall be CV's which detail qualification, training and experience.*

**A11. Sales Invoice**

*A11. Evidence of sales invoices to show they align with the enquiry and daily activity records e.g. drilling, loop installation, backfilling, pressure testing, etc.*

### **A12. Visit around office and yard**

A12. Visual inspection of the organization premises shall include rigs, drilling equipment and other plant. The inspection shall include tidiness and compliance e.g. correct rig guarding; statutory notices particularly health & safety, etc.

### **A13. Visit to Operational Site**

A13. Visual inspection of the organization's operational activity to meet site personnel (employees, staff, operatives, etc) working on category/sub-category that is being assessed. This inspection shall observe tidiness, compliance and serviceability of rigs, plant, drilling and testing equipment. In addition the visit shall include checking and compliance with welfare regulations, safe working practice e.g. site specific induction records, health and safety plan on site and understood by site personnel, overhead/buried services identification/avoidance, correct PPE and support equipment.

### **A14 Customer Satisfaction Questionnaire Response**

A14. Evidence that they are being issued and responses recorded including rectification process if required.

## **B. Closed Loop (Drilling & Installation) – Up to 100m depth – GD/CLS/DIB**

### **B1. General Information**

B1. Information as outlined in section A above.

### **B2. Site Observations**

B2. These shall include but not be limited to;

- The rig, vehicles, equipment and working area is organised and compliant e.g. guarding, etc.
- Working area is clean and tidy and the flush produced by the drilling operation is controlled
- Loop and materials are stored in a manner to avoid potential damage to the loop or damage or spillage of backfill materials
- Existence of site specific Method Statement and Risk Assessment signed off by Lead Driller, Driller and supervising person from the Organization.
- Evidence that all materials are stored and handled in accordance with COSHH assessment
- Evidence of Ground Heat Exchanger plan with details of each drill hole (location, depth, spacing etc.)
- Evidence of drill hole plan according to end hole diameter specified
- Evidence of rig, equipment and technique selection e. g. overburden drilling system, which type of flush, drill bit choice, appropriate rods and casing, etc.
- Evidence of safety and environmental good practice
- Drillers Daily Log to include depths, descriptions, flush medium, casing depths, water strikes, loop installation, backfilling etc.

### **B3. Drilling Observations**

B3. These shall include but not be limited to;

- Drilling rig set up is safe
- Working area is protected and controlled in relation to other site activities and third party access
- PPE is in accordance with Method Statement and Risk Assessment
- Correct manual handling operations
- Correct operational drilling procedure
- Evidence of sufficient flushing capacity to maintain up hole velocity requirements
- Evidence of correct mixing of muds/polymer if used

- Evidence of correct adjustment/control of fluid volume and pressure during drilling
- Evidence of correct control of flush returns e.g. run off, storage and recirculation
- Evidence that drill hole has been drilled to planned depth
- Evidence that completed drill hole has been sufficiently flushed clean

#### **B4. Loop Installation Observations**

*B4. These shall include but not be limited to;*

- Evidence that loop pipe is to specification and that Lead Driller has fully inspected it for any sign of damage either prior to insertion or during insertion (Specification shall include minimum of PE100+ pipe, fusion welded U-bend and metre marks)
- Evidence that the loop pipe is installed in accordance with GSHPA Vertical Borehole Standards (see Appendix B) e.g. loop installer reeler, wellhead roller, loop weights etc.
- Evidence that loop pipe is installed to specified depth and gently clamped prior to backfilling
- Evidence that loop ends are fitted with secure caps immediately after loop pipe installation

#### **B5. Backfilling Observations**

*B5 These shall include but not be limited to;*

- Evidence that grout material is to specification in accordance with GSHPA Vertical Borehole Standards
- Evidence that grout material is thoroughly mixed prior to any grout pumping operation
- Evidence of correct use of a tremie pipe for grout insertion from bottom to top of drill hole
- If backfilling with granular material, evidence of use of a tremie pipe to the base of the target zone and gradual removal as backfilling proceeds

#### **B6. Completion Report**

*B6 These shall include but not be limited to;*

- Items in Scheme definition
- Job Reference
- Date/Day
- Crew
- Rig type
- Strata encountered and depths to changes of strata
- Diameter of borehole
- Type and size of bit
- Diameter and length of casing
- Time take to complete various drilling stages
- Water ingress
- Reference number of loop installed
- Depth of loop installed
- Grout mix
- Depth of grout
- Type and depth of other backfill
- Delays and break downs

### **C. Closed Loop (Drilling & Installation) – Greater than 100m depth – GD/CLD/DIB**

#### **C1. General Information**

*C1. Information as outlined in section A above.*

- Greater than 100m requires rigs, plant, equipment and skill to overcome the difficulties of operating at significant depths e. g. power/capability of rigs and plant, skill level of operatives, etc.

#### **C2. Site Observations**

C2. As B2 but also including;

- Evidence that Lead Driller has previously performed drilling to greater than 100 metres e.g. CV, testimonials etc.
- Evidence that drill rig is of sufficient capacity to drill in excess of 100 metres at finished hole diameter of at least 150mm e.g. sufficient torque and hoisting capacity
- Evidence that flush pump is of sufficient capacity to drill in excess of 100 metres at finished hole diameter of at least 150mm
- Evidence that there is equipment in place to handle large reels of pipe
- Evidence that there is a method in place for handling and installing the loops
- Loop diameter to be appropriate to the depth of the installation

### **C3. Drilling Observations**

C3. As B3 but also including;

- Correct casing installation

### **C4. Loop Installation Observations**

C4. As B4 but also including;

- Method of checking the pressure in the loop to ensure the loop is not being crushed by the grouting operation

### **C5. Backfilling Observations**

C5. As B5;

### **C6. Completion Report Observations**

C6 As B6 but also including;

- Items in definition

## **D. Pressure & Flow Testing (Closed Loop) – GD/CL/PFT**

### **D1. General Information**

D1. Information as outlined in section A above.

- Evidence that an appropriately qualified or experienced tester is employed and in charge of the testing / report writing

### **D2. Site Observations**

D2. These shall include but not be limited to:

- Evidence that the borehole and closed loop to be tested has been drilled and installed by a company that is certified under the National Sector Scheme 29A Land Drilling in Geothermal Drilling in the specific mode of Closed Loop
- Evidence that the testing equipment (comprising a flushing pump system, pressure and flow monitors) is compliant with GSHPA Closed-loop Vertical Borehole, Design, Installation and Material Standards)
- Evidence that the testing equipment (comprising a flushing pump system, pressure and flow monitors)) is calibrated and maintained in accordance with Appendix E testing equipment
- Evidence of a record of the borehole and closed loop installation
- Evidence that the test procedure is in accordance with BS EN 805 and WRc guide (as required by GSHPA Closed-loop Vertical Borehole, Design, Installation and Material Standards)
- Evidence that the closed loop and all piping has been flushed clean of all debris
- Leak proof connection of pipes from testing equipment to closed loop pipes
- Evidence that the closed loop and all piping has been flushed clean of all debris
- Correct filling of the closed loops, connecting pipes and testing equipment with potable water

- Careful de-aeration of the above prior to the test commencing
- Evidence that the test procedure is in accordance with BS EN 805 and WRc guide (and as required by GSHPA Closed-loop Vertical Borehole, Design, Installation and Material Standards)
- Evidence that the test pressure has been determined based upon the density of the grout backfill and the depth of the installed loop
- Detailed recording of
  - Borehole construction
  - Installation of loop
  - Headworks
  - Etc.
- Demonstration of flow testing in both directions prior to pressure testing
- Pressure dial to be fitted on outflow end of the loop to ensure recording of correct pressure, pressure is not to be recorded by a dial on the hand pump or pressure gauge on inflow end of the loop
- Observe flow and pressure testing and recording of the test procedure
- Observe third party sign off of the pressure testing.

### **D3. Field Report Observation**

*(Note: The report is compiled during the site phase. A copy of the report shall be examined)*

*D3. The report shall include but not be limited to;*

- record of the installation of the closed loop
- annular space filling record
- checking record
- record of measured values and test results

### **D4. Completion Report Observation**

*(Note: The report is compiled after evaluation of the results obtained during the site phase. A copy of the report shall be examined)*

*D4. The report shall include but not be limited to;*

- the field report (in original and/or computerised form)
- test evaluation (including)
- a numerical presentation of the results of the pressure and flow test
- a graphical presentation of the results combined with a plot
- name and signature of the responsible expert

## **E. Thermal Response Testing (Closed Loop) – GD/CL/TRT**

### **E1. General Information**

*E1. Information as outlined in section A above plus:*

- Evidence that an appropriately qualified or experienced “thermogeologist” is employed and in charge of the testing / report writing

### **E2. Site Observations**

*E2. These shall include but not be limited to;*

- Evidence that the borehole and closed loop to be tested has been drilled and installed by a company that is certified under the National Sector Scheme 29A Land Drilling in Geothermal Drilling in the specific mode of Closed Loop
- Evidence that the testing equipment (comprising a heating device, adjustable circulating pump and data recording device) is compliant with CEN/TC 341 Geotechnical investigation and testing – Determination of thermal conductivity of soil and rock using a borehole heat exchanger or similar manual
- Evidence that the testing equipment (comprising a heating device, adjustable circulating

*pump and data recording device) is calibrated and maintained in accordance with Appendix E testing equipment*

- *Evidence of a record of the borehole and borehole heat exchanger installation*
- *Evidence that the borehole heat exchanger has been flow and pressure tested in accordance with the requirements for the thermal response test*
- *Evidence that borehole has been flushed and filled with clean water.*
- *Leak proof connection of pipes from testing equipment to borehole heat exchanger pipes*
- *Insulation of pipes from testing equipment to the borehole closed loop installation*
- *Correct filling of the borehole heat exchanger, connecting pipes and testing equipment.*
- *Careful de-aeration of the above prior to the test commencing*
- *Correct test procedure for the duration of the test in accordance with CEN/TC341 Geotechnical investigation and testing – Determination of thermal conductivity of soil and rock using a borehole heat exchanger or similar manual.*
- *Detailed recording of*
  - *the inflow temperature at the top of the borehole heat exchanger over time;*
  - *the outlet temperature at the top of the borehole heat exchanger over time;*
  - *the thermal output over the test duration;*
  - *the power supply;*
  - *the flow rate;*
  - *the ambient conditions*

### **E3. Field Report Observation**

*(Note: The report is compiled during the site phase. A copy of the report shall be examined)*

*E3. The report shall include but not be limited to;*

- *summary log according to EN ISO 22475-1*
- *drilling record according to EN ISO 22475-1*
- *sampling record according to EN ISO 22475-1*
- *record of identification and description of soil and rock according to EN ISO 22475-1*
- *record of the installation of the closed loop*
- *annular space filling record*
- *checking record*
- *record of measured values and test results*
- *record of test parameters and test history*
- *record of data file name(s) and location*

### **E4. Completion Report Observation**

*(Note: The report is compiled after evaluation of the results obtained during the site phase. A copy of the report shall be examined)*

*E4. The report shall include but not be limited to;*

- *the field report (in original and/or computerised form)*
- *test evaluation (including the ground equilibrium temperature, effective thermal conductivity and thermal borehole resistance , evaluation method)*
- *a numerical presentation of the results of the geothermal response test*
- *a graphical presentation of the measured data and any interpreted temperature responses*
- *borehole log*
- *temperature depth profile – where measured*
- *name and signature of the responsible expert*

## **F. Headworks Installation (Closed Loop) – GD/CL/H**

### **F1. General Information**

*F1. Information as outlined in section A above.*

- *Wherever appropriate in what follows below, reference should be made to the relevant sections of the UK GSHPA Closed-loop Vertical Borehole Design, Installation and Materials Standards. All references to headworks in the Standard are also of relevance to the headworks of horizontal / trenched closed loop GSHP installations*

### **F2. Site Observation**

*The headworks for a closed loop borehole system include all pipework and connections from the top of the boreholes to the location of the heat pump(s) – or at least entry to the plant room.*

*Required competencies of operatives will vary significantly between those required for the installation and testing of a small (say one to three boreholes) domestic system and a large non-domestic systems ranging up to several hundred boreholes.*

*F2. These shall include but not be limited to;*

- *Evidence that installers of sub-surface headwork pipework are fully trained and certified for the jointing technology being employed. In the case of fusion welding – e.g. butt or socket fusion, and/or electro-fusion, the operatives must show evidence of having been trained to standards equivalent to those required for gas work installation.*
- *Evidence that installers and their managers/supervisors engaged in the connection of trench based pipework are aware of the risks of trench working and hold appropriate CSCS cards.*
- *Evidence that operators /supervisors are aware of the environmental conditions under which pipe welding should not be undertaken. Provision of suitable protection for inclement conditions – e.g. tentage/weather-proof enclosure.*
- *Evidence of installation specification/drawing that the headworks are being installed against.*
- *Installers should fully understand the functional difference between manifolded arrangements and reverse return arrangements.*
- *Evidence that electrofusion or other pipe welding equipment has been calibrated and has a current calibration certificate.*
- *Installers to be aware of site safety requirements related to the operation of electrical welding equipment, and associated generators and cabling.*
- *Evidence that operatives understand the specifications for the pipework to be used on a job i.e. type of pipe, diameter, SDR and pressure rating.*
- *Evidence that due care and attention is paid to cleanliness of pipework, pipe scraping requirements, clamping and pipe marking requirements, welding requirements and times and cooling times.*
- *Evidence that care is taken during installation of header pipework to prevent ingress of dirt, stones, and any other contamination.*
- *On larger installations there may be contractual requirements to provide records of every subsurface connection. These may include;*
  - *Date /time*
  - *Joint identification, location, type*
  - *Welding record generated by welding equipment*
  - *Heating time, cooling time.*
  - *Operator/ welder.*
- *Evidence of consistent physical separation of flow and return pipework in header trenches.*
- *Evidence that due care and attention is paid to the careful bedding, and backfilling of header pipework. Marking of pipework with warning/location tape.*
- *Evidence that care has been taken to ensure that air locking cannot occur. Pipework to generally rise towards plant room and/or manifolds. Installation of air bleed points at high points in the system where required.*

- Pipework in trenches to be laid below local frost line depth. Pipework rising to surface externally to be suitably insulated from below ground level to building entry point.

#### **Pressure testing.**

- Depending on the size of the system, pressure testing can be undertaken in totality or in sub sections as work progresses. For systems of all sizes a final pressure test is required. Evidence that these pressure tests have been carried out to EN EN805 as described in the GSHPA Standards for Vertical Boreholes Section 10.4. Test data to be recorded. Test to be witnessed as required by the contract. Backfilling of header trenches only when sub-sections or the whole systems have been successfully pressure tested.
- Evidence of calibration of pressure testing equipment.

#### **Flushing and purging.**

- Evidence of completion of the header pipework installation and that the entire ground loop system has been flushed and purged. The level of competency and equipment required will vary between that required for simple domestic systems, and that for complex, large non-domestic installations.
- Evidence that suitable flush and purge carts, and or equivalent for larger systems conform to the following. These need to be capable of achieving suitable flush speeds in all of the header pipework (ie > 0.6 m/s). Provision for adding circulation water, reversing flow, and for collection / filtering of any debris. System to be progressively flushed and purged until the entire system is full of clean water only, with all air removed. Heat pump to be isolated from this exercise by suitable valves, until clean water achieved in the entire system.
- System to be left pressurised at nominal pressure of 1 to 2 bar.
- Evidence that if the system has been left for any length of time prior to connection to the heat pumps and final commissioning that a suitable quantity of biocide has been introduced and mixed into the system to prevent biological growth. Details of biocide and concentration to be left onsite.
- A thermal transfer fluid is generally specified for GSHP systems delivering heating. This can be introduced to the system at the time of final heat pump /system commissioning.
- If the ground loop array is to be left over winter periods without being commissioned, the thermal transfer fluid should be introduced to the system to prevent freezing of water in manifolds and/or other shallow headwork pipe.

#### **Insulation.**

- Evidence that all above ground side pipework has been insulated with closed cell (chilled water) insulation. Conventional heating style insulation not acceptable.

#### **Expansion systems.**

- Evidence that the following has been complied with;
- Depending on the type of grout employed, it is possible to avoid the use of expansion systems on small systems. The ground loop pipework is capable of accommodating the expansion.
- For all other systems a suitably sized expansion vessel must be connected to the ground loop array.
- Consideration should be given to fitting a safety blow off valve to prevent any future over-pressurisation of the ground loops that could lead to ground loop failure.

#### **Filling systems.**

- Evidence that provision has been made for topping up the ground loop system. These can be simple valved off connection points with local access to a water supply. Automatic loop filling systems must not be left permanently connected to a ground loop array. Automatic air vent systems/de-aerators can be used, but a facility for locking them off from the ground loop array, after a suitable commissioning period, should be provided.

#### **Pressure gauge(s).**

- It is recommended that an easily accessible pressure gauge is always fitted to the ground loop array to provide indication of the integrity of the system.

### **F3. Completion Report Observation**

F3. The report shall include but not be limited to;

- *Location, position and depth of all installed headworks*
- *Plan of installed headworks including co-ordinates reference.*
- *Certificates for all joints made*
- *All pressure and flow tests that have been performed*
- *Details of any thermal transfer fluid left in headworks after completion.*
- *Signature of all personnel involved e .g. ground loop fabricator, contract manager, etc.*
- *Signature of clients representative to confirm that headwork are contractually accepted*

## **G. Open Loop (Drilling & Installation) any depth – GD/OP/DIB**

### **G1. General Information**

*G1. Information as outlined in section A above plus:*

- *Evidence that Groundwater Investigation Consent has been obtained from the Environment Agency prior to the commencement of any drilling*
- *Evidence that all special precautions and licensing conditions have been taking into account in the planning of the drilling programme (e.g. prevention of aquifer contamination, cleaning and disinfection of equipment, location of monitoring wells etc)*
- *Geophysical Logging excluded from scope as performed by specialist organization.*

### **G2. Site Observations**

*G2. These shall include but not be limited to;*

- *Evidence that Lead Driller has previous experience of waterwell drilling e.g. NVQ Land Drilling – waterwell endorsement; BDA Audit card with waterwell endorsement; CV; testimonials etc.*
- *The rig, vehicles, equipment and working area is organised and compliant e.g. guarding, etc.*
- *Evidence of site plan with details of each drill hole (location, depth, borehole design, etc.)*
- *Evidence of the sites service plan showing all in-ground structures and services*
- *Evidence of drill hole plan according to end hole diameter specified*
- *Evidence of rig, equipment and technique selection e. g. overburden drilling system, which type of flush, drill bit choice, appropriate rods and casing, etc*
- *Evidence of safety and environmental good practice*
- *Drillers Daily Log to include depths, descriptions, flush medium, casing depths, water strikes, pump tests, screen placement, filter pack placement etc.*

### **G3. Drilling Observations**

*G3. These shall include but not be limited to:*

- *Correct operational drilling procedure*
- *Evidence of sufficient flushing capacity to maintain up hole velocity requirements*
- *Evidence of correct mixing of muds /polymer if used*
- *Evidence of correct adjustment/control of fluid volume and pressure during drilling*
- *Evidence of correct control of flush returns e.g. run off, storage and recirculation*
- *Evidence of correct installation of casings*
- *Evidence that drill hole has been drilled to planned depth*
- *Evidence that completed drill hole has been sufficiently flushed clean*

### **G4. Abstraction Well Installation Observations**

*G4. These shall include but not be limited to:*

- *Evidence that the screen (material, slot size and density) meets required design has*

*been completed to take into account the specific conditions expected at the site (e.g. host formation, grain size, hydrochemistry, etc.)*

- *Evidence of the gravel pack installation (where required) has been completed to the required design and has been adequately developed to remove fines and settle the pack*
- *Evidence that a pump test has been completed as per section J below, to locate the depth of the permanent pump installation*
- *Evidence of material selection processes and weight calculations to correctly specify installed components (e.g. pump, riser, water level monitoring equipment etc.)*
- *Evidence that the well chamber has been designed to minimise the potential for the ingress of contamination from surface water run-off, ponding or man-made contamination*
- *Evidence that annular seal and grouting meets required design (required depth, grout consistency, grout volumes)*

#### **G5. Recharge Well Installation Observations**

*G5. These shall include but not be limited to:*

- *Evidence that the screen (material, slot size and density) meets required design has been completed to take into account the specific conditions expected at the site (e.g. host formation, grain size, hydrochemistry, etc.)*
- *Evidence of the gravel pack installation (where required) has been completed to the required design and has been adequately developed to remove fines and settle the pack*
- *Evidence that a recharge test has been completed to measure the rate of groundwater recharge and water levels under recharge conditions*
- *Evidence of material selection processes and weight calculations to correctly specify installed components (e.g. pump, riser, water level monitoring equipment etc.)*
- *Evidence that the well chamber has been designed to minimise the potential for the ingress of contamination from surface water run-off, ponding or man-made contamination*
- *Evidence that annular seal and grouting meets required design (required depth, grout consistency, grout volumes)*

#### **G6. Completion Report**

*G6 These shall include but not be limited to;*

- *Items in Scheme definition*
- *Job Reference*
- *Date/Day*
- *Crew*
- *Rig type*
- *Daily Drillers log*
- *Strata encountered and depths to changes of strata*
- *Diameter of borehole*
- *Type and size of bit*
- *Diameter and length of casing*
- *Time take to complete various drilling stages*
- *Water ingress*
- *Details of screen and gravel pack*
- *Details of annular seal and grout installation*
- *Type and depth of other backfill*
- *Details of pump tests completed*
- *Delays and break downs*
- *Signature of all personnel involved e .g. lead driller, contract manager, etc.*
- *Signature of clients representative to confirm that open loop is contractually accepted*

## **H. Acidisation (Open Loop) – GD/OL/AC**

### **H1. General Information**

*H1. Information as outlined in section A above.*

- *There are significant health and safety issues relating to the acidisation of boreholes, for this reason this type of work should only be undertaken by a competent contractor using trained staff.*
- *Evidence that hazardous materials are transported, stored and handled in line with method statement*
- *Evidence that adequate risk assessment and method statement has been prepared for acidisation*

### **H2. Site Observations**

*H2. These shall include but not be limited to;*

- *That the works have been fully planned and the hazards and risks identified.*
- *That an exclusion zone, consisting of a physical barrier, is set up and maintained around the works.*
- *That the exclusion zone is policed and no unauthorised personnel are allowed within the working area.*
- *Those chemicals to neutralise any spillage are present before any acids are delivered to site.*
- *That a suitable water supply is present on site before any acids are delivered or used. This may be required to wash down any spillage.*
- *That signage is placed warning of the presence of chemicals as well as the works being undertaken.*
- *That acid storage vessels, typically Intermediate Bulk Containers (IBCs), are stored on drip trays of sufficient capacity.*
- *That the correct PPE is being worn by all personnel within the exclusion zone. This will include, chemical resistant boots, chemical resistant overalls (chemical suit) including hood, chemical resistant gloves, full face mask and respirator with filter for acid gases.*
- *That an emergency drench shower is provided for use by personnel, alternatively a manned wash down hose.*
- *That the well is sealed and monitoring equipment is installed to measure pressure within well.*
- *That facilities are in place to vent the well during the acidisation process should excessive pressures build up.*
- *That overflow tanks of sufficient capacity are provided, in the event of significant returns due to chemical reaction and pressure build up.*
- *That consideration has been given to the affects on nearby wells and the requirement to seal and monitor these.*
- *That suitable plans are in place to dispose of any acidic returns from the well.*

### **H3. Field Report Observation**

*H3. The report shall include but not be limited to;*

- *A record of the type of acid used, and its concentration*
- *The amount of acid placed in the well*
- *The depth(s) of acid placement*
- *The pressure recorded in the well*
- *Records of the pressure dissipation with time*
- *Whether the well was vented to relieve pressure at any stage*

## **J. Pumping Test (Open Loop) – GD/OL/PT**

### **J1. General Information**

*J1. Information as outlined in section A above.*

- *Evidence that Groundwater Investigation Consent has been obtained from the Environment Agency prior to the commencement of any drilling. The consent will usually stipulate the precise requirements of any pump tests*
- *Evidence that all special precautions and licensing conditions have been taken into account in the planning of the Pump Tests (.e.g. prevention of aquifer contamination, cleaning and disinfection of equipment, location of monitoring wells etc.)*
- *Evidence that consents for prolonged use of generators, on site lighting equipment etc. has been obtained from interested stakeholders (e.g. site operators, neighbours, etc.)*
- *Evidence that consent to discharge has been obtained from the Environment Agency, Local water and sewerage undertaker or landowner as appropriate*
- *Evidence that access arrangements have been agreed with relevant parties to access all monitoring locations for the duration of the tests and subsequent recovery periods*

**J2. Site Observations**

*J2. These shall include but not be limited to;*

- *Evidence that the contractor has sufficient experience in the design, implementation and management of groundwater pumping tests and is aware of any specific precautions required at each site (e.g. flooding, subsidence, damage to property etc)*
- *Evidence of agreed control limits for key parameters beyond which a test may be terminated to prevent adverse impacts*
- *Evidence that the equipment specified is fit for purpose and has been adequately maintained or serviced prior to installation*
- *Evidence that the pump is adequately sized for the expected flow rates and that the test can be operated at varying rates of flow (variable speed pump or valve to throttle flow) as required by the test specification*
- *Evidence that the pump can be operated at varying rates of flow as required by the test specification*
- *Evidence that all equipment introduced into the well has been adequately cleaned and/or sterilised to prevent contamination of the aquifer, if required by specification.*
- *That all measurement equipment has been calibrated prior to installation*
- *Evidence that all equipment used in the test has been adequately checked and operational prior to installation. New batteries may be required on automatic data loggers and sensors*
- *There should be a record of key parameters prior to commencement of the test procedure. As a minimum these will include: Resting water level (RWL) at the pumping well, Well construction details (total depth, diameter, location of screened sections etc), Resting Water Levels in all designated monitoring wells. Additional parameters (for example: electrical conductivity, pH and temperature) should also be recorded where specified in the test specification, Ideally all Resting Water Levels should be monitored for a minimum of 24 hours prior to commencement of the test procedure. Where non-vented transducers are deployed there will be an additional requirement to monitor atmospheric pressure to correct data at a later time*
- *During testing parameters (such as water levels, electrical conductivity, pH, temperature, flow rate) will be logged at prescribed intervals using automatic data loggers. In addition, manual checks should be made at periodic intervals during the test to check the calibration of any installed or automatic equipment.*
- *Evidence of accurate record keeping and operational logs throughout the test procedure*
- *Evidence that the test is conducted in accordance with BS ISO 14686*

**J3. Field Report Observations**

*J3. The report shall include but not be limited to;*

- *Rest water level prior to pumping*
- *Water level in the pumped well, and observation wells if present, at the frequencies specified in BS ISO 14686*

- *Abstraction flow measurements at the frequencies specified in BS ISO 14686*

#### **J4. Post Test Reporting**

*J4. The reporting shall include but not be limited to;*

- *Completion and submission of Environment Agency form WR39 if abstraction licence applicable.*

### **K. Headworks Installation (Open Loop) – GD/OL/H**

#### **K1. General Information**

*K1. Information as outlined in section A above.*

#### **K2. Site Observations**

*K2. As per K2 above with the addition of:*

- Evidence that the headworks have been designed and sized for the expected flow rates.
- Evidence that the headworks takes into account the weight of the pump, riser, water column etc. suspended from it.
- Evidence that any lifting eyes, or similar, are suitably sized to take into account the weight of headworks, pump, riser, water column etc.
- Evidence that the maintenance requirements have been taken into account in headworks design.
- Where the borehole is installed below ground, the design should provide evidence of adequate drainage and the prevention of well contamination by the accumulation of water within the borehole chamber.
- Where an electric submersible pump, or other such electrical equipment is to be installed, there should be evidence of the installation of a suitable ground earth loop and an installation certificate provided by a competent electrician.
- Evidence that the well chamber design and construction follows best practice guidance as provided by the Environment Agency, SEPA and GSNI.

<sup>1</sup>Water Supply Borehole Construction and Headworks - Guide to Good Practice. Environment Agency, Nov 2000.

<sup>2</sup>Water supply borehole location, construction and Headworks: Guide to good practice. SEPA.

<sup>3</sup>Groundwater Regulatory Guidance: Ground source (borehole) geothermal heating and cooling systems. Note 002, Northern Ireland Environment Agency. 2009.

#### **K3. Completion Report Observation**

*K3. The report shall include but not be limited to;*

- *Location, position and depth of all installed headworks*
- *Plan of installed headworks including co-ordinates reference.*
- *Certificates for all joints made*
- *Signature of all personnel involved e .g. ground loop fabricator, contract manager, etc.*
- *Signature of clients representative to confirm that headwork are contractually accepted*

## **PART 2 – SURVEILLANCE AUDITS OR RECERTIFICATION**

Note – The surveillance audits process shall be conducted annually and recertification audit once over the period of certification (typically every three years)

### **(i) Surveillance Audits or Recertification**

*NOTE: This review will comprise of any changes to organization (see sections 4 to 8) of the company and financial details, insurance renewals, safety changes, quality and management systems, training and environmental.*

The surveillance audits or recertification will include but not be limited to;

- Annual renewal of time expired evidence e.g. Insurance, LOLER Certificates, CSCS Cards, BDA Audit, Emergency First Aid at Work Certificates, all vehicle certification (MOT, road tax, etc.), Calibration Test Certificates ( LOLER on rigs, etc.), etc.
- Any changes to company policies covering safety, quality management systems, training and environmental
- Any change in company management or employment structure which has an effect on safety, quality management, training and environment

**(ii) Review of Category and Sub Category**

The surveillance audits or recertification will include but not be limited to;

- Office and yard visit to interview key personnel of the organization e.g. senior management (covering safety, project management, training, etc.)
- Office and yard visit to observe rigs, plant and equipment e.g. LOLER certificates, etc.
- Office and yard visit to review documentation on category and sub category on recent projects e.g. Client references, plant and equipment lists, etc.
- Site visit to visibly observe category and sub category matches requirements e. g. field operations are being maintained according to any changes in BS EN ISO standards and industry best practice, etc.

## **APPENDIX H: ORGANIZATION ACCEPTANCE AND GUIDANCE FOR NEW ENTRANTS**

### **1. Organization Acceptance**

1.1 For work carried out for EON, DECC, GSHPA, BDA etc. only those Organizations holding a valid Certificate of Registration for work within the scope of this SSD shall be accepted.

1.2 Other clients may accept the Certificate of Registration.

1.3 The Organization shall notify Lantra (Lantra House, Stoneleigh Park, Kenilworth, CV8 2LG) and the Secretary of the SSAC-LD-GD of their registration to this Sector Scheme immediately following confirmation from the Certification Body and thereafter annually, as detailed in paragraph 4.1 of Section 4 of this SSD. This will allow inclusion of the Organization in the published list of registered Organizations maintained by Lantra. In addition the Organization shall provide details of a focal point for the Organization.

### **2. Guidelines for New Entrants – Requirements**

2.1 Organizations shall use the required experienced and qualified Lead Drilling Operatives and management who meet the requirements of this Sector Scheme. Organizations shall

demonstrate that their equipment and systems meet the requirements of this Sector Scheme.

- 2.2 Organizations shall have applied for registration with a Certification Body that is accredited by UKAS to audit against this Sector Scheme. Organizations shall demonstrate that they have been audited for office and site based activities.

### **3 Trade Associations**

- 3.1 Membership of a trade association is advantageous particularly the British Drilling Association (BDA) and Ground Source Heat Pump Association (GSHPA).

## **APPENDIX J1: FEEDBACK TO SCHEME COMMITTEE**

Any observations, feedback or complaints relating to the content to this document or the process described herein should be sent using the feedback form detailed below:

### **FEEDBACK FORM**

The Secretary  
Sector Scheme Advisory Committee for Land Drilling  
c/o British Drilling Association  
"Wayside"  
London End  
Upper Boddington  
Daventry  
Northamptonshire, NN11 6DP

Tel 01327 264622  
Fax 01327 264623  
E-mail: [office@britishdrillingassociation.co.uk](mailto:office@britishdrillingassociation.co.uk)  
Web Site: [www.britishdrillingassociation.co.uk](http://www.britishdrillingassociation.co.uk)

Issue Identified:

Suggested Action:

Name:  
Organization:  
Address:

Contact details:

Date:

## **APPENDIX J2: COMPLAINTS TO CERTIFICATION BODY**

Feedback relating to certification matters including alleged deficiencies in the land drilling service provided under this scheme should in the first instance be taken up with the Organization. In the event that the matter cannot be satisfactory resolved written complaints should be made to the Organization's certification body, detailing the problem identified. Contact addresses may be obtained by following the procedure given in Appendix F.

Issue Identified:

Organization Details:

Name:

Address:

Complaint:

Name:

Organization

Addresses

Date:

Signed:

### **APPENDIX J3: FEEDBACK TO CLIENT BODY ON POLICING OF NSS REGISTRATION**

Feedback relating to policing of National Sector Schemes registration matters in respect of alleged contractual mismanagement/oversights or alleged omissions in contract requirements by client organizations, their management agents or principal contractors where contracts can be or may have been awarded to organizations not registered to this National Sector Scheme, or where contracts are alleged to have omitted requirements for compliance with this National Sector Scheme should be referred back to the client body through an independent third party e.g. a trade association. Details of the alleged mismanagement or omission should as a minimum include the following details;

a) Contract identified

- b)
  - i) Details of omission in contract or
  - ii) Organization Identified as being awarded the contract or
  - iii) both i) and ii) above

c) Organization raising feedback / issue

Name:

Organization:

Contact details (Address, email address, telephone etc)

d) Date: \_\_\_\_\_ Signed: \_\_\_\_\_

## High ways Agency Roads/Contracts – Route for Feedback

Feedback should be sent to [Standards\\_Feedback&Enquiries@highways.gsi.gov.uk](mailto:Standards_Feedback&Enquiries@highways.gsi.gov.uk)

## Other Clients

Feedback should be sent back to the relevant clients project manager or head of division responsible for the contract works.

## Health and Safety Executive

Concerns about Health and Safety issues should be referred to HSE via HSE's information line 0845 345 0055. Further information is available from HSE's web site ([www.hse.gov.uk](http://www.hse.gov.uk))

## **APPENDIX K1: THE INTERPRETATION OF CERTIFICATES ISSUED BY CERTIFICATION BODIES**

The certification bodies issue a variety of styles of Certificates of Registration, which shall include the scope of the registration and the location of premises that are covered by the certificate of registration.

The full scope of registration shall be included on the certificate or in an Appendix; it may be a text list or described as a schedule. Other Appendices or addendum may also be used to list the Organization's premises included in the certification.

Many organizations operate from several locations e.g. regional offices, service depots etc. It is

important that each and every location covered by the certificate of registration is identified by the certification body and included with the certificate as an essential part of the registration process. This may be achieved by the attachment of an addendum or appendix that is referred to on the certificate of registration. The Addendum or Appendix shall include sufficient information that will identify the scope of registration at each location and where applicable the relevant category of work that can be undertaken at that location.

As a minimum a valid certificate of registration will contain the following information:

- The scope of registration including specific registration to BS ISO 9001:2008 and this NSS including the scheme title e. g. National Sector Scheme for Land Drilling in Geothermal Drilling
- The identification of each and every location to which the certification of registration is applicable
- The services/products offered by the Organization at each location identified on the certificate of registration for NSS 29A – Sector Scheme for Land Drilling in geothermal drilling and any applicable categories with associated typical sub-categories where applicable
- Logos for the NSS, UKAS (or equivalent) and the CB
- The name and address(es) of the Organization
- The validity of the certificate (3 years for ISO 9001)
- A unique reference number/code
- The signature of a relevant CB official with his name and title

\*Note where Organization has an extension to scope to include for this NSS, the expiry date of the certificate remains as 3 years after their initial assessment/or triennial assessment and not 3 years after obtaining the extension to their certificate i.e. the validity of the certificate will not be reset following their NSS assessment.

Category & Sub Category of services offered are:

- Closed Loop (Drilling & Installation) up to 100m depth.
- Closed Loop (Drilling & Installation) greater than 100m depth.
- Pressure & Flow Testing (Closed Loop)
- Thermal Response Testing (Closed Loop)
- Headworks Installation (Closed Loop)
- Open Loop (Drilling & Installation)
- Acidisation (Open Loop)
- Pumping Test (Open Loop)
- Headworks Installation (Open Loop)
- Commissioning of Sub-Contractors
- Any combination of sub-categories

(Note: These lists are not exhaustive and the description of the categories and sub-categories may vary).

The following are example models for the certification;

Figure 1: Shows the scope of registration on the certificate.

Figure 2: Shows an example of an Appendix for scope of registration. The italic text in square brackets indicates where specific text would need to be included. Where appropriate the information

on location and their respective scopes may be included on the Appendix for scope of registration.

Figures 3 and 4: Show example model certificate and Appendix respectively for this particular scheme.

Figure 1 Example Model Certificate of Registration

**[Certification Body Name ]**

**C E R T I F I C A T E   O F   R E G I S T R A T I O N**

**[ORGANIZATION NAME]**

*[Organization Address]*

*[Town]*

*[County]*

*[Post Code]*

*[Certification Body Name]* issues this certificate to the above named company after assessing the company's quality management system and finding it in compliance with

**BS EN ISO 9001:2008 AND THE FOLLOWING NATIONAL SECTOR SCHEMES**

For the following scope of registration

*[List of appropriate related works].*

National Sector Schemes

**[Sector Scheme number and Title]**

**[Sector Scheme number and Title]**

*[(Appendix ... details the full scope of registration and Appendix ... details the locations covered by this registration)]*

Certificate Number: *[Certificate Number]*

Issue Date *[date]*

Renewal Date *[date]*

Signature

*[Name & Title of Certification Body Official]*

***[Certification Body standard footer: Name / UKAS Logo/ etc.]***

Figure 2 Example Model Appendix

***[Certification Body Name ]***

**APPENDIX**

To Certificate Number *[Certificate Number]* Appendix No.*[1]* Page 1 of *[1]*

This Appendix declares the scope of registration of the certificate granted to:

***[ORGANIZATION NAME]***

*[Organization Address]*  
*[Town]*  
*[County]*  
*[Post Code]*

Scope of Registration

*[List of appropriate related activities]*  
 National Sector Schemes  
*[Sector Scheme Number and Title]*  
*[Sector Scheme Number and Title]*  
*[Sector Scheme Number and Title]*

<b><i>Depot, Regional Office etc</i></b>	<b><i>Applicable Sector Scheme(s)</i></b>	<b><i>Scope of Registration</i></b>
<i>[Depot 1 New road, Newtown]</i>	<i>[Sector Scheme Number and title]</i>	<i>[Detailed scope]</i>
	<i>[Sector Scheme Number and title]</i>	<i>[Detailed scope]</i>
<i>[Depot 2 Old Road, Oldtown]</i>	<i>[Sector Scheme Number and title]</i>	<i>[Detailed scope]</i>

Figure 3 Example Model Certificate of Registration for Land Drilling

**[Certification Body Name ]**

**C E R T I F I C A T E   O F   R E G I S T R A T I O N**

**[ORGANIZATION NAME]**  
 [Organization Address]  
 [Town]  
 [County]  
 [Post Code]

[Certification Body Name] issues this certificate to the above named company after assessing the company's quality management system and finding it in compliance with

**BS EN ISO 9001:2008 AND NATIONAL SECTOR SCHEME 29A**

For the following scope of registration

*LAND DRILLING IN GEOTHERMAL DRILLING for;*

CATEGORY	SUB-CATEGORY	CODE
<i>CLOSED LOOP (Drilling &amp; Installation)</i>	<i>Up to 100m depth</i>	<i>GD/CLS/DIB</i>
<i>Pressure &amp; Flow Testing</i>	<i>Closed Loop</i>	<i>GD/CL/PFT</i>

National Sector Schemes  
**29A – Sector Scheme for Land Drilling in Geothermal Drilling.**

Certificate Number:                      **[Certificate Number]**  
 Issue Date                                   **[date]**  
 Renewal Date                               **[date]**

Signature

*[Name & Title of Certification Body Official]*

*[Certification Body standard footer: Name / UKAS Logo / etc.]*

SS 29A

Figure 4 Example Model Appendix to Certificate of Registration for Land Drilling

*[Certification Body Name ]*

## APPENDIX 01

To Certificate Number *[Certificate Number]* Appendix No.*[1]* Page 1 of *[1]*

This Appendix declares the scope of registration of the certificate granted to:

***[ORGANIZATION NAME]***

*[Organization Address]*  
*[Town]*  
*[County]*  
*[Post Code]*

Scope of Registration:  
*Land Drilling in Geothermal Drilling for*

CATEGORY	SUB-CATEGORY	CODE
<i>CLOSED LOOP (Drilling &amp; Installation)</i>	<i>Up to 100m depth</i>	<i>GD/CLS/DIB</i>
<i>Pressure &amp; Flow Testing</i>	<i>Closed Loop</i>	<i>GD/CL/PFT</i>

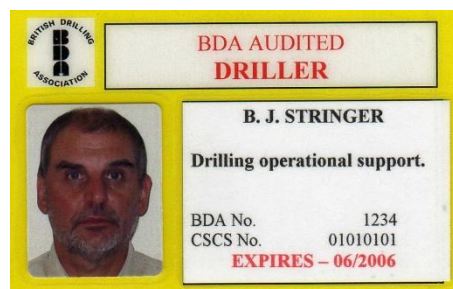
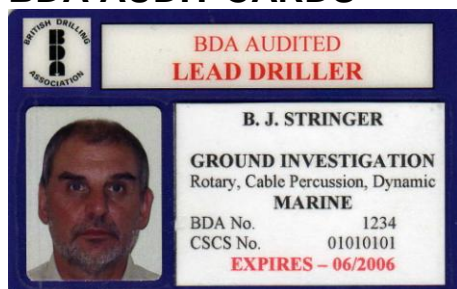
National Sector Schemes  
*29A – Sector Scheme for Land Drilling in Geothermal Drilling*

<b><i>Depot, Regional Office etc</i></b>	<b><i>Applicable Sector Scheme(s)</i></b>	<b><i>Scope of Registration</i></b>
<i>Depot 1 New Road, Newton</i>	<i>Sector Scheme 29A for Land Drilling in Geothermal Drilling</i>	<i>Closed Loop (Drilling &amp; Installation) (i) Up to 100m depth</i>
<i>Depot 1 New Road, Newton</i>	<i>Sector Scheme 29A for Land Drilling in Geothermal Drilling</i>	<i>Closed Loop (Drilling &amp; Installation) (i) Greater than 100m depth</i>
<i>Depot 1 New Road, Newton</i>	<i>Sector Scheme 29A for Land Drilling in Geothermal Drilling</i>	<i>Closed Loop (i) Pressure &amp; Flow Testing (ii) Thermal Response Testing (iii) Headworks Installation</i>

SS 29A

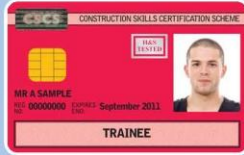
## APPENDIX K2: SAMPLE SKILL CARDS OF LAND DRILLING OPERATIVES

### BDA AUDIT CARDS



## CSCS CARD EXAMPLES

# CSCS – the card scheme for construction



**Red**  
Working towards N/SVQ level 2 or 3  
Trainee



**Green**  
Site Operative (labourer)



**Red**  
Graduate



**Blue**  
Craft Skills



**White**  
Professionally Qualified Person



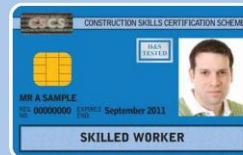
**Black**  
N/SVQ level 4 or 5  
Senior Management



**Yellow**  
N/SVQ level n/a  
Visitor (no construction skills)



**Red**  
Experienced Worker (Temporary Card)



**Blue**  
Working towards N/SVQ level 2  
Skilled Worker



**Green**  
N/SVQ level 1



**Gold**  
N/SVQ level 3  
Advanced Craft/Supervisory



**White**  
N/SVQ level n/a  
Construction Related Occupation



**Red**  
Experienced Technical, Supervisor or Manager

Whatever your job or level of experience, there's a CSCS or affiliated card that's right for you. It proves you are competent and have passed the Health & Safety test.  
To find out more, call **0844 576 8777**, visit **www.cscs.uk.com** or speak to your site manager.



TWCS006/06/09/09/12/00

## APPENDIX L: GUIDANCE FOR CLIENTS

## 1.0 General

It is recommended that Clients acknowledge the requirements of this sector scheme as a contract requirement.

This guidance is primarily of relevance to Clients and their supervisory staff.

The SSD for Land Drilling was originally conceived as a document for use by Clients to specify the minimum standards for quality, training and competence of Organizations used by them to carry out Land Drilling.

The implementation of the Sector Scheme and development of training and competency requirements is intended to provide:

- a) A qualified workforce competent at carrying out Land Drilling.
- b) Requirements to evaluate risks and develop processes associated with Land Drilling and the production of an associated comprehensive quality plan for each contract.

*(During the introductory period for this Sector Scheme, Clients may take into consideration in the quality assessment of an Organization's tender, their commitment to compliance with this Sector Scheme. This may be demonstrated through the extent to which the Organization has introduced a qualified skilled workforce for undertaking the Land Drilling.)*

It is necessary for the Client to ensure that all those involved in carrying out the Land Drilling are appropriately trained and skilled, whether or not they are directly employed. The training and assessment of competency schemes described in this SSD are designed to cater for the range of skills within the overall process of the Land Drilling.

Clients and Customers that require confirmation of compliance with the Contract Specification in respect of the supply of services, products or materials should confirm that the quality management system certificate issuer is accredited by UKAS or equivalent and that specific reference is made to relevant Sector Schemes on certificates.

For the Sector Scheme to achieve its objectives it is essential that Clients, either directly or via the agents and individuals they employ, ensure that the requirements of this document are complied with. This includes ensuring that sub-contractors employed directly or indirectly, are registered to the Sector Scheme. Supervisory staff must be instructed to carry out spot checks of identification cards.

Lantra Awards have established and manage a schedule of registered companies that have been registered to National Highways Sector Schemes; free access to the schedule is obtained by logging on to the Lantra Awards website [www.scheduleofsuppliers.com](http://www.scheduleofsuppliers.com). However, it should be noted that only those companies that confirm entry onto the schedule to Lantra Awards are listed. The list of all registered suppliers is held by Lantra Awards (if notified); Clients should contact Lantra Awards by email at [NHSSscheduleofsuppliers@lantra.co.uk](mailto:NHSSscheduleofsuppliers@lantra.co.uk) to ascertain/check the status of company if it is not listed on the schedule.

## 2.0 CLIENT SPECIFIC DOCUMENTATION

Certain clients have specific documentation relating to their requirement and these should be noted, if not covered by the sector scheme requirements, for instance;

### 2.1 Corporate Manslaughter and Corporate Homicide Act 2007.

Advice from HSE regarding corporate manslaughter and corporate homicide is available on the HSE web-site - the following extract has been copied from the HSE web-site.

“The Corporate Manslaughter and Corporate Homicide Act 2007 is a landmark in law. For the first time, companies and organizations can be found guilty of corporate manslaughter as a result of serious management failures resulting in a gross breach of a duty of care.

The Act, which came into force on 6 April 2008, clarifies the criminal liabilities of companies including large organizations where serious failures in the management of health and safety result in a fatality.

- The Ministry of Justice leads on the Act and more information is available on its Corporate Manslaughter and Corporate Homicide Act 2007 webpage.

HSE welcomes and supports the Act. Although the new offence is not part of health and safety law, it will introduce an important new element in the corporate management of health and safety.

Prosecutions will be of the corporate body and not individuals, but the liability of directors, board members or other individuals under health and safety law or general criminal law, will be unaffected and the corporate body itself and individuals can still be prosecuted for separate health and safety offences.

The Act also largely removes the Crown immunity that applied to the previous common law corporate manslaughter offence. This is welcome, and consistent with Government and HSE policy to secure the eventual removal of Crown immunity for health and safety offences. The Act provides a number of specific exemptions that cover public policy decisions and the exercise of core public functions.

Companies and organizations should keep their health and safety management systems under review, in particular, the way in which their activities are managed and organised by senior management. The Institute of Directors and HSE have published guidance for directors on their responsibilities for health and safety. ‘Leading health and safety at work: leadership actions for directors and board members’ (INDG417)

Contact us for specific questions about the act and guidance:

- Ministry of Justice

For health and safety information and answers to specific health and safety questions contact HSE Infoline:

- HSE Infoline

Note - This list is not complete and other documentation should be considered which is relevant to the application of environment of the operations.