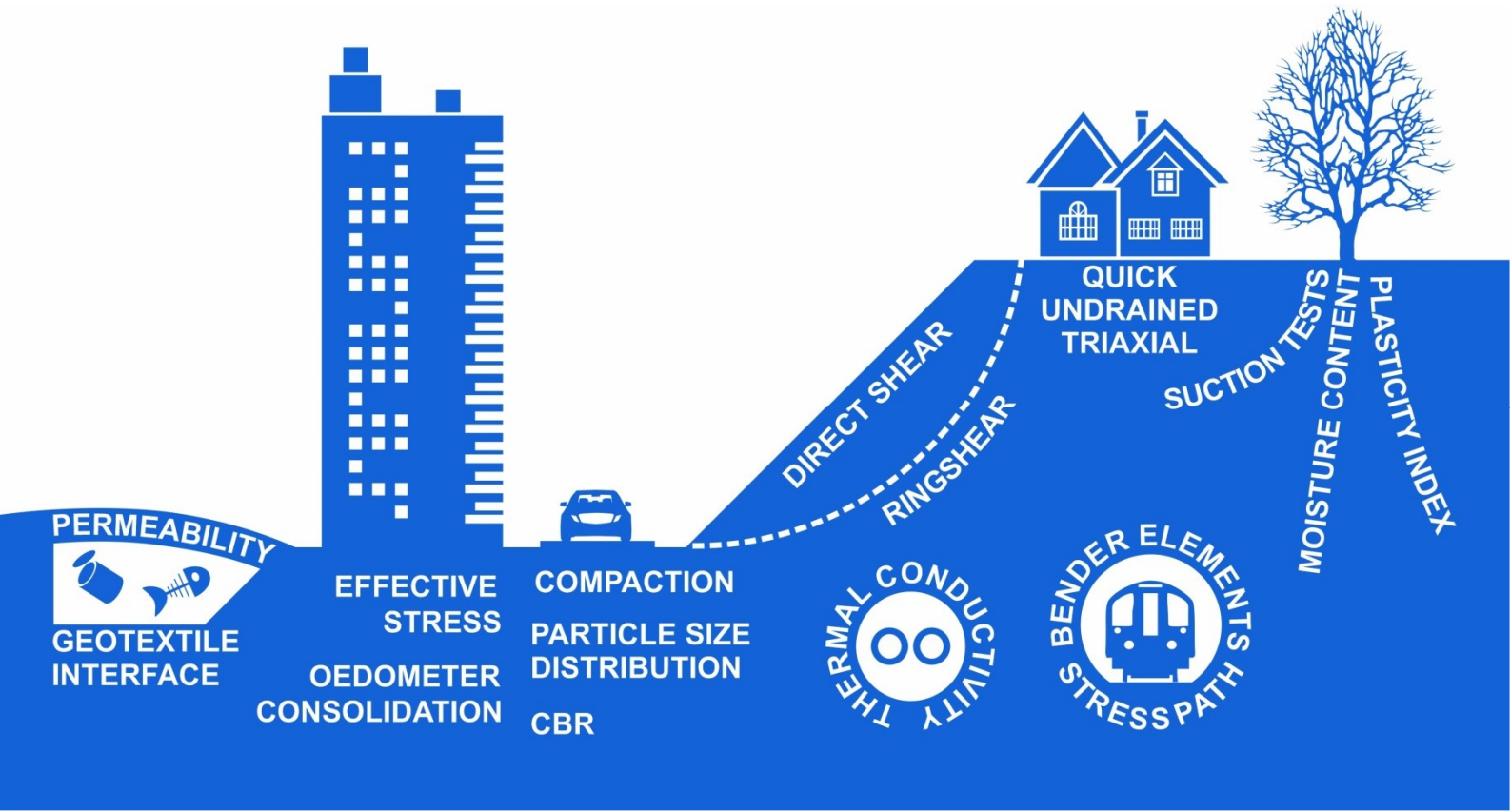
GEOLABS®

Geotechnical Soil and Rock Laboratory Testing

Company Overview

2025



GEOLABS LIMITED - QUALITY ASSURANCE

Geolabs Limited was formed in 1995 and has testing facilities and resources to undertake an extensive range of soils and rock testing including classification; earthworks, total stress, consolidation, shearbox, permeability, effective stress and advanced testing, as well as research oriented and bespoke testing to meet customer-specific project requirements.

We ensure that the highest level of quality is achieved and maintained in our operations through the application of a robust Quality Management system and quality assurance procedures across all laboratory activities.

The Geolabs Limited Quality Management system and associated documentation is reviewed and audited at least annually by the United Kingdom Accreditation Service (UKAS), which is the sole national accreditation body recognised by the UK government to assess organisations that provide certification, testing inspection and calibration services against published international standards for technical competence.

UKAS assess our compliance with relevant National Standards, test and project-specific specifications in accordance with the requirements of International Standard *BS EN ISO/IEC 17025: 2017 - General requirements for the competence of testing and calibration laboratories.*

This recently revised standard is the international reference for testing and calibration laboratories wishing to give confidence to their customers in their capability to deliver reliable results, and enables laboratories accredited to this standard to demonstrate their technical competence both nationally and around the world. Closely aligned to the requirements of BS EN ISO 9001:2015, UKAS accreditation to BS EN ISO 17025: 2017 also confirms a commitment to impartiality, protection of customer confidentiality, staff training and development and continuous improvement throughout the organisation.

Customers using a UKAS BS EN ISO 17025:2017 accredited laboratory can be assured that the accredited services that the laboratory provides will be recognised internationally, as BS EN ISO/IEC 17025:2017 was developed through the liaison of 18 internationally renowned organisations such as the International Laboratory Accreditation Cooperation (ILAC). This international recognition further reduces the need for multiple assessments and third-party audit by customers seeking to guarantee the quality of their required laboratory services.

Geolabs Limited actively organises and participates in a Proficiency and Interlaboratory Comparison Testing Scheme (PICTS), which provides geotechnical laboratories with the opportunity to monitor and assess their performance and validity of their test results through comparison with other laboratories in accordance with the requirements of clause 7.7.2 of BS EN ISO/IEC 17025:2017.

Geolabs Limited
Bucknalls Lane
Garston
Watford
Hertfordshire
WD25 9XX
United Kingdom

Schedule of Accreditation

issued by

United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

1982

Accredited to ISO/IEC 17025:2017

Geolabs Limited

Issue No: 029 **Issue date:** 27 March 2025

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E-Mail: admin@geolabs.co.uk
Website: www.geolabs.co.uk

Testing performed by the Organisation at the locations specified

Locations covered by the organisation and their relevant activities

Laboratory locations:

Location details		Activity	Location code
Address Bucknalls Lane Garston Watford Hertfordshire WD25 9XX	**Local contact** Mr J R Masters	Testing: Soils - mechanical tests & physical tests	Watford
Address Midlands Office Albany House Station Road Coleshill North Warwickshire B46 1HT.	**Local contact** Mr J Reynolds	Testing: Soils - mechanical tests & physical tests	Midlands

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
GEOTECHNICAL INVESTIGATION and TESTING - Laboratory testing of soil	Water content	BS EN ISO 17892-1:2014 +A1:2022	Watford Midlands
	Bulk density - linear measurement method	BS EN ISO 17892-2:2014	Watford Midlands
	Determination of bulk density – immersion in fluid method	BS EN ISO 17892-2:2014	Watford Midlands
	Determination of particle density – fluid pycnometer method	BS EN ISO 17892-3:2015	Watford Midlands
	Determination of particle size distribution -sieving method -pipette method	BS EN ISO 17892-4:2016	Watford Midlands
	Determination of particle size distribution -hydrometer method	BS EN ISO 17892-4:2016	Midlands
	Incremental loading oedometer test	BS EN ISO 17892-5: 2017	Watford Midlands
	Unconfined compression test	BS EN ISO 17892-7:2018	Watford Midlands
	Unconsolidated undrained triaxial test	BS EN ISO 17892-8:2018	Watford Midlands
	Isotropically consolidated triaxial compression tests on water saturated soils	BS EN ISO 17892-9:2018	Watford
	Consolidated triaxial compression tests on water saturated soils, Anisotropic consolidation (CAU and CAD tests)	BS EN ISO 17892-9:2018	Watford
	Direct Shear Tests – Small Shearbox	BS EN ISO 17892-10:2018	Watford

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
GEOTECHNICAL INVESTIGATION and TESTING - Laboratory testing of soil (cont'd)	Direct Shear Tests – Large Shearbox	BS EN ISO 17892-10:2018	Watford
	Direct Shear Tests – Ring Shear Test	BS EN ISO 17892-10:2018	Watford
	Permeability in a triaxial cell	BS EN ISO 17892-11 2019	Watford
	Determination of liquid limit by the fall cone method	BS EN ISO 17892-12 2018 +A2:2022	Watford Midlands
	Determination of plastic limit	BS EN ISO 17892-12 2018 +A2:2022	Watford Midlands
	Plasticity Index and Liquidity Index	BS EN ISO 17892-12 2018 +A2:2022	Watford Midlands
SOILS for civil engineering purposes	Moisture content - oven drying method	BS 1377- 2:1990 BS1377-2: 2022	Watford Midlands
	Liquid limit - cone penetrometer	BS 1377- 2:1990 BS1377-2: 2022	Watford Midlands
	Liquid limit - cone penetrometer - one point	BS 1377- 2:1990 BS1377- 2: 2022	Watford Midlands
	Plastic limit	BS 1377- 2:1990 BS1377- 2: 2022	Watford Midlands
	Plasticity index and liquidity index	BS 1377- 2:1990 BS1377- 2: 2022	Watford Midlands
	Particle size distribution - wet sieving	BS 1377- 2:1990 BS1377- 2: 2022	Watford Midlands
	Particle size distribution - dry sieving	BS 1377- 2:1990 BS1377- 2: 2022	Watford Midlands
	Particle size distribution - sedimentation pipette method	BS 1377- 2:1990 BS1377- 2: 2022	Watford Midlands
	Particle size distribution - sedimentation hydrometer method	BS 1377- 2:1990 BS1377- 2: 2022	Midlands

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS for civil engineering purposes (cont'd)	Dry density/moisture content relationship (2.5 kg rammer)	BS 1377- 4:1990 BS1377- 2: 2022	Watford Midlands
	Determination of Electrical Resistivity	BS 1377-3: 2018 + A1: 2021	Watford
	Thermal Conductivity of Soil and Soft Rock by Thermal Needle Probe	ASTM D5334 – 22A	Watford
	Dry density/moisture content relationship (4.5 kg rammer)	BS 1377- 4:1990 BS1377- 2: 2022	Watford Midlands
	California Bearing Ratio (CBR)	BS 1377- 4:1990 BS1377- 2: 2022	Watford Midlands
	Measurement of swelling of soaked CBR specimen	BS 1377- 4:1990 BS1377- 2: 2022	Watford Midlands
	Moisture condition value – natural moisture content	BS 1377- 4:1990 BS1377- 2: 2022	Watford Midlands
	MCV / moisture content relation	BS 1377- 4:1990 BS1377- 2: 2022	Watford Midlands
	Soil-steel interface (ICP) ring shear test	ICP design methods for driven piles in sands and clays' –Jardine et al 2005 (Appendix A)	Watford
	One-dimensional consolidation properties	BS 1377- 5:1990 BS1377- 2: 2022	Watford Midlands
	One Dimensional Consolidation Properties of Saturated Cohesive Soils using Controlled-Strain Loading	ASTM D4186 / D4186M - 20^{E1}	Watford
	Permeability in a triaxial cell	BS 1377- 6:1990 BS1377- 2: 2022	Watford
	Unconfined compressive strength - load frame method	BS 1377- 7:1990 BS1377- 2: 2022	Watford Midlands

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
SOILS for civil engineering purposes (cont'd)	Undrained shear strength – triaxial compression without measurement of pore pressure	BS 1377- 7:1990 BS1377- 2: 2022	Watford Midlands
	Undrained shear strength – triaxial compression with multistage loading and without measurement of pore pressure	BS 1377- 7:1990	Watford Midlands
	Shear strength - small shearbox	BS 1377- 7:1990 BS1377- 2: 2022	Watford
	Residual strength - small ring shear apparatus	BS 1377- 7:1990 BS1377- 2: 2022	Watford
	Shear strength – large shearbox	BS 1377- 7:1990 BS1377- 2: 2022	Watford
	Uniformity coefficient	Specification for Highway Works table 6/1 footnote 5	Watford Midlands
	Effective shear strength – consolidated-undrained triaxial compression test with measurement of pore pressure	BS 1377- 8:1990 BS1377- 2: 2022	Watford
	Effective shear strength – consolidated-drained triaxial compression test with measurement of volume change	BS 1377- 8:1990 BS1377- 2: 2022	Watford
	Effective shear strength – consolidated drained multistage triaxial compression test with measurement of volume change	Documented In-House Method Test Procedure 38	Watford
	Effective shear strength – consolidated undrained multistage triaxial compression test with measurement of pore pressure	Documented In-House Method Test Procedure 38	Watford

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
ROCK	Water Content.	The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006, Editors: R Ulusay & J A Hudson	Watford
	Porosity and density-by saturation and caliper techniques.	The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006, Editors: R Ulusay & J A Hudson	Watford
	Determination of point load strength and anisotropy indices (loads from 2 to 55kN).	The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006, Editors: R Ulusay & J A Hudson	Watford
	Unconfined Compressive Strength (loads from 10 to 2000kN)	The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006, Editors: R Ulusay & J A Hudson	Watford
	Slake durability index	The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006	Watford
	Cerchar abrasivity test	The ISRM Suggested Methods for Rock Characterization Testing and Monitoring: 2007 – 2014	Watford
	Cerchar abrasivity test	ASTM D7625-10	Watford
	Preparation of rock cores for strength testing	ASTM D4543-08	Watford

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used	Location Code
ROCK (cont'd)	Determination of Indirect Tensile Strength – Brazil Test	The Complete ISRM Suggested Methods – Rock Characterization Testing and Monitoring 1974 – 2006, Editors: R Ulusay & J A Hudson	Watford
AGGREGATES	Particle size distribution – sieving method	BS EN 933-1: 2012	Watford
	Particle density and water absorption – pyknometer method	BS EN 1097-6: 2013	Watford
END			

Geotechnical Soils & Rocks Testing Facilities

GEOLABS Limited

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Geolabs Limited is a leading independent geotechnical soils, rocks and associated materials testing laboratory with state-of-the-art, in-house testing facilities.

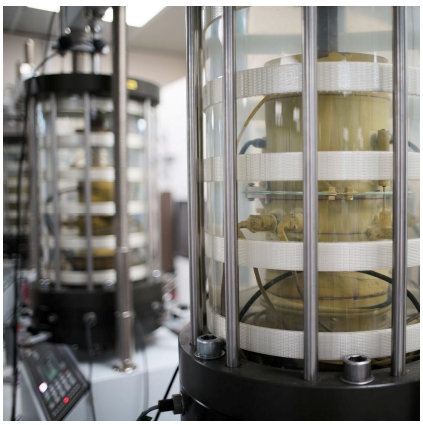
Based in the in the United Kingdom with laboratories in Watford and Birmingham, our facilities enable us to perform a wide range of test procedures to British and other National and International Standards as well as in-house and bespoke methods.

We perform a wide range of geotechnical tests for civil engineering and construction projects, including exploration and testing for mineral resources, all types of advanced and routine testing relating to the development of renewable energy resources (offshore and onshore), tunnelling, embankment construction, pipeline projects and major construction projects requiring high quality testing. We regularly undertake testing commissions from clients and projects from all over the world as well as providing essential technical support when required.

Staff

Our staff are knowledgeable and have expertise in all routine and advanced geotechnical laboratory testing with a combined geotechnical testing experience in excess of 500 years.

With staff serving on numerous National and International Standards committees, working groups and technical panels, often in the capacity of Chairmen or Working Group Coordinators we keep at the forefront of developments in the geotechnical and testing world. Our staff also lecture and present technical papers throughout the world.



Resonant Column

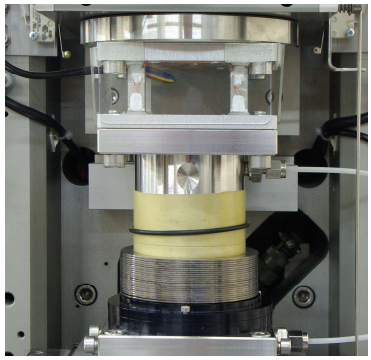
Our Hardin Type Resonant Column apparatus (H-RCA) allows elastic moduli to be determined over a wide range of strains, including the damping properties of the soil.

Advanced and Standard Triaxial

Our Advanced triaxial testing capabilities comprises up to eleven stress path stations each with their own dedicated stepless, computer-controlled compression frames. We routinely test both 70mm and 100mm diameter specimens. Each cell is capable of being equipped with three pairs of bender elements to determine shear wave velocities in up to three directions, mid-plane pore pressure transducer, and local axial and radial strain measurements in compression and extension. All stress path cells can perform tests to greater than 10 % axial strain on 100mm diameter specimens.

Our Dynamic Triaxial equipment can provide cyclic loading tests on 70 mm and 100 mm specimens with both strain and stress control capability, together with additional instrumentation including mid-plane pore pressure, local axial strain, and local radial strain transducers, as well as bender elements.

We can run concurrently up to 60 standard effective stress tests from 38 mm to 150 mm diameter using thirty-two compression machines from 1 tonne to 10 tonne capacity dedicated to effective stress testing. Eleven high-pressure cells and high-pressure maintainers allow tests to be undertaken with effective pressures in excess of 1000 kPa and confining pressures of up to 3500 kPa.

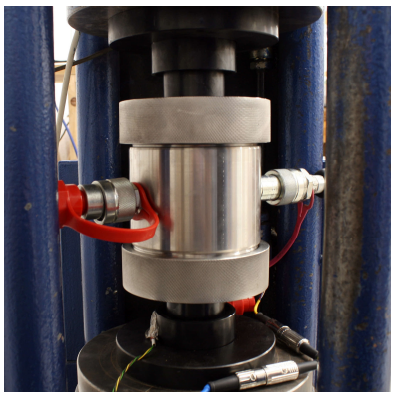


Dynamic Cyclic Simple Shear

Our three sets of state-of-the-art Dynamic Cyclic Simple Shear (DCSS) apparatus, two of 10 kN capacity and one 5 kN capacity, use their dedicated high-speed closed-loop computer control to enable both static and dynamic (cyclic) measurements to be made. We use low friction PTFE coated precision ground stainless steel rings to confine the 66mm diameter specimen.

Routine Testing

Our extensive equipment resources enable us to perform a wide range of testing of a routine nature (all BS1377 and BS EN ISO 17892 tests including classification, durability, compactions, CBR's, MCV's and total stress shear strength). We also perform the Fall Cone and other tests to other specifications and National Standards. We have jointly developed a new, proven, in-house method for determining maximum dry density of sands which gives high densities with minimal grain crushing.



Rock Testing

Our facilities allow us to perform a wide range of rock testing including: Unconfined and Triaxial Compressive Strength tests (which can include Young's Modulus and Poisson's Ratio determinations with load/unload cycles and utilise stress or strain controlled loading); Indirect Tensile Strength (Brazilian); Sound Velocity (P&S waves); Cerchar Abrasivity; Shore Scleroscope; Shearbox tests (on specimens up to 150 mm diameter); Petrographic analysis; Angularity; Swelling Pressure; Swelling Strain; Free Unconfined Swelling Strain; Volumetric Strain etc.

Direct Shear and Ringshear

We have eighteen 60 mm x 60 mm shearbox apparatus (two capable of also performing 100 mm x 100 mm specimens and one capable of testing at higher normal stresses); two 300 mm x 300 mm shearboxes (one capable of also performing 150 mm x 150 mm specimens and both capable of performing soil v Geofabric, Geomembrane, Geotextiles, Geosynthetic etc. tests to BS and ASTM Standards); three Ringshear apparatus (for performing both BS1377 and custom interface tests); one Hoek shearbox apparatus *(for rock testing)*. These extensive resources enable us to provide many combinations of direct shear testing.

Consolidation Testing

Geolabs have forty-three one-dimensional consolidation stations capable of performing tests on samples from 38 mm to 150 mm diameter. We also have six 76 mm, one 100 mm and six 250 mm diameter hydraulic consolidation (Rowe) cells; these cells can also be used for Permeability tests. In addition, we have Floating Ring and three Constant Rate of Strain (CRS) apparatus capable of applying back pressure and monitoring pore pressures.

Permeability Tests

We have the capacity to perform in excess of fifty triaxial permeability tests simultaneously, to BS1377, BS EN ISO 17892 and Environment Agency Procedures. We have the resources to perform Constant Head permeability tests in 76 mm and 112 mm diameter cells, Falling Head and Highways Agency permeability tests for graded aggregates. We also have apparatus to perform permeability tests on one-dimensional consolidation tests at each stage of incremental loading.

Quality

Quality is our mission!

UKAS TESTING 1982

Geolabs Limited is accredited in accordance with BS EN ISO/IEC 17025:2017 - *General requirements for the competence of testing and calibration laboratories*. We are audited annually by independent UKAS Technical Assessors to ensure that we comply with the BS EN ISO/IEC 17025:2017 Standard as well as complying with the National Testing Standards and/or documented Technical Procedures that we hold accreditation for. Our accreditation demonstrates that we are technically competent and have the necessary technical expertise and experience to perform our extensive scope of accredited tests. Our accreditation and annual surveillance and monitoring is certificated by the United Kingdom Accreditation Service (UKAS) which is the recognised national body in the United Kingdom responsible for assessing the competence of organisations in the fields of calibration, testing, inspection and certification of systems, products or services.
We have been a UKAS Accredited laboratory since 1999 and have held accreditation for effective stress testing since 2000.

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Sample Preparation and Logging

Independent Soil and Rock Geotechnical Laboratory Testing

Liner Cutting

Cutting core liners without causing disturbance

The Geolabs liner cutter has been custom designed for horizontally cutting PVC or similar liners which contain undisturbed soil samples.

The powerful, motorised cutting head precisely and safely cuts along both sides of the plastic liner causing no disturbance to the soil inside. This allows the top half of the now neatly split liner to be easily removed to expose the pristine core within for description and photography, as well as permitting easy sub-sampling for other laboratory testing.

The sharp cutting blades are adjustable to allow for different liner thicknesses between 1 mm to 5 mm and can accommodate core liner lengths up to 1.5 m and core diameters from 60 mm to 125 mm.

Horizontal & Vertical Extruding

Extruding undisturbed soil samples

Geolabs have two 1.5 m electro-hydraulic, horizontal extruders for extruding undisturbed samples from 70 mm to 110 mm in diameter. As well as horizontal extruders, we have vertical extruders that can extrude undisturbed samples from different core sizes from 38 mm to 250 mm diameter.

Soil lathing and other sub-sampling

Preparing quality soil and rock specimens

Geolabs have a wide range of other sub-sampling apparatus to obtain undisturbed samples from block samples or to reduce the diameter of specimens to comply with required standards or specifications.

We have soil lathes to obtain specimens from 38mm, 50mm, 70mm and 100mm.

Our precision water-lubricated recoring and end-grinding equipment can core hard soils, rocks and concrete to provide specimens from 38 mm to 145 mm in diameter.

Sample Description & Photography

Geolabs have a dedicated team of experienced, degree-qualified Laboratory Engineers and Geologists to conduct examination and description of soil samples and rock cores in accordance with BS5930. We are also capable of logging chalk to CIRIA C574 (2002). All samples are photographed with a colour chart, grey scale and specimen identification.

Our team can perform index testing (such as Torvane and pocket penetrometer) for rapid assessment of shear strength and unconfined compression strength of cohesive soils. We can also undertake undisturbed and disturbed sub-sample preparation for other laboratory testing requirements (such as Triaxial, Oedometer, Laboratory Vane, Shearbox, Particle Size Distribution and Atterberg limits etc).


SAMPLE DESCRIPTION

GEO / 30961

EXAMPLE PROJECT

GEOLABS

Logging

Logs are presented using our in-house sample description sheet containing the following information as a minimum:

- Project name
- Core reference number
- Sample depth and type
- Photograph of the sample in JPEG format with colour chart, grey scale and specimen identification
- Visual description of the material
- Depth of any changes in the sample
- Geological classification of the material
- Depth of any sub-sample collected and corresponding laboratory test

If you have any particular requirements that are not listed above, please do contact us; we would be happy to discuss adapting our sheet to produce a custom format that would exactly meet your needs.

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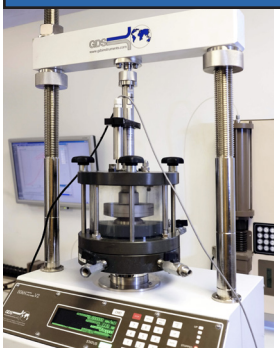
GEOLABS®

Advanced Soil Testing

Independent Soil and Rock Geotechnical Laboratory Testing

CRS Consolidation

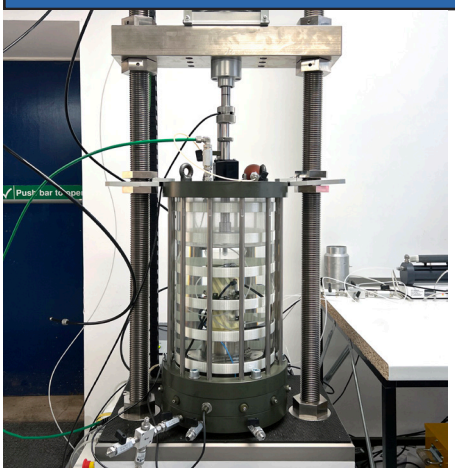


2 closed-loop controlled **Constant Rate of Strain (CRS)** oedometers measure permeability and allow consolidation parameters and permeability to be calculated **seamlessly** over the **whole testing stress range**.

- 38mm, 50mm, and 66mm diameter samples
- Maximum load capacity of 50 kN
- Pre-consolidation pressure based on continuous curve
- Continuous curve of void ratio (e) vs log p'
- Continuous c_v
- Continuous m_v
- Continuous k (calculated)

Imperial Suction Probe

Imperial College type **suction probe** test measures the **matric suction** of arriving soil samples to the laboratory.
Piezoelectric bender elements are also employed to measure the shear wave velocity through the soil sample in vertical (Svh) and horizontal directions with both polarizations (Shv & Shh).



Cyclic Triaxial

Lubricated Ends Triaxial Tailing Specimen

Advanced Triaxial

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GEOLABS®

Advanced Soil Testing

Independent Soil and Rock Geotechnical Laboratory Testing

In addition to our vast scope of routine soil and rock testing, Geolabs also offers an impressive range of advanced soil testing capabilities. These make Geolabs a one-stop solution for all your geotechnical testing needs, irrespective of the size or complexity of your project.

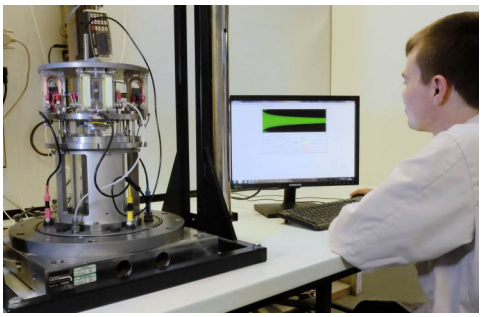
We are always willing to discuss how we can adapt and customise our methods to suit your particular needs.

Advanced Triaxial Testing

- Stress path control
- Anisotropic capability
- Small strain stiffness
- Shear Modulus (G)
- Stiffness decay curve
- K_0
- Custom modelling
- Slow cyclic behaviour

8 advanced triaxial cells with computer controlled stress path capability allow the fitting of **Piezo Bender Elements** for measuring shear wave velocities in 3 orientations for deriving G_{max}. **Local Strain** using submersible LVDTs enables axial and radial strains to be measured to assess parameters such as small strain stiffness decay curves and Poisson's Ratio. **Mid-Height Flushable Probes** ensure accurate pore pressure determination.

Resonant Column



Shear Modulus (G) and Damping (D) •

Very small strains (typically 10^{-5} to 10^{-2} %) •

Defines the early stiffness decay curve •

The **Resonant Column** test provides shear moduli over a range of **very small strains** which can link with local strain data from advanced triaxial tests to give a broad picture of the material's **stiffness characteristics**. Induced vibrations can be either **torsional** or **flexural**

CRS Consolidation

- Pre-consolidation pressure based on continuous curve
- Continuous e v log(p')
- Continuous c_v
- Continuous m_v
- Continuous k (calculated)

3 Closed-loop controlled **Constant Rate of Strain** (**CRS**) oedometers measure permeability and allow consolidation parameters and permeability to be calculated **seamlessly** over the **whole stress range** tested.

Cyclic Direct Simple Shear

Shear Modulus (G) •

Shear Stress (τ) •

Shear Strain (γ) •

Up to 5 Hz (cycles/second) •

Specimens can be pre-prepared by consolidating from 1.5 x LL material •

Our **Direct Simple Shear** (**DSS**) apparatus can perform both **static** and **cyclic** tests with sinusoidal or custom loading profile. Tests can be carried out controlling either the **shear load** or the **shear strain**. Platens are available with **pins** or **ridges** to best prevent slippage

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GEOLABS®

Tailings Testing

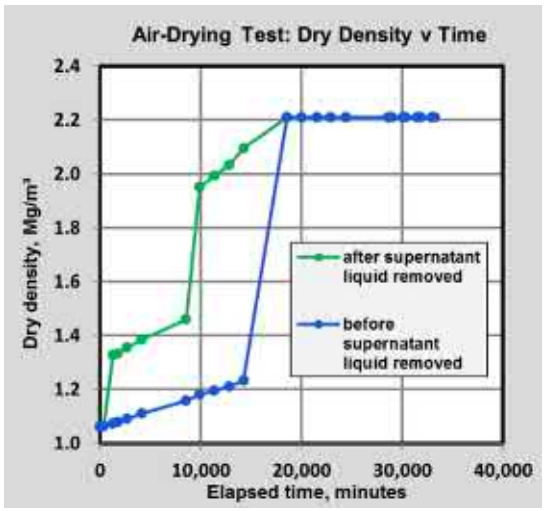
Independent Soil and Rock Geotechnical Laboratory Testing

Tailings tests are an important tool for understanding the behaviour of the fine materials that are often pluviated into holding ponds and dams as part of the extraction processes performed at ore and precious metals processing plants. Geolabs provides a range of tests that measure how these materials settle under various conditions and their physical properties once settled.

- Drained Settling
- Undrained Settling
- Permeability (constant head and falling head)
- Coefficient of Consolidation
- Air-Drying
- Pulp Density
- Marsh Cone Viscosity
- Particle Settling Velocity

Undrained Settling measures how the fines settle out of a homogenous slurry that has been either supplied by the client, or mixed by Geolabs to a specified pulp density from dried materials. Where permitted by the materials, two properties are measured over time during the test: the gradually rising height of the settled materials, and the gradually lowering height of the fines above which there is clear water.

The **Drained Settling** test is similar to the Undrained Settling test except that water is allowed to drain out of the base through the settling material. This simulates how water levels would drop in tailings ponds by permeating through the surrounding soil.



Once the tailings have settled out of the slurry and reached a constant height, water can be percolated through them to determine their **Permeability.**

Alternatively, the head of water can be maintained and water allowed to drain from the base. This allows the **Coefficient of Consolidation** to be determined.

The **Air-Drying** test replicates the desiccation of a tailings slurry as it dries naturally once no more slurry is being added to the pond or dam. The bulk and dry densities, together with the water content, are measured during the drying.

Geolabs can measure a sample's **Pulp Density** - how much solids there are in a slurry - or mix a sample to a specific Pulp Density to perform a test.

Often required to assess pumping requirements, the **Marsh Cone Viscosity** test measures how easily the slurry flows.

The **Particle Settling Velocity** measures how fast differently sized fractions of particles settle through a column of water.

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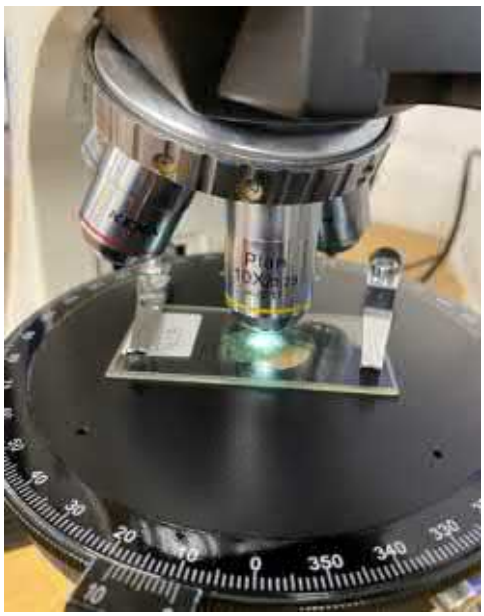
Testing Facilities

Geolabs Limited have a dedicated team of experienced petrographers to conduct petrographic examination in rock, aggregate, sand, concrete, mortar, bricks, plaster and other building and construction materials. Some of the examples are:

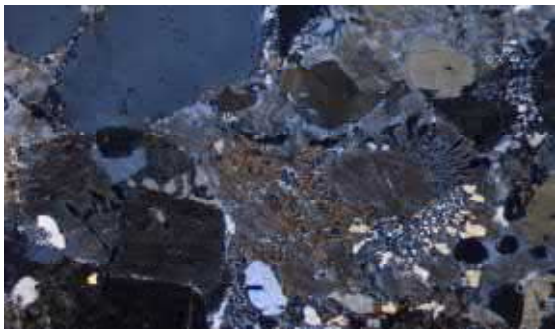


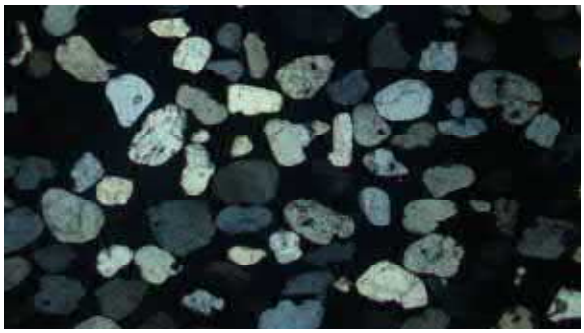
- ***ISRM 1974 – 2006*** *- Suggested Method for Petrographic Description of Rocks.*
- ***BS EN 1997-2:2007 Eurocode, Part 2 / BS 5930:2015+A1:2020*** *- Code of Practice for Site Investigation.*
- ***ISO 14689:2017*** *- Identification and classification of rock.*
- ***BS EN 12407: 2019*** *- Natural Stone tests Methods - Petrographic Examination.*
- ***BS EN 12670: 2019*** *- Natural Stone tests Methods - Petrographic Examination.*
- ***BS EN 12620:2002*** *- Aggregates for concrete.*
- ***ASTM C295/C295M: 2020*** *- Standard Guide for Petrographic Examination of Aggregates for Concrete.*
- ***BS EN 932-3-1997*** *- Tests for general properties of aggregates Part 3: Procedure and terminology for simplified petrographic description.*
- ***BS 7943: 1999*** *- Guide to the Interpretation of Petrographical Examinations for Alkali-Silica Reactivity.*
- ***ASTM C856/C856M: 2020*** *- Standard Practice for Petrographic Examination of Hardened Concrete.*
- ***ASTM C1324: 20a*** *- Standard Test Method for Examination and Analysis of Hardened Masonry Mortar.*
- *Other Documented In-house procedures for specific building and construction materials.*

Our laboratory has the latest equipment for the full range of petrographic examination including a Leica microscope, cameras and software to inspect, analyse, measure and document a variety of different type of samples. The system has ergonomically designed high-quality imaging systems to tackle everything from everyday routine analyses to the most challenging materials' research applications.

Rock, Aggregate & Sand

Petrographic analysis provides in-depth investigation of the physical features of a particular rock sample and a complete analysis covers macroscopic to microscopic investigations of the rock sample. Aggregate testing plays a vital role in the construction project by providing owners, designers and contractors with valuable information throughout a project's progress.

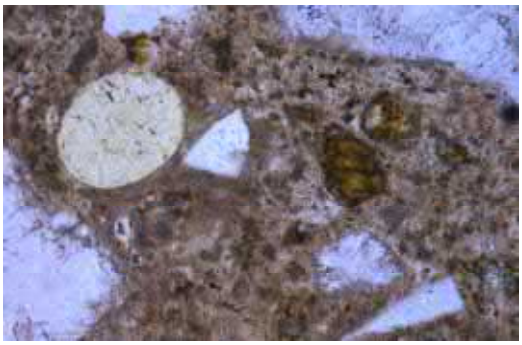


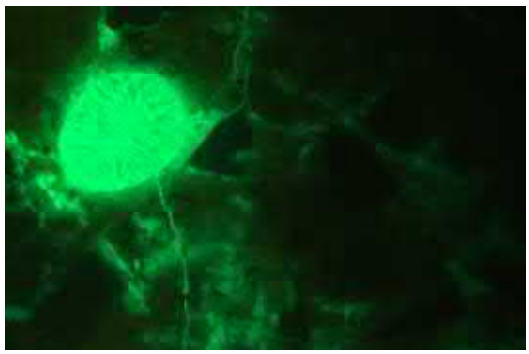


In concrete aggregates, petrographic examinations are used to characterize the rock type, name, and its suitability for use as a concrete aggregate. This helps to identify the constituents that are susceptible to alkali silica reactions in concrete and also when used in freeze/thaw environments.

Concrete, Mortar & Plaster

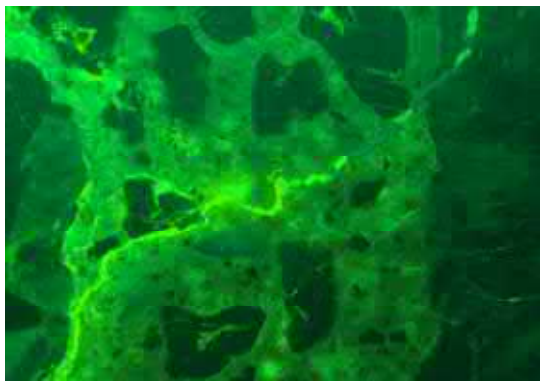
Petrographic examination that follows ASTM C856 can be applied to verify that the product was mixed as designed and that the appropriate or specified materials were used. Concrete petrography also helps to identify the nature of deterioration or defects, determine the degree of damage, and to evaluate whether the damage will continue. Perhaps most critically, petrographic analyses aid repair versus replace decisions, making them an integral part of evaluation strategies.





Geolabs Limited can also investigate hardened concrete by looking at the following:

- Aggregate type (mineralogical), characteristics, size & distribution
- Cement type
- Mineral additives (ground granulated blast furnace slag, fly ash, silica fume, etc.)
- Micro-crackings
- Degree of cement hydration, air void content and Water-cement (w/c) ratio
- Micro-porosity
- Carbonation depth
- Alkali-silica reaction (ASR), Alkali-carbonate reaction (ACR)
- Sulphate attack (ettringite & thaumasite), Delayed Ettringite Formation (DEF)
- Fire damage



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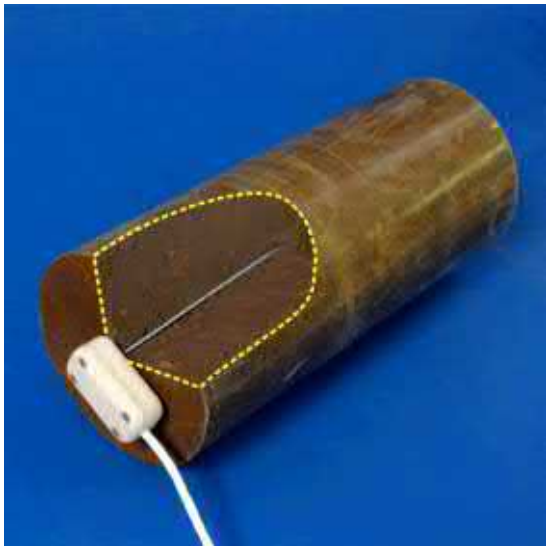
Thermal Properties

Independent Soil and Rock Geotechnical Laboratory Testing

Thermal conductivity under steady-state conditions is an important parameter in the design of infrastructure for the transport of electricity though high voltage cables and high temperature oil through pipelines. Geolabs provides a range of thermal property measurements of soils and rocks for both offshore and land-based projects.

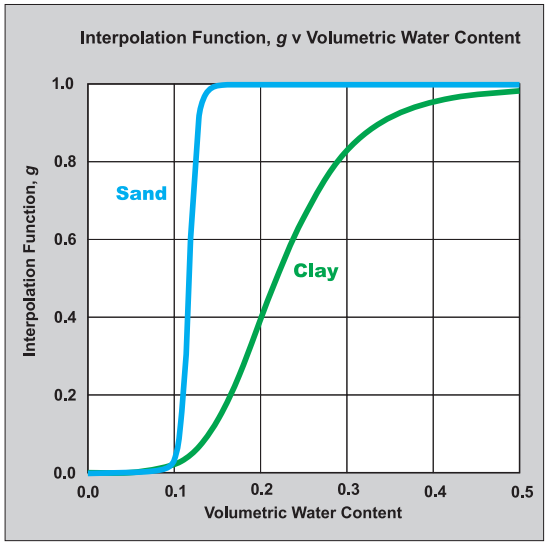
- Thermal conductivity by needle probe procedure (ASTM D5334-14)
- Thermal resistivity (IEEE 442-03 heat transfer theory)
- Volumetric specific heat capacity
- Thermal diffusivity



Thermal conductivity is the intrinsic ability of a material to transfer or conduct heat. **Thermal resistivity** is the capability of a material to resist the flow of heat and is the reciprocal of thermal conductivity.

The **volumetric specific heat capacity** of a material is the amount of energy in the form of heat that has to be added to one unit volume of the material in order to cause an increase of one unit temperature.

Thermal diffusivity is the rate of temperature change through a material or, alternatively, how quickly a material reacts to a change in temperature.



Thermal Dryout Curves

Thermal conductivity of a soil depends strongly on the water content.

Thermal dryout curves represent the effect on the conductivity of this variability.

Geolabs can provide dryout curves for various soil types by modelling, testing or a combination of both.

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Hydraulic (Rowe) Cell Testing

Independent Soil and Rock Geotechnical Laboratory Testing

The Facility

Independent testing company exclusively devoted to commercial, research and client-specific geotechnical laboratory testing, whose multidisciplinary staff are experienced in all aspects of soil and rock testing.

Dedicated facility for hydraulic (Rowe) cell consolidation and permeability testing.

UKAS accredited laboratory with staff having significant knowledge and experience of many national and international standards and Eurocode requirements.

Rapid processing of test data using in-house developed software to provide clients with reports in printed, PDF and electronic formats.

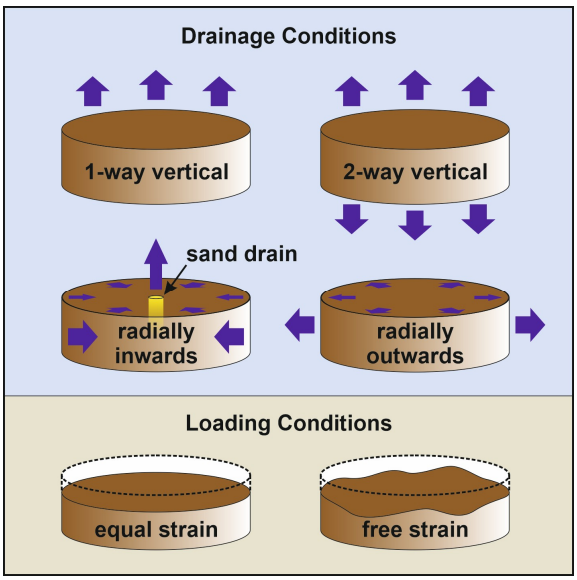
The Analysis

Capability to determine consolidation and permeability parameters of specimens of 75, 100 and 250 mm diameter.

Comprehensive variety of drainage paths include: one-way and two-way vertical, and outwards and inwards horizontal (radially outwards to the periphery, and radially inwards from the periphery to a central sand drain).

Specimens can be consolidated with equal strain (as with an oedometer), or with free strain (where the specimen's height can change variably across its top surface under uniform vertical stress, so accommodating any non-uniform compressibility).

Height change, volume change and base pore pressure are monitored and logged throughout the test allowing flexibility when analysing the test data.



An unlimited number of test stages can be performed, including loading and unloading loops, up to a maximum confining pressure of 3500 kPa.

The Benefits

The wide range of drainage and loading conditions compared to traditional oedometer apparatus allows for closer modelling of in-situ conditions making the derived parameters much more applicable (such as measuring the horizontal permeability of laminated materials).

Capability to test larger, more representative specimens which are particularly suitable for material incorporating coarser particles, and variable materials such as peats.

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Effective Stress Testing

Independent Soil and Rock Geotechnical Laboratory Testing

The Facility

A temperature-controlled laboratory (maintained to better than ± 2°C) using the latest electronic data acquisition for 24 hours-a-day, 365 days-a-year testing.

Multidisciplinary staff experienced in all aspects of soil and rock testing.

Rapid processing of raw test data using our own in-house developed software to generate reports in printed, PDF and AGS formats.

A large testing capacity including: 3 cyclic triaxials, 8 advanced triaxials with local strain and bender element capability, and 54 standard effective stress triaxials comprising a mix of manual and fully automated setups.

The Analysis

Cyclic and static compression or extension capability.

Anisotropically and isotropically consolidated **undrained** triaxial compression testing, performed as single stage or multistage.

Anisotropically and isotropically consolidated **drained** triaxial compression testing, performed as single stage or multistage.

Capable of testing a wide range of sample sizes (from 38 mm to 150 mm) and sample types (U100's, Shelby, MOSTAP, piston, Delft, windowless etc.) as well as lathing-down from intact block samples.

Facilities for high pressure testing using cell pressures in excess of 1700 kPa (up to 3500 kPa for some diameters and test types).

The Benefits

Independent testing facility exclusively devoted to commercial and research geotechnical laboratory testing.

An all-round service of the highest standard backed-up by a fully documented quality management system.

High quality testing and results presentations, both of which can be tailored to your requirements.

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GEOLABS®

Consolidation Testing

Independent Soil and Rock Geotechnical Laboratory Testing

The Facility

- Independent testing company exclusively devoted to commercial, research and client-specific geotechnical laboratory testing, whose multidisciplinary staff are experienced in all aspects of soil and rock testing.
- Dedicated facility for Oedometer Consolidation, Isotropic Consolidation, Hydraulic (Rowe Cell) Consolidation, and Continuous Rate of Strain Consolidation.
- Rapid processing of the raw test data using our own in-house developed software to generate to generate reports in printed, PDF and AGS formats.

The Analysis

- **Oedometer Consolidation** and swelling tests on samples from 50 mm to 150 mm diameter.
- **Isotropic Consolidation** in a triaxial cell on samples from 38mm to 150mm diameter as well as the conventional 100mm diameter. This can be augmented with direct measurements of permeability at each effective pressure.
- **Hydraulic (Rowe Cell) Consolidation** on samples from 76 mm to 250 mm to allow either vertical drainage or horizontal drainage (either radially inwards or outwards), and also free or fixed vertical strain. As with the Isotropic Consolidation, this test can have permeability stages added to it.

The Benefits

- Independent testing facility exclusively devoted to commercial and research geotechnical laboratory testing.
- An all-round service of the highest standard backed by fully documented quality management system.
- High quality testing and results presentation, both of which can be tailored to meet clients requirements.
- Geolabs are **UKAS Accredited** for the Oedometer Consolidation and follow fully documented procedures for the other test methods.

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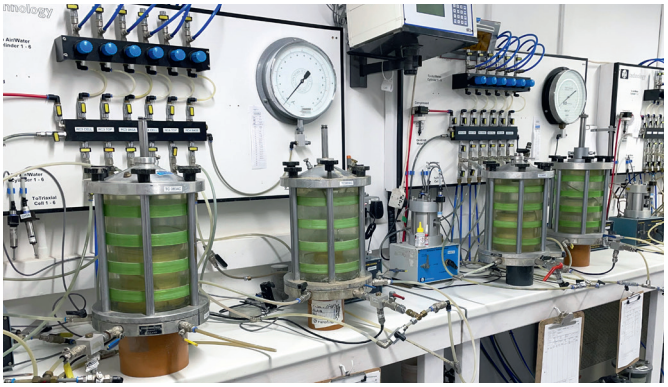
Permeability Testing

Independent Soil and Rock Geotechnical Laboratory Testing

The Facility

- A Temperature controlled laboratory (maintained to better than ± 2°C) using the latest electronic data acquisition for 24 hours-a-day, 365 days-a-year testing.
- Rapid processing of raw test data using our own in-house developed software to generate reports in printed PDF and AGS formats.



The Analysis

- **Triaxial Permeability** (BS EN ISO 17892 - 11: 2019 and WRc Accelerated Method). Particularly suited for landfill site clay liners, BES, bentonite enriched and other stabilised materials.
- **Oedometer Permeability** in a one-dimensional consolidation cell. BS EN ISO 17892 – 11: 2019
- **Constant Head Permeability** in a Permeameter for non-cohesive material up to 10mm particle size. BS EN ISO 17892 – 11: 2019
- **Horizontal Permeameter** (DoT: HA4190). Used for drainage layer material up to 37.5 mm particle size.
- **Hydraulic (Rowe) Cell** - from 76 mm tp 250mm sizes. Permeability can be measured in either vertical or horizontal directions - excellent for laminated soils.
- **Contaminated Materials** - Capability to determine permeability of soils using contaminated materials and other fluids
- **Falling Head Permeability**.

The Benefits

- Independent testing facility exclusively devoted to commercial and research geotechnical laboratory testing.
- An all-round service of the highest standard backed by fully documented quality management system.
- High quality testing and results presentation, both of which can be tailored to meet clients requirements.
- Geolabs are **UKAS Accredited** for the Triaxial Permeability and follow fully documented procedures for the other test methods.

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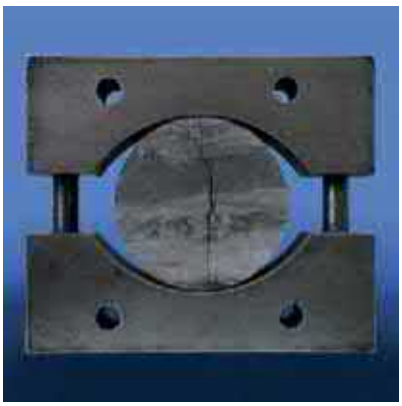
Rock Testing

Independent Soil and Rock Geotechnical Laboratory Testing

- Unconfined Compressive Strength (UCS)
- Young's Modulus, E, and Poisson's Ratio, ν
- Stress-controlled or strain-controlled loading for compression tests
- Hoek Triaxial up to 70 MPa confining pressure
- Hoek Triaxial can have E and ν determinations
- Sophisticated preparation techniques to allow testing at any orientation in relation to foliation/drilling angle
- Rock Shear Box (Direct Shear)
- Indirect Tensile Strength by Brazilian Disc method



- Rock permeability
- Rock swelling pressure
- Swelling Strain Index
- Cherchar Abrasivity
- Slake Durability Index
- Point Load Test (PLT)
- Thermal Conductivity
- Specific Heat Capacity
- Electrical Resistivity/Conductivity

- Petrography - analysis of rocks in thin section
- Thin section preparation
- Petrographic optical microscopy analyses
- Grain shape, sphericity and angularity determination
- Schmidt Hammer
- Shore Scleroscope

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Shearbox & Ringshear Testing

Independent Soil and Rock Geotechnical Laboratory Testing

The Facility

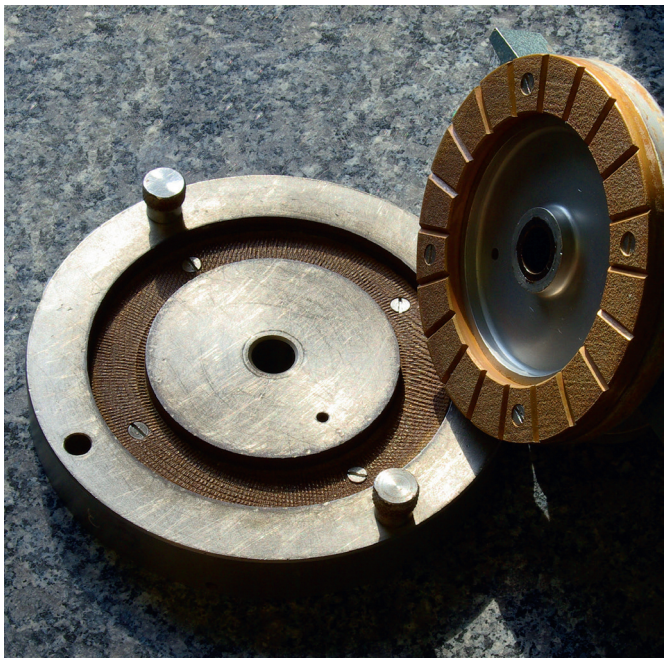
- Independent testing company exclusively devoted to commercial, research and client-specific geotechnical laboratory testing, whose multidisciplinary staff are experienced in all aspects of soil and rock testing.
- Rapid processing of raw test data using our own in-house developed software to generate reports in printed, PDF, and AGS formats.

The Analysis

- **Direct Shear** strength determination (peak and residual) using 60mm, 100mm and 300mm square shearboxes for specimens with up to 20mm largest particle size.
- Samples can be prepared from many sources (including remoulded bulk samples, U100's, core cutters, piston tubes and intact block samples).
- **Ringshear** apparatus for residual shear strength determination of fine-grained material, both to BS CEN ISO 17892-10: 2018 and the ICP Design Methods (particularly suitable for pile design) with **interface roughness measurement** if required.
- **Geotextile / Geomembrane / Other soil interface testing** to ASTM, BS, SHW and other client specified test procedures.

The Benefits

- An all-round service of the highest standard backed by a fully documented quality management system.
- High quality testing and results presentation, both of which can be tailored to meet clients requirements.
- Geolabs are **UKAS Accredited** for testing to BS EN ISO 17892 for the small and large Shearboxes and the Ringshear apparatus, as well as a wide range of other specialist and routine tests.



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