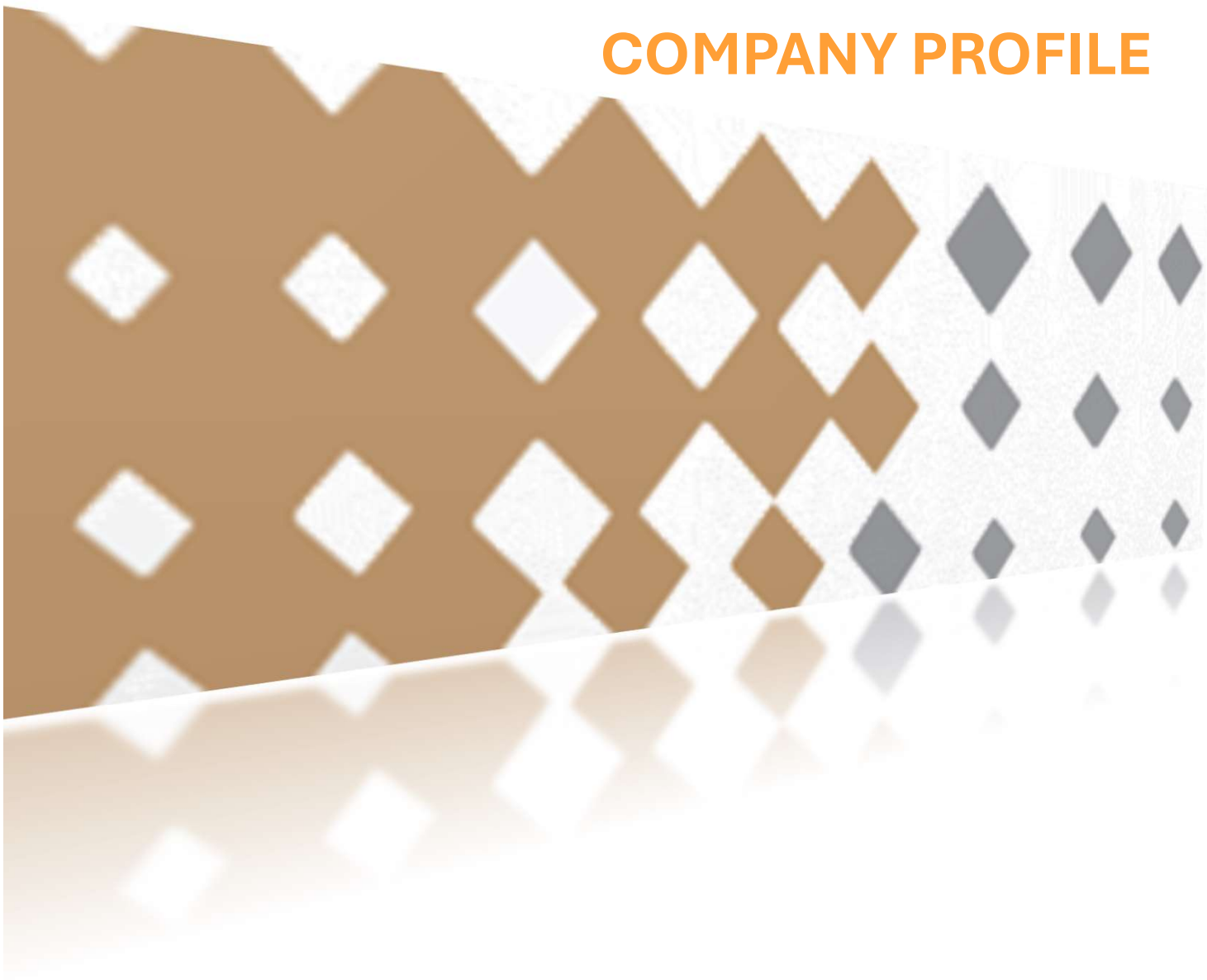
GEONAMICS

YOUR ONE-STOP PROFESSIONAL TESTING CENTRE

**TESTING**
**INSPECTION**
**CERTIFICATION**
**INSTRUMENTATION**
**CALIBRATION**

# COMPANY PROFILE



www.geonamics.com.my
www.geonamics.com.sg



*2024-05-02*

GEONAMICS

YOUR ONE-STOP PROFESSIONAL TESTING CENTRE

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# Message From Managing Director

Dear Valued Partners and Clients,

I am delighted to extend my heartfelt greetings to all of you as the director of Geonamics, a leading provider of geotechnical engineering testing services and now proud to announce our expansion into inspection, certification, and calibration solutions.

Since our establishment, Geonamics has been dedicated to setting the benchmark for excellence, integrity, and innovation in the geotechnical engineering testing industry. As an independent testing agent, we have earned the trust of our clients across diverse sectors by delivering precise and reliable data, vital for informed decision-making and ensuring the integrity and safety of structures and infrastructures.

Today, I am thrilled to share that we have expanded our portfolio to offer comprehensive inspection, certification, and calibration services, further solidifying our commitment to meeting the evolving needs of our clients. With this expansion, we now stand as a one-stop solution provider, offering a full spectrum of services to support your engineering projects from inception to completion.

Our inspection services are designed to provide thorough assessments of equipment, materials, and processes, helping you maintain compliance with industry standards and regulations. Whether you require routine inspections or specialized evaluations, our team of experts is here to ensure the reliability and safety of your assets.

Furthermore, our certification services offer independent verification of quality, safety, and performance, instilling confidence in your products, systems, and processes. With our rigorous certification processes and globally recognized accreditations, you can demonstrate compliance with regulatory requirements and differentiate yourself in the marketplace.

As we embark on this new chapter of growth and expansion, our core values of excellence, integrity, and customer-centricity remain unwavering. We are committed to delivering superior solutions tailored to your specific needs, backed by unparalleled technical expertise, industry-leading technology, and a relentless focus on quality and innovation.

I would like to take this opportunity to express my deepest gratitude to our clients, partners, and employees for their continued trust, support, and dedication. It is through your collaboration and commitment that we have achieved this significant milestone, and it is with your ongoing partnership that we will continue to thrive and make a positive impact in the industry.

Thank you for choosing Geonamics as your trusted partner for geotechnical engineering testing, inspection, certification, and calibration services. We are excited about the opportunities that lie ahead and look forward to serving you with excellence every step of the way.

Warm regards,

Dato Ir. Chuah Lam Siang
Managing Director, Geonamics

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## Who We Are

Geonamics is a leading one-stop testing centre for construction and geotechnical works. With a strong commitment to delivering accurate and reliable results accordance to the latest test standards, we offer a comprehensive range of testing services across various departments.

Our commitment to excellence, reliability, and professionalism has made us a trusted partner for numerous clients in the construction industry. We take pride in our ability to deliver accurate results, adhere to strict timelines, and provide cost-effective solutions. Our team of experts is always ready to go the extra mile to meet the unique requirements of each project.

Geonamics is dedicated to playing a pivotal role in the success of our clients' ventures. With our expertise, advanced-calibrated facilities, and commitment to quality, we strive to exceed expectations and contribute to the growth and development of the construction and geotechnical sectors.

## Our Mission

To provide testing, inspection, certification, instrumentation, and calibration services fully compliance to the latest test standard.

## Our Vision

To safeguard the construction industry with reliable and accurate testing results.

## Our Values

Our commitment to keep quality, impartiality, competence and confidentiality of testing services.

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# Our Services

## Inspection (ISO 17020)

- **Scaffold**
- **Falsework**
- **Site Investigation Work***
- **Geotechnical Borehole***
- **Instrumentation & Monitoring***

## Calibration

- **Strain Transducer (PDI) Calibration**
- **Single & Multi Jack for PC Strand**
- **SPT Hammer Calibration**

## Testing (ISO 17025)

- **Site Investigation**
  - *On-shore*
  - *Near-shore / Offshore*
- **Construction Materials Testing**
  - *Soil & Rock Materials*
  - *Aggregate*
  - *Concrete*
  - *Steel (Steel Bar, Plates, Coupler, PC Strand, Pipes)*
  - *Bituminous Materials*
  - *Geosynthetic Materials**
- **Non-destructive Testing**
  - *Ultrasonic Pulse Velocity (UPV) Test*
  - *Electromagnetic Covermeter Test*
  - *Rebar Scanning & Mapping Test*
  - *Rebound Hammer Test*
  - *Windsor Probe Test*
- **Deep Foundation Testing**
  - *Static Load Tests*
    - *Kentledge Method*
    - *Bidirectional Load Test*
    - *Lateral Pile Load Test*
  - *High & Low Strain Dynamic Load Test (PDA & PIT)*
  - *Cross-hole Sonic Logging Test*
  - *SHAPE Test*
  - *Rapid Load Test*
- **Geophysical Testing**
  - *Soil Resistivity Mapping**
  - *Downhole Seismic Test**

## Instrumentation & Monitoring

- **Geotechnical Engineering Applications**
  - *Deformation of Retaining Structures/Slope (via inclinometer, SAA etc.)*
  - *Displacement/Settlement of Greenland or Built Structures*
  - *Excess Porewater Pressure in Soil*
  - *Underground Water Fluctuations*
- **Structural Health Monitoring**
  - *Temperature monitoring of mass concrete casting*
  - *Deformation of Bridge Structures (via SAA)*
  - *Structure Cracks Monitoring*
  - *Dilapidation Survey*

## Certification (ISO 17065)

- **Scaffold**
- **Falsework**
- **Piling Works Product***
- **Ready-Mix Concrete***

# Accreditations & Recognition

**Geonamics** is honored to be recognized for our commitment to excellence and adherence to industry standards. We take great pride in our accreditations and recognitions, as they affirm our dedication to quality, integrity, and continuous improvement. These accolades serve as a testament to our relentless pursuit of excellence in everything we do, providing our clients with the confidence and assurance that they are partnering with a trusted and reputable organization. Allow us to introduce our accreditations and recognitions, each symbolizing our unwavering commitment to upholding the highest standards of professionalism and service excellence.

## MALAYSIA
**Geonamics (M) Sdn. Bhd.**

ilac-MRA
STANDARDS MALAYSIA ACCREDITED
SAMM 999
CERTIFIED ISO 9001:2015
BUREAU VERITAS
UKAS MANAGEMENT SYSTEMS 0008

## SINGAPORE
**Geonamics (S) Pte. Ltd.**

Accredited Laboratory SAC-SINGLAS LA-2013-0548-B
Accredited Inspection Body SAC IB-2019-173-F
Accredited Certification Body SAC QS-2019-34
ADVANCED CERTIFICATION ISO 9001:2015

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## Our Partners

Geolab (M) Sdn. Bhd.

Ikram Geotechnique Sdn. Bhd.

**We** take pride in our collaborative approach to delivering exceptional solutions to our clients. We are honored to introduce "our partner," a trusted ally whose expertise and dedication complement our own, enabling us to enhance the quality and breadth of services we offer. With a shared commitment to excellence and customer satisfaction, "our partner" embodies the same values and principles that define our company. Together, we are dedicated to providing innovative and comprehensive solutions that exceed expectations and drive success for our clients.

## Our Clients

Our clients are at the heart of everything we do. We are privileged to introduce "our client," a valued partner whose vision, challenges, and aspirations drive us to excel every day.

JKR JABATAN KERJA RAYA MALAYSIA
PKNS
PTP
IJM
中国交通建设 CHINA COMMUNICATIONS CONSTRUCTION
GAMUDA
SUNWAY CONSTRUCTION
WCT
CANTILEVER
MMC Engineering
GDB
lendlease
EKOVEST
ECOWORLD CREATING TOMORROW & BEYOND
TIONG NAM
HEC 中国港湾 CHINA HARBOUR
中国中铁 CHINA RAILWAY ENGINEERING CORPORATION
CR SEA
KELLER
SAMSUNG C&T
BAUER
BACHY SOLETANCHE
ECONPILE
Pintaras Jaya Berhad
ak antara koh
JF 地基土木工程 FOUNDATION
SKL PILING & CONSTRUCTION SDN BHD

... and many more.

# Recent Key Projects

**We** are pleased to involve in the impactful projects we undertake. Allow us to introduce some of our key projects, each representing a testament to our expertise, innovation, and commitment to excellence. These projects not only showcase our technical prowess but also highlight our dedication to delivering solutions that meet and exceed the unique needs of our clients. From groundbreaking infrastructure developments to intricate engineering challenges, our key projects demonstrate our ability to turn vision into reality and make a meaningful impact in the communities we serve.

TNB monopole transmission tower Penang

Merdeka 118


Tun Razak Exchange


Johor Bahru–Singapore Rapid Transit System (RTS)

Penang Swettenham Pier

Malaysia-Singapore Second Link

Penang 2nd Bridge Project

Electrified Double Track Project (EDTP)

LRT 3

ECRL
East Coast Rail Link

KVMRT2 Project

DUKE E39 SPE

JKR ECER CSR CENTRAL SPINE ROAD

LEBUHRAYA KAJANG SILK HIGHWAY E18

WCE WEST COAST EXPRESSWAY

E31 DASH
DAMANSARA-SHAH ALAM ELEVATED EXPRESSWAY

E19 SUKE
SUNGAI BESI-ULU KELANG ELEVATED EXPRESSWAY

E12 AKLEH
Ampang-Kuala Lumpur Elevated Highway

# Branches

## MALAYSIA

### Geonamics (M) Sdn. Bhd.

Address: No. 6, Lot 25, Jalan Udang Harimau 1, Medan Niaga Kepong, 51200 , Kuala Lumpur.
Phone: +603 6243 4715
Email: info@geonamics.com.my

### Geonamics (Sarawak) Sdn. Bhd.

Address: CJ206, Lorong Andar Baru, Batu Kawah 1H, Batu Kawah New Township, 93250, Kuching, Sarawak
Phone: +6016 723 6491
Email: info@geonamics.com.my

## SINGAPORE

### Geonamics (S) Pte. Ltd.

Address: 5 Kwong Min Rd, Singapore 628708
Phone: +65 6893 6913
Email: info@geonamics.com.sg

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# APPENDIX

# Appendix 1 – LEGAL REGISTRATION

CIDB MALAYSIA

## PERAKUAN PENDAFTARAN

Adalah dengan ini diperakui bahawa kontraktor yang dinyatakan di bawah ini telah berdaftar dengan Lembaga mengikut Bahagian VI Akta Lembaga Pembangunan Industri Pembinaan Malaysia 1994. Pendaftaran ini adalah tertakluk kepada syarat-syarat yang telah ditetapkan bersama perakuan ini.

| | | |
|---|---|---|
| **No. Pendaftaran** | : | 1970606-JH034083 |
| **Nama Kontraktor** | : | GEONAMICS (M) SDN. BHD. |
| **Alamat Berdaftar** | : | NO 6, LOT 25, JALAN UDANG HARIMAU 1, MEDAN NIAGA KEPONG, 51200 KUALA LUMPUR<br>WILAYAH PERSEKUTUAN KUALA LUMPUR |
| **Daerah** | : | KUALA LUMPUR |
| **Tarikh Mula Berdaftar** | : | 06/06/2000 |

| GRED | KATEGORI | PENGKHUSUSAN |
|---|---|---|
| G3 | B | B04 |
| G3 | CE | CE21 CE25 |
| G3 | ME | M15 |

Tarikh Mula Berkuatkuasa : **27/11/2023**

Tarikh Habis Tempoh Perakuan : **24/11/2026**

**STATUS: AKTIF**

Ketua Eksekutif

Lembaga Pembangunan Industri Pembinaan Malaysia

Tarikh: 27/11/2023

# Appendix 2 - ISO 9001

BUREAU VERITAS

Bureau Veritas Certification

## GEONAMICS (M) SDN BHD

No. 6 Lot 25, Jalan Udang Harimau 1, Medan Niaga Kepong, 51200 Kuala Lumpur, Malaysia.

*Bureau Veritas Certification Holding SAS - UK Branch certifies that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below*

## ISO 9001:2015

*Scope of certification*

1. PROVISION OF GEOTECHNICAL INVESTIGATION, INSTRUMENTATION MONITORING AND TESTING ON VARIES FOUNDATION, SLOPES, EARTH RETAINING AND UNDERGROUND STRUCTURES

2. PROVISION OF CONSTRUCTION MATERIALS TESTING ON SOIL, ROCK, CONCRETE, STEEL AND ASPHALT/BITUMINOUS MATERIALS

| | |
|---|---|
| Original cycle start date: | 25-11-2017 |
| Expiry date of previous cycle: | 24-11-2023 |
| Certification / Recertification Audit date: | 10-11-2023 |
| Certification / Recertification cycle start date: | 25-11-2023 |
| Subject to the continued satisfactory operation of the organisation's Management System, this certificate expires on: | 24-11-2026 |

Certificate No.: MY009783 Version: 1 Issue date: 24-11-2023

UKAS MANAGEMENT SYSTEMS 0008

Mohd Nizam Abdul Malik - Chief Executive (Malaysia)
*Signed on behalf of BVCH SAS UK Branch*

*Certification Body Address: 5th Floor, 66 Prescot Street, London, E1 8HG, United Kingdom*

*Local Office: Lot 19.01 & 19.02, 19th Floor, Menara KH, Jalan Sultan Ismail, 50250 Kuala Lumpur, Malaysia.*

Further clarifications regarding the scope and validity of this certificate, and the applicability of the management system requirements, please call: +603 2733 7700

UKAS Certificate Template Single Site Rev.4.1 28 Aug 2023

1/1

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# Appendix 3 – Accredited Scope (MALAYSIA)

**Issue Date: 17 November 2025**
**Valid Until: 18 February 2029**

**NO: SAMM 999**
(Issue 2, 17 November 2025 replacement
of SAMM 999 dated 08 February 2024)



| | |
|---|---|
| **LABORATORY LOCATION/ CENTRAL OFFICE:** | GEONAMICS (M) SDN. BHD.<br>NO.6, LOT 25, JALAN UDANG HARIMAU 1<br>MEDAN NIAGA KEPONG<br>51200 KUALA LUMPUR<br>MALAYSIA |
| **ACCREDITED SINCE:** | 18 FEBRUARY 2021 |
| **FIELD OF TESTING:** | MECHANICAL |
| **FIELD OF CALIBRATION:** | DIMENSIONAL |

This laboratory has demonstrated its technical competence to operate in accordance with MS ISO/IEC 17025:2017 (ISO/IEC 17025:2017).

This laboratory's fulfillment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid test results and calibrations. The management system requirements in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001 (see Joint ISO-ILAC-IAF Communiqué dated April 2017).

*** The uncertainty covered by the CMC is expressed as the expanded uncertainty corresponding to a coverage probability of approximately 95 % and have a coverage factor of k=2 unless stated otherwise.**

| | |
|---|---|
| **CENTRAL LOCATION:** | GEONAMICS (M) SDN. BHD.<br>NO.6, LOT 25, JALAN UDANG HARIMAU 1<br>MEDAN NIAGA KEPONG<br>51200 KUALA LUMPUR |
| **FIELD OF TESTING:** | MECHANICAL |

**SCOPE OF TESTING: MECHANICAL**

| Materials/ Products Tested | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|---|---|---|
| Aggregate | Determination of Loose Bulk Density and Voids for Aggregates | BS EN 1097-3 |
| | Determination of Aggregate Crushing Value (ACV) | BS 812-110 |
| | Determination of Ten Per Cent Fines Value (TFV) | BS 812-111 |

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**Valid Until: 18 February 2029**

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## SCOPE OF TESTING: MECHANICAL

| Materials/ Products Tested | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|---|---|---|
| Aggregate | Determination of Aggregate Impact Value (AIV) | BS 812-112 |
| | Determination of Shell Content- Percentage of Shell in Coarse Aggregate | BS EN 993-7 |
| | Determination of Clay Lumps and Friable Particles in Aggregates | ASTM C142/C142M |
| | Determination of Potential Presence of Humus (Organics Impurities) | BS EN 1744-1, Clause 15.1 |
| | Determination of Particle Size Distribution: Sieving Method | BS EN 933-1 |
| | Determination of Particle Density and Water Absorption | BS EN 1097-6 |
| | Determination of pH Value | BS 1377-3, Clause 12 |
| | Determination of Particle Shape-shape Index | BS EN 933-4 |
| | Determination of Particle Shape- Flakiness Index | BS EN 933-3<br>BS 812-105.1 |
| | Elongation Index | BS 812-105.2 |
| | Soundness of Aggregate | ASTM C88/C88M |
| | Organic Impurities in Fine Aggregate for Concrete | ASTM C40/C40M |
| | Determination of the Water Content by Drying in a Ventilated Oven | BS EN 1097-5 |

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## SCOPE OF TESTING: MECHANICAL

| Materials/ Products Tested | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|---|---|---|
| Soils | Determination of Water Content (Oven Drying Method) | BS 1377-2, Clause 4.1<br>BS EN ISO 17892-1<br>MS 1056: Part 2, Clause 4.2 |
| | Determination of the Liquid Limit: Fall Cone Method | BS 1377-2, Clause 5.2 & 5.3<br>BS EN ISO 17892-12, Clause 5.3<br>MS 1056: Part 2, Clause 5.3 & 5.4 |
| | Determination of the Plastic Limit and Plasticity Index | BS 1377-2, Clause 6<br>BS EN ISO 17892-12, Clause 5.5<br>MS 1056: Part 2, Clause 6 |
| | Determination of Shrinkage Characteristics: Linear Shrinkage Method | BS 1377-2, Clause 7<br>MS 1056: Part 2, Clause 7.5 |
| | Determination of Density: Linear Measurement Method | BS 1377-2, Clause 9<br>BS EN ISO 17892-2, Clause 5.1<br>MS 1056: Part 2, Clause 8.2 |
| | Determination of Particle Density: Fluid Pycnometer Method | BS 1377-2, Clause 8<br>BS EN ISO 17892-3, Clause 5.1<br>MS 1056: Part 2, Clause 9.3 & 9.4 |
| | Determination of Particle Size Distribution: Sieving, Hydrometer and Combined Tests | BS 1377-2, Clause 10<br>BS EN ISO 17892-4, Clause 5.2, 5.3 & 5.5<br>MS 1056: Part 2, Clause 10.2, 10.3 & 10.5 |
| | Determination of Dry Density/ Water Content Relationship:<br>2.5 kg Rammer Method<br>4.5 kg Rammer Method<br>Vibrating Hammer Method | BS 1377-2,<br><br>Clause 11.3 & 11.4<br>Clause 11.5 & 11.6<br>Clause 11.7<br><br>MS 1056: Part 4<br><br>Clause 4.3 & 4.4<br>Clause 4.5 & 4.6<br>Clause 4.7 |

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## SCOPE OF TESTING: MECHANICAL

| Materials/ Products Tested | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|---|---|---|
| Soils | Determination of California Bearing Ratio (CBR) | BS 1377-2, Clause 15<br>MS 1056: Part 4, Clause 8 |
| | Consolidated Triaxial Compression Tests on Water Saturated Soils (CIU, CAU, CID, CAD) | BS EN ISO 17892: Part 9<br>MS 1056: Part 8 |
| | Unconsolidated Undrained Triaxial Tests (UU) | BS EN ISO 17892: Part 8<br>MS 1056: Part 7, Clause 9 |
| | Unconfined Compression Test (UCT) | BS EN ISO 17892: Part 7<br>MS 1056: Part 7, Clause 8.2 |
| | Incremental Loading Oedometer Test | BS EN ISO 17892: Part 5<br>MS 1056: Part 5, Clause 4 |
| Concrete | Compressive Strength of Test Specimens | BS EN 12390-3 |
| | Density of Hardened Concrete | BS EN 12390-7 |
| | Depth of Penetration of Water Under Pressure | BS EN 12390-8 |
| | Cored Specimen- Taking, Examining and Testing in Compression | BS EN 12504-1 |
| | Determination of Water Absorption | BS 1881-122 |
| | Determination of Secant Modulus of Elasticity in Compression | BS EN 12390-13 |
| | Determination of the Initial Surface Absorption of Concrete | BS 1881-208 |
| | Flexural Strength of Test Specimens | BS EN 12390-5 |
| | Tensile Splitting Strength of Test Specimen | BS EN 12390-6 |
| | Determination of Rebound Number | BS EN 12504: Part 2 |

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**SCOPE OF TESTING: MECHANICAL**

| Materials/ Products Tested | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|---|---|---|
| Rocks | Unconfined Compressive Strength of Intact Rock Core Specimens | ASTM D7012, Method C |
| | Elastic Moduli of Intact Rock Core Specimen in Uniaxial Compression | ASTM D7012, Method D |
| | Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classification | ASTM D5731 |
| Bituminous Materials | Marshall Stability and Flow of Asphalt Mixtures | ASTM D6927 |
| | Bulk Specific Gravity and Density of Non- Absorptive Compacted Asphalt Mixtures | ASTM D2726/D2726M |
| | Quantitative Extraction of Asphalt Binder from Asphalt Mixtures | ASTM D2172/D2172M (Method A- Centrifuge Extraction) |
| | Thickness of Height of Compacted Asphalt Mixtures | ASTM D3549/D3549M (Method A) |
| Metal & Metal Product (Steel Bar) | Tensile Properties | MS 146, Clause 7.3.3<br>MS ISO 6892-1<br>ISO 6892-1<br>MS ISO 15630-1<br>BS EN ISO 15630-1<br>BS 4449, Clause 7.2.3 |
| | Bend Performance | BS EN ISO 15630-1 |
| Metal & Metal Product (Weldable Reinforcing Steel) | Tensile Test Properties | BS 4449: Clause 7.2.3 |
| | Bend Performance (Bend, Ageing & Re-bend Test) | MS 146, Clause 7.3.5<br>BS 4449, Clause 7.2.5 |
| | Dimensions, Mass Per Meter and Tolerances | BS EN ISO 15630: Part 1, Clause 12<br>MS 146, Clause 7.4<br>BS 4449, Clause 7.3 |

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**SCOPE OF TESTING: MECHANICAL**

| Materials/ Products Tested | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|---|---|---|
| Metal & Metal Product<br>(Steel Wire) | Tensile Test Properties | BS EN ISO 15630: Part 1, Clause 5<br>ISO 6892: Part 1<br>MS 144, Clause 7.2.3<br>BS 4482, Clause 7.2.3 |
| | Bend Performance Test (Bend, Ageing & Re-bend Test) | BS EN ISO 15630: Part 1, Clause 6 & 7<br>MS 144, Clause 7.2.4<br>BS 4482, Clause 7.2.5 |
| | Dimensions, Mass Per Meter and Tolerances | BS EN ISO 15630: Part 1, Clause 12<br>MS 144, Clause 7.3<br>BS 4482, Clause 7.3 |
| Metal & Metal Product<br>(Multi-Wire Steel Prestressing Strand) | Tensile Test | ASTM A1061/A1061M, Clause 9<br>BS EN ISO 15630: Part 3, Clause 5 |
| Metal & Metal Product<br>(Reinforcement Couplers for Mechanical Splices of Bars) | Tensile Test Properties | ISO 15835: Part 2, Clause 5.3 |
| | Slip Test | ISO 15835: Part 2, Clause 5.4<br>BS 8110: Part 1. Clause 3.12.8.16.2 |
| Welds and Welded Test Specimens<br>(Welded Steel Fabric) | Tensile Properties | MS 145, Clause 8.1.3.1<br>MS ISO 15630-2<br>BS EN ISO 15630-2<br>MS ISO 6892-1<br>ISO 6892-1 |
| | Bend Performance | MS 145, Clause 7.2.5<br>MS ISO 15630-2<br>BS EN ISO 15630-2 |
| | Weld Shear Force | MS 145, Clause 7.2.4<br>MS ISO 15630-2<br>BS EN ISO 15630-2 |

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**SCOPE OF CALIBRATION: DIMENSIONAL**

| Instrument Calibrated/ Measurement Parameter | Range | Calibration and Measurement Capability Expressed as an Uncertainty(±)* | Remarks |
|---|---|---|---|
| Strain Transducer Sensitivity (Pile Dynamics, Inc models) | Up to 200 με/V | 2.6 με/V | In-house method – "BDI Automated Strain Transducer Calibration System (ASTCS)".<br><br>In House Method – Determination of Calibration Factor/Sensitivity for Strain Transducer (PDI Model) |

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| | |
|---|---|
| **SITE LOCATION (HQ)** | 1. SITE 1 |
| **FIELD OF TESTING:** | MECHANICAL |

**SCOPE OF TESTING: MECHANICAL**

| Materials/ Products Tested | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|---|---|---|
| Soils | In-situ Density Tests: Sand Replacement Method Suitable for Fine and Medium Grained Soils (Small Pouring Cylinder Method) | BS 1377-9, Clause 2.1 |
| | In-situ Density Tests: Sand Replacement Method Suitable for Fine and Medium Grained Soils (Medium Pouring Cylinder Method) | In-house method GEO/CMT/TM/06/014 with Reference to BS 1377-9 |
| | In-situ Density Tests: Sand Replacement Method Suitable for Fine, Medium and Coarse-grained Soils (Large Pouring Cylinder Method) | BS 1377-9, Clause 2.2 |
| | In-situ Density Tests: Core Cutter Method for Cohesive Soils Free from Coarse-Grained Material | BS 1377-9, Clause 2.4 |
| | In-situ Vertical Deformation and Strength Tests: Determination of the In-situ California Bearing Ratio (CBR) | BS 1377-9, Clause 4.3 |
| | Mackintosh Probe Test | In house test method GEO/CMT/06/01 with reference to JKR Specification |
| Other materials (Pile Testing) | Standard Test Method for High-Strain Dynamic Testing of Deep Foundations | ASTM D4945 |

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CALIBRATION

# Appendix 4 – Accredited Scope (SINGAPORE)

SINGAPORE LABORATORY ACCREDITATION SCHEME

Accredited Laboratory SAC-SINGLAS

# Schedule

Geonamics (S) Pte Ltd
No 5, Kwong Min Road
Singapore 628708

Certificate No. : LA-2013-0548-B

Issue No. : 8

Date : 30 August 2024

Expiry of Certificate : 15 September 2025



FIELD OF TESTING: Civil Engineering Testing

| MATERIALS/ PRODUCTS TESTED | TESTS/PROPERTIES | STANDARD METHODS |
|---|---|---|
| **A. PILE** | | |
| A1. | High-strain dynamic testing of deep foundations | ASTM D 4945-17 |
| A2. | Standard test method for low strain impact integrity testing of deep foundations | ASTM D 5882-16 |
| A3. | Standard test method for integrity testing of concrete deep foundations by ultrasonic cross-hole testing | ASTM D 6760-16 |
| A4. | Measuring inclination and shaft profile of deep foundations (SHAPE Method) | ASTM D8232-18 |
| A5. | Standard test method of energy measurement for dynamic penetrometers | ASTM D4633-16 |
| A6. | Rapid Load Testing | BS EN ISO 22477-10: 2016 |
| **B. SOIL** | | |
| B1. | Determination of moisture / water content | BS 1377-2:2022#4<br>BS EN ISO 17892-1:2014+A1: 2022<br>ASTM D2216-19 |
| B2. | Determination of liquid limit, plastic limit and plasticity index & shrinkage characteristics – linear shrinkage | BS 1377-2:2022 #5,6 & 7<br>BS EN ISO 17892-12: 2018+A2: 2022<br>ASTM D4318-17e1 |
| B3. | Determination of dry and bulk density / unit weight | BS 1377-2:2022 #8<br>BS EN ISO 17892-2:2014<br>ASTM D7263-21 |

# Schedule

Accredited Laboratory SAC-SINGLAS

Certificate No. : LA-2013-0548-B Issue No. : 8

Date : 30 August 2024 Page : 2 of 7

| MATERIALS/ PRODUCTS TESTED | TESTS/PROPERTIES | STANDARD METHODS |
|---|---|---|
| B4. | Determination of particle density / specific gravity | BS 1377-2:2022 #9<br>BS EN ISO 17892-3: 2015<br>ASTM D854-23 |
| B5. | Determination of particle size distribution | BS 1377-2: 2022 #10<br>BS EN ISO 17892-4:2016<br>ASTM D6913/D6913M-17<br>ASTM D7928-21e1 |
| B6. | a) Determination of one-dimension consolidation properties | BS 1377-2:2022 #16<br>ASTM D2435/D2435M-11 (2020) |
| | b) Incremental loading oedometer test | BS EN ISO 17892-5:2017 |
| B7. | Determination of swelling and collapse characteristics | BS 1377-2:2022 #17 |
| B8. | a) Determination of permeability in a triaxial cell | BS 1377-2:2022 #23 |
| | b) Permeability tests | BS EN ISO 17892-11:2019 |
| B9. | Determination of unconfined compressive strength (UCT) | BS 1377-2:2022 #27<br>BS EN ISO 17892-7:2018<br>ASTM D2166/D2166M-16 |
| B10. | a) Unconsolidated undrained (UU) triaxial test | BS 1377-2:2022 #28<br>BS EN ISO 17892-8:2018<br>ASTM D2850-23 |
| | b) Unconsolidated undrained triaxial test with measurement of pore water pressure (UUpwp test) | K.H. Head Vol 3 Chapter 19.3 |
| | c) Multistage loading (MUU test) | BS 1377-7:1990#9 |
| B11. | a) Consolidated triaxial compression test on water saturated soil (CIU & CAU tests) | BS1377-2:2022 #29<br>BS EN ISO 17892-9:2018<br>ASTM D4767-11 (2020) |
| | b) Multistage loading (MCU test) | K.H Head Vol.3 Chapter 13.6.5 |
| B12. | a) Consolidated triaxial compression test on water saturated soil (CID & CAD tests) | BS 1377-2:2022 #30<br>BS EN ISO 17892-9:2018<br>ASTM D7181-20 |
| | b) Multistage loading (MCD test) | K.H Head Vol.3 Chapter 19.2 |

# Schedule

Accredited Laboratory SAC-SINGLAS

Certificate No. : LA-2013-0548-B Issue No. : 8

Date : 30 August 2024 Page : 3 of 7

| MATERIALS/ PRODUCTS TESTED | TESTS/PROPERTIES | STANDARD METHODS |
|---|---|---|
| B13. | Determination of resistivity test – Wenner probe method | BS 1377-3:2018+A1:2021 #13.5<br>ASTM G57-20 |
| B14. | Determination of thermal conductivity of soil and soft rock by thermal needle probe procedure | ASTM D5334-22$^{ae1}$ |
| B15. | Thermal resistivity measurements of soils and backfill materials | IEEE 442-2017 |
| B16. | Determination of maximum and minimum dry densities for coarse soils | BS 1377-2:2022 #12 |
| B17. | Determination of dry density / water content relationship (compaction) | BS 1377-2:2022 #11 |
| B18. | Slaking Test | MPA Annex 2: Section D |
| B19. | Dispersibility by Pinhole Test Apparatus | BS 1377-2: 2022 # 18<br>ASTM D4647 / D4647M-13 (Reapproved 2020) |
| B20. | Direct Shear by Small Shearbox | BS 1377-2: 2022 # 25<br>BS EN ISO 17892-10: 2018<br>ASTM D3080 / D3080M-23 |
| B21. | Consolidation – One Dimensional Test using Controlled Strain Loading (CSL) | ASTM D4186 / D4186M-20e1<br>BS EN ISO 19901-8 # B.3.3: 2023 |
| B22. | In-situ Plate Load Test | BS 1377: 1990: Part 9: Clause 4.1 |
| B23. | Amount of Material Finer than 75 μm (No. 200) Sieve in Soils by Washing | ASTM D1140-17 |
| B24. | Rapid Determination of Carbonate Content of Soil | ASTM D4373-21 |
| **C. GEOTEXTILE** | | |
| C1. | (a) Wide-Width Tensile Test of Geotextiles | ASTM D4595-23 |
| | (b) Geosynthetics – Wide Width Tensile Test | BS EN ISO 10319: 2015 |
| C2. | (a) Prefabricated Vertical Drain (PVD) Discharge Capacity Test | ASTM D4716 / D4716M-22 |
| | (b) Geosynthetics – Test Method for the determination of water discharge capacity for prefabricated vertical drains (Index Test) | BS EN ISO 12958-1:2020 |

# Schedule

Accredited Laboratory SAC-SINGLAS

Certificate No. : LA-2013-0548-B Issue No. : 8

Date : 30 August 2024 Page : 4 of 7

| MATERIALS/ PRODUCTS TESTED | TESTS/PROPERTIES | STANDARD METHODS |
|---|---|---|
| | (c) Geosynthetics – Test Method for the determination of water discharge capacity for prefabricated vertical drains (Performance Test) | BS EN ISO 12958-2: 2020 |
| C3. | (a) Prefabricated Vertical Drain (PVD) Discharge Capacity Test with kinks (NUS Method 2) | ASTM D4716/D4716M-22 |
| | (b) Geosynthetics – Test Method for the determination discharge capacity for prefabricated vertical drains with kinks (Index Test) – NUS Method 2 | BS EN ISO 12958-1: 2020 |
| | (c) Geosynthetics – Test Method for the determination of water discharge capacity for prefabricated vertical kinks (Performance Test) – NUS Method 2 | BS EN ISO 12958-2: 2020 |
| C4. | (a) Apparent Opening Size of Geotextile | ASTM D4751-21a |
| | (b) Determination of the Characteristic Opening Size | BS EN ISO 12956: 2020 |
| C5. | (a) Geosynthetics Nominal Thickness of Geotextile | ASTM D5199-12 (Reapproved 2019) |
| | (b) Geosynthetics – Determination of Thickness at Specific Pressure – Part 1: Single Layers | BS EN ISO 9863-1: 2016 + A1: 2019 |
| C6. | Trapezoid Tearing Test of Geotextiles | ASTM D4533/ D4533M-15 (2023) |
| C7. | Grab Breaking Load and Elongation of Geotextiles | ASTM D4632/ D4632M-15a (2023) |
| C8. | (a) Water Permeability of Geotextiles by Permittivity | ASTM D4491/D4491M-22 |
| | (b) Determination of water permeability characteristics normal to the plane, without load | BS EN ISO 11058: 2019 |

# Schedule

Accredited Laboratory SAC-SINGLAS

Certificate No. : LA-2013-0548-B Issue No. : 8

Date : 30 August 2024 Page : 5 of 7

| MATERIALS/ PRODUCTS TESTED | TESTS/PROPERTIES | STANDARD METHODS |
|---|---|---|
| C9. | (a) In-Plane Permeability of Geotextiles | ASTM D4716/D4716M-22 |
| | (b) Geotextiles and geotextile-related products – Determination of water flow capacity in their plane (Index Test) | BS EN ISO 12958-1: 2020 |
| | (c) Geotextiles and geotextile-related products – Determination of water flow capacity in their plane (Performance Test) | BS EN ISO 12958-2: 2020 |
| C10. | (a) Static Puncture Strength of Geotextiles | ASTM D6241-22a |
| | (b) Geosynthetics – Static Puncture Test (CBR Test) | BS EN ISO 12236: 2006 |
| C11. | (a) Measuring Mass per unit area of Geotextiles | ASTM D5261-10 (Reapproved 2018) |
| | (b) Geosynthetics – Determination of mass per unit area of geotextiles and geotextile-related products | BS EN ISO 9864: 2005 |
| C12. | Geosynthetics – Dynamics Perforation Test (Cone Drop Test) | BS EN 918 / ISO 13433: 2006 |
| C13. | (a) Geosynthetics – Tensile test for joint / seams by wide-width strip method | ISO 10321: 2008 |
| | (b) Strength of Sewn or Bonded Seams of Geotextiles | ASTM D4884 / D4884M-22 |
| C14. | Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in A Xenon Arc-Type Apparatus | ASTM D4355/D4355M-21 |
| C15. | Standard Test Method for Index Puncture Resistance of Geomembrane and Related Product | ASTM D4833 / D4833M-07 (Reapproved 2020) |
| C16. | Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method) | ASTM D5035-11 (Reapproved 2019) |
| C17. | Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method | ASTM D6637 / D6637M-15 (2023) |

# Schedule

Accredited Laboratory SAC-SINGLAS

# Schedule

Accredited Laboratory SAC-SINGLAS

Certificate No. : LA-2013-0548-B Issue No. : 8

Date : 30 August 2024 Page : 7 of 7

| MATERIALS/ PRODUCTS TESTED | TESTS/PROPERTIES | STANDARD METHODS |
|---|---|---|
| **D. ROCK** | | |
| D1. | Dimension and Shape Tolerance | ASTM D4543-19 |
| D2. | Water Content of Soil & Rock | ASTM D2216-19<br>ISRM 1977: Part 1-1 |
| D3. | Point Load Test | ASTM D5731-16<br>ISRM 1985 |
| D4. | Compressive Strength Test | ASTM D7012-23<br>ISRM 1979 |
| D5. | Swelling Pressure Index | ISRM 1977: Part 2-1 |
| D6. | Swelling Strain Index | ISRM 1977: Part 2-2 |
| D7. | Slake Durability of Shales and Other Similar Weak Rocks | ASTM D4644 -16 |
| **E. CONCRETE** | | |
| E1. | Compressive Strength of Hardened Concrete Cube | BS EN 12390-3: 2019 |

**Approved Signatories**

| | | |
|---|---|---|
| Mr Chong Kean Chew | - | Section A (except A6) |
| Mr Gilbert Chuah F S | - | Section A6 |
| Mr Tang Kim Chuan | - | Section A6 |
| Dr Henry Tan C Y | - | Sections B, C, D & E |
| Mr Tay Keng Hui | - | Sections B (except B22 and B24), D & E |
| Mr Htet Wai Myint | - | Sections B (except B22), D & E |

Note :

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025. A laboratory's fulfilment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and **management system requirements** that are necessary for it to consistently deliver technically valid tests. The **management system requirements** in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001.

SINGAPORE LABORATORY ACCREDITATION SCHEME

Accredited Laboratory SAC-SINGLAS

# Schedule

Geonamics (S) Pte Ltd
Site Laboratory:
Tanah Merah Coast Road T
Supply Lot 04962N(PT) MK31 LP112F
Singapore 490000

Certificate No. : LA-2013-0548-B-1

Issue No. : 4

Date : 16 August 2023

Expiry of Certificate : 15 September 2025



FIELD OF TESTING : Civil Engineering Testing

| MATERIALS/ PRODUCTS TESTED | Item | TESTS /PROPERTIES | STANDARD METHODS/ TECHNIQUES |
|---|---|---|---|
| A. SOIL | 1.0 | Determination of moisture / water content | - BS 1377-2:1990 CL 3<br>- BS 1377-2: 2022 # 4<br>- BS EN ISO 17892-1:2014+ A1: 2022 |
| | 2.0 | Determination of liquid limit, plastic limit and plasticity index & shrinkage characteristics – linear shrinkage | - BS 1377-2:1990 CL 4 & 5<br>- BS 1377-2: 2022 # 5,6 & 7<br>- BS EN ISO 17892-12: 2018 + A2: 2022 |
| | 3.0 | Determination of dry and bulk density | - BS 1377-2:1990 CL 7<br>- BS 1377-2: 2022 # 8<br>- BS EN ISO 17892-2:2014 |
| | 4.0 | Determination of particle density | - BS 1377-2:1990 CL 8<br>- BS 1377-2: 2022 #9<br>- BS EN ISO 17892-3:2015 |
| | 5.0 | Determination of particle size distribution | - BS 1377-2:1990 CL 9<br>- BS 1377-2: 2022 #10<br>- BS EN ISO 17892-4:2016 |
| | 6.1<br><br>6.2 | Determination of one-dimensional consolidation properties<br><br>Incremental loading oedometer test | - BS 1377-5:1990 CL 3<br>- BS 1377-2: 2022 # 16<br><br>- BS EN ISO 17892-5:2017 |
| | 7.0 | Determination of swelling and collapse characteristics | - BS 1377-5:1990 CL 4<br>- BS 1377-2: 2022 # 17 |
| | 8.1<br><br>8.2 | Determination of permeability in a triaxial cell<br><br>Permeability tests | - BS 1377-6-1990 CL 6<br>- BS 1377-2: 2022 # 23<br><br>- BS EN ISO 17892-11:2019 |

# Schedule

Accredited Laboratory SAC-SINGLAS

Certificate No. : LA-2013-0548-B-1 Issue No. : 4

Date : 16 August 2023 Page : 2 of 2

| MATERIALS/ PRODUCTS TESTED | Item | TESTS /PROPERTIES | STANDARD METHODS/ TECHNIQUES |
|---|---|---|---|
| A. SOIL | 9.0 | Determination of unconfined compressive strength (UCT) | - BS 1377-7:1990 CL 7<br>- BS 1377-2: 2022 # 27<br>- BS EN ISO 17892-7:2018 |
| | 10.1 | Unconfined undrained triaxial test | - BS 1377-7:1990 CL 8<br>- BS 1377-2: 2022 # 28<br>- BS EN ISO 17892-8:2018 |
| | 10.2 | Unconsolidated undrained triaxial test with measurement of pore pressure (UUpwp test) | - K.H. Head Vol 3 Chapter 19.3 |
| | 10.3 | Multistage loading (MUU test) | - BS 1377-7:1990 CL 9 |
| | 11.1 | Consolidated triaxial compression test on water saturated soil (CIU & CAU tests) | - BS 1377-8:1990 CL 4,5,6 & 7<br>- BS 1377-2: 2022 # 29<br>- BS EN ISO 17892-9:2018 |
| | 11.2 | Multistage loading (MCU test) | - K.H Head Vol.3 Chapter 13.6.5 |
| | 12.1 | Consolidated triaxial compression test on water saturated soil (CID & CAD tests) | - BS 1377-8:1990 CL 4,5,6&8<br>- BS 1377-2: 2022 # 30<br>- BS EN ISO 17892-9:2018 |
| | 12.2 | Multistage loading (MCD test) | - K.H Head Vol.3 Chapter 19.2 |
| | 13.0 | Determination of resistivity test – Wenner probe method | - BS 1377-3:2018 CL 13.5<br>- BS 1377-3: 2018+ A1: 2021 # 13.5 |

**Approved Signatories**

Dr Henry Tan C Y - Section A

Mr Tay Keng Hui - Section A

Note :

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025. A laboratory's fulfilment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and **management system requirements** that are necessary for it to consistently deliver technically valid test results. The **management system requirements** in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001.

ACCREDITATION SCHEME
FOR INSPECTION BODIES

Accredited Inspection Body
SAC

# Schedule

Geonamics (S) Pte Ltd
5 Kwong Min Road
Singapore 628708

Certificate No. : IB-2019-173-F

Issue No. : 6

Date : 08 February 2024

Expiry of Certificate : 24 January 2027



Inspection Field : Site Investigation

Type A Inspection Body

| TYPE OF PRODUCT | TYPE AND RANGE OF INSPECTION | INSPECTION METHOD, CODES OR STANDARDS USED |
|---|---|---|
| 1. Soil | Site Investigation | BS 5930:1999+A2:2010 /<br>BS 5930: 2015+A1:2020<br>BS EN 1997-2:2007<br>SS EN 1997-2: 2010 (2015)<br>BS EN ISO 22475-1: 2021 |
| | Identification, description and classification | BS EN ISO 14688:2018, Parts 1 and 2 |
| | Under Undisturbed Sampling<br>a) Stationary Piston Sampler | BS EN ISO 22475-1: 2021<br>BS 5930: 2015+A1:2020 |
| | b) Open Thin Wall Sampler | |
| | c) Mazier Sampler | |
| | Under Functional Testing<br>a) Cone Penetration Test (CPT) | ASTM D 5778-20<br>BS 5930: 2015+A1: 2020, Section 39<br>BS EN ISO 22476-1: 2023 |
| | b) Standard Penetration Test (SPT) | BS EN ISO 22476-3: 2005+A1:2011<br>BS 1377: 1990: Part 9, Clause 3.3 |
| | c) Vane Shear Test | BS 1377:1990: Part 9, Clause 4.4<br>BS EN ISO 22476-9 :2020 |
| | d) Field Permeability Test | BS EN ISO 22282-1: 2012<br>BS EN ISO 22282-2: 2012<br>BS 5930: 2015+A1: 2020, Section 48 |

# Schedule

Accredited Inspection Body SAC

Certificate No. : IB-2019-173-F Issue No. : 6

Date : 08 February 2024 Page : 2 of 3

| TYPE OF PRODUCT | TYPE AND RANGE OF INSPECTION | INSPECTION METHOD, CODES OR STANDARDS USED |
|---|---|---|
| | e) In Situ Density Test- Sand Replacement method | BS 1377: 1990: Part 9: Clause 2.1 |
| | f) Radio-Isotope Cone Test | Geonamics In-House Method, REV 0 |
| | g) Earth Resistivity / Soil Resistivity Test | ASTM G57-20 (Wenner Four-Electrode Method) |
| | h) Pressuremeter Test<br>• Pressuremeter Test (Menard) | BS EN ISO 22476-4: 2021 |
| 2. Rock | Site Investigation | BS 5930:1999+A2:2010 /<br>BS 5930: 2015+A1:2020<br>BS EN 1997-2:2007<br>SS EN 1997-2: 2010 (2015)<br>BS EN ISO 22475-1: 2021 |
| | Identification, description and classification | BS EN ISO 14689:2018 |
| | Under Undisturbed Sampling<br>a) Rock Core Barrel | BS EN ISO 22475-1: 2021<br>BS 5930: 2015+A1: 2020, Section 24.11.3 & 25.7 |
| | Under Functional Testing | |
| | a) Pressuremeter Test<br>• Pressuremeter Test (Menard) | BS EN ISO 22476-4: 2021 |
| 3. Geotechnical Borehole<br><br>Instrumentation & Monitoring | Measuring Displacement<br>a) Magnetic Extensometer<br>b) Rod Extensometer<br>c) Inclinometer<br>d) Total Station<br>e) Digital Level<br>f) Tiltmeter | <br>BS EN ISO 18674-2: 2016<br>BS EN ISO 18674-2: 2016<br>BS EN ISO 18674-3: 2017+A1: 2020<br>BS EN ISO 18674-1: 2015<br>BS EN ISO 18674-1: 2015<br>BS EN ISO 18674-1: 2015 |
| | Measuring Pressure<br>a) Vibrating Wire Piezometer<br>b) Casagrande Piezometer<br>c) Total Pressure Cells | <br>BS EN ISO 18674-4: 2020<br>BS EN ISO 18674-4: 2020<br>BS EN ISO 18674-5: 2019 |
| | Measuring Groundwater Level<br>a) Water Standpipes | <br>BS EN ISO 18674-1: 2015 |

# Schedule

Accredited Inspection Body SAC

Certificate No. : IB-2019-173-F Issue No. : 6

Date : 08 February 2024 Page : 3 of 3

| TYPE OF PRODUCT | TYPE AND RANGE OF INSPECTION | INSPECTION METHOD, CODES OR STANDARDS USED |
|---|---|---|
| 4. Instrumentation & Monitoring for Struts | Measuring Force<br>a) Load Cells<br>b) Strain Gauges<br><br>Miscellaneous Instruments<br>a) Geophone Accelerometer | <br>BS EN ISO 18674-1: 2015<br>BS EN ISO 18674-1: 2015<br><br>BS EN ISO 18674-1: 2015 |

Approved signatories

Er Yeoh Boon Kang - Rock and Soil

Dr. Henry Tan CY - Instrumentation & Monitoring for Geotechnical Borehole and Struts

Note:

An inspection body's fulfilment of the requirements of ISO/IEC 17020:2012 means the Inspection body meets both the technical competence requirements and **management system requirements** that are necessary for it to consistently deliver technically valid inspection results. The **management system requirements** in ISO/IEC 17020:2012 (Section 8) are written in language relevant to inspection body operations and are aligned with the pertinent requirements of ISO 9001.

ACCREDITATION SCHEME
FOR CERTIFICATION BODIES

SAC Accredited Certification Body

# Schedule

Geonamics (S) Pte Ltd
5 Kwong Min Road
Singapore 628708

| | | |
|---|---|---|
| Certificate No | : | PD-2023-27 |
| Issue No | : | 1 |
| Date | : | 05 June 2023 |
| Expiry of Certificate | : | 04 June 2027 |
| Page | : | 1 of 1 |

## Product Certification Scheme – Ready Mixed Concrete

| | |
|---|---|
| ISO/IEC Type 5 | Certification scheme consisting of type test of a sample of the product representative of production; initial inspection of production control; and subsequent periodic inspection of production control, quality management system and samples of the product |

| | |
|---|---|
| **Standard used for certification:** | SS EN 206: 2014<br>Concrete – Specification, performance, production and conformity<br><br>SS 544: Part 1: 2019 (including Amendment No.1 - 2021)<br>Concrete – Complementary Singapore Standard to SS EN 206<br>- Part 1: Method of specifying and guidance for the specifier<br><br>SS 544: Part 2: 2019 (including Amendment No. 1 – 2021)<br>Concrete – Complementary Singapore Standard to SS EN 206<br>- Part 2: Specification for constituent materials and concrete<br><br>SAC CT 06: 2019<br>SAC Criteria for Ready-Mixed Concrete Producers |
| **Overseas location(s) with key activities:** | Nil |
| **Countries where certificates are issued:** | Singapore, Malaysia |

GEONAMICS

YOUR ONE-STOP PROFESSIONAL TESTING CENTRE

TESTING
INSPECTION
CERTIFICATION
INSTRUMENTATION
CALIBRATION

# Appendix 5 – Brochures of Testing Services

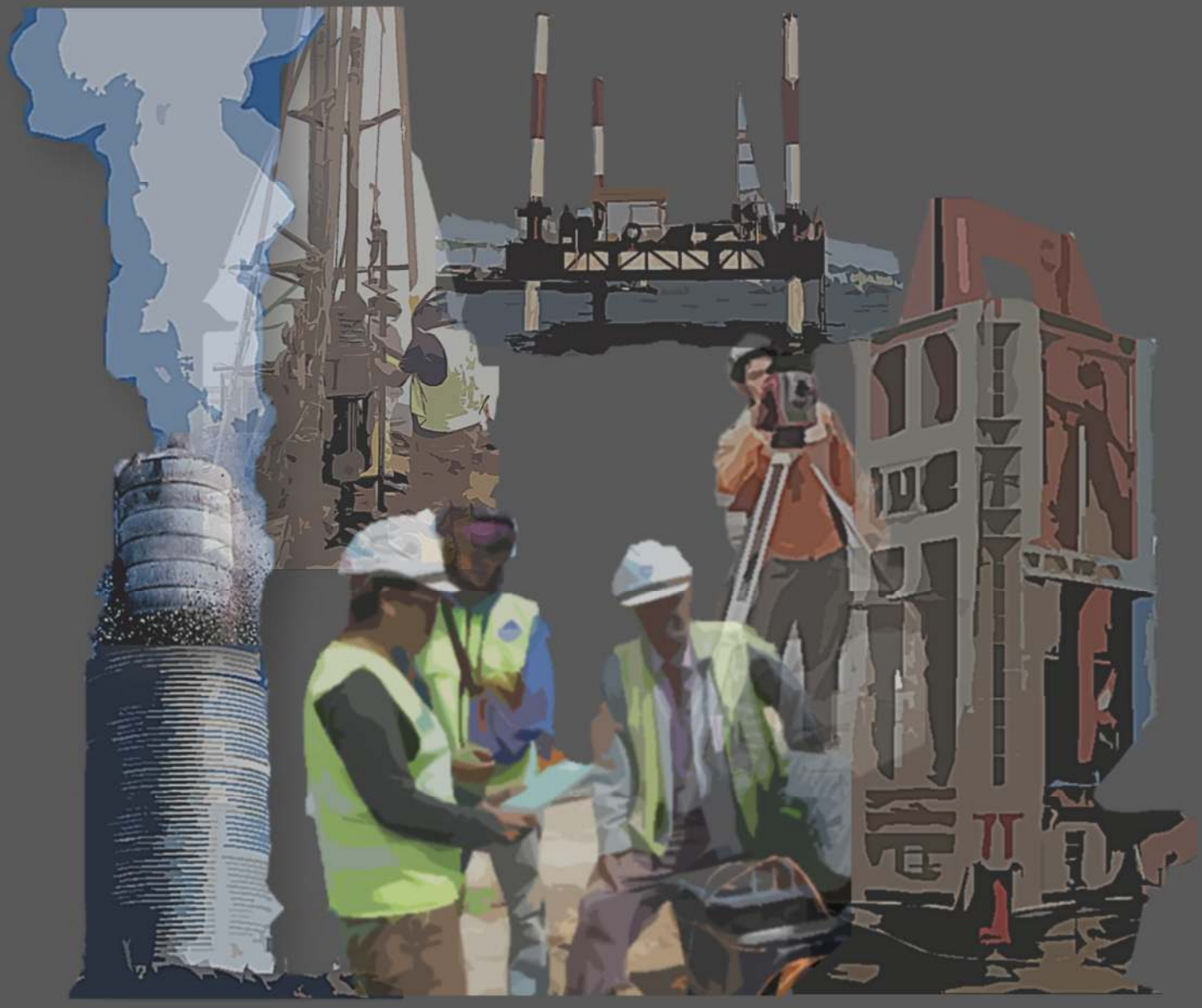
GEONAMICS

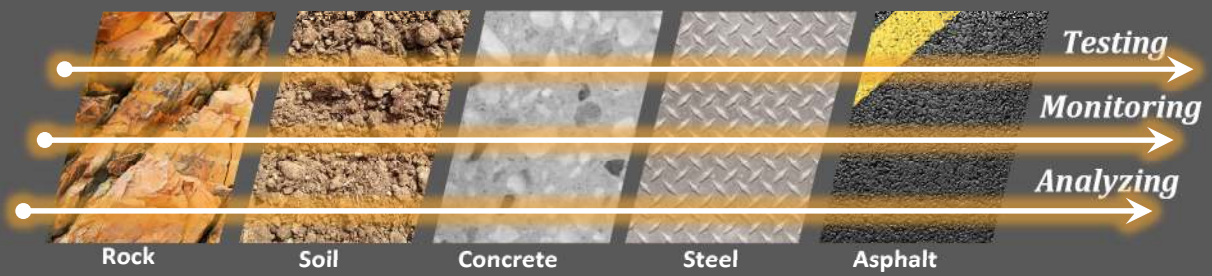
*YOUR ONE STOP PROFESSIONAL TESTING CENTRE*

*Ground Investigation & Geophysical Tests*
*Geotechnical Instrumentation & Monitoring*
*Construction Materials Testing*
*Shaft Area Profile Evaluator*
*Rapid Pile Load Test*
*Low-Strain & High-Strain Dynamic Pile Tests*
*Bidirectional Pile Load Test*

# GEONAMICS (M) SDN. BHD.

## TESTING SERVICES OVERVIEW






**GEONAMICS (M) SDN. BHD. (Reg. No: 342862-W)**
No. 6, Lot 25, Jalan Udang Harimau 1, Medan Niaga Kepong, 51200 , Kuala Lumpur, Malaysia
Phone: +603 6243 4715 Fax: +603 6242 6496
Email: info@geonamics.com.my Website: www.geonamics.com.my

CERTIFIED ISO 9001

SAMM 999

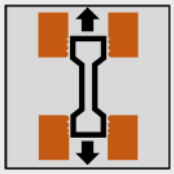
GEONAMICS

YOUR ONE STOP PROFESSIONAL TESTING CENTRE

*Ground Investigation & Geophysical Tests*
*Geotechnical Instrumentation & Monitoring*
*Construction Materials Testing*
*Shaft Area Profile Evaluator*
*Rapid Pile Load Test*
*Low-Strain & High-Strain Dynamic Pile Tests*
*Bidirectional Pile Load Test*

# GEONAMICS (M) SDN. BHD.
# COMPANY PROFILE

*Ground Investigation & Geophysical Tests*

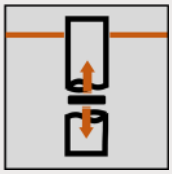


*Construction Materials Testing*

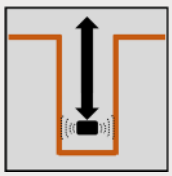
*Low-Strain & High-Strain Dynamic Pile Tests*

*Rapid Pile Load Test*

*Geotechnical Instrumentation & Monitoring*



*Bidirectional Pile Load Test*



*Shaft Area Profile Evaluator (SHAPE)*

**Geonamics (M) Sdn. Bhd.** is founded in 1995, as a subsidiary of Geolab (M) Sdn. Bhd. The group of Geolab (M) Sdn. Bhd. is recognized as a market leader in the construction industry for construction materials, ground investigation and exploration works, geotechnical engineering related instrumentation and monitoring works and various deep foundation testing.

Over the many years of development, Geonamics exposure to needs of industry to integrate various testing services, instrumentation and monitoring work have enabled the company to established a series of testing services specific to local problems and engineering conditions. Geonamics is therefore uniquely placed to provide reliable and cost effective solutions. With that, Geonamics own a chain of branches throughout the major cities in Malaysia and Singapore.

## Products and Services

Geonamics is more than a company or product; Geonamics provides almost a full range of testing services in geotechnical engineering works. A large spectrum of engineering testing, instrumentation, monitoring services spanned from pre-construction stage, to during-construction stage and the latter post-construction stage are offered by Geonamics. We covers numerous field and laboratory test and instrument monitoring services.

## Quality Control Assurance

With our experienced Professional Engineers and qualified engineering staffs, we always strive with one common objective: professionalism and reliability in our testing services. Geonamics is constantly embracing new technologies and innovation and to ensure the test services are fully complied to the each latest test standard. The quality control complies in full to ISO 9001 standards and a range of testing services are also accredited by Standard Malaysia (SAMM).

20220307-100-lf (Company_profile)

**GEONAMICS (M) SDN. BHD. (Reg. No: 342862-W)**
No. 6, Lot 25, Jalan Udang Harimau 1, Medan Niaga Kepong, 51200 , Kuala Lumpur, Malaysia
Phone: +603 6243 4715 Fax: +603 6242 6496
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GEONAMICS

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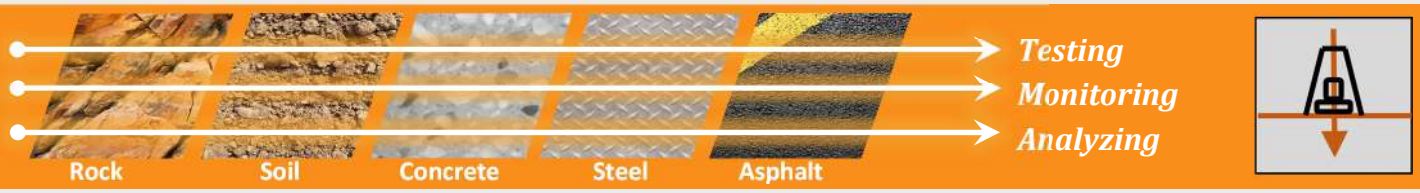


# Ground Investigation & Geophysical Tests

*Drilling, boring & coring*

*Geophysical survey*

**Ground Investigation & Geophysical Tests** develops tailored geotechnical exploration programs in support of each client's specific project. We know what is below the surface can be as crucial and complex as the structure it supports. Our team approach to geotechnical engineering extends beyond simply providing engineering data. We educate our clients about the risks and benefits of the engineering recommendations if needed.

## Services Include

- **Drilling, Boring, & Coring** — To penetrate and explore the stratigraphy of ground via drilling, boring , and coring vertically at the specific project location.
- **In-situ Testing** — To perform varies in-situ soil tests at the interested depth according the specification to derive the in-situ soil properties and behavior. The in-situ tests include standard penetration test, vane shear test, field permeability test, cone penetration test, pressuremeter, Mackintosh Probe Test, and etc.
- **In-situ Sampling** — To obtain the disturb and undisturbed samples for soil/rock for subsequent laboratory testing or evaluation study. A few type of sampler are available for in-situ sampling, include Thin-wall Tube Sampler, Piston Sampler and Mazier Sampler.
- **Geophysical Surveys & Subsurface Exploration** — For subsurface exploration with a non-destructive method, geophysical survey is an alternative solution to provide an overview of the ground stratigraphy via resistivity or seismic techniques.

## Why Geonamics?

- Expert in the market.
- Advanced on-shore and off-shore exploration capability.
- Industry-leading in-situ testing.
- Advanced geotechnical laboratory testing capability.

*In-situ Sampling Specimen*

20220307-100-lf (GI & GT)

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Testing
Monitoring
Analyzing

# Construction Materials Testing

*Triaxial Tests*

*Liquid Limit Test*

*Sieve Test*

*Hydrometer Test*

*Tensile Test*

**Construction Materials Testing Department** is primarily running a laboratory and field works that testing structural materials used to construct a project from the ground up, or components used to construct new additions to an existing facility. The scopes include destructive and non-destructive testing and evaluation for earthwork, shallow and deep foundations, concrete, structural masonry, structural steel, and asphalt pavement. We deliver field and laboratory reports rapidly, giving the construction team valuable information on a timely basis. All tests results are reviewed and approved by our test engineer and endorsed by authorized signatory personnel.

## Services Include

- **Independent Material Testing** — To provide independent third-party testing results for the verification of construction material specifications.
- **Special Inspections** — To test items that require a construction materials testing and require an inspection program conducted by a third party, specifically for new buildings.

## Why Geonamics?

- Certified personnel
- Accredited facilities compliance to MS ISO 17025
- Well-calibrated facilities
- Rapid providers of innovative solutions for earthwork and foundation construction
- Advanced soil and materials testing capability

*Concrete Cube Test*

*UPV test*

*Asphalt test*

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Testing
Monitoring
Analyzing

| Material | Test | Standard | SAMM Accredited | Ground Investigation & Exploration | Ground Improvement | Deep Foundation & Excavation | Concrete Structure | Road Construction |
|---|---|---|---|---|---|---|---|---|
| Rock | Unconfined Compressive Strength of Intact Rock Core Specimens | ASTM D7012-14e1, Method C | √ | √ | | √ | | |
| | Determination of the Point Load Strength Index of Rock and Application to Rock Strength Classifications | ASTM D5731-16 | √ | √ | | √ | | |
| | Elastic Moduli of Intact Rock Core Specimen in Uniaxial Compression | ASTM D7012-14e1, Method D | √ | | | | | |
| Soil | Particle size distribution: Wet sieving, dry sieving and sedimentation by Hydrometer Method | BS 1377-2:1990, Clause 9.2, 9.3 & 9.5 | √ | √ | √ | | | |
| | Determination of Moisture Content | BS 1377-2:1990, Clause 3 | √ | √ | √ | | | |
| | Determination of the Liquid Limit: Cone Penetrometer Method | BS 1377-2:1990, Clause 4.3 & 4.4 | √ | √ | | | | |
| | Determination of the Plastic Limit and Plasticity Index | BS 1377-2:1990, Clause 5 | √ | √ | | | | |
| | Determination of Maximum Dry Density/ Moisture Content Relationship: 2.5kg Rammer Method, 4.5kg Rammer Method , Vibrating Hammer Method | BS 1377-4:1990, Clause 3.3, 3.4, 3.5, 3.6 & 3.7 | √ | √ | | | | √ |
| | Determination of Particle Density: Small Pyknometer Method | BS 1377-2:1990, Clause 8.3 | √ | √ | √ | | | |
| | Determination of Density: Linear Measurement Method | BS 1377-2:1990, Clause 7.2 | √ | √ | √ | | | |
| | Determination of Shrinkage Characteristics: Linear Shrinkage Method | BS 1377-2:1990, Clause 6.5 | √ | √ | | | | |
| | Determination of California Bearing Ratio (CBR) | BS 1377-4:1990, Clause 7 | √ | √ | √ | | | |
| | One-Dimensional Consolidation Test | BS 1377-5:1990, Clause 3 | | √ | √ | | | |
| | Determination of Unconfined Compressive Strength | BS 1377-7:1990, Clause 7 | | √ | √ | | | |
| | Determination of Undrained Shear Strength in Triaxial Compression | BS 1377-7:1990, Clause 8 & 9 | | √ | √ | | | |
| | Compressive Strength for Cement Mixed Soil | In house Method | | √ | √ | | | |
| | Static Modulus of Elasticity for Cement Mixed Soil | In House Method | | | √ | √ | | |
| | In-situ Density Tests: Sand Replacement Method (Small and Large Pouring Cylinder) | BS 1377-9:1990, Clause 2.1 & 2.2 | √ | | √ | | | √ |
| | In-situ Density Tests: Core Cutter Method | BS 1377-9:1990, Clause 2.4 | √ | | √ | | | √ |
| | Mackintosh Probe Test | In house test method GEO/ CMT/06/01 with reference to JKR Specification | √ | √ | √ | | | √ |
| | In-situ Deformation and strength tests: Determination of the In-situ California Bearing Ratio (CBR) | BS 1377-9:1990,Clause 4.3 | √ | √ | | | | √ |
| | Plate Load Test | BS 1377-9: 1990, Clause 4 | | | √ | | | √ |
| | Chemical Test for Soil | BS 1377-3:1990 | | √ | √ | √ | | |
| Bituminous Mixtures & Asphalt | Marshall Stability and Flow of Asphalt Mixtures | ASTM D6927-15 | √ | | | | | √ |
| | Bulk Specific Gravity and Density of Non-Absorptive Compacted Asphalt Mixtures | ASTM D2726/D2726M-21 | √ | | | | | √ |
| | Quantitative Extraction of Asphalt Binder from Asphalt Mixtures | ASTM D2172/D2172M-17 (Method A– Centrifuge Extraction) | √ | | | | | √ |
| | Thickness or Height of Compacted Asphalt Mixtures | ASTM D3549/D3549-18 (Method A) | √ | | | | | √ |
| | Rate of Spray Prime/Tack Coat | In House Method with reference to JKR Specification | √ | | | | | √ |

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YOUR ONE STOP PROFESSIONAL TESTING CENTRE


Testing
Monitoring
Analyzing

| Material | Test | Standard | SAMM Accredited | Ground Investigation & Exploration | Ground Improvement | Deep Foundation & Excavation | Concrete Structure | Road Construction |
|---|---|---|---|---|---|---|---|---|
| Aggregate | Determination of Loose Bulk Density and Voids for Aggregates | BS EN 1097-3:1998 | √ | | | | | |
| | Determination of Shell Content-Percentage of Shell in Coarse Aggregate | BS EN 933-7:1998 | √ | | | √ | √ | |
| | Determination of Clay Lumps and Friable Particles in Aggregates | ASTM C142/C142M-17 | √ | | | √ | √ | |
| | Determination of Potential Presence of Humus (Organic Impurities) | BS EN 1744-1:2009+A1:2012, Clause 15.1 | √ | | | √ | √ | |
| | Determination of Particle Size Distribution-Sieving Method | BS EN 933-1:2012 | √ | | | √ | √ | √ |
| | Determination of Particle Density and Water Absorption | BS EN 1097-6:2013 (Wire Basket Method) | √ | | | √ | √ | √ |
| | Determination of pH Value | BS 1377-3:2018, Clause 12 | √ | | | √ | √ | |
| | Determination of Particle Shape-Shape Index | BS EN 933-4:2009 | √ | | | √ | √ | √ |
| | Determination of Particle Shape of Flakiness Index | BS EN 933-3:2012, BS 812-105.1:1990 | √ | | | √ | √ | √ |
| | Soundness of Aggregate | ASTM C88/C88M-18 | √ | | | √ | √ | |
| | Elongation Index | BS 812-105.2:1990 | √ | | | √ | √ | √ |
| | Determination of Aggregate Crushing Value (ACV) | BS 812-110:1990 | √ | | | √ | √ | √ |
| | Determination of Ten Per Cent Fines Value (TFV) | BS 812-111:1990 | √ | | | √ | √ | √ |
| | Determination of Aggregate Impact Value (AIV) | BS 812-112:1990 | √ | | | √ | √ | √ |
| | Determination of Sand Equivalent Test | BS EN 933-8:2012+A1:2015, ASTM D 2419-14 | | | | √ | √ | √ |
| | Chemical Tests for Aggregate | BS EN 1744-1:2009+A1:2012 | | | | √ | √ | |
| Concrete | Compressive Strength of Test Specimens | BS EN 12390-3:2019 | √ | | √ | √ | √ | |
| | Density of Hardened Concrete | BS EN 12390-7:2019 | √ | | | | | |
| | Depth of Penetration of Water Under Pressure | BS EN 12390-8:2019 | √ | | | | √ | |
| | Determination of Carbonation Depth in Hardened Concrete by the Phenolphthalein Method | BS EN 14630:2006 | | | | | √ | |
| | Determination of Secant Modulus of Elasticity in Compression | BS EN 12390-13:2021 | √ | | | √ | √ | |
| | Cored Specimen– Taking, Examining and Testing in Compression | BS EN 12504-1:2019 | √ | | | | √ | |
| | Determination of Water Absorption | BS 1881-122:2011+A1:2020 | √ | | | | √ | |
| | Determination of the Initial Surface Absorption of Concrete | BS 1881-208:1996 | √ | | | | √ | |
| | Flexural Strength of Test Specimens | BS EN 12390-5:2019 | √ | | | | √ | |
| | Tensile Splitting Strength of Test Specimen | BS EN 12390-6:2009 | √ | | | | √ | |
| | Penetration Resistance of Hardened Concrete using Steel Probe (Windsor Probe) | ASTM C803-C803M-18 | | | | √ | √ | |
| | Ultrasonic Pulse Velocity (UPV) | BS EN 12504-4:2021 | | | | √ | √ | |
| | Determination of Rebound Number | BS EN 12504-2:2021 | | | | | √ | |
| | Electromagnetic Covermeter | BS 1881-204:1988 | | | | | √ | |
| | Magnetic and Non-magnetic Coatings | ASTM B499-09, ASTM B530-09 (2014) | | | | | √ | |
| | Concrete/Rock Core Drilling | In house method | | | √ | √ | √ | |
| Metal and Metal Product Weld and Welded Test Specimens | Steel Bar– Tensile Properties | MS 145:2014, Clause 8.1.3.1, MS ISO 15630-2:2012, BS EN ISO 15630-2:2019, MS ISO 6892-1:2017 & ISO 15630-2:2019 | √ | | | √ | √ | |
| | Steel Bar– Bend Performance | MS 145:2014, Clause 7.2.5, MS ISO 15630-2:2012 & BS EN ISO 15630-2:2019 | √ | | | √ | √ | |
| | Multi Wire Steel Strand (PC Strand) | ASTM A1061/A1061M-2016 | | | | √ | √ | |
| | Welded Steel Fabric– Tensile Properties | MS 145:2014, Clause 8.1.3.1, MS ISO 15630-2:2012, BS EN ISO 15630-2:2019, MS ISO 6892-1:2017 & ISO 6892-1:2019 | √ | | | √ | √ | |
| | Bend Performance | MS 145:2014, Clause 7.2.5, MS ISO 15630-2:2012 & BS EN ISO 15630-2:2019 | √ | | | √ | √ | |
| | Weld Shear Force | MS 145:2014, Clause 7.2.4, MS ISO 15630-2:2012, BS EN ISO 15630-2:2019 | √ | | | √ | √ | |

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No. 6, Lot 25, Jalan Udang Harimau 1, Medan Niaga Kepong, 51200 , Kuala Lumpur, Malaysia
Phone: +603 6243 4715 Fax: +603 6242 6496
Email: info@geonamics.com.my Website: www.geonamics.com.my

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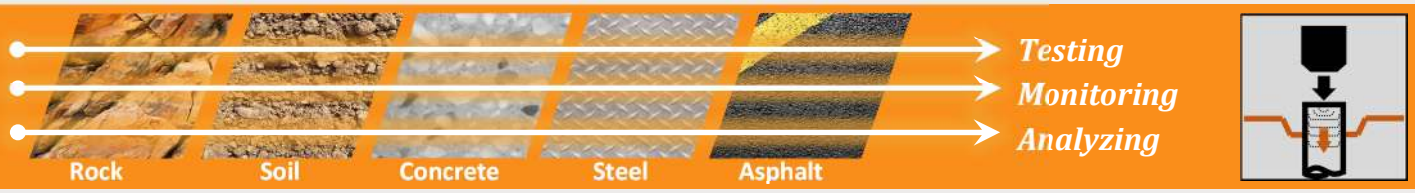


# Low-Strain Dynamic Load Test & Cross-hole Sonic Logging Test


*The Low Strain Dynamic Test Apparatus*

*Low strain dynamic pile test*


*The ultrasonic cross-hole (CSL) Test Apparatus*

*A typical ultrasonic cross-hole testing.*

**Pile Dynamic & Integrity Testing Department** provides a full range of pile tests that used to evaluate the structural integrity and geotechnical capacity of varies pile foundation. We deliver qualified testing engineers for field testing, and the subsequent post-analysis and interpretation of the test results if required. All tests results are reviewed by authorized signatory personnel and endorsed by our professional engineer.

## Services Include

- **Low Strain Impact Integrity Testing (ASTM D5882-16)** — The top of the pile is tapped with a lightweight hammer to generate wave in the pile and record the reflected wave by an accelerometer. The reflected wave signal or reflectogram is used to evaluate the continuity of the tested pile.

- **Ultrasonic Cross-hole Testing (ASTM D6760-17)** — A direct transmission integrity testing method to evaluate the concrete homogeneity in a bored pile. A piezoelectric transducer (i.e. Transmitter) is used to generate an ultrasonic signal that propagate as sound/compression wave crosses the concrete section and recorded by another transducer (i.e. Receiver) in the pre-installed tubes.

## Why Geonamics?

- Certified testing personnel
- Well-calibrated equipment
- Well-compiled local case references

20220307-100-lf (LS & HS DPT)

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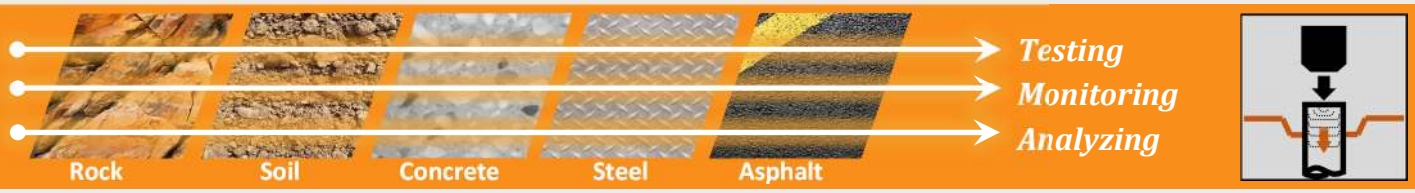
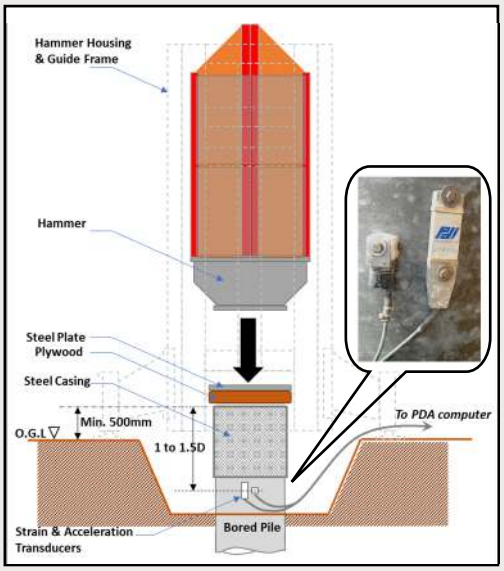



# High Strain Dynamic Load Testing of Deep Foundation (HSDLT)




*Schematic diagram of HSDLT*


*HSDLT with 60tonnes of hammer*

**Pile Dynamic & Integrity Testing Department** provides High Strain Dynamic Load Testing of Deep Foundation with the field work compliance to ASTM D4945-17 which under accreditation of SAMM. We deliver qualified testing engineers for field testing, and the subsequent post-analysis and interpretation of the test results if required. All tests results are reviewed by authorized signatory personnel and endorsed by our professional engineer.

## Services Include

- **Pile Driving Monitoring Test** — In the monitoring test, the soil resistance, driving hammer performance, maximum driving stresses, and pile integrity of each hammer blow are continuously monitored and evaluated. With that, HSDLT helps to establish the driving criterion and contributes to safe and economical production pile installation.

- **Driven Pile Restrike Test** — The soil strength changes as a function of time, that the calculated capacities correspond to the time of testing (i.e. End of Drive (EOD) or Begin of Restrike (BOR)). Therefore restrike tests are important., especially to correlate the dynamic test and a static load test.

- **Bored Pile Strike Test** — After the installation of bored pile with achievement of adequate compressive strength, HSDLT can be performed on bored piles to estimate the pile capacity and integrity at field. It is followed by a post-analysis verification work with signal matching process via CAPWAP.

## Why Geonamics?

- Accredited by SAMM (work accordance to ASTM D49450-17).
- Traceability of Measurement Results.
- Certified testing personnel
- Well-calibrated equipment
- Well-compiled local case references
- Testing equipment especially for large diameter of pile

20220307-100-lf (LS & HS DPT)

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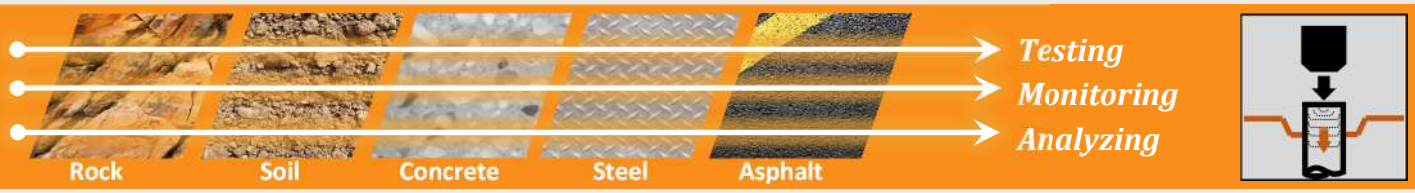
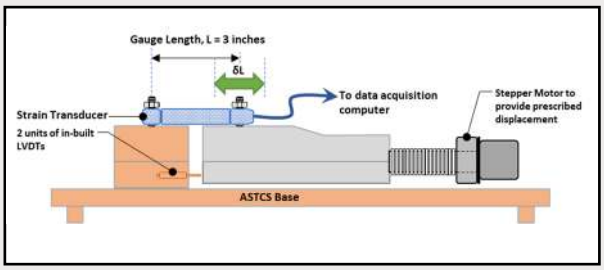



# Calibration of PDI Strain Transducer


*PDI Strain Transducer.*




*Schematic diagram of ASTCS calibrator.*


*The overall view of ASTCS calibrator.*

**Strain transducer** is the key sensor in High Strain Dynamic Load Test (HSDLT) to measure the mobilized strain at the pile head to deduce the dynamic forces. According to ASTM D4945-17, the transducers shall be calibrated prior to installation or mounting to an accuracy of 3% throughout the applicable measurement range. The need for calibration arises frequently in the use of strain transducer instrumentation. Periodic calibration is required to assure the accuracy and linearity of the instrument itself.

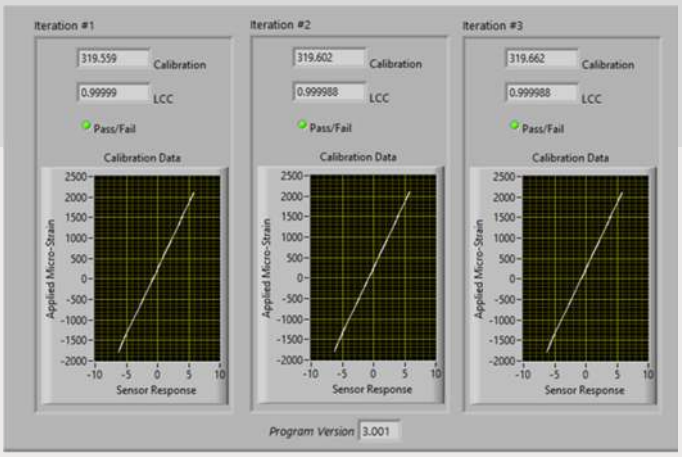
## Services Include

**Calibration*** — BDI Automated Strain Transducer Calibration System (ASTCS) machine offer a "direct" calibration method of PDI strain transducer. By given a known accurate excitation voltage and a known prescribed displacement of the transducer, a calibration factor/sensitivity of strain transducer in term of με/mV can be deduced.

**Geonamics offer a calibration of PDI Strain Transducer with SAMM accredited scope accordance to an in-house method.*

## Why Geonamics?

- Accredited by SAMM based on ISO/IEC 17025.
- Traceability of Measurement Results.
- Established of Measurement of Uncertainty.
- Well-calibrated equipment .




*Iteration of multicycle of calibration.*

20220307-100-lf (LS & HS DPT)

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Email: info@geonamics.com.my Website: www.geonamics.com.my

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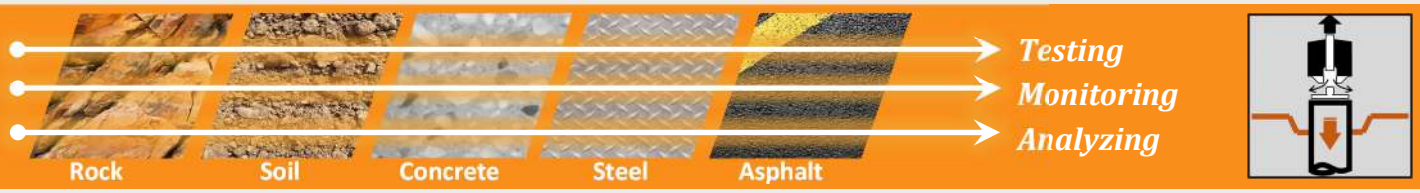
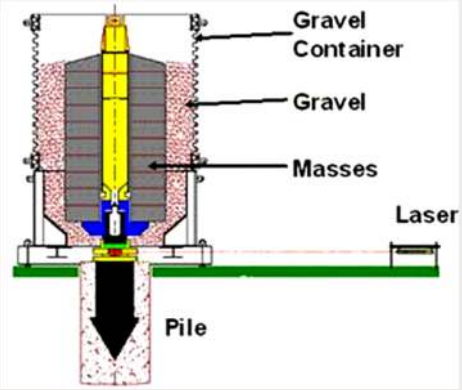



# Rapid Pile Load Test




*Schematic diagram of Statnamic Test*

*Setup of Statnamic Test*

*Launching of Statnamic Test*

**Rapid Load Test Department** is specialized in performing one of the Rapid Load Tests called *Statnamic Test.* The pile load testing is a critical step to evaluate a pile foundation, to verify design parameters as well as to evaluate pile performance. Statnamic Test offers a more efficient, quicker, and/or cost effective pile load test than the conventional Static Load Test (SLT).

## Services Include

- **Rapid Load Test (Statnamic Test)** — It launches a reaction mass from the pile head with fast-expanding and high-pressure gases in a confined cylinder. The high-pressure gases are produced by the burning of a solid propellant fuel within the piston cylinder assembly. Typically, the reaction mass is accelerated upwards at 20g, thus a downward force in the order of 20 times the reaction mass will be generated. Therefore, the required reaction mass is only 5% of the static mass equivalent to the final test load. This salient feature of STN has become one of the key advantages over the conventional SLT. It saves the required amount of reaction mass in the pile load test, and hence time and effort in setting up.

- **Preinstallation of Instruments in Pile** — To capture the mobilization of skin friction, end-bearing component, or elastic shortening of a pile, we offer the installation of instruments such as strain gauges or extensometer and monitoring works during the Statnamic Test.

## Why Rapid Load Test with Geonamics?

- Suitable for On-shore and Off-shore pile foundation.
- Significant reduction of setting-up time for a pile load test.
- Less space requirements.
- Less logistic hassle, less carbon footprint, environmental friendly.
- Consistent and user-independent results that correlate well with static load testing (SLT) results.
- Accepted in international relevant codes (ASTM, Japan, Eurocode etc.).
- Higher productivity.

20220307-100-lf (RLT)

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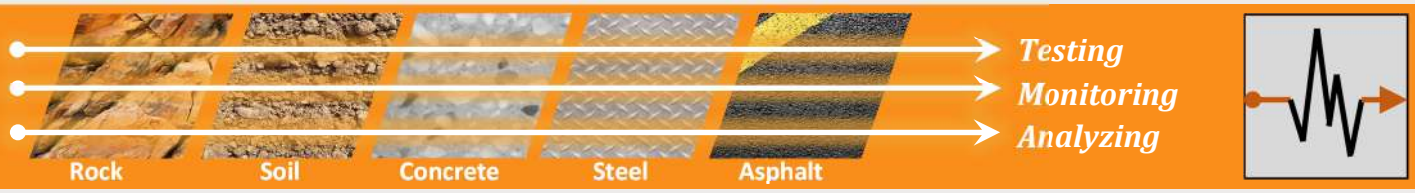


# Geotechnical Instrumentation & Monitoring

*Instrumentation and monitoring for deep excavation*

*Lateral pile load test monitoring*

*Shape Accel Array (SAA) system*

*Instrumentation and monitoring for slope stability*

**Geotechnical Instrumentation & Monitoring Department** is specialized in performing the installation of instrumentation and the subsequent monitoring works on the specified construction activities by the client. There is a need to raise the alarm for the impact of the construction activities to the surrounding existing structural or the environment by a consistent monitoring scheme. We cover the instrumentation and monitoring that are required in the deep excavation, backfilling activities, reclamation, slope stability, meteorological study, tunneling, as well as the environmental effect of construction.

## Instrumentation Services Include

- **Tilt Meter** — A tiltmeter is a sensitive inclinometer designed to measure very small changes from the vertical level, either on the ground or in structures.
- **Standpipe Piezometer** — Pore pressure of soil is importance to evaluate the ground behaviour, before—during—and after construction. The piezometer is suitable choice of instrument for this purpose.
- **Settlement Marker** — Settlement markers are installed on the columns of existing structures or buildings to determine any inherence settlement or heave.
- **Inclinometer** — Portable vertical inclinometer probe is used to obtain segment inclination through vertically installed inclinometer casing which make gradual displacement with subsoil movement.
- **Shape Accel Array (SAA)** — SAA is an advanced innovative instruments that can be installed near vertical to track the magnitude and direction of lateral deformation, or near horizontal to track vertical deformation. It can also be installed along the cross-section of tunnels to measure convergence. The SAA is also able to monitor 3D vibration data and temperature if required with special built-in sensors.
- **Noise & Vibration Monitoring** — The assessment of impact from noise and vibration due to industrial activities can be measured and monitored over periods of duration.
- **Others** — There are many other geotechnical instruments offered by this department and kindly contact us for details.

## Why Geonamics?

- Well-calibrated equipment.
- Well-trained engineers.

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No. 6, Lot 25, Jalan Udang Harimau 1, Medan Niaga Kepong, 51200 , Kuala Lumpur, Malaysia
Phone: +603 6243 4715 Fax: +603 6242 6496
Email: info@geonamics.com.my Website: www.geonamics.com.my

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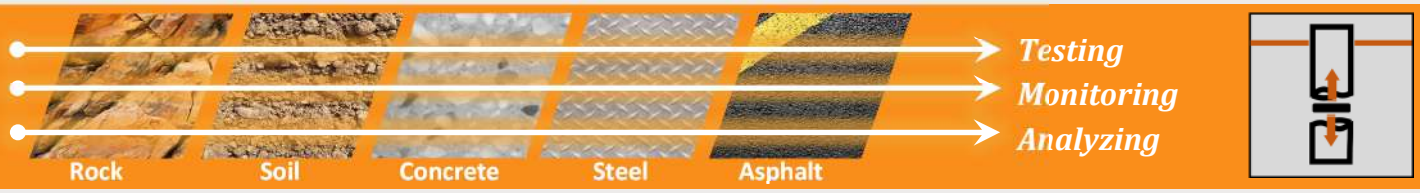
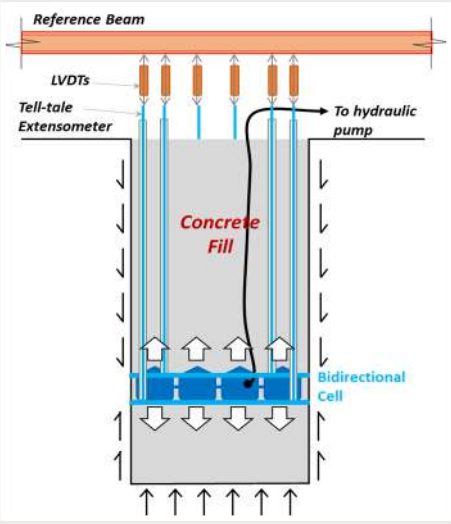



# Bidirectional Pile Load Test




*Schematic diagram of Bidirectional Test*

**Bidirectional Load Test** is to examine the pile performance in accordance with the design, to verify the soil parameters used in the design conformed to the ground condition. The design of the bored pile will be evaluated if any discrepancy found from the pile load test regarding to the bearing capacity and the soil parameters. With our synergy partner who is one of the pioneer of Bidirectional Test in China, we are pleased to provide this professional testing service.

## Services Include

- **Preinstallation of Instruments in Pile** — To capture the mobilization of skin friction, end-bearing component, or elastic shortening of a pile, we offer the installation of instruments such as strain gauges or extensometer and monitoring works during the Bidirectional Load Test.

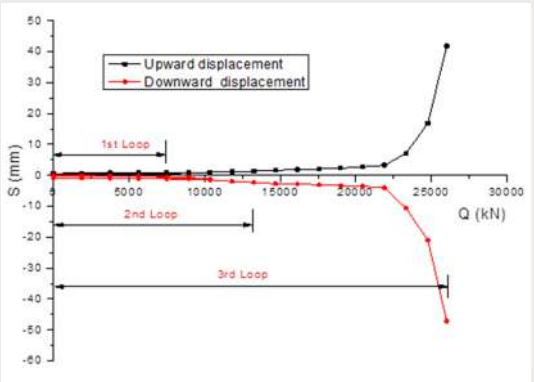
- **Bidirectional Load Test** — is a static pile load test that incorporates single or multiple-layer of sacrificial hydraulic jack-like device that assembled in a symmetrical Bidirectional (BD) Cell. The BD cell will be placed at the depth of equivalent capacity between the upper and lower portion of the pile. The Equivalent Top-loaded Load Settlement curve can be derived by measuring the displacement of upward and downward movement of the BD cell corresponding to the loading step.

*A typical bidirectional cell for bored pile*

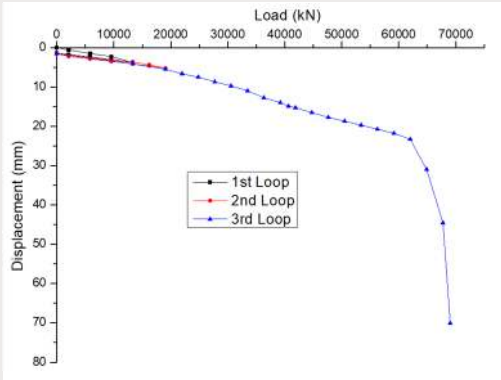
## Why Geonamics?

- Well-calibrated hydraulic jacks by ILAC-MRA accredited laboratory before assembly to a BD cell.
- Well QA/QC record on leakage etc. before delivery of BD cell.
- Experienced installer.

*Installation of bidirectional cell inside the reinforcement cage*




*A typical upward and downward displacement in a bidirectional test*




*The equivalent top-loaded load settlement curve*

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Phone: +603 6243 4715 Fax: +603 6242 6496
Email: info@geonamics.com.my Website: www.geonamics.com.my

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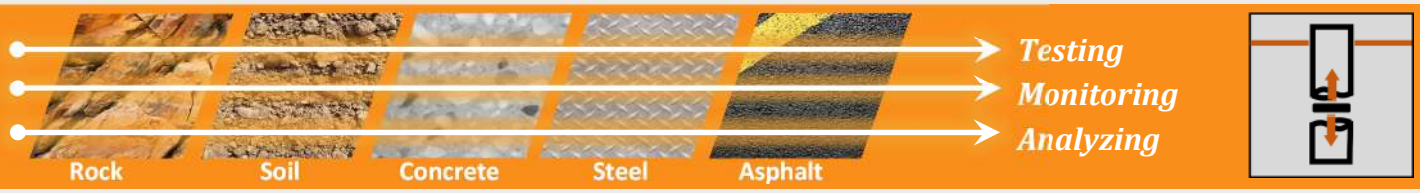


# Bidirectional Pile Load Test

*Penang 2nd Bridge, Malaysia*

*Suramadu Bridge, Indonesia*

*Shenzhen – PingAn International Finance Centre, China*

*The Sun Project, Vietnam*

## Case References

Our Bidirectional Load Test has been successfully used to evaluate the capacity of varies foundation in many countries. These foundations are built for high-rise buildings, bridges, railway, and varies infrastructure. The capacity of the foundation is vital to be verified through a competence test. Several remarkable case references of Bidirectional Test is listed as below:

| No. | Country | Projects | Year | Pile dia. (m) | Length (m) | Max. Test Load (t) |
|---|---|---|---|---|---|---|
| 1. | China | HangZhou Cross Bay Bridge | 2002 | 2.8 | 120 | 6000 |
| 2. | China | ZhouSan Islands Westgate Bridge | 2004 | 2.8 | 40 | 13009 |
| 3. | Vietnam | Daweng Bridge | 2005 | 1.5 | 48 | 1426 |
| 4. | Vietnam | Qinyu Bridge | 2005 | 2 | 49 | 1884 |
| 5. | Indonesia | Suramadu Bridge | 2006 | 2.4 | 97 | 4883 |
| 6. | Cambodia | New Monivong Bridge | 2008 | 1.5 | 51 | 1400 |
| 7. | Malaysia | The 2nd Penang Bridge | 2008 | 1.2 | 74 | 1454 |
| 8. | China | WenZhou Bridge | 2008 | 2.2 | 122 | 5000 |
| 9. | China | Nanjing QingAou Centre | - | 2 | 69 | 8374 |
| 10. | Vietnam | Phu My Hung Shopping Mall | 2009 | 1.5 | 66 | 3112 |
| 11. | Sudan | Sennar Bridge | 2010 | 1.5 | 42 | 2293 |
| 12. | Angola | Soyo LNG | 2010 | 1.2 | 45 | 794 |
| 13. | China | ShenZhen PingAn International Finance Centre | - | 1.8 | 24 | 1740 |
| 14. | Indonesia | Tayan Bridge | 2013 | 1.5 | 38 | 1711 |
| 15. | Indonesia | Merah Putih Bridge | 2014 | 1.5 | 46 | 2090 |
| 16. | Mozambique | Maputo Bridge & Link Roads | 2014 | 2.2 | 100 | 5774 |
| 17. | Cambodia | Diamond Twin Tower | 2015 | 1.2 | 43 | 2388 |
| 18. | Brunei | Pulau Muara Besar Bridge | 2016 | 1.5 | 77 | 6902 |
| 19. | Maldives | China-Maldives Friendship Bridge | 2016 | 3.2 | 44 | 28929 |
| 20. | Singapore | Changi Airport Terminal 5 | 2017 | 1 | 34 | 958 |
| 21. | Singapore | Private Building | 2017 | 0.8 | 33 | 837 |
| 22. | Indonesia | Jembatan Pendekat Pulau Kalimantan & Pulau Laut | 2017 | 1.5 | 32 | 1769 |
| 29. | Indonesia | Jembatan Holtekamp Jayapura | 2017 | 1.2 | 49 | 1359 |
| 30. | Vietnam | The Sun Project | 2017 | 1.8 | 92 | 8893 |

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*Monitoring*
*Analyzing*

# Shaft Area Profile Evaluator

*The SHAPE equipment .*

**Shaft Area Profile Evaluator (SHAPE)**, manufactured by Pile Dynamics Inc. (PDI), is a cost-effective quality assurance testing device used for deep foundations such as drilled shafts, slurry walls, barrettes and more to determine the excavation dimensions and verticality. Drilled shafts are rarely ideal cylinders and irregularities can affect capacity and design. SHAPE better characterizes the shape of drilled shafts and other excavated deep foundation elements. SHAPE provides a fast, economical visual representation of the foundation excavation and verticality prior to placing concrete in wet conditions.

## Why SHAPE?

- A continuous scanning profile along the depth.
- Quick connection to Kelly bar or can be used with an optional winch system.
- Multi-channel ultrasonic device to scan the sidewall condition of wet pour drilled shafts .
- Data acquisition at a rate of approximately one (1) scan per second.
- Data acquisition calculations of shaft profile to determine shaft radius, volume and verticality at field after the scanning process.

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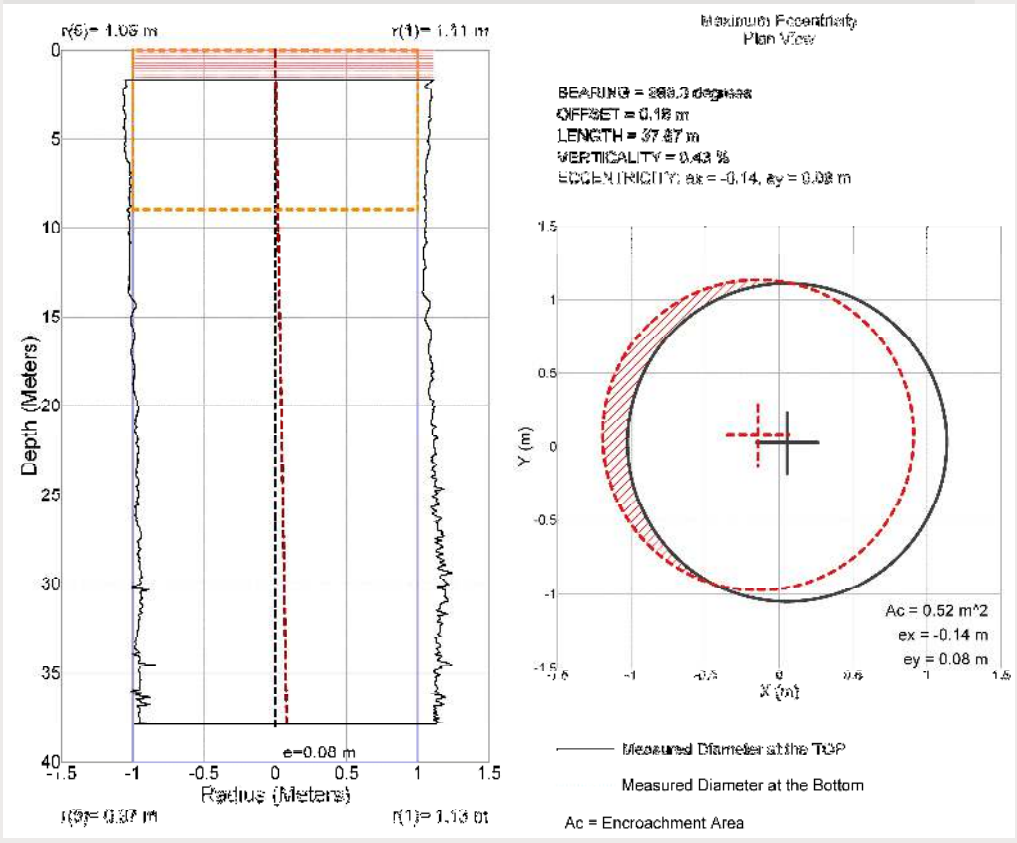
*The SHAPE is lowered down into the bored hole with Kelly Bar*


*The mobile read-up unit of SHAPE*




*A typical result of SHAPE after the scanning process.*

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