GEOSCIENCE ASSOCIATES

Integrated GeoScience for Economy Safety and Environmental Responsibility

GSA

INTRODUCTION TO
PILE TESTING DIVISION

"Finding Security at Depth"

"GEOSCIENCE ASSOCIATES IS COMMITTED TO MAINTAINING HIGH STANDARDS OF QUALITY, RESPONSIVENESS AND PROFESSIONAL ETHICS IN PROVIDING ITS CONSULTANCY AND TESTING SERVICES"

GEOSCIENCE ASSOCIATES (GSA) is a professional engineering company which specializes in providing High Strain Dynamic Pile Testing, CAPWAP Analysis, Cross Hole Sonic Logging, Sonic Integrity Testing, Bi-Directional Static Load Testing, Consulting Services and other specialize testing services for the foundation engineering industry. To enable us to provide high quality testing services, we own and operate state-of-art equipment and computer software. The systems we used are market leading brands and their reliability proven through thousands of field tests conducted every year both in local and international market.

"OUR UNIQUE COMBINATION OF ADVANCE EQUIPMENT TECHNOLOGY AND PILE TESTING EXPERTISE HELP US TO BE MORE EFFECTIVE IN SERVING OUR CUSTOMERS".

"The only Company in Pakistan having American (PDCA & PDI) Certified HSDPT Professional"

➢ HIGH STRAIN DYNAMIC PILE TESTING (ASTM-D4945)

"Quick, Cost Effective and Reliable. You save precious time, money and gain quality assurance"

High Strain Dynamic Pile Testing is performed using Pile Driving Analyzer (PDA) together with strain Sensor and accelerometers. PDA is used to verify the mobilized capacity of all types of drilled and driven piles. Testing is conducted in a quick and non-destructive manner.

Dynamic measurements of force and velocity will be collected by the strain sensors and accelerometers attached to the pile. The PDA monitors the strain and acceleration caused by the hammer impact and processes these signals after each hammer blow during driving or re-strike to give immediate visual. The signals are digitized by PDA, results are computed and the data array of the signals for a blow is stored.

The following PDA results are typically obtained on site:

a) Mobilized Static Load Capacity based on CASE method.
b) Pile Integrity-Location and extent of damage
c) Driving Stresses-maximum compression/tension forces at pile top/toe
d) Hammer performance-maximum energy transferred to pile

Advantages of Dynamic Pile Testing

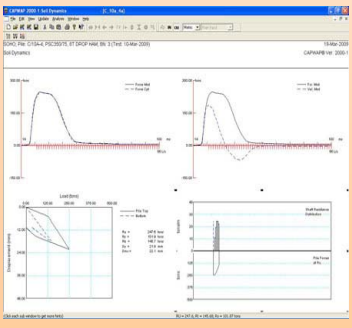
1. Instant preliminary results on site
2. Instant checks on the pile integrity and the location of any damage
3. Feedback on maximum tension and compression forces
4. Direct measurements of hammer input energy and efficiency
5. Cost effective

Static Load Tests are expensive and time consuming and therefore are often conducted only on a very small number of piles. With PDA many more piles can be tested at a much lower cost and faster speed. This improves quality assurance and helps to optimize pile driving criteria. PDA results also correlate well with the pile capacity obtained from conventional Static Load Test and therefore confirm the structural integrity of the pile element.

"PDA is the answer for projects where Static Testing is prohibitively expensive or physically impossible".

CAPWAP ANALYSIS

"CAPWAP maximizes the benefits of PDA results"



CAPWAP (Case Pile Wave Analysis Program) is a rigorous numerical analysis this models the pile and soil behavior that allows full and accurate analysis of PDA field data. It involves applying the measured pile top force and velocity-time as a boundary condition to a wave equation model of the pile.

The results produced provide total pile bearing capacity, resistance distribution, dynamic soil response and a simulated static load test. Pile settlement predictions obtained by CAPWAP have been extensively compared with static load tests, with excellent correlation between the two. This unequaled wealth of comparative data has provided up most confidence in CAPWAP results.

➢ CROSS-HOLE SONIC LOGGING (ASTM-D6760)

"Cross Hole Ultrasonic Monitor is great for reliable Cross Hole Sonic Logging and improved quality assurance of concrete foundation."

Cross Hole Ultrasonic Monitor (CHUM-PileTest, UK) is used to determine the quality and consistency of the concrete of bored piles. Selected bored pile is pre-installed with steel tubes that span the whole axial length before casting. A Transmitter lowered down into one tube sends a high frequency signal that travels through the concrete and detected by a Receiver in the second tube. As these sensors are raised and/or lowered along the length of the pile, the CHUM records at regular depth intervals, the time that the signal takes to travel from the transmitter to the receiver (First Arrival Time) as well as the signal energy. These two parameters will indicate the concrete quality between the pair of tubes at a particular depth. The entire shaft length is logged and the test is then repeated for each pair of tubes, allowing for full and thorough investigation of defects both along the length and by its quadrant.

➢ SONIC INTEGRITY TESTING (ASTM-D5882)

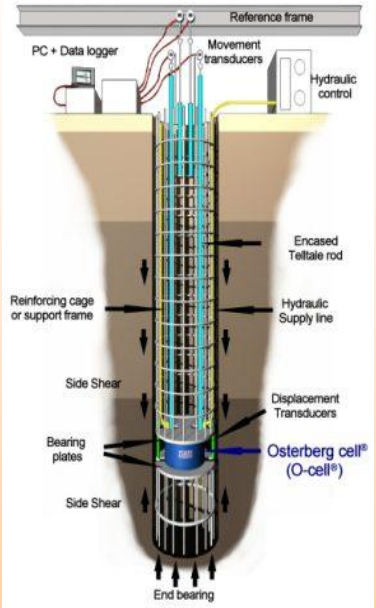
"Sonic Integrity Testing makes it economically feasible to verify the integrity of every pile on your site"

Sonic Integrity Testing (SIT/PIT) also known as Sonic Echo or Pulse Echo methods is used for the Low Strain Integrity Testing. The SIT may be used for auger Cast-in-place piles, bored shafts, driven concrete piles and concrete filled pipes. It detects potential defects such as major cracks, necking, soil inclusions or voids and in some situations, the method can determine unknown lengths of piles. SIT does not require advance planning or access tubes which make it the most affordable option when the pile integrity is in question.

An accelerometer attached to the top of the installed pile monitors the impact and resulting deflections from a small hand-held hammer. The accelerometers signals is evaluated in the field or transferred to a personal computer for further analysis by SIT-W, a Windows based software program. If defect is present along the shaft, its size and location can be estimated by analyzing the propagation and reflection of the wave induced on the foundation by the hammer impact. It is also possible to estimate the depth of the pile toe.

➢ BI-DIRECTIONAL STATIC LOAD TEST

"No overhead reaction, no tie-down piles - A truly innovative Static Load Testing technique."



GeoScience Associates is dedicated in advancing the Deep Foundation Load Testing Techniques. We offer a truly innovative Static Load Testing technique using the Bi-Directional Static Load Test method. It is the only Load Test that provides separate measurement of a pile's end bearing and skin friction.

No job has been too big or too small to enjoy the advantages of the Bi-Directional Static Load Test. Numerous world testing records were set using this method, including one with a Test Load of 28,000 tonnes.

GeoScience Associates offers Bi-Directional Static Load Test equipment and installation assistance. We also provide full planning and specification support, field load testing and an analytical service.

What is it?

The Bi-Directional Static Load Test is a well known static load testing method that uses a time and space saving approach by loading the pile resistance from the mid-pile or near–toe position instead of top-loading. Whether for flyover project, over water structure or space constrained site, our Bi-Directional Static Load Test method has risen to every challenges. Widely adopted in the US, Europe and other parts of Asia, Bi-Directional Static Load Test has gained world wide acceptance in the marketplace for its many benefits and advantages.

Benefits and Advantages:

Mobility and Space Efficiency
Eliminates the need for overhead beams or reaction piles.
Time Efficiency
It only takes few days of preparation for the installation of the pre-manufactured bi-directional hydraulic jack(s).
Precision Testing
Simple to conduct, Bi-Directional Static Load Test provides engineers with separate data on the end-bearing and frictional resistance of the shaft.
Cost Efficiency
The Bi-Directional Static Load Test has proven to be much more cost effective with even higher test load.
Versatility
The Bi-Directional Static Load Test can be applied to barrette, bored pile (compression or tension), inclined pile or belled shaft. The tested pile could be reused to carry working loads after testing is completed. This can be easily done by grouting the pile after the test.

Testing Methodology

Method
A hydraulically-driven, high capacity, sacrificial bi-directional hydraulic jacks are pre-installed to the test pile. Loading is applied in equal and opposite directions: Upwards against upper skin friction and Downward against lower skin friction and end bearing. By using multiple bi-directional jacks on a single horizontal plane, the available test capacity can be increased to more than 10,000 tonnes. By utilizing multiple bi-directional jacks on different planes, distinct elements within a shaft can be isolated for testing.

Test Results
The effectiveness and wealth of information provided by the Bi-directional Static Load Test is the reason why engineers and piling contractors are turning to the method. Since the end-bearing and upward skin friction is measured separately, there is no guesswork as to how much load was carried by each section. The incorporation of the strain gauges within the shaft helps to determine the distribution of load throughout the shaft length. The speed and accuracy of testing makes the Bi-directional Static Load Test a valuable tool for valuable engineering.

TECHNICALLY BACKED BY

Pile Dynamics, Inc.
Quality Assurance for Deep Foundations

DEEP FOUNDATIONS INSTITUTE DFI

GRL engineers, inc.

profound

PILETEST Take a Deeper Look

LIST OF PROJECTS
CONDUCTED BY FOUNDATION PILE TESTING DIVISION

A) Sonic Integrity Testing (ASTM – D5882)

Sr. No.	Description of Work	Year	No. of Piles
1.	High Tension Power Line Towers Mangla – Khushab – Kala Shah Kako Client: G.M. – Monitoring & Surveillance, WAPDA	1999	40
2.	Bridge on River Lund, Shahdan-Lund, D.I. Khan. Client: National Highway Authority	2000	29
3	Reconstruction of NMB Wharf, Karachi Port Trust. Client: Maqbool Associates Pvt. Ltd.	2003-04	300
4.	New Bridge Over Sutlej River, Bahawalpur Client: Ghulam Rasool & Company	2004	60
5.	71km, Section N-50, D.I.Khan Client: Husnain Cotex Pvt. Ltd.	2005	56
6.	Flyovers-National Stadium, Karsaz, Sohrab Goth, FTC – City District Government , Karachi Client: Maqbool Associates Pvt. Ltd.	2005 – 06	375
7.	Ali Bahr Canal, Ranipur-Sindh Client: National Highway Authority	2006	12
8.	Bridge Over River Jhelum, Naluchi- Muzaffarabad Client: DECON Pvt. Ltd.	2006	36
9.	Sukhe Ki Mandi, Telenor Towers-Sheikhupura Client: Director Bridges	2006	15
10.	Kund Bridge N-5, Peshawar Client: National Highway Authority	2007	24
11.	PTCL Exchange-Bahel	2005	12
12.	Sher-Shah Bridge on River Chenab, Multan Client: Husnain Cotex Pvt. Ltd.	2004	118
13.	White Oil Pipe Line – D.G.Khan Client: Ghulam Rasool & Company	2002 – 03	150
14.	Dolman City, Phase-2, Karachi Client: National Engineering Company Limited.	2007	20
15.	Software Technology Park, PITB, Lahore Client: Condrill Pvt. Ltd.	2007	250
16.	Under Passes at Jail Road, FC College, Doctors Hospital and Dharampura, City District Government-Lahore Client: NESPAK Pvt. Ltd.	Different	400
17.	Platinum Square, World Trade Centre, DHA Phase 2, Islamabad Client: IJM Gulf Limited	2007-08	1334
18.	Gold Crest, DHA-2, Islamabad Client: Bina Good Year Construction Co.	2007-08	949
19.	Engro Chemicals Private Limited, Daharki – Sindh Client: DESCON Engineering Ltd.	2007 – 09	1024
20.	JAMROD Canal, Spinal Drain Pipe Line Project, Near Jamshoro. Client: OGDCL	2007	14
21.	Saif 225 MW, CCPP-Qadirabad, Sahiwal Client: Condrill Pvt. Ltd.	2007 – 08	157
22.	Centaurus Tower, Islamabad (Via TDRT Method) Client: China State Construction Engineering Co.Ltd	2007 – 08	707
23.	Engro Vopak Terminal Limited – Port Qasim, Karachi Client: National Engineering Co. Ltd.	2008	60
24.	Fatima Fertilizer Company – Goth Machi, Sindh Client: Fatima Fertilizer Company	2008-09	21
25.	Fauji Fertilizer Company – Mirpur Mathelo Client: DESCON Engineering Limited	2008	18
26.	Engro Energy Power Plant-Qadirpur, District Ghotki, Sindh Client: Engineering Concept Pvt. Ltd.	2008-09	384
27.	175 MW, CCPP-Daharki Client: Echo West International	2008	129
28.	Shabaz Chowk Flyover – Hyderabad Client: Shamsi Builders Pvt. Ltd.	2008	100
29.	234-MW CCPP, Muridke Client: DESCON Engineering Limited	2008	152
30.	Grand Hyatt Hotel-Islamabad Client: Consolidated Engineering Services Pvt. Ltd.	2008	225
31.	Indus Highway Project,N-55,Phase-III (Dera Ismail Khan to Sarai Gambila) Client: Husnain Cotex Pvt. Ltd.	2008-09	133
32.	Fauji Fertilizer Company Limited Head Quarter Building Project-Rawalpindi Client: Guarantee Engineering Pvt. Ltd.	2009	112

Sr. No.	Description of Work	Year	No of Piles
33.	Railway Flyover Ranipur – Sindh Client: SKB	2009	12
34.	425 MW, Combined Cycle Power Plant-Nandipur Client: Condrill Pvt. Ltd.	2009	136
35.	Avari Hotel-Islamabad Client: Meinhardt Pvt. Ltd.	2009	106
36.	Head Muhammad Wala Bridge Near Multan Client: Ghulam Rasool & Company	2009-10	44
37.	Moosa Pak Shaheed Bridge Over River Sutlej at Aimenwala, Distt. Bahawalpur. Client: Husnain Cotex Pvt. Ltd.	2009-10	30
38.	Kheermori Bridge, Dadu-Sindh Client: BHP Zamzama Plant	2009	04
39.	Bridge Over Nala Aik At Daburgi Mallian, Sialkot Client: FWO-121QCBN	2010	01
40.	Bahu Gas Field - Construction of Supporting Structural System of Electrical Works Client: OGDCL	2010	22
41.	Benazir Bhutto International Airport, Islamabad Client: China Railway First Group	2010	1377
42.	Bridge Over River Soan at Trap, Distt. Attock Client: Ch. Abdul Latif & Co.	2010	90
43.	Nagshah Flyover Project- Multan Client: Ch.Abdul Latif & Co.	2011-2012	48
44.	Chunian To Wan Radha Ram (Group-1) bridge No. BS1 & BS2 Link Canal Project-Okara Client: Provincial Highway Division Okara	2011	08
45.	Chora Bridge Project-Mardan Client: C & W Highway Division- Mardan	2011	01
46.	Construction of Parking Plaza Gujrat Client: District Government Gujrat	2011	06
47.	Access Bridge for Patrind Hydro Power Project, Muzzaffarabad-Azad Jammu Kashmir Client: Deawoo-Sambu (JV) Muzzaffarabad	2011	22
48.	Construction of ASU 130 TPD Project Sundar Industrial-Estate, Raiwind Road Lahore Client: BOC Pakistan Limited	2011	02
49.	Construction of 200 BED Surgical Hospital-Sukkur Client: Expertise (Private) Limited	2012	242
50.	Construction Of Rathoa Haryam Bridge Across Reservoir Channel On Mirpur- Islamgarh Road Client: M/s Condrill Private Limited	2012	01
51.	Water Source Development At OPF Housing Scheme Zone-V, Islamabad Client: Overseas Pakistanis Foundation	2013	02
52.	Fatima Co-Generation – 2x60 MW, Power Plant-Sanawan. Client: Fatima Energy Limited	2014-2015	284

B) Cross Hole Sonic Logging (ASTM – D6760)

Sr. No.	Description of Work	Year	No. of Piles
1.	Fauji Cement, Jhang Bhatar-Taxila Client: Bemsol Pvt. Ltd.	2007	05
2.	Centaurs Tower, Blue Area, Islamabad Client: China State Construction Engineering Corporation	2007-2008	15
3.	Bridge Over River Indus, Connecting Larkana - Khairpur, Districts Client: Sachal Engineering Work Pvt Ltd.	2007-2009	87
4.	Mubarak Center, Lahore Client: Bauer International Pvt. Ltd.	2008	02
5.	425 MW, CCPP-Nandipur Client: Condrill Pvt. Ltd.	2009	12
6.	Bahria Icon Tower, Clifton-Karachi Client: Paragon Constructors Pvt. Ltd.	2009	02
7.	Construction of Railway Bridge No. 34A, Pattoki Client: Railway Constructions Pakistan Limited	2011	01
8.	Construction of Sultan Bahoo Bridge Over River Chenab Linking Shorkot & Garh Maharaja Client: SARCO JV MSL; (40 Piles To Be Tested)	2011-2012	38
09.	Construction of Amri - Qazi Ahmed Bridge Over River Indus Connecting Amri (N55) With Qazi Ahmed (N5) Client: M/s Sachal Engineering Works Pvt. Ltd	2012-2013	68
10.	Shaheed Benazir Bhutto Bridge Over River Indus At Nishtar Ghat. Client: Frontier Works Organization	2012-2013	51
11.	Hotel Tower At Bahria Town Icon, Karachi. Client: Atlas Pakistan Pvt. Ltd.	2013	11
12.	Chinese Aided Post Flood Rehabilitation Project on N-35 (North Section) of NHA. Client: China Railway 17th Bureau Group Co. Ltd.	2014-2015	51
13.	Link Bridge Over The River Indus Connecting Jhirk & Mulla Katiar Client: M/s Sachal Engineering Works Pvt. Ltd	2014-2015	70
14.	Construction of Bridge at River Indus between Rahim Yar Khan & Rojhan. Client: Ashfaq Associates Pvt. Ltd.	2015	62
15.	THATTA – SUJJAWAL Bridge Over River Indus Client: M/s Sachal Engineering Works Pvt. Ltd	2015	42

C) High Strain Dynamic Pile Testing(ASTM-D4945)

Sr. No.	Description of Work	Year	No of Piles
1.	Software Technology Park, PITB, Govt. of Punjab, Lahore. Client: Condrill Pvt. Ltd. Type of Pile: Bored Pile (760 mm dia) Testing Load: 225 Tons	2007	05
2.	Kandhkot Field Gas Compression Station Project, Kandhkot. Client: Sachal Engineering Works Private Limited. Type of Pile: Bored Pile (760 mm dia) Testing Load: 230 Tons	2008	01
3.	Saif Power Project, CCPP-Qadirabad, Sahiwal Client: Condrill Pvt. Ltd. Type of Pile: Bored Pile (600 mm dia) Testing Load: 320 Tons	2008	12
4.	Engro Energy Power Plant-Qadirpur, Distt. Ghotki Client: Engineering Concept Pvt. Ltd. & Faisal Enterprises Private Limited Type of Pile: Bored Pile (600 mm dia) Testing Load: 128 Tons	2008-09	02
5.	425 MW, CCPP-Nandipur Client: Condrill Pvt. Ltd. Type of Pile: Bored Pile (600 mm dia & 800 mm dia) Testing Load: 225 Tons & 400 Tons	2009	08
6.	FAP Grain & Fertilizer Terminal-Port Qasim, Karachi Client: Consolidated Engineering Services-Karachi Type of Pile: PHC Pile – 110 mm Thick (800 mm O.D. & 690 mm I.D.) Testing Load: 5850 kN	2009	02
7.	Bahria Icon Tower, Clifton-Karachi Client: Paragon Constructors Pvt. Ltd. Type of Pile: Bored Piles (1200 mm dia) Testing Load: 2250 Tons	2009-10	12
8.	Qasim International Containers Terminal-2, Port Qasim-Karachi Client: China Harbor Engineering Company Limited Type of Piles: Bored Pile-2 No. (1400 mm dia) Steel Tubular-5 No's (2016 mm dia) Testing Load: 6200 kN & 7542 kN	2009-10	07
9.	Plot No. 58-C, Bukhari Commercial Area, Lane 13, Phase 06, Dha Karachi, Pakistan Client: Mr. Ibrahim Shamsi Type of Pile: Bored Pile (550 mm dia) Testing Load: 200 Tons	2010	02
10.	Bridge Over River Jhelum At Garhi Doppatta Project, Muzaffarabad-AJ &K Client: Sachal Engineering Works Pvt. Ltd. Type of Pile: Bored Pile (1000 mm dia) Testing Load: 1000 Tons	2011	01
11.	Pakistan Deep Water Container Port, Keamari Groyne Terminal-Karachi Client: CHEC & CES Type Of Pile: Bored Piles (1600 mm dia) Testing Load: 4600 Tons & 4650 Tons	2011	02
12.	Nauseri Bridge Project, Azad Jammu & Kashmir Client: Sachal Engineering Works Private Limited. Type of Pile: Bored Pile (1000 mm dia) Testing Load: 453 Tons	2012	01
13.	Hotel Tower at Bahria Town Icon, Karachi. Client: Atlas Pakistan (Pvt.) Ltd. Type of Pile: Bored Piles (1200 mm dia) Testing Load: 2250 Tons	2013	04
14.	G 02, Block 02, Clifton – Karachi Client: Times Enterprises. Type of Pile: Bored Pile (1200 mm dia) Testing Load: 14250kN	2014	06
15.	Hoshang Pearl Tower-Karachi Client: Atlas Pakistan (Pvt.) Ltd. Type of Pile: Bored Pile (1200mm) Test Load: 1500Tons & 1800Tons	2014	02
16.	2X660 MW Coal Fired Project, Port Qasim-Karachi Client: SEPCO III Type Of Pile: Bored Pile (1000mm & 750mm) Test Load: 840 Tons & 312 Tons	2014	06
17.	LNG Terminal at Port Qasim, Karachi Client: China Harbour Engineering Company Limited Type of Pile: Steel Tubular Pile (1220mm) Test Load: 12500 kN	2014	02
18.	35 Mw, Coal Fired Power Plant-Sitara Chemical Industries Limited, Faisalabad Client: Condrill Pakistan Pvt. Ltd. Type of Pile: Bored Piles Test Load: Upto 1700kN	2015	05

Sr. No.	Description of Work	Year	No. of Piles
19.	Fatima Co-Generation–2x60 MW, Power Plant-Sanawan. Client: Fatima Energy Limited Type of Pile: Bored Piles Test Load: Upto 4500kN	2014-2015	75
20.	2 x 660MW, Coal Power Plant Project, Sahiwal Client: SDEPCI Contractor: Bemsol Pvt. Ltd. Type of Pile: Bored Piles Test Load: Upto 6000kN	2015	03
21.	Ship lift Platform and Transfer System at Karachi Shipyard and Engineering Works, West Wharf-Karachi. Client: Karachi Shipyard and Engineering Works. Type of Pile: Bored Pile Test Load: Upto 488 Tons	2015	03

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