Abe Construction Services, Inc.

Introduction

ACS is a professional engineering firm specializing in testing, analysis and consulting services for the deep foundation industry. The firm is owned and operated by Mr. Steven K. Abe who has a BS degree in geological sciences from the University of Michigan, an MS degree in geotechnical/civil engineering from Cleveland State University, and is a registered professional engineer in California, Nevada, and Utah. Mr. Abe has over fifteen years experience in the deep foundation testing and analysis industry and has worked on piling projects around the world. From 1988 to 2002 Mr. Abe worked for GRL Engineers, the firm that pioneered dynamic pile testing and developed the PDA (Pile Driving Analyzer), and GRLWEAP and CAPWAP analysis software, which is now routinely used on pile driving projects worldwide. Since opening and managing the California office for GRL In 1995, Mr. Abe has primarily worked on numerous pile driving projects in California. In 2002, Mr. Abe left GRL to establish ACS, and continues to provide the same professional services to his clients.

Services

ACS specializes in the following testing and analysis services:

Dynamic Pile Testing using the Pile Driving Analyzer® (PDA), to measure pile capacity, pile, soil and hammer performance during driving or restrike. Performed on all types of driven piles, including steel piles, concrete, or timber piles, as well as on drilled piles and auger-cast piles.

CAPWAP® Analysis- a **signal matching** program for calculating soil resistance distribution and dynamic soil parameters using pile top force and velocity measured during pile driving by a PDA.

GRLWEAP™, a **wave equation analysis** program for prediction of capacity, blow count, and stresses during pile driving.

Pile Driveability Analysis- Required for most Caltrans projects to evaluate the suitability of proposed pile driving equipment prior to construction. The process involves estimating soil resistance profiles based on static capacity analysis procedures and performing GLRWEAP analysis.

Static Pile Capacity Analysis- Perform pile design based on the project geotechnical data and structural load requirements.

PIT (Pile Integrity Testing)- A “low strain” non-destructive testing procedure, which uses the pulse-echo method to check the length of, or detect defects in cast-in-place or driven piles. Routinely used to determine pile lengths for existing piles under existing structures.

SPT energy measurements, using the PDA and instrumented SPT rods to measure and calibrate the energy efficiency of SPT hammers used for geotechnical investigations. Required for ASTM D6066 standard when SPT is used for liquefaction evaluation. Routinely require by the California Department of Water Resources, the California Department of Safety of Dams, and the US Army Corps of Engineers.

CSL (Cross-hole Sonic Logging)- Non-destructive test, which involves pulling Sonic, probes through inspection pipes to evaluate concrete quality and detect defects in drilled shafts or slurry walls. The result consists of logs of wave velocity, which correlates to concrete quality.

Gamma-gamma Logging- A non-destructive test performed on CIDH piles or concrete walls, which use a nuclear density probe to create a log of average bulk density vs. pile depth. Deviations in average bulk density are used to identify pile anomalies or defects and to assess pile/concrete quality.

Vibration and Noise Monitoring- Vibration and noise compliance monitoring services for pile driving projects. Instrumentation includes Blastmate triaxial seismographs and Quest Technologies Class II data logging sould level meters.

Becker Testing- Monitor Becker hammer and drill with the PDA in a manner similar to SPT energy measurements, to evaluate hammer performance and soil; resistance vs. depth.
Allows for a check on energy transferred to the drive rod and a calculation of shaft resistance on the drive rod during the use of this Penetrometer.

Clients

ACS's clients include owners of private, public, state and federal projects. We are routinely hired by contractors to comply with project requirements, to offer value-engineering services, or to troubleshoot difficult deep foundation construction issues. We also often work for engineering firms as a sub-consultant or to provide specialized testing services.

Projects

Measurement and analysis services of driven piles comprise the major portion of ACS's workload. Our projects include residential developments, state, county and federal highway bridges; Numerous pier, dock, and wharf projects for owners such as the Ports of Oakland, LA, Long Beach, and Honolulu; Municipal projects consist of airport facilities, wastewater treatment plants, civic centers, and parking structures. Private owner projects include office building, shopping centers, amusement parks, etc. In addition, ACS specializes in offshore pile testing for the petroleum industry. A partial project experience list for ACS is attached.

Professional Affiliations

ACS is an active member of ASCE, the Deep Foundation Institute, and the Pile Driving Contractors Association.

Publications and seminars

Mr. Abe has authored and presented several technical papers for publications and conferences such as Geotechnical News, the Deep Foundation Institute, The International Stress-wave Conference, and ASCE (American Society of Civil Engineers). He has also presented and participated in numerous seminars regarding dynamic pile testing, wave equation analysis, and non-destructive pile integrity testing.

ACS- Partial Project Experience List for Dynamic Pile Testing

Job Description	City	State	Country	Client
San Francisco Bay Bridge	San Francisco	CA	USA	Kiewit Pacific/ KFM
Concord Naval Weapons Station, Pier 3	Concord	CA	USA	Dillingham
San Mateo Bridge Retrofit	San Mateo	CA	USA	MK Construction
Carquinez Bridge	Crockett	CA	USA	FCI Constructors
Port of Long Beach- Pier T	Long Beach	CA	USA	Leighton & Assoc.
Port of Long Beach- Pier T Extension Phase I & II	Long Beach	CA	USA	Manson Construction Co
San Francisco International Airport- Boarding Area G	San Francisco	CA	USA	SFO Associates
San Francisco International Airport Terminal	San Francisco	CA	USA	GEI Consultants
Port of Los Angeles- New Dock Street	Los Angeles	CA	USA	Geofon, Inc.
New Benicia Bridge	Benicia	CA	USA	Kiewit Pacific
Port of Los Angeles, Pier 301	Los Angeles	CA	USA	Geofon, Inc.
Seaside/Navy Way - Port of Los Angeles	Los Angeles	CA	USA	Geofon, Inc.
Lopez Dam	Arroyo Grande	CA	USA	Hayward Baker
Port of Oakland, Berths 57-58	Oakland	CA	USA	Manson / Dutra
Port of Oakland-Berth 59	Oakland	CA	USA	Subsurface Consultants, Inc.
MCON Project 262R;Pier 7 Upgrade, Naval Station	San Diego	CA	USA	General Construction Company
San Francisco Bay Bridge	San Francisco	CA	USA	Caltrans
Carnival Cruise Terminal	Los Angeles	CA	USA	Kajima
Sacramento Airport	Sacramento	CA	USA	Kleinfelder
ZAP Platform Installation	Congo		Africa	Chevron
ACT Production Platform	South China Sea		China	Texaco/ Chevron
West Sacramento Treatment Plant	Sacramento	CA	USA	Shimmick Construction
Delta Energy Center	Antioch	CA	USA	Foundation Constructors
Pearl Harbor Container Facility	Pearl Harbor	HI	USA	Nordic Construction
US Coast Guard Station	Honolulu	HI	USA	Lahaina Pile
Coast Guard Island Bridge	Alameda	CA	USA	Dutra Construction
US Navy Hazmat Facility	Guam		USA	Black Construction
Bouquet Dam- Seismic Evaluation	Santa Clarita	CA	USA	Taber Consultants
UC Mission Bay Student Housing	San Francisco	CA	USA	Kiewit Pacific
AMTRAK Maintenance Facility	Oakland	CA	USA	Kiewit Pacific
Salinas River Bridge	Monterey County	CA	USA	Kiewit Pacific
Port of Panama City	Panama City		Panama	Productos De Concreto, SA
Cushing Parkway Bridge	Freemont	CA	USA	URS Corporation
San Jose Civic Center	San Jose	CA	USA	URS Corporation
Port of Stockton Deepening Study	Stockton	CA	USA	Han-Padron
Oakland Aviation Maintenance Facility	Oakland	CA	USA	Foundation Constructors
Homeport Carrier Complex	Everett	WA	USA	General / Manson, JV
Metcalf Energy Center	San Jose	CA	USA	Dillingham Construction
T2, Port of Vancouver	Vancouver	WA		URS /Woodward
Port of Guam- Typhoon Repair	Guam		USA	Black Construction
Hwy. 101 over Santa Clara River	Ventura	CA	USA	MCM Construction
Cosumnes Power Plant	Stockton	CA	USA	Foundation Constructors
Lopez Dam Stone Column Seismic Retrofit	San Luis Obispo	Ca	USA	Hayward Baker
SR 126 over I-5	Valencia	CA	USA	Foundation Pile, Inc.
Valley Transportation Authority, Hwy 101/85 Bridges	Santa Clara	CA	USA	FCI Constructors

ACS- Partial Project Experience List for Vibration and Sound Monitoring

Job Description	City	State	Country	Client
Metcalf Energy Facility	San Jose	CA	USA	Dillingham
Foster City Water Tank	Foster City	CA	USA	Foundation Constructors
Santa Clara Valley Water Lab	Santa Clara	CA	USA	Foundation Constructors
San Jose International Airport	San Jose	CA	USA	Foundation Constructors
Hartnell College	Salinas	CA	USA	Stroer and Graff
EBMUD Grit System	Oakland	CA	USA	Proven Management
Kaiser Hospital	Modesto	CA	USA	Consolidated Engineering Labs
Kaiser Hospital	Antioch	CA	USA	Kiewit Construction
Auburn Canal	Auburn	CA	USA	Consolidated Engineering Labs
Capital Mall	Sacramento	CA	USA	Foundation Constructors
Sacramento Towers	Sacramento	CA	USA	Treadwell Rollo
Oakland International Airport	Oakland	CA	USA	Foundation Constructors
4th Street Bridge	San Francisco	CA	USA	Mitchell Engineering
White Cap Supply	San Francisco	CA	USA	Stroer & Graff
Tiburon Mist	Tiburon	CA	USA	Watt Communities
Estuary Cove	Oakland	CA	USA	Nelson Lewis Construction
San Jose Parking Garage	San Jose	CA	USA	Swinerton Builders
Carmel Water Treatment Plant	Calmel	CA	USA	Foundation Constructors
Northstar Village	Truckee	CA	USA	Foundation Constructors
Humboldt State Boating Center	Eureka	CA	USA	SHN Engineers
Tassajara Creek Bridge	San Ramon	CA	USA	Greenbriar Homes

ACS- Partial Project List for CSL and GGL Testing

Job Description	City	State	Test	Client
Alum Rock Rd. / Silver Creek Bridge	San Jose	CA	GGL	Harris & Associates
Benicia Bridge	Benicia	CA	CSL	Malcolm Drilling/ Caltrans
Cache Creek Bridge	Yolo County	CA	CSL	Jarrett Construction
Carquinez Bridge	Crockett	CA	CSL	FCI Constructors
Church Street Bridge	Gilroy	CA	GGL	Harris Associates
Crocker Rd. Bridge	Cloverdale	CA	GGL	Vali Cooper
Dunmore Homes	Fresno	CA	GGL	Dunmore Homes
East Contra Costa Canal	Antioch	CA	GGL	Biggs Cardosa
Freport Water Intake Structure	Freeport	CA	CSL	Freeport Water Authority
Hetch Hetchy Overpass	Fremont	CA	GGL	Kleinfelder
Highway 101 Viaduct	San Francisco	CA	CSL	Malcolm Drilling
Hwy 237/Guadelupe River Bridge	San Jose	CA	GGL	Santa Clara Valley Water District
Hwy 580/680 Springtown Road	Dublin	CA	GGL	Kleinfelder
Hwy. 101 over Van Duzen River	Fortuna	CA	GGL	MCM Construction
Joiner Parkway	Roseville	CA	GGL	Parsons Brinkerhoff
Liesuretown Road Overcrossing	Vacaville	CA	GGL	Parikh Consultants
Lockheed Martin	Santa Clara	CA	CSL	Smith Emery
Milpitas City Hall	Milpitas	CA	CSL	Smith Emery
Mountainhouse Blvd Overcrossing	Livermore	CA	CSL	Biggs Cardosa
Mountainhouse Blvd Overcrossing	Livermore	CA	GGL	Biggs Cardosa
Oyster Point Blvd.	San Francisco	CA	CSL	Malcolm Drilling
Pilarcitos Creek Pedestrian Bridge	Half Moon Bay	CA	GGL	Biggs Cardosa
Piney Creek Bridge	King City	CA	CSL	Malcolm Drilling
Richmond-San Rafael Bridge	San Rafael	CA	CSL	Agra / Caltrans
Santa Clara Valley Water District	San Jose	CA	GGL	Smith Emery
Santa Cruz Ave Bridge	Menlo Park	CA	GGL	Biggs Cardosa
Stony Creek Bridge	Glenn County	CA	CSL	Glenn County
Thornton Road Bridge	Thornton	CA	CSL	MCM Construction
Trilogy Development	Rio Vista	CA	GGL	Biggs Cardosa
US Border Patrol	Calexico	CA	CSL	Geomatrix Consultants
Uvas Creek Bridge	Santa Clara	CA	GGL	Santa Clara County
Welburn Ave. Bridge	Gilroy	CA	GGL	Parikh Consultants
Wheeler Ranch Road Bridge	Olivehurst	CA	GGL	Tiechert Construction
Windemere Pkwy. Bridge	San Ramon	CA	GGL	Cornerstone Structural Engineering
Smith River CSL	Crescent City	CA	CSL	Key
Mcarren International Airport- Terminal 3	Las Vegas	NV	CSL	Malcolm
BATA Toll Plaza GGL	Oakland	CA	CSL	PB
Jacklin Rd	Freemont	CA	CSL	Pacific Coast Drilling
580 Castro Valley GGL	Livermore	CA	GGL	Kleinfelder/ S&C
Tepusquet Rd GGL	Santa Maria	CA	GGL	Shasta
North Texas St. Sign	Fairfield	CA	GGL	Vali Cooper
Manzanita Ave- Chico GGL	Chico	CA	GGL	Vali Cooper
Sacramento Airport	Sacramento	CA	GGL	Wallace-Kuhl
Hwy. 152 Bridge	Gilroy	CA	GGL	Jarrett Foundation
BATA Bay Bridge Toll Plaza	Oakland	CA	GGL	PB
Hazel Ave. Bridge	Folsom	CA	GGL	TRC
BART Oakland Airport Approach	Oakland	CA	CSL	Flatiron/Parsons
Bradshaw Crossing	Lathrope	CA	CSL	Engeo
Jerrold Ave / UPRR	San Francisco	CA	CSL	Disney Construction
Kings River Bridge	Sanger	CA	CSL	Biggs Cardosa
McCarren International Airport- Terminal 3	Las Vegas	NV	CSL	Malcolm Drilling
I 15 Rancho Approach	Las Vegas	NV	CSL	Case Pacific
Iron Horse Trail	Walnut Creek	CA	GGL	TRC

CERTIFICATE OF COMPLETION

STEVE ABE

Has successfully completed MSI training for

MGX II GEOPHYSICAL LOGGER + HLP-2375 PROBE

July 31, 2003

MOUNT SOPRIS INSTRUMENTS

James J. LoCoco, CPG
Mount Sopris Instruments

SEAL

This is to certify that

Mr. Steven K. Abe

of

GRL and Associates Inc.

has achieved

Advanced Level

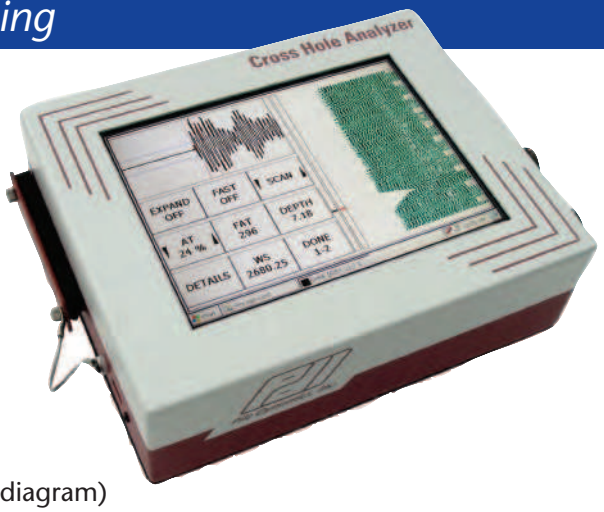
in the Dynamic Pile Testing Examinations comprising
Part A : "Data Acquisition for high-strain dynamic pile tests" and
Part B : "Data Interpretation for high-strain dynamic pile tests"
held in Orlando on March 9, 2001

Foundation QA Pty. Ltd.

foundation Qa

Cross-Hole Analyzer (CHAMP)

For crosshole and single hole sonic logging



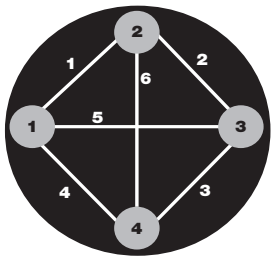
The Cross-Hole Analyzer (CHAMP) determines the quality and consistency of the concrete of drilled shafts, slurry walls, bored piles, cast-in-situ piles and other types of concrete foundations. It may be used for crosshole sonic logging (CSL) of drilled shafts or single hole sonic logging (SSL) of smaller augered cast-in-place piles.

- Small
- Light weight
- Rugged
- Easy touch screen operation
- Color LCD visible even in direct sunlight
- Battery lasts an entire day of normal testing

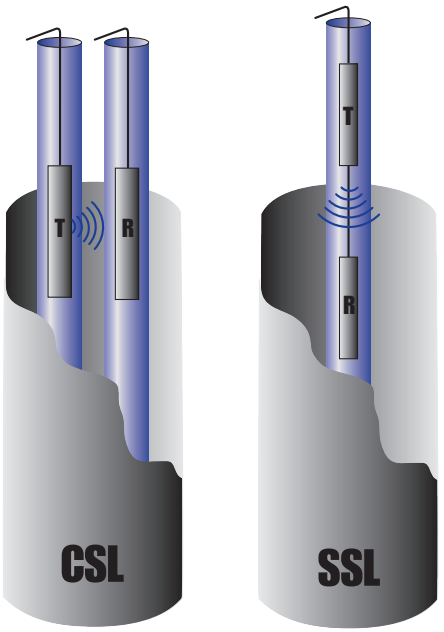
The CHAMP performs essential real time analysis (waterfall diagram) on site. Data is transferred to a computer for review and additional analysis with CHA-W and Tomosonic Software, and for report preparation.

THE TEST:

Shafts that will be tested with the CHAMP are built with steel (preferred for CSL) or PVC (required for SSL) tubes that span their length. A transmitter in one tube sends a high frequency signal that travels through the concrete and is detected by a receiver in another tube (or in the same tube for SSL). As these sensors are raised and/or lowered along the length of the foundation, they progressively scan the concrete for signal strength versus time and depth. In CSL, scanning various tube combinations for the entire shaft allows evaluation of concrete quality and defect location along the length and by quadrant.



Shaft cross section with four tubes, six paths are tested.



Shaft schematics showing one tube (SSL test, right) or one pair of tubes (CSL test, left), with signal being sent from transmitter (T) to receiver (R).

The CHAMP meets or exceeds the requirements of ASTM D6760-08 and several other crosshole sonic logging codes and standards. Visit www.pile.com for a listing.

Pile Dynamics, Inc.

Quality Assurance for Deep Foundations

Cleveland Ohio USA *info@pile.com*

tel: +1-216-831-6131 ***www.pile.com***

Cross-Hole Analyzer (CHAMP)

For crosshole and single hole sonic logging

DATA PROCESSING SOFTWARE

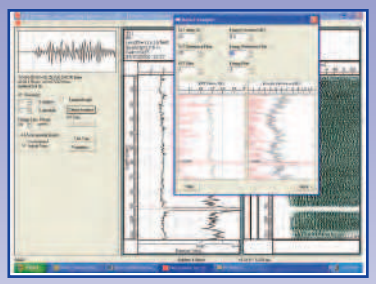
CHA-W

Performs data quality checks.
Provides powerful tools for data analysis:

- Edge Finder for First Arrival Time detection.
- Defect Analysis for easy defect identification.
- Two methods of signal strength evaluation (energy or amplitude).

Outputs user customized graphs and tables:

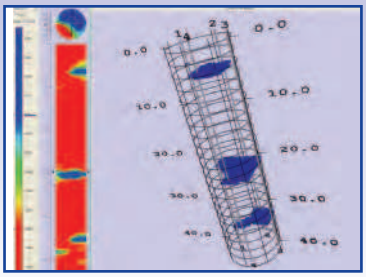
- Sonic Map - Signal strength versus time and depth in traditional waterfall diagram.
- First Arrival Time - Signal travel time from transmitter to receiver, versus depth.
- Wave-speed Plot - Wave-speed (an indicator of concrete strength) versus depth.
- Wave–speed Table - Wave-speeds, means and standard deviations.
- Energy or Amplitude Plot - Signal strength versus depth.
- Defect location graphically (horizontal red line) and in table format.



CHA-W screen

TOMOSONIC*

Tomosonic optical tomography software produces 2-D and 3-D color coded images that help visualize local defects. Views include horizontal and vertical slices and a three dimensional representation of the shaft.



Tomosonic screen

CHAMP Specifications

Physical

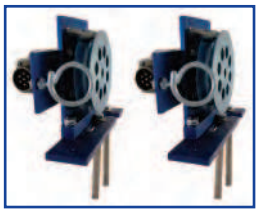
Size: 115 x 190 x 240 mm
Weight: 4.2 kg
Screen: VGA sunlight readable touch screen display
Screen Size: 21.3 cm
Operating temperature range: 0 to 40°C.
Power: Internal 12V battery (lasts at least 5 hours in data collection mode)

Electronic

PCMCIA drive including removable memory card ≥ 128 MB
Analog to digital converter resolution: 12 bits
Sampling rate: 500 kHz, 1 MHz and 2 MHz, user selectable
Scan rate: 32 scans/s (pull rate allows up to approx. 1.5 m/s)
User adjustable gain, trigger and transmission power level
User selectable record size: 250, 500, and 1,000 points

Other

Operates in English or SI units
Windows® CE operating system
Furnished with CHA-W software (CHA-W is compatible with Windows® 2000, XP and Vista)
User manual included
One year warranty
Lifetime technical support



Depth encoders for direct placement on tubes.

Tripod assembly with dual encoders.

The CHAMP supports dual high resolution encoders to independently track the depth and direction of probe movements. Probes may be at different levels during pulling. Data can be taken in both upward and downward movements of the probes. The encoders may be placed directly on the tubes or on a tripod for CSL tests. SSL is always performed with a tripod.

Probes are sturdy: their oil-filled brass shells are pressure tested for water depths up to 300 m. Transmitter probes have an exclusive safety feature, they are powered by a 12 volt source in the probe and transformed to higher voltages within the probe itself. These higher voltages allow testing between access tubes more than 3 m apart. The probes may be fitted with bottom extension weights for deeper shafts and centralizers to position the probes in the center of the tubes.

Probes Specifications

Physical

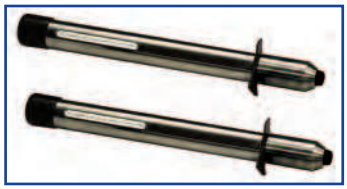
Diameter: 25 mm
Length: 215 mm
Cable length: 60 m, 100 m or 150 m
Cable jacket: Heavy duty polyurethane
Element: Ceramic
Enclosure: Nickel Plated Brass

Electronic

Transmitter frequency (nominal): 45 kHz
Receiver tuned to 45 KHz nominal
Transmitter voltage: 200 – 800 Volts (user selectable)

Other

Independent depth encoder for each probe.



Transmitter and receiver with weights.

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Pile Dynamics, Inc.

Pile Driving Analyzer® (PDA) Model PAX

For Dynamic Load Testing and Dynamic Pile Monitoring

Bearing capacity of all types of deep foundations.

The Pile Driving Analyzer (PDA) acquires data from **accelerometers** and **strain transducers** attached to a pile or shaft. The tests require the impact of a pile driving hammer or, if that is not available, of a suitable drop weight.

High Strain Dynamic Tests per ASTM D4945 - quick, reliable and non-destructive

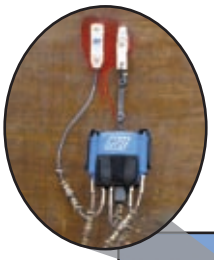
Dynamic Load Test

- Results: **Bearing capacity, structural integrity assessment**
- PDA data analyzed with the CAPWAP® software
- Excellent correlation with static load tests
- Performed on drilled shafts, continuous flight auger, cast-in-situ or driven piles on a restrike

Dynamic Pile Monitoring

- Results: **Capacity at the time of testing (Case Method and iCAP™), driving hammer performance, driving stresses, pile integrity**
- Performed during driving
- Helps establish the Driving Criterion
- Contributes to safe and economical production pile installation

The PAX may also evaluate the energy of SPT Testing Equipment by force and velocity measurements, per ASTM D4633 (optional SPT program).

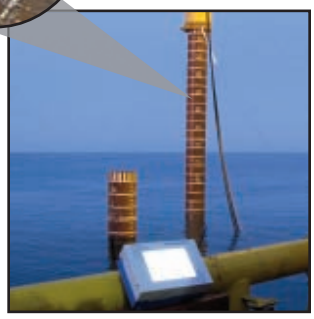


Smart accelerometer and strain transducer, offshore version.

PAX Wireless Mode

- All cables from the test pile to the PDA are eliminated
- Uses Pile Dynamics Smart Sensors and Wireless Transmitters
- Smart Sensors communicate their calibration value to the PAX, eliminating entry errors
- Signal transmission of up to 100 m (330 ft)
- Reduced volume and weight of the PDA system, simplified field setup

The PAX may also be used with cabled (traditional) accelerometers and strain transducers.



PAX in Wireless Mode at Offshore job.

SiteLink™ *(Remote Testing)*

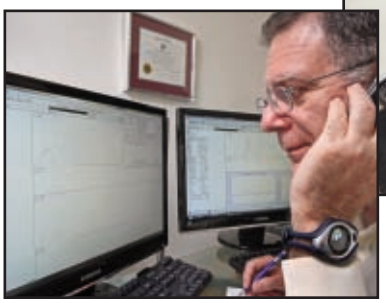
- The engineer performs High Strain Dynamic Tests from any office
- Real time field to office data transmission via Internet (PDA-R mode)
- All field measured signals and results on a computer running PDA-W software
- Simple PAX field setup may be performed by a technician
- Improves testing efficiency:
- Eliminates engineer's travel time, delays and expenses and down time on the job
- Allows immediate data analysis with CAPWAP and faster reporting of results

Pile Dynamics introduced the idea of collecting dynamic testing data from a job site and immediately transmitting it to a remote office computer back in the late 1990s, and was granted a patent for the first remote data transmitting PDA in 2001.*

*Remote Pile Driving Analyzer U.S. Patent No. US 6,301,551 B1

The PAX may also be used by a field engineer on location, displaying results, measured signals and all variables of interest on the PAX screen (PDA-L mode with iCAP).

PAX arrives at job for SiteLink.



Receiving test data with SiteLink.

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Email: info@pile.com www.pile.com

Pile Driving Analyzer® (PDA) Model PAX

For Dynamic Load Testing and Dynamic Pile Monitoring

Available as PAX-4 or PAX-8

Most High Strain Dynamic Tests require only 2 strain transducers and 2 accelerometers installed near the top of the foundation. These 2 pairs of sensors are sufficient to obtain the force and velocity records needed for the PDA calculations, thus making four channels of data acquisition (as in the PAX-4) adequate for the test.

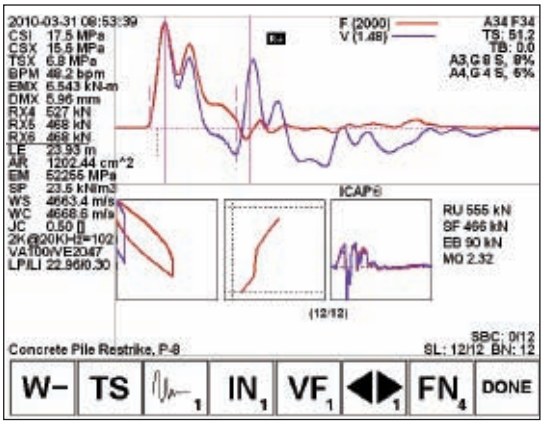
Eight channels of data acquisition (PAX-8) – 4 strain transducers and 4 accelerometers - are recommended for dynamic tests of augered cast-in-place / continuous flight auger piles, drilled shafts and spiral-welded pipes. Eight channels are also essential for dynamic measurements to be made simultaneously on follower and pile, and when a pair of accelerometers and strain transducers is installed at a second location along the length of the foundation (for example by embedding sensors near the toe of a concrete pile). If a drop weight is to be instrumented to measure force by Newton's Law, then eight channels are also required. The PAX-8 has both PE and PR accelerometer connections.

Software

The Pile Driving Analyzer is furnished with:

PDA software suite: PDA-W with iCAP™, PDIPLOT, PDI-Curves

- **PDA-W** processes PAX data files, either in real time or after the conclusion of the test. PDA-W data is interpreted for soil resistance at the time of the test, and, for driven piles, compression stresses induced at top and bottom, tension stresses along the shaft, energy transferred to the foundation and pile integrity. PDA-W calculates over 200 parameters in real time and compares them with user specified target values. PDA-W also permits the creation of a driving log, and issues quality alerts during data acquisition.
- **iCAP** calculates capacity at the time of testing through a signal matching procedure performed during Pile Driving Monitoring. Because it is based on CAPWAP® logic, it is a step beyond capacity determined by the Case Method. With no user interaction, iCAP extracts the soil behavior from dynamic measurements, computes capacity at the time of test, and produces a simulated static load test graph in real time.
- **PDIPLOT** generates tables and plots of up to six PDA results versus blow number, length or elevation. It provides the statistical summary output required by ASTM D4945.



iCAP screen in the field.

- **PDI-CURVES** combines plots of Force-Velocity versus time (required by ASTM D4945), and of other quantities from multiple PDA-W files in one single document.

CAPWAP uses force and velocity records measured by the PDA sensors to, by signal matching, determine resistance distribution and dynamic soil response and simulate a static load test. Hundreds of comparisons demonstrate the excellent correlation of CAPWAP analysis with static load testing results. CAPWAP analysis of PDA data is standard practice for Dynamic Load Testing.

GRLWEAP is a wave equation analysis program that simulates pile driving. It can be used to select the hammer for pile driving or to evaluate the suitability of a drop weight system for the Dynamic Load Test of a drilled shaft.

Engineers around the world have been using the PDA for more than 35 years. High Strain Dynamic Tests performed with the Pile Driving Analyzer are standardized by ASTM 4945 and are recognized by, among others:

- National Codes of Australia, Brazil, Canada, China, Egypt, Qatar, United Kingdom and Eurocode 7
- International Building Code (USA)
- Specifications of the American Association of State Highway Officials, US Federal Highway Administration and most US Departments of Transportation
- Specifications of regional, provincial or municipal governments in Argentina, Mexico and the Philippines
- Manuals and Codes of Practice of US organizations such as American Society of Civil Engineers, Deep Foundations Institute and Pile Driving Contractors Association.

Please contact Pile Dynamics for information on compliance with standards from other countries.

Other PAX Features: small, weighs about 5 kg, 6 hour internal battery. High visibility touch screen display doubles up as control panel and keyboard. For complete current specifications visit www.pile.com/specifications.

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Quality Assurance for Deep Foundations

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Minimate® Plus

Advanced Vibration and Overpressure Monitor

Range of Applications:

- Blast-monitoring for compliance
- Near-field blast analysis
- Pile driving
- Construction activity
- Demolition activity
- Heavy Transportation
- Bridge monitoring
- Structural analysis
- Underwater blast monitoring
- 4 or 8 channel data acquisition
- Remote monitoring - Auto Call Home™
- Structural monitoring - Flex™

When we asked what you wanted in a vibration monitor, you said "Everything." So, we designed the **Instantel® Minimate® Plus** vibration and overpressure monitor. Ever since, it has become a favourite of contractors, consultants, engineers and blasters, because it offers unrivalled features and versatility in a rugged and easy-to-use package.

Versatile

Use the **Minimate Plus** monitor with an **Instantel Standard Triaxial Geophone** (ISEE or DIN version) and an overpressure microphone (Linear or A Weight) to provide a rugged, reliable compliance monitoring system. Add the **Instantel 8-Channel** option and a single monitor may be used with two triaxial geophones and two microphones.

For more demanding monitoring applications, the **Instantel Blastware® Advanced Module** software provides the capability to monitor a broad selection of vibration and overpressure sensors, as well as sensors for structural and environmental measurements. Monitor vibration, ambient environmental conditions, and the movement of structural cracks, all at the same time, all using the same **Minimate Plus** monitor.

Intelligent

For remote installations, the **Instantel Auto Call Home™** feature will automatically transfer event files from field to office as they are recorded using a variety of wired or wireless modems. From there, the **Blastware Mail** feature of the **Blastware** software automatically distributes files or summary information to multiple e-mail or text messaging addresses.

Easy to use

Even with all of these features, the **Minimate Plus** system is still easy for anyone to use. A high-contrast LCD, eight-key tactile keypad, coupled with simple menu-driven operations, provides complete control and confidence.

Minimate Plus - everything you need and more.

Key Features

- **Instantel Histogram Combo™** mode allows capture of full waveform records while recording in histogram mode.
- **Auto Call Home** feature automates remote monitoring applications.
- Sample rates from 1,024 to 16,000 S/s, per channel with up to 65,000 S/s available on a single channel.
- Available **Instantel 8-channel** option allows for two standard geophones and two microphones to be operated from one **Minimate Plus** monitor.
- Non-volatile memory with standard 300-event storage capacity (optional 1,500-event capacity).
- Records waveform events up to 100 seconds long with standard setup, or up to 500 seconds with advanced setup.
- Continuous monitoring means zero dead time, even while the unit is processing.
- Any channel can be matched to a wide variety of sensors - geophones, accelerometers, or hydrophones.

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Instantel

Minimate® Plus

General Specifications	Minimate Plus
Channels	Microphone and Triaxial Geophone or 4 independent user-configurable channels (two Microphones and two Triaxial Geophones or 8 independent channels with optional 8-channel upgrade)
Vibration Monitoring (with Standard Triaxial Geophone)	
Range	Up to 254 mm/s (10 in/s)
Resolution	0.127 mm/s (0.005 in/s) or 0.0159 mm/s (0.000625 in/s) with built-in preamp
Accuracy (ISEE / DIN)	+/- 5% or 0.5 mm/s (0.02 in/s), whichever is larger, between 4 and 125 Hz / DIN 45669-1 standard
Transducer Density	2.13 g/cc (133 lbs/ft^3)
Frequency Range (ISEE / DIN)	2 to 250 Hz, within zero to -3 dB of an ideal flat response / 1 to 315 Hz
Maximum Cable Length (ISEE / DIN)	75 m (250 ft) / 1,000 m (3,280 ft)
Air Overpressure Monitoring	
Weighting Scales	Linear or A-weight
Linear Range	88 to 148 dB (500 Pa (0.072 PSI) Peak)
Linear Resolution	0.25 Pa (0.0000363 PSI)
Linear Accuracy	+/- 10% or +/- 1 dB, whichever is larger, between 4 and 125 Hz
Linear Frequency Response	2 to 250 Hz between -3 dB roll off points
A-weight Range	50 to 110 dBA
A-weight Resolution	0.1 dBA

Waveform Recording

Record Modes	Manual, Single-shot, Continuous
Seismic Trigger	0.125 to 254 mm/s (0.005 to 10 in/s)
Acoustic Triggers	
Linear	100 to 148 dB
A-weight	55 to 110 dBA
Sample Rate	1,024 to 16,000 S/s per channel (independent of record time), up to 65,000 S/s in single-channel mode with advanced software (max 8,000 S/s per channel for 8 channels)
Record Stop Mode	Fixed record time, **Instantel® AutoRecord™** record stop mode
Record Time	1 to 100 seconds (programmable in one-second steps) or 500 seconds plus 0.25 seconds pre-trigger
AutoRecord Time	Auto window programmable from 1 to 9 seconds, plus a 0.25 second pre-trigger. Event is recorded until activity remains below trigger level for duration of auto window, or until available memory is filled.
Cycle Time	Recording uninterrupted by event processing - no dead time
Storage Capacity	
Full Waveform Events	300 one-second events at 1,024 S/s sample rate (1,500 event capacity with optional memory upgrade)
Event Summaries	1,750 (8,750 event capacity with optional memory upgrade)

Histogram Recording

Record Modes	Histogram and **Instantel Histogram Combo™** (monitor captures triggered waveforms while recording in Histogram mode)
Recording Interval	2, 5 or 15 seconds; 1, 5 or 15 minutes
Storage Capacity	46,656 intervals - 3 days at 5-second intervals or 102 days at 15-minute intervals (with memory upgrade - 15 days at 5-second intervals or 540 days at 15-minute intervals)

Physical Specifications

Dimensions	81 x 91 x 160 mm (3.2 x 3.6 x 6.3 in)
Weight	1.4 kg (3 lbs)
Battery	Rechargeable 6 V sealed gel cell - capacity for 210 hours of continuous monitoring
User Interface	8-key keypad with domed tactile keys
Display	4-line x 20-character, high-contrast, backlit LCD with on-line help
PC Interface	RS-232
Auxillary Inputs and Outputs	External Trigger, Remote Alarm, coordinate download from GPS
Environmental	
LCD Operating Temperature	-10 to 50°C (14 to 122°F)
Electronics Operating Temperature	-20 to 60°C (-4 to 140°F)
Remote Communications	Compatible with Telephone, GSM, Cellular, RF, Satellite, Short-haul modems and Ethernet® device servers. Automatically transfers events when they occur through the **Instantel Auto Call Home™** feature.
Additional Features	Monitor start/stop timer

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Instantel

California Certification Report

1646260 - ABE CONSTRUCTION SERVICES INC - MB

Legal Business Name	ABE CONSTRUCTION SERVICES INC		
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Active Certifications	SB (micro) Jun 27, 2011 - Jun 30, 2013		
Business Types	Service;		
Classifications	[811015] Civil engineering		
Keywords	FOUNDATION ENGINEERING, CONSTRUCTION, CIVIL ENGINEERING, GEOTECHNICAL, INSPECTION		