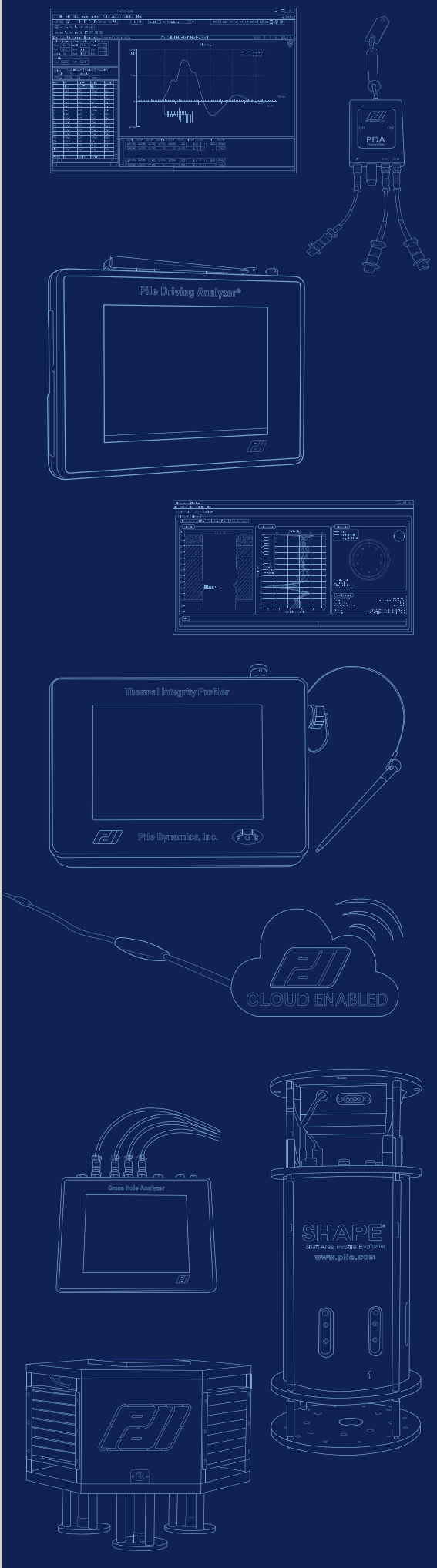
Pile Dynamics, Inc.

The World Leader in Quality Assurance Systems for the **Deep Foundation Industry**



WWW.PILE.COM INFO@PILE.COM +1 (216) 831-6131

Pile Driving Analyzer® (PDA)

GRLWEAP14

Dynamic Load Tester (PDA-DLT)

SPT Analyzer

Thermal Integrity Profiler (TIP™)

Thermal Aggregator (TAG)

Cross Hole Analyzer (CHAMP-Q)

Pile Integrity Tester (PIT-Q)

Shaft Area Profile Evaluator (SHAPE®)

Shaft Quantitative Inspection Device (SQUID™)

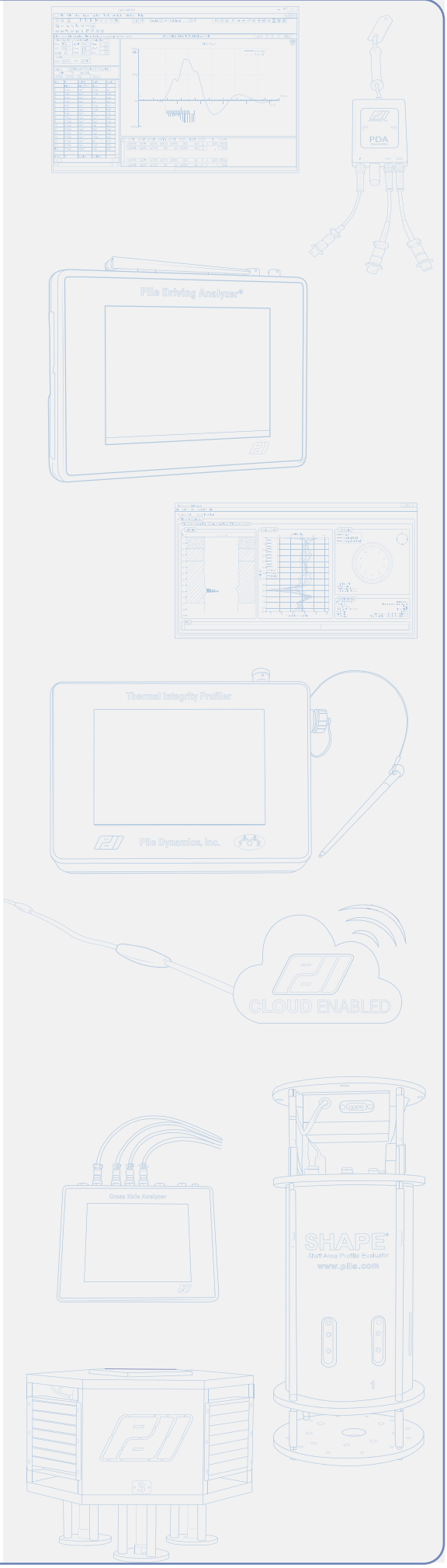
Static Load Tester (SLT)

Pile Installation Recorder (PIR-Q)

Saximeter (SAX-Q)

E-Saximeter (E-SAX)

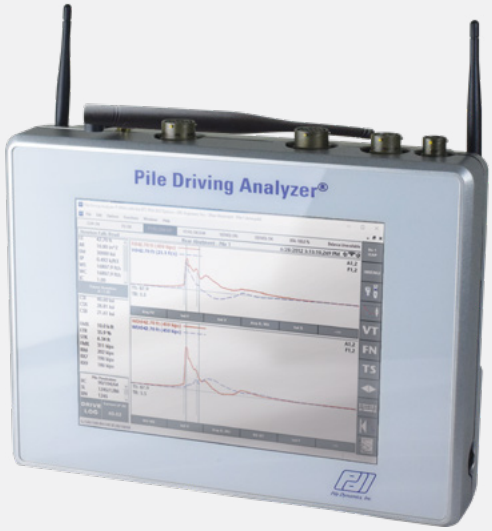
Length Inductive Test Equipment (LITE)



Pile Driving Analyzer® (PDA)

High strain dynamic load testing and pile driving monitoring system.

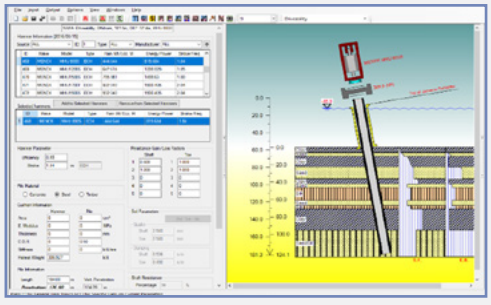
- Performs dynamic load testing on most types of deep foundations
- Calculates bearing capacity
- Assesses driving stresses and hammer performance
- Available in cabled or wireless versions



The Pile Driving Analyzer® (PDA) is the most widely employed system for Dynamic Load Testing and Pile Driving Monitoring in the world. The system also evaluates shaft integrity, driving stresses, and hammer energy when monitoring installation.

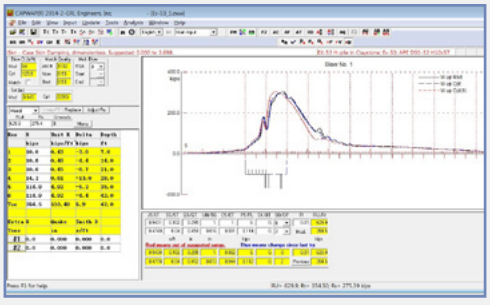
The PDA-8G offers up to 16 universal channels of data acquisition, all capable of reading data from Smart Sensors in traditional (cabled) or wireless mode. This functionality allows for extreme pile testing flexibility. Improved data transfer makes it easier to test hydraulic hammers with high blow rates.

Conforms with ASTM D4945



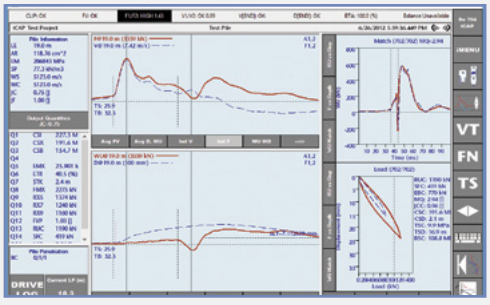
GRLWEAP14 Software

- Simulates motions and forces in a foundation pile
- Improves the accuracy of predicted driving stresses, bearing capacities, blow count, and installation time
- Estimates total driving time



CAPWAP® Software

- Calculates soil resistance by signal matching collected data
- Estimates total bearing capacity of a pile or shaft
- Assesses resistance distribution along the shaft and at the toe



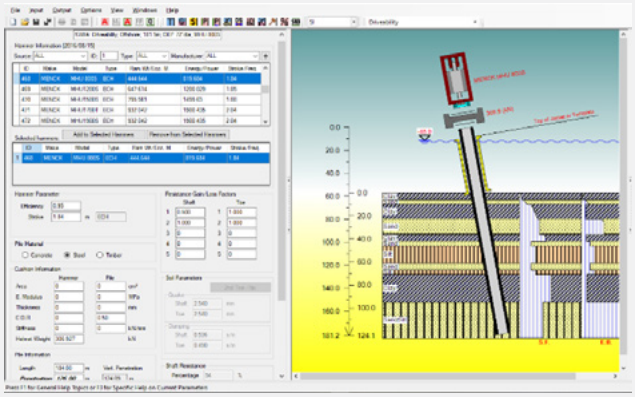
iCAP® Software

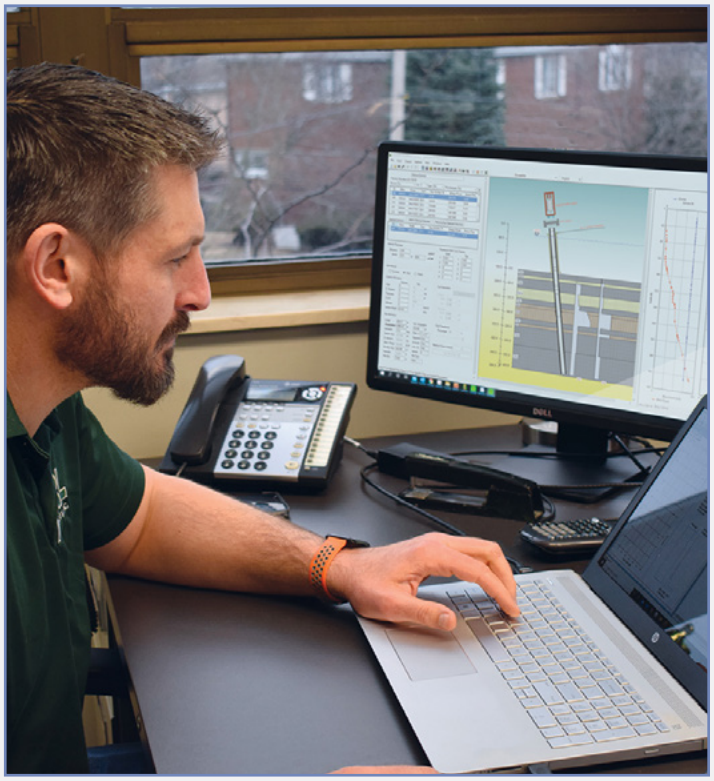
- Calculates capacity at the time of testing
- Produces a simulated static load test graph
- Fully automatic signal matching procedure

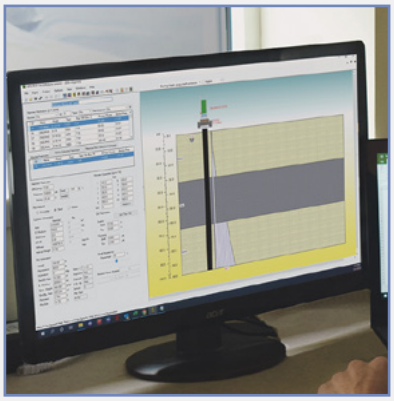
GRLWEAP14 Wave Equation Analysis

GRLWEAP14 simulates motions and forces in a foundation pile when driven by either an impact or a vibratory hammer. Its features help improve the accuracy of predicted driving stresses, bearing capacities, blow counts and installation time when matched with field observation and measurement results defined by the Pile Driving Analyzer® system (PDA).

- Simulates the pile response to pile driving equipment
- Helps select appropriate hammer(s) and driving system with known piling, soil, and capacity requirements
- Estimates the total driving time
- Calculates soil resistance, dynamic pile stresses, and estimated blow count for a given hamer and pile system







GRLWEAP14 Offshore Wave Versions

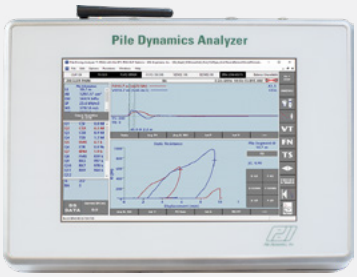
In challenging situations the GRLWEAP14 Offshore Wave software can assist with special features:

- Free riding hammers
- Non-uniform and battered piles
- Fatigue output tables

Dynamic Load Tester (PDA-DLT)

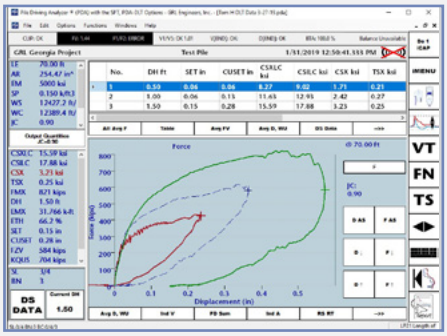
The PDA-DLT system was designed specifically for quality assurance dynamic load testing of drilled shafts and bored piles. The PDA-DLT allows for multiple configurations of force measurement.

- Monitors high strain dynamic load tests using a drop weight system
- Evaluates bearing capacity, structural integrity, and foundation stresses
- Optimized for a small number of blows with variable drop heights
- Top transducer eliminates concrete build up and excavation



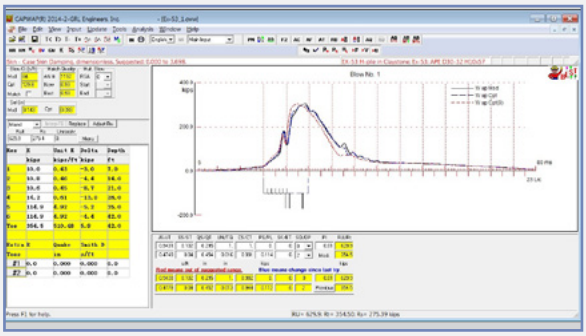
Conforms with ASTM D4945

PDA-DLT Software



PDA-S

- Estimates soil resistance at time of the test
- Issues warnings and alerts during data input and acquisition
- Outputs customized graphs with up to three appearing on screen in real-time



CAPWAP® Software

- Estimates total bearing capacity of a pile or shaft
- Estimates resistance distribution along the shaft and at the toe
- Performs a soil resistance test with collected DLT data

Top Force Transducer

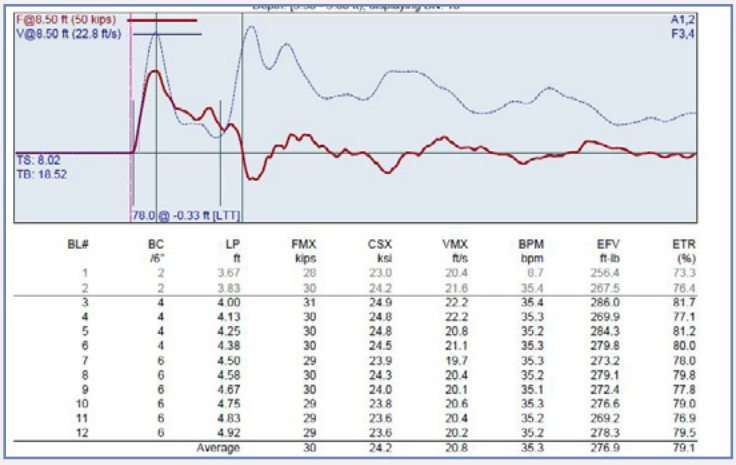
A top force transducer eliminates concrete build up or excavation on drilled concrete piles. Using Pile Dynamics, Inc's Top Force Transducer allows for quick set up. When used with the PDA-DLT, the Top Force Transducer improves force accuracy and reduces labor costs.

- 91 cm (36") – 4,000 tons (includes 8 strains)
- 61 cm (24") – 2,400 tons (includes 8 strains)
- 41 cm (16") – 1,150 tons (includes 8 strains)

SPT Analyzer

The SPT Analyzer determines the energy transferred by SPT hammers using force and velocity measurements for improved reliability of SPT N-values.

- Corrects the observed N-Value to help improve reliability of soil strength estimates
- Determines energy transferred by SPT Hammers using force and velocity measurements
- Includes Smart Sensor technology to obtain sensor calibration and rod cross-sectional area for simplified set-up
- Offers simplified reporting and analysis option to speed testing results



BL#	BC /6"	LP ft	FMX kips	CSX ksi	VMX ft/s	BPM bpm	EFV ft-lb	ETR (%)
1	2	3.67	28	23.0	20.4	8.7	256.4	73.3
2	2	3.83	30	24.2	21.6	35.4	267.5	76.4
3	4	4.00	31	24.9	22.2	35.4	286.0	81.7
4	4	4.13	30	24.8	22.2	35.3	269.9	77.1
5	4	4.25	30	24.8	20.8	35.2	284.3	81.2
6	4	4.38	30	24.5	21.1	35.3	279.8	80.0
7	6	4.50	29	23.9	19.7	35.3	273.2	78.0
8	6	4.58	30	24.3	20.4	35.2	279.1	79.8
9	6	4.67	30	24.0	20.1	35.1	272.4	77.8
10	6	4.75	29	23.8	20.6	35.3	276.6	79.0
11	6	4.83	29	23.6	20.4	35.2	269.2	76.9
12	6	4.92	29	23.6	20.2	35.2	278.3	79.5
		Average	30	24.2	20.8	35.3	276.9	79.1

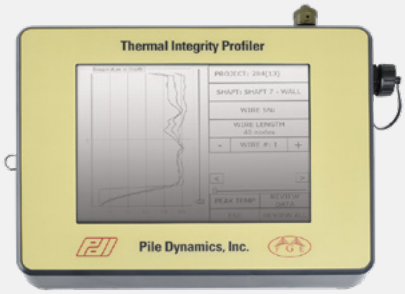
SPT Analyzer Output

The SPT Analyzer has a Report Creation Option that makes it quick and easy to summarize results and create output graphs of Force, Velocity, Energy and Displacement versus Time, as well as numerical, statistical, and graphical results for each data set. The software is fully customizable.

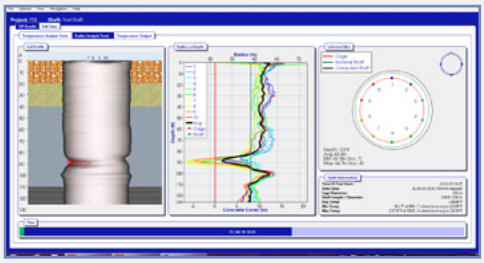
Thermal Integrity Profiler (TIP™)

TIP™ testing evaluates the entire cross-section and the entire length of the deep foundation element measuring heat generated by hydrating cement to assess the quality of drilled shafts/bored piles, augered cast in place (ACIP)/continuous flight auger (CFA), drilled displacement piles, slurry walls, barrettes, soil nails, and jet grouted columns.

- Evaluates concrete quality inside and outside the cage
- Accelerates construction with tests conducted during initial concrete curing
- Reveals necking or inclusions, bulges, and concrete cover variations
- Thermal Wire® cables can replace access tubes



Conforms with ASTM D7949



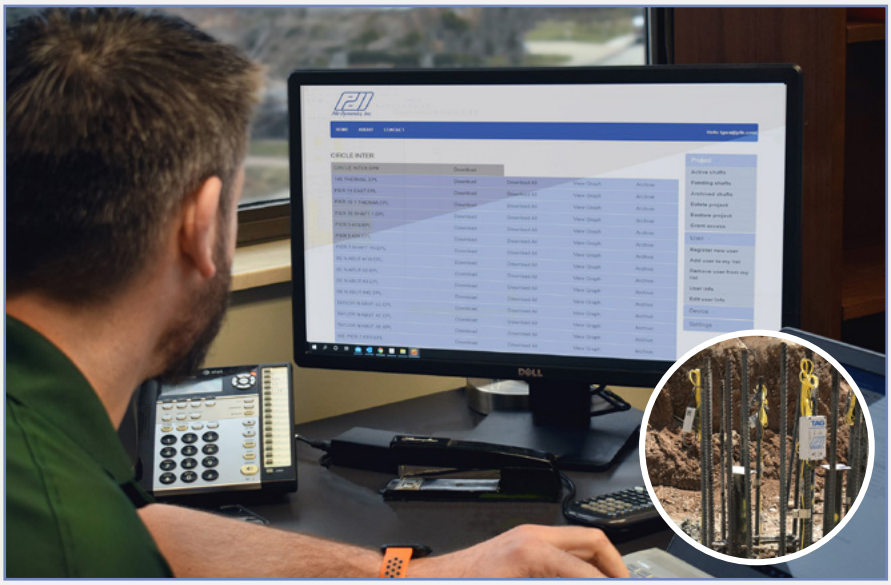
TIP Reporter Software:

- Displays measured temperatures vs depth to identify areas of concern
- Profiling data illustrated by mapped cross sections of the shaft
- Estimates concrete cover along length of shaft
- 3-D visualizations of the pile's shape against a soil profile

Secure Cloud Enabled Data Collection

- Data can be sent from the site to the office for review via a secure Cloud server
- Allows the engineer, designer, and contractor to evaluate data from any location
- Saves construction time and money with earlier shaft evaluation

CLOUD ENABLED



Thermal Aggregator (TAG) and Thermal Acquisition Port (TAP-Edge)

Thermal Integrity Profiling (TIP™) utilizes heat generated by curing of concrete to assess the integrity and quality of drilled shafts. PDI's TAG units can be used to collect TIP data from multiple TAP-Edge boxes attached to a foundation, sending the data via a cellular modem to a secure Cloud server.

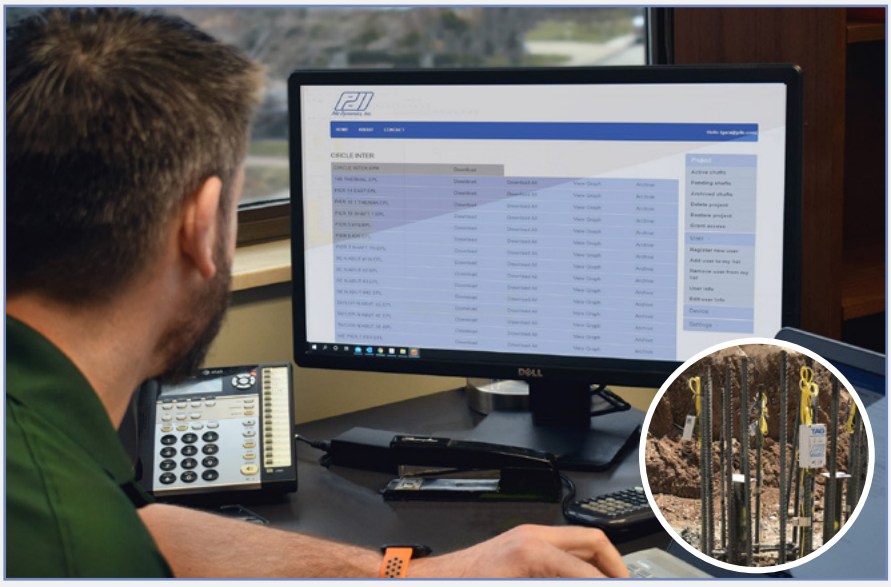
- Evaluates concrete quality cover and cage alignment
- Temperature vs. depth plot reveals potential voids
- Tests early after casting
- Collection of TIP data sent to the Cloud for real-time, offsite analysis

Conforms with ASTM D7949

Secure Cloud Enabled Data Collection

- Provides real-time data collection to a secure Cloud server
- Allows the engineer, designer, and contractor to evaluate data from any location
- Saves construction time and money with early shaft evaluation

CLOUD ENABLED

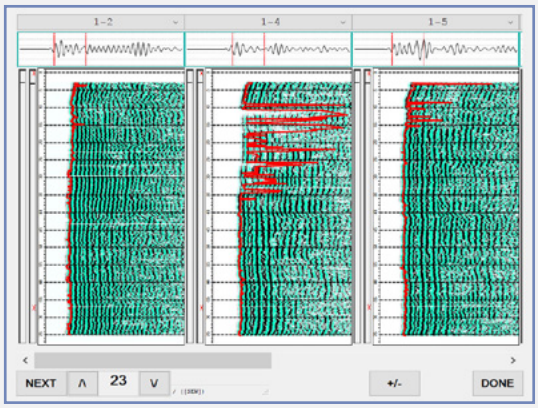


Cross Hole Analyzer (CHAMP-Q)

The CHAMP-Q 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, using the Crosshole Sonic Logging (CSLT) method.

- Up to four probes (six profiles) pulled at once for efficient data collection
- Includes color-coded cables for easy identification of probe location
- Performs real-time analysis onsite
- Optimized data entry for speed of testing and minimization of erroneous input

Conforms with ASTM D6760

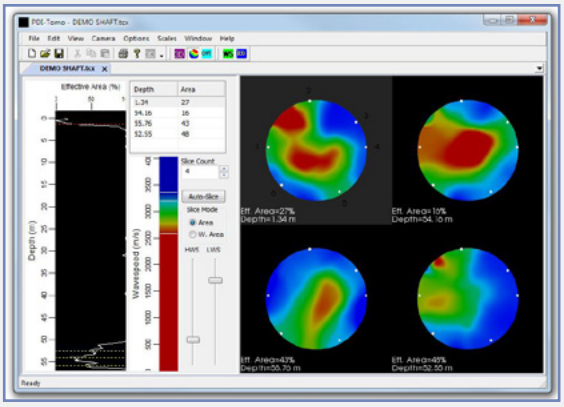


CHA-W Software

- 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 versus depth
- Wave–speed Table: Means, and standard deviations
- Energy or Amplitude Plot: Signal strength versus depth

PDI-TOMO 3-D Tomographic Software (Upgrade Option)

- Provides a more precise location and shape of a defect detected through CSL data
- Generates easily comprehensible and professional outputs of the engineering analysis
- Offers an intuitive, tomographic, visual identification of the damaged areas



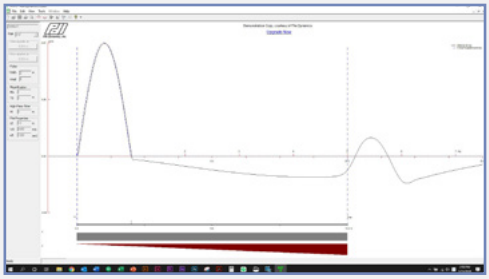
Pile Integrity Tester (PIT-Q)

The PIT-Q assesses the structural integrity of drilled shafts/bored piles, ACIP/CFA, and drilled displacement piles, driven concrete or timber piles and concrete filled pipes. The PIT-Q performs wave equation-based, non-destructive foundation investigations known as Low Strain Impact Integrity Tests or Low Strain Dynamic Tests, providing assurance that a pile or shaft is free of major cracks and voids.

- Low strain integrity testing by pulse echo or transient response methods
- Reveals major cracks or defects
- May determine unknown pile lengths
- Available in: velocity only, or force and velocity channels

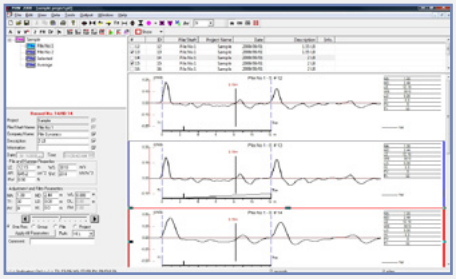
Conforms with ASTM D5882

PIT-Q Software



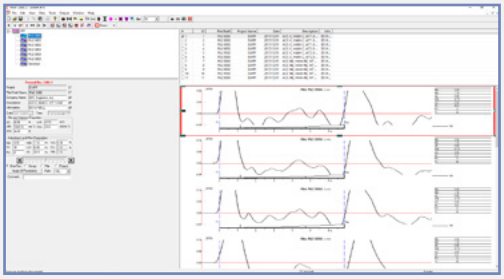
PIT-S

- Simulates the performance of low strain integrity testing
- Curves simulated by PIT-S may be compared to measured curves for a simple signal matching process that helps investigate the cause of observed reflections
- User enters pile shape, soil layer, and characteristics of hammer impact



PIT-W

- Allows data to be filtered and magnified with an exponential amplification as a function of time
- Analysis in the time domain helps locate the depth of a potential defect
- Outputs user customized tables and reports



PIT-Professional (Upgrade Option)

- Offers advanced modeling and analysis reporting
- Estimates the impedance (and shape) of the pile and quantifies the severity of defects
- Analyzes records from two accelerometers or from an instrumented hammer

PIT-Q Models for Various Applications

Features	PIT-QV	PIT-QFV
Channels of data acquisition	1	2
Displays velocity vs time graph	✓	✓
Displays force vs time graph		✓
Optional second velocity graph		✓
Data acquisition	Instrumented	Instrumented
Real-time data	✓	✓

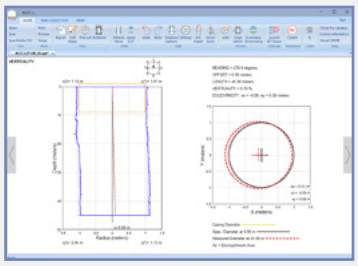
Shaft Area Profile Evaluator (SHAPE®)

SHAPE® is a cost-effective quality assurance testing device for deep foundations such as drilled shafts, slurry walls, and barrettes to determine the excavation verticality and profile.

- Available for both wet and dry excavations
- Data acquisition at a rate of approximately one scan per second
- Eight channels scanned simultaneously
- Quick connection to Kelly bar or optional winch system

The Standard and Cabled SHAPE have eight ultrasonic signals scanning the sides of the shaft prior to placing concrete in wet conditions. SHAPE-AIR for dry excavations utilizes Lidar sensors. All SHAPE units provide a quick and economical view of the shaft verticality, radius, shape, and volume. The Cabled SHAPE presents data in real time with a cabled connection as it descends and ascends the length of the excavation.

Conforms with ASTM D7949



SHAPE® Data Collection Software

SHAPE software generates reports based on data collected during testing. The software allows users to view and interpret the collected data with the following features:

- Pressure modifications during testing
- Edit Edges – select first arrival times for the circle fit process
- Sensor Data – view measured pulses
- Report – output shaft profiles, verticality, and eccentricity information

Features	SHAPE®	SHAPE®-AIR**	Cabled SHAPE®*
Ultrasonic Sensors	✓		✓
Lidar Sensors		✓	
Mounts to Kelly bar and adapter	✓	✓	✓
Mounts to winch system	✓	✓	✓
Dry shafts		✓	
Wet shafts	✓		✓
Min shaft diameter	26 inches (71 cm)	20 inches (51 cm)	26 inches (71 cm)
Max shaft diameter	20 feet (6m)	20 feet (6m)	20 feet (6m)
Real-time data acquisition	✓***	✓***	✓

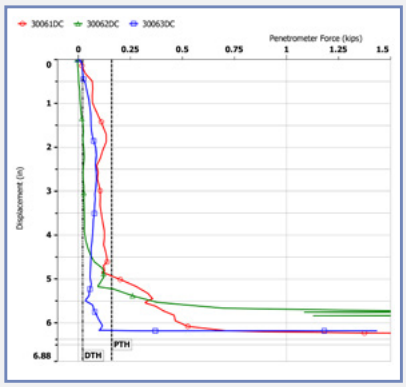
* The minimum radial measurement is 13 inches using Ultrasonic measurement method and the Maximum is 10 feet.
** The minimum radial measurement is 10 inches using LIDAR measurement method and the Maximum is 10 feet.
*** Real-time analysis available upon SHAPE unit connection to tablet at the surface.

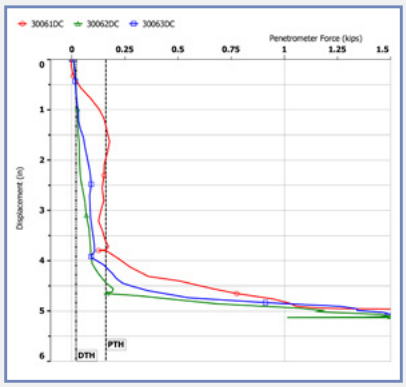
Shaft Quantitative Inspection Device (SQUID™)

SQUID™ provides a quantitative, real-time assessment of the cleanliness and competency of the bottom surface of bored pile or drilled shaft foundations.

- Measures thickness of debris at the shaft base
- Provides three independent force and displacement measurements
- Real-time data can be viewed during testing
- Quickly attaches to any drilling stem or Kelly bar

Prior to reinforcement and concrete placement in a drilled excavation, the bottom should be cleaned and inspected. SQUID takes accurate displacement and penetrometer measurements, providing an objective, quantitative assessment.





Drilled Shaft Cleanout

SQUID features independent displacement of three penetrometers into the soil layer and measures:

- Displacement, beginning with the first encounter of a layer
- Thickness of the debris layer at various locations around the borehole bottom
- Bearing pressure of three independent standard size (10 cm²) cone penetrometers

SQUID Against Competition

Features	SQUID	Camera Competitors
Data collection	✓	
Testing time	10 minutes	45 minutes
Optional wireless connection	✓	
Attaches to Kelly bar	✓	
Camera		✓
Real-time data acquisition	✓	

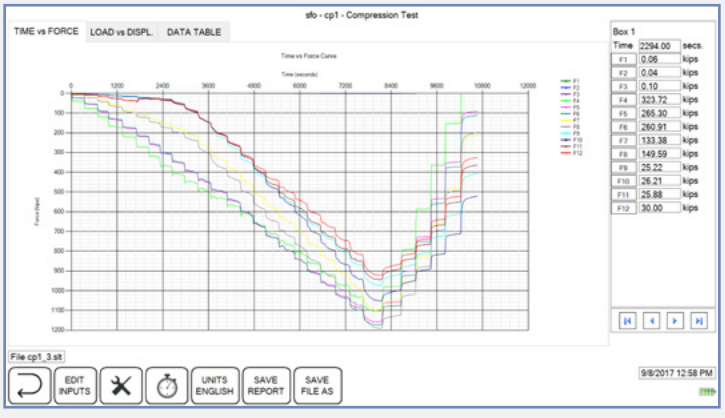
Static Load Tester (SLT)

The SLT automatically records reliable readings at programmable load intervals during a static load test.

- Monitoring of up to 16 channels per data acquisition box with Smart universal inputs
- Provides quick and accurate monitoring of force and displacement during a static load test
- Remote data collection box(es) capable of being daisy-chained to monitor a large number of sensors
- Real-time graphical presentation of load, strain, displacement and pressure measurements

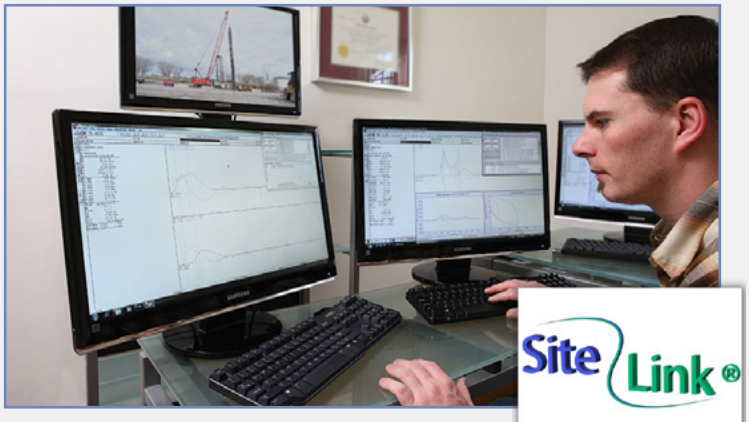
Conforms with ASTM D1143

Static load testing is used to evaluate the load resistance behavior of deep foundations prior to structure construction. Static Load Tests can be performed to validate foundation design assumptions regarding the axial compression or axial tension resistance provided by a deep foundation element, or its deflected shape under a lateral load.



SLT-S Software

- Handles compression (both top-down and bi-directional), tension, and lateral load



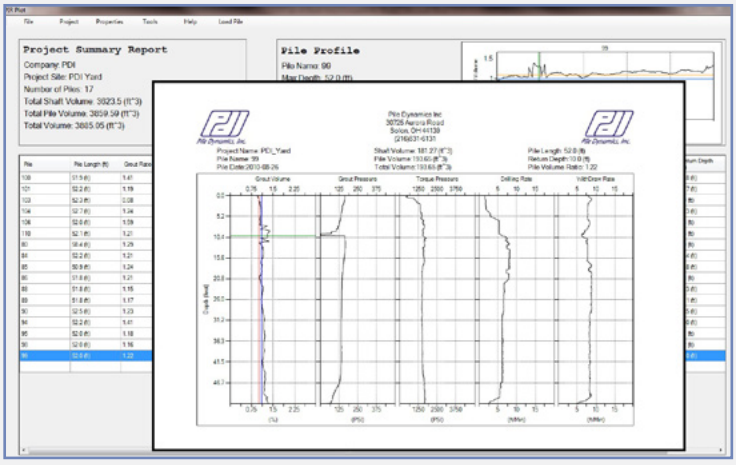
SiteLink® (Remote Technology)

- Cost and time efficient alternate to traditional onsite testing
- Real-time field to office data transmission via Internet

Pile Installation Recorder (PIR-Q)

The PIR-Q is Automated Monitoring Equipment that assists in the installation of augered cast-in-place (ACIP)/continuous flight auger (CFA) and drilled displacement piles by displaying pumped grout/concrete as a function of depth in real time.

- Records and displays accurately measured, pumped grout volume and auger depth
- Option to record and display grout pressure or torque measurements and RPM
- Installation log results printed immediately on a small field printer
- Data collection can be monitored remotely in real-time



PIR-PLOT Software

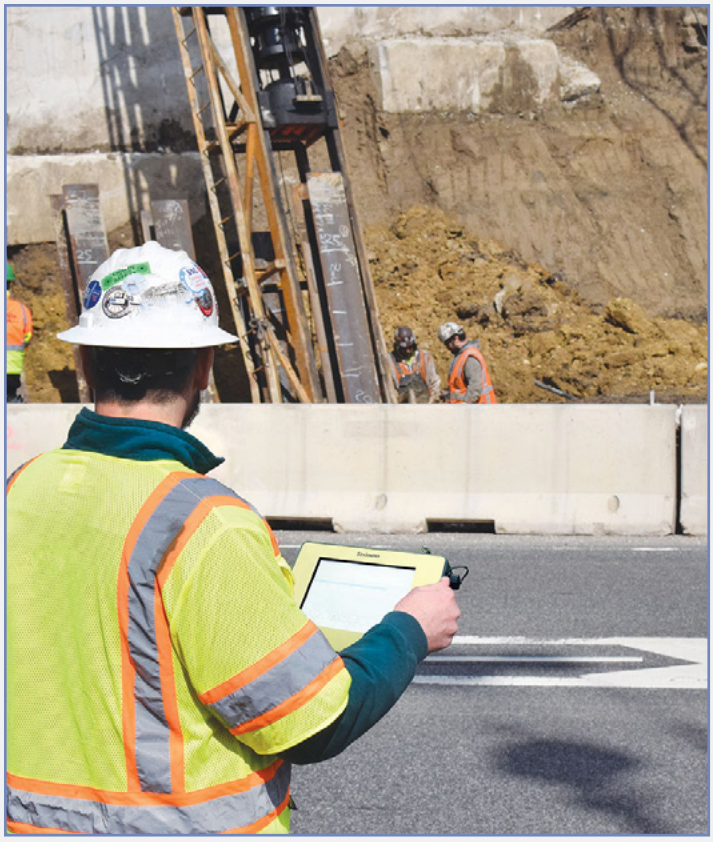
PIR-PLOT software allows you to summarize multiple piles on one chart, and to graph parameters of a specific pile. A summary report includes:

- Actual and theoretical volumes
- Total length drilled
- Duration of drilling, grouting, and total installation

Saximeter-Q (SAX-Q)

The Saximeter (SAX-Q) a rugged, dependable digital blow count device used for pile driving monitoring. During driving the SAX-Q detects a hammer impact by either a built in sound recognition circuit or by manually tapping a button on the device screen. The SAX-Q also determines the time elapsed between consecutive blows and calculates the stroke of an open-end diesel hammer or blows per minute for other hammer types. The results are saved to open format and secure data files, and can optionally be formatted using DOT or user defined templates. The device can also share plan images and driving records from office to field via a secure Cloud server.

- Automatically counts blows
- Calculates stroke for OED hammers
- Displays BPM for other hammers
- Optionally creates full driving log for each pile



Pile Dynamics, Inc.
SaxViewer 1.0.5.0
Printed 04-November-2021

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Saximeter S/N 9999 GA
Operator: JB

Project: Project 2

Pile: P-2
Start Pen.: 2.00 ft

Length: 50.30 ft
Start of Collection: 03-September-2021 12:15:56

DELMAG-D 30-32 Open End Diesel Hammer

Ram Weight: 6.60 kips
Max. Stroke: 11.43 ft

Max. Energy: 75.44 kip-ft
Max. BPM: 90.0

Time	BL #	BPM	Stroke ft	Bl. Count blows/ft	Pen. ft	Note
12:15:58	1	0.0	0.00	5.0	2.20	
12:15:59	2	60.7	3.60	5.0	2.40	
12:16:00	3	55.5	4.37	5.0	2.60	
12:16:01	4	52.8	4.86	5.0	2.80	
12:16:02	5	61.1	3.55	5.0	3.00	
12:16:03	Average	57.5	4.10	5.0	3.00	
12:16:05	6	0.0	0.00	6.0	3.17	
12:16:06	7	60.1	3.68	6.0	3.33	
12:16:07	8	64.7	3.13	6.0	3.50	
12:16:08	9	60.9	3.58	6.0	3.67	
12:16:09	10	63.1	3.30	6.0	3.83	
12:16:10	11	58.1	3.96	6.0	4.00	
12:16:11	Average	61.4	3.53	6.0	4.00	
12:16:13	12	0.0	0.00	9.0	4.11	
12:16:14	13	56.5	4.21	9.0	4.22	
12:16:15	14	63.6	3.25	9.0	4.33	
12:16:16	15	66.3	2.96	9.0	4.44	
12:16:16	16	0.0	0.00	9.0	4.56	
12:16:18	17	37.7	9.87	9.0	4.67	
12:16:18	18	65.8	3.01	9.0	4.78	
12:16:19	19	62.6	3.37	9.0	4.89	
12:16:20	20	61.4	3.51	9.0	5.00	
12:16:22	Average	59.1	4.31	9.0	5.00	
12:16:24	21	0.0	0.00	9.0	5.11	
12:16:25	22	64.7	3.13	9.0	5.22	
12:16:26	23	53.7	4.70	9.0	5.33	
12:16:27	24	58.4	3.92	9.0	5.44	Calculated pen.
12:16:31	Average	58.9	3.92	9.0	5.44	

Time Summary

Drive 29 seconds 12:15:58 - 12:16:27 BN 1 - 24

SaxPlan - Software and Cloud Capabilities

Using the SaxPlan program, the user can create Plans for their projects. These Plans are divided into “Footings”, each one containing an unlimited number of piles. The SaxPlan program generates a file containing all the Plan information. This file is then exported to the devices that will be used for testing the piles on a given job. Several files can be exported to a given device. Optionally, the Plan can be sent to a secure Cloud server.

CLOUD ENABLED

E-Saximeter (E-SAX)

Hand held instrument registering relevant pile driving parameters, calculating diesel hammer stroke, or hammer blows per minute (BPM), for an accurate pile driving log.

- Counts hammer blows, and equivalent blows per minute for all hammer types
- Calculates stroke height for diesel hammers
- Provides a drive log of blow count as a function of depth
- Results are downloaded from the E-SAX to your computer

E-SAX/PDA Correlations

When the E-SAX is correlated with the Pile Driving Analyzer (PDA), it allows driving criteria to be in terms of hammer energy instead of blows per foot at a certain stroke. The E-SAX can assess the hammer potential and kinetic energy. The PDA calculates the energy actually transferred to the pile.

Length Inductive Test Equipment (LITE)

The LITE evaluates the length of existing steel piles (Steel Sheet Piles, H-piles, Pipe piles, Cased Drilled Shafts, and highly reinforced Drilled Shafts) using the inductive field method. The measurement is performed in a borehole installed within 300 mm of the existing foundation element.

- Assesses unknown depth of existing steel foundations
- Offers a solution for detecting steel pile length
- May help determine if a foundation is able to be reused
- Testing can be performed in minutes

LITE Operation

- Lower the LITE probe into a PVC lined hole drilled within 18 inches (450 mm) of the pile to be tested
- If the LITE detects the proximity of the steel pile its LED indicates “METAL”
- If there is no metal in its range of detection the LITE LED indicates “NO METAL”
- The probe cable has evenly spaced markings for simple observation of th pile depth once the “NO METAL” indicators light up