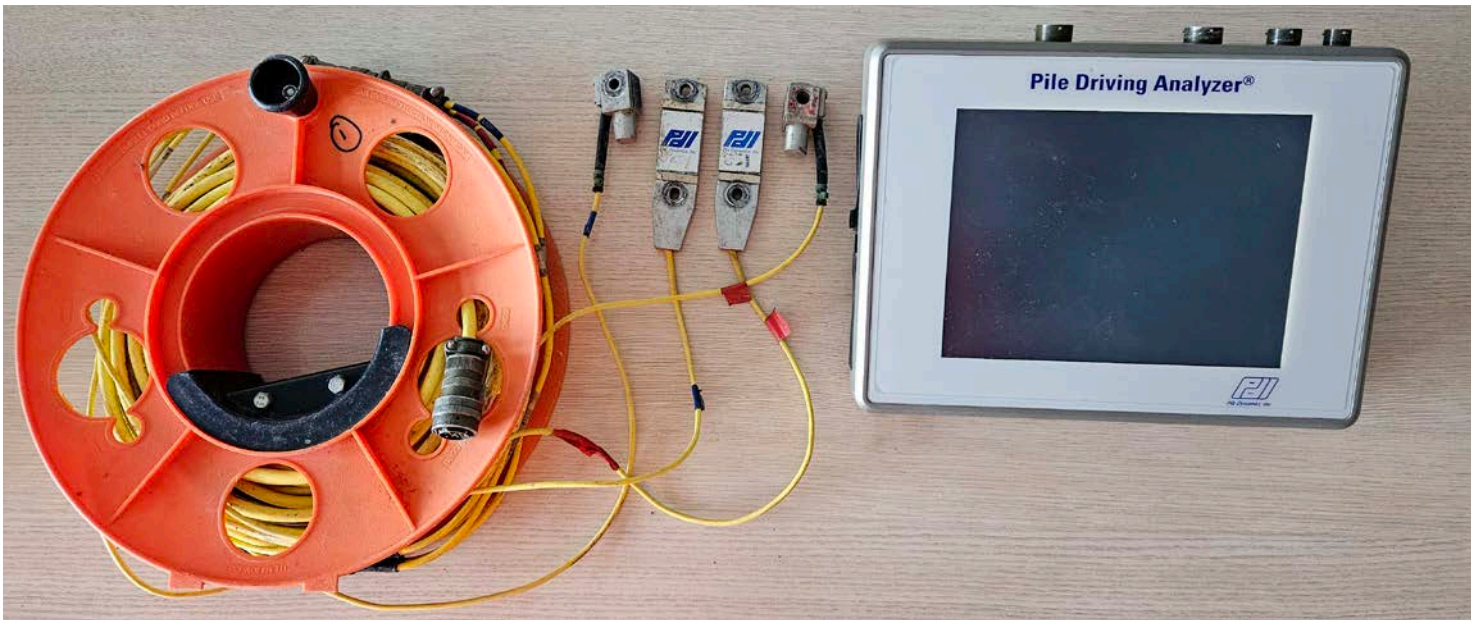
TIMBER POLE
DEEP PILE FOUNDATION
PDA TESTING



What is PDA Testing

Pile Driver Analyzer® (PDA) Testing is a system of High-strain Dynamic Pile Testing used to verify pile capacity, and infer tensile capacity, of timber, concrete, or steel piles in deep pile foundations. It can be used to determine the pile capacity of test piles in the design stage or to validate pile capacity in production piles after installation as part of a quality assurance protocol.

The testing equipment is made up of accelerometers and strain inducers which are easily attached to the pile shaft. The pile is struck by a hammer or drop-weight with sufficient energy to mobilise the pile. The accelerometers and strain inducers are connected with cables to the Pile Driver Analyzer ® and real-time data is captured. Several piles can be tested in a single day. Pile set measurements are also taken during PDA testing.

PDA Testing is carried out by a trained PDA engineer. The data is analysed using CAPWAP® (Case Pile Wave Analysis Program) signal matching software and a detailed test report generated.

PDA Testing is an acceptable test method, as referenced in the Australian Standard AS2159-2009 Piling – Design and Installation, to prove the piles meet the requirements of the NZ Building Code. It is a non-destructive test that can be carried out either during installation (driving or end of driving test) or at any time after installation (re-strike test).

The PDA Test equipment is independently calibrated regularly.

Why PDA Test

PDA Testing is a valuable tool in both the design stage and construction stage of a project. It can be used on small, large, or complex projects. It can be performed on driven piles, drilled shafts, continuous flight auger piles, or cast in-situ piles. In some foundation installations it is recommended PDA Testing should be combined with Static Load Testing.

AS2159-2009 Piling – Design and Installation recommends that High-strain Dynamic Pile Testing be used when specified for any of the following:

a) To proof-test nominated (production) piles as work proceeds

b) To predict the ultimate geotechnical strength at a preliminary or later stage of work

c) To provide an indication of resistance distribution

d) To monitor pile stresses during installation (and thus avoid pile damage)

e) To assess hammer energies and confirm input for driving formulae

f) To estimate and confirm parameters used in wave equation analysis

g) To check assumptions made concerning pile driveability

h) To assess pile integrity

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Richard Zhang, Director, Roc Consulting Ltd

By utilising PDA Testing there is potential for significant cost saving through:

- **Test results showing piles with a greater capacity than what the geotechnical or structural engineer expected**
  The pile capacity data captured during PDA Testing, which is generally more reliable since it is based on actual in-situ test data rather than geotechnical data and engineering calculations alone, allows for optimisation of the pile design. This can help minimise variations between the expected design performance of the piles versus the actual performance.
- **Determining a less conservative strength reduction factor**
  Generally a deep pile foundation is designed using a Basic Geotechnical Strength Reduction Factor (refer to AS2159) which is based on a conservative average risk rating. When PDA Testing is utilised the data and subsequent report can determine that a less conservative strength reduction factor may be justified, leading to optimisation of the design, resulting in overall cost savings.

PDA Testing is also used as part of a quality assurance protocol to provide confidence that all piles meet the expected pile capacity. Generally, only 1-5% of production piles need to be PDA Tested. Pile set measurements taken during PDA Testing can be correlated to pile set measurements on non-PDA Tested piles.

Data collected during PDA Testing can establish the integrity of the installed pile - if the pile has been damaged or broken on installation. It can also be used to calculate the driving stresses in the pile to ensure they are below allowable stresses and to minimise the chance of damage during driving. PDA Testing is also used to measure the hammer or drop-weight efficiency.

PDA Test Methodology

- The test load and schedule is determined by the geotechnical/ structural engineer
- The piles are prepared to ensure that the hammer or drop-weight and pile are aligned to prevent bending during the test blows
- A hammer or drop-weight with energy sufficient to mobilise the pile in a single blow should be used
- Testing should be carried out during pile installation (driving or end of driving test) or at any time after installation (re-strike test). Re-strike testing should be carried out 24 hours or more after initial driving
- Sufficient strain transducers and accelerometers (usually 4 in total) shall be arranged around the pile and where possible should be attached to the pile shaft a minimum of 1.5m below the pile head
- Unless otherwise specified, testing shall commence with small drop heights/low impact blows to verify pile hammer/drop-weight alignment. Drop heights shall be increased until the test load/ schedule specified has been verified. Drop heights shall then be increased until the test data indicates a pile soil resistance equal to or greater than specified
- The PDA engineer directs testing until satisfied that enough data has been gathered for analysis
- Care shall be taken during testing to ensure pile compression or tension stress limits are not exceeded, and to ensure pile hammer/drop-weight alignment is maintained
- Data is gathered and analysed using CAPWAP® software. A comprehensive test report is generated by an independent geotechnical engineer

GROUND CONTROL

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