

A photograph of two men in a construction setting. The man on the left wears a white hard hat, glasses, and a black jacket. The man on the right wears a yellow hard hat and a white suit with a blue tie. They are both looking down at a set of blueprints on a wooden table. The man on the right is holding a white pen. The background shows wooden structural elements of a building under construction.

STATIC PILE LOAD TEST

BY: Motionics, LLC

INTRODUCTION

Static load tests on foundation piles are generally carried out in order to determine load-displacement characteristics.

The test encompasses the direct measurement of pile head displacement in the response to a physically applied test load. It is the most fundamental form of pile load test and is considered as the benchmark of pile performance.

IMPORTANCE

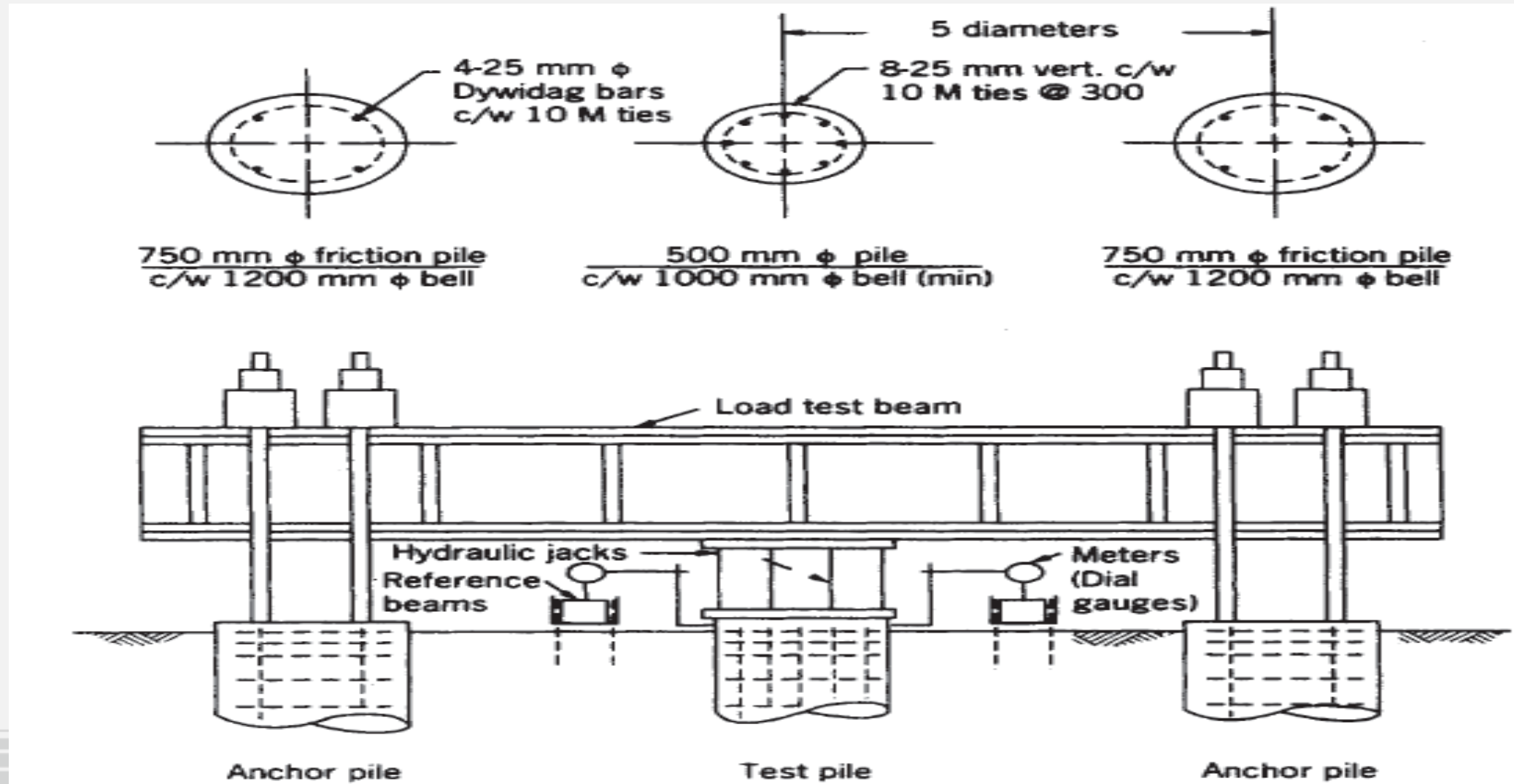
- The Static Loading Test (SLT) is the most definitive method of determining load capacity of a pile.
- Testing a pile to failure provides valuable information to the design engineer for recommendation prior to foundation design.
- The test permits the selection of both the optimum pile foundation and the design load.

OBJECTIVES

The primary objectives of pile load test are;

- To establish load-deflection relationships in the pile-soil system,
- To determine capacity of the pile-soil system, and
- To determine load distribution in the pile-soil system.

SCHEMATICS OF TEST ARRANGEMENT



[Image Reference: Civil Engineer](#)

TYPES OF STATIC LOAD TESTS

The SLT may be carried out for the following load configurations:

- Axial compression (ASTM D1143)
- Axial tension (ASTM D3689)
- Lateral (ASTM D3966)

STATIC LOAD TEST PREREQUISITES

Requirements for Static Load Tests are:

- Detailed subsurface information program
- Well-defined soil stratigraphy
- Static capacity calculations to select pile type, length, and load test locations

PREPARATION FOR A LOAD TEST

The SLT may be carried out for the following load configurations:

- Specify required capacity of loading apparatus,
- Specify load cell & spherical bearing plate,
- Specify dial gages with sufficient travel,
- Require dynamic monitoring on load test piles.

PREPARATION FOR A LOAD TEST PLATFORM

- The installed test pile top is exactly at the required height and the support surface must be perfectly horizontal.
- Steel plates are then glued on top of the pile head while the lower surface of the protruding parts is clear of the ground surface.

PREPARATION FOR A LOAD TEST PLATFORM

- The distance between these parts and the ground surface will be such that the test load is not carried by the ground.
- There should be enough clearance around the pile cap to prevent resistance from the sides or in particular, the base of the cap. A gap of 100 to 150mm is usually adequate below the cap.

LOADING PROCEDURE

Three types of loading procedures for a static load test are:

- 1) The Quick Load Test,
- 2) The Incremental Static Load Test, and
- 3) The Constant Rate of Penetration Test.

SCHEMATIC TESTING APPARATUS

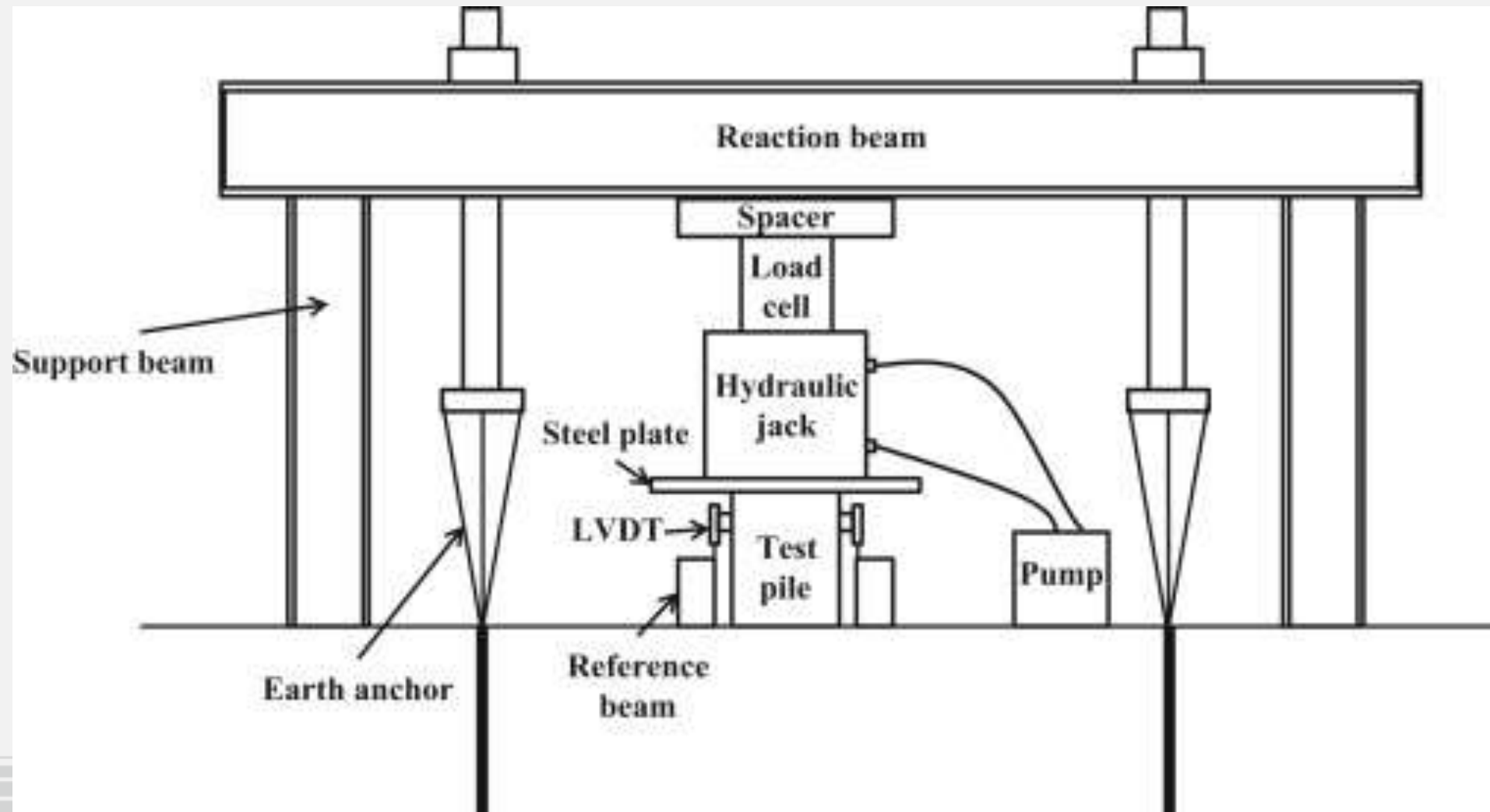


Image Reference: [Science Direct](#)

TESTING APPARATUS

Reaction Beam

The steel girders will be laid across the test pile with system set up.

Hydraulic Jacks

Axial Compressive Test: One hydraulic jack will be provided on top of the pile head as loading apparatus.

Axial Tension Test: One hydraulic jack will be provided on top of the pile head as loading apparatus.

Lateral Test: One hydraulic jack will be provided on the side of the pile head as loading apparatus.

TESTING APPARATUS

Ball Bearing

To provide non-eccentric load to the pile head, a ball bearing shall be inserted in between the reaction beam and the hydraulic jack.

Dial Gauges

Dial gauges will be provided to monitor the pile movements by mounting between the pile head and reference beams.

The micrometer has a range of 0-50 mm and an accuracy of 0.01 mm.

TESTING APPARATUS

Reference Beam

Two cross-connected reference beams laid on support which firmly embedded in ground.

Leveling Instrument

Relative movements of the test pile head, reference beam and anchor pile will be checked by a precise leveling instrument with an accuracy of 0.01 mm.

Readings will be made on ruler scale fixed on the reading points (1 point at pile head, 2 points at reference beams and 1 point at each anchor pile).

LOAD APPLICATION SYSTEM

Load apply to the pile by jacking against a reaction with one or more hydraulic jacks. The following notes are considered for load application:

- The minimum distance between test pile face to face of any supports shall be 3-10 meters test pile diameters whichever is greater.
- The minimum distance between reaction supports face to face any supports shall be 3-10 meters test pile diameters whichever is greater.

LOAD APPLICATION SYSTEM

- The load beam which is connected by stiffener at the points of bearing bear the load transfer beams.
- The beam need stiffening to prevent excessive bending.
- Anchors may be used to supplement or replace the reaction loads.
- Anchors design should be with sufficient free length so as not to interfere with the load test pile or the reference system.

LOAD APPLICATION SYSTEMS

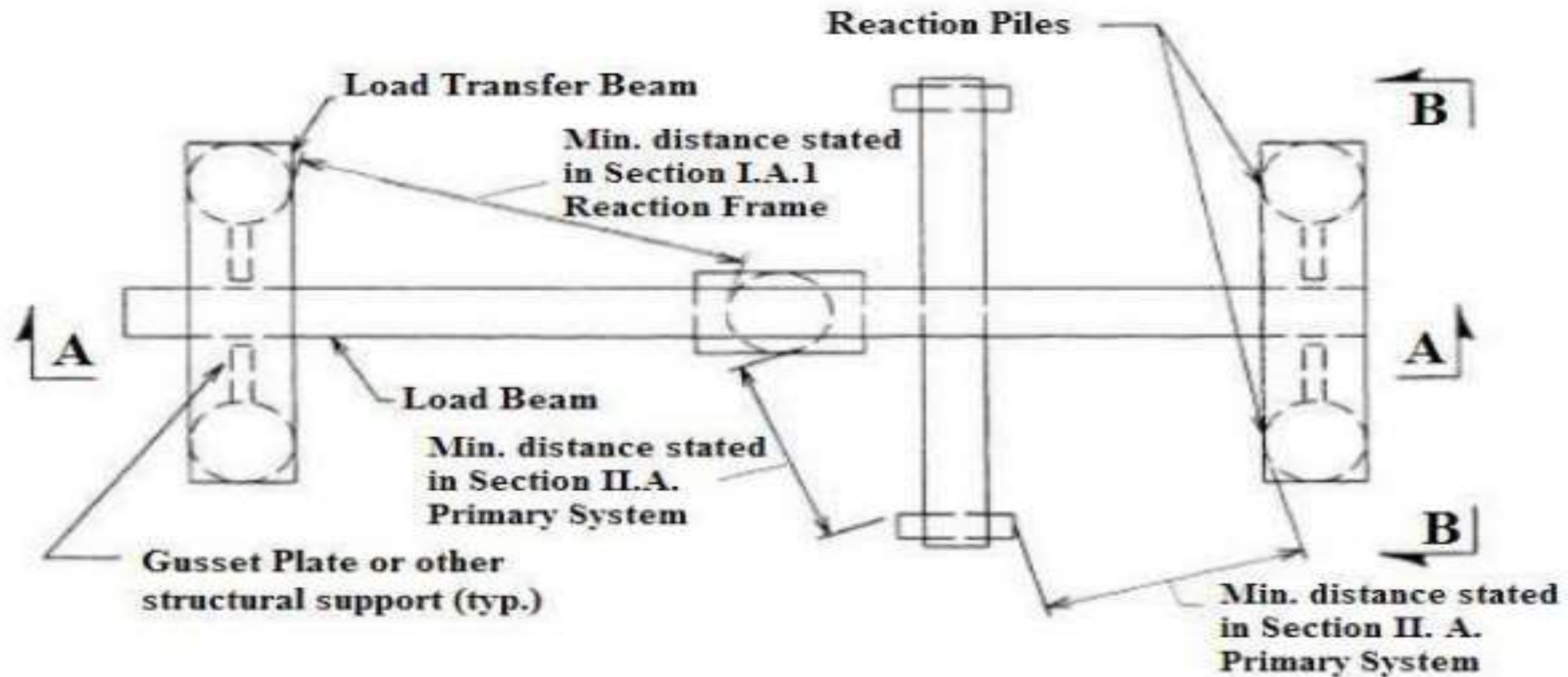
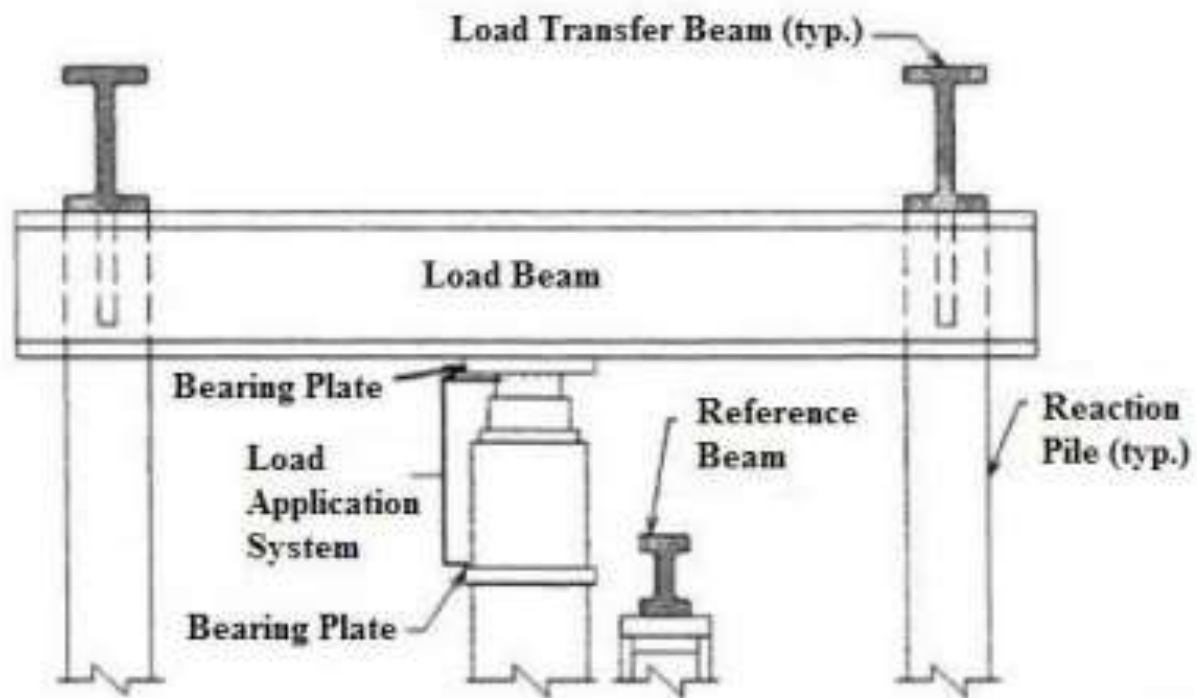
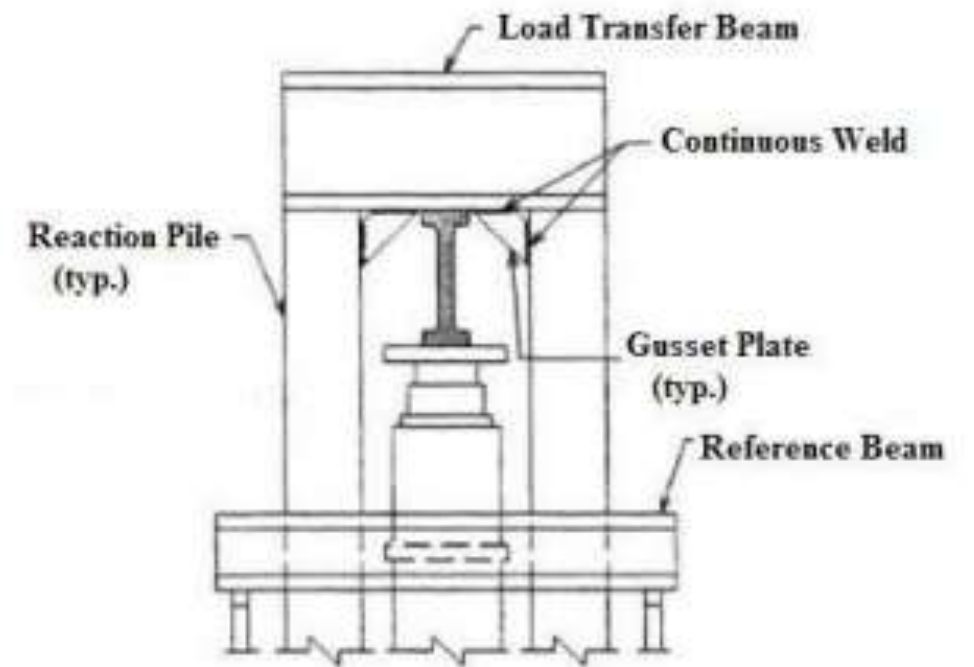


Image Reference: [NYS DOT](https://www.nysdot.com)

LOAD APPLICATION SYSTEMS



Section A-A



Section B-B

Image Reference: [NYSDOT](https://www.nysdot.com)

LOAD APPLICATION SYSTEMS

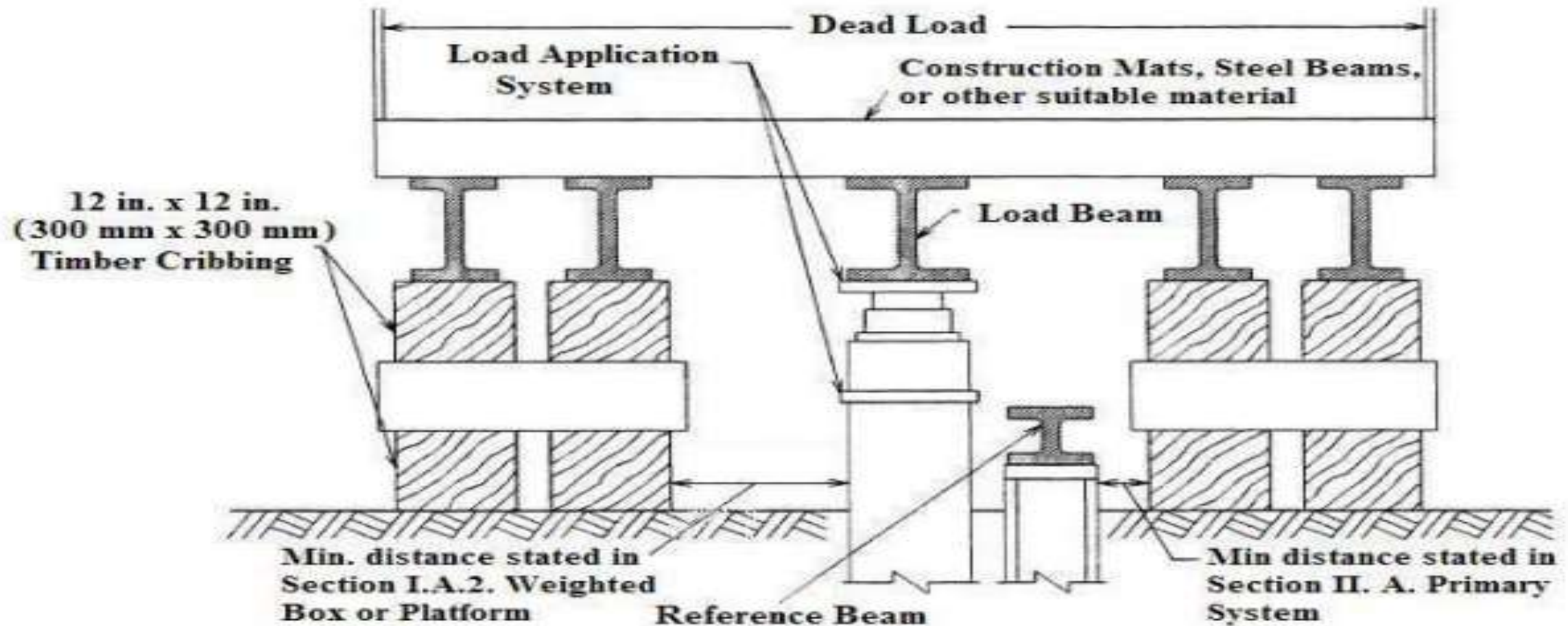


Image Reference: [NYSDOT](#)

LOAD APPLICATION SYSTEMS

Weighted Box or Platform:

Construct a weighted box or platform over the test pile, supported on cribbing or on other piles installed after the test pile.

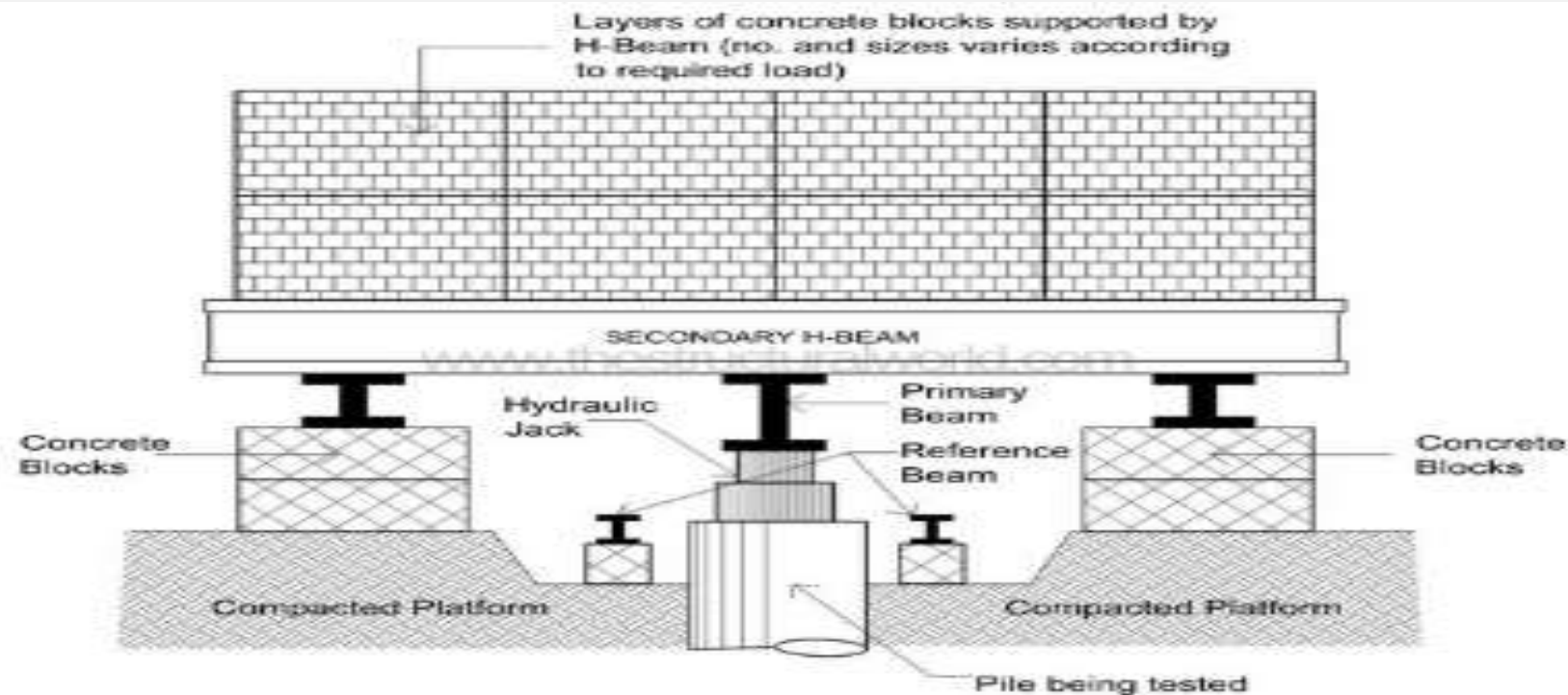


Image Reference: [The Structural World](http://www.thesstructuralworld.com)

SITE PROTECTION

- Complete protection for the pile supports and reference beam from wind, direct sunlight, frost action, and other disturbances should be provided.
- Temperature of not less than 10° C throughout the duration of the test and monitored by a thermometer.
- It may be necessary to construct an enclosure of suitable materials accepted to the Engineer.
- Need adequate lighting for the duration of the test.

MEASURING APPARATUS

Apparatus for measuring settlement consisting of a primary system with at least one auxiliary system and a network of settlement reference points.

Establish two fixed independent benchmarks at least 15 m from the test site to monitor the settlement reference points.

Image Reference: [NYSDOT](#)

MEASURING APPARATUS

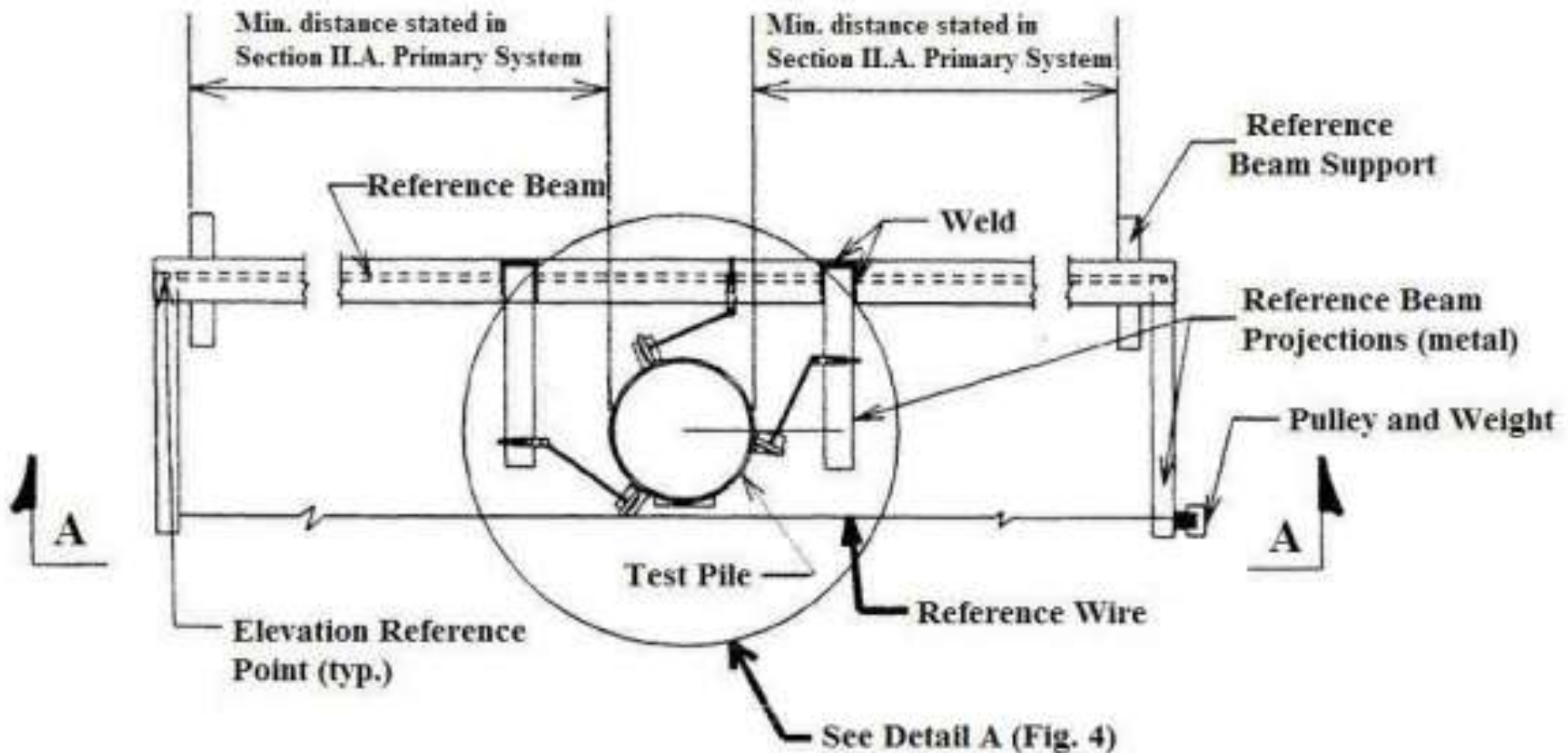
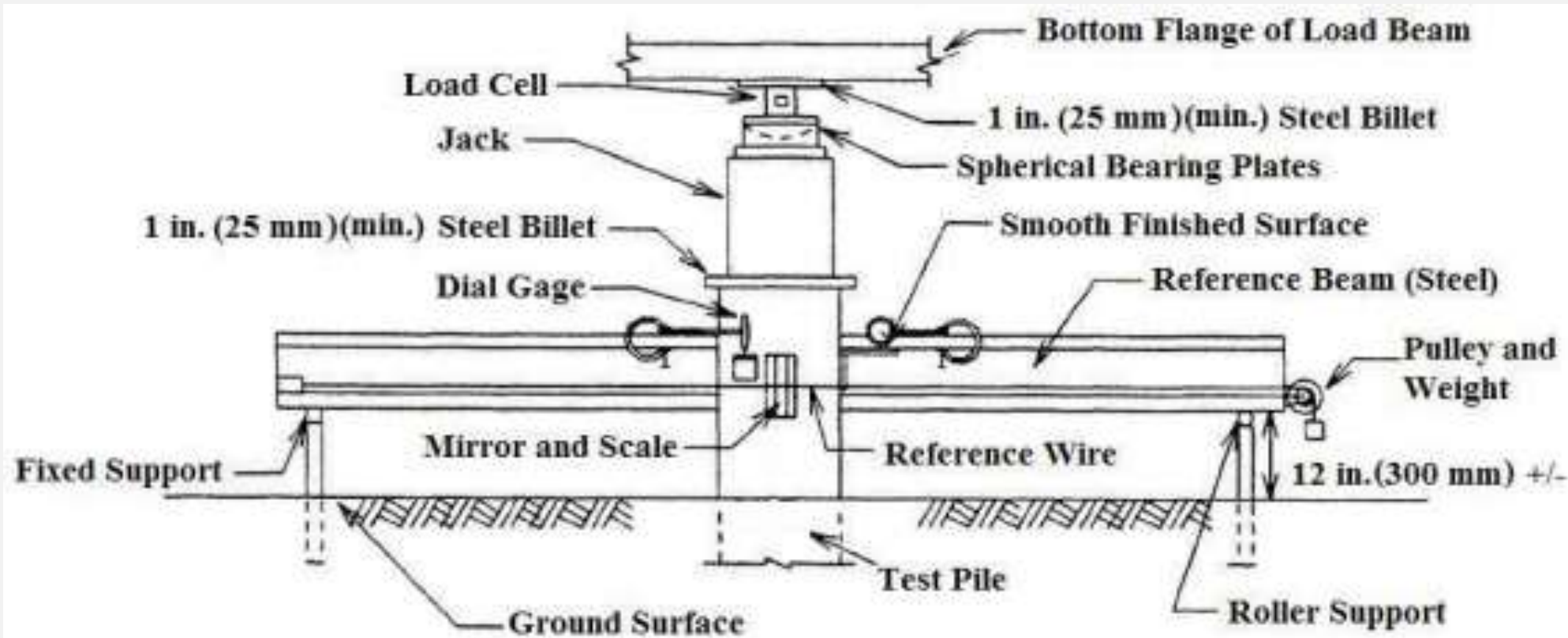


Image Reference: [NYSDOT](#)

MEASURING APPARATUS

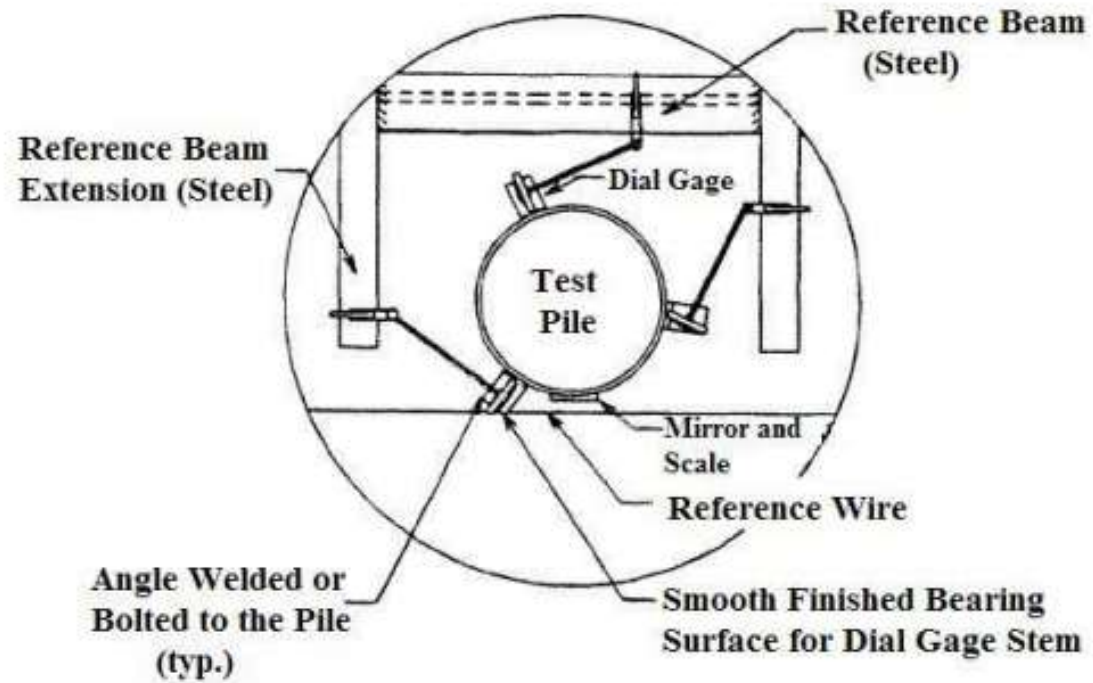


Section A-A

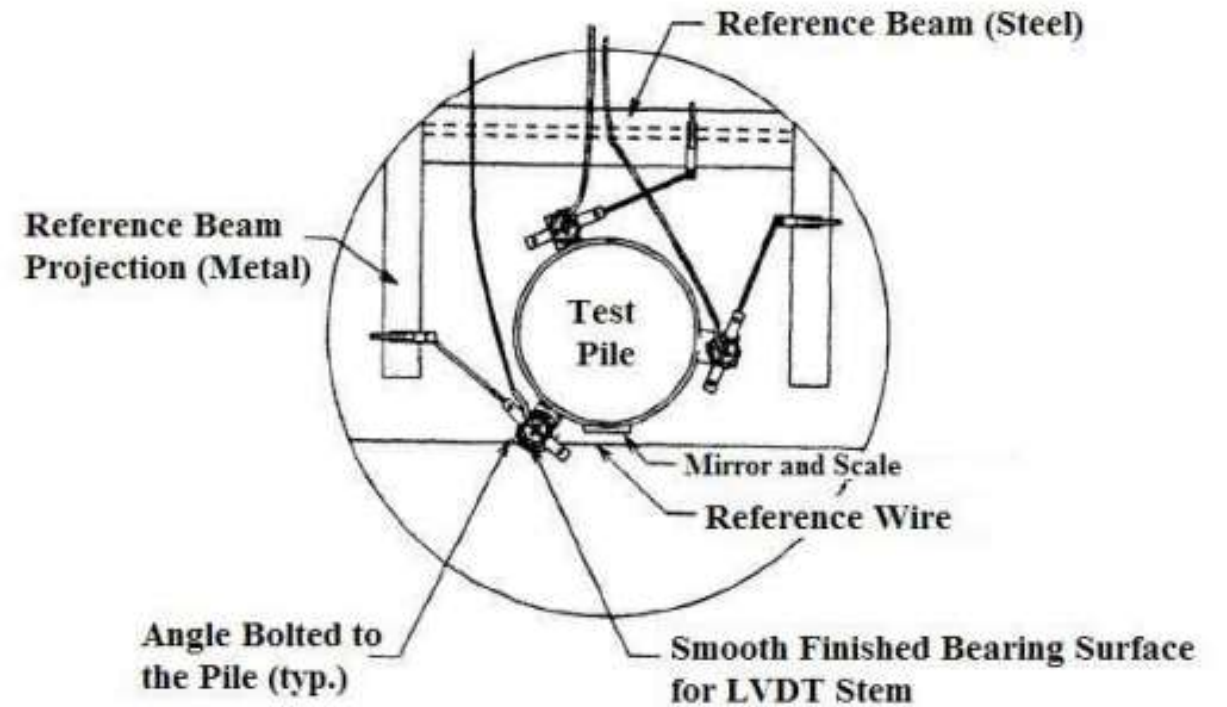
Figure 3 Typical Setup for Measuring System

Image Reference: [NYS DOT](https://www.nysdot.com)

MEASURING APPARATUS



Detail A for Dial Gages



Detail A for LVDTs

Image Reference: [NYS DOT](https://www.nysdot.com)

SETTLEMENT REFERENCE POINTS

Acceptable reference points locations and materials are as follows:

1. On the reference beam: Round-head bolt, or round bead of weld about 1/5" (5 mm) high
2. On the test piles: Lug on the side about 1 in. (25 mm) from the top, or bead of weld on the steel billet
3. On the reaction piles: cut mark made by a hacksaw, or lug welded to the pile.

The Engineer will verify the elevation of these reference points with respect to the two fixed independent benchmarks.

INTERPRETATION OF TEST RESULTS

The test results will then be reported in the form of Time, load, and settlements:

- Load vs. settlement curve.
- Time vs. settlement curve.
- Time vs. load curve.
- Report and recommendations on the ultimate pile capacity.
- Schedule of loading.
- Certification of calibration (Dial Gauges and Pressure measure)

SAMPLE DATA SHEET

GE 380 (7/03)

PILE LOAD TEST

TIME SETTLEMENT DATA SHEET

JOB STAMP

D123456 Highway Bridge
Example Co. Replacement Project
PIN 1234.56 Town of Example
XYZ Construction Co.

BRIDGE DESIGNATION BRIDGE NO. 12

DATE 4/30/98

LOCATION SOUTH ABUTMENT

PREPARED BY S.W.C.

PILE NO. 164

COMPUTED BY J.W.P.

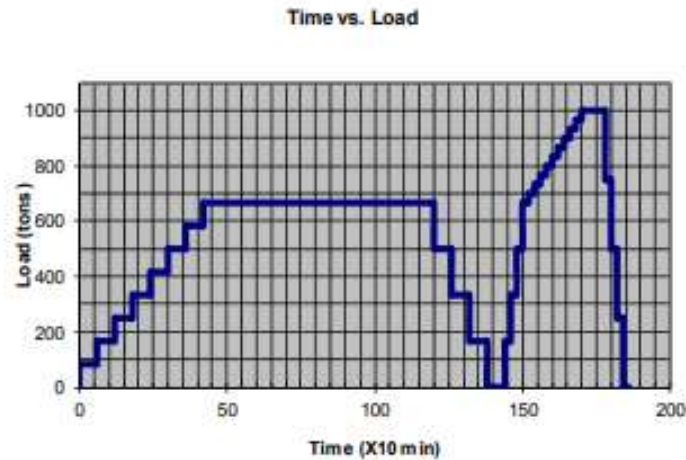
PILE LOAD TEST NO. 1 QUICK TEST

CHECKED BY R.W.G.

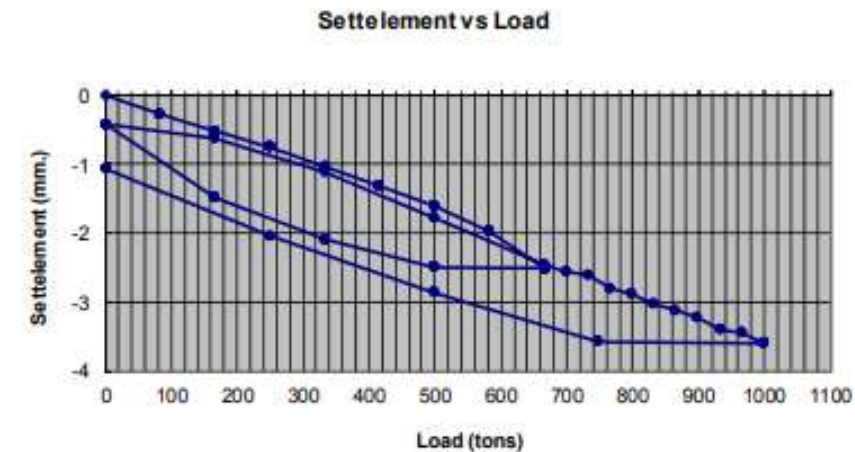
PILE TIP ELEVATION 931.2 ft.

| ELAPSED TIME | READ TIME | JACK GAGE READ (psi) | JACK LOAD (kips) | LOAD CELL READ | LOAD CELL (kips) | DIAL READINGS -(in) | | | MEAN | DEFL. | TELL TALES-(in) | | | | REMARKS |
|--------------|-----------|----------------------|------------------|----------------|------------------|---------------------|-------|-------|-------|-------|-----------------|-------|------|-------|-----------------|
| | | | | | | A | B | C | | | READ | DEFL. | READ | DEFL. | |
| 10:46:00 | 00:00.0 | 0 | 0 | 0 | 0 | 0.181 | 0.303 | 0.157 | 0.214 | 0.0 | 0.571 | 0.000 | | | |
| 10:47:00 | 00:00.0 | 928 | 46 | 51 | 45 | 0.268 | 0.390 | 0.240 | 0.299 | 0.087 | 0.575 | 0.004 | | | |
| 10:47:30 | 00:30.0 | 928 | 46 | 51 | 45 | 0.268 | 0.390 | 0.240 | 0.299 | 0.087 | 0.575 | 0.004 | | | |
| 10:48:00 | 01:00.0 | 928 | 46 | 51 | 45 | 0.268 | 0.390 | 0.240 | 0.299 | 0.087 | 0.575 | 0.004 | | | |
| 10:49:00 | 02:00.0 | 928 | 46 | 51 | 45 | 0.268 | 0.390 | 0.240 | 0.299 | 0.087 | 0.575 | 0.004 | | | |
| 10:52:00 | 05:00.0 | 928 | 46 | 51 | 45 | 0.268 | 0.390 | 0.240 | 0.299 | 0.087 | 0.575 | 0.004 | | | |
| | | | | | | | | | | | | | | | Load to 67 kips |
| 10:53:00 | 00:00.0 | 1441 | 71 | 76 | 67 | 0.295 | 0.413 | 0.264 | 0.324 | 0.110 | 0.579 | 0.008 | | | |
| 10:53:30 | 00:30.0 | 1441 | 71 | 76 | 67 | 0.295 | 0.413 | 0.264 | 0.324 | 0.110 | 0.579 | 0.008 | | | |
| 10:54:00 | 01:00.0 | 1441 | 71 | 76 | 67 | 0.295 | 0.413 | 0.264 | 0.324 | 0.110 | 0.579 | 0.008 | | | |
| 10:55:00 | 02:00.0 | 1441 | 71 | 76 | 67 | 0.295 | 0.413 | 0.264 | 0.324 | 0.110 | 0.579 | 0.008 | | | |
| 10:58:00 | 05:00.0 | 1441 | 71 | 76 | 67 | 0.295 | 0.413 | 0.264 | 0.324 | 0.110 | 0.579 | 0.008 | | | |

GRAPHICAL RESULT EXAMPLE



| Pile Test Results | | | |
|-----------------------|-----------------|-------------------|----------------|
| Site | | Client | |
| Pile No. | Test pile No. 1 | Installation Date | 20/12/2011 |
| Type | Bored pile | Testing Date | 23/01/2012 |
| Pile Dimension | 1.5 m dia | Working load | 333 ton |
| Effective Length (m.) | 28 m From N.G.L | Testing Load | 666 - 1000 ton |



Standard Graphical result for a compression test up to 1000 ton (300% of the designed load)

Image Reference: [IP Consultant](#)

ACCEPTANCE CRITERIA

Acceptance of the load test results is generally governed by the building code for that jurisdiction and subject to review by the structural designer.

Other acceptance criteria include:

- Maximum total settlement under a specified load
- Maximum net settlement after the test load
- Maximum settlement under the design load

MOTIONICS WIRELESS PILE LOAD TEST KIT



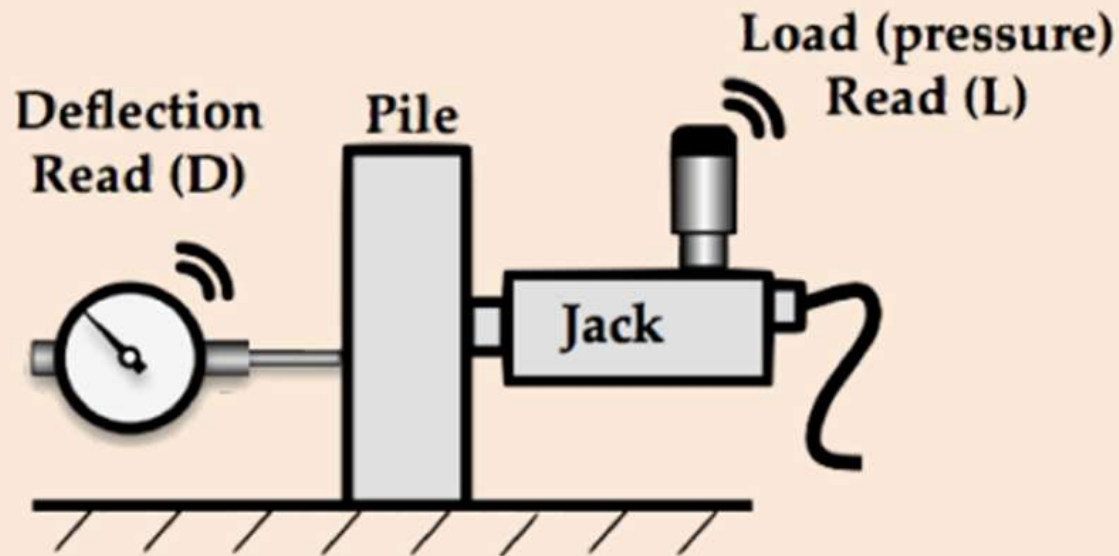
MOTIONICS WIRELESS PILE LOAD TEST KIT



MOTIONICS WIRELESS PILE LOAD TEST KIT

Wireless Pile Load Test Kit measures pile deflection under different load conditions with multiple (up to 10)

Bluetooth dial indicators, BlueDials, and Bluetooth pressure sensor, BluePSI on iPad.



Included in the Package:

- BlueDial(s): Bluetooth Dial Indicator(s)
- Bluetooth Pressure Sensor 1X
- Protective Carrying Case 1X
- Wireless Pile Load Test App for iPad
- iPad with rugged protective case (optional)

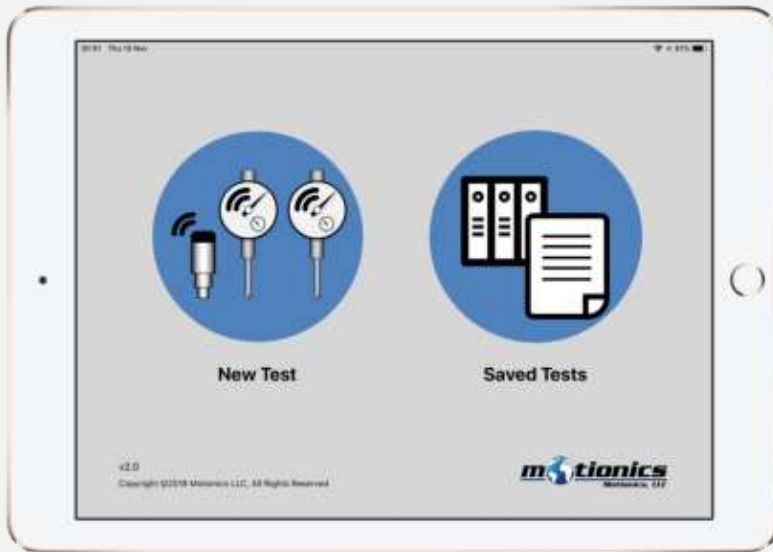
Motionics wireless pile load test system consists of three major parts:

- BlueDial(s): Bluetooth Dial Indicator(s) 2x (or more)
 - Bluetooth Pressure Sensor 1x
 - iPad Pile Load Test App
-
- 2 BlueDials attached to the test pile measures movements during load application/removal
 - The Bluetooth pressure sensor is mounted on the hydraulic pump to monitor load

- The App runs on Apple iPad and pairs with the BlueDials & the Bluetooth pressure sensor.
- Readings from all 3 wireless gages will be logged and recorded in the App.



MOTIONICS WIRELESS PILE LOAD TEST KIT



iPad with rugged protective case and
the custom Pile Load Test app for simultaneous
capturing of
Displacements and pressure



Protective carrying case
For whole product

MOTIONICS WIRELESS PILE LOAD TEST KIT

Specifications:

| Bluetooth Pressure Sensor | Specification |
|----------------------------|-------------------------------------|
| Measurement Range | 0-5000 psi (more options available) |
| Accuracy | ±0.25% of full scale |
| Data Transmission Interval | 5 s (adjustable) |
| Transmission Range | 20 m (indoors)/30 m (outdoors) |
| Working Temperature | -20 - 85 °C |
| Battery Life | 2 yrs (CR2050) with 5 s intervals |
| Pressure Port | ¼-18 NPT (more options available) |

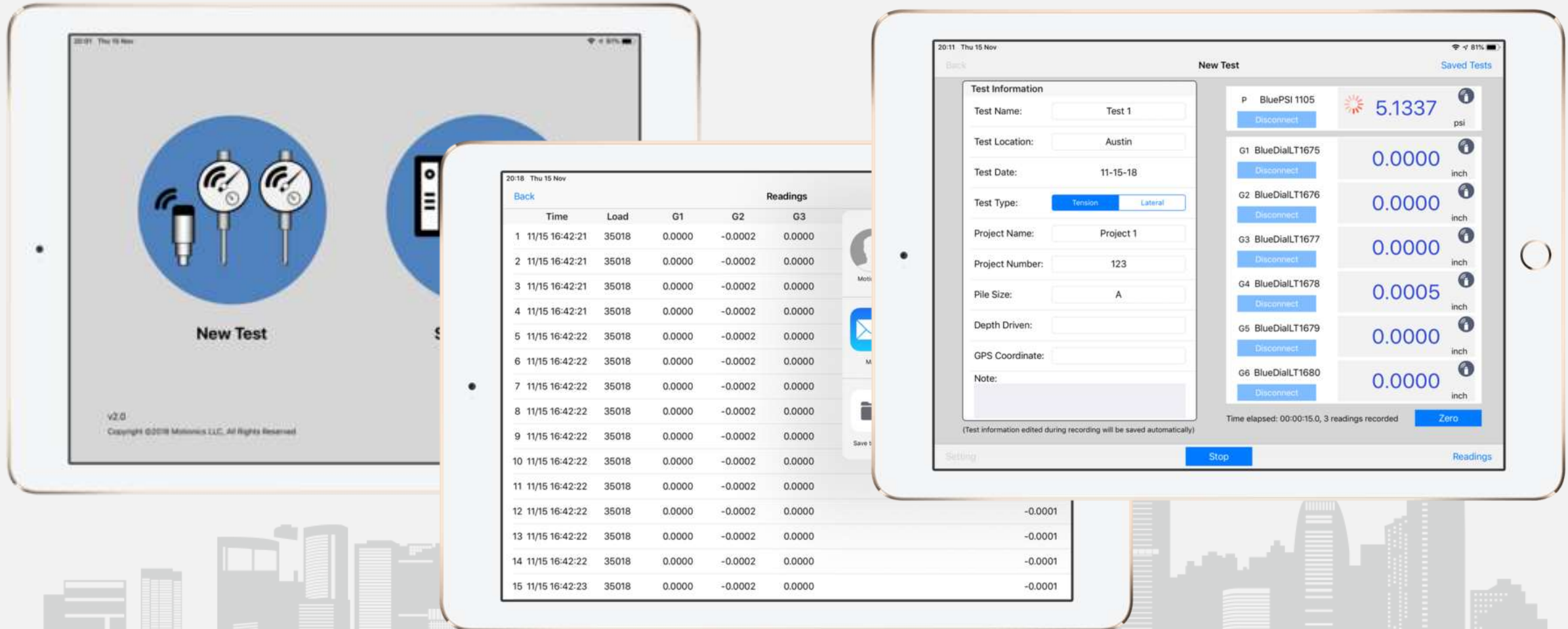
| BlueDial | Specification |
|------------------------|--------------------------------|
| Measurement Range | 2 in/50 mm |
| Resolution | 0.0005 in/0.01 mm |
| Accuracy | 0.001 in |
| Wireless Data Rate | 10 HZ |
| Transmission Range | 20 m (indoors)/30 m (outdoors) |
| Working Temperature | 0 - 50 °C |
| Bluetooth Battery Life | 50 hrs (rechargeable) |

MOTIONICS WIRELESS PILE LOAD TEST KIT

App Features:

- Easy pair/unpair with sensors
- Simultaneous recording of BlueDials and pressure sensor
- Measurement results organized in table
- Remote zeroing BlueDial readings in the App
- Automatic calculation of average deflection
- Option to enter jack calibration equation for automatic pressure-load conversion
- Excel CSV export via email
- Local saving on iPad for future access and export

MOTIONICS WIRELESS PILE LOAD TEST App



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- Method Statement for Static Pile Load Test by Infratech ASTM Co., Ltd., 1032/217, Phaholyothin, 18/1, Bangkok.
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- Static Pile Load Testing O-cell, and Statnamic, Reference Manual Chapter 18, Lesson 25.
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