THE BRIDGES

METHODOLOGY FOR

LATERAL LOAD TEST

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PURPOSE

This test results also provide information that can be used to determined lateral resistance distribution along pile shaft and also long-term behavior of load-deflection. With this test results foundation engineer can determine ultimate capacity of pile under lateral load and deflection under service load after using proper factor of safety of pile/pile group.

TERMINOLOGY

Cut-off level: The level where the installed pile is cut-off to support the pile caps or beams.

Datum Bar: - A rigid bar placed on immovable supports at a distance of 3 D (Subjected to minimum, of 1.5 m) from the edge of piles. (Where D is dia pile)

Inital test: - It is carried out a working pile with a view to check whether pile is capable of taking the working load (i.e. 2.5 times of safe load).

Routine test: - It is carried out a working pile with a view to check whether pile is capable of taking the working load (i.e. 1.5 times of safe load).

Kenteledge: Dead weight used for applying the test load on piles by dead load method or anchorage method through pile.

Ultimate Load: The maximum load which a pile can carry load before failure of ground.

Safe Load: It is load on a pile derived by applying a factor of safety on ultimate load capacity of pile as determined by load test.

Working Load: The load designed to a pile according to design.

Pile test may be carried out on a single pile or group of piles as required. For group of piles, cap will be provided for test.

Before starting the pile load test work at the site ensure the availability of below list of equipment and tools.

- Hydraulic Jacks
- Power pack
- Pressure Gauge
- Magnetic stand and Deflectometer (0.01 mm sensitivity) and Glass sheet
- Crane

- Concrete block

Preliminary Activities

Traffic Management

The traffic management shall be implemented as per the submitted 'Environment Health & Safety' plan & IRC: SP:87-2010, Section9 & IRC:SP: 55)

Structures & Other Encumbrances

Identified structures and encroachments along the alignment shall be removed by the authority before commence of the work

Cube Test for the Concrete

The Cube tests for the pile concrete shall be carried out and shall be recorded prior to the load test.

Calibration of Deflection dial gauges

The deflection dial gauges shall be calibrated in accredited laboratory for their correction factor. The calibration certificate for the dial gauges shall be submitted to client for the review.

Calibration of Pressure Gauges

The pressure gauges shall be calibrated in accredited laboratory for their correction factor. The calibration certificate for the dial gauges shall be submitted to client for the review.

Calibration of Hydraulic jacks

As such there is no proving ring higher capacity available for testing the efficiency of hydraulic Jacks. For the purpose of Pile load test the efficiency of Hydraulic Jacks can be considered as 95%. The Manufacturer's drawing shall be used to calculate the area of the ram under pressure shall be considered.

Sequential Construction Activities

Preparation of Pile Head

After casting of piles, a proper pit shall be excavated with proper slope as shown in general arrangement drawing. A sump shall be provided for percolating water. After casting of pile, the additional built up portion shall be Chipped up to the design cutoff level / or till sound concrete is reached, whichever is lower. The pile shall be cast with a suitable pile head as detailed in drawing. Suitable structural arrangement shall be made to facilitate fixing of magnetic stand and deflect-meter for measuring the settlement of pile

Reaction

The reaction on pile for testing can be done by following ways:

- Usually two or more piles are installed vertically. They offer required reaction capacity to support maximum expected lateral loads chosen to testing. Reaction piles are capped by

steel, timber or reinforced concrete. Bracing between piles or any type of fastening system of pile butts are done to make them a unit to develop lateral resistance of entire group.

- For a proper site or soil conditions, deadman is installed which consist of timber panels, cribbing, sheeting or identical construction supported against side of excavation or embankment so that required reaction capacity for maximum expected lateral loads can be provided.
- A platform constructed of suitable materials like concrete, timber or steel and loaded with adequate weights to provide necessary support for the load transferring system. This should have sufficient bearing surface on its edge to support them and necessary resistance for lateral load test loading.

Test plate, Bearing plates, Struts and Blocking

Test plate or plates are set vertical side of test pile at application point or points of load and normal to line or lines of loading. Test plate should be of steel having sufficient stiffness to have resistant against bending under applied load, but at least 50 mm (2") thickness is essential.

Test plate should have adequate size to accommodate hydraulic cylinder; the dimension of horizontal side of plate should be at least on half of pile diameter or receiving side dimension of test pile or piles but not more than pile diameter or dimension of receiving side of pile or piles.

When tests conducted on single piles, the pile head can be capped to facilitate placement of test plate against a vertical plane bearing surface or it can be set by high-strength grout or can be welded adequately to side of pile using appropriate filler material to establish complete bearing against projected area of test pile. If test plate is/are supported independently of test pile while assembling testing apparatus, temporary supports should be removed while applying test loads.

Placement of Jack

The jack will place horizontally between test pile and reaction pile or block. All the required capacity jacks shall be identical and connected to the power pack with a common manifold; this shall ensure that equal pressure is developed in all the jacks simultaneously.

Datum Bar

The datum bar of size as detailed in the drawing shall be positioned.

Method of loading

After Placing of reference system for measurement of pile deflection, the hydraulic jacks shall be activated with the help of powerpack. The rate of activation in the hydraulic jacks shall be @50Kg/sq.cm per minute. However there is no specific codal requirement for this. The rate of activation shall be controlled from the powerpack. After reaching the required pressure the pressure shall maintained for the required time as specified in the cycle. If any loss in pressure during the standing time shall be applied.

Measurement of Settlement

Displacements shall be read by using at least two dial gauges of 0.01 mm sensitivity (As per IS) spaced at 30 cm and kept horizontally one above the other on the test pile

Lateral Load Test

The test has been carried out as per the procedure outlined below:

During testing in both preproduction verification and proof test phases, care should be exercised to avoid permanent structural damage of pile that will reduce axial capacity. So criterion for acceptance (defined by maximum movement under certain load) must be selected carefully not to produce potential damage to structures.

The test may be carried out by introducing a hydraulic jack with gauge between two piles or pile groups under test or the reaction may be suitably obtained otherwise. If it is conducted by jack located between two piles or groups, the full load imposed by the jack shall be taken as the lateral resistance of each pile or group. The loading should be applied in increments of about 20 percent of the estimated safe load.

The next increment should be applied after the rate of displacement is nearer to 0.1 mm per 30 minutes.

Displacements shall be read by using at least two dial gauges of 0.01 mm sensitivity (As per IS) spaced at 30 cm and kept horizontally one above the other on the test pile and the displacement interpolated at cut off level from similar triangles where cut-off level is unapproachable and for approachable cut-off level, however, one dial gauge placed diametrically opposite to the jack shall directly measure the displacement. Where, it is not possible to locate one of the dial gauges in the line of the jack axes, then two dial gauges may be kept at a distance of 30 cm at a suitable height and the displacement interpolated at load point from similar triangles.

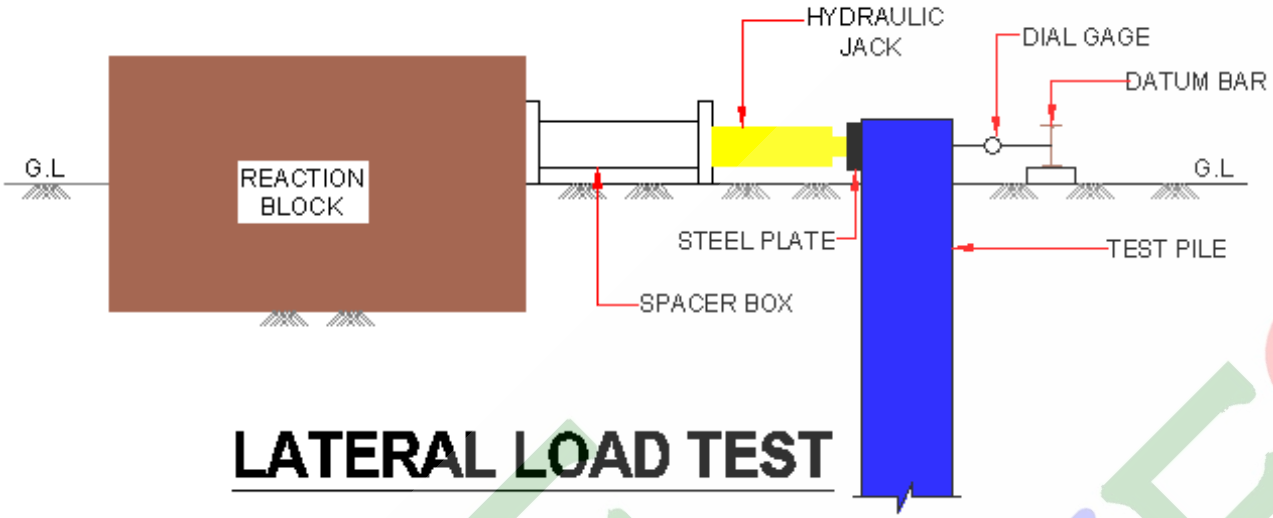
Conclusion

The safe load on the pile shall be the least of the following.

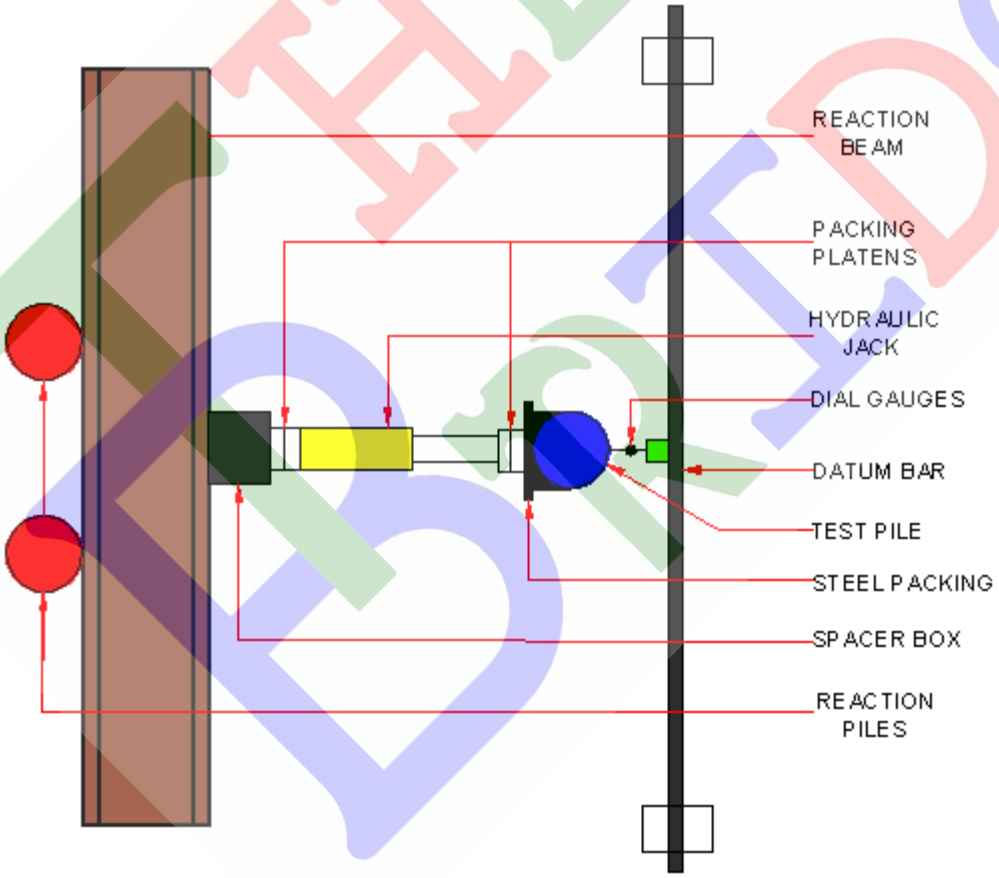
- 50% of the final load at which the total displacement increases to 12mm.
- Final load at which the total displacement corresponds to 5mm.

At Offsite Location

Test Data Analysis & Reporting: After completion of the test data shall be analyzed and reported as a design report for finalizing the design criteria for the design of working piles.



LATERAL LOAD TEST



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