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Analytical Research of Vertical Load Test on Bore Pile

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Abstract: ***The vertical lode test is conducted on RCC bore pile this test is conducted as per the guidelines of IS 2911 part 4 respectively. This test is conducted on "Perstorp site which is located in dist. -Bharuch Gujrat. In this region the Strata of soil is soft aquifer hence to carry heavy structural load, pile foundation is best solution. The experimental study is carries out on 10 meter length of Bore pile of 500mm in diameter of loading area of 283.5 sq.cm. This paper is based on experimental study on bore pile due to vertical loading condition and expressing the behaviour of pile under the vertical incremental loading condition. And in this paper we follow the approach of analytical and experimental.***

I. INTRODUCTION

This experimental test is carried out at Perstorp site project of chemical production which is located in dist.-Bharuch Gujrat come in seismic zone 3 and the geological condition of this region is soft rock aquifer having very high ground water table approximate of 5-10 m from ground level so, there is only pile foundation is option to Carry heavy structural load. In the paper perform experimental study on bore pile under the axel loading condition. This test is performed on 10 m depth of pile of 500 mm diameter. This test is performed commercial corporate geo Dynamics. In this experiment all the testing procedure and equipment are as per IS 2911 part 4. The loading is applied by

Precast concrete block of 2.5 MT each which is resting on flat MS plate supported by ISMB sections. The testing equipment is a hydraulic jack along with manual pump was used to applied load on pile. The reaction was obtained from adjacent reaction system the pile head defection was measure by means of two dial gages having least count of 0.01 mm the dial gauge is attached to drum bar by mean of magnetic stand.

II. METHODOLOGY AND DETAILS

A. Pile Details

The pile was RCC bored pile with diameter of 500mm, details which are given below

Pile location	Group A
Pile length	10 m
Pile Diameter	500 mm
Working load	40.51tons
Test load	101.275 tons
Concrete grade	M30
Jack capacity	200 ton
Effective area of Jack	283.5 sq. cm
Test Type	Initial Vertical Load Test

B. Procedure for Vertical load test

The test should be carried out by applying series of downward incremental loads. Each increment being of 20 percent of safe load on percent of safe load on pile. For testing of pile its essential that loading is along axis. Four dial gauge will be fix for vertical load test at the pile head level .MS base plate of thickness 25 to 50 mm will be positioned on pile head. Hydraulic jack of required capacity will be placed on this base plate. The dial gauge will be positioned at equal distance around the piles on datum base. Care will be taken to ensure that the datum base supports are not disturbed. The load is applied on pile top by hydraulic jack. Each stage of loading shall be applied till the rate of displacement of each pile top is either 0.1mm in first one hour. The next increment in load shall be applied on achieving the aforesaid criteria. The applied test load shall be maintained for 24 hours. Releasing applied load is to be carried out gradually 20% in every 10-minute interval

TABLE I
Loading and Unloading Sequence

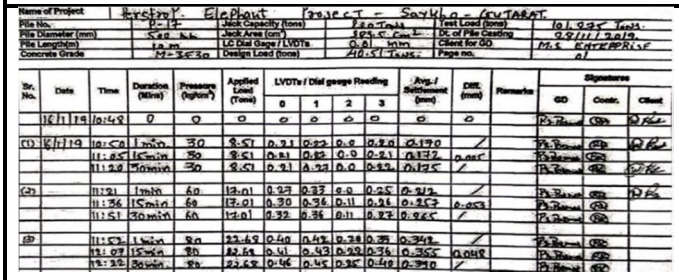
Loading		Unloading	
Pressure (kg/sq cm)	Load (Tons)	Pressure (kg/sq. cm)	Load (Tons)
0	0.00	340	96.39
30	8.51	320	90.72
60	17.01	290	82.22
80	22.68	260	73.71
120	34.02	230	65.21
140	39.69	200	56.70
170	48.20	170	48.20
200	56.70	140	39.69
230	65.21	120	34.02
260	73.71	80	22.68
290	82.22	60	17.01
320	90.72	30	8.51
340	96.39	0	0.00
360	102.06	-	-

Photograph while testing procedure is going on

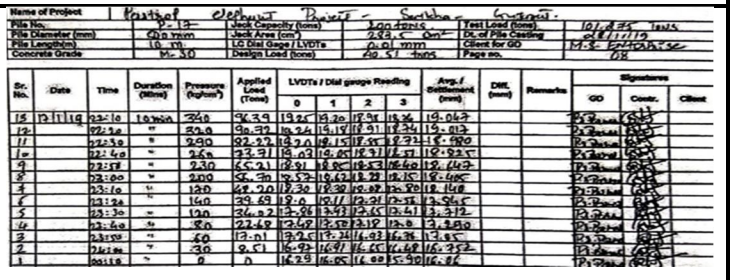
III. OBSERVATION TABLE 1

Sr no	Time	Duration (min)	Pressure (Kg/cm2)	Applide Load (Tones)	Dial Gauge Reading				Avg.Settlement (mm)	Differance (mm)	Remark
					0	1	2	3			
1	10:48	0	0	0	0	0	0	0	0	0	
2	10:50	1 min	30	8.51	0.21	0.27	0	0.2	0.17		
	11:05	15 min	30	8.51	0.21	0.27	0	0.21	0.1725	0.005	
	11:20	30 min	30	8.51	0.21	0.27	0	0.22	0.175		
3	11:21	1 min	60	17.01	0.27	0.33	0	0.25	0.2125		
	11:36	15 min	60	17.01	0.3	0.36	0.11	0.26	0.2575	0.053	
	11:51	30 min	60	17.01	0.32	0.36	0.11	0.27	0.265		
4	11:52	1 min	80	22.68	0.4	0.42	0.2	0.35	0.3425		
	12:07	15 min	80	22.68	0.41	0.43	0.22	0.36	0.355	0.048	
	12:22	30 min	80	22.68	0.46	0.45	0.25	0.4	0.39		

Observation Table of loading condition of Vertical Load Test



Observation Table of Unloading condition of Vertical Load Test



Line Graph of Load Displacement Vs Displacement

IV CONCLUSION

According to IS 2911 part 4 for pile up to including 500 mm diameter pile the safe load taken as least of the following

1) Two -third of the final load at which the total displacement attains a value of 12 mm or maximum of 2 % of pile diameter whichever is less unless otherwise required in given case on the basis of nature and type of structure in which case, the safe load should be corresponding to the stated total displacement permissible.

2) 50 % of the final load at which the total displacement equal 10 % of the pile diameter (D/10) in case of uniform diameter piles and 7.5 % of bulb diameter in case of under reamed piles.

Since this pile is test pile, it was supported to be loaded to 2.5 times the design loads the pile has undergone maximum settlement of 19.06 mm at the maximum applied load of 102.06 tons. As per first criteria for the safe load estimation pile undergone settlement of 12mm at the load of 96.3 tons thus the safe load is estimate to be 64.2 tons (i.e., 2/3 * 96.3 tons). Pile was not loaded till it reached D/10 i.e., 50mm as test load was achieved. Conservatively, safe load can be considered as 51 tons (102.06/2) as per criteria 2, which is more than working load of 40.51 tons. The net settlement was observed to be around 16.06mm.

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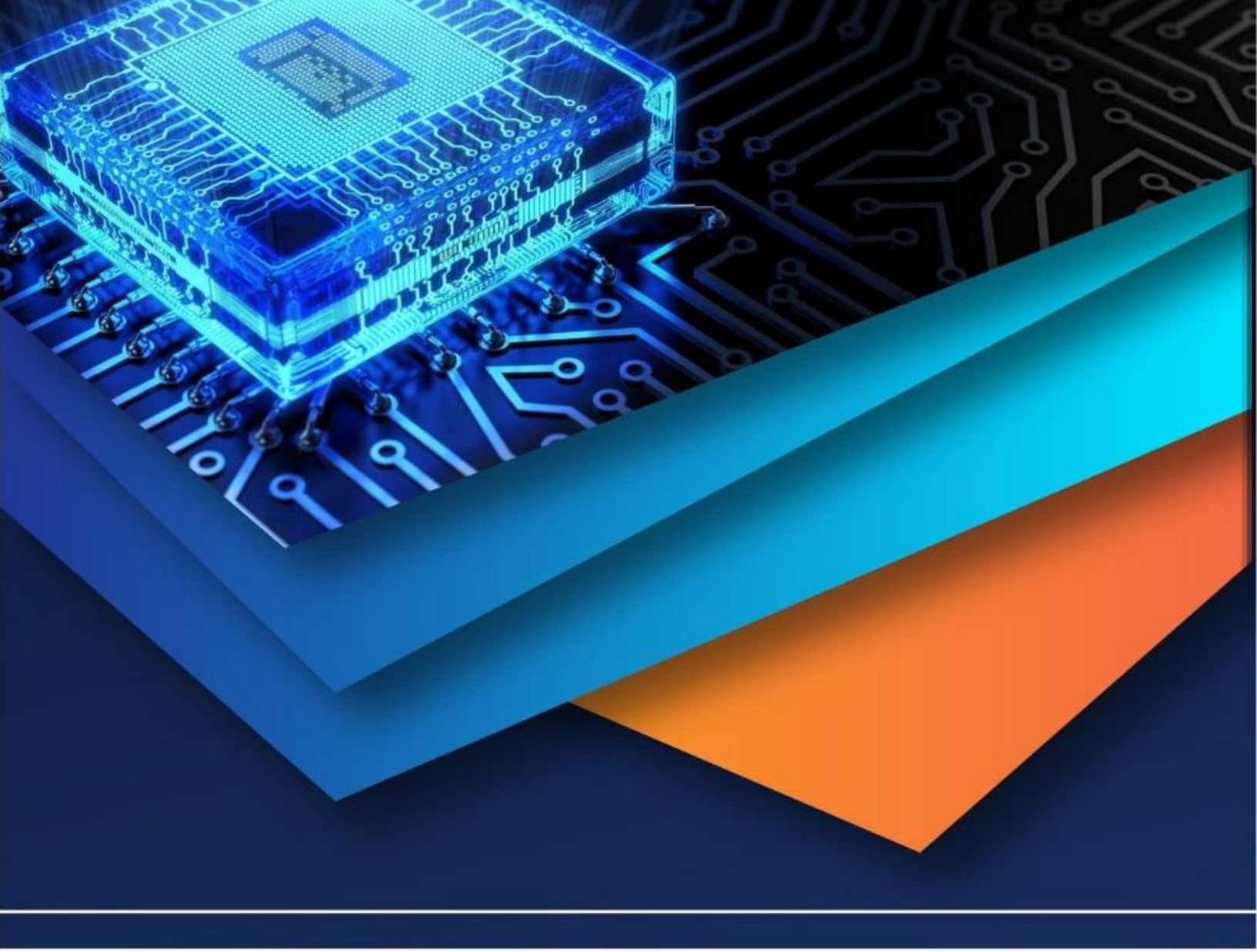

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