

CHAPTER IVEXPERIMENTAL INVESTIGATION1. Introduction1.1 Purpose of the investigation

In this research the main purpose is to find the ultimate bearing capacity of piles. By some techniques of loading test and some instruments embedded in piles, the performance of short driven pile can be known therefore the purpose of the investigation can be summarized as follows :-

- 1) The ultimate bearing capacity of piles having various shapes
- 2) To find the working load by load ratio method
- 3) The load-settlement relation
- 4) The economical shape of friction pile
- 5) The adhesion factor of piles having various shapes

1.2 Shapes of piles for comparing1.2.1 The square and the double-half moon section

The two sections have the same minimum perimeter. The double half moon section has more perimeter than the square one because of the irregular boundary. Therefore the purpose is to find the effect of perimeter on the skin friction and to use the minimum perimeter concept

1.2.2 The circular and the octagonal sections

The radius of the circular section is equal to the inner tangent of the octagonal one. The boundary of both sections are almost the same but the cross sections are different. The circular is hollow while the octagonal pile is solid. Therefore the comparison of the load capacity can be made on the hollow and the solid section

1.2.3 The square and the triangular section

The boundary of both are straight. The perimeter of the square are $4/3$ of the triangle, the load-ratio capacity should be compared

1.2.4 The shape effect

The perimeter is kept constant while the shapes vary. The shapes for comparing are triangular (3x35 cm) circular (3.14x35 cm) y-114 (3.24x35 cm) The skin friction of each pile will be found out and the shape effect on the skin friction can be compared

2. Description of The Piles

2.1 Details of strain rod

The strain rod that used in this reasearch is modified from the "telltale" because this equipment has not been used in local. The strain rod is embedded in the pile at different level for measuring the settlement of the pile at each level. Finally the load distribution of pile is expected to be obtained. It contains a strain indicator of $\frac{6}{8}$ in diameter polished and well

ciled. This rod is lowered into the $1\frac{1}{2}$ in diameter guide pipe and rests on the level of the pile of which the settlement is required. The strain indicator is laterally supported by collar in the guide pipe (details of strain rod is drawn in (Fig. 16)

2.2 Details of piles :-

All the dimension of piles is shown in Fig. (17)

2.2.1 The square and the octagonal pile

The square pile is precast prestressed concrete pile while the octagon is reinforced with normal reinforcement. The length of the square and the octagon are 10.5 m, 10 m respectively. The strain rods are set on the elevation 2, 4, 8, 10 m. The dimension of the square is 35 cm and the inscribed circle of the octagon is 35 cm.

2.2.2 The double-halfmoon and the triangle

The dimension of the equilateral triangle is 35 cm and the dimension of the straight side of the double-half moon is 36 cm while the radius of the circle of it is 11 cm. The strain rod is only fixed at the toe of these two sections for measuring the toe settlement. The double halfmoon is precast prestressed concrete pile while the equilateral triangle is precast and reinforced with normal reinforcement.

2.2.3 The circular and the y-shape

Both are precast prestressed concrete piles. The circular is hollow pile with outer and inner diameter 35 cm and 20 cm. The dimension of y-shape is shown in Fig 17. No strain rod or any instrument is embedded.

3. Pile Location And Layout Plan

All piles are driven with drop hammer. The test site is near the hydraulic lab of the Faculty of Engineering, Chulalongkorn University. Twelve anchored piles of 0.20 x 0.20 cm are also driven. The general plan is shown in (Fig 18)

4. Procedure of Testing

4.1 Method of test

The load is applied in increments by means of hydraulic jack. All piles are tested to failure. The mechanical strain gauges are mounted on fixed a referenced beam for measuring the top settlement of piles and all strain indicative rods.

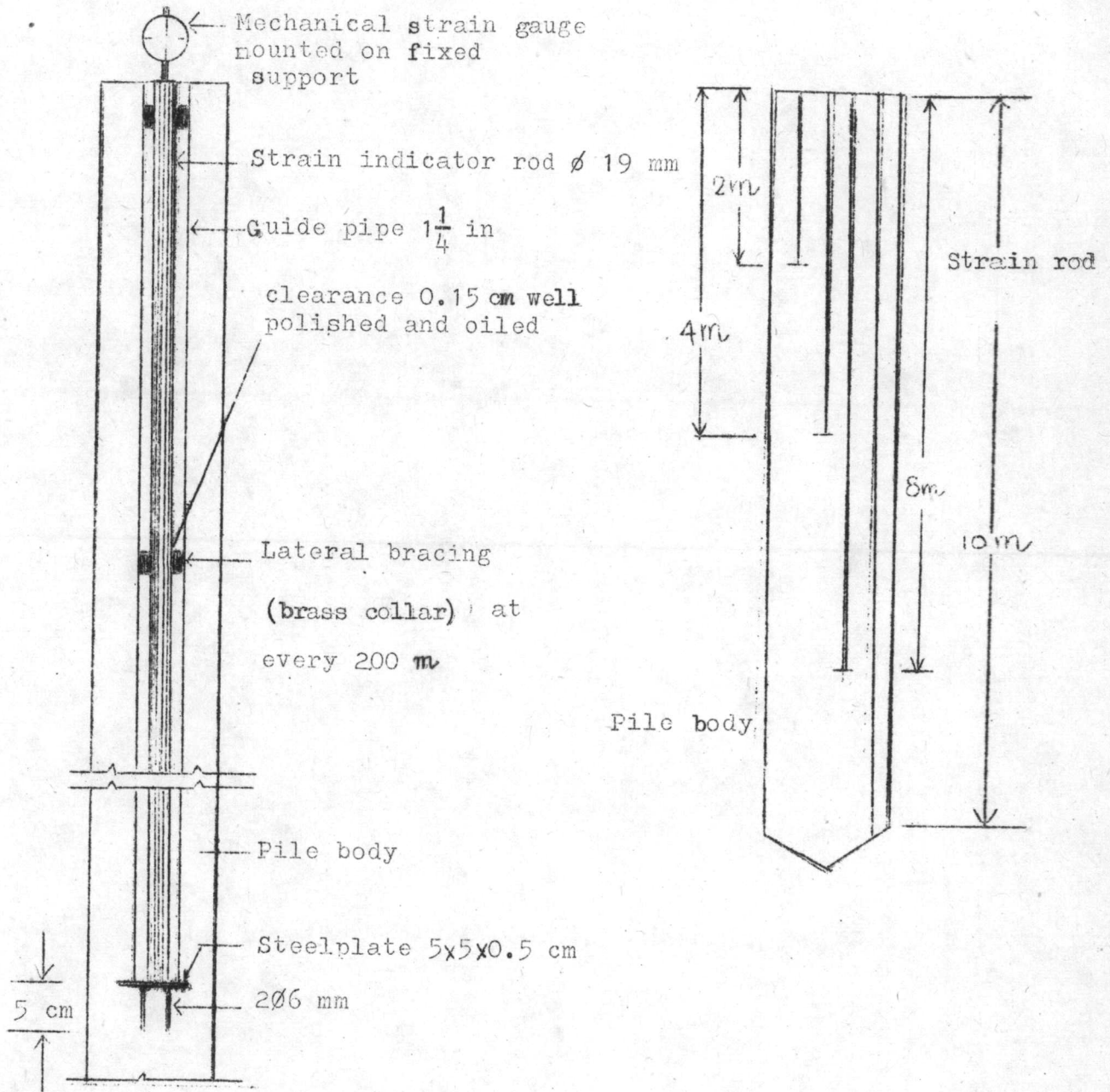
4.2 Cyclic loading test

Loads are applied on pile top for increments of 2 ton. Each load is maintained on pile top 20 minutes. Settlements are recorded at the interval of 5 minutes. Then the load on pile is removed, the pile is unloaded for 10 minutes for each increment. Settlements are also recorded at the interval of 5 minutes. All piles are tested in the same procedure until failure is reached

4.3 Quick test

Loads are applied on pile top for increments of suitable loads. The increment is not more than 3 ton.

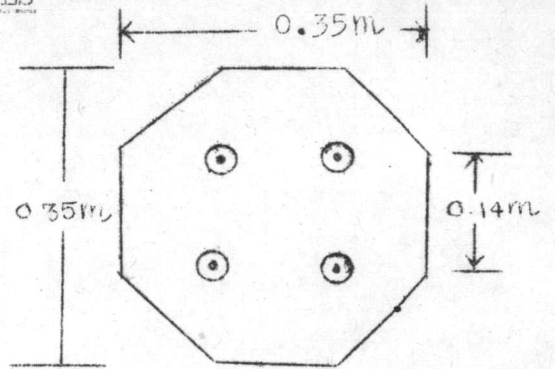
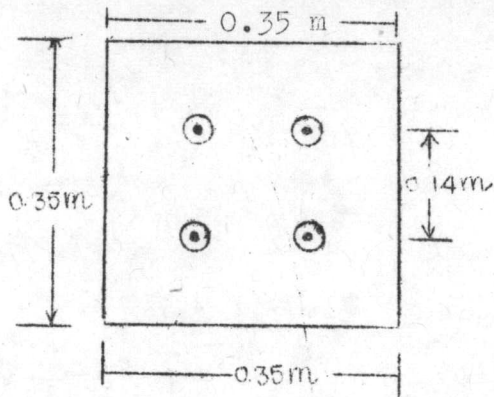
Three maintained time of each load are 60, 30, 15 seconds then the next increment of load is applied. Quick tests are run after the cyclic loading is finished.



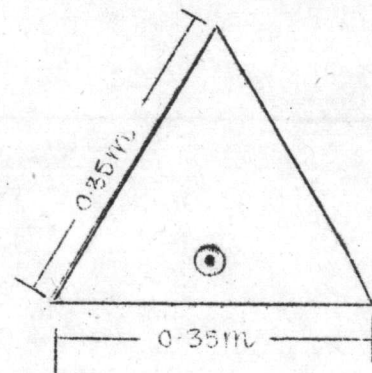
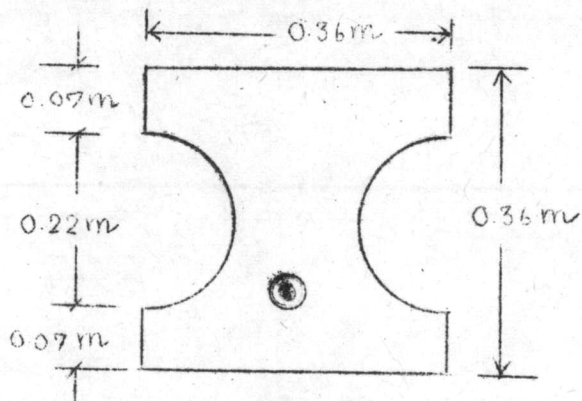
Note Dimension not to scale .

FIG 16 THE DETAILS OF STRAIN ROD

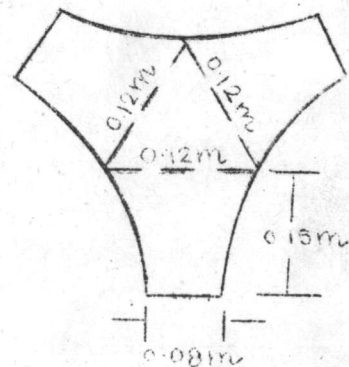
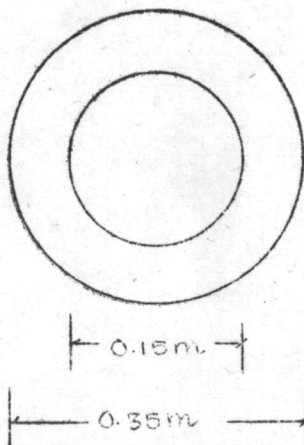
A THE SQUARE AND THE OCTAGONAL PILES



B THE DOUBLE-HALF MOON AND THE EQUILATERAL TRIANGULAR PILES



C THE CIRCULAR AND THE Y SHAPE PILES



Note
 Strain indicator rod $\phi \frac{6}{8}$ in
 Guide pipe $\phi 1\frac{1}{4}$

FIG 17 DETAILS OF PILES

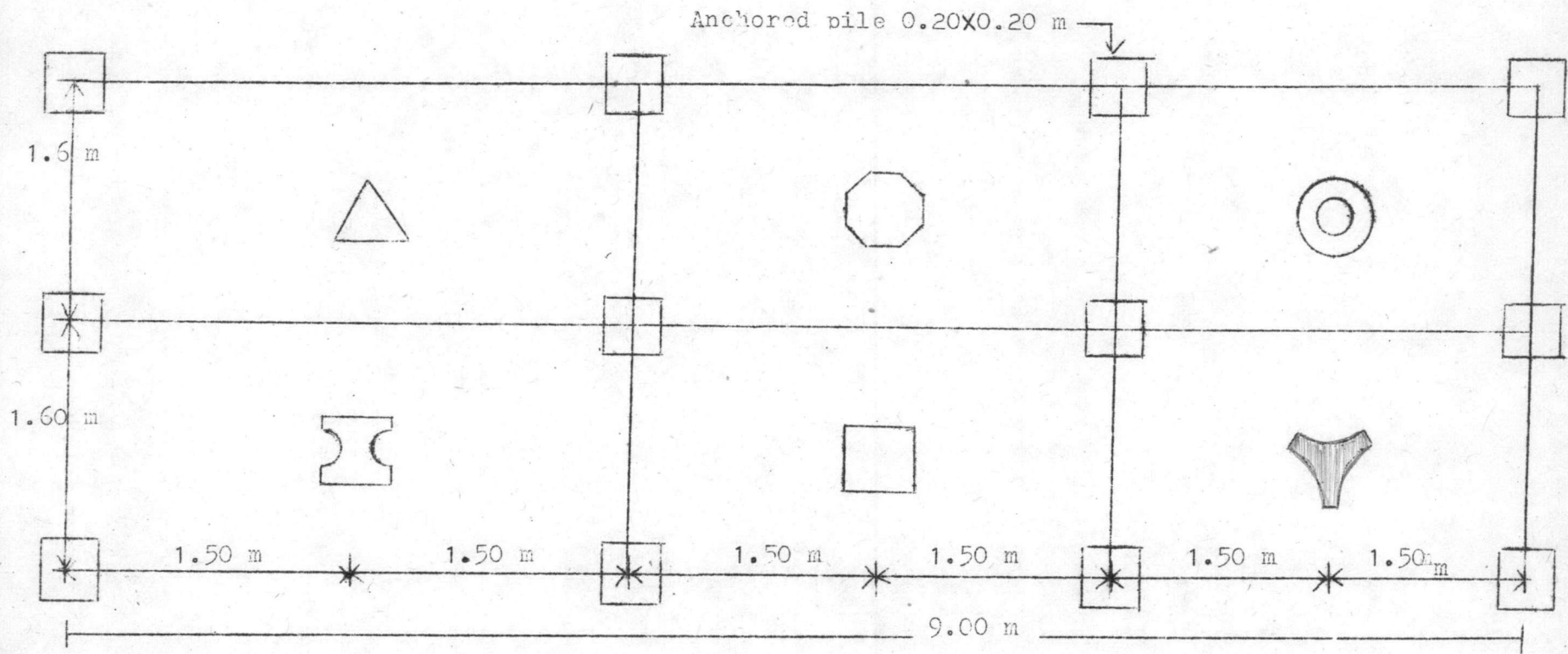


FIG 18 LAY - OUT OF THE SITE

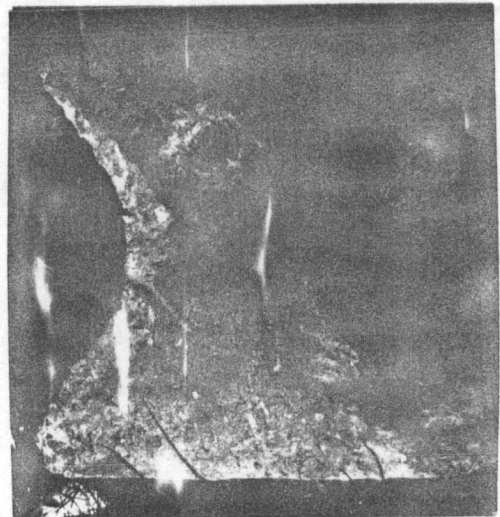
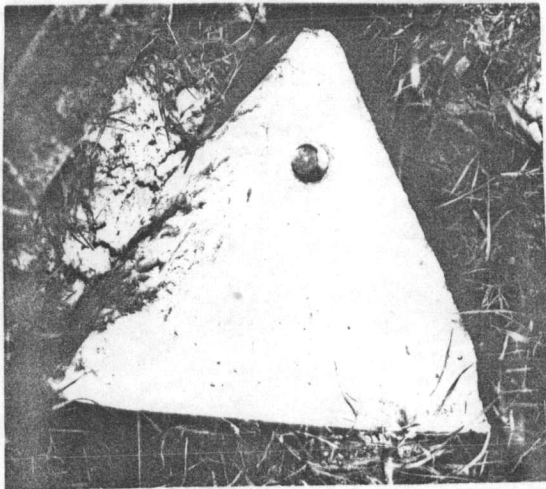
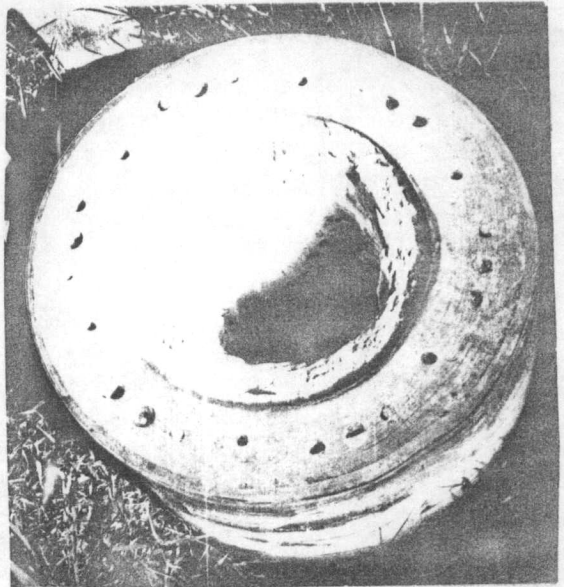
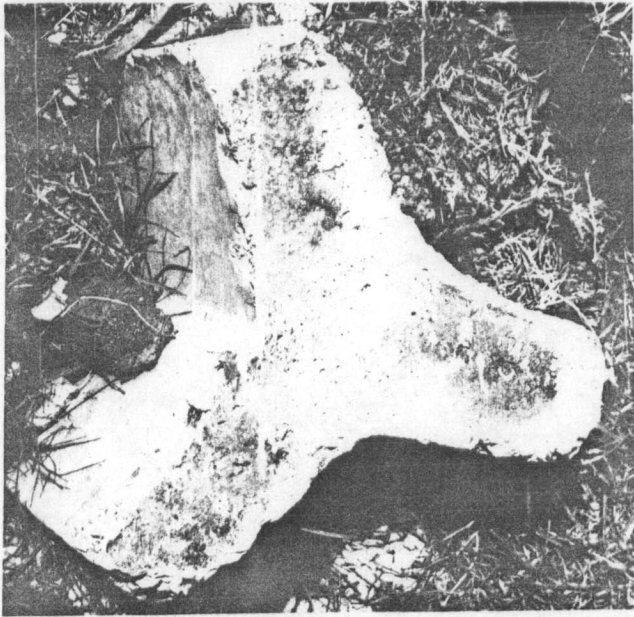


FIG 19 SHAPES OF PILES FOR TEST

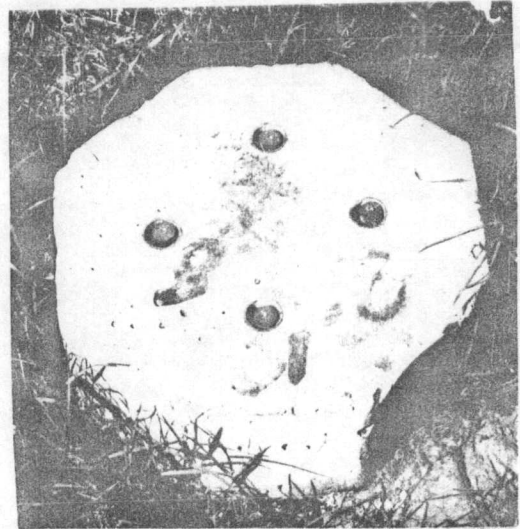
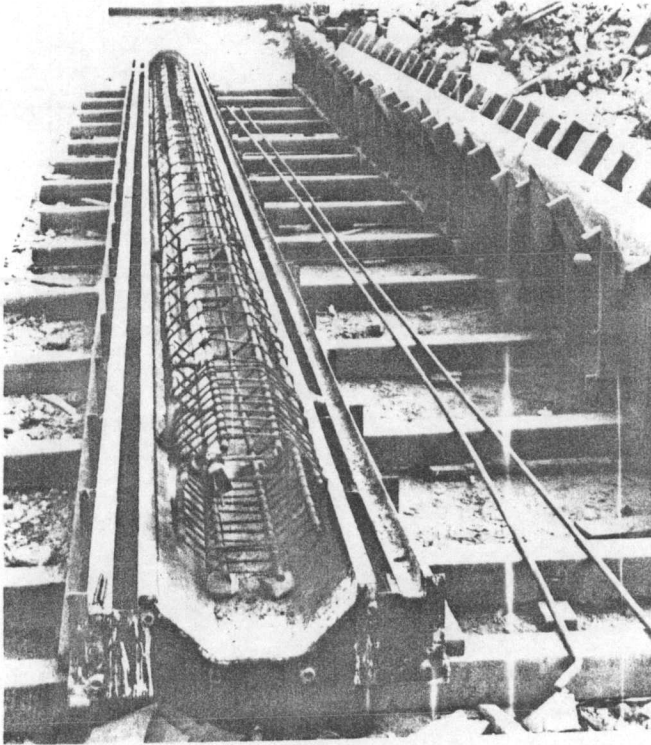
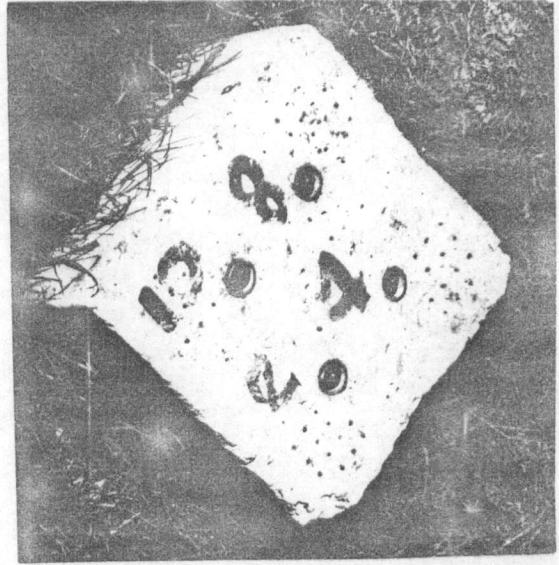
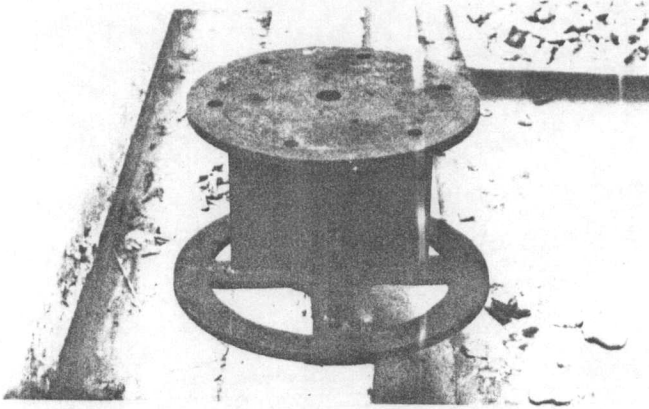


FIG 20 STRAIN RODS INSTRUMENTATION EMBEDDED IN PILES

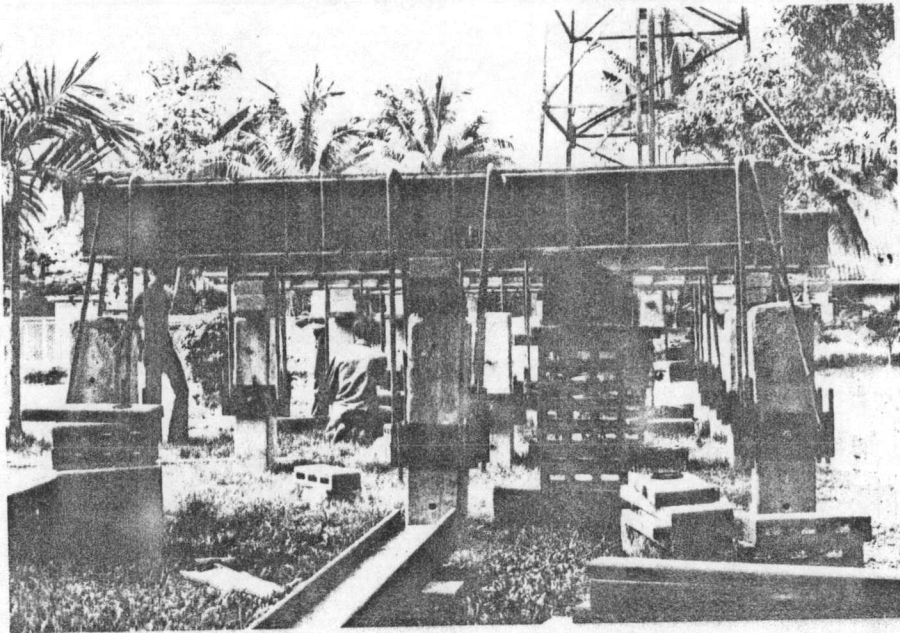
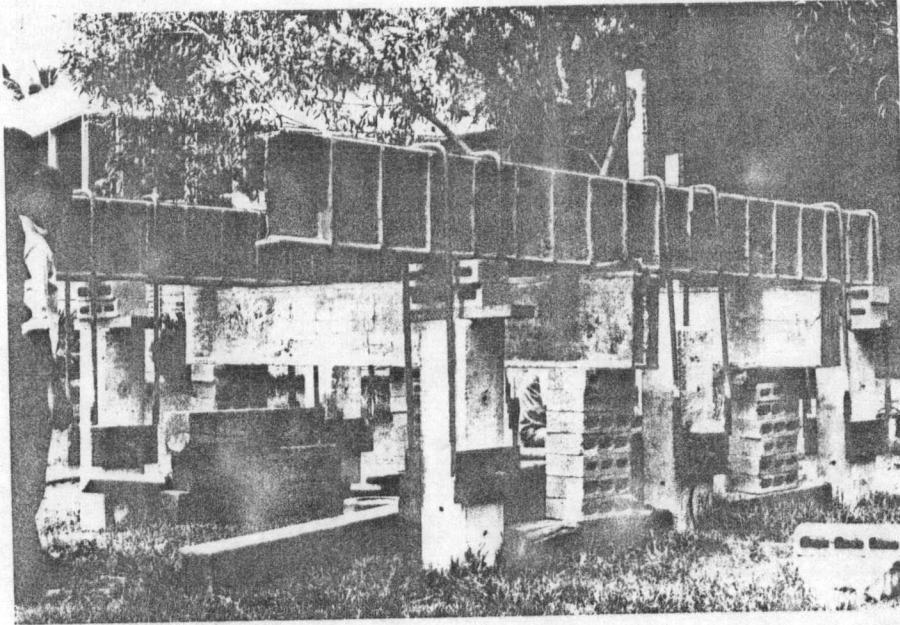


FIG 21 SET-UP EQUIPMENT FOR TEST

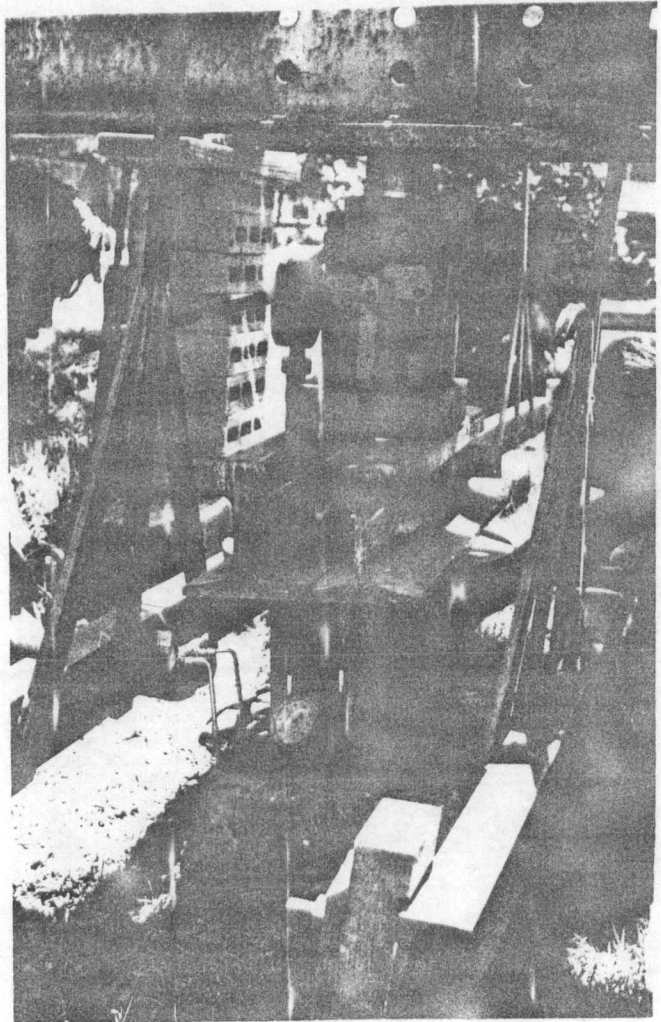
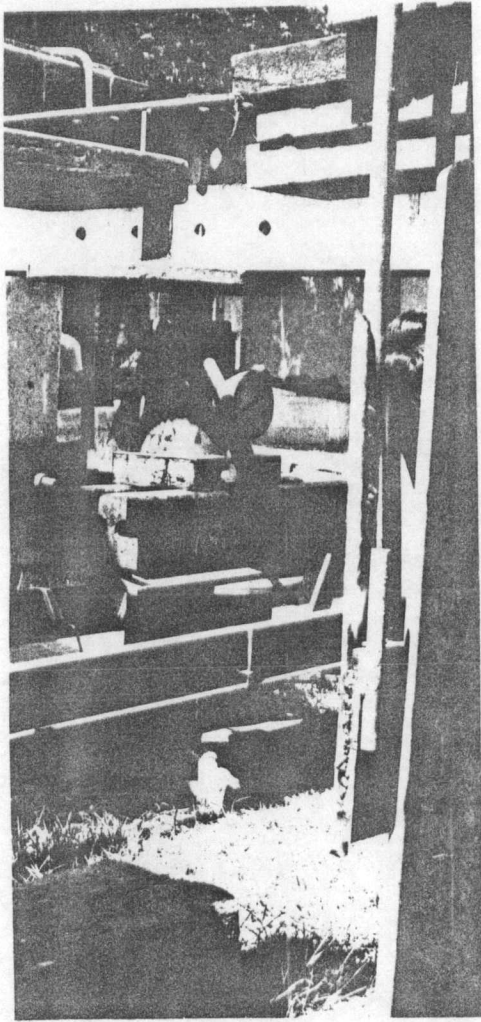


FIG 22 PILE LOAD TEST

5. Special Collected Data

Three sectional shapes of long piles are tested at NONG KHAEM Thonburi by The United Construction Material Co, Ltd. These sections are the square (0.35 x 0.35 m), the circular (outer diameter 0.35 m, inner diameter 0.20 m), the I section (straight sides 0.35 m). One bore-hole is performed for investigation the subsoil properties all engineering properties being summarized in (Fig 47)

All piles are driven by drop hammer to (- 21.50 m) below the ground level, the load is applied on pile top by hydraulic jack Eight anchored piles of length 10 m is used for testing one pile All piles are cyclic loading test. The increment of load is 10 ton both in increasing and rebounding. The rebounded load is 30, 60, 90, 120, 150 ton. Each increment of load is maintained for 1 hour and the settlement is recorded at the interval of 20 minutes. The piles are not tested to failure because the anchored piles tend to uplift. The maximum tested load of all piles is 150 ton.