

## **Module 5 : Design of Deep Foundations**

### **Lecture 21 : Types of pile load test [ Section 21.1 : Different types of pile load test ]**

#### **Objectives**

**In this section you will learn the following**

- Terminologies
- Maintained Load Test
- Constant Rate Of Penetration Test

## Module 5 : Design of Deep Foundations

### Lecture 21 : Types of pile load test [ Section 21.1 : Different types of pile load test ]

#### Terminologies

- Test pile -pile chosen for pile load test only. It may or may not be a working pile. It can work as a working pile if routine load test is carried out on it is up to half of the safe load.
- Initial test -it is done on test piles to determine the safe load or allowable load or ultimate load bearing capacity.
- Trial pile -minimum two initial test should be conducted and half percentage of the total number of piles used in a project must be subjected to routine test. For largely varying strata and for important structure, it is up to 2%.

#### Different types of pile load test

##### 1. Maintained Load Test

Load is maintained in 10 or 8 steps and maintained for sometime to exact settlement.(step load test).To test a single pile at least 3 dial gauges should be used and 4 dial gauges for group piles.loading rate is 0.1mm/hr. For clay it is 0.02mm/hr.loadf is maintained for atleast 2hrs. safe load is maintained for 24 hrs.

##### 2. Constant Rate Of Penetration Test

Generally used for soft clays and penetration is done for constant rate of 0.75mm/min.

#### Cyclic load test

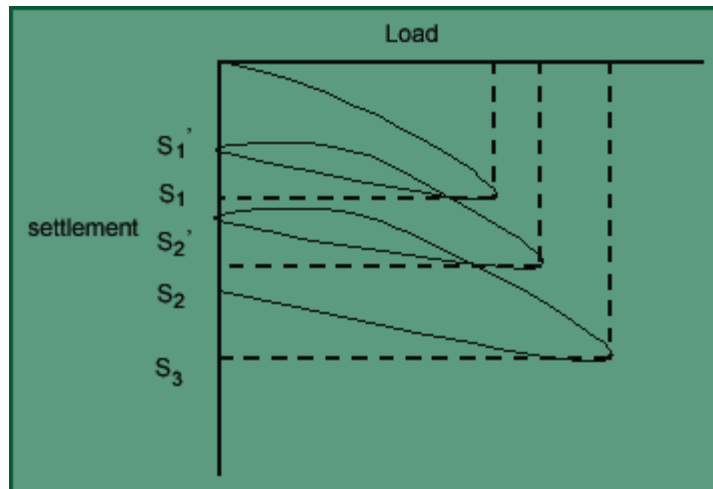


Fig. 5.8 Load vs settlement

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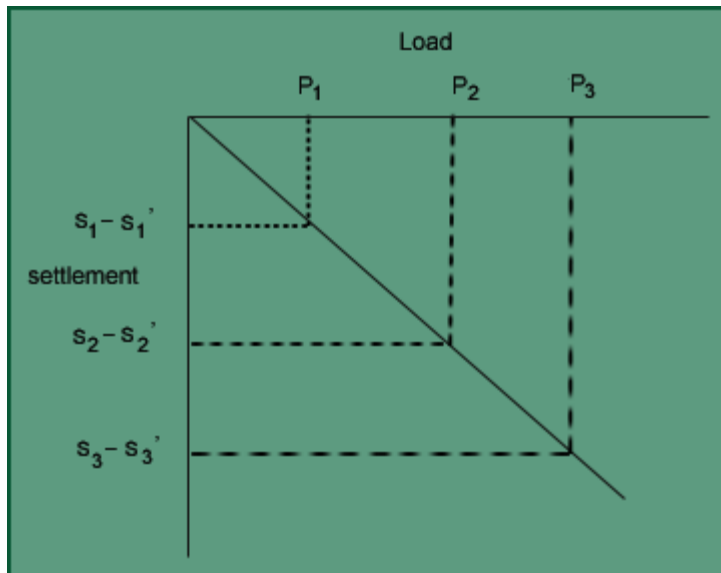


Fig. 5.9. Elastic settlement vs load

Elastic compression of the soil, 
$$\Delta L = \frac{\left[ P - \frac{Q_s}{2} \right] L}{AE}$$

Where,  $\Delta L$  = length of the pile

P=pile load

L=length of pile

A=area of cross section of the pile

E=modulus of elasticity of the pile

Compute the pile tip capacity and shaft end capacity.

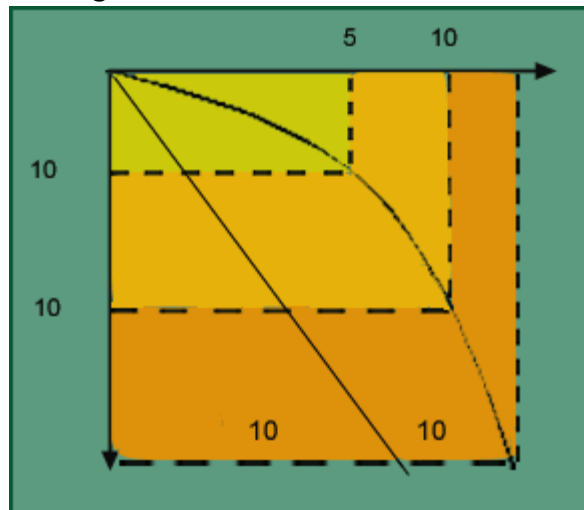


Fig-5.10 Q Calculate the Value of Tip Resistance and Shaft Resistance in Cyclic Pile Load Test.

## **Module 5 : Design of Deep Foundations**

### **Lecture 21 : Types of pile load test [ Section 21.1 : Different types of pile load test ]**

#### **Recap**

**In this section you have learnt the following.**

- Terminologies
- Maintained Load Test
- Constant Rate Of Penetration Test

## **Module 5 : Design of Deep Foundations**

### **Lecture 21 : Types of pile load test [ Section 21.2 : Problem ]**

#### **Objectives**

**In this section you will learn the following**

- Problem

## Module 5 : Design of Deep Foundations

### Lecture 21 : Types of pile load test [ Section 21.2 : Problem ]

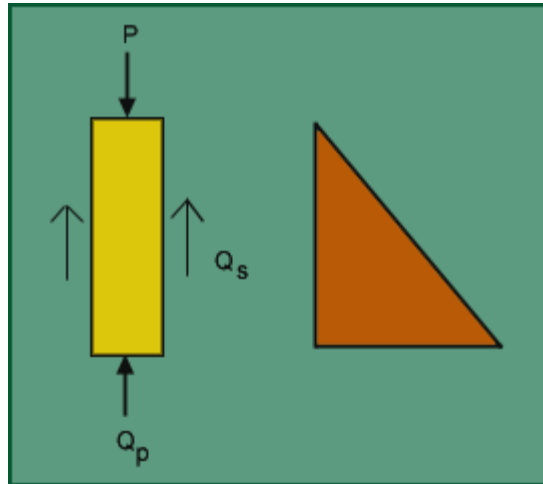


Fig. 5.11 Variation Of  $Q_s$  with Depth Of pile

Here  $Q_s$  = Shaft Resistance,  $P$  = Applied Load,  $Q_p$  = Tip Resistance,  $S_{es}$  Settlement in soil,  $S_{ep}$  = Settlement in Pile.

#### Given Data

Loads (Ton)	Total Settlement (mm)	Net Settlement (mm)	Elastic Settlement (mm)
0	0	0	0
5	2.5	0.5	2
10	4	1.25	2.75
20	9.5	3.75	5.75
30	16.5	8	8.5
40	27	14	13
50	40.5	21	19.5
60	61	31	30

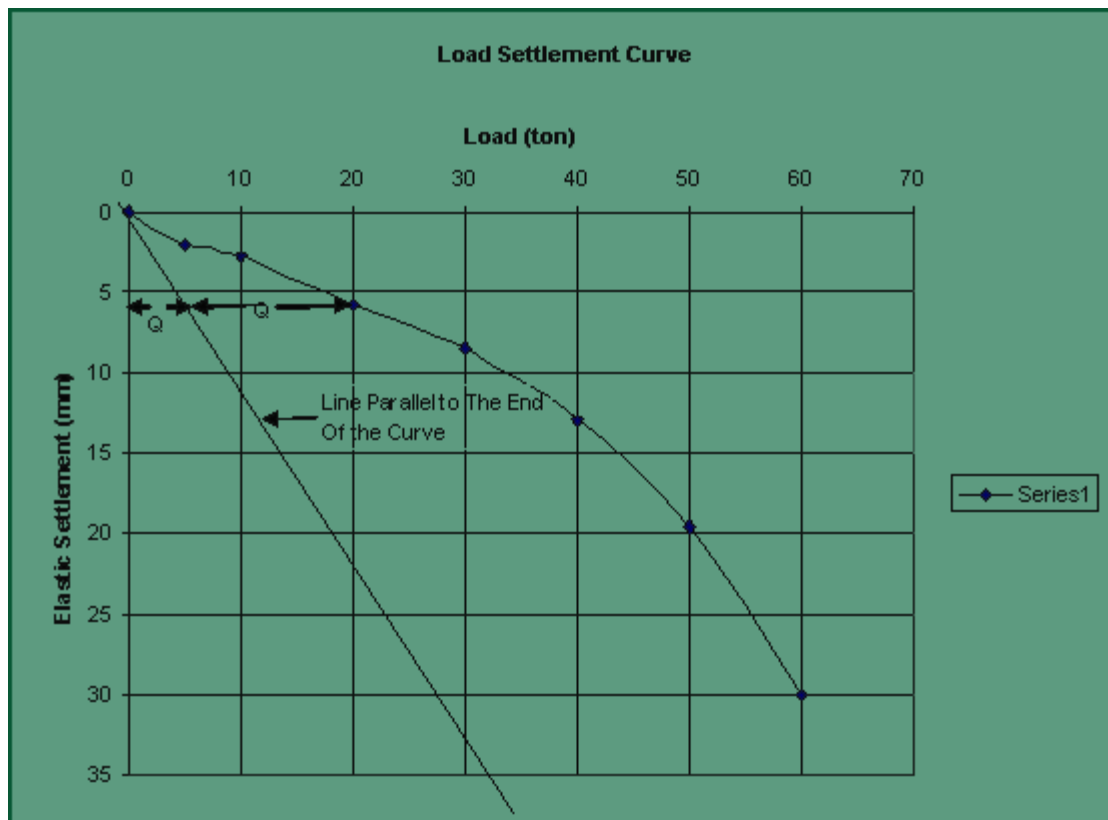
## Module 5 : Design of Deep Foundations

### Lecture 21 : Types of pile load test [ Section 21.2 : Problem ]

Initially	$\Delta L = 0$	$S_{es} = S_{ep}$		
Loads	$Q_p$ (ton)	$Q_s$ (ton)	$\Delta L = (P( Q_s / 2)).L/AE$	Elastic Settlement (mm)
0	0	0	0.00	0.00
5	1.75	3.25	0.35	1.65
10	2.5	7.5	0.66	2.09
20	5.25	14.75	1.33	4.42
30	8.25	21.75	2.01	6.49
40	12.5	27.5	2.76	10.24
50	18.75	31.25	3.61	15.89
60	29	31	4.67	25.33

**Load Vs Elastic Settlement Curve** (Total Elastic Recovery of the Pile Top)

First Trial



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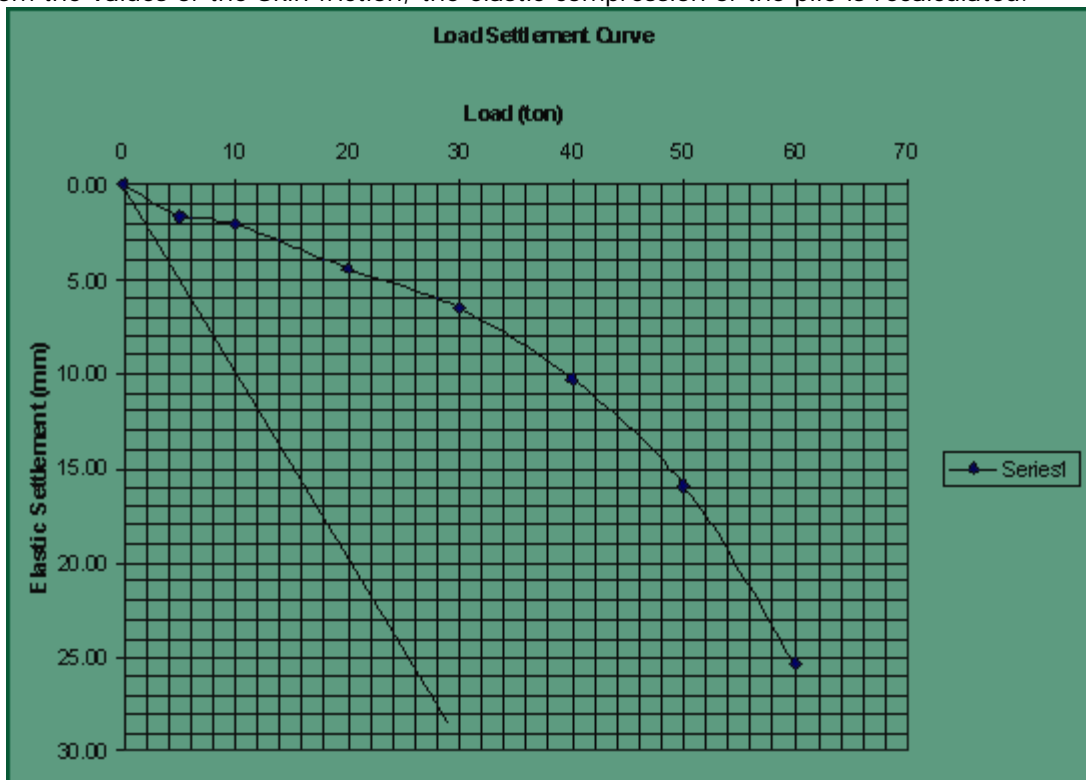
### Lecture 21 : Types of pile load test [ Section 21.2 : Problem ]

#### Second Trial

Loads (ton)	$Q_p$ (ton)	$Q_s$ (ton)	$\Delta L = (P - (Q_s / 2)) \cdot L / AE$	Elastic Settlement (mm)
0	0	0	0.00	0.00
5	1.5	3.5	0.34	1.66
10	2	8	0.63	2.12
20	4.5	15.5	1.29	4.46
30	6.5	23.5	1.92	6.58
40	10.25	29.75	2.64	10.36
50	16	34	3.47	16.04
60	25.5	34.5	4.49	25.51

#### Load Vs Elastic Settlement of soil Curve For Second Trial

Second Curves gives new values of skin friction and point resistance which are more accurate than earlier values. From the values of the Skin friction, the elastic compression of the pile is recalculated.





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### Lecture 21 : Types of pile load test [ Section 21.2 : Problem ]

#### Third Trial

Load (ton)	$Q_p$ (ton)	$Q_s$ (ton)	$\Delta L = (P - (Q_s / 2)) \cdot L / AE$	Elastic Settlement (mm)
0	0	0	0.00	0.00
5	1.75	3.25	0.35	1.65
10	2.25	7.75	0.64	2.11
20	4.75	15.25	1.30	4.45
30	6.75	23.25	1.93	6.57
40	10.75	29.25	2.66	10.34
50	16.75	33.25	3.50	16.00
60	25.5	34.5	4.49	25.51

#### Load Vs Elastic Settlement Curve For Third Trial



Final Value Of Tip Resistance & Skin Resistance

**Ans**

$Q_p$ (ton)	$Q_s$ (ton)
0	0
1.75	3.25
2.25	7.75
4.75	15.25
6.75	23.25
10.75	29.25
16.75	33.25
25.5	34.5

## **Module 5 : Design of Deep Foundations**

### **Lecture 21 : Types of pile load test [ Section 21.2 : Problem ]**

#### **Recap**

**In this section you have learnt the following.**

- Problem

**Congratulations, you have finished Lecture 21. To view the next lecture select it from the left hand side menu of the page**