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# Soil improvement technique by sand piling

**Md. Shariful Islam**
Department of Civil Engineering, RUET, Bangladesh
sharif.ruet12@gmail.com

**Abstract**

A common practice in Bangladesh especially Rajshahicity is to install sand piles for the purpose of densifying loose soil. Significant increases in bearing capacity can be achieved by sand piling. Sand piling is a ground improvement technique which allows the use of shallow foundations, even the case of high rising buildings. Test for soil, and sand properties determinations, the standard penetration test (SPT), were made. The comparison between the tests allows the quantifying soil improvement by sand piling. A prediction of shallow foundation bearing capacity in sandy soils improved by sand piling, based on SPT values is presented.

Key words: Bearing capacity, shallow foundation, Sand piling, SPT.

## 1. Introduction:

The existing soil at a construction site may not always be suitable for the supporting structures such as buildings, bridges, highways, and dams. In granular soil deposits the in situ soil may be very loose and indicates a large elastic settlement. In such case, the soil needs to be densified to increase its unit weight and thus the shear strength. Sometimes the top layers of soil is undesirable and must be removed and replaced with better soil on which the structural foundation can be built. Compacted fills may be required in low lying areas to raise the ground elevation foundation construction. Soft clay layers are often encountered at shallow depth below foundation. Depending on the structural load and depth of the clay layers, usually large settlement consolidation may occur. Special soil improvement techniques are required to minimize settlement.

**i. Various soil improvement technique:**

i. Sand piling
ii. Compaction
iii. Vibroflotation
iv. Precompression
v. Sand drains
vi. Stabilization
vii. Stone column

### 1.3. Sand piling:

Sand piling is a soil improvement technique by which bearing capacity of soil is increased. Soil improvement with the use of sand piles happen through a compacting process, in which the sand piles are places in low strength soils, which are then improved by dynamic force or vibration. The piles promote neighboring soil compacting, thus improvement the bearing capacity, and decreasing the foundation settlement. Granular soil properties are improved by the compacting process through physical displacement of the particles, which decreases the void ratio, increases the relative density, and bearing capacity of soil.

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## 2. The objective of this Study:

i. To investigate the usability of sand to improve bearing capacity of soft soil.
ii. To compare the variation of bearing capacities between before compaction and after compaction.
iii. To identify the mechanism of improving bearing capacity of soil after using sand piles.

## 3. Methodology:

### 3.1: Materials properties:

a) Specific gravity
b) Moisture content
c) Grain size analysis
d) Standard proctor test
e) Void ratio
f) Standard penetration test

### 3.2. Site Description:

A sand piling technique is provided at a site of laxipur at Rajshahi.

Figure 1: Drive of sand pile

### 3.2.1: Dimension of sand piling:

- Depth of sand piling=11 ft
- Diameter of sand piling =9 in
- Weight of compactor =10 ton
- Spacing of sand piling =2 ft

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# 4. Results:

## 4.1: Grain size Distribution of existing soil

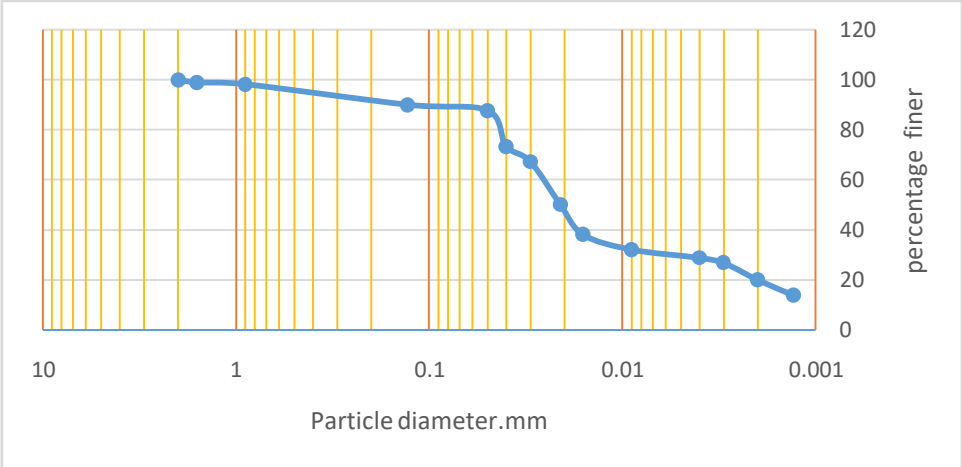


Figure 2: Particle size distribution curve

## 4.2: Graph for sieve analysis of used materials

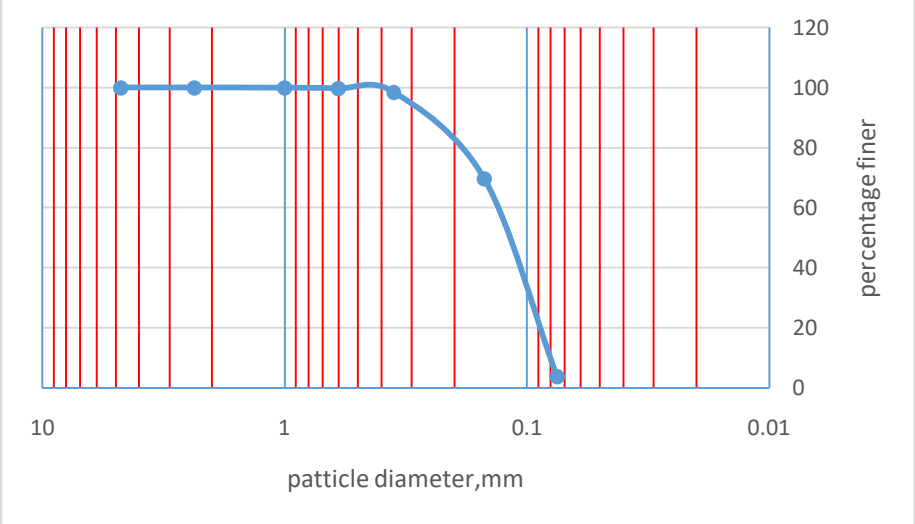


Figure 3: Particle size distribution curve

## 4.3: Variation of dry unit weight of existing soil with respect to moisture content:

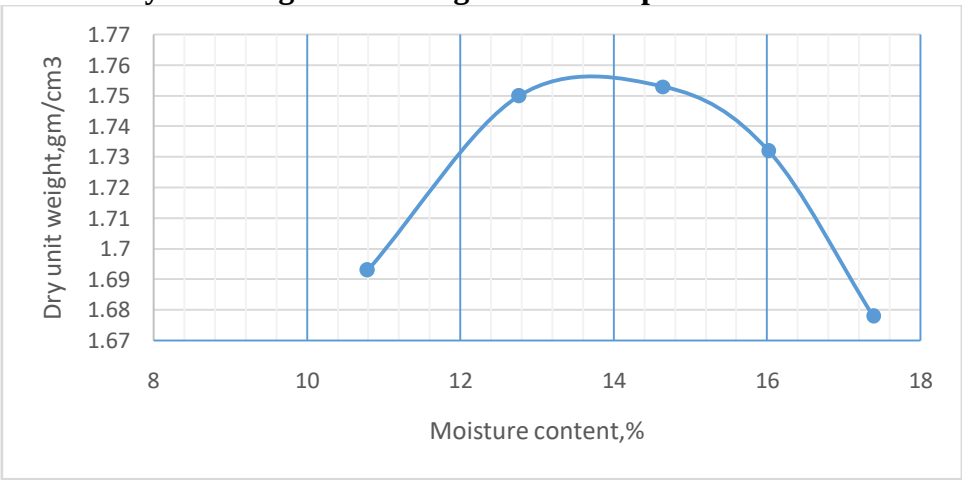


Figure4: Moisture content,(%) Vs Dry unit weight (gm/cm3)

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### 4.4: Variation of dry unit weight of sand with respect to moisture content:

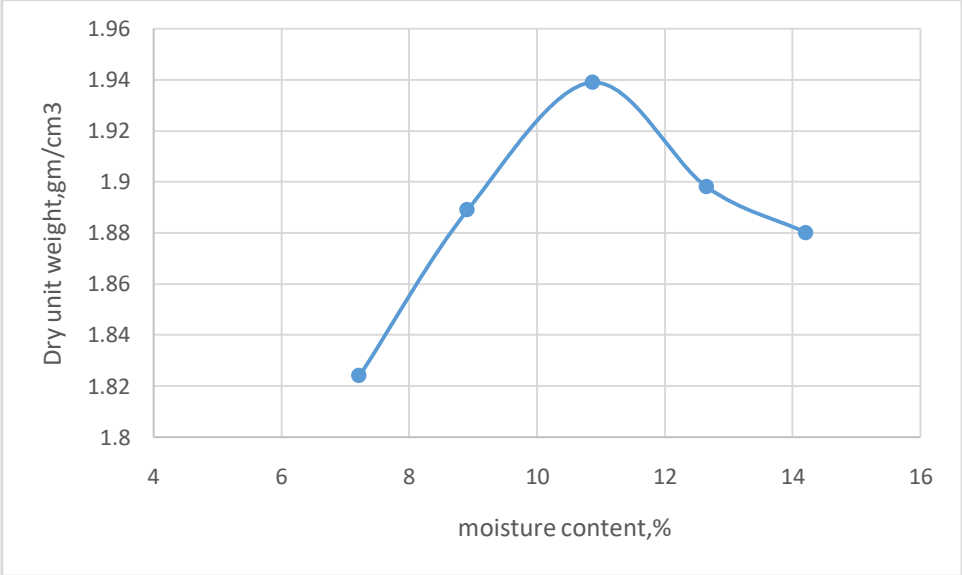
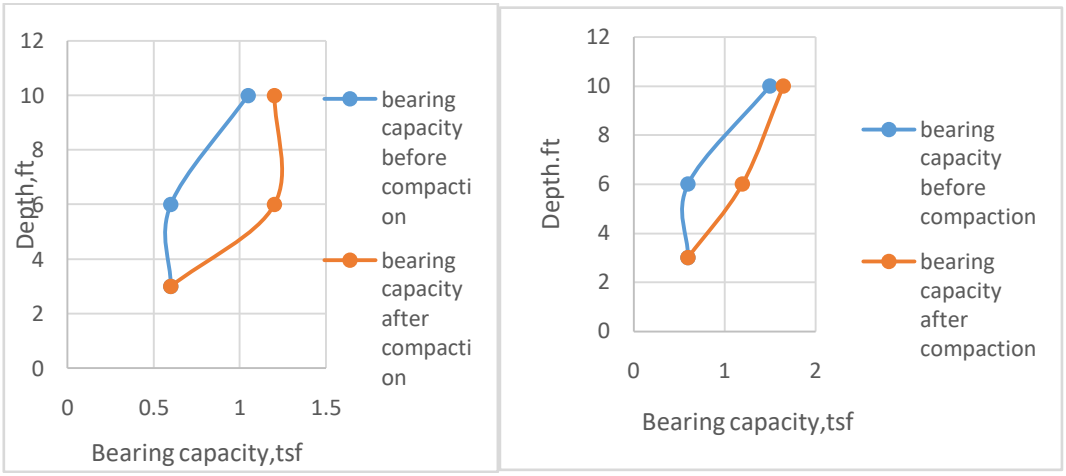



Figure5: Moisture content,(%) Vs Dry unit weight (gm/cm3)

## 5. Graph Bearing capacity:




(a) (b)

Figure6: (a) Bearing capacity at bore hole 1 (b)Bearing capacity at bore hole 2

### Conclusion:

Compaction at the middle of total depth is maximum and is decreasing to outwards from middle. To get better compaction at lower portion of pile, it is needed to increase number of blows or to enlarge pile depth.

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