Imperial Journal of Interdisciplinary Research (IJIR)
Vol-3, Issue-2, 2017
ISSN: 2454-1362, http://www.onlinejournal.in

Effect of Shear Parameters on Sand with Addition of Coal

B. Sai Laxman[1], G. Amulya[2] & N. Bharathi[3]
[1]Assistant Professor, Kakatiya Institute of Technology & Science, Warangal.
[2,3] Assistant Professor, Kakatiya Institute of Technology & Science, Warangal.

Abstract*: Soil is the base for any civil engineering structures. One of the main constraints faced by the geo-technical engineers is the construction of any type of foundation over a weak or soft soil as the soil may possess low shear strength So, improving the SHEAR PARAMETERS is very much essential ,especially in the case of SANDS. Various techniques have been adapted to improve the shear strength of the soil. In this present case study, coal as a stabilizer is added to sand in varying percentages ranging from 0 to 2.5% in increments of 0.5% i.e. 0.5, 1.0, 1.5, 2.0, 2.5%, etc and the effect of coal on sand regarding the shear parameters were studied by conducting direct shear test*

1. Introduction

Soil is considered as complex material and it is very common that the soil at a site is not ideal from the view point of geo technical engineers because different soils have different properties and these properties may lead to excessive settlement problems or stability problems sometimes. An attractive approach to avoid some of the problems to the soil is to stabilize it. Stabilization is one of the methods of treating the soil to increase the engineering properties so that they are fit for construction. Varieties of stabilizers like Traditional stabilizers (lime, cement, etc.) By product stabilizers (fly-ash, quarry dust, phosphorus and gypsum) are frequently used.
From the literature, the stabilization of sand is done by different materials. In this paper an attempt is made to add coal as a stabilizer because there is availability of coal in the surrounding area.(Singareni collieries)

2. Aim & Objectives of Study

2.1 Aim

To study the effect of shear parameters of sand with addition of coal.

2.2 Objectives

- To procure coal from Singareni collieries and to study their properties.
- To procure sand from Dharmasagar and to study their properties.
- To study the effect of coal on sand regarding Shear parameters.

3. Materials

3.1 Soil

Sand has been used as base material in this study. The sand used for the present study was brought from Dharmasagar Mandal in Warangal district, Telangana.

Table 1. Properties of soil sample

Specific gravity	2.63
Co efficient of curvature(Cc)	1.07
Coefficient of uniformity(Cu)	3.12
Cohesion (kg/cm^2)	0
Angle of internal friction (Φ)	$41^0 11'$

3.2 Coal

In the present case study the coal is brought from Singareni collieries at Ramagundam, Peddapalli district, Telangana. The coal is “B” grade.

Table 2. Properties of Coal

Specific gravity	1.15
Cohesion (kg/cm^2)	0.14
Angle of internal friction (Φ)	21^0

4. Experiments Performed

The following tests were performed to analyze the properties of sand, coal and their combination:

- Grain size analysis- to know the gradation of the sample.
- Specific gravity - To determine the amount of solids particles.
- Direct Shear Test - To determine the shear parameters (c,Φ).

All the above experiments are performed according to IS codal provisions.

5. Results

The following results can be drafted from the experiments performed.

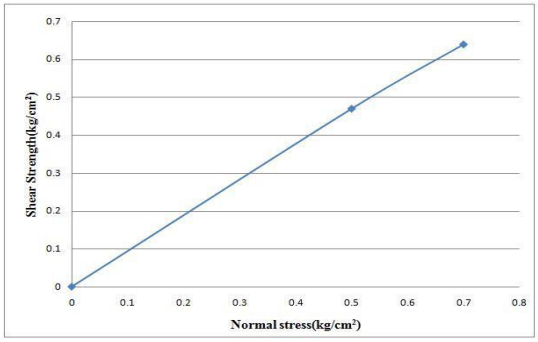

Figure 1 Failure Envelope for Sand

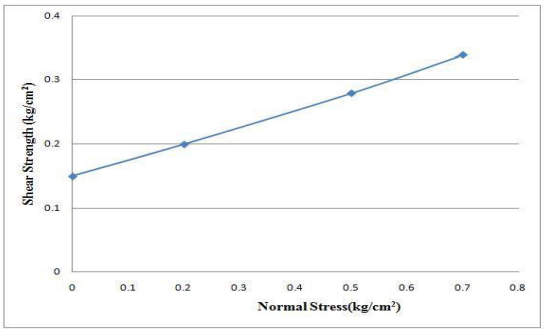

Figure 2 Failure Envelope for Sand with 0.5% Coal addition

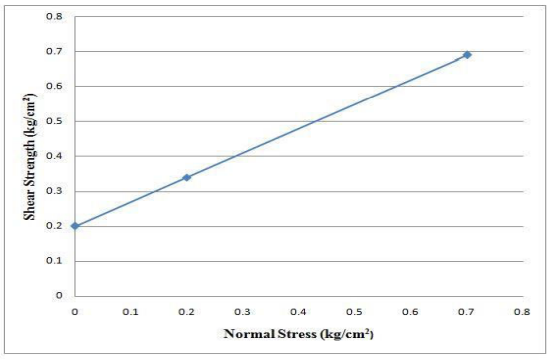

Figure 3 Failure Envelope for Sand with 1.0% Coal addition

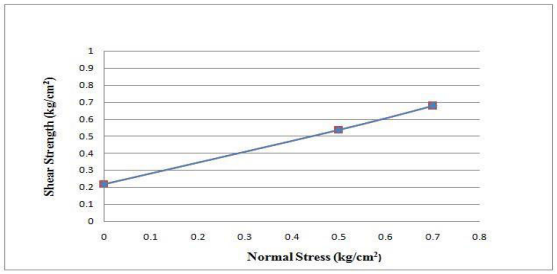

Figure 4 Failure Envelope for Sand with 1.5% Coal addition

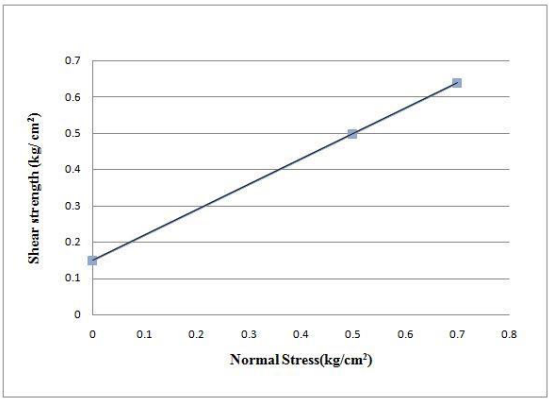

Figure 5 Failure Envelope for Sand with 2.0% Coal addition

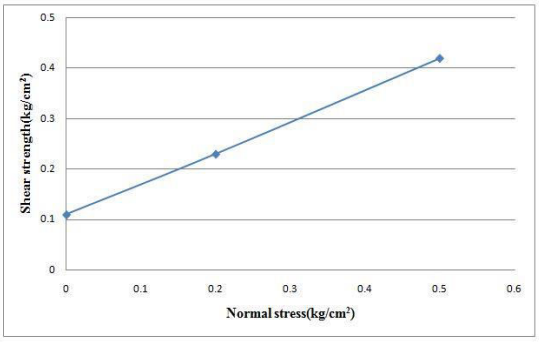

Figure 6 Failure Envelope for Sand with 2.5% Coal addition

Table 3. Results of Shear parameters (c, Φ)

S No	Percentage of Coal addition	Cohesion (kg/cm^2)	Angle of internal friction(Φ in degrees)
1	**0**	0.00	$41^0 11^1$
2	**0.5**	0.12	$18^0 43^1$
3	**1.0**	0.20	$34^0 30^1$
4	**1.5**	0.22	$39^0 10^1$
5	**2.0**	0.15	$34^0 6^0$
6	**2.5**	0.11	$31^0 47^1$

From the above results, it was observed that there is an increase in cohesion of sand with addition of coal in varying percentages.

6. Conclusions

The addition of Coal in varying percentages to Sand yields the following conclusions

- According to IS classification, the soil specimen taken in the present study is poorly graded sand (SP).

- The shear parameters of the sand specimen taken in the present study are Cohesion is Zero (C=0kg/cm^2) and angle of internal friction (Φ) is $41^0$11'.
- The effect of coal addition to sand in varying percentages in increments of 0.5% indicates an increase in Cohesion of the sand.
- Addition of 1.5% coal to sand shows an increase of 22% cohesion and decrease of 5.14% in angle of internal friction which proves to be optimum value. Further increase in coal leads to decrease in cohesion value.
- Addition of 1.5% coal to sand increases the shear strength of soil.

7. References

[1] Aparna roy "soil stabilization using Rice Husk Ash And Cement" International journal of research in engineering and technology ,IJCER,volume 5, number 1(2014), pp.49-54

[2] C Rajakumar, Meenambal "Effect of Coal Ash in the Stabilization of Expansive Soil for the Pavement", International Journal of ChemTech Research, Vol.8, No.1, pp 170-177, 2015

[3] Scott M Mackiewicz, E.Glen Ferguson, "Stabilization of soil with self cementing coal ashes ", WOCA, April 2015.

[4] IS 2720-3-1(1980), IS 2720-4(1985), IS 2720-Part 7(1980), IS 2720-13(1986)