# MODIFICATION OF SUBGRADE SOIL BLENDED WITH FLY ASH

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***Abstract-***The soil subgrade plays a pivotal role in the load carrying capacity in both flexible as well as rigid pavement. Due to the effect of water-logging the subgrade gets deteriorated. Moreover, Tripura being a high rainfall area, is prone to water-logging and thus resulting in weakening of subgrade soil. Hence Engineers are always looking for a suitable soil stabilizing agent which will add up to the strength of local soil at minimal cost. In India about 73% of the electrical energy is generated by thermal power plants and 90% of the thermal power plants are coal based. About 100 million metric tons of coal ash is produced by the coal based thermal power plants annually. The fly ash is the residue from the combustion of pulverized coal collected by the mechanical or electrostatic separators from the flue gases of thermal power plants. Fly ash consists of organic and inorganic matters present in coal that are fused during coal combustion. This study deals with the optimum utilization of fly ash with soil starting from 0% to 20% at suitable intervals.

***Keywords-*** Fly ash (FA), Standard Proctor test, Permeability, Silty soil.

## 1. Introduction

We know that all civil engineering structures to be constructed on soil. Most of them are to be constructed on poor soil deposit. As we know poor deposit means soil exhibits low bearing capacity, high permeability, high compressibility and large settlement. To overcome these hazardous conditions general conventional techniques are replacing the poor soil by a suitable material, provide deep foundation to bypass weak strata. But the above solutions require more time and also the construction cost should be high. So to overcome all the above problems improving the soil may be the excellent solution.

## 2. Literature Review

Punthutaecha et al. (2006) while investigating volume change behaviors of expansive soils stabilized with recycled ash and fibre reported that bottom ash treated soils showed improvements in reducing shrinkage and plasticity characteristics [1].Bera et al. (2007) observed the effect of specific gravity on dry density of pond ash while studying the compaction characteristics of pond ash and reported that with increase in specific gravity, maximum dry density increases [2].Subbarao and Ghosh (1997) reported the chemical composition of pond ash from Kolaghat thermal power station, West Bengal, India that in percentage were $SiO_2$: 52.80, $Al_2O3$: 29.80, $Fe_2O_3$: 9.00, CaO: 1.00, and MgO: 0.10 [3].

## 3. Objective of the study

The main objective of the present study is by using low cost admixture to improve locally available soil. Thus local soil is improved by Kolaghat Thermal Power Plant (W.B.) fly ash at different percentage.The scope of the present study is summarized below:-

- Study the effect of fly ash on specific gravity of silty soil.
- Study the effect of fly ash on MDD and OMC of soil.
- Effect of fly ash on permeability of soil should be studied.

## 4. Methodology

Difficulties associated with fly ash are as follows:

• Day to day decrease of land for disposal of fly ash;

• Disposal of fly ash into the sea may affect the aquatic ecosystem;
• Tendency to fly in air when it is in dry state;
• Toxic metals of fly ash may contaminate the surface water or ground water while leaching;
• Radio-active particles of fly ash may create dangerous health problem of mankind andother animals.

This brings us to the fact that in order to reuse or utilize this fly ash we have to understand and study it better. This will help us to utilize FA in an environment friendly way. The chemical analysis was conducted in the lab for FA. Chemical composition was determined in accordance withASTM standards (ASTM C618-93) and for determination of pH value the ASTM standards (ASTM D2976-71(2004)) were followed. The percentages of the constituents of the fly ash samples of this study are within the following ranges: $SiO_2$ = 60.50−66.10, $Fe_2O_3$ = 7.40−8.80, $Al_2O_3$ = 11.70−18.20, CaO = 3.80−6.60, MgO = 3.10−5.30, LOI = 3.20−3.80 and Others= 0.40−1.30. The predominant chemical constituent in the fly ash is silica (SiO2). According to the ASTM C618-93 all the fly ash samples of this present study are of class F type. The pH values are above 7.00 (i.e., alkaline in nature) for seven fly ash samples and the pH value for the remaining samples, BBP and BAB, are 6.90 and 6.96 respectively.

## 5. Results and Discussions

Results of the present study is based on the specific gravity, proctor density and permeability test. Themost important test though is the proctor density test which determines the optimum percentage of fly ash to be added to the natural soil. The test results are given in the following figures.

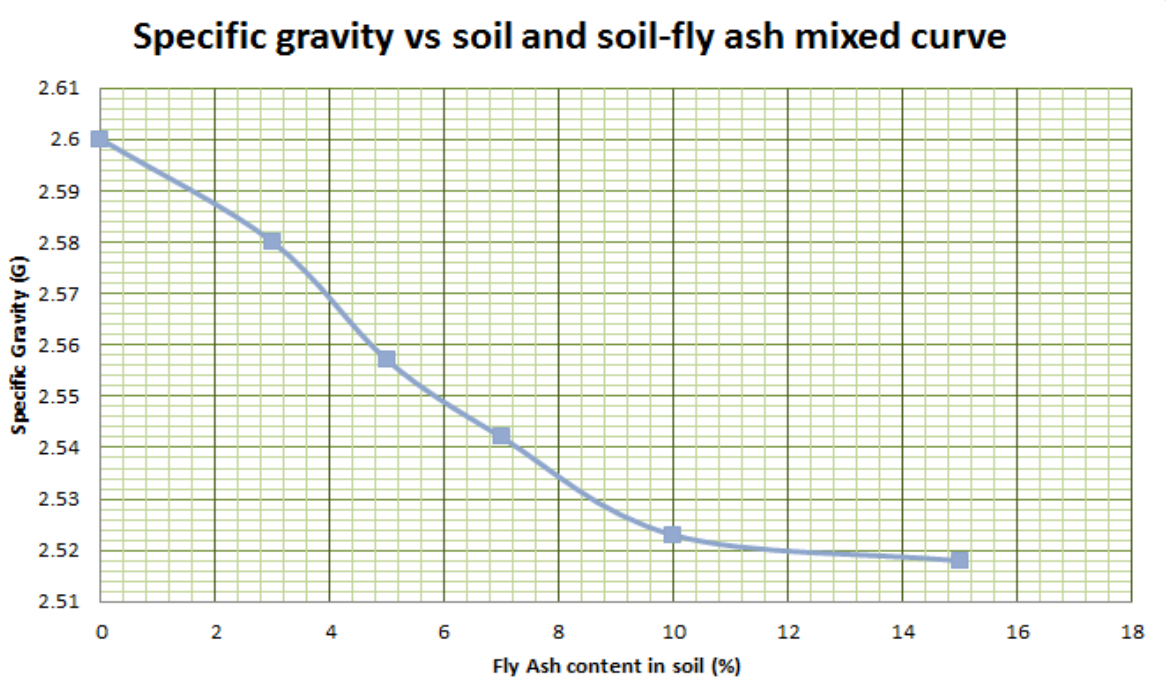


Figure 1: Specific Gravity test of soil-fly ash mixture

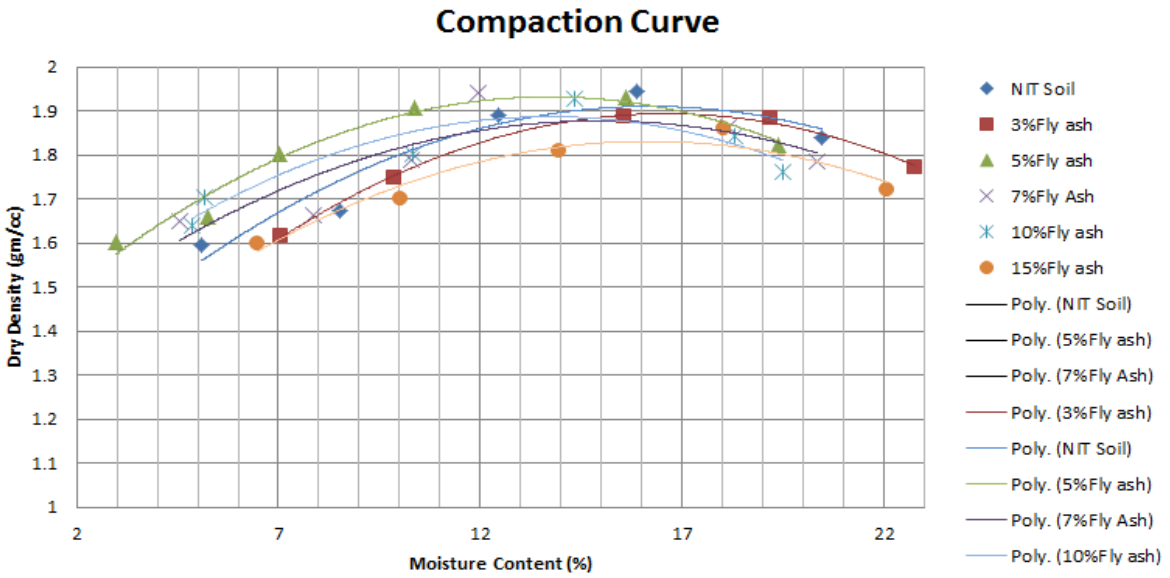


Figure 2: Moisture Density relationship of soil-fly ash mix

The above figure shows that at 5% fly ash content the dry density achieved is maximum. The further study is mainly based on this proportion of soil and fly ash (5%). As this fly ash content is giving us the maximum possible density, the permeability tests are based on this result only. The permeability test results are given in the following table:

Table: Permeability test results

| Material Composition | Permeability test results (cm/sec.) |
|---|---|
| Untreated Soil | $2.79 \times 10^{-5}$ |
| Treated Soil(5%FA) | $5.96 \times 10^{-6}$ |

## 6.REFERENCES

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