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Permeability characteristics of alccofine stabilized soil

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Abstract - *Soil is a heterogeneous material. Strength and stability of any structure mainly depends on its foundation which in turn depends on the soil in which it rests. Alccofine is a micro fine cementitious material that is mixed in soil at different proportions to find its optimum dosage. The main focus is to observe the permeability characteristics of soil with addition of alccofine. Soil underlying dams, reservoirs and other hydraulic structures if permeable will reduce its capacity. Hence, soil in such areas need to be mostly impermeable. The soil specimen were mixed in different proportions of alccofine . Direct shear test, permeability test and scanning electron microscope test were carried out.*

Key Words: **soil, alccofine, permeabilty, strength, SEM**

1.INTRODUCTION *(Size 11 , cambria font)*

The responsibility of propping an entire structure lies with its foundation. Most foundations rest on soil whose properties at large determine the extent of forces it is capable to bear. Soil is an unpredictable material whose properties change not only from place to place but also with depth. Due to constraints in land available for construction, the viable option is to improve the properties of soil at site. Here, we aim to achieve this by the use of alccofine. Alccofine is mixed with soil in 3,6,9,12,15,18,21,24 and 27% and a set of laboratory tests were carried out to find the optimum dosage.

2 Materials

2.1 Soil

Soil was collected from a site in Kothamangalam, Kerala. From the grain size analysis, it was inferred that the soil was well graded sand.

2.2 Alccofine

Alccofine is a micro fine cementitious particle manufactured by Ambuja Cement. Alccofine 1101 was mixed in different proportions with soil to obtain the optimum dosage.

3 Tests

3.1 Standard Proctor test

Light compaction test was conducted on the sample. The sample was compacted in 3 layers with each layer being tamped 25 times with a hammer weighing 2.6 kg.

3.2 Permeability test

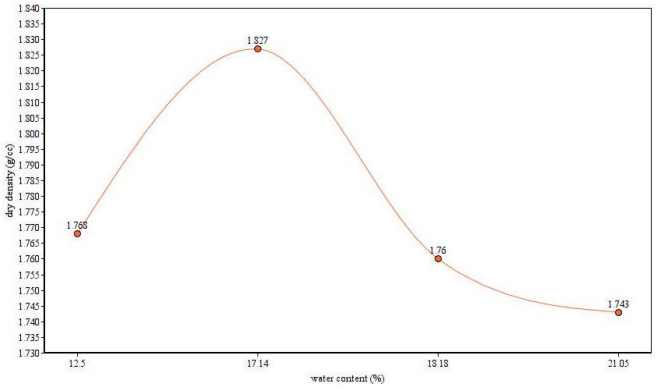
Constant head permeability was carried out when soil was mixed with 3, 6 9 12, 15, 18, 21, 24 and 27% of alccofine.

3.3 Scanning Electron Microscope

UCC sample of 15% alccofine mixed with soil was tested in Field emission scanning electron microscope just after preparation of sample and curing after 28 days.

4 Results

4.1 Standard Proctor test



OMC = 17.14%

Maximum dry density = 1.827 g/cc

4.2 Permeability test

PERCENTAGE OF ALCCOFINE ADDED	k (cm/s)
0	3.27×10^{-3}
3	5.6×10^{-4}
6	4.5×10^{-4}
9	2.7×10^{-4}
12	6×10^{-5}
15	4×10^{-5}

18	3.9×10^{-5}
21	3.87×10^{-5}
24	3.76×10^{-5}
27	3.72×10^{-5}

4.3 Scanning Electron Microscope

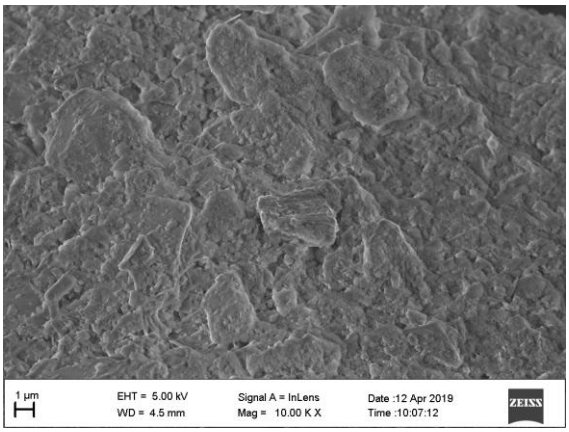


Fig -1: Sample image obtained from SEM (without curing)

From fig 1 significant aggregation can be seen. Also deposits looking like unreacted additives are visible.

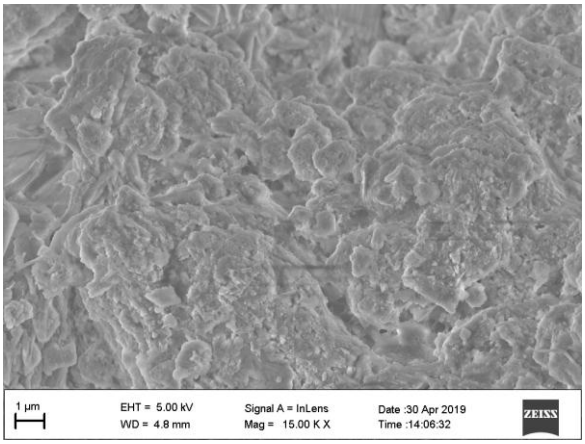


Fig -2: Sample image obtained from SEM (after 28 days curing)

From fig 2, considerable binding can be observed between alccofine and soil particles after a curing period of 28 days.

5 Conclusions

- Permeablity of soil decreases with the addition of alccofine upto 15% and remains constant thereafter.
- Permeability decreased by 98.77%.
- Decrease in permeability may be due to binding between the soil particles and alccofine.
- Hence, the optimum amount of alccofine to be mixed with well graded sand is 15%.

6. References

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