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STABILIZATION OF SOFT SOIL USING INDUSTRIAL WASTE (GROUND GRANULATED BLAST FURNACE SLAG)

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ABSTRACT

Due to rapid increase in urbanization, the lands are required essentially. The role of land in developments is very important. For the development of any country or nations sufficient, land should be available, but the land resources are limited. Some of them are suitable for structures or buildings, but there are some land resources which are not suitable for structures for example soft soil. Soft soils have low bearing capacity. Due to this reason, it is not suitable for structures. The bearing capacity of soft soil can be maximize are increased with the help of some industrial wastes and by using some methods. In this review paper, there is a list of industrial wastes (i.e. GGBS) and methods or tests (CBR, compaction sp. Gravity etc.) for improving of bearing capacity of soft soil.

Keywords : Soft soil, industrial wastes (i.e. GGBS), bearing capacity, CBR test, compaction test, sp. gravity test.

I.INTRODUCTION

Due to increase population, loose soil is very necessary for stabilization of soft soil at which hat buildings and roads are stabilized in this soil. In this soil, Geotechnical properties of soft soil are not sufficient likes low bearing capacity, low shear strength, more moisture content, Due to variation moisture content, the volume of soil is also variated at which swelling and shrinkage action are generated. Any structure is fell on this soil. For this remedy, we can use the industrial waste (i.e.GGBS) mixed with soil. Cement is not preferable at this time because the cost of this is more as compared to GGBS. In the production of cement, the carbon dioxide (co2) is more emitted in the environment. There are some wastes, which are used for the improvement of bearing capacity of soil such as GGBS, flyash, RHA, geotextile, lime etc. We can use the industrial waste (i.e.GGBS) mixed with soil. Cement is not preferable at this time because the cost of this is more as compared to GGBS. In the production of cement, the carbon dioxide (co2) is more emitted in the environment.

II.LITERATURE REVIEW

According to Alanmusuru[1], The consistency, compaction characteristics, and strength of lateritic soil can be affected by using of GGBS in the soil. GGBS content can be varied from 0 to 15% by weight of dry soil. Liquid limits and plastic limits decreases and plasticity index increases, if GGBS content or amount of GGBS increases. Compaction, cohesion and CBR are also increased if GGBS increase up to 10% and after 10% the value of compaction, cohesion and CBR decreases. If GGBS content increases then the angle of internal friction decreases.

According to wong[2], Early strength can be achieved by finer GGBS, if working time is long then GGBS preferred and it is effective in controlling of erosion like as Portland cement.

According to wild et. al.[3], The expansion of highway and other foundation layers due to sulphate can be reduced by using GGBS.

According to Higgins at. Al. [4], GGBS reduces the swelling of the soil of soil which is due to sulphate. According to Neerja and Rao[5], IF we use lime up to 5%, RHA, and GGBS up to 15% and FAF up to 20%. Then the property of soil changed maximum.

Dayalan J (2016), According to Dayalan J studied the different amount of GGBS, flyash individually added to the soil. For example 5, 10, 15, 20 % by dry weight of soil and performed some test specific gravity, atterberg's limits, CBR test at the moisture content and it is found that soil is stabilized maximum at 15 % of fly ash and maximum stabilized take place at 15 % of GGBS. These results are calculated on the basis of CBR test.

Tarkeshwar pramanik et al (2016), The stabilization of sandy and clayey soil is performed by using marble dust and GGBS different proportions. For example 0%+0%, 5%+5%, 10%+10%, 15%+15%, 20%+20% and behaviour of soil observed and it is found that marble dust and GGBS (15%+15%) is the best proportion for the CBR value.

III.MATERIAL USED

(i) Location of study

Soft soil for the study has collected from Hooghly river bank hawda bridge, Kolkata India at 0.6-meter depth, and GGBS has collected from Krishna Udyog Kolkata India.

(ii) Testing method

There is some laboratory test which is performed on natural raw soil such as atterberg's limit, specific gravity, compaction, CBR, and UCS.

IV.METHOD OF SOIL STABILIZATION

There is some method for stabilization.

(i) Mechanical stabilization

(ii) Cement stabilization

(iii) Lime stabilization

(iv) Bitumen stabilization

(v) Chemical stabilization

(i) Mechanical stabilization

Compaction is the basic form of mechanical stabilization of soil. We can use some additional material for the mechanical stabilization. The physical prospect can be changed but chemical properties cannot be changed by mechanical property, The percentage of additional material will be from 10 to 15 % mechanical stabilization is economical for poorly graded soil.

(iii) Cement stabilization

OPC is very useful for the soil stabilization by using OPC bending between material particle take place due to this soil stabilized. Hydrated cement is the main reason for cement stabilization of soil. If cement content is increased then the soil stabilization also increase.

(iv) Lime stabilization

Lime is a material which can be used in the soil stabilization. Lime, stone is the source of lime. In the road construction, quicklime and hydrated lime are used in solid form.

(v) Bitumen stabilization

Bitumen or Tar has the property of viscosity at sufficient temperature. The deposition of bitumen takes place when the solvent evaporates from the emulsion of bitumen. The function of bitumen is liked as the glue which is helpful for the binding of the material. In some cases, bitumen acts as an impervious surface or layers.

(vi) Chemical stabilization

These are some chemicals which are used in the stabilization of soil such as calcium chloride, sodium chloride etc. These chemicals may be expensive due to more required money. It is not economical. We can minimize the cost of soil stabilization by using some admixture which is easily available and cost-effective. For example, GGBS is an admixture which is economical. There are some properties are as volume stabilities, strength, permeability, stress, stress-strain properties, and durability. Swelling and shrinkage can be controlled by replacement of calcium, magnesium, aluminium and iron GGBS.

V.SCOPE OF GROUND GRANULATED BLAST FURNACE SLAG

There is some scope for future work:

(i) GGBS can be the ideal choice for civil engineering application.

(ii) Cement production is highly energy intensive.

(iii) Future scope of GGBS is positive due to benefit in durability, strength obtains by partial replacement of GGBS with cement in soil stabilization.

VI.CONCLUSION

There are many admixtures which can be used for the soil stabilization. Some of them are expensive and some are economical. GGBS is an admixture which is used in the soil stabilization and it is economical and available. According to the study, there is some conclusion such as followings:

(i) GGBS is cheaper than cement, lime so it is cost saving.

(ii) GGBS is easily available from near steel plant.

(iii) Use of GGBS enhances the waste management techniques.

(iv) The stability is more by using GGBS as compared to using lime.

(v) By using GGBS, The voids of soil can be reduced and the compression strength can be increased by increasing the GGBS percentage.

(vi) By using GGBS, the specific is increased and the soil gets denser.

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