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DEVELOPMENT OF CONSTRUCTION BRICK BY USING COAL MINE WASTE

Prashant Mani Tripathi[1], Meghna[2]

[1]M.Tech, Department of Civil Engineering, Maharishi University of Information Technology, Lucknow, U.P.
[2]Assistant Professor, Department of Civil Engineering, Maharishi University of Information Technology, Lucknow, U.P.

Abstract - Waste from mines is a big problem for mining industry which has no other option rather than its utilization. One of the waste is over burden dump commonly known as ob dump. It is a kind of soil which is extracted while digging is done. Ob dump consist of heavy metal small particle of coal and absence of nutrients so this soil is of no use. The utilization of ob dump is for making construction brick and blocks which could be the replacement of traditional construction brick. For this proper traditional brick making processes was followed before that geotechnical testing's were done on ob dump which when find suitable then brick casting was done and further on testing for the bricks were done as per Indian standard and lastly compressive analysis test was also conducted so as to ensure that the casted bricks were able to bear the compressive force when used in construction.

Key Words: Over burden Dump, Brick, Compressive test, specific gravity, hardness test.

1. INTRODUCTION

Mining causes the destruction of natural ecosystems through removal of soil and vegetation and burial beneath waste disposal sites. The restoration of mined land in practice can largely be considered as ecosystem reconstruction and restore the capability of the land to capture and retain fundamental resources. In ecological restoration planning, it is imperative that goals, objectives, and success criteria are clearly established to allow the restoration to be undertaken in a systematic way, while realizing that these may require some modification later in light of the direction of the restoration succession. Even though ecological theory lacks general laws with universal applicability at the ecosystem level of organization, ecological knowledge does have high heuristic power and applicability to site-specific ecological restoration goals. However, monitoring and management are essential, as the uncertainties in restoration planning can never be overcome.

The concept of adaptive management and the notion that a restored site be regarded as a long-term experiment is a sensible perspective. Ecological restoration includes the management of all types of physical, chemical and biological disturbances of soils such as soil pH, fertility, microbial community and various soil nutrient cycles that makes the degraded land into productive one. The productive ecosystem becomes a source of livelihood to the dependent population through providing tangible (fuel, fodder, timber, medicine) and intangible (purifying air and water, detoxifying and decomposition of wastes, regulation of climate, regeneration of soil fertility and pollination of crops) benefits. Traditional management of ecological systems focuses on products or services desired by people, with emphasis on marketable commodities.

Resource managers learn just enough about ecosystems to maximize the production of these commodities. As a result, ecosystems are overused and poorly understood. A different perspective and approach to ecosystem management is required. Resource managers have begun to appreciate the relationship between an ecosystem's condition and its sustainability for human use. Some studies suggest that regional ecosystem degradation can lead to a decline in production of natural resource commodities. Evidence of widespread ecosystem decline is seen in the growing number of threatened plant and animal species worldwide. Decline is defined as reduced species, and collapse in ecosystem structure, functions and processes. Ideally, ecological restoration should work on mosaics of ecosystems and ecotones over large landscapes, while at the same time paying close attention to localized species populations, isolated habitats, and the small levels of ecological organization.

2. SAMPLING

The sampling for over burden dump is done at Bastacolla Area, Jharia coalfield, Dhanbad, Jharkhand. About 35 kg of over burden dump is collected from the sampling area for the present study.

3. METHODOLOGY

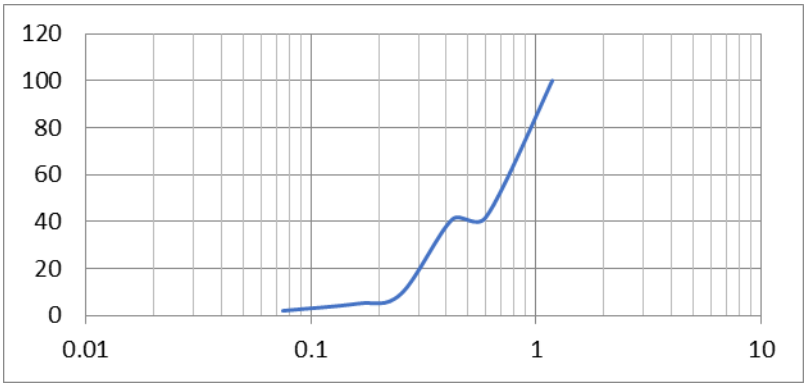
The methodology adopted in the present work was divided into four parts namely screening and sieving of ob dump, geotechnical testing on ob dump, brick casting as well as curing and testing on ob dump brick.

The sampling of over burden dump is done at Bastacolla Area, Jharia coalfield, Dhanbad, Jharkhand. About 35 kg of over burden dump is collected from the sampling area for the present study. Screening and sieving of the collected ob dump sample was done in the laboratory. Geotechnical testing such as specific gravity, bulk density, moisture content, compaction, permeability, grain size analysis, plastic limit and shrinkage limit was done at geotech laboratory. Then mixing of water in a ratio of 10% by weight and casting of brick was done then it was left over night for air dry then burning of brick is done in muffle furnace at 1100^0 C. Final brick suitability test was performed. The test that was performed was Compression Strength Test, Water Absorption Test, Efflorescence Test, Impact Test, Soundness Test, Hardness Test and Structure Test. On the basis of these test result conclusion were obtain.

4. RESULT

1) Results of geotechnical parameter

- Specific gravity of the over burden dump sample is found to be 1.197
- Bulk Density of the over burden dump sample is found to be 1.22 g/cm^3
- Optimum Moisture Content of the over burden dump sample is found to be 1.1045 %.
- Compaction results are found to be very high at 19.55%.
- Permeability of the over burden dump sample is found to be 2.5 x 10^{-4} cm^2.
- Sieve analysis graph curve is not a total S curve which shows that the over burden dump sample is not a well grade sample with a Uniformity Coefficient (Cu) = 2.27 Coefficient of Gradation (Cc) = 1.016.



- Plastic limit values are found to be 17.19%
- Shrinkage Limit values are found to be 14%.

2) Testing on Ob Dump Brick

1. Compression Strength Test: - The compressive test were performed on five bricks and the average of it were taken into consideration. The Average Compressive Strength is 67.22 kg/cm^2

2. Water Absorption Test: - The two water absorption test was performed and the average value of both were taken into consideration. The Average Water Absorption of the brick samples are 22.48%

3. Efflorescence Test: - Nil. There is seen no deposit of any salt even after repeated wetting.

4. Impact Test: - Five bricks were chosen randomly and dropped from the height of 1 meter and not a single brick got break. So the brick are of good impact value and acceptable for construction work.

5. Soundness Test: - Two bricks are chosen and they are struck with one another. Then sound produced was a clear metallic sound was heard and brick does not break.

6. Hardness Test: - For this test finger nail is used and with the help of that we try to make scratches on the randomly chosen sample brick but no mark was made on the brick by the scratch action.

7. Structure Test: - Five bricks were chosen randomly and they were fracture and closely examine. There were no holes or cracks were found on all the samples.

5. CONCLUSIONS

- Compressive Strength Test of the bricks was tested in a lot of five brick and an average value of the compressive strength of the bricks was calculated which was 67.22 kg/cm^2 and the compressive strength value of the second class brick is 70 kg/cm^2 and the compressive strength value of the bricks commonly used in building construction is 35 kg/cm^2.
- The water absorption was tested on two bricks and then average of both the values were calculated and it is 22.48% which is little bit high it should not exceed 20%.
- Nil efflorescence was found on the brick while testing the brick which is a very good result.
- The result for impact test was very good as after dropping all five bricks from one meter distance no brick got break.
- While striking two bricks with each other for soundness test, a sharp metallic sound was heard which shows that that quality of the brick is very good.
- After trying to put some scratches with finger nail for hardness test, no mark was made on the brick which shows that the quality of the bricks is very good.
- No hole or crack is found while examining for structure test this also shows that the quality of brick is very good.
- The overall brick is very good compressive strength is good which is very close to class second brick and all other tests such as impact test, soundness test, hardness test & structure test the results are very good but for water absorption test the value is little bit high (which can be subject of further study) but it can ignore for some area overall the bricks made from over burden dump can be used for construction.

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