

SOIL STABILIZATION USING WASTE TYRE STRIP AND GLASS POWDER

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Abstract: Soil stabilization is the method of improving the one-of-a-kind type of engineering residences of the soil. It is able to be achieved with the aid of using controlled compaction, proportioning and the addition of suitable different styles of admixtures and stabilizers. Stabilization of soil may be done using many different materials, specially through products so that it becomes not pricey. We have stabilized our soil pattern by using waste tyre and glass powder so that it will increase cbr value and lots of different houses of soil. Stabilization is very essential for various construction works like road pavement and basis. This venture represents study of waste tyre strips and glass powder as admixtures or stabilizers in enhancing some engineering properties of soil. The venture evaluates the consequences of waste tyre strip and glass powder on a few fundamental engineering homes of soil i. E., compaction of soil and California bearing ratio of soil. The percentage of waste tyre used varies from 0.5% to 2% besides percentage of glass powder varies from 2% to 6%. The properties like California Bearing Ratio (CBR), Optimum Moisture Content (OMC) values etc. have been studied in this project. The maximum dry density (MDD) decreases while California Bearing ratio (CBR) increase with increase in glass powder percentage and in case of tyre shreds with varying percentage of glass powder Maximum dry density (MDD) of soil decreased. The objective of this work is to estimate the effect of shreds tyre and glass powder on some geotechnical properties of soil, in order to determine the suitability of tyre shreds and glass powder for use as a modifier or stabilizer in the treatment of soil for further work.

Keywords: Waste Tyre Strips, Glass Powder, Soil Stabilization, CBR, OMC & MDD.

INTRODUCTION:

Soil is used as a creation material for roads, dams, canals, pavements, as a fill in the back of maintaining partitions etc. It might be perfect to discover a soil at a selected web page to be great for the intended use as it exists in nature but regrettably, the sort of thing is of rare prevalence. So, it is very vital for the engineer to recognize approximately the volume to which soil residences may be improved or to think of other alternatives for the construction of supposed structure on the available website.

[1] **Ghatge Sandeep Hambirao and Dr.P.G.Rakaraddi (2014)** Inside the present investigation strive is made to stabilize black cotton soil and sandy soil. Black cotton is collected from Vidyagiri location of Bagalkot town and sandy soil is accrued from Haliyal road of Dharwad town place with randomly dispensed shredded rubber tyre chips with 5%, 10%, 15% and cement with 2% and 4% percent.

[2] **Rao and Dutta (2001)** This paper is all about addition of rubber if you want to improve the soil properties in which assessments had been carried out on sand blended with rubber chips. Motive of this examine turned into to behavior compressibility checks and tri-axial tests. The strain pressure members of the family and electricity parameters had been studied. It became observed that the cost of internal friction and effective concord of sand extended with boom in percentage of rubber up to 15%.\

[3] **Baykal et al and Foose (1992-1996)** If tire chips are used in sand as a reinforcement then only up to a certain amount it shows the improvement in the hydraulic conductivity and other

soil properties. Combined clay with used tire obtained from retarding enterprise and hydraulic conductivity checks have been carried out the use of water gas as permeates. The strength of soil tire powder decreases as soon as the rubber content material exceeds 30% in the aggregate.

[4] **S. H. Ghatgeet *al.and* K.V. (1990)**the shredded rubber tyre chips were used as a soil stabilizing agent. Stabilization of black cotton and sandy soil the usage of waste shredded rubber tyre chips were the primary purpose of the take a look at in an effort to enhance soil houses like liquid restrict, shear strength, compaction, and california bearing ratio etc. The unconfined compression (ucs) and cbr tests have been executed with various percentages of rubber tyre from 5– 15% with curing period of 4, 7 and 14 days.

[5] **Praveen Kumar (1997)**By adding rubber crumb powder in the soil and mixing it thoroughly and adding 2% to 4% of cement for binding purpose. Rubber crumb powder has more shear strength and load bearing capacity compared to the normal soil, so it can with stand against shear failure. This process can be implemented in road construction whereas in the sub-grade in the road pavement.

[6] **Mohammed Abdullateef Al-Neami (2018)** Performed stabilization of sandy soil using recycle wastetire chips. Increasing tire chips content material inside the sand ends in boom the percentage

development in cbr values of stabilized sand from 2.3% to 21. 5% whilst the tire chips content boom from 2% to 8% respectively.

EXPERIMENTAL INVESTIGATIONS:

The Glass powder, Tyre Strip & Soil are blended completely on dry weight foundation in the correct required proportions. There's one of a kind check sieve evaluation, compaction, california bearing ratio take a look at had been completed in laboratory as per IS code standards.

The following tests are conducted:

- Sieve analysis
- Standard Proctor test
- California Bearing Ratio

MATERIALS:

1. Natural Soil

Soil sample was collected from the borrow pit which is inside the lovely Professional university, time when we have taken sample construction of swimming pool was taking place at that location and coordinate of that place is also mentioned in the image given below. The sample collected was air dried and pulverised manually. It was oven dried for 24 hours before conducting the tests on the soil. The specific gravity of soil sample was measured by pycnometer and average value of three sample found to be 2.35.

2. Industrial Waste Glass Powder

Million lots of waste glass is being generated annually everywhere in the world. As soon as glass will become a waste material it is disposed as landfill, that is unsustainable because it does not decompose in the surroundings. Glass powder is a waste material obtained from waste glassindustries and commercial building etc. Waste glass is powdered and sieved through 1.18mm sieve. Glass powder is thoroughly mixed in soil in a particular amount and thenlaboratory tests are performed. The parameters likeliquid limit, maximum dry density,California bearing ratio test are investigated and compared with the normal soil sample result.

3. Waste Tyre Strip

Disposal of tires wastes are critical because it motive diverse risky to the surroundings. Globally, it's miles estimated that thirteen. Five million tonnes of tyres are scrapped each yr; 40% of which come from rising markets inclusive of china, india, south america ,south europe ect. India's waste tyres account for about 6-7% of the worldwide total. With the nearby tyre industry growing at 12% consistent with annum, waste volumes are growing. India has been recycling and reusing waste tyres for four a long time, even though it is envisioned that 60% are disposed of thru unlawful dumping.

The soil often is found weak and has no enough stability in heavy loading in highways pavement, underground structure and foundation etc. In this test Shredded rubber tyre became cut into exceptional sizes stages from 8mm to 10mm (Width) and 25mm to 30mm (Length). These tyre chips were added varied in proportions of 0.5%, 1%, 1.5% and 2% with a particular amount of waste glass powder randomly. The parameters like MDD, CBR tests were being performed and compared with the normal soil.

SAMPLE PREPARATION AND TESTING:

Glass powder is mixed in varying percentage of 2%, 4% and 6% with natural soil. The soil sample thus obtained is kept in oven for 24 hours.

Similarly, Tyre strip is mixed in varying percentage of 0.5%, 1% and 1.5% and 2% with afixed content of glass powder that gave maximum required results on soil. The soil sample thus obtained is kept in oven for 24 hours.

RESULT AND DISCUSSION:

SIEVE ANALYSIS:

Based on the test results from the sieve analysis, the value of C_u obtained from the analysis is 5.31. whereas value of C_c is 0.76. It has also been noted that more than 50% of the soil is retained on 75 micro meter which means that the soil is coarse-grained soil. It has been noticed that the soil has properties of SP.

OPTIMUM MOISTURE CONTENT(OMC):

The following figure shows the comparisons of dry density and optimum moisture content for different proportion of Glass powder and Tyre Strip. Dry density changed into decreased with increasing of glass powder percentage and most useful moisture content turned into reduced with increasing of glass powder. While for Tyre Strip both dry density and optimum moisture content were decreased on adding Tyre Strip.



Fig. 1 Performing OMC test

A. Soil + Glass Powder

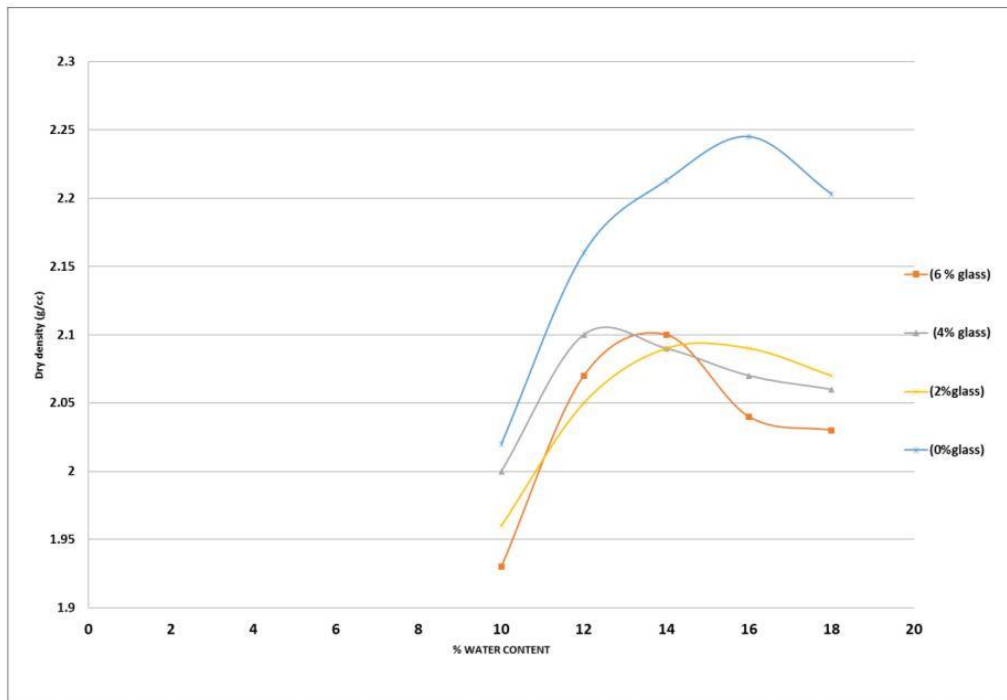


Fig. 2 Graph comparing OMC of normal soil with soil with Glass powder as additive

B. Soil + Glass Powder +Tyre Strip

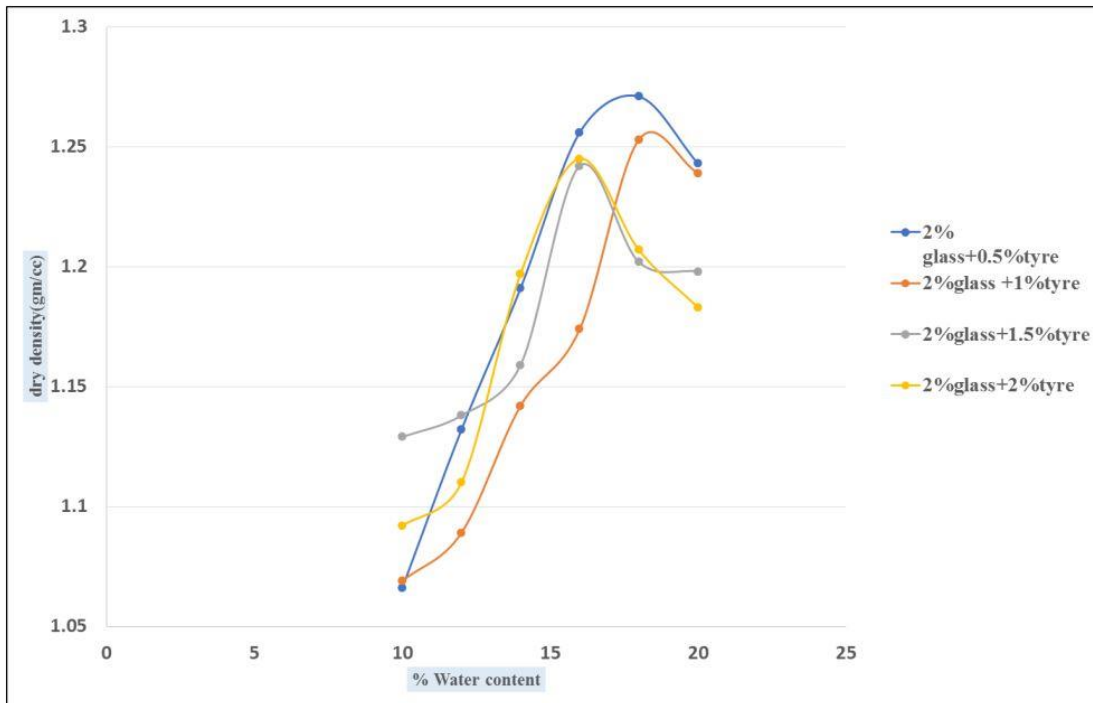


Fig. 3 Graph comparing OMC of normal soil with soil with Tyre Strip as additive

CALIFORNIA BEARING RATIO (C.B.R):

The following figures show the comparison of CBR values at optimum moisture content for soil with Glass powder and Tyre Strip. There was increase in California bearing ration with addition of Glass powder and Tyre Strip. It was maximum at 2% Glass powder and 2% Tyre Strip.

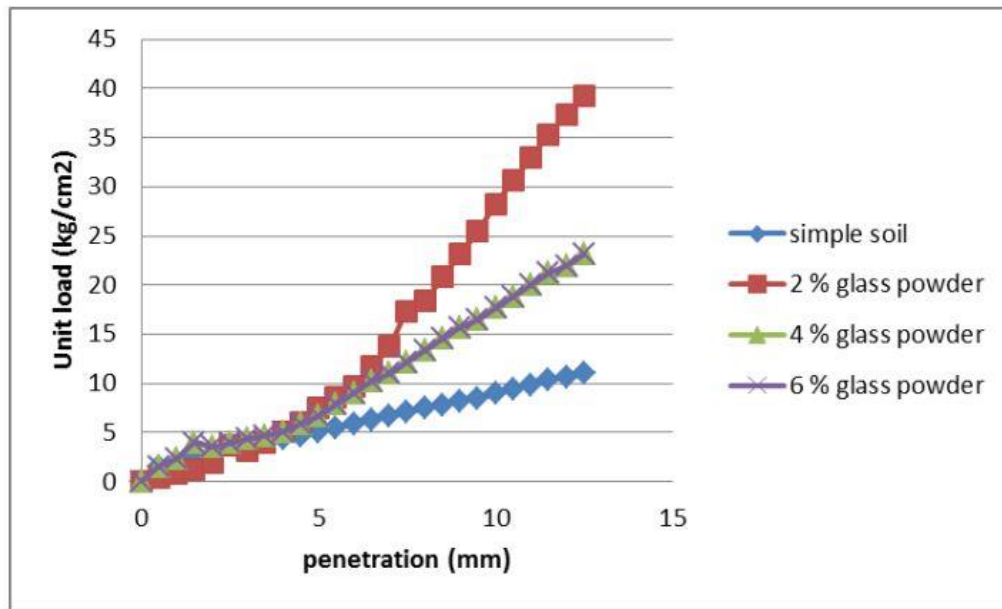


Fig. 4 Graph of CBR sample with varying percentage of glass powder

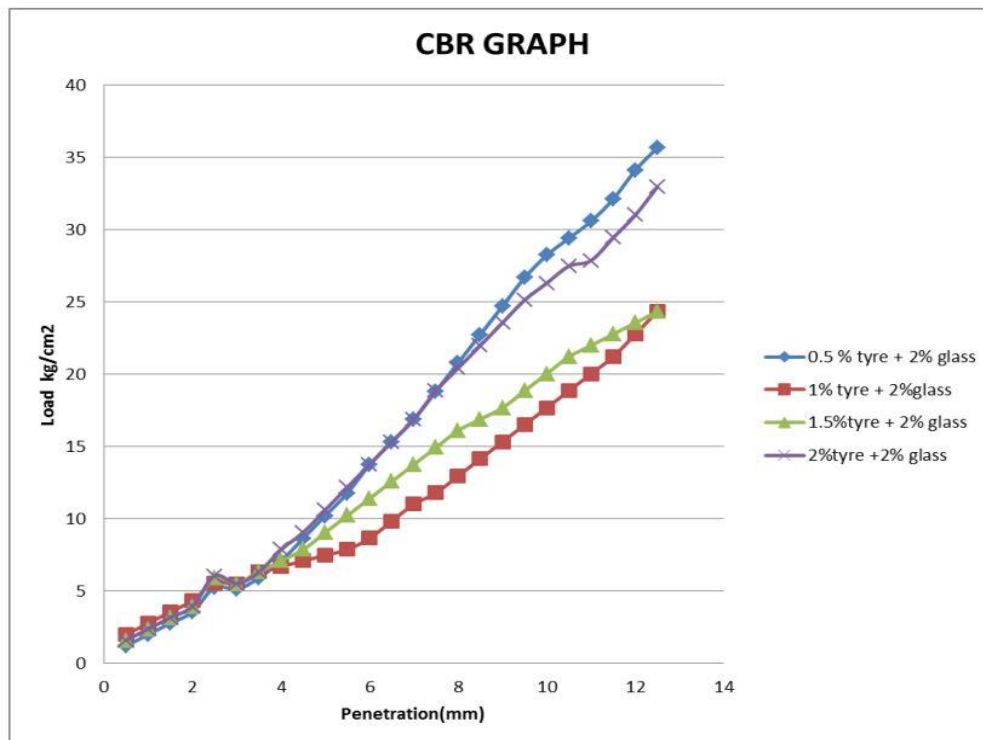


Fig. 5 Graph of CBR sample with varying percentage of tyre strips and glass powder

CONCLUSION:

1. At water content of 18%, max. dry density of 1.253 gm/cc is obtained when the percentage of glass powder is 2% and 1% is of tyre strips.
2. CBR (5 mm) of simple soil + 2% glass powder=7.11% and CBR (5 mm) of simple soil + 2% glass powder + 0.5% tyre strip =9.730%
3. On adding different percentage of glass powder and combination of glass powder with tyre strip, there is increment of CBR value 25 % to 100% compared to the virgin soil.
4. On mixing of 2% glass powder + 2 % tyre strip there is an increment of CBR value of 87%.

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