EFFECT OF GLASS DUST ON PROPERTIES OF SOIL

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Abstract

The subfloors most affected by a number of problems when it comes to the loss of flooring with low shear strength and load capacity. Drawdown with persistent soil and cut occurs when the cut of the ground voltage exceeds the limit. The improvement of base materials or soil stabilization is an integral part of construction activities. Weak soils are usually stabilized with cement or lime in addition to mechanical stress. Since the cement and lime with respect to the road, then the soil stabilization and improvement of its properties using other "cheap" materials such as stekloporoshok from the electric arc furnace. In this study we wanted to examine the effect of using glass blocks to improve the geotechnical properties of the soil by means of some laboratory tests. Taking soil samples from the sooty depths, Jalandhar which is a low strength soil with low load bearing capacity. In addition, this area needs to be improved. We examined the physical-chemical properties of the virgin soils and made treatment additives of glass soil powder to stabilize the local soil. The addition of glass powder has been finished in different proportions are 4%, 8% and 12%, etc. There have been several tests such as classification, specific gravity, standard seal limits Proctor, Atterberg, straight cut, CBR, and so on. The results were obtained by analysing the stabilization of sprayed glass. It has been found that glass powder can be used effectively as a soil stabilizer, as it has been seen that mainly strength characteristics were evaluated. The results showed that the soil gradation is reduced in the particle size analysis. Plasticity index (p. I), yield strength (n. L) and tensile ductility (P. L) were reduced with the addition of glass powder. The reason for the reduction in IP may be the fact that the glass powder does not have a clutch. The ideal percentage of glass powder as a stabilizer is 8%. These improvements include achieving the highest level of CBR, done using 4%, 8% and 12% glass powder. The reason for this is that glass is a pozzolanic material that when mixed with soil gives additional strength. Achieved an increase in the rate of change of 4% of the values of the angle of internal friction and 8% and the rate of decrease of change of the values obtained by 12% in substances stekloporoshkovyh. traction coefficient is reduced to 8%, and begins to increase to 12%. The density increases dry maximum, because the density of the glass is higher than that of the soil and the optimum moisture content (OMC) is reduced due to the low absorption capacity of the glass. Research has shown that the best stabilisation for the particular case (Deep Nagar, Jalandhar) is a glass powder, and the optimum dosage is 8%

Introduction: -

Soil Stabilization - this change in the soil in order to improve its physical properties. It can increase the cutting resistance of the soil, control its property swelling and improve its load capacity. Soil stabilization can be used in roads, parking lots, development projects, facilities, airports and many other situations where the soil surface is not suitable for construction. It can also be used to treat a wide range of materials from down to expandable clays to granular soils, as well as to improve other physical properties of soils, such as increasing their resistance to erosion, dust or frost formation. They tend to have low shear strength, which is further reduced when wet or other physical conditions are present . Clay soils often have low strength characteristics and create serious problems in their construction, causing a large drop to structures built on them. They can be plastic and flexible; they can grow when wet and shrink when dry. Some species expand and contract after wetting and drying significantly, showing very desirable characteristics. Stabilization can be achieved using simple materials or chemicals. Ash, rice hull ash (RHA), sawdust, wood dust, powder, slag, glass, dust, fibers, etc. G. Coming their resistance to cutting, which makes them prone to slippage. They develop high side pressure and generally have a low modulus of elasticity. For these reasons, clay, as a rule, is a bad material for foundation. In some cases, it may be necessary to improve their soil stabilization properties. Engineers have known for a long time about the stabilizing effects of different materials on the ground. The first and undoubtedly the largest and most efficient stabilization was developed by French engineer Henri Vidal in the late 1950's. godov's system was known as "reinforced earth", which involves placing reinforcing steel strips at predetermined intervals in the fill to provide tensile or cohesive strength [1]. possible technical specifications for the use of culverts in road construction based on their testing at the Texas Department of Transportation (TxDOT). The study investigated the characteristics of limestone and waste glass mixtures of 5% to 95%; 10% - 90%; 20% - 80%; 50% + 50%, respectively, and different sizes. The study examined the long-term performance of broken glass in the construction industry, and developed a technique to improve its performance. 2] Glass as a product of human ingenuity, perhaps as old as bronze, older is the use of safety glass used for arrowheads and artifacts. However, glass vials and enamel are 4500 years old, which shows that people manipulate their resources to satisfy aesthetic desires. Glass is an inorganic polymer like [3]. The seal is usually removes the largest pores of the earth. Most of the original soil air is displaced from the root zone of the upper plant, and continuously feeds the minimal resistance and air movement, water movement and penetration of the destroyed roots. Under comparable conditions, soil with the particle size of the soil (e.g. fine-grained soils) is generally more compact than even sand with a particle size [4]. Objective method of chemical stabilisation to improve the technical properties of the soil by the addition of chemicals, or other similar materials and is generally practical. These additives are made to react with the soil, typically clay minerals, resulting in the formation of new precipitates, insoluble minerals, which bind the soil together [5]. Glass is absolutely inert and therefore not biodegradable. It degrades like natural stone. As inert building material, it can increase the strength of the various elements in road construction. Glass has been tested as a replacement aggregate in asphalt concrete. Crushed glass is also used as a soil aggregate

Emphasis was placed on waste management and the development of environmentally friendly products through the development of a secondary glass expansion (RFG) in Italy, which is a by-product of glass processing. Research has focused on the use of waste resulting from glass processing, as only a small number were available during the process of developing RFG, and the rest were to be sent for reprocessing or landfill. RFG was a good building material, and so its use is reduced to occupying the earth's load. The study also showed the need for further research on the use of BVRS in road construction and other possible areas [7]. The use of recycled glass on the floor of the UAYDOT Laramie Wyoming highway in the United States and highlighted the possible use of broken glass bottle pieces on the lower road. The study suggests the use of glass with replacement ratios of 10%, 20% and 30% when the size of 3/4" and 3/8" and its impact on discussed pavements [8]. Glass recycling is recommended for road use. The study was conducted in Australia on a few Lomah glass geotechnical properties. The study suggests that the use of glass for drainage in the protective wall reduces the risk of clogging of drainage equipment, and that increasing the permeability of the glass improves drainage time for the water storage wall [9]. It can improve the quality of soil curvilinear cutting control its properties and increase its load limit. Soil correction can be used in roads, areas, initiatives, landscaping, air terminals and many other circumstances stopping in underground works unsuitable for development. Similarly, it can be used to treat a wide range of seabed materials that are different from large scale clays to granular soils, as well as to improve other physical properties of the soil, such as frost. In the past there have been many studies to improve the technical properties of the soil through the use of additives. 10] Therefore, despite the apparent recovery of glass in direct purity, the reuse rate is one of the lowest compared to a normal level of 30.6% CSF recovery [11]. Hypothetically glass is 100% recyclable; it can be used several times without loss of quality. According to official EPA statistics, the US municipal solid waste (MSW) stream in the USA contains approximately 5.3% or 12.5 million tonnes of waste glass. Soil is an important construction material, which is widely used in all types of construction. All types of facilities are built on the basis that they ultimately rest on the ground. Remember that foundations do not carry the load, but simply transfer it to the ground. The entire load must only be absorbed by the ground. If the floor is not capable of carrying the load, it will not be used as both designed and reinforced foundations.

The objectives of the study are as follows.

1. To clarify the geotechnical parameters of the soil, including mixing.

2. Occasionally, review the quality characteristics of the soil that will be used for the glass.

3. To examine the impact of changes in the glass level on the soil.

Materials

2.1. Soil

The soil sample for this study was collected from Deep Nagar, Jalandhar, India.

Table 1. Geotechnical Properties of soil

Moisture Content (%)	Liquid limit (%)	Plastic Limit (%)	Plasticity Index	Specific Gravity	Maximum Dry Density	Optimum Moisture Content	CBR Unsoaked (%)
6.4%	35.50	32.18.	5.14	2.5	2.3.	9.1	45

2.2. Glass Powder

Silapid was taken from the fence plant for indirect glass processing Phase 3 in Ludhiana, where the glass is made. Glass waste is taken to the laboratory at the time of driving with a hammer. The ball mill is a machine that is used to grind materials. Waste glass turned into ash by a ball mill apparatus. The resulting glass powder was used as a total mixture by changing speed depending on the dry soil mass. From the glass powder cake it had a fineness particle shape passed through the filter 200. The specific gravity was observed to be 2.56. The tests were carried out on samples mixed with the glass powder at different speeds.

4. Research Methodology

In order to achieve the following tasks you should perform the above mentioned purposes.

a) Test set for deep soot, Jalandhar, which is a poor quality field, which should be improved.

b) Add the mixture in different ways after 4%, 8% and 12% and so on.

c) Conducting various tests, such as quality, specific gravity of, standard Proctor Atterberg stamp limits, direct cutting, and CBR.

d) Measuring the various properties of geotechnical integrates maximum dry density and strength of the soil in the example.

e) Comparison between typical results of soil analysis, and balanced soil analysis.

5. Results and Discussion

The studies were carried out in the examples in combination with various percentages of glass powder, i.e. 4%, 8% and 12% for the determination of modified building soil properties. Sample parameters were determined using ASTM guidelines.

5.1. Gradation test

Tone curve of the soil sample is substantially fine material .The tone curve for each soil sample Relationship characteristics between moisture content and dry density of the sealing soil is determined by the modified test monitor

Table 2. Variation of MDD and OMC with Glass Powder

Soil + Glass Powder	100 + 0	96 + 4	92 + 8	88 + 12
MDD (gm/cc)	3.3	3.358	3.401	3.42
OMC (%)	9	7.8	6.9	5.5

It was observed that the maximum dry soil density increased to 2.42 g/cm, with 2.3 g/cm at 12% expansion of the glass powder. While in the case shown in the Table OMC species. Maximum OMK obtain in glass powder 0%, glass powder and expansion reduces OMC, as shown in Table 2.

5.3. Atterberg limit test

Strength Percentage of yield, tensile ductility and plasticity index with respect to the mixture are shown in Table 3. It should be noted that as the level of additive (glass powder), where possible, the limit of plasticity and ductility index will continue to decrease. Table 3 LL PL PI and variations for ground and powdered glass mixtures

Table 03. Variation of P.L , L.L and P.I with glass and soil dust				
Soil + Glass Powder (%)	100 + 0	96 + 4	92 + 8	88 + 12
Liquid Limit (%)	34	33.12	29.15	27
Plastic Limit (%)	30.128	29.38	26.54	24.3
Plasticity Index (%)	4.15	3.52	3.16	2.89

5.4. Specific Gravity

The percentage change in specific gravity of the mixture is shown in table 4. It can be seen that as the percentage of mixture (glass dust) increases, the specific gravity increases.

Table 04. Specific gravity changes with various percentages of soil - glass dust				
Glass + soil powder (%)	100 + 0	96 + 4	92 + 8	88 + 12
Specific gravity	2.54	2.6	2.64	2.68

5.5. Straight cut tests

A variety of resistance cut parameters shown in the table. During expansion of the soil clutch mixture (glass powder) is reduced to 8% of the added material and increased by 12%, and the angle of internal friction is increased to 8% of the decreases added material by 12%.

Table 05. Changes in the angle of cohesion C and internal friction with various percentage of glass dust and soil				
Soil + Glass Powder (%)	100 + 0	96 + 4	92 + 8	88 + 12
Cohesion (N/cm2)	0.08	0.06	0.03	0.07
Angle Of Internal Friction	27.35	28.55	31.33	24.66

5.6. California Bearing Ratio

The CBR was expanded as the %age of glass dust increased , as shown in table 06. The development in the CBR value can be allocated to a remarkable upgrade in the angle of cut resistance.

Table 06. CBR variations with a different percentage of glass dust and soil

Glass+ soil Powder (%)	100 + 0	96 + 4	92 + 8	88 + 12
CBR (%)	45.17	50.12	56.04	59.23

6. Conclusion

This study showed that the improvement of the acquired properties of the subsoil is therefore more noticeable with the expansion of the glass powder. It seems that the rate of glass powder needed to obtain the best results in the formulation properties of the soil is about 8% of the soil mass. Furthermore, from these results it can be concluded that glass powder can be used advantageously as a soil stabilizer, as it can create impressive property change. There are technical, economic and environmental advantages to using glass waste to modify the properties of loose soil.

1. The specific weight of the soil increased with increasing glass content, while the Atterberg limits decreased.

2. Internal angle of friction increased to 8% sprayed glass, but more than 8% sprayed glass began to decline.

3. For 4% and 8% of the glass content the cohesion started to decrease with increasing glass content. When the glass content of 4% and 8% decrease in cohesion was 25% and 83.33% individually.

4. The Bank of Russia increased with increasing glass content. CDB growth was 11.56%, 8.97% and 5.98% to 4%, 8% and 12% of the individual glass content

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