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# A Review on Stabilization of Soil Using Low Cost Methods

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**Abstract** - *Soil can be characterized as a material comprising of rock particles, sand, sediment, and dirt. It is generally weak and does not have enough stability under heavy stacking. Unstable soil can make huge issues for asphalts or structures. Soil reinforcement is the procedure which includes upgrading the physical properties of the soil so as to improve its quality, sturdiness and so forth by mixing or blending it with added substances. These are utilized to upgrade the qualities of soil and have given a handy method for building structural designing structures monetarily. In this way the point of the study is to review on stabilization of soil utilizing minimal effort strategies. Among every one of the strategies some may have the disservices of being ineffectual and costly. In light of writing, Portland cement, lime, fly ash and scrap tyre are minimal effort, low cost and compelling to soil adjustment.*

***Key words:*** **Cement, Lime, Fly ash, Scarp Tyre, Soil Stabilization.**

## 1. Introduction

Practically all the structural designing structures are situated on different soil strata. Soil can be characterized as a material comprising of rock particles, sand, silt, and dirt. It is shaped by the slow breaking down or deterioration of rocks because of characteristic procedures that incorporates crumbling of rock because of stresses emerging from development or withdrawal with temperature changes. Enduring and deterioration from chemical changes that happen when water, oxygen and carbon dioxide continuously join with minerals inside the stone arrangement, in this way it is separating to sand, residue and dirt. Temperature, precipitation and waste assume significant jobs in the development of soils as in the distinctive climatic locales. Experiencing area having delicate soil for development prompts a consideration towards embracing ground improvement methods, for example, soil adjustment or soil stabilization.

Soil stabilization is utilized to decrease the porousness and compressibility of the soil mass in earth structures and to improve its shear strength. It is required to increase the bearing limit of establishment soils. Soil stabilization is additionally used to make a zone trafficable within a brief timeframe for military and other crisis purposes. Sometimes it is utilized for city and rural boulevards to make them more noise absorbing.

## 2. Methods of Soil Stabilization

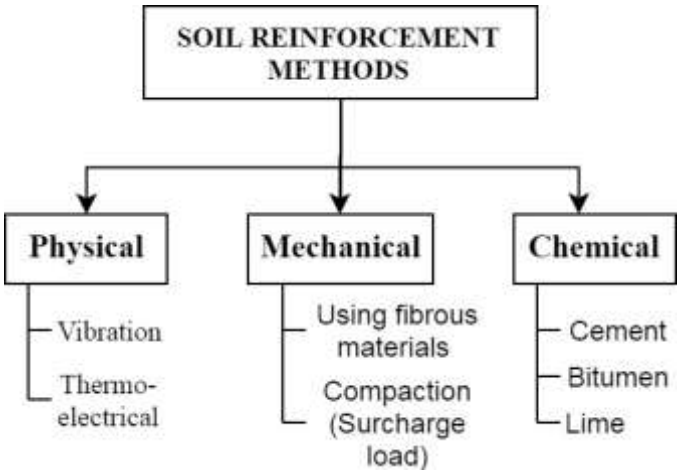


**Fig 1:** Different soil stabilization methods:

### 2.1 Cement Stabilization

Cement stabilization is soil particles bonding brought about by hydration of the bond particles which develop into crystals that can interlock with each other giving a high compressive strength. So as to accomplish a successful bond the cement particles need to coat the greater part of the material particles. To give great contact between soil particles and bond, and along these lines proficient soil cement adjustment, blending the bond and soil with certain molecule measure appropriation is fundamental. Soil-cement is a very compacted blend of soil, aggregate, cement and water. Soil-cement is now and then called cement balanced out base, or cement treated aggregate base. Soil-cement turns into a hard and sturdy material as the cement hydrates and develops strength. Cement stabilization is done when the compaction procedure is proceeding. As the cement fills the void between the dirt particles, the void proportion of soil is reduced. After this when water is added to the soil, concrete responds with water and goes hard. Along these lines, unit weight of soil is increased. Due to solidifying of concrete shear quality and bearing limit is likewise increased. Cement helps decrease the liquid limit as far as possible and increment the plasticity index and workability of clayey soils. Cement reaction isn't reliant on soil minerals, and the key job is its reaction with water that might be accessible in any soil. This can be the reason behind why cement is utilized to balance out a wide range of soils. The OMC of mixture (soil-cement) increase with increasing of cement content. The UCS of stabilized soil increases with increasing the quantity of cement in a

mixture. The UCS of stabilized soil increases with increasing the curing period.

### 2.2 Lime stabilization

Lime provides an economical method for soil stabilization. The technique for soil improvement where lime is added to the soil to improve its properties is known as lime stabilization. The types of lime used to the soil are hydrated high calcium lime, monohydrated dolomite lime, calcite quick lime, dolomite lime. The amount of lime is utilized in most soil stabilizer is in the range of 5% to 10%. Lime is utilized as an incredible soil balancing out materials for profoundly dynamic soils which experience through continuous expansion and shrinkage. Lime acts quickly and improves different property of soil, for example, carrying capacity of soil, resistance from shrinkage during moist conditions, decrease in plasticity index, increment in CBR value and consequent increment in the compression resistance with the increase in time.

### 2.3 Stabilization with fly ash

Fly ash stabilization is gaining more importance recent times since it has wide spread availability. This method is inexpensive and takes less time than any other methods. It has a long history of use as an engineering material and has been successfully employed in geotechnical applications. Fly ash is a byproduct of coal fired electric power generation facilities; it has little cementations properties compared to lime and cement.

### 2.4 Stabilization using scrap rubber tyre

It will help in not only saving huge spaces occupied by waste tyre and tubes, but the environmental health hazards will also be reduced. The use of natural soil will be reduced, there by rendering cost saving benefits. The various soil properties such as bearing capacity, shear with the introduction of waste tyre rubber in soil its capacity to absorb and dissipate energy will be enhanced drastically. Non-hazardous, Non-biodegradable and thus more durable. The maximum unconfined compressive strength increases with an increase in the size of the crumb rubber in the soils with kaolinite, but decreased in the soils with montmorillonite. The coefficient of permeability was found to increase as the crumb rubber content in the mixtures increased. In general, the strength is higher when the size of the tires used is smaller.

## 3. Literature review

(Ahsan rabbani 2017) It was found that higher the quantity of cement added to the soil dry density of soil decreased and optimum moisture content increased. With addition of cement to the soil, unconfined compressive strength increased.

(Ibtehaj Taha Jawad 2014) Lime-treated soil effectively increases the strength, durability and workability of the soil. Such treatment also improves soil compressibility. A fluctuation behavior was observed on the influence of lime on soil permeability.

(Habiba Afrin 2017) Most of the fly ashes belong to secondary binders; these binders cannot produce the desired effect on their own. However, in the presence of a small amount of activator, it can react chemically to form cementations compound that contributes to improved strength of soft soil.

(Binod Tiwari 2014) The maximum dry density and the optimum moisture content increased as the shredded rubber tire becomes smaller. In general, the strength is higher when the size of the tires used is smaller.

(J. S. Yadav 2017) It was noticed that crumb rubber helps in reducing the swelling pressure and compression index of the mixes. Incorporation of crumb rubber in uncemented and cement clayey soil potentially reduces the reinforcement cost and deteriorating impact of waste tire disposal on the environment.

## 4. Conclusion

Yearly, tones of waste rubber are produced and occupy a lot of space. It is important to discover an answer for take care of this issue. In light of writing, one of the arrangements is utilization of various size waste rubbers in soil reinforcement and stabilization. According to the literature review Portland cement, lime, fly ash and scrap tyre are economical and compelling to soil adjustment. Use of rubber will help in not only saving huge spaces occupied by waste tyre and tubes, but the environmental health hazards will also be reduced. The use of natural soil will be reduced, there by rendering cost saving benefits. With the introduction of waste tyre rubber in soil its capacity to absorb and dissipate energy will be enhanced drastically.

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