

## STABILIZATION OF CLAYEY SOIL USING SUGARCANE BAGASSE ASH AND RICE STRAW ASH

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**Abstract** - The sheltered removal of both perilous and non-risky waste gets dangerous for structural architects. This is on the grounds that solitary a couple of states can dump these squanders exude from ventures securely. This paper presents research on the sheltered manner of modern waste, for example, Rice Straw Ash (RSA) and sugarcane bagasse Ash. Thus, endeavors have been made utilizing RSA and sugarcane bagasse Ash in this exploration to patch up the nature of the dirt. The primary goal of the ground improvement is expanding the shear quality and diminishing the compressibility of the dirt. The examination was led utilizing the broad soil by taking changing amounts, which are then blended with the various extents of balanced out material for Atterberg limit tests and Unconfined compressive strength(UCS) test and soil held inside 7 days restoring period for California bearing ratio(CBR) test. These tests are tested and demonstrated by the standard tests IS 2720 lastly inferred that test outcomes enhance the geotechnical properties of the dirt. There has been an endeavor to use a lot of bagasse ash, the buildup from the sugar business and the bagasse biomass fuel in electric age industry. The use of mechanical and horticultural waste delivered by industrial measure has been the focal point of waste decrease research for conservative, ecological, and technical reasons. Sugarcane Bagasse Ash is a stringy waste result of the sugar refining industry, alongside ethanol fume. Bagasse Ash essentially contains aluminum particle and silica. The current examination is pointed toward using sugarcane bagasse Ash concrete, with halfway substitution of concrete. The substitution is done at different rates like 0%, 4%, 8%, 12%, 16%, 20%, and 24% and its impact on properties of cement was examined. New and hardened properties were practiced with different substitution levels. The examination showed that sugarcane bagasse Ash can effectively be utilized as concrete substitution (up to 10%) without significant change in quality

**Key Words:** Sugarcane Baggash Ash, Rice Straw Ash, Stabilization of soil, California Bearing Ratio etc.

### 1. INTRODUCTION

The evacuation of modern and rural waste material requests dire and practical arrangements on account of the debilitate impact of these items on nature.. Landfilling is costing a great deal of cash and, as certifiable administration of assets is turning into a focus on a gathering of individuals living in a similar spot, the acknowledgment of landfilling or burning is diminishing. To worry with the rising removal issue of removal issue of these waste is an issue coordination and backing on that aspect of all administration bodies public and experts and a few organizations.

However this sort of utilization couldn't be compromisable the quality and effectiveness of the development and foundation of the thruway and not produce terrible impact in the earth. Ostensible exploration has been finished to discover the assets of possible waste items and the useable of these items for highways(roads).Enormous examines have been done to improve the asphalt quality by utilizing altered bitumen. The elective choice is to improve the subgrade soil strength utilizing waste materials.

Utilization of waste item which is accessible locally and enough amount is exceptionally stressed for street development straightforwardly or after treatment. Various mixes of locally items like rock, soil, moorum, fine rock, and waster materials like modern slag, civil waste, squander plastic, jute geo-material, mine waste, soil-compounds and so on are productively utilized as an opt The objective of the exploration introduced in this paper is to utilize the waste material Rice Straw Ash and bagasse Ash as an adjustment specialist for soil subgrade material. The significance of utilizing subgrade soil with RSA and BA is the efficient and waste use. These materials may increment its quality for a long span due to pozzolanic reactivity. Bagasse Ash is additionally pozzolanic material that can bepotentially utilized as a stabilizer. Sugar Bagasse Ash a waste product from the sugar mill is used as a stabilizer in enhancing the properties of the soil.

## 2. LITERATURE REVIEW

A lot of research work has been done worldwide in the direction of utilization of Sugar Bagasse Ash & Rice Straw Ash to enhance the properties of soil. Some published papers show the results of these waste material on the soil as follows-

**Ajay Goyal (2007)** done the examination on the WSA (Rice straw Ash) and rice Straw ash. They found the nature of Ash higher consuming temperature. Subsequent to consuming 10% Ash comes out from the above material. These are sinewy material and they directed the test and know the tantamount compressive and flexural quality of the mortar in the wake of blending these material. Finishing the testing they found that improve the quality of the mortar due to siliceous and aluminous properties of material.

**Humberto (2007)** direct the trial to establish the connection between the harvest finishing material in the wake of consuming and soil. They realize that expanding the property of natural carbon of soil after mixing. This research inferred that dirt natural carbon upgrade the elastic property not increment the shear quality of the dirt. Due to 66.66% Rice straw Ash not change into the dirt natural carbon.

**Amu (2011)** led the testing on the essential properties of the dirt by blending sugar bagasse Ash as stabilizer. Diverse test performed reasoned that California Bearing Ratio test, explicit gravity and dampness content. Here the dirt utilized is lateric soil. The siliceous and aluminous properties having cementeous quality at a specific warm effect. PI of the dirt abatements for various examples which show the dirt improvement. CBR is additionally increments higher % regarding unique sample. UCS is the fundamental property of the clayey soil. The end is that subsequent to blending sugar bagasse Ash brilliant outcomes found in expanding the quality of the dirt.

**Mr. Santosh (2015)** In this examination the utilizing of two material to expanding the quality of soil, these two materials are RSA and slag which is originated from horticultural and industrial (iron production line) squander individually. On the dark cotton soil tests are performed to blending the losses in with various % on the grounds that because of various mineral dark cotton soil is truly expandable and fundamental geotechnical properties and UCS and compaction test gives recipient results at 9% of Rice Straw and slag creation upgrading the geotechnical properties of soil on various long periods of relieving.

## 3. MATERIALS AND METHODOLOGY

### Sugar Bagasse Ash

Bagasse Ash is the remaining part of the sugarcane from sugar factory or mills Sugar is

extracted from the sugarcane in the sugar mills in Large scale. After extracting the sugar from sugarcane then the disposing problem of sugarcane straw in the environment. Only 30% bagasse ash is produced with crushed or used sugarcane straw.

For removing the disposing problem of sugarcane straw many researchers used its ash as binding material because of fibrous material contained in the sugarcane which gives the stability to the weaken soil. So sugar bagasse ash used as stabilizer. Temperature is also affect the ash property of sugar which is basically used by the researcher when burning the sugarcane straw.



FIG.-1 Bagasse Ash

Table.1 Chemical Composition of Sugar Bagasse Ash

S.NO.	COMPOUND	VALUE(%)
1	Silica (SiO <sub>2</sub> )	70.20
2	Aluminum (Al <sub>2</sub> O <sub>3</sub> )	1.93
3	Iron (Fe <sub>2</sub> O <sub>3</sub> )	2.09
4	Calcium (CaO)	12.20
5	Magnesium (MgO)	1.95
6	Potassium (K <sub>2</sub> O)	3.05
7	Sodium (NaO)	0.0012

### Rice Straw Ash

Rice Straw Ash is producing from Agricultural field which is locally available in the village of Sultanpur district. Rice Straw ash contain a silicious property and it is used for many purposes improving the soil strength. When the farmers extracting the food grain from the Rice plants then remaining parts comes under the disposing problem. Then many researchers found that silica % is very high in Rice Straw ash and this property is used in the stabilization of soil.

Generally (20 -22) % Rice Straw is produces and only 25% ash is generated by Straw. Its property is also changed by the temperature effect. Normally 600 degree celcius temperature is used for burning of Rice Straw.

The chemical properties of RSA are shown in Table-



Fig.-2 Rice Straw Ash

Table.2 Chemical properties of RSA at 600 °C

S.NO.	COMPOUND	VALUE(%)
1	Silicon Oxide(SiO <sub>2</sub> )	43.22
2	Potassium Oxide(K <sub>2</sub> O)	11.30
3	Magnesium Oxide(MgO)	0.99
4	Iron Oxide (Fe <sub>2</sub> O <sub>3</sub> )	0.84
5	Sodium Oxide(Na <sub>2</sub> O)	0.16
6	Chromium oxide(Cr <sub>2</sub> O <sub>3</sub> )	0.0004
7	Calcium Oxide(CaO)	5.46
8	Manganese Oxide(MnO <sub>2</sub> )	0.02

The soil was collected from SultanpurFaizabad road from the agricultural field. These soils are carried to the laboratory in sacks after that soil was air dried for three to four days and the testing was followed by sieving the soil through 4.75mm IS sieve. Table 3.3 represents the various codes used for the determination of corresponding property. These are described as given below:

Table.3 List of tests as per code

S.NO.	TEST	CODE
1	Specific gravity	IS 2720 (Part-3)
2	Particle size distribution	IS 2720 (Part-4)
3	Liquid limit	IS 2720 (Part-5)
4	Plastic limit	IS 2720 (Part-5)
5	Standard Proctor Test	IS 2720 (Part-7)
6	California bearing ratio	IS 2720 (Part-16)
7	Permeability	IS 2720 (Part-17)

### RESULTS AND CONCLUSIONS

experimental data obtained and discussed in chapter 5 for clayey soil added with different proportions of Bagasse Ash & Rice Straw Ash has been analyzed in a combined way for the outcome properties such as OMC, MDD, CBR and Unconfined Compressive Strength calculated and analyzed are given below in tabulated form-

#### For clayey Soil only

Table.4 Test Results of Original Soil

Basic Properties of Soil	Values
Specific Gravity	2.72
Sand + Gravel Content	2.48%
Silt + Clay	97.92%
Liquid Limit	43.12%
Plastic Limit	25.45%
Plasticity Index	17.67%
OMC & MDD	20.63% & 1.67g/cc
UCS	1.36Kg/cm <sup>2</sup>
CBR	3.26%

In the present work, experimental data has been collected for soil and further added with sugar bagasse ash & Rice Straw ash in different proportions for OMC, MDD, CBR & UCS (from 0 to 24%).Based on the experimental data collected and analyzed in chapter 4 and 5 for soil added with sugar bagasse ash & Rice Straw ash in various proportions from 0 to 24% by weight, this experimentally collected data has been further analysed in detail to see the effect of sugar bagasse ash & Rice Straw ash mixing in the soil in a combined view. The main conclusions that may be drawn from the present study are as given below:

#### For virgin soil

The soil chosen in present thesis is -

1. Clayey soil having specific gravity, liquid limit, plastic limit, plasticity index, OMC, MDD, CBR & UCS as 2.72, 43.12%, 25.45%, 17.67%, 20.63%, 1.67g/cc, 3.26%, 1.36Kg/cm<sup>2</sup>.



## Soil mixed with sugar bagasse ash & Rice Straw ash in different proportions in selected soil

### Optimum moisture content & Maximum dry density

1. Optimum moisture content continuously increases with increasing different proportions of sugar bagasse ash & Rice Straw ash.

2. Maximum dry density of sugar bagasse ash decreases continuously 0% to 16% and then increases.

Similarly Maximum dry density of Rice Straw ash decreases 0% to 20% and then increases.

### CBR Variation

1. It was concluded that clayey soil have attained maximum CBR value i.e. 6.18 and 5.55 respectively when 16% Bagasse ash & 20% RSA added in soil. For the clayey soil the maximum value of CBR is obtained at (16%bag + 20%RSA)

2. The percentage increase in CBR added with bagasse ash & RSA for clayey soil is about 117.66% as compared to original soil.

### UCSVariation

1. It was concluded that clayey soil have attained maximum UCS value i.e. 161.51(kpa) and 157.26(kpa) respectively when 16% Bagasse ash & 20% RSA added in each case. For the clayey soil the maximum value of UCS is obtained at (16%bag + 20%RSA) i.e.171.12(kpa).

2. The percentage increase in CBR added with bagasse ash & RSA for clayey soil is about 28.45% as compared to original soil.

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