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## Stabilization of Soil With Murrum, Saw Dust, and Coconut Fiber

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### ABSTRACT

*Stabilization in a broad sense, incorporates the various method employed for modifying the properties of a soil to improve its engineering performance. In civil engineering, soil stabilization is a technique To refine and improve the engineering properties of soils. These properties include Mechanical strength, Permeability, compressibility, durability and plasticity. Stabilization is being used for a variety of engineering works, the most common application being in the construction of road and to reduce the construction cost by making best use of the locally available materials. The material used in soil stabilization depend on what technique is being employed. Method of stabilization may be grouped under two main two main types: (a) modification of the properties with the help of admixtures. Compaction and drainage are the first type, which improve the inherent shear strength of soil. Examples; of the second type are: mechanical stabilization, stabilization with cement, lime, bitumen and chemicals, fly ash, seeds, different grade of soil and aggregates, synthetic resins, recycled and waste product etc. Some more method are in soil.*

**Keywords:** *Stabilization, Compressibility, Durability, Recycled and Waste.*

### 1. INTRODUCTION

Soil stabilization a general term for any chemical, mechanical, or combined method of changing a natural soil to meet an engineering purpose. Soil having poor bearing and shearing strength need to make it suitable Soil Stabilization for construction purpose. Improvements include increasing the dry unit weight, bearing capabilities, volume changes, the performance of in situ subsoils, sands, and other waste materials. That's why we used for Soil Coconut Fiber and Saw Dust. In this study carried out to evaluate the effect of Coconut Fiber and Saw Dust on Compressive Strength The concept of fiber and Saw Dust reinforcement was developed in long times, ago.

Coconut Fiber is also called as Coir Fiber. It is Natural Material, Eco-friendly and available in cheap price. Synthetic fibers are damage or harmful to the nature or environments that's why we use of natural fiber and Saw Dust. Natural fiber and Saw Dust are not harmful to the environment. This are the recycled product. Soil reinforced with fiber and Saw Dust behaves as a composite material in which fibers improves the strength of soil. This study related to around the reinforcement of soil by coconut fiber and Saw Dust the difference between engineering properties before and after stabilization.

The Stabilization process ensures the soil is stable by reducing the permeability and increasing its overall strength. Reduce the water absorption capacity of the soil. Reduce the settlement of the structure on the soil. Reduce the shrinkage and swelling characteristics of soils.

Three different tests on soil samples. Aim of this study is improvement of the compressive strength parameters. Then we can find can we replace the brick or not.

#### 1.1. Types of Soil

Material used: Saw Dust Ash + Red Clay Soil + Laterite Soil.  
Tested Carried Out: Compaction Test, Direct Shear Test

As per following many types of soil

1) Murrum (2) Red Soil (3) Black soil (4) Alluvial soil (5) Clay (6) Loam (7) Sand (8) Gravel etc.... to your research should be of font size 10 and justified font.

#### 1.2. Property of Soil

- |      |                                   |
|------|-----------------------------------|
| 1)   | Primary Property                  |
| i.   | Water content                     |
| 2)   | Index Property                    |
| i.   | Void ratio (e)                    |
| ii.  | Porosity (n)                      |
| iii. | Relationship between Porosity and |

void ratio

- iv. Degree of Saturation (S)
- v. Density Index
- vi. Density (p)
- vii. Specific Gravity (G)
- viii. Consistency of Soil

**2. LITERATURE SURVEY**

Narangowada MJ “Effect of sawdust ash and fly ash on stability of expansive soil”. Material used: Saw Dustash + Fly Ash + Clay Soil. Tested Carried Out: Differential Swell Test, Atterberg Limit, Proctor’s Compaction Test, CBR, UCC

- i. OMC, MDD, plasticity index, UCS of the soil is improved on addition of 10% fly ash and wood ash.
- ii. The swelling index of soil is controlled.
- iii. CBR value of the soil is increased of addition of 15 % of both lime and fly ash.

N. CHIRANTHANA “Stability of red clay laterite Soil With sawdust as an amendment”.

- i. OMC and MDD is improved by adding SDA to red clay and laterite soil.
- ii. The study revealed that small percentage of saw dust ash can be used as a cheap stabilizing agent in red clay and laterite soils for engineering works.

B. G. Rahul “Stabilization of debris material by using soil”. Material used: Debris Material + Black Cotton Soil. Tested Carried Out: Heavy Compaction Test, Density Test, Pycnometer Test.

- i. Specific Gravity of debris material is higher than black cotton Soil.
- ii. OMC of debris material is more than black cotton soil
- iii. MDD of concrete debris is also more than black cotton soil

**3. SELECTION & PROPERTY OF SOIL**

The soil used is collected from surrounding area such as Murrum. After collecting the soil sample cubes are made from these soil samples to test their compressive strength.

Murrum is the word derived from the Tamil language, which means powdered rock. Murrum is one type of laterite soil, which is red due to a higher amount of iron oxide.

Murrum soil is the soil of humid tropical or equatorial zones. Murrum is also a soil type of laterite soil, mostly used for construction purposes. Generally, it is deep brown or red in color.

It is used as an initial ballast for new construction and also as sub-ballast. The most reliable murrum for ballast is that which contains a large amount of small laterite stone. It is also rich in aluminum. Meaning of murrum is the disintegration of rock i.e., fragments of rock, that’s why it does not rock.

**4. LABORATORY OF SOIL TEST & CALCULATION**

Taking out 3 Test

- i. Water Content
- ii. Specific Gravity
- iii. Standard Proctor Test

Their results as follows:

**Table -1: Water content:**

Sr.no	Sample No:	Observation No;

		1	2	3
I.	Container No:	1	2	3
II.	Mass of empty Container (W1)	23	24	26
III.	Mass of Container with Soil (W2) (gm)	54	58	75
IV.	Mass of Container with lid & Dry Soil(W3) (gm)	52	56	73
V.	Mass of Water Ww = (W2 – W3) (gm)	2	2	2
VI.	Mass of Water Ws=(W3 – W1) (gm)	29	32	47
VII.	Water Content % =(Ww / WS) x100	6.89	7.40	4.27
VIII.	Average Water Content of Murrum Soil	6.18%		

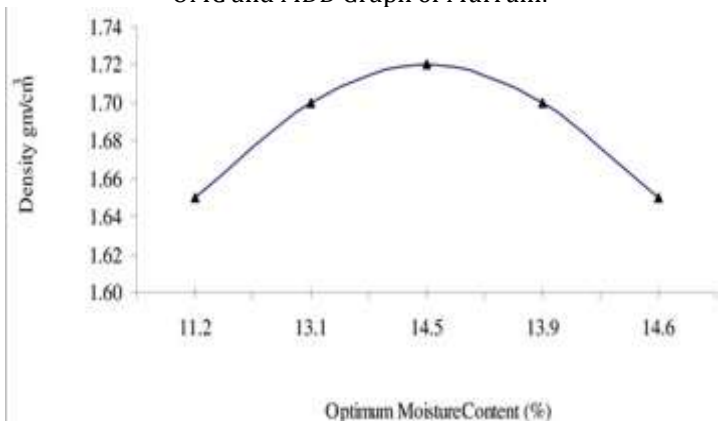
**Table -2: Specific Gravity:**

Sr. No:	Particulars	Observations		
		1	2	3
1	Mass of Empty Pycnometer (W1)gm	620	620	620
2	Mass of Pycnometer with Dry (W2) gm	844	814	762
3	Mass of Pycnometer with Soil & Water (W3)gm	1646	1694	1642
4	Mass of Pycnometer with Water (W4) gm	1518	1558	1561
5	Specific Gravity G = (W2- W1) / [(W2 - W1) - (W3 - W4)]	2.33	3.34	2.32
6	Average Specific Gravity of Murrum Soil	2.66		

**Table -3: Basic Characteristics of Murrum:**

Description	Specific Gravity SG	Liquid limit LL %	Plastic Limit PL %	OMC %	MDD gm/cc	CBR
Murrum	2.6	30	Non plastic	14.5	1.72	3.33

**OMC and MDD Graph of Murrum:**



**5. EXPERIMENTAL OBSERVATION, RESULTS & DISCUSSION**

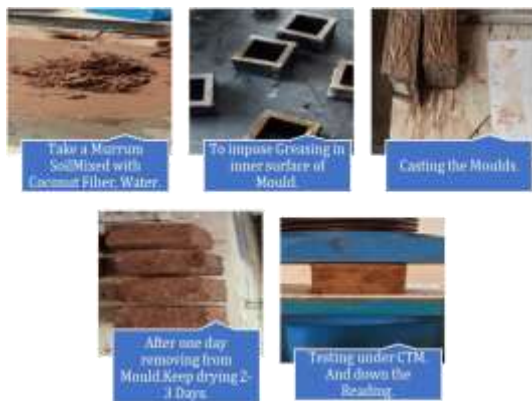
- Procure of Cube Testing Murrum with SawDust :

  1. First, we take 400 gm Murrum Soil and sifted through a sieve measuring 1.18 mm. Then take 5 percent of soil Saw Dust.
  2. Then Saw Dust mixed into the soil.
  3. We mixed 50 percent of the soil with water.
  4. Then a 6 X 6 cm size of mound and filled it with the mixture.
  5. The above method created two cubes.
  6. Put it to dry for two days.
  7. And as above 10, 20 and 40 percent of the soil was mixed wood dust.
  8. Next repeat the procedure.
  9. By making it all cubes.
  10. All cubes Testing the under CTM Machine one by one.
  11. Note down the all reading.



**Procure of Cube Testing Murrum with Coconut Fiber:**

1. First, we take 400 gm Murrum Soil and sifted through a sieve measuring 1.18 mm. Then take 2 percent of soil Coconut Fiber.
2. Before Mix into Soil cut the Coconut Fiber horizontally.
3. Then coconut fiber mixed into the soil.
4. We mixed 50 percent of the soil with water.
5. Then a 6 X 6 cm size of mould and filled it with the mixture.
6. The above method created two cubes.
7. Put it to dry for two days.
8. And as above 4 and 6 percent of the soil was mixed.
9. Next repeat the procedure.
10. By making it all cubes.
11. All cubes Testing the under CTM Machine one by one.
12. Note down the all reading.



- Procure of Cube Testing Murrum with SawDust And Coconut fiber.

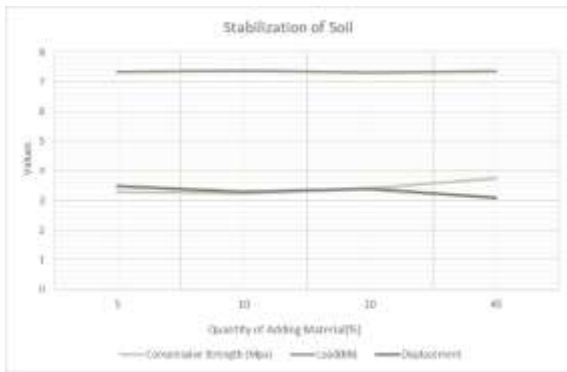
1. First, we take 400 gm Murrum Soil and sifted through a sieve measuring 1.18 mm. Then take 2 percent of soil Coconut Fiber and Saw Dust.
2. Before Mix into Soil cut the Coconut Fiber horizontally.
3. Then coconut fiber and Saw Dust mixed into the soil.
4. We mixed 50 percent of the soil with water.
5. Then a 6 X 6 cm size of mould and filled it with the mixture.
6. The above method created two cubes.
7. Put it to dry for two days.
8. And as above 4 and 6 percent of the soil was mixed.
9. Repeat the next procedure.
10. By making it all cubes.
11. All cubes Testing the under CTM Machine one by one.



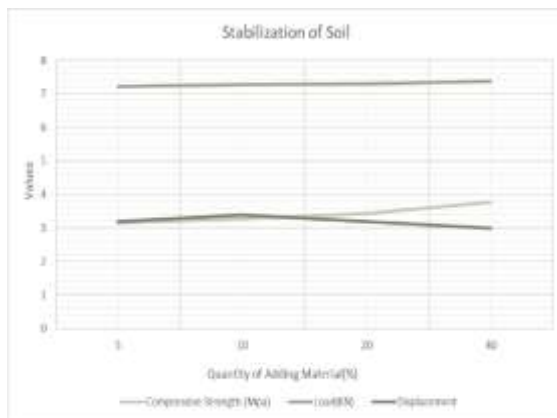
**Table 4: Specific gravity**

Cube No:	Quantity of Adding Material (%)	Weight (gm)	Compressive Strength (Mpa)	Load (KN)	Displacement
<b>Murrum Soil Mixed with Saw Dust.</b>					
1	5	400	3.291	7.34	3.5
2		400	3.151	7.22	3.2
3	10	400	3.252	7.38	3.3
4		400	3.264	7.28	3.4
5	20	400	3.401	7.31	3.4
6		400	3.423	7.29	3.2
7	40	400	3.753	7.35	3.1
8		400	3.777	7.37	3.0
<b>Murrum Soil Mixed with Coconut Fiber.</b>					
9	2	400	4.012	7.54	2.1
10		400	4.111	7.46	2.5
11	4	400	4.532	7.54	2.3
12		400	4.514	7.44	2.9
13	6	400	4.929	7.49	2.5
14		400	4.114	7.50	2.4
<b>Murrum Soil with Coconut Fiber &amp; Saw Dust.</b>					
15	2	400	4.401	8.16	1.9
16		400	4.401	8.17	1.4
17	4	400	4.451	8.16	1.7
18		400	4.503	8.22	1.6

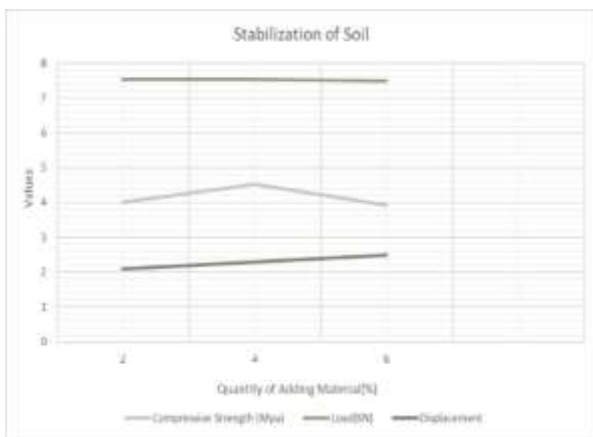
8					
1	6	400	4.554	8.40	1.4
9					
2		400	4.604	8.96	1.3
0					



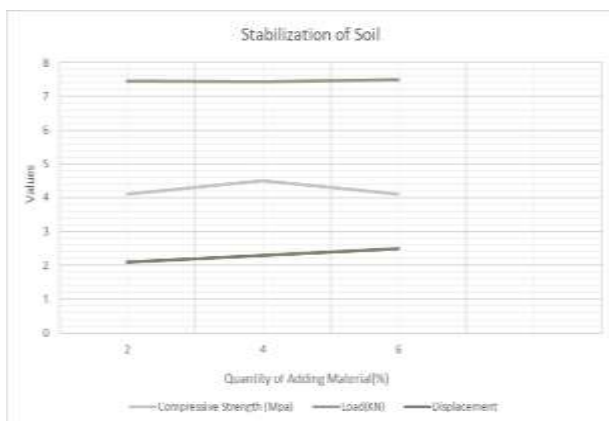
Cube no. 1, 3, 5, 7



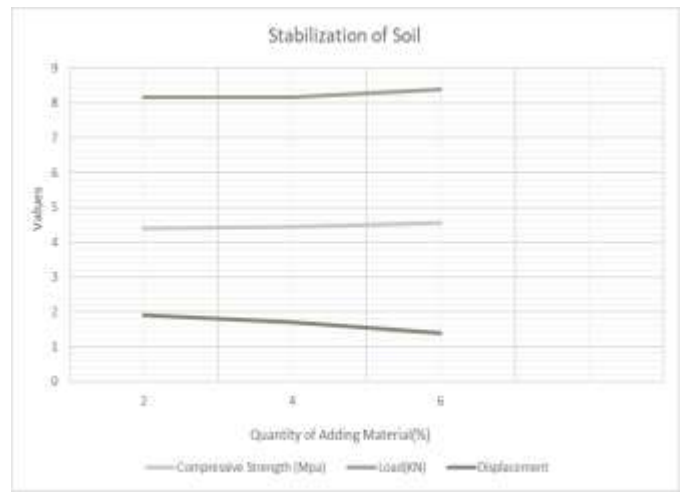
Cube No. 2, 4, 6, 8



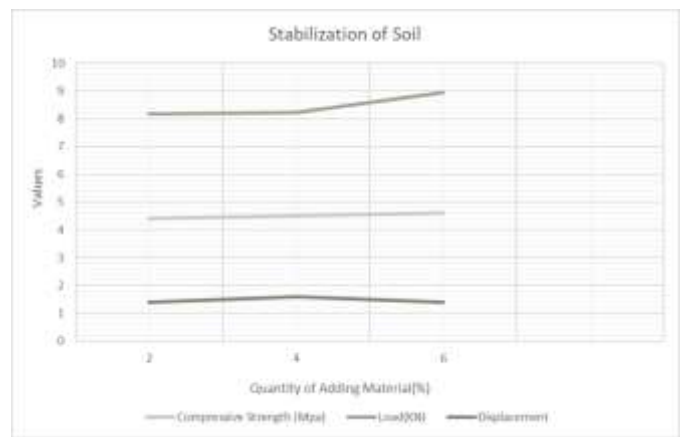
Cube no. 9, 11, 13



Cube No. 10, 12, 14



Cube no. 15, 17, 19



Cube No. 16, 18, 20

## 5. CONCLUSIONS

1. Sample or Case No. 2 & 3 they give Strength & Elasticity.
2. Coconut Fiber it gives the More Strength than Saw Dust.
3. Recycled successfully the coconut fiber and Saw Dust.
4. We can make the Brick as per the Proportion.
5. The Methodology used for Low-cost Housing.
6. Also used for Construct directly wall as a partition wall or temporary structure.

## 6. FUTURE SCOPE

1. Coconut Fiber and Saw Dust is the waste material obtained from the fiber of coconut fruit and Saw Dust can be used for Civil Engineering Constructions.
2. We can add in the future metal slag, fly ash, rice husk, mortar etc.... other additives will be used in mix Coconut fiber and Saw Dust for increase the strength of soil.
3. Study on consolidation and compressibility features or characteristics of soil mixed with
4. Coconut fiber and Saw Dust.
5. Taking different soil samples and different test in the future.

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