# EXPERIMENTAL COMPARISON OF SOIL STABILIZATION WITH BUILDING DEMOLISHED WASTE AND SAW DUST ASH

**A.OORKALAN[1], NAVIN.K[2], SIDDHARTHAN.R[3], VIGNESHWARAN.S[4], VISHNU.T[5]**

*[1]Assistant Professor, Department Civil Engineering, K.Ramakrishnan College of Technology, Samayapuram, Trichy, India.*
*[2,3,4,5]Under Graduate Students , Department Civil Engineering, K.Ramakrishnan College Of Technology, Samayapuram, Trichy, India.*

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**Abstract** - : *Soil stabilization may be defined as the process of changing the properties of soil to improve the density and strength. The aim of the study was to review on stabilization of clayey soil using building demolished waste and saw dust ash. Various methods are available for stabilizing clayey soil. These methods include stabilization with chemical additives, soil replacement, compaction control, moisture and thermal methods. All these methods may have the disadvantages of being ineffective and expensive. Here we used Mechanical stabilization. We are collected the soil sample from samayapuram, Trichy .We conducted the test of Index properties and the compaction characteristics using Standard Proctor Test and compression test using unconfined compression test. We collected the building demolished waste from Mannachanallur, Trichy and choose the size 2.36mm IS sieve. We are add the building demolished waste in the following percentages (5,10,15 and 20). Finally got the good result in adding 5% of building demolished waste and 7.5% of water the Maximum dry density increases and Optimum Moisture Content constant further .We collected the saw dust from samayapuram, Trichy and choose the size 1.18mm IS sieve. We are add the saw dust ash in the following percentages (5,10,15,20). Finally got the good result adding 15% of combustion of saw dust and 7.5% of water the MDD increases and OMC constant further.*

**Keywords: clay soil, building demolished waste, saw dust ash, MDD, OMC, UCS.**

## 1. INTRODUCTION

Soil improvement can be divided into modification or stabilization or both. Soil modification is the addition an some waste materials like sawdust ash and building demolished waste to soil to change its index properties ,while soil stabilization is the treatment of soils to enable their density and strength to be improved such that they become totally suitable for construction beyond their original classification. The physical additives such as building demolished waste and saw dust ash can be mixed with the soil to improve the texture, increasing strength characteristics. The aim of this study is to investigate and to show the potential use of and saw dust ash as an additive to stabilize a clay soil. This is an experimental study to determine the concentration of building demolished waste and sawdust ash as an additive, the development of compressive strength. A laboratory was conducted on soil sample of clay soil stabilized using building demolished waste and saw dust ash. This paper focuses on the development of compressive strength of clay soil stabilized with building demolished waste and sawdust ash at varying percentages such as (5,10,15,20) and (5,10,15,20) respectively. The result shows that building demolished waste and sawdust ash is a sawdust ash is a waste material. Construction waste is taken from Mannachanallur and sawdust ash is taken from samayapuram. It can be used as additives to clay soil and increasing the engineering properties of the soil.

## 2. MATERIALS AND METHOD

### 2.1. Soil

Disturbed soil samples used for this study are brought from borrow pit at a depth of 1.5 m collected from samayapuram .The collected soil sample is spread in laboratory for 4 days for air- drying at room temperature to eliminate an natural water content in the soil .then dry sample is sieve in 4.76 mm sieve for test process.

**Fig 1:** clay soil

### 2.2 Building demolished waste

Building demolished waste (BDW) means those materials resulting from the alteration, construction, destruction, rehabilitation, or repair of any manmade physical structure including houses, buildings, industrial or commercial facilities, and roadways.

**Fig 2:** building demolished waste

### 2.3 Saw dust ash

Saw dust ashes are a loose particles. The Chemical composition of saw dust ashes is Different with various type of wood, but they predominantly comprise silica, alumina and lime.

**Fig 3:** saw dust ash

**Table 2.1 :** shows the properties of SDA

| Test Parameter | Result(%) |
|---|---|
| Alumina($Al_2O_3$) | 9.46 |
| Silica($SiO_2$ ) | 61.45 |
| Calcium($CaO$) | 11.43 |
| Iron($Fe_2O_3$ | 4.45 |
| Magnesium Oxide(MgO) | 4.02 |
| Sodium($Na_2O$) | 0.035 |
| Potassium$K_2O$) | 1.71 |

## 3. RESULT AND DISCUSSIONS

### 3.1 Specific gravity test

This test is carried out to test a specific gravity of different samples [11].

**Table 3.1 :** Result shows the value specific gravity of different materials.

| MATERIALS | SPECIFIC GRAV |
|---|---|
| SOIL | 2.46 |
| BUILDING DEMOLISHED WASTE (BDW) | 3.14 |
| SAW DUST ASH (SDA) | 2.83 |

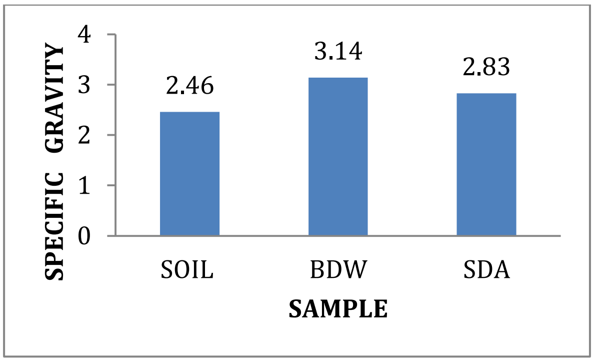


**Fig 4 :** specific gravity

### 3.2 Atterberg limits

This test is carried out to determine an plastic limit and liquid of soil[12].

**Table 3.2 :** Result shows the value of atterberg limit .

| TEST | VALUE |
|---|---|
| LIQUID LIMIT | 24.5% |
| PLASTIC LIMIT | 24.86% |

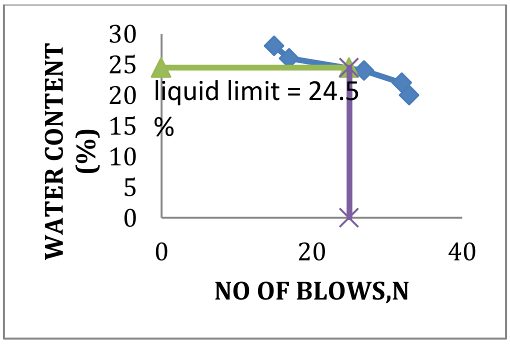


**Fig 5:** liquid limit graph

### 3.2 Standard proctor test

The effect of Building Demolished Waste(BDW) on the strength and compaction characteristics of clay soil .The percentage of BDW was varied from 0% to 20% with an increment of 5% [13]and the result are shown table 3.3.

**Table 3.3:** result showing the maximum dry density And optimum moisture content of clay soil+ BDW.

| Soil+ % BDW | MDD g/cc | OMC % |
|---|---|---|
| Soil+0% BDW | 1.54 | 10 |
| Soil+5% BDW | 1.60 | 7.5 |
| Soil+10% BDW | 1.54 | 7.5 |
| Soil+15% BDW | 1.51 | 7.5 |
| Soil+20% BDW | 1.52 | 7.5 |

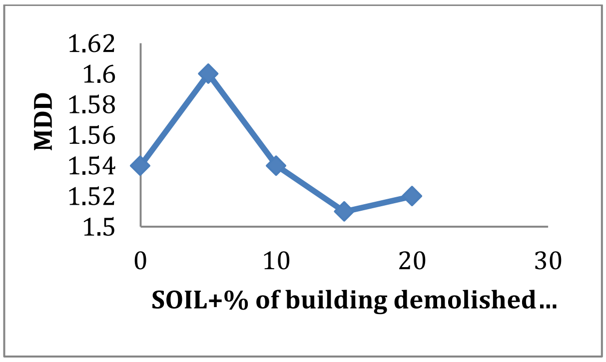


**Fig 6:** plot showing the variations of Maximum Dry Density with % replacement in clay soil with BDW.

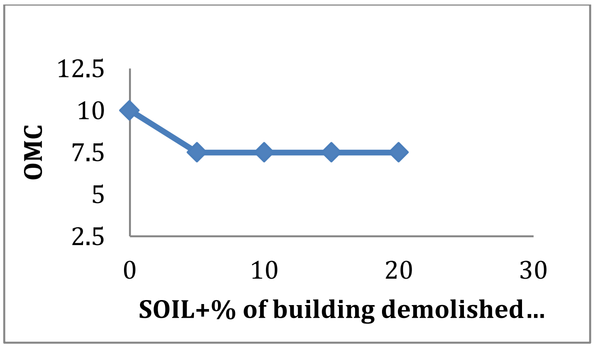


**Fig 7:** plot showing the variations of Optimum moisture content with % replacement in clay soil with BDW.

**Table 3.4:** result showing the maximum dry density And optimum moisture content of clay soil+ SDA.

| Soil+% SDA | MDD g/cc | OMC % |
|---|---|---|
| Soil+0% SDA | 1.54 | 10 |
| Soil+5% SDA | 1.47 | 10 |
| Soil+10% SDA | 1.53 | 10 |
| Soil+15% SDA | 1.57 | 7.5 |
| Soil+20% SDA | 1.51 | 7.5 |

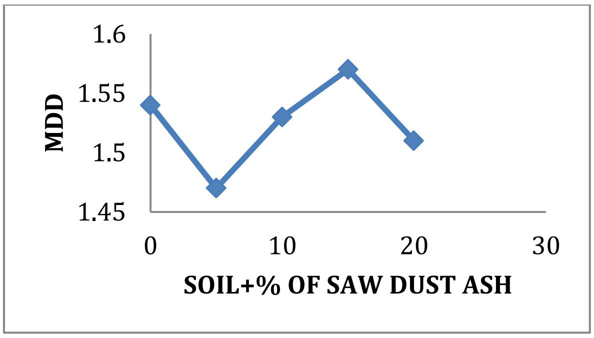


**Fig 8:** plot showing the variations of Maximum Dry Density with % replacement in clay soil with SDA.

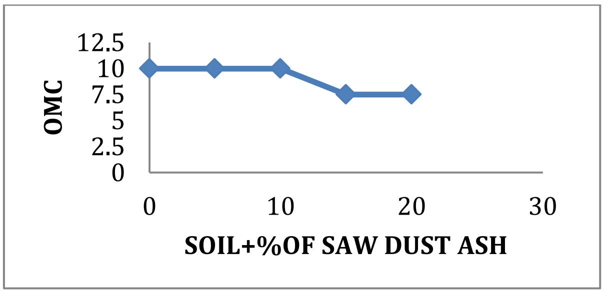


**Fig 9:** plot showing the variations of optimum moisture content with % replacement in clay soil with SDA.

### 3.4. Unconfined compressive strength

**Table 3.5 :** result showing the unconfined compressive strength and undrained shear strength of clay soil+ BDW [14].

| SOIL+%BDW | Unconfined compressive strength($q_u$) (KN/m$^2$) | Undrained shear strength($C_u$) (KN/m$^2$) |
|---|---|---|
| SOIL+0%BDW | 52.2 | 26.1 |
| SOIL+5%BDW | 81.5 | 40.75 |
| SOIL+10%BDW | 65.31 | 32.655 |
| SOIL+15%BDW | 61.58 | 30.79 |
| SOIL+20%BDW | 59.72 | 30.79 |

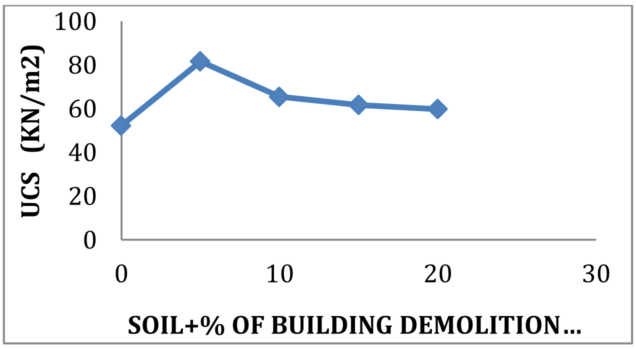


**Fig 10:** plot showing the unconfined compressive strength with % replacement in clay soil with BDW.

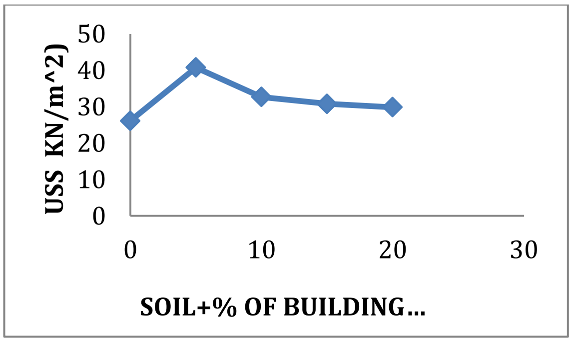


**Fig 11:** plot showing the undrained shear strength with % replacement in clay soil with BDW.

**Table 3.6 :** result showing the unconfined compressive strength and undrained shear strength of clay soil+ SDA.

| SOIL+%SDA | Unconfined compressive strength($q_u$) (KN/m²) | Undrained shear strength($C_u$) (KN/m²) |
|---|---|---|
| SOIL+0% SDA | 52.2 | 26.1 |
| SOIL+5% SDA | 50.4 | 25.2 |
| SOIL+10% SDA | 53.15 | 26.575 |
| SOIL+15% SDA | 55.01 | 27.505 |
| SOIL+20% SDA | 52.26 | 26.13 |

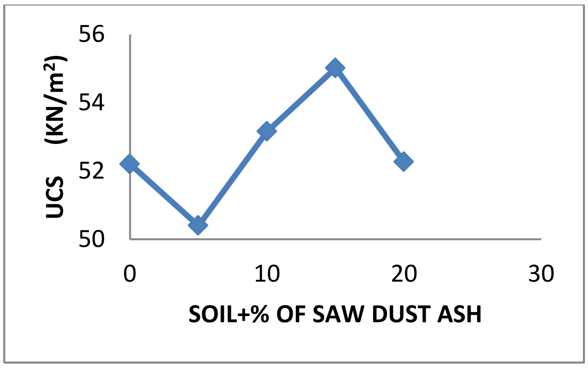


**Fig 12:** plot showing the unconfined compressive strength with % replacement in clay soil with SDA.

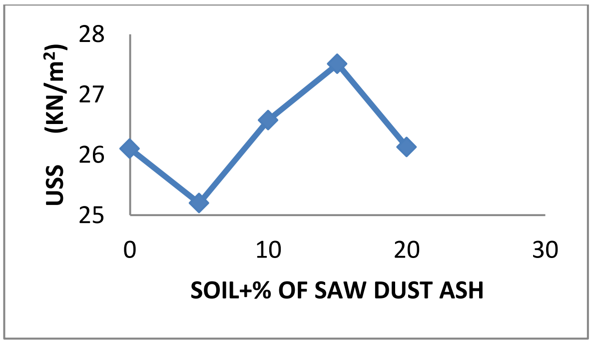


**Fig 13:** plot showing the undrained shear strength with % replacement in clay soil with SDA.

## 4. CONCLUSION

1. The Maximum dry density increased up to replacement of 5% of building demolished waste and 15% of sawdust ash and decreased further. The soil mixed with demolished waste resulted in higher maximum dry density values compared to soil mixed with sawdust ash. The results show that soil replaced with construction waste is exhibiting greater optimum moisture content than the soil replaced with sawdust ash. As the maximum dry increases from 1.54 to 1.60 gm/cc for BDW. The maximum dry density increases from 1.54 to 1.57 for SDA.

2. The unconfined compressive strength and undrained shear strength increased up to replacement of 5% of building demolished waste and 15% of sawdust ash and decreased further. The soil mixed with demolished waste resulted in higher UCS and USS values compared to soil mixed with sawdust ash. The results show that soil replaced with construction waste is exhibiting greater UCS and USS value than the soil replaced with sawdust ash. The UCS and USS value increases from 52.20 kN/m² to 81.5 kN/m² and 26.1 kN/m² to 40.75 kN/m² for BDW.The UCS and USS value increases from 52.20 kN/m² to 55.01 kN/m² and 26.1 kN/m² to 27.505 kN/m² for SDA.

3. Soil gives only higher strength in utilization BDW 5% and it can be used as an stabilizing agent of clay soil.

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