e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:02/Conference:01/July -2020 www.irjmets.com
International Conference on Recent Trends in Engineering and Technology-2020 (ICRTET)
Organized by VSM College of Engineering, Ramachandrapuram, Andra Pradesh

EFFECT OF RED SOIL STABILIZED USING FLY ASH & CERAMIC WASTE

K. Saroja Rani*1, V. Tanuja*2, B. Anil Kumar*3

*1Associate Professor, VSM College of Engineering, Ramachandrapuram, India.

*2,3Assistant Professor, VSM College of Engineering, Ramachandrapuram, India.

ABSTRACT

Soil stabilization is one of the most important for the construction which is widely used in connection with road pavement and foundation construction because it improves the engineering properties of soil such as strength, Stability and durability. Soil stabilization is any process which improves the physical properties of soil such as increasing shear strength, bearing capacity etc, which can be done by use of controlled compaction, adding of suitable add mixes like lime, cement, fly ash, ceramic, rice husk etc. In this present investigation evaluate the geotechnical properties and shear strength of ordinary soil and strength properties for stabilized red soil by using different percentages of fly ash and ceramic waste.

Keywords: controlled compaction, fly ash, ceramic waste, geotechnical properties.

I. INTRODUCTION

Red soil in India is largely found in Deccan Plateau. It is mainly seen in the state of Tamil Nadu, In India red soil is also found in several other regions including Madhya Pradesh, Andhra Pradesh, Southern Karnataka, Bihar, Maharashtra, Goa, Eastern Rajasthan, West Bengal and other states of north-east. Red soils have matured on older crystalline rocks, under deep and rational rainfall conditions.

Red soil contains more drainage properties than other types of soils. Red soils in India are lack f nitrogenous materials, phosphoric acid and organic matter and are rich in iron. It is formed by the breakdown of igneous rocks and metamorphic rocks.

- A number of studies have been made on the red looking sediments that are extensively the Visakhapatnam coastal region on the east coast of India.
- Mahadevan and Satapathi (1949) have considered that these red sediments of, what they called 'Waltair Highlands' were formed by the cumulative work of both wind and running water.
- Prudhvi Raju and Vaidyanadhan (1978) opined that these red sediments were formed due to the long period of tectonic stability and the products transported to the present places by fluvial agents in a subsequent humid phase.

II. MATERIALS

These soils are abundantly available in the north coastal district of Andhra Pradesh starting from Srikakulam to east Godavari district. These soils are product of tropical weathering i.e. wind and water born deposits. It contains large amounts of quartz, silica and oxides of iron, magnesium & hydrated alumina and low amounts of kaolinite & calcite. Its strength is high in dry condition and significant reduction of strength takes place on wetting (saturation).

In this present study the red soil is collected from Rajahmundry at a depth of 1.5 m from the ground surface and conducted gradation properties, Index properties and shears strength properties for the basic soil, and tested for strength test after stabilized with fly ash and ceramic waste.

III. TESTS AND RESULTS

3.1 The soil is tested for various geotechnical properties i.e. Grain size distribution, specific gravity, consistency limits, compaction characteristics, strength characteristics values and are tabulated below:

Table 3.1: Basic Properties of soil

S.NO	Description of the property	Values
1	Gravel (%)	0
2	Sand (%)	76.9

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:02/Conference:01/July -2020 www.irjmets.com
International Conference on Recent Trends in Engineering and Technology-2020 (ICRTET)
Organized by VSM College of Engineering, Ramachandrapuram, Andra Pradesh

3	Fines (%)	23.1
4	Liquid Limit (%)	36
5	Plastic Limit (%)	32.5
6	Plasticity Index	3.5
7	Specific Gravity	2.99
8	OMC (IS Heavy Compaction) Optimum moisture Content (%) Maximum dry density	 8.6 2.19
9	Unconfined Compressive strength test (kPa)	59.5

- ✓ Red soil is coarse grained soils dominated by sand particles by 76.9% and fines of 23.1%. this soil have liquid limit of 36 %, Plasticity Index of 3.5, whereas the optimum moisture content was 8.6% at a maximum dry density of 2.19 g/cc. The red soils can attain high density and bearing values in terms of bearing capacity can be effectively used in civil engineering constructions.

3.2 Characteristics of soil after adding different percentages of fly ash and ceramic waste:

The soil collected was dried and added different percentages of fly ash and ceramic waste to its weight with a percentage of 4,6,8,10,12 and tested for optimum moisture content and maximum dry density are determined and shown below:

Table: 3.2.1 Compaction Characteristics of fly Ash and Ceramic Waste

S.No	% OF ADMIXTURE ADDED	FLY ASH		CERAMIC WASTE	
		OMC	MDD	OMC	MDD
1	0	8.6	2.19	8.6	2.19
2	4	9.2	2.27	9	2.21
3	6	10	2.30	10.71	2.39
4	8	10.71	2.33	11.11	2.91
5	10	11.11	2.38	12.21	2.15
6	12	12.31	2.14	--	--

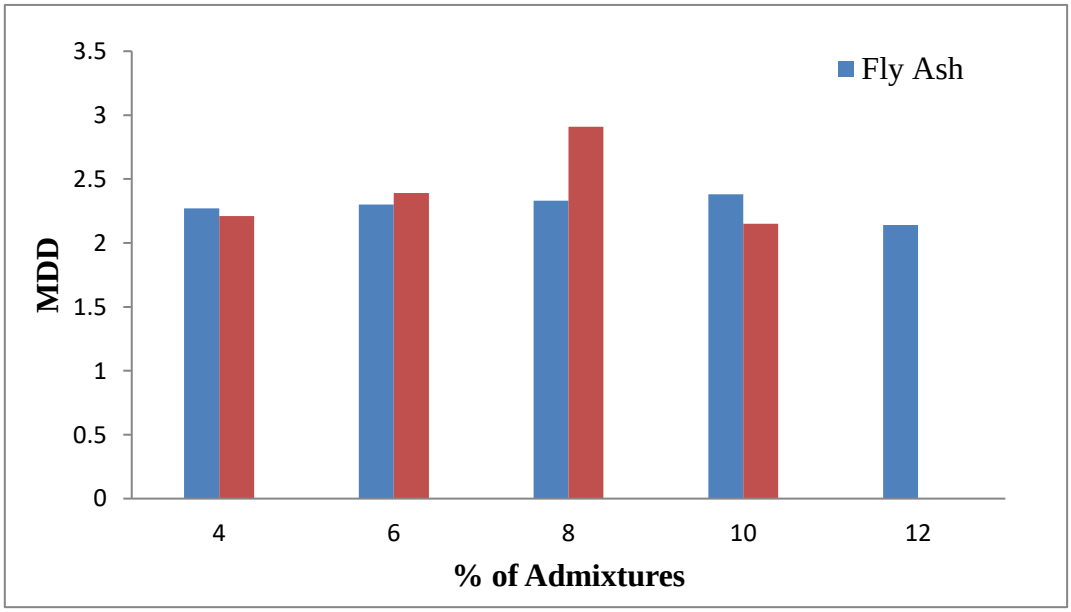

Fig: 3.2.1 Variations of different admixtures with soil

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:02/Conference:01/July -2020 www.irjmets.com
International Conference on Recent Trends in Engineering and Technology-2020 (ICRTET)
Organized by VSM College of Engineering, Ramachandrapuram, Andra Pradesh

3.3. Strength Characteristics of soil after adding different percentages of fly ash and ceramic waste:

The soil collected was dried and added different percentages of fly ash and ceramic waste to its weight with a percentage of 4,6,8,10,12 and tested for shear strength and shown below:

Table 3.3.1 Strength Characteristics of Fly Ash

S.NO	% OF ADMIXTURE	0 DAYS	3 DAYS	7 DAYS	14 DAYS	28 DAYS
1	4	60.90	73.90	88.10	93.40	110.30
2	6	78.10	86.60	92.70	109.70	125.40
3	8	85.30	98.20	102.10	112.10	140.00
4	10	94.20	106.30	112.50	132.50	155.00
5	12	47.20	60.90	74.20	80.20	89.20

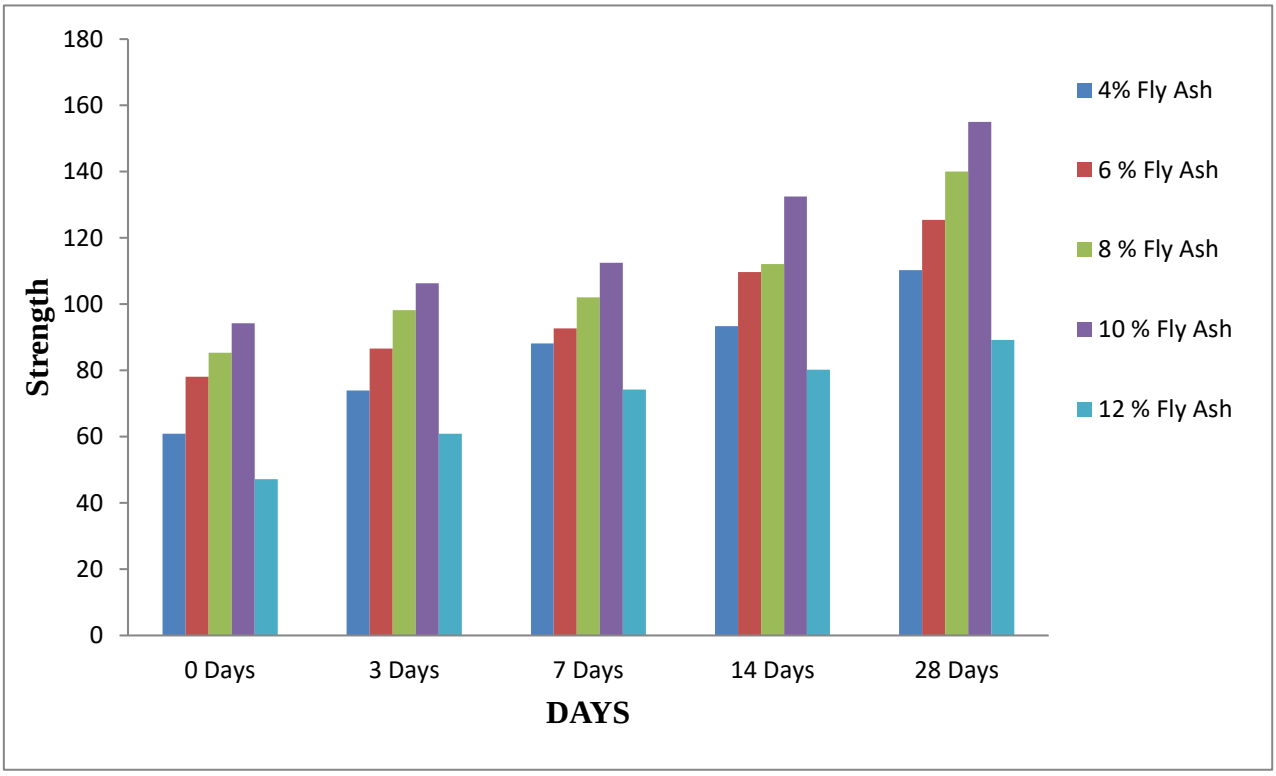

Fig. 3.3.1 Strength Variations based on number of days (Fly Ash)

The ultimate compressive strength of soil + fly ash is increased than ordinary soil.

The ultimate compressive strength has increased from 4 % to 10% of fly ash when compared with 12 % of additive. 10% additive has high compressive strength.

Table 3.3.2 Strength Characteristics of Fly Ash

S.NO	% OF ADMIXTURE	0 DAYS	3 DAYS	7 DAYS	14 DAYS	28 DAYS
1	4	72.1	82.4	98.6	101.0	110.2
2	6	90.2	102.2	112.5	139	157.1
3	8	112.5	132.5	155	189.2	225
4	10	56.6	72.6	89.2	100.8	121.5

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:02/Conference:01/July -2020 www.irjmets.com
International Conference on Recent Trends in Engineering and Technology-2020 (ICRTET)
Organized by VSM College of Engineering, Ramachandrapuram, Andra Pradesh

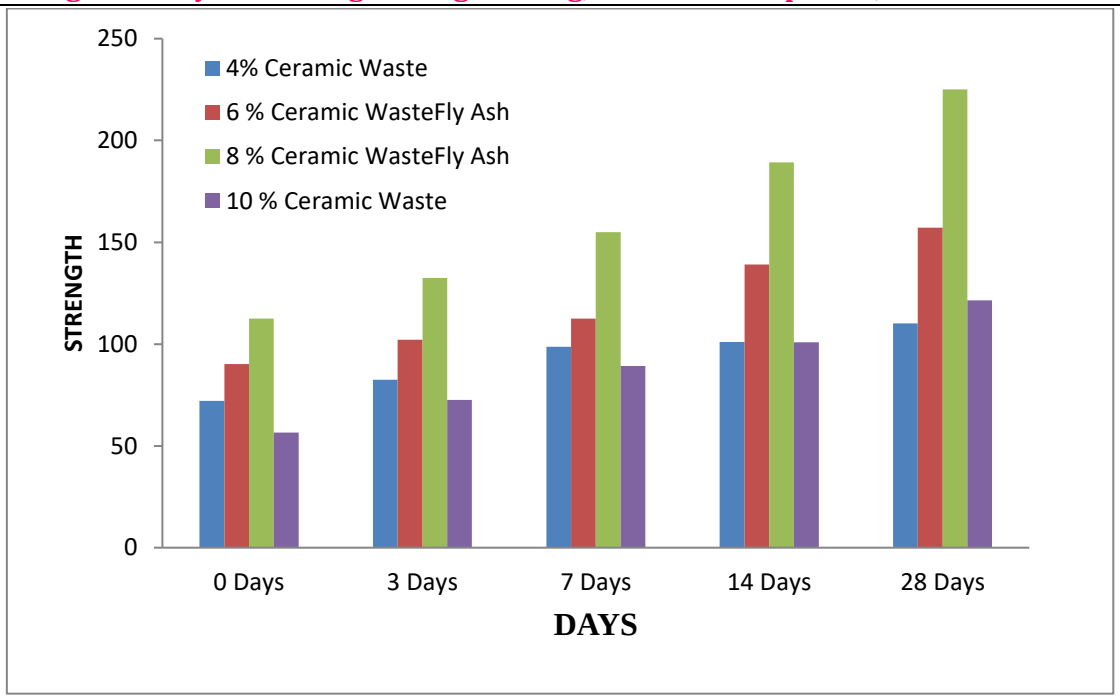

Fig. 3.3.2 Strength Variations based on number of days (Ceramic Waste)

The ultimate compressive strength of soil + Ceramic waste is increased than ordinary soil.

The ultimate compressive strength has increased from 4% to 8% of ceramic waste when compared with 10% of additive. 8% additive has high compressive strength.

IV. CONCLUSION

1. The strength of soil goes on increasing up to 10% by weight of fly ash.
2. The strength of soil goes on increasing up to 8% by weight of ceramic waste.
3. The maximum dry density is maximum for 8% of ceramic waste than of the fly ash. The unconfined compressive strength of soil also shows its peak value at that percentage only.
4. The fly ash shows a decrease in strength, maximum dry density at 12 % of the addition of admixture.
5. The ceramic waste shows a decrease in strength, maximum dry density at 10% of the addition of additive.

V. REFERENCE

[1] IS 2720: Part 10: 1991 Methods of test for soils –Part 10: Determination of Unconfined compressive strength.

[2] IS 2720: Part 3: Sec 2:1980 Methods of Test for Soils –Part III: Determination of Specific Gravity –Section 2: Fine, Medium and coarse Grained Soils.

[3] IS 2720: Part 4: 1985 Methods of test for soils –Part 4: Grain sieve analysis.

[4] IS 2720: Part 5: 1985 Methods of test for soils –Part 5: Determination of liquid limit and plastic limit.

[5] IS 2720: Part 8: 1983 Methods of test for soils –Part 8: Determination of water content -dry density relation using heavy compaction.

[6] K. Saroja Rani, P.V.V. Satyanarayana, Prediction of Collapsible Behaviour of Red Soils, International Journal of Engineering Research and Application ISSN: 2248-9622, Vol. 9, Issue 1 (series -I) Jan 2019, pp 07-12.

[7] Meckechnie, W.R (1989): "General report of discussion on collapsible soils." Session 7 proceedings, 12thInternational conference on soil Mechanics and Foundation Engineering, Rio de Janeiro, Balkema.

[8] Miller, G.A., Muraleetharan, K.K., and Lim, Y.Y. (2001). "Wetting-induced settlement of compacted –fill embankments." Transportation Research Record, 1755, 111 –118.

[9] Rollins, K. M., and Rogers, G.W. (1994).Mitigation measures for small structures on collapsible alluvial soils. Journal of Geotechnical Engineering, Vol. 120(No. 9), 1533–1553.