

Use Of Pet And Condor Ss In Black Cotton Soil For Density And Compressive Strength

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Abstract -

This study involves Use of PET and Plastic and their effect on black cotton soil due to some harmful impact of such waste create pollution. So need to take lead to use of such waste in large quantity to create healthy environment. Use of such raw material in alteration of Soil properties helps to minimize their impact. This study involve in changing of soil properties. Use of waste plastic in the form of strips is a profitable method, cheaply accessible material and found suitable.

Keywords: OMC, MDD, PET, Condor SS, CBR.

1. INTRODUCTION

Soil is a complex material produced by the weathering action of the solid rock. The formation of the soil is a geologic cycle continually taking place on the surface of the earth. Process consists of weathering, transportation, deposition and again followed by weathering, and so on. Weathering is occur due to physical agencies such as a temperature changes, action of flowing water, and wind and plants and animals. Physical disintegration of rocks plays important role in formation of cohesionless soils. Some of the portion of India such as Central India and South India are basically covered with Black Cotton soils. These soils are residual deposits formed from basalt or trap rocks. Black cotton soils consist clays of high plasticity, due to greater percentage of the montmorillonite mineral, and soil becomes unstable, high shrinkage and swelling characteristics, and makes it highly compressible and cause to very low bearing capacity. It is difficult to task to work with this soil, as do not possess sufficient strength to withstand with loads imposed upon them either during construction or during the service life of the structure. For better performance of structures constructed on such soils, soils need to be improved with suitable means.

2. RELATED WORK

It is seen that many research were conducted on Black cotton soil, some of the work as fallows

2.1. PET based:

Babu G.L. Shivkumar [1]: conducted work by adding polyethylene fiber as reinforcement for consolidated undrained test and conclude that strength of soil get increase due increase in friction between soil and plastic fiber.

Dr. Ravi Kumar Sharma, et.al. [2] During the compaction test with Plastic Strips increase slightly MDD at 0.3% of plastic content, and thereafter reduced the Dry Density. For CBR test, un-soaked and soaked cases it is observed that the Value of CBR with plastic strips initially increases and then decreases. Addition 0.3% plastic strips maximum value of CBR obtained.

ArpanLaskar and Sujit Kumar Pal [3] MDD decreases with increasing fiber content for plastic mix soil, OMC 17.10% which is independent of amount of fibers. Compression Index (Cc) and coefficient of volume change (Mv) of soil decreases upto 0.50% with increase of plastic fibers in soil.

PragyanBhattarai, et.al.[4] Concluded that, CBR at AR 4 and 0.5% plastic strips decreases whereas in AR 3 and 0.5% plastic strips it had increased. When aspect ratio increase then strength parameter also increase but use of more aspect ratio also decreases the CBR. Use of plastic strips can be in right proportion.

Mercy Joseph Powethet. al.[5] has performed no. of test and conclude that the Maximum dry density is obtained when 0.25% plastic was added in to the soil and OMC corresponding to 0.25% is less than that of soil without plastic. CBR decreases when 0.5% of plastic is added. It is increased when 0.75% of plastic is added. The shear stress is maximum when 0.25% of plastic is added.

G. Shravani, et.al. [6] Increase in OMC and decrease in MDD with increase in % of plastic, for UCS value decreases with increase in % of plastic, maximum CBR value obtained at 0.5% of plastic in soil.

2.2 Liquid Based:

Babu G.L. Shivkumar[5]: Use condorSS as soil stabilizer at Bagalkot District Karnataka and obtained great result with use of CSS.

3. METHODOLOGY

3.1 General:

The whole work is under following groups

- 1) Soil only 2)PET varying with percentage 0, 0.25, 0.5, and 0.75. With soil.
- 3) Soil + Condor SS (1%) 4)PET varying with percentage of 0, 0.25, 0.5, and 0.75 with 1% Condor SS with PET

3.2 Material:

3.2.1 Soil: Soil sample was obtained from Village Sonaj, Tal- Malegaon Dist: Nashik (MH). Some points of location black cotton soil occurs upto 2m depth, which is expensive and having ability to hold water for long duration. It is found that decreases its resistance in swelling and shrink condition, due development of tensile stresses in it and leads towards failure, hence such soil is not suitable for construction activity and need to treat it by suitable means.

Table I- Properties of B.C.

Sr. No.	Properties	Black Cotton Soil	IS Classification
1	S.G.	2.6	IS 2720 Part 3
2	LL	53.10	IS 2720 Part 4
3	PL	29.10	---
4	IS Classification	CH	---

3.2.2 Plastic:

Water bottles were collected from various hotels of nearby area, converted into strips of required Aspect ratio of 1:1, 1:2, 1:3. Use 0.25, 0.50, and 0.75 percent for experimentation.



Fig. 1 Waste Plastic Bottles

Table II -Properties of PET

Sr. No.	Properties	Unit
1	Young's Modulus	2850 – 3150 Mpa
2	Elastic Limit	50-150%
3	Tensile Strength	50-80Mpa
4	Density	1.36 g/cm ³

3.2.3. Aeonian Earth Solution (Condor SS) :

Obtained from Aeonian Earth Solution Mumbai, having potential to neutralize the soil to balance state and having ability absorb less water and increase its resistance against load. Its value in percentage is constant with 1% by dry weight of soil.

3.3 Test:

For experiment with properties of black cotton soil, soil samples were tested for Modified Proctor Test and UCS with variation with percentage of waste plastic and plastic with Aeonian Earth Solution (Condor SS).

4. RESULT AND CONCLUSION

From the above study following results were obtained as follows:

MDD and OMC: OMC and MDD were conducted with 0.25%,0.5%,0.75% with and without CSS.

Table III- OMC and MDD of B.C. without Condor SS.

Sr. No.	Length of Strip	Percentage of Strips (0%)		Percentage of Strips (0.25%)		Percentage of Strips (0.50%)		Percentage of Strips (0.75%)	
		OMC (%)	MDD (kg/cm ²)	OMC (%)	MDD (kg/cm ²)	OMC (%)	MDD (kg/cm ²)	OMC (%)	MDD (kg/cm ²)
1	10 mm x 10mm	19.20	1.62	18.70	1.65	18.15	1.69	16.38	1.67
2	10 mm x 10mm			16.50	1.68	16.23	1.72	15.76	1.70
3	10 mm x 10mm			15.86	1.63	15.23	1.68	15.08	1.66

Table IV- OMC and MDD of B.C. with Condor SS.

Sr. No.	Length of Strip	Percentage of Strips (0%)		Percentage of Strips (0.25%)		Percentage of Strips (0.50%)		Percentage of Strips (0.75%)	
		OMC (%)	MDD (kg/cm ²)	OMC (%)	MDD (kg/cm ²)	OMC (%)	MDD (kg/cm ²)	OMC (%)	MDD (kg/cm ²)
1	10 mm x 10mm	15.42	1.64	15.79	1.67	14.61	1.72	14.17	1.70
2	10 mm x 10mm			14.18	1.71	13.63	1.74	13.62	1.73
3	10 mm x 10mm			13.98	1.69	12.54	1.73	12.32	1.71

From the above experimental calculation it is concluded that, A.R. 2 with 0.50% have maximum value of OMC and MDD for both the cases of with or without Condor SS, above table shows the maximum value of MDD 1.72 without Condor SS and the value get increases upto 1.74 with the help of Condor SS. From the study it is observed that the Principal of Condor SS to Neutralized the soil by ionization get works and increases the MDD with decreasing water content.

UCS: UCS was conducted for 0, 7, and 28 days.

Table V- UCS without Condor SS

For UCS Value for untreated soil with CSS (0 Days)

Sr. No.	Plain Soil	Percentage of Strips	UCS value of reinforced soil without CSS		
			Size of Strips		
			10 mm x 10mm	10mm x 20mm	10mm x 30mm
1	2.152	0.25%	2.41	3.25	2.56
2		0.50%	2.72	3.72	2.96
3		0.75%	2.64	3.65	2.84

Table VI- UCS without Condor SS

For UCS Value for untreated soil with CSS (7 Days)

Sr. No.	Plain Soil	Percentage of Strips	UCS value of reinforced soil without CSS		
			Size of Strips		
			10 mm x 10mm	10mm x 20mm	10mm x 30mm
1	2.4	0.25%	2.68	3.64	2.84
2		0.50%	3.25	4.62	3.32
3		0.75%	3.1	4.46	3.2

Table VII- UCS without Condor SS

For UCS Value for untreated soil with CSS (28 Days)

Sr. No.	Plain Soil	Percentage of Strips	UCS value of reinforced soil without CSS		
			Size of Strips		
			10 mm x 10mm	10mm x 20mm	10mm x 30mm
1	3.05	0.25%	3.56	3.73	3.29
2		0.50%	4.14	4.95	3.73
3		0.75%	4.0	4.6	3.63

Table VIII- Results for UCS with Condor SS

For UCS Value for treated soil with CSS (0 Days)

Sr. No.	Plain Soil	Percentage of Strips	UCS value of reinforced soil with CSS		
			Size of Strips		
			10 mm x 10mm	10mm x20mm	10mm x 30mm
1	2.50	0.25%	2.65	3.48	2.72
2		0.50%	2.93	4.01	3.26
3		0.75%	2.87	3.96	3.15

Table IX- Results for UCS with Condor SS

For UCS Value for treated soil with CSS(7 Days)

Sr. No.	Plain Soil	Percentage of Strips	UCS value of reinforced soil with CSS		
			Size of Strips		
			10 mm x 10mm	10mm x20mm	10mm x 30mm
1	2.70	0.25%	2.99	3.92	3.11
2		0.50%	3.41	4.88	3.66
3		0.75%	3.32	4.7	3.51

Table X- Results for UCS with Condor SS

For UCS Value for treated soil with CSS (28 Days)

Sr. No.	Plain Soil	Percentage of Strips	UCS value of reinforced soil with CSS		
			Size of Strips		
			10 mm x 10mm	10mm x20mm	10mm x 30mm
1	3.415	0.25%	3.94	4.235	3.63
2		0.50%	4.51	5.22	4.22
3		0.75%	4.38	4.98	4.11

5. CONCLUSION

From the experimental study it was found that the plastic waste can be effectively used as stabilizer for improving the properties of soil such as Black Cotton soil and which helps to minimize effect of waste.

- Maximum Value of MDD occurs at Aspect Ratio 2 at 0.5% of PET in both cases of test without CSS and with CSS
- OMC get decrease with increase in the % of PET and MDD increase upto 0.5% PET and there after get decreased in both the cases of test without CSS and with CSS.
- The unconfined compressive strength for BC soil is increased due to inclusion of plastic waste strips the strength of the soil is increased up to addition of plastic strips. This reduction in strength due to loss of integrity in soil fibers. It can be conclude that 0.5% of plastic strips optimum % to be used as stabilizing agent for sizes 10 x 10mm, 10 x 20mm and 10mm x 30mm.

REFERENCES

- [1] Babu, G.L. Shivakumar, et.al. *"Strength and Compressibility Response of plastic waste mixed soil"*. Indian Geotechnical Conference-Dec 2010, GEOTrendz, IGS Mumbai and IIT Bombay..
- [2] Dr. Ravi Kumar Sharma, et.al. *"Compaction and subgrade characteristics of clayey soil blended with Beas Sand, Fly Ash and Waste plastic strips"* Journal of Indian Highways June 2013.
- [3] ArpanLaskar and Sujit Kumar Pal, *"Effect of Random Inclusion of waste plastic fibers on engineering behavior's of reinforced soil"*. Proceedings of Indian Geotechnical Conference, 22-24 Dec. 2013, Roorki.
- [4] PragyanBhattarai, et.al. *"Engineering Behaviour of soil reinforced with plastic strips"*. International Journal of Civil, Structural, Environmental and Infrastructure Engineering Research and Development, Vol. 3, 2 June 2013 83-88 .
- [5] Mercy Joseph Poweth, FemeedaMuhammedHaneef, Melvin T Jacob, Remya Krishnan, SheetalRajan, *" Effect of Plastic Granules On The Properties Of Soil"*, International Journal Of Engineering Research And Applications, ISSN: 2248-9622, Vol. 4, Issue 4 (Version 1), April 2014
- [6] G. Sravani, B. Bhargava, K.P. Bharathi, V.B. Silpitha, *" International Journal of Engineering Research- Online ISSN: 2321-7758"*
- [7] G.L. ShivkumarBabu, *"Report of Stabilization of expensive Soil using Condor SS"* for Client Sunil Rastogi, Director Aeonian earth solution (P) Ltd.