EFFECT OF TENSION MEMBERS ON FLY ASH CONTENT

Mrs. Vidyotama Pandit[1], Mr. Chetan Kumar [2], Er. Trimurti Narayan Pandey[3], Er. Amit Choudhary[4],

[1]*PG Scholar, Department of Civil Engineering, Bhagwant University, Ajmer Rajasthan., India*
[2]*PG Scholar, Department of Civil Engineering, Bhagwant University, Ajmer Rajasthan., India*
[3]*PG Scholar, Department of Civil Engineering, Bhagwant University, Ajmer Rajasthan., India*
[4]*Assistant Professor, Department of Civil Engineering,Bhagwant University , Ajmer Rajasthan., India*
[5]*Assistant Professor, Department of Civil Engineering,Bhagwant University , Ajmer Rajasthan., India*

ABSTRACT

The production of fly ash from coal based thermal power production plants creates an abundant problem of disposal. Thus, it has become challenge for civil engineers and environmentalist to overcome the disposal problems. From the ancient time till today the researchers has to came to an extent that one of the best method to overcome this situation is using fly ash as construction material. fly ash is a very fine material which exhibits the puzzolonic characteristics. The effect of reinforcement on stress- strain behavior of fly ash is studied and analyzed experimentally by uniaxial compression test under this paper. The stress strain behavior of sample was studied. It was observed that the inclusion of GI reinforcement increases the peak stress; axial strain at failure. In general, inclusion of reinforcement in fly ash layer can greatly increase the strength, stiffness of fly ash layer thereby comparable strength can be obtained even with decrease of thickness of layer.

Keywords- *Fly Ash, GI Reinforcement, Uni-Axial Compression Test, Shear Strength.*

INTRODUCTION

In current scenario, wastes are the major problem throughout the world. Their collection, execution and disposal is a great challenge for civil engineers and environmentalists. The building material industry is a domain of interest for wastes as researchers have tried to produce new construction materials. Fly ash, residue from coal based thermal power plants, and comprises of fine particles that rise with the flue gases. The reinforced earth is a combination of tensile reinforcements and a frictional back fill soil. Generally, a well graded sand or gravel sand is used as a backfill material as they offer adequate friction and provide good drainage. With the usage of fly ash in the backfill not only the method of construction becomes more economical; the disposal problem of fly ash is also taken care to some extent.

Fly ash has proved very advantageous as a concrete content enabling earlier setting due to its fine grain property and good strength. Attempts are made to study the behavior of fly ash on the tensile members. With the widespread and rapid use of reinforcement in today’s world and introduction to various light materials as content of concrete, it is necessary to study the impact of new materials on the reinforcement and non- reinforced structures. Some of these investigations are given here to provide a reference to existing experimental data on the behavior of reinforced structures.

Fly ash has been using an element for use in concrete since 1915.though, for the first time the use of fly ash in the concrete conducted by Davis et al. (1937), Abdun nur (1961) compile information under the property and uses of fly ash from the literature from 1934 to 1959 including an annotated bibliography. several other extensive review papers on the use of fly ash in concrete published over the years (Synder 1962, Joshi 1979, Berry and Malhotra 1985 and 1987, Swamy 1986)

Before 1980 maximum research on literature of fly ash in concrete, maximum coming from power, chosen as class F puzzolonas in ASTM condition. Before 1960 only class F fly ash was there and then we found the applications of this fly ash, uses and disadvantages of class F fly ash was found. joint tests were conducted by ASTM group -9 (1962) and the study done exclusively on class F fly ash and were account by Minnick (1959) from side to side this period.

Broms (1977) researched the mechanical behavior of geotextile reinforced sand with monotonous grain size using a number of tri axial tests. Holtz et al. (1982) conducted a number of long-term and short-term triaxial tests on dry sand reinforced by woven and nonwoven geotextiles. They also observed the influence of reinforcement on the creep of reinforced samples. Nakai (1992) investigated the stress- strain behavior of reinforced sand using triaxial tests and finite element analysis, a comprehensive set of laboratory unconfined compression tests was carried out on fly ash with and without reinforcement. The stress strain behavior was analyzed by changing geo grid numbers with different locations. The influences of the number of geogrid layers on sample were studied and concluded that the hyperbolic equation (Kondner, 1963) can be used to represent the stress–strain relationship of both unreinforced and reinforced fly ash.

Here all the above investigations studied the effect of geotextile on the behavior of sand; the present investigation contributes for the effect of GI reinforcement on stress-strain behavior on Fly ash. GI reinforcement is used in order to improve the bearing capacity of fly ash for its versatile uses and the stress – strain behavior of the reinforced fly ash is determined. The optimum position and numbers of GI reinforcement distance between the layers of geo grids are determined.

2. METHODOLOGY

2.1 MATERIALS

A) FLY ASH

Fly ash used during the study was according to the ASTM C618 – 15 (Standard specifications for coal fly ash and raw or calcinized pozzolona). Samples were oven dried at 105^0 C and are preserved for future use. Tests like standard proctor test, modified proctor test, direct shear, and Specific gravity are conducted.

B) GALVANIZED IRON SHEETS

Commercially available GI has been used in the present investigation as a reinforcement which having a grid size of 1cm x 1cm.the properties and specifications of the galvanized iron used was according to IS 277 (2003)

2.2 METHOD

As per IS-2720, Standard Proctor test (part-7) and Modified Proctor test (part- 8) was conducted and the relation between Optimum moisture content and dry density was determined. As per IS-2720(part-10) uni-axial compression test (75 mm diameter and 150 mm height) was performed under the strain controlled loading conditions to obtain maximum vertical stress for respective densities, for both unreinforced and reinforced fly ash samples. The stress-strain curves for different layers and position of GI reinforcement are plotted and the peak stress was figured out.

A) STANDARD PROCTOR TEST

Standard proctor test is conducted for cohesive soils like fly ash but we can't get proper result if use for cohesion less soils like gravels because we can't compact properly with hammer because the gravel displaces while compacting. to get higher density, we need to use maximum energy for compaction, for which modified proctor test is adopted.

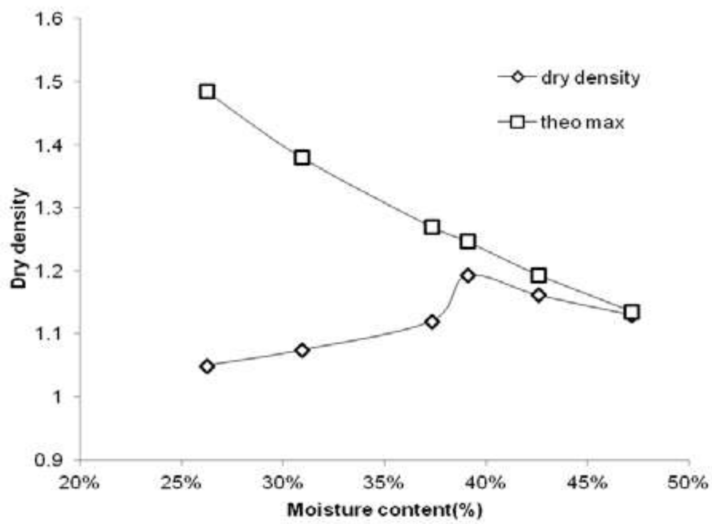

Fig-1 graph between dry density and moisture content using standard proctor test

B) MODIFIED PROCTOR TEST

We have to plot curve by taking water content on x- axis and dry density on y-axis in order to find the maximum dry density by optimum moisture content. optimum moisture content (OMC) can be found using maximum dry density. thus, density is also called as maximum dry density (MDD) and the corresponding moisture content is called as optimum moisture content (OMC).

SR. NO.	DENSITY	WATER CONTENT	DRY DENSITY
1	1.336	16.96	1.1423
2	1.437	20.88	1.1887
3	1.554	25.37	1.239
4	1.72	27.45	1.284
5	1.656	33	1.245

3. RESUTS AND CONCLUSION

3.1 RESULTS

The parameters dry density γ_d and OMC obtained from standard proctor test. Unconfined compression test, was conducted using the obtained OMC and γ_d values, and stress-strain curves obtained. The typical stress-strain curves for unreinforced and reinforced sample with different number of reinforcement and different locations under 80% and 90% 100% OMC have been shown in below figures.

Table 1: stress-strain values for different no have and position of GI reinforcement at 100% OMC using standard proctor values

S. No.	Strain (%)	Area	STRESS					
			No reinforcement	reinforcement in middle	reinforcement in bottom	reinforcement in top	2 Reinforce-ements	3 Reinforce-ements
1	0	4415.63	0	0	0	0	0	0
2	0.033	4417.08	2.96	1.06	1.62	0.42	2.04	4.3
3	0.066	4418.54	5.99	5.36	5.14	3.31	6.34	8.1
4	0.1	4420.05	9.088	7.89	8.59	6.83	10.15	12.19
5	0.1333	4421.52	12.88	11.76	12.25	10.1	14.79	16.83
6	0.1666	4422.99	16.68	15.77	16.34	14.08	19.5	21.05
7	0.2	4424.47	20.13	20.13	20.48	18.23	23.65	25.76
8	0.2333	4425.95	22.65	24.2	24.2	21.59	28.77	30.82
9	0.2466	4426.54	23.88	25.39	25.68	22.86	30.95	33.77
10	0.2666	4427.43	22.8	28.98	28.13	25.6	33.83	35.66
11	0.2866	4428.32	-	32.42	29.04	26.37	37.13	37.69
12	0.3	4428.91	-	30.79	30.3	27.35	37.55	39.51
13	0.3133	4429.5	-	-	29.17	27.69	37.54	38.38
14	0.32	4429.8	-	-	-	28.19	37.26	39.37
15	0.3333	4430.39	-	-	-	27.55	37.18	39.35

Table 2: stress-strain values for different no have and position of GI reinforcement at 100% OMC using modified proctor values

			STRESS					
Sl.	**St rain**	**Area**	**No**	**reinforce**	**reinforce**	**reinforce**	**2**	**3**
No	**(%)**	**(mm^2)**	**reinforc**	**ment in**	**ment in**	**ment in**	**reinfor**	**reinfor**
			ement	**middle**	**bottom**	**top**	**cements**	**cements**
1	0	4415.6	0	0	0	0	0	0
2	1.66	4490.2	1.333	1.48	1.63	1.18	2.073	2.37
3	3.33	4566.3	3.35	3.64	3.49	2.47	4.22	4.37
4	4.5	4623.7	5.465	5.6	5.46	5.034	6.47	6.76
5	6.66	4727.6	8.44	8.15	8.02	8.02	8.86	8.44
6	8.32	4816.3	11.046	10.76	10.63	10.35	11.32	11.18
7	10	4906.3	13.419	13.28	13.15	12.61	13.96	14.23
8	11.66	5111.6	14.701	14.83	14.7	14.71	15.74	15.87
9	13.33	5210.1	15.954	16.08	16.33	15.95	17.87	18.12
10	14.5	5281.4	17.376	17.63	17.62	17.5	20.02	20.15
12	18	5355.6	20.449	21.05	20.44	20.81	23.45	24.06
13	19.66	5499	21.796	22.62	22.38	22.38	24.51	26.04
14	21.66	5636.5	23.95	24.77	24.77	24.68	27.14	28.32
15	23.33	5759.3	25.634	26.44	26.55	26.21	28.87	30.02
16	24.5	5848.5	27.403	28.43	28.54	27.85	30.59	31.95
17	26.66	6020.8	28.496	29.82	29.82	29.93	32.031	33.47
18	28.32	6189.6	29.009	31.16	31.16	31.16	33.41	34.92
19	30	6308	30.572	32.15	32.68	32.89	34.99	36.58
20	31.66	6430.2	31.543	33.51	34.43	34.13	36.19	38.16
21	33.33	6590.4	29.767	34.72	35.52	34.31	37.33	39.55
22	34.5	6741	-	36.01	35.52	34.53	38.57	40.94
23	36.66	6964.7	-	36.76	36.18	31.98	39.43	41.72
24	38.32	7000	-	38.45	34.67	-	41.32	43.6
25	40	7359.3	-	-	-	-	42.02	43.55
26	41.66	7568.7	-	-	-	-	42.96	43.93
27	43.33	7791.8	-	-	-	-	40.54	41.39

3.2 CONCLUSIONS

The effect of variation of moisture content on unconfined compressive strength of varies samples tested are (both standard & modified proctor tests) shown in the above figure concluded that:

1. The reinforcement inclusion increases the peak stress and shear strength of the samples considerably, compared with unreinforced samples and Significant variations are observed on changing the location and numbers of GI reinforcement.

2. effective results are observed when a single reinforcement is placed on the middle compared to other locations whereas, as the numbers of reinforcement are increasing at different places, the strength acquired also increasing, and achieved the constant state.
3. The inclusion of GI reinforcement in middle gives better result compared to others and also with increase in numbers of GI reinforcement.

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