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Comparative Study of Compaction Behaviour of Moorum Flyash & Soil Flyash at Varying Water Content by Standard Proctor Compation Apparatus

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Abstract: ***One of the ways in which highly urbanized cities cope with increasing amounts of municipal solid waste (MSW) generated by the population is incineration. As land is a very preciols commodity&land fills are fast dwindling in most highly urbanized cities. The disposal of the ash generated from MSW incineration poses increasingly difficult problems for the municipalities. A viable solution to the disposal problems would be the reuse of MSW ash for civil engineering applications. A research study of the properties of incineration fly ash derived from MSW incineration indicated that fly ash is a potential source of jet grouting admixture for soil improvement. The fly ash Exhibits a likelihood of pozzolanic reaction due to its chemical composition & physical characteristics. The use of fly ash as an admixture in the stabilized of a soft marine clay resulted in stabilized sample with an improved strength more than 75 times that of the untreated clay. In corporation of fly ash also improved drainage property by at least one order of magnitude & reduced both the plasticity & compression indices by about 69 & 23% respectively. Leachate investigation conducted that chromium was well below the world health organization drinking water limit while nickel &lead leachate concentration diminished to below the acceptable drinking water limits over a period of about 130 &110 days.***

Keywords: Bearing capacity, Fly ash stabilization

1. Introduction of Soil

Soil are vital for the existence of many forms of life that have evolved on over planet. When water moves downward into the soil it causes both mechanical & chemical trans locations of material. The soil fertility is directly influenced by PH through the solubility of many nutrients. At a PH lower than 5.5 many nutrients become very soluble and are readily leached from the soil profile. At high PH nutrients become in soluble and plants cannot readily extract them. Maximum soil fertility occurs in the range 6 to 7.2 soils tend to have distinctvariations in colour both horizontally and vertically. The colouring of soils occurs because of a variety of factors. Soil of the humid tropics is generally red or yellow because of the oxidation of iron or aluminium respectively. In the temperate grass lands, large addition of humus cause coniferous forest soil to be gray. High water table in soil tend to have greenish and gray – blue hues. Organic matter colors the soil black. The combination of iron oxides and organic content gives many soil types a brown color. Other colouring materials sometimes present includer white calcium carbonate, black manganese oxides and black carbon compounds.

1) Use of Waste Materials

Fly ash: -Fly ash can be used in place of soil borrow materials to construct road embankment. The most distinguishing feature of a fly ash embankment would be use of fly ash as core material with earth cover. Intermediate soil layers of thickness 200 to 400 mm are usually provided when height of embankment exceeds 3m. These Intermediate soil layers provide fly ash embankment from erosion due to rain and winds the embankment should be protected by providing earth cover.

2) Fly Ash Stabilization

Sub base course can be constructed using pond ash or bottom ash replacing conventionally used moorum. Laboratory and field studies conducted in India and abroad have established that fly ash can be adopted for stabilization of sub base/ base. Fly ash are cohesion less materials and therefore non- plastic in nature while soil particles are generally cohesive mixing of soil and ash in suitable proportions improves the gradation and plasticity characteristics of the mix there by improving the strength. Fly ahs is one f the residues generated in the combustion of coal.

3) Chemical Composition

Toxic constituents depend upon the specific coal bed make up but may include one or more of the following elements or substances in quantities from trace amount to several percent arsenic, beryllium , boron, cadmium chromium, chromium VI, cobalt, lead, manganese, mercury molybdenum, selenium strontium, thallium and vanadium, along with dioxins and PAH compounds. In the past fly ash was generally released in to the atmosphere but pollution but control equipment mandated in recent decades now requires that it be captured prior to release.

4) Basic of Soils

Soil is usually composed of three phases solid ,liquid &gas . The mechanical properties of soil depend directly on the interactions of these phases with each other &with applied potentials i.e. stress ,hydraulic head, electrical potential & temperature difference .

The solid phase of soil contains various amounts of crystalline clay & nonclay minerals non crystalline clay material, organic matter &precipitated salts. These minerals are commonly formed by atoms of elements such as oxygen, silicon, hydrogen &aluminium, organized in various

crystalline forms. These elements along with calcium, sodium, potassium magnesium & carbon comprise over 99% of the solid mass of soils.

5) Bearing Capacity

The bearing capacity of soils is the average contact stress between a foundation of structure. The soil which will cause shear failure in the soil. Allowable bearing stress is the bearing capacity divided by a factor of safety. Sometimes loaded foundation without actual shear failure occurring in such cases, the allowable bearing stress is determined with regard to the maximum allowable settlement. Three modes of failure are possible in soil general shear failure, local shear failure &punching shear failure.

2. Discussion

In the road construction sector the world is facing a major problem of scarcity of conventional construction materials. On the other hand, there are some materials which are lying as waste. Some waste products i.e. fly ash can be utilized as an additive to conventional construction materials. In this study, reinforcement fly ash was tried as sub base material. The influence of various reinforced fly ash parameters was planned to be investigated through static &dynamic load tests and semis field tests. It was planned to observe the effect of polypropylene fibre reinforcement on conventional parameters of fly ash such as unconfined compressive strength modulus of elasticity shear strength & California bearing ratio. The effect of reinforcement &confinements on permanent strain, resilient strain & resilient modulus of fly ash where also studied. Tests are carried out to study the effect of reinforcement on rut depth formation on a modal section with simulation of field condition. Based suitable in sub base if it is reinforced with polypropylene fibre.

Methodology of Compaction

In this initially soil sample is taken &passed through 4.75 mm Sieve & than the passed material is taken into the oven for 24hours to get maturity after 24hours the sample is taken outside & allow coming in normal temp. Then the mould are cleaned &fix the base. Then the collar is attached to the mould, making sure that the inside portion of the mould may be greased thoroughly. Then the soil is mix in required proportion thoroughly with additive to total of 3kg samples &thus started compacting in 3 layer with each layer is being given 25 blow from the rammer weighing 2.6kg dropping from a height of 310mm.

Description:-SOIL +25%FLY ASH

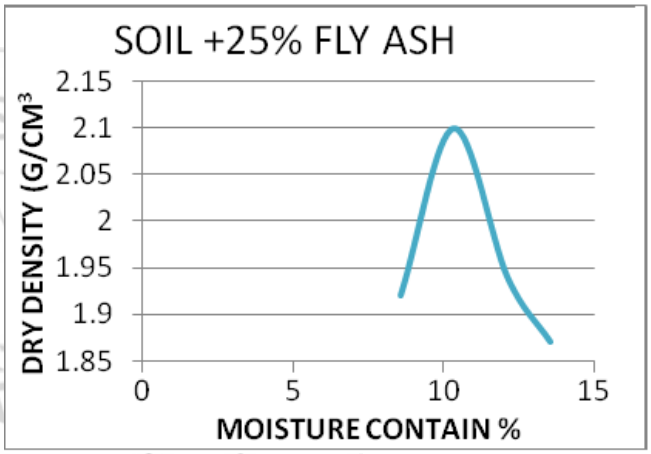
Table 1: Density Determination

Sample no	1	2	3	4
Water added	8%	10%	12%	14%
Wt. of moist soil +mould g.	4477	4576	4567	4514
Wt. of mould g.	2394	2394	2394	2394
Wt. of moist soil g.	2083	2182	2173	2120
Volume of mould cm^3	1000	1000	1000	1000
Wet density g/cm^3	2.083	2.182	2.173	2.12
Dry density g/cm^3	1.92	2.10	1.94	1.87

Moisture Determination

Sample no.	1	2	3	4
Moisture can no.	70	86	44	43
Wt. of can +Wet soil g.	29.49	40.81	57.05	56.86
Wet of can +Dry soil g.	28.35	38.60	53.7	52.86
Wet of water g.	1.14	2.21	3.35	4.00
Wet of can g.	15	17.25	26.06	23.32
Wet of dry soil g.	13.27	21.35	27.64	29.54
Water contain %	8.60	10.35	12.12	13.54

Diameter of mould	100
Wt. of rammer kg	2.6
Height of fall mm	310
No. of blows	25
No. of layers	3
OMC	10.35
MDD (g/cc)	2.10



Remarks:-Starting from 8% water content the graph of MDD increases upto 10% water content then it started decreasing so the maximum value of MDD attained at 10% water content is 2.10 gm/cc^3

Description: SOIL +40%FLY ASH

Density determination

Sample no	1	2	3	4	5
Water added	10%	12%	14%	16%	18%
Wt. of moist soil +mould g.	4364	4383	4452	4448	4413
Wt. of mould g.	2394	2394	2394	2394	2394
Wt. of moist soil g.	1870	1989	2058	2054	2019
Volume of mould cm^3	1000	1000	1000	1000	1000
Wet density g/cm^3	1.870	1.989	2.058	2.054	2.019
Dry density g/cm^3	1.71	1.80	1.81	1.80	1.73

Moisture Determination

Sample no.	1	2	3	4	5
Moisture can no.	65	62	25	15	66
Wt. of can +Wet soil g.	38.79	47.58	54.27	54.24	33.06
Wet of can +Dry soil g.	37.13	44.90	50.63	50.29	30.49
Wet of water g.	1.66	2.68	3.64	3.95	2.57
Wet of can g.	19.84	21.87	23.99	24.02	15.28
Wet of dry soil g.	17.29	23.03	26.64	26.27	15.21
Water contain %	9.6	11.64	13.70	15.04	17.00

Remarks:-Starting from 10% water content the graph of MDD increase upto 14% water content then it started

decreasing so the maximum value of MDD attained at 14% water content is 1.81 gm/cc^3.

Diameter of mould	100
Wt. of rammer kg	2.6
Height of fall mm	310
No. of blows	25
No. of layers	3
OMC	13.7
MDD (g/cc)	1.81

Description:-Morrum +25% fly ash

Density Determination

Sample no	1	2	3	4	5
Water added	8%	10%	12%	14%	16%
Wt. of moist soil +mould g.	4369	4511	4585	4547	4507
Wt. of mould g.	2394	2394	2394	2394	2394
Wt. of moist soil g.	1975	2117	2191	2153	2113
Volume of mould cm^3	1000	1000	1000	1000	1000
Wet density g/cm^3	1.975	2.117	2.191	2.153	2.113
Dry density g/cm^3	1.80	1.90	1.94	1.90	1.82

Diameter of mould	100
Wt. of rammer kg	2.6
Height of fall mm	310
No. of blows	25
No. of layers	3
OMC	13.16
MDD (g/cc)	1.94

Moisture Determination

Sample no.	1	2	3	4	5
Moisture can no.	22	16	8	86	35
Wt. of can +Wet soil g.	55.08	32.21	43.14	42.91	54.87
Wet of can +Dry soil g.	52.24	30.21	40.50	39.49	50.32
Wet of water g.	2.84	2.00	2.64	3.42	4.55
Wet of can g.	21.72	13.13	20.45	17.27	21.81
Wet of dry soil g.	30.52	17.08	20.05	22.22	28.51
Water contain %	9.30	11.70	13.16	15.39	15.95

Remarks : - Starting from 8% water content the graph of MDD increasing upto 12% water content then it started decreasing so the maximum value of MDD attained at 12% water content is 1.94 gm/cc^3.

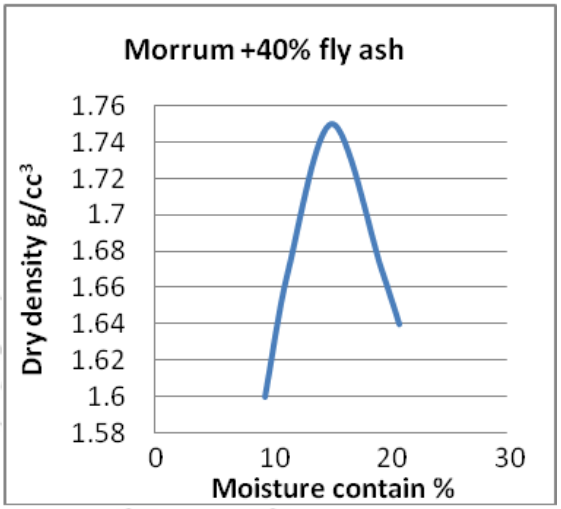
Description:-Morrum +40% fly ash

Density Determination

Sample no	1	2	3	4	5
Water added	8%	10%	12%	14%	16%
Wt. of moist soil +mould g.	4149	4264	4412	4392	4370
Wt. of mould g.	2394	2394	2394	2394	2394
Wt. of moist soil g.	1755	1870	2018	1998	1976
Volume of mould cm^3	1000	1000	1000	1000	1000
Wet density g/cm^3	1.755	1.870	2.018	1.998	1.976
Dry density g/cm^3	1.60	1.67	1.75	1.67	1.64

Moisture Determination

Sample no.	*1*	*2*	*3*	*4*	*5*
Moisture can no.	43	14	15	78	72
Wt. of can +Wet soil g.	58.77	60.17	58.08	39.81	53.19
Wet of can +Dry soil g.	55.97	56.44	53.63	35.85	47.56
Wet of water g.	2.8	3.73	4.45	3.96	5.63
Wet of can g.	25.97	23.50	24.03	15.28	20.45
Wet of dry soil g.	30.00	32.94	29.60	20.57	27.11
Water contain %	9.33	11.32	15.03	19.25	20.76



3. Remarks

Starting from 8% water content the graph of MDD increasing upto 12% water content then it started decreasing so the maximum value of MDD attained at 12% water content is 1.74 gm/cc^3.

4. Conclusion

In this study the thesis is doneat various fly ash percentage when fly ash is mix with soil it give a lower value than mix with moorum. The maximum value of MDD in case of soil fly ash &moorum fly ash is achieved at 4% but as far as graph suggest soil fly ash shows a parabolic & sharp graph indicating sustainability of material upto 25% fly ash addition then started failure but in case of moorum fly ash its graph suggest that it started crumbling at right from very initial stage to final stage at it show a hazardous type of curve although the value of MDD in both the cases is almost same but the graph suggest the soil fly ash is more suitable in compaction than moorum fly ash at varying water content. So finally it is found that compaction behavior of soil fly ash is better than the moorum fly ash at various water content.

5. Scope for Further Study

In this study the whole and sole concentration was made on only the dry density of the admixture the other parameter variation such as California bearing ratio test the value of co-efficient can be further studied. Diff. admixture such as lime sand cement , iron chips, rice husk, ash can be mixed with soil and moorum fly ash admixture can to be mixed with soil and moorum fly ash admixture.

In this study we emphasis on the behavior of mix at varying water percentage but in further study it can be done at varying water temperature.

As far as this study is done to find compaction behavior but this can be carried out for further study with the help of tri axial and slope stability analysis for finding the suitable embankment.

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