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STABLISATION OF SOIL USING CEMENT AND BRICK KILN DUST

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ABSTRACT

The Clay Soil is Known as cohesive soil many time locally available soil properties does not match with the desired standard due to which improvement in soil properties are required the improvement of such engineering properties or the desired standard of properties can be conveyed by the stablisation of weak soil with brick kiln dust or brick powder soil stablisation is process to treat a soil to maintain after or improve the performance of soil as a construction material in this present paper different research result is been reviwed to analysis the effect of brick kiln dust or brick powder stabliser on soil properties this proper throw light on the suitability of waste brick kiln dust as soil stabliser for use in pavement the role of brick kiln powder in improving the characterstics of expansive subgrade material and then subbase is analyzed the amount of cost saving for soil when it stabilized with brick kiln waste initially the physical properties of clay brick kiln dust and red soil have been studies by cconducting wet sieveanalysis,liguidlimit,plasticlimit,then for the purpose of determining the strength of virgin and stabilizer material,California bearing ratio test have been conducted.

Keywords; Soil Stablisation, Brick kiln dust, Cement, Soil, Strength, UCS test

I. INTRODUCTION

The engineering properties of soil are depends upon the many points like minerals,watertable,soil water behavoiuretc.which vary as per area to area due to which we can't get desire propertiers suitable to our needs of construction to resolve this problem we have technique called stablisation which means to stable or to modify or to improve the soil properties in positive matter.so we have can a construction works which fulfill our needs and objectives

II. STABLISATION

Soil Stablisation is a technique or method its aimed at increasing or maintaining the stability of soil mass and chemical alteration of soil to enhance their engineering propereties Stablisation allows for establishement of design additives and admixture rate to used in order to achieve stablisation process can include higher resistance value,reduction in plasticity ,lower permeability, reduction of pavement thickness, elimination of excavation material hauling and holding Soil stablisation is done by various method by adding flyash, rise husk ash, chemical fibres adding lime, by different geo material like geo synthetic, geo grid and geoform, bricksurkhi, soil stablisation allows engineer to distribute a large loads with less material over a longer life cycles.

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II. ADVANTAGE OF SOIL STABLISATION

1) Stabilized soil functions as a working platfoem for the project.
2) Stablization water profs the soil.
3) Stablisation improve soil strength.
4) Stablisation helps reduce soil volume change due to temperature oe moisture.
5) Stablisation improve soil workability.
6) Stablisation reduce dust in work environment
7) Stablisation upgrade marginal materials.
8) Stablisation improve durability.
9) Stablisation dries wet soil.
10) Stablisation conserves aggregate materials.
11) Stablisation reduce cost

III. PROPERTIES OF CLAY SOIL

Though different soil have a wide range of colos,texture and other distinguishing features there are only three type soil particles that geologist consider distinct the quality of soil depends on the amount of sand,loam and clay that its contains because soil with differing characterstics soil with a large amount of clay is sometimes hard to wwwork with due to some of clay chacterstics.

1) **PARTICLE SIZE:** clay has the smalleastpaticle size of any soil type

2) **STRUCTURE:** Because of the small particle size of clay soil,the structure of clay heavy soil tends to be very dense.

3) **PERMEABILITY AND WATER HOLDING CAPACITY:** With clay soil is its slow permeability resulting in a very large water holding capacity because the soil particles are small and close together.

4) **IDENTIFYING CLAY;** There are several test can use to identify clay soil if rubbed between your figure a sample of clay soil often feel stick and may stick to your finger or leave streaks on your skin.

IV. LITERATURE REVIEW

Cement contains calcium required for the pozzolanic reactions to occur.further cement already contains silica thus stablisation with cement is fairly independent of soil properties.the only thing required is water for hydration process to begin and attribute to the improvement of strength and compressibility characterstics of soil. It has long history of use as an engineering material and has been successfully employed in geotechnical applications. MukeshA.patel,H.Spatel research scholar ganpat university mehsandgujratindia associated professor departed of applied mechanics his work include peterlogicalstidies and scaining electron microscope analysis ismail 2017 treated and stabilized these ametrial related to road construction using brick surkhi 20% and brick/soil 3/100 he determine consistency limit compaction properties and shear uniaxial strength The cohesion and the friction angle of the imoroved material increased for all the treared mixture.

Roobhakshan and kalantari(2013) conducted consistency limit,standard compaction test,unconfined compressive test and CBR test and concluded that there is remarkable influence on strength and CBR value at 1% cement+6% brick kiln dust for CBR and 7% cement+6% brick kiln dust for UCS which as optimum percentage

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Sabat(2012) Conducted series of test and concluded that addition of brick dust decrease liguid limit, plastic limit, plasticity index, optimum moisture content, maximum dry density, angle of internal friction of expansive soil.

Al aboon &mahasneh, (2009) the use brick dust as significant effect on the compressive strength while it has sharp effect on slump values.

Misra et al,(2008) the auther using brick dust in soil stablisation production of tiles,mortars and self compacting concretre

Kowalski et al (7) Portland cement is hydraulic cement made by heating lime stone and clay mixture in a kiln and pulverizing the resulting material which can be used either to ,modify or to improve the quality of tesoil or to transform the soil into a cemented mass with increased strength and durability.the amount of cement used will depend upon whether the soil is to be modified opr stabilized.

Kent Newman and jebs.tingle[5] in their study of previous research efforts.Portland cement was used as the stabilizer control for comparison of properties to the polymers and was used at concentration of 2.75%,6% and 9%.

Previous research work have shown that the addition of inert material (sand) to swelling soil can be a method of soil.

BahaiLouafi and Ramdanebahar[1] in their experimental work have study the effect of performance of an addition of sand as stabilizer on swelling soil. Based on the study undertaken, they found that the addition of sand reduces consistency limits. They have also worked on introducing sand layer into two different configuration and found that these layers effectively reduse the swelling of soil.

A) COMPONENT MATERIAL:

Component material were.

- Soil
- Brick surkhi or brick kiln dust
- Cement

The clayey soil used for the study was collected from sahabad in kurukshetra district clay soils are inorganic clays of medium to high compressibility and form a major soil group in india they are characterized by high shrinkage and swelling properties the clayey soil have been challenge to the civil engineer the clayey soil is very hard when dry but losssits strength completely when in wet condition rich proportion of montmorllionite is found in clayey soil form minerlogical analysis high percentage of monomorllionite render high degree of expansiveness this property result cracks in soil without any warming these cracks may sometimes extent to serves limits.

So building to be found on this soil may suffer serve damage with change of atomospheric conditions.

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Table:-4.1 Properties of Soil

S.NO	Parameter	Result
1.	I.S Classification	Cl
2.	Liquid Limit	40.62
3.	Plastic Limit	33.3
4.	Plastic Index	7.32
5.	Specific Gravity	2.65

MIXING PROPORTIONS:-

Clayey soil,bricksurkhi and cement is to be mixed thoroughly to have a uniform and homogenous mixture.sample will be prepared using different combinations of brick surkhi and parent soil and different test will be conducted on the prepared samples and result will be compared with originals clay sample

Sample 1:

Clayey soil =100%

Sample 2:

Clayey soil =92%

Brick surkhi =5%

Cement =3%

Sample 3:

Clayey soil =85%

Brick surkhi =10%

Cement =5%

Sample 4:

Clayey soil = 75%

Brick surkhi= 15%

Cement = 10%

PROPERTY	IS CODE 8112-1989
Specific Gravity	3.05
Consistency limit	26.75
Intial Setting Time	30 mintue
Final setting Time	10 hours

Table:-4.2 Physical Properties Of Cement

Properties	Value
Moisture Content(%)	4.2
Specific Gravity (unit)	2.6
Fineness Modulus	2.11
Bulk Modulus(kg/$m^{3)}$	
Loose	1181.8
Compacted	1370.8

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Table:-4.3 Physical Properties Of Brick Kiln Dust

V. EXPERIMENTAL PROGRAMME

5.1 Objectives

- To stabilize and study the behaviours of tge soil using Brick kiln dust (Brick industry waste) and Ordinary Portland cement
- To add the brick kiln dust with clay soil 5%,10%,15% by weight and cement 3%,5%,10% at an interval of 5%
- To treat the soil with a low cost material or industrial waste materials.

5.2 Experiment Details

The following soil properties were studied by using various percentage of brick kiln dust and cement

- Liquid Limit
- Plastic Limit
- Proctor Compaction Test
- Unconfined Compressive Strength

5.3 Experimental Results

5.3.1 Atterberg's Limits

Sr.No	Proportion	Value
1	Parent Soil	L.L=40.62%, P.L=33.3,PI=7.32
2	Parent Soil With 5%BKD and 3% OPC	L.L=34.06%, P.L=31.66,PI=2.4
3	Parent Soil With 10% BKD and5%OPC	L.L=31.44%, P.L=30.55,PI=0.8
4	Parent Soil With 15% BKD and10%OPC	L.L=30.90%, P.L=30.0,PI=0.90

Table-5.1

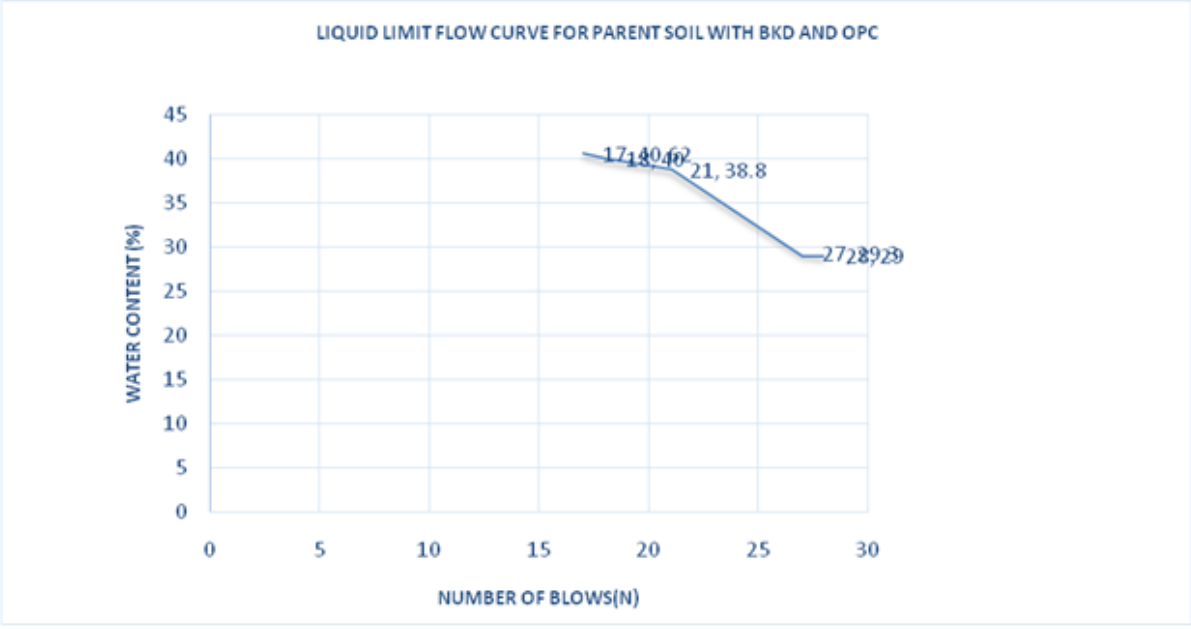

Fig-1

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5.3.2 Compaction Test (Proctor Test)

Sr.No.	Proportions	Value
1	Parent Soil	OMC=22.685%,MDD=1.737g/cc
2	Parent Soil with 5% BKD and 3% OPC	OMC=18.79%,MDD=1.702g/cc
3	Parent Soil with 10% BKD and 5% OPC	OMC=10.05%,MDD=1.780g/cc
4	Parent Soil with 15% BKD and 10% OPC	OMC=19.78%,MDD=1.094g/cc

Table-5.2

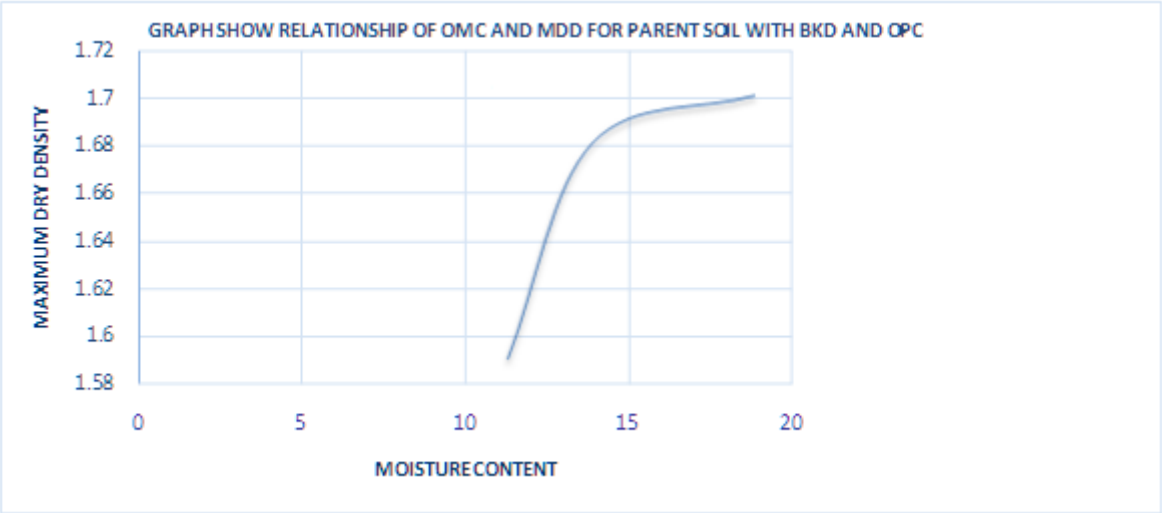

FIG-2

5.3.3 Unconfined Compressive Strength Test

Sr.No.	Proportions	Value
1	Parent Soil	UCS=1207 N/mm^2
2	Parent Soil with 5% BKD and 3% OPC	UCS=1377 N/mm^2
3	Parent Soil with 10% BKD and 5% OPC	UCS=1440 N/mm^2
4	Parent Soil with 15% BKD and 10% OPC	UCS=1483 N/mm^2

Table-5.3

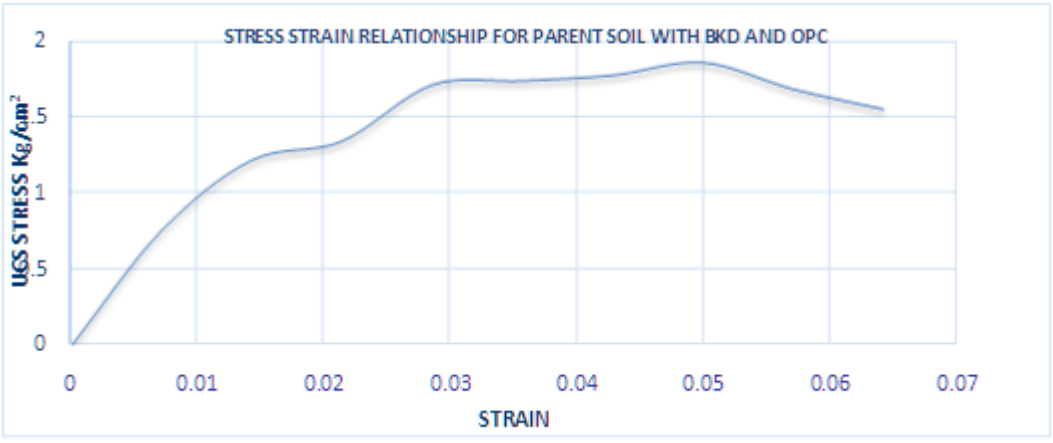

FIG-3

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VI. REVIEW CONCLUSION

From the above literatures we can concluded that by the addition of brick surkhi stabilizers the property of soil can be improved above literaures shows that by addition of different stabilizers the expansiveness ,swelling shrinkage can bereduced of clayey soil effectively.Brick dust has good potential for use in geotechnical applications of soil is a proven method to save money and money and time on construction project.Brick dust creates stablisatiion creates long term chemical change in unstable clay.

1) Brick dust is the potential variable materials to be used as fine aggregate to produced durable concretre.

2) Brick kiln dust resulted in improved MDD and OMC of kalonite clays.

3) Brick kiln dust and ordinary Portland cement decrease the liquid limit of clay soil by increasing the proportions of these materials upto 15%

4) By stabilisation improve the load bearing capacity of soil and to make the soil capable of load

5) There is an improvement over soil properties by increasing percentage of BKD upto 15% is stidied by UCS

6) By increasing the percentage of BKD and OPC its liquid limit may be decrease and achieve the Optimum moisture content correspounding to maximum dry density

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