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STABILIZATION OF SOIL USING CHEMICAL STABILIZER FROM KHAMBHAT REGION

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ABSTRACT:
The role of soil in design and construction of any structure is very crucial. Since the soil is in direct contact with the structure, it is act as a medium of load transfer and hence for any analysis of force acting on the structure, one has to consider the aspects of stress distribution through the soil as ability of structure itself depends upon the soil properties. Geotechnically study of site is crucial at feasibility stage, taking place before the design in order to understand the characteristic of subsoil upon which the structure will stand.
This study investigate the properties of soil sample taken from khambhat region the practical study examine the change in properties of soil after adding chemical admixture ($cacl_2$) to increase and improve the stability of soil and to reduce the cost of construction by making best use of locally available material.

KEYWORDS— Calcium chloride, poor graded soil, index properties, engineering properties

I. INTRODUCTION:

For any land based structure, the foundation is most important and has to be strong to support the entire structure. In order to the foundation to be strong the soil around it plays very critical role. So,

to work with soil, we need to have proper knowledge about their properties and factors which affect their behaviour. The process of soil stabilization helps to achieve proper required properties in a soil needed for the construction work.

Soils are generally stabilized to increase their strength and durability or to prevent erosion and cavitation formation in soil. The main aim is the creation of a soil material or system that will hold under the design used condition and for design life of engineering project. The properties of soil vary a great deal at different places or at certain cases even at one place; the success of soil stabilization is depends upon a soil testing. Various methods are employed to stabilize soil and the method should be verified in laboratory with the soil material before applying it on the field.

Soil stabilization is generally as making major improvements to the engineering properties of the soil characteristic with an additive. These additives may include other soils or materials such as Portland cement, lime, fly ash, asphalt cement, polymers and fibres. Traditionally, additive such as bitumen, cement, and lime have achieved widespread used. Bitumen is typically used as a soil surface treatment to limit dust and losses of fineness. Cement is used to provide strength to soil. Lime is often used in clay soil to control plasticity. The effect of the additives and the optimum amount of additives to be used are dependent mainly on the mineralogical composition of the soils. The project focuses about the various stabilization techniques that are in practise for improving the poor grade soil for reducing its swelling potential and the limitation of the method of stabilization on .modification of soil by chemical admixture $cacl_2$ is a effective method for stabilizing the swell-shrink tendency of expansive soil

II. EXPERIMENTAL INVESTIGATION:

a) Scope of Work

1. Specific Gravity of soil using a pycnometer
2. Sieve Analysis
3. Determination of soil index properties (Atterberg Limits) Liquid limit by cassagrande's apparatus and Plastic Limit
4. Determination of the maximum dry density (MDD) and the corresponding optimum moisture content (OMC) of the soil by Proctor compaction test.
5. Determination of the shear strength by unconfined compressive strength test (UCS).
6. Determine the swelling properties of soil
7. Determine the Shrinkage Limit of soil
8. Field Density Test By core cutter

b) Materials Used

Soil sample location: Near bajrang ground (khambhat region)

Chemicals: Calcium chloride ($cacl_2$)

c) Methodology

Using different proportion (5%,10%,15%)of cacl2 chemical stabilizer to improve the stability of soil and to determine in which proportion best outcomes are there.

d) Experiments Performed

Field Density Test By Core Cutter Method ,Sieve Analysis Test, Specific Gravity Test ,Liquid and plastic Limit Test, Shrinkage test, Swelling Index, Unconfined Test, Proctor Compaction Test

II. RESULTS AND DISCUSSION:

Field bulk density of soil is 20.33kN/M^3

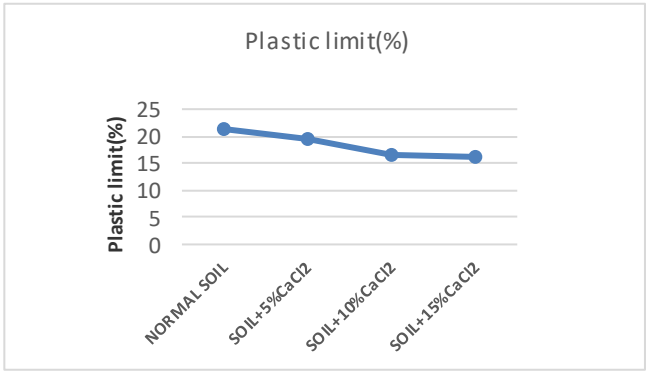
Dry density of soil is 17.53kN/M^3

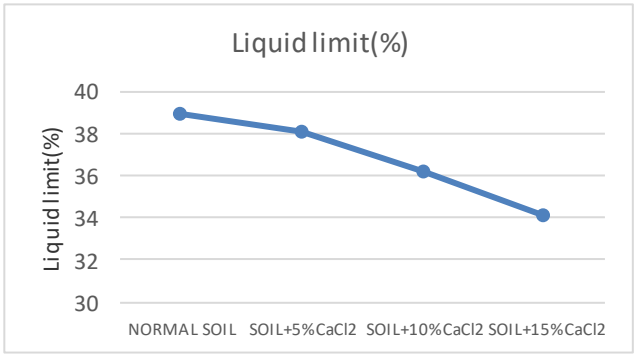
Specific Gravity Sp.G = 2.27

Sieve Analysis: Cu = 12.5, Cc = 0.356 (For Poor Graded)

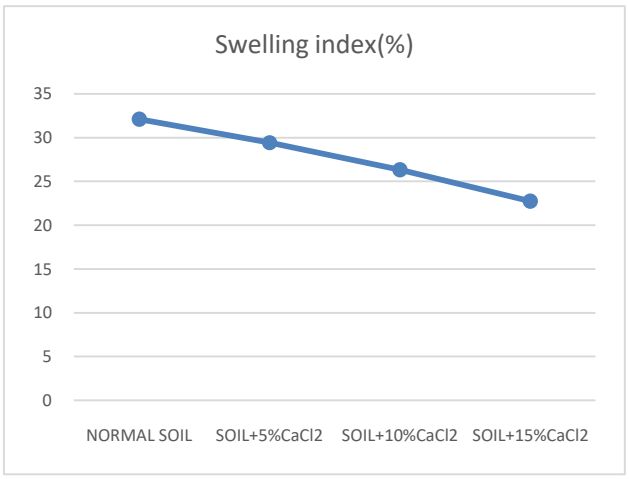
Atterberg's Limit

Soil	Liquid limit(%)	Plastic limit(%)
NORMAL SOIL	39	21.18
SOIL+5%CaCl2	38.14	19.4
SOIL+10%CaCl2	36.25	16.73
SOIL+15%CaCl2	34.12	16.2

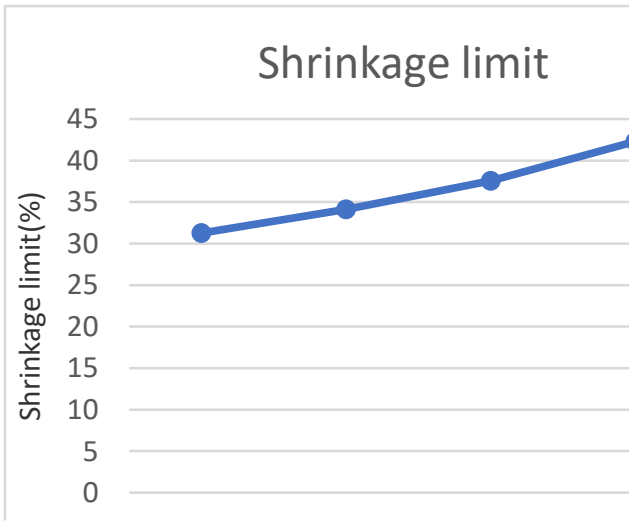




SOIL	Swelling index (%)
NORMAL SOIL	32.1
SOIL+5%CaCl2	29.41
SOIL+10%CaCl2	26.31
SOIL+15%CaCl2	22.72

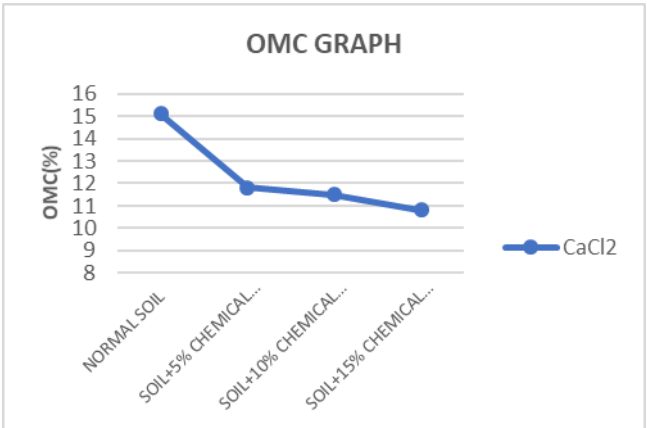


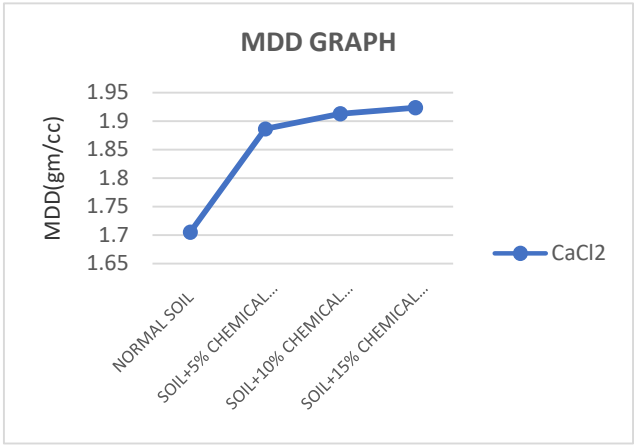
Normal soil	31.28
Soil+5%CaCl2	34.13
Soil+10%CaCl2	37.55
Soil+15%CaCl2	42.29



Proctor compaction test

OMC	READINGS	MDD	READINGS
0	**20**	**0**	**1.60**
2	**20**	**2**	**1.64**
5	**17**	**5**	**1.73**
10	**17**	**10**	**1.75**
15	**18**	**15**	**1.78**





CONCLUSIONS

Graphical representation of the test results are presented above with varying percentage of calcium chloride. Based on the test result following conclusions are established.

- Adding $Cacl_2$ will increase the stability of soil and will enhance the index and engineering properties
- It is cheap and can be used as an alternative to piles and will reduce the cost of project.
- The required result is coming in adding 10% chemical stabilizer.
- Soil from Khambhat region is of poor grade.
- $Cacl_2$ increase maximum dry density is increase.
- $Cacl_2$ increase optimum moisture content is decrease.
- $Cacl_2$ content increase and liquid limit decrease.
- $Cacl_2$ content increase and plastic limit decrease.

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