MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE

(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Gwalior, Madhya Pradesh - 474005

MINI - Report

GEOTECHNICAL ENGG

ON

"UNCONFINED COMPRESSIVE STRENGTH (UCS) OF SODIUM BENTONITE SOIL"

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Department of Civil Engineering

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CERTIFICATE

Madhav Institute of Technology & Science
Gwalior

This is to certify that the project entitled " **UNCONFINED COMPRESSIVE STRENGTH (UCS) OF SODIUM BENTONITE SOIL**" presented by the students of group in incomplete satisfaction of the necessity of the recompense of the Bachelor of Technology degree in Civil Engineering at Madhav Institute of Technology & Science, Gwalior is a genuine work completed by the students under my watch and direction.

To the best of my insight, the matter epitomized in the theory has not been submitted to any other college/Institute for the recompense of any Degree or Diploma

Under the Guidance of-

(Dr. Charan Gupta)

Guide Name -

Department of Civil Engineering

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Finding unconfined compressive strength (UCS) of sodium bentonite soil

MAIN BODY

1. INTRODUCTION

- The main objective of the test is to determine the unconfined compressive strength (qu) of cohesive soil.
- The test is suitable for saturated non-fissured cohesive soil, for which the angle of shearing resistance may be assumed to be zero.
- The undrained shear strength can be taken as half the unconfined compressive strength. i.e Cu=(qu /2) .
- In this simple test, a cylindrical specimen of soil is subjected to simple vertical compressive stress, till the sample fails either due to shear along a diagonal plane or by lateral bulging.
- The maximum load at which the failure takes place when divided by the cross-sectional area of the sample will give the value of the unconfined compressive strength of the soil.

2. THEORY

- **Unconfined compressive strength (qu):** Unconfined compressive strength (qu) is the load per unit area at which an unconfined cylindrical specimen of soil will fail in a simple compression test.
- If P_f is the failure load, and A_f is the final cross-sectional area of the sample at failure,

$$qu = \frac{Pf}{Af}$$

- Where, A_f is given as,

$$Af = \frac{Ao}{(1 - \varepsilon a)}$$

- εa = total deformation of the soil sample at failure.

3. OBJECTIVES OF STUDY

The primary objective of this test is to determine the unconfined compressive strength, which is then used to calculate the unconsolidated undrained shear strength of the clay under unconfined conditions. According to the ASTM standard, the unconfined compressive strength (qu) is defined as the compressive stress at which an unconfined cylindrical specimen of soil will fail in a simple compression test. In addition, in this test method, the unconfined compressive strength is taken as the maximum load attained per unit area. L_o

4. PROCEDURE FOLLOWED

- Take the split mould and coat the inside with a thin layer of grease or oil to prevent the adhesion of the soil.
- Take 3000g sodium bentonite soil and mix it with 24% water
- Now fill the split mould with a mixture of soil in 3 layers while compacting it between every layer
- Then insert a sampling tube in the mould offset of the centre to collect a sample.
- Now take the tube and extract the sample using the extractor then trim the extra from both ends leaving it around 77mm in height and 38mm in diameter.
- Place the extracted specimen on the bottom plate flat side down, of the unconfined compressive strength machine. Then lower the upper plate so that it touches the top of the sample.
- Place the deformation measuring gauge then make both it and the ring dial gauge 0.
- Turn the machine on to apply the load that produces axial strain.
- Note the reading of both gauges, while the load is applying until the failure occurs (either ring dial gauge becomes constant or it starts to revert back).

5. RESULTS & CONCLUSION

Optimum moisture content (OMC) of the soil = **24%**

S NO.	VALUES	OBSERVATIONS
1	initial length of specimen Lo (mm)	77
2	Initial diameter of the specimen Do(mm)	38
3	Initial area of the specimen Ao (mm2)	9192.3
4	Water content (%)	24

S NO.	Deformation in length (ΔL)	Lo	D	Area	Strain e= ΔL/Lo	Corrected area Ac=Ao/1-e	Normal load (Kn)	Compressive stress (Kn/mm^2)
1	8.7	77	38	9192.3	0.112987	10363.208	1.4285	0.000137843
2	7.8	77	38	9192.3	0.101299	10228.4264	1.4176	0.000138594

The average compressive strength of sodium bentonite soil =

0.000138219 Kn/mm^2

Or

138.219 KPa

6. OUTCOMES

Unconfined compressive strength (UCS) of sodium bentonite soil =**138.219 KPa**