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E.M. Super Repair's Effect on The Strength Parameters of the Collapsible Soils

S. Sohrabi Shekafti[1] , S. H. Mousavi Jahromi [2*]

1- M.Sc. Student, Department of Civil Engineering, Water Engineering, Shahid Chamran University, Ahwaz, Iran
2- Professor, Department of Water Engineering, Shahid Chamran University, Ahwaz, Iran

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ABSTRACT

There are some kinds of soils in nature which show a significant decrease in volume by increasing the humidity percentage under a fixed pressure.these solis are called collapsible soils. Collapsible soil shows a noticeable decrease in its volume with an increase in its moisture content under fixed stress. This decrease in volume causes irreversible damages to any structures on collapsible soil and the ones which are under construction. The study of the behavioral characteristics of collapsible soil and its stabilization is crucial. The main purpose of this study is stabilizing collapsible soil and increasing shear strength by adding E.M. Super Repair with different combinations. A sample was collected from Hamidiyeh region near Ahvaz. The primary geotechnical tests were done on the sample. Then shear strength parameters were determined by adding E.M. Super Repair with different combinations. The results show this substance improve the shear strength parameters. The most shear strength has been observed in 1% combination.

KEYWORDS

Collapsible Soils, Direct Shear Test, E.M. Super Repair.

* Corresponding Author, Email: habib@musavi.info

1- INTRODUCTIOM

Collapsing soils are kind of problematic soils which cause sudden and asymmetric subsidence. Collapsing soils structure must be improved before constructing any structures on these soils. In this research , the impact of E.M. Super Repair with different combination percentage (0.5, 1, 1.5, 2, 3, 5) has been studied to enrich the structure of collapsing soil (The specimen has been collected from Hamidiyeh Region) Some studies have been done to reform the shear strength parameters of collapsing soils including Mohammad Alizadeh Rafiee (2009) who studied the effect of injecting lime on collapsing soils. He concluded that by adding lime to the collapsing soils, soil adhesion is decreased and the angle of internal friction will be increased [2]. Ashraf (2012) studied motor oil impact with different combination percentages of 4, 8 and 12 on collapsing soil. He inferred that this substance decreases the collapsing potential, angle of internal friction, Atterberg limits, maximum dry unit weight and optimized the moisture whereas it increases the soil adhesion , noticeably [3].

2- METHODOLOGY

E.M Super Repair is a powder mixture which is based on cement. Its high adhesion and specific gravity to different surfaces and materials provide a perfect insulation. In this paper , Direct Cut and Strain Control have been used. The specimens were carried out under the vertical pressure of 54.5, 109 and 218 Kilopascals. In order to determine the collapsing rate , ASTM D5333-03 Standard was used.

3- DISCUSSION AND RESULTS

The Specimen has been collected from Hamidiyeh Region near Ahvaz. Atterberg Limit Tests and Direct Cut and Density have been performed on the specimen to establish its physical and geophysical characteristics. The results are presented in Table (1).

Table 1: The specimen's characteristics

Angle of internal friction	Adhesion	Optimized moisture	Maximum dry weight	Plasticity Limit	Liquid Limit	Soil group in Unified Soil Classification System
34.31	33.75	13.93	19.06	5.82	24.12	CL-ML

In the next stage, the specimen is mixed with E.M Super Repair in different combination percentage (0.5, 1, 1.5, 2, 3 and 5 weight percentage) then, all the above mentioned tests are done on the specimen. The results showed that in all combination , percentage liquid limit and plasticity limit are increased. Liquid limit is greater than plasticity limit. It is also observed that this substance hasn't changed maximum dry density greatly. According to Coulomb's law (1776) Shear strength follows vertical pressure [1], [4].

$$\tau = c + \sigma \tan \varphi \qquad (1)$$

Based on the equation (1) the value of shear strain for various combination has been calculated under different surcharges. The results are shown in Figure (1).

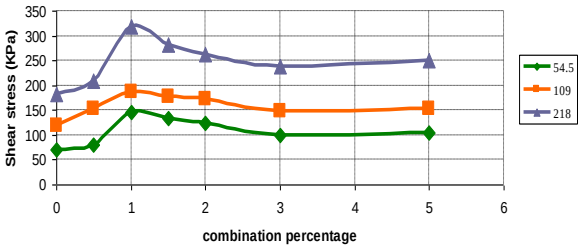

Figure 1. The comparative figure of shear strain changes by adding E.M Super Repair under various surcharges

As it is shown in Figure 1, shear strength reaches its highest value in 1% combination percentage. Soil adhesion and the angle of internal friction are increased to 163.4% and 35.26% , respectively. According to the tests which have been done in soil chemistry laboratory of Shahid Chamran University, adding S.M. Super Repair to the collapsing soil decreases Sodium and increases Calcium. The substitution of Calcium for Sodium is one of the reasons for high shear strength in 1% combination percentage.

4- CONCLUSION

The most important results of this study are as follows:

1- E.M Super Repair increases the shear strength parameters , which prove this substance , plays an important role on the stabilization and reinforcement of collapsing soils.

2- In 1% combination percentage, the value of soil adhesion and angle of internal friction show greater value compared to the other combination percentages . It causes greater shear strength in this combination which is due to the substitution of Ca^{2+} Ion by Na^{+} Ion after combining collapsing soil with E.M Super Repair.

5- REFERENCE

[1] Das, B. M. ,"Principles of Geotechnical Engineering. (Translated by tahoni, sh.)", In Persian, 2007.

[2] Rafiei, A. M. ,"The stabilization of the collapsible soil using Injection Technology - A Case Study in Semnan-Damghan Railway", M.S. thesis, Imam Khomeini International University, Ghazvin (In Persian), 2009.

[3] Ashraf, K. N. ,"Stabilization of Collapsible Soil with Engine Oil", J. International Review of Civil Engineering, Vol. 3, Issue 6, 487, 2012.

[4] Coulomb,C.A. ,"Essai Surune Application des regles des Maximis et Minimis a Quieques Problems des Statique Relatifs a L'Architecture", Mem, Acad. Roy. Pres. Divers Savants, Paris, vol. 7, 1776.