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# REVIEW ON GEOTECHNICAL SITE INVESTIGATION OF COLLAPSIBLE SOILS NEAR JHELUM AREA IN KASHMIR

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## ABSTRACT

Geo-Technical Engineering plays a vital role in any construction projects like in the construction of bridge, roads, buildings, development of hydro power projects, foundation of massive structures like big chimney and transmission towers. The main purpose of the investigation is to get an idea related to the site where the structure is to be built. This not only saves the design and construction time but also may be considered as the main source of information for the proper planning, safe and sound, economical design and proper execution. The geo-technical investigation also gives us ideas about the Sub-surface condition of the site where the construction is to be proposed. Geo-technical investigations can be considered as an essential part for the design of structures and for the planning the construction techniques.

## I. INTRODUCTION

Collapsible soils may be formed due to geological hazard in civil engineering projects. As far as construction is concerned, this type of soil always poses a challenge for engineers as well as geotechnical experts due to non-availability of the knowledge on this soil. This chapter in this dissertation work provides brief information about collapsible soil and the interests for choosing this research topic. Rapid increase in population has resulted in the land occupancy and tremendously increased the construction techniques on those problematic soils. Due to this rapid increase in population, it is considered to be the important aspect for geotechnical engineers to have in depth knowledge to deal with such type of soil, including collapsible soils. As far as collapsible soils are concerned, they have the tendency to withstand good number of loads in an unsaturated condition, the settlements may it be equal or unequal settlement associated with the induction of water into this system may some sometimes lead to extensive repairs. Due to increase in water content, unforeseen reduction in volume may prove as one of the most costly and complicated geological hazards in geo-technical engineering.

## II. LITERATURE REVIEW

Micromechanical methods in which soil collapse is studied based on the distribution of pores in soil structure. Recent advances in image processing tools have made it possible researchers analyze collapse through microstructural vital factors such as contact relationship, particle pattern, bonding material and pore formation (Li et al., 2016). Last two factors have the greatest influence on the collapse process (Lommler and Bandini, 2015; Jing-bo and Yun, 1994; Gao, 1980a)

A combination of the first two methods in which the unsaturated soil mechanics along with microstructural analysis of folding soils are used to interpret the behavior soil during collapse (El-Ehwany and Houston, 1990). Recently, scientists have developed a relationship between total soil collapse and suction transformation matrix using void ratio. In this proposed method, the pore size distribution was calculated using image analysis software under various factors such as dry density, humidity content and surcharge load to better understand the collapse behavior

The collapse behavior of loess soils is highly dependent on their microstructure, which includes bonding material, pore formation, particle pattern and contact relationship (Kozubal and Steshenko, 2015). Although bonding material and pore formation have a more profound effect on collapse behavior, a comprehensive study of loess soil behavior cannot be fundamentally characterized with respect one single factor (Kozubal and

Steshenko, 2015). Although many studies were carried out up to 20 Limited studies have attempted to show how soil compaction is directly related to porosity importance of pore size distribution in soil. Campum et al. (2002), in his study of compressibility of soils under tropical weather conditions, showed that the total soil void ratio has no significant effect on collapse. However, with respect to inter- and intragranular pores in soil particles, a direct relationship can be developed between the coeff collapse and void ratio. Information on changes in pore size distribution due to loading and wetting provides better evidence that different types of pores contribute differently to collapse (Jiang et al., 2014a; Jiang et al., 2014b; Jiang et al., 2012)

Watts and Charles have also extensively discussed the failure behavior of embankments in their book 'Building on embankment: geotechnical aspects', a BRE publication. They generally recognized two forms of fillings: engineered and non-engineered fillings. According to Watts and Charles, engineered fills are fills selected, placed and compacted under controlled conditions to achieve a specification to exhibit engineering behavior appropriate to their purpose, while non-engineered fills are created as by-products of human activity. involving the disposal of waste materials with no subsequent engineering use in sight. However, both types of fills can represent either natural soils and rocks, or several forms of waste material placed above the natural soil. Some of the waste materials found particularly in the UK include surface mine tailings, mine tailings, municipal landfills, domestic waste, industrial and chemical wastes, pulverized fuel ash, hydraulic fills, buried docks, pits and quarries, etc.

Mellors studied the influence of the clay component on the collapse of the loess soil structure and described the arrangement of soil grains and the contact modification on the wetting surface of the grains under loading. Mellors argued that prior to wetting and despite shear stress due to external loading, the interparticle bonds remained strong enough to resist shear failure at the contact sites. However, after wetting, microshear occurred at the point of contact, causing the collapse of the soil structure. Mellors noted that water wetting reduces the shear strength of the joints so that it is less than the shear stresses acting at the point of contact, and thus collapse occurs. Mellors used the equation introduced by Lamb in 1960 to explain the mechanism of loess collapse.

Vilar and Davies studied the collapse behavior of clayey sand using a suction-controlled oedometer test and a triaxial compression test. The collapse deformations observed in the oedometer tests were more significant than those measured in the triaxial pressure tests, which can be attributed to the effect of lateral deformations on the collapse magnitude.8 Lloret and Alonso used a finite element method coupled with a finite difference scheme to model the volume change behavior of unsaturated soils based on the continuity equations of air and water. Lloret and Alonso also developed a method to calculate the water and air pressures caused by undrained loads. Khalili et al performed triaxial and oedometric saturated and unsaturated tests in addition to analyzing the results of several tests obtained from the literature and suggested that the effective stress principle is applicable in the prediction of shear strength and volume change of unsaturated soil.

## III. CONCLUSION

The study of collapsible soils was started as early as 1820s, but due to the inadequate knowledge on the nomenclature of soil collapse, the researchers cannot predict the full understanding of collapse phenomenon. Also, due to the variety in types and chemical composition of soils has amplified this problem.

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