The Formula Study of Strength Index for Remolded Loess

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Abstract—At present, the research is not enough for the formula of water content and strength index in domestic.The paper aims how the change of water content influence strength index of remolded loess by consolidation drained triaxial shear test for the Linxian loess.The results showed that: The shear strength of loess decreases larger with the increasing of water content. The change of shear strength index c is obvious with the increasing water content. The change of shear strength index φ is not obvious with the increasing water content.According to the formula of strength index, to predict the strength index for certain water content of the tests loess, have some theoretical significance for the relation research.

Key words：consolidation drained; remolded loess; water content; strength index; formula

I. INTRODUCTION

The strength of the loess is an important soil mechanics.A lot of engineering problem have associated with soil stability, such as bearing capacity of loess foundation, tunnel and slope. Many scholars have done a lot of work about the strength problem of soil. Wang Zhi-jie et al[1] think the dry density has little effect on the dynamic shear modulu of remodeled loess under the condition of pre-shearing stress.Initial average prinicipal stress has some certain effect on the modulu.SHEN Chun-ni et al[2] think that the cohesion of unsaturated soil has an exponent increase with the increasing of dry density; but the friction angle has little change with the increasing of dry density. The comparison of the test results with controlled suction and water content equaling constants is carried out. The shear strength formula including impact of water content is proposed, which can be for reference in engineering application.The studies showed that: the remolded loess strength is influenced by conditions such as water content. The different conditions have distinct effects for the strength index of loess. However, for the strength characteristics of remolded loess, there is rare research on the formula of loess strength index [3]-[27].

With the help of consolidated drained triaxial tests to research the shear strength characteristics of remolded loess for different water content. Analysis the formula of loess strength index, to come up some conclusions. The study have some theoretical significance for the research of remolded loess strength index. And it will provide reference for the future research of remolded loess strength.

II. THE LOESS OF TEST

The loess of tests is taken from certain pit at the Linxian district, in a depth of 3m below the surface, which is silty clay. And the loess samples have been whittled to length 30cm~ 33cm cube in the field. The natural water content of the loess was 7.3%, through the burette method to configure the required water content for the sample.

III. TEST INSTRUMENTS AND TEST METHOD

A. Test Instruments

The test instrument is the conventional triaxial shear apparatu which come from a

Nanjing experimental instrument factory. The pressure will pass to the specimen with the help of the counterproductive of fixed beam.

B. Test Method

Prepare remolded triaxial loess specimen which water content are separate 7.5%, 9.5%, 11.5%, 13.5%, 15.5% and the amount is also four.The confining pressure are separate 50 kPa, 100 kPa, 200 kPa, 400 kPa for drained consolidated test. The specimen install before exert confining pressure, open the drain valve to consolidation, and start motor to cut after the end of consolidation. The final shutdown standard is the axial deformation which reach 12mm.

IV. Test Results and Analysis

A. The law of shear strength changing with water content for remolded loess

According to formula 1:

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

The law of remolded loess shear strength changing with water content is indicated in Fig .1toFig .5:

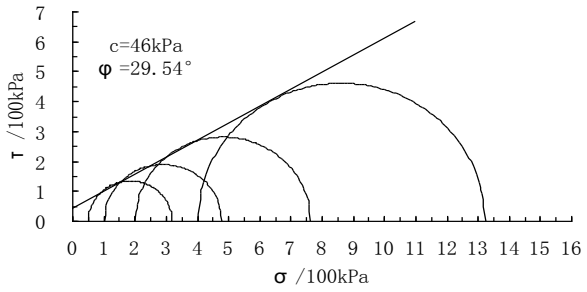

Figure 1. Shear strength lines for w =7.5%

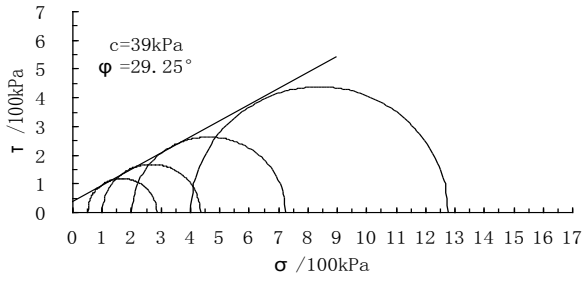

Figure 2. Shear strength lines for w =9.5%

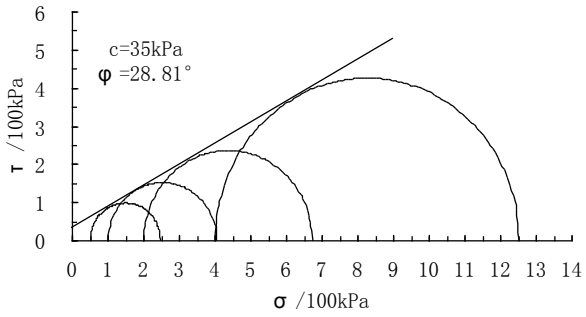

Figure 3. Shear strength lines for w =11.5%

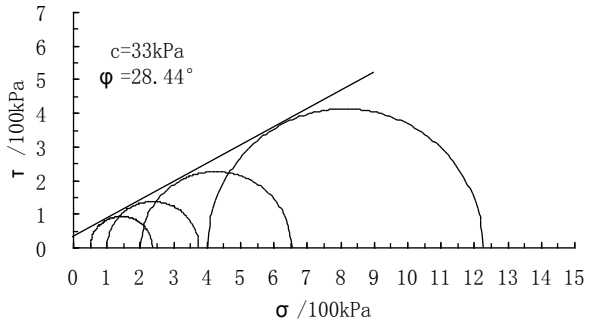

Figure 4. Shear strength lines for w =13.5%

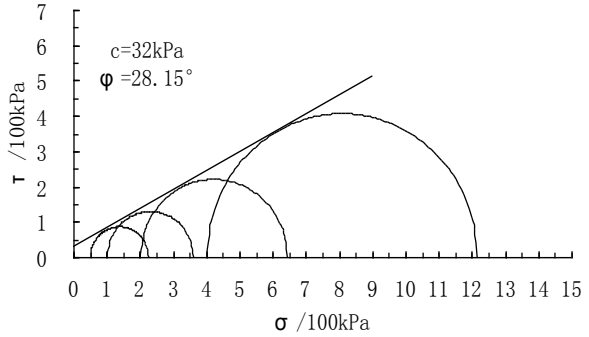

Figure 5. Shear strength lines for w =15.5%

Fig .1 to Fig .5 show that the shear strength of loess decreases larger with the increasing of water content.

B. The law of strength index changing with water content for remolded loess

The law of remolded loess strength index under different water content is indicated inFig .6 to Fig .7:

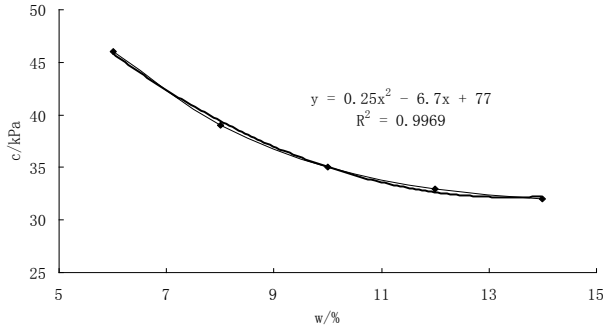

Figure 6. Strength index c for water content

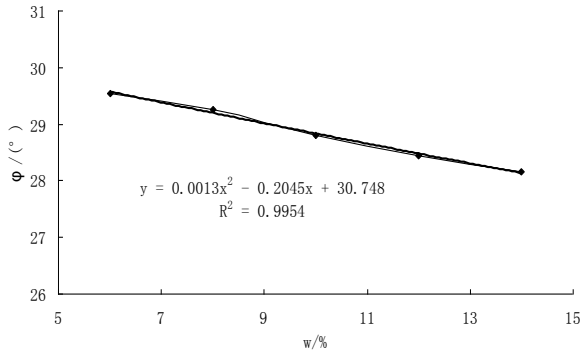

Figure 7. Strength index φ for water content

Fig .6, Fig .7 show that the change of shear strength index c is obvious with the increasing water content. The change of shear strength index φ is not obvious with the increasing water content.

According toFig .5, Fig .6,the relationship of strength index and water content can be converted to the following formula:

$$c = 0.25\omega^2 - 6.7\omega + 77 \qquad (2)$$

$$\phi = 0.0013\omega^2 - 0.2045\omega + 30.748 \qquad (3)$$

According to formula 2, formula 3, to predict the strength index for certain water content, have some theoretical significance for the relation research.

V. CONCLUSIONS

In this paper, conventional triaxial test apparatus is applied to study remolded loess strength index under water content. The main conclusions are as follows:

(1) The shear strength of loess decreases larger with the increasing of water content.

(2) The change of shear strength index c is obvious with the increasing water content. The change of shear strength index φ is not obvious with the increasing water content.

(3) According to the formula of strength index, to predict the strength index for certain water content of the tests loess , have some theoretical significance for the relation research.

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