강도변화에 따른 황토의 탄성계수에 관한 연구

Elastic Coefficient of Loess due to Compressive Strength

구엔닌투이* 이두안* 권혁문**
Nguyen, Ninh Thuy Le, Anh Tuan Kwon, Hyugmoon

ABSTRACT

Construction industry is one of the fastest growing sectors in the world. Rapid construction activity and growing demand of houses have led traditional building materials. In order to satisfy that purpose, the researchers need to vary new and innovative building materials.

This paper describes the experiment carried out to investigate the elastic coefficient of loess due to compressive strength.

Keywords: Elasticity, loess

1. Introduction

Recent years, loess has been used more and more as a construction material The researches of the properties of loess are under developing. Modulus of elasticity is frequently expressed in terms of compressive strength. This experiment is studied about the elastic coefficient of loess specimens that was made by the different compacting stress: 5, 10, 15, 20 MPa with the water ratio to materials is 8%.

2. Materials

2.1. Loess - Quartz (LQ)

Table 1. Sieve test of LQ

Sieve No.	Sieve diameter (mm)	Percentage retained	Cumulative percentage passing	Cumulative percentage retained
16	1.18	0	100	0
25	0.6	13.0	87.0	13.0
50	0.3	0.5	86.5	13.5
100	0.15	41.0	45.5	54.5
tray	<0.15	45.5	0.00	100

The properties of LQ is like this: unit weight is 1.65 g/cm^3. The grading of sieve analysis is on table 1.

*정회원, 영남대학교 토목공학과 박사과정
**정회원, 영남대학교 토목공학과 교수

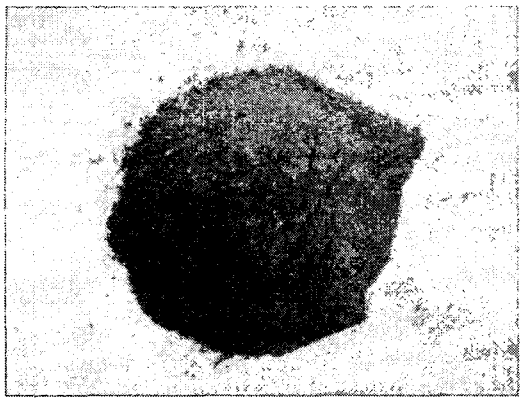


Fig. 1 Loess – Quartz mixing

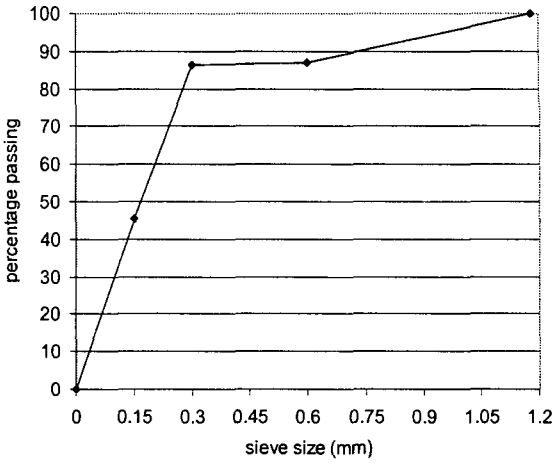


Fig. 2 Sieve test

2.2. Binder (B)

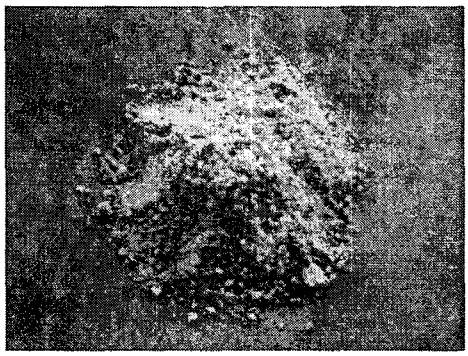


Fig. 3 Binder

The binder bonds the loess particles. In this way dimensional stability, increasing the compressive strength and improving durability can be expected. The binder used for the experiment within this paper is based alumino-silicate and calcium silicate binders. Specific area: 3200 cm^2/g. Unit weight is 1150 kg/m^3.Specific gravity is 3.02g/cm^3. The chemical composition of binder is listed below.

Table 2 Chemical composition of binder

Oxide	SiO_2	CaO	Al_2O_3	MgO	Others	Ig loss
Content (%)	34.5	46.2	9.1	3.2	2.0	5

3. Experiment and discussion

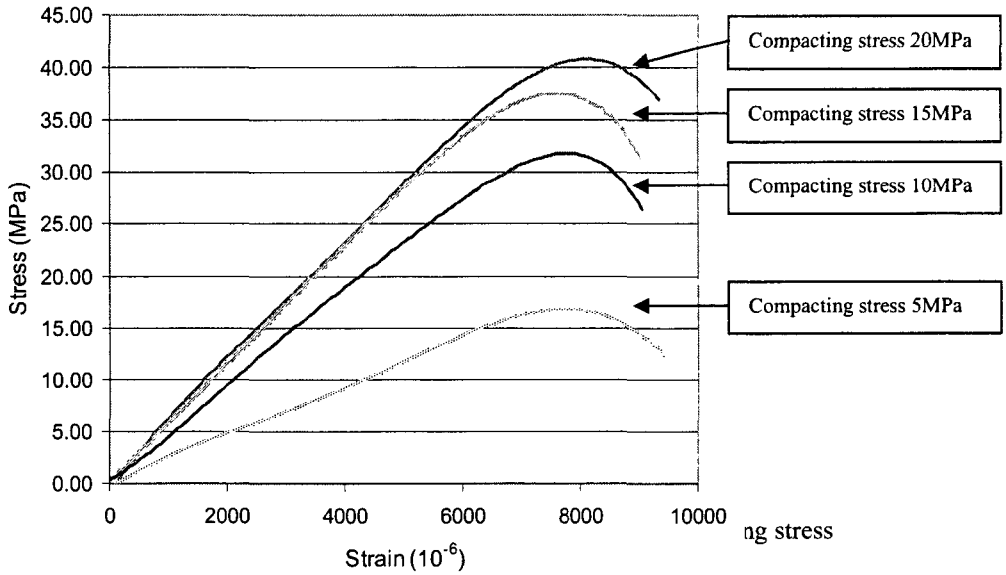
3.1. Mix proportion

Table 3 Mix proportions

Series	Materials (%)		Water ratio (%)	Compacting stress (MPa)
	LQ	B		
I-1	70	30	8	5
I-2	70	30	8	10
I-3	70	30	8	15
I-4	70	30	8	20

3.2. Results and discussion

This research is based on KS F 2329 to make the specimens for compressive test. The specimen is 50mm diameter and 100mm height.



With the low compacting stress, the compressive strength of loess is also very low. A compacting stress is the higher, the compressive strength is the higher. The compressive strength of loess is very different due to compacting stress (fig. 4). There are 4 levels of maximum strength: 17.2 MPa (5MPa compacting stress), 31.8 MPa (10MPa compacting stress), 38 MPa (15MPa compacting stress) and 42MPa (20MPa compacting stress). When the compacting stress is low, the cohesion of particles in the structure of loess is so weak that the adhesive force between particles is very low. The elastic coefficient at 5MPa compacting stress is 2125 MPa, weaker than the others. The elastic coefficients are 4625MPa, 5750MPa and 5875MPa that correspond to compacting stresses are 10MPa, a5MPa and 20MPa. It follows that the higher strength of loess, the higher elastic coefficient of loess is (fig. 5).

However, the higher strength loess exhibits a lower strain. The elastic coefficient at compacting stress 15MPa and 20MPa are not much difference.

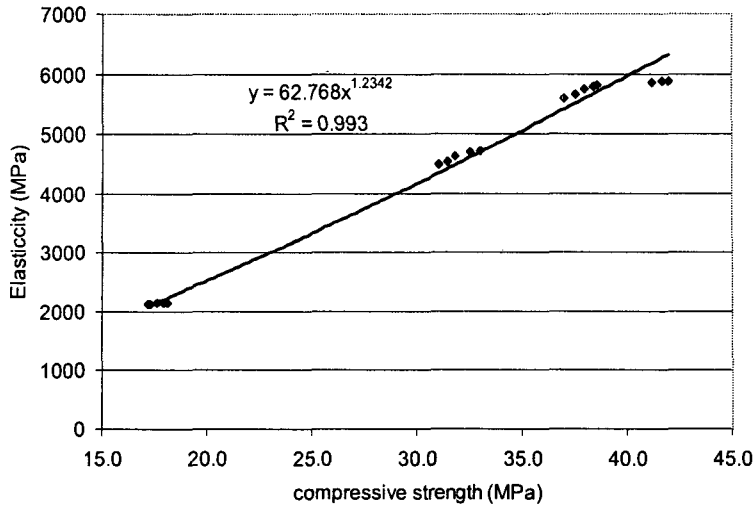


Fig. 5 Elasticity due to compressive strength

4. Conclusion
   - The strain of loess at the maximum stress is 0.008.
   - The elastic range of loess is about 0.004.
   - When the compressive strength is high, the elasticity coefficient is high.

Reference

1. KS F 2329
2. Gere and Timoshenko, "Mechanics of materials", 3rd Ed., Chapman & Hall, 1992
3. Lee, Sang-Chil, "Improving strength of Loess by compacting method", Master thesis, Dept. of Civil Engineering, Yeungnam University, June 2006.