CHANG' AN UNIVERSITY
Xi'an, China

Research on Permeability test of loess in Heifangtai Platform under different consolidation pressures

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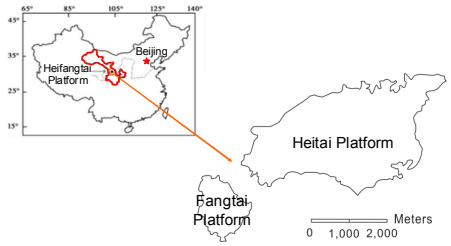
The main topics

1. Introduction

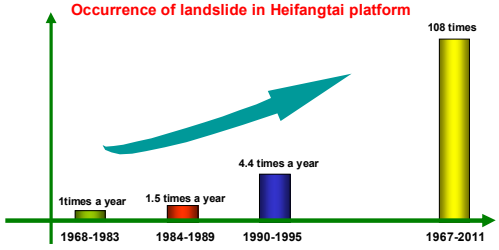


Heifangtai Platform, located in Yongjing county, Gansu province of China.
It covers an area of 13.44 km².
It is one of the largest benches.

1. Introduction

In 1967
Irrigation project → Landslide

Occurrence of landslide in Heifangtai platform



1. Introduction

Irrigation
↓
Permeability
↓
Permeability coefficient

The in-door experiment
Simple equipment
Low cost
The test is carried without loading
Rebound generated after unloading

+

The field test
The actual pressure is considered
It can not be used in the deeper soil
Higher cost

2. Test Plan-Instrument


The permeameter

+

Invention patents
ZL200710018038.1

The shear creep apparatus

=


The instrument after improved

Pulley block

Advantage
- Low cost
- Simple equipment
- The actual pressure is considered

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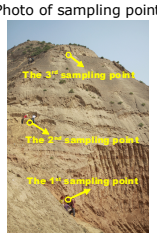
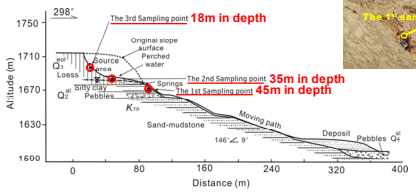
2.Test Plan-Samples

Photo of sampling point



Main profile of sampling point



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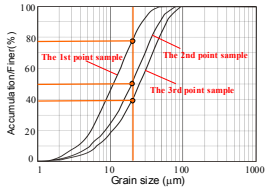
Physical parameters of three point samples

Sample	Specific gravity Gs	Dry density r_d/g·cm^{-3}	Natural contentw /%	Void ratio e	Liquid limit w_L/%	Plastic limit w_p/%	Plasticity index I_p/%	Clay content /%
The 1st point sample	2.71	1.54	12.1	0.760	25.0	15.6	9.4	15.2
The 2nd point sample	2.69	1.40	3.8	0.921	25.6	15.8	9.8	7.5
The 3rd point sample	2.69	1.27	2.4	1.118	28.7	16.2	12.5	5.8



Grainsize measurement curves of three point samples

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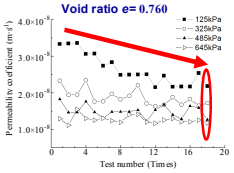
3.Test Results

The change of permeability coefficient under different consolidation pressures

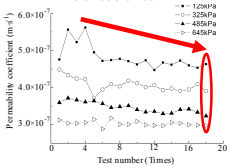
The 1st point sample

Void ratio e= 0.760



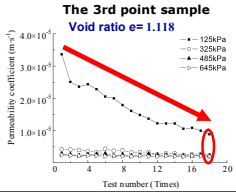
The 2nd point sample

Void ratio e= 0.921



The 3rd point sample

Void ratio e= 1.118



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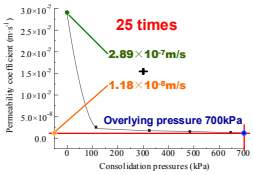
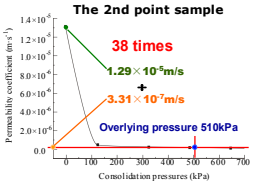
3.Test Results

Relation between permeability coefficient and consolidation pressures

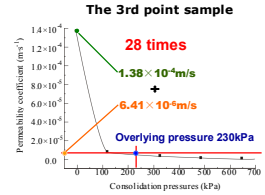
The 1st point sample



The 2nd point sample



The 3rd point sample



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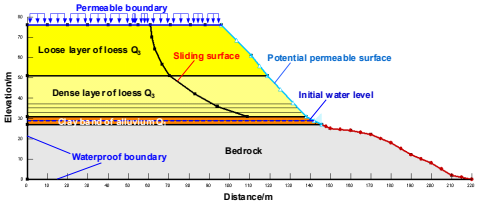
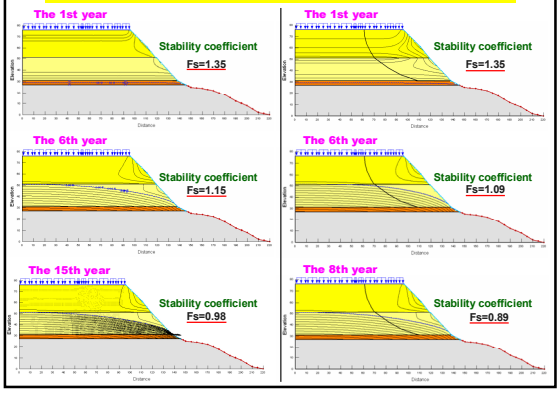
4. Finite Element Simulation

Permeability coefficient —Import→ GeoStudio-SEEP/W



The initial simulation of slope in Heifangtai platform

The influent seepage simulation of slope in Heifangtai platform



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Conclusions

- For different samples, if a same consolidation pressure was exerted, the permeability coefficients of those with higher initial void ratios tended to change more largely but reached a stable value finally, which showed that in actual working conditions, as long as the thickness of overlaying sola was not increased, soil horizon of a certain depth should have a stable permeability coefficient.

- In an indoor conventional penetration test and a penetration test under consolidation both targeted the loess from Heifangtai Platform, permeability coefficient of different soil horizons resulted form the former was 25-40 times as high as the later, which showed the results from the conventional test had overestimated the permeability coefficient.

- When the permeability coefficient resulted form the penetration test under consolidation was introduced into SEEP software to conduct a irrigation influent seepage simulation for slope, the results were consistent with actual reconnaissance ones, indicating that the data from the penetration test under consolidation are more likely to reflect practical phenomena, thus have more practical application.

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Thank you

for your attention!