

# 異方圧密粘土のすべり線の力学: 中空円筒ハダカ供試体による実験と理論

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# 1991 Fiscal Year Final Research Report Summary

Mechanism of shear band formation in Ko-consolidated clayey soil--  
experimental and theoretical approaches by naked hollow-cylindrical  
soil specimen--

Research Project

## Project/Area Number

02805057

## Research Category

Grant-in-Aid for General Scientific Research (C)

## Allocation Type

Single-year Grants

## Research Field

基礎・土質工学

## Research Institution

Kanazawa university, Dept. of Civil Engineering

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## Project Period (FY)

1990 - 1991

## Keywords

Strength of material / Stress-strain relation / Shear band formation / ko-consolidation / Compression shear / Strain localization / Elasto-plastic theory

## Research Abstract

The purpose of this research is to give theoretical and experimental bases to capture the failure mechanism of the ground material. The development of localized deformation and its prominence may cause the instability of foundation ground and lead to its failure. Such localized deformation is commonly observed during large deformation of soils, for instance, slip lines observed in the laboratory, the sliding failure of embankment foundation and the fault caused by the orogenic movement. The simulation of shear bands formation may lead to clarify the occurrence mechanism of their phenomena and also

make it possible to explain the soil behaviors consistently from the beginning of deformation up to the limit failure state.

In this research, the theoretical basis of bifurcation problem is summarized and classified in regard to the formation of shear band. In particular, the mathematical conditions of the formation of shear band under axisymmetric condition discussed relating to the non-coaxiality of the elasto-plastic constitutive model for Ko-consolidated clay specimen proposed by Sekiguchi and Ohta (1977). As to experimental study, a new shear test equipment is designed and developed to observe the development of shear band with increase of shear strain in the axisymmetric soil specimen. The distinctive features of it are : 1) able to carry out Ko-consolidation, 2) able to measure Ko-value, 3) able to observe the development of shear bands (slip lines), because a rubber membrane is not used (naked specimen like the unconfined compression test specimen), 4) able to estimate parameters in terms of effective stresses, because the pore water pressure can be measured using measurement system of negative pressure with the ceramic disk.

It was found in this research that the apparent strain-softening stress strain relation in axisymmetric soil specimen is not an essential phenomenon of material but the consequence of inhomogeneous distribution of stress and strain in the specimen as a boundary-value problem.▲ Less

## Research Products (24 results)

All Other

All Publications (24 results)

- [Publications] 坪内 正記,太田 秀樹,飯塚 敦,北 倫彦: "Ko圧密履歴を受けたハダカ中空円筒供試体のせん断試験" 第27回土質工学研究発表会概要集. ▼
- [Publications] 飯塚 敦,太田 秀樹,坪内 正記,北 倫彦: "中実および中空円筒供試体に発生するすべり線について" 第27回土質工学研究発表会概要集. ▼
- [Publications] 小島 謙一,飯塚 敦,太田 秀樹: "せん断帯生成シミュレーションにおける有限要素の選択について" 第27回土質工学研究発表会概要集. ▼
- [Publications] Iizuka,A.,Yatomi,C.,Yashima,A.,Sano,I.,and Ohta,H.: "The effect of stress induced anisotropy on shear band formation" Archive of Applied Mechanics. ▼
- [Publications] Ohta,H.: "Embankment and excavation under construction" Proc.9th Asian Regional Conf.Soil Mech. & Foundation Engrg.,Bangkok,. 2. 12 (1991) ▼
- [Publications] Ohta,H.: "Role of constitutive model in estimating design strength" Proc.Int.Conf.Geotechnical Engrg for Coastal Development-Theory and Practice on Soft Ground-Geo-Coast '91.2. (1991) ▼
- [Publications] R. Fukagawa, H. Ohta, A. Iizuka, A. Nishihara & Y. Morita: "Effects of drainage on interpretation of pressuremeter tests in clay." Proc. 3rd Int. Symp. on Pressuremeter, oxford. 189-198 (1990) ▼
- [Publications] M. Shoji, H. Ohta, K. Arai, T. Matsumoto & T. Takahashi: "Two-dimensional consolidation back-analysis." Soils and Foundations. 30, No. 2. 60-78 (1990) ▼
- [Publications] H. Ohta, T. Muta, K. Kaneko, M. Ohtake & A. Iizuka: "Strength of compacted earth fill." Proc. 10th Int. Conf. ISTVS, Kobe. 1123-1128 (1990) ▼
- [Publications] E. Ichimoto, M. Nozu, K. Okuyama, H. Ohta & A. Iizuka: "Strain-softening analysis of composite ground. (in Japanese)" Proc. 35th Symp. Geotechnical Engrg, Tokyo. 39-46 (1990) ▼
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- [Publications] K. Matsumoto, H. Ohta & A. Kobayashi: "Evaluation of initial stress condition subjected to stress history of soft clay ground. (in Japanese)" Proc. 35th Symp. Geotechnical Engrg, Tokyo. 77-84 (1990) ▼
- [Publications] H. Ohta, K. Ohmori & T. Terada: "Identification of sliding block and stability of discontinuous rock mass. (in Japanese)" Proc. JSCE. No. 424, III-14. 217-225 (1990) ▼
- [Publications] R. Fukagawa, M. Fahey & h. Ohta: "Effect of partial drainage on pressuremeter test in clay." Soils and Foundations. 30, No. 4. 134-146 (1990) ▼
- [Publications] H. Ohta: "Strength obtained by in-situ tests and triaxial tests. (in Japanese)" Proc. Symp. Triaxial Testing Methods, Tokyo. 35-38 (1991) ▼
- [Publications] H. Ohta, A. Iizuka, A. Nishihara, R. Fukagawa & Y. Morita: "Design strength su derived from pressuremeter tests." Proc. 7th Int. Conf. Computer Methods and Advanced in Geomechanics, Cairns. 1. 273-278 (1991) ▼
- [Publications] K. Arai, H. Ohta & M. Miyata: "Comparison of static and statistical methods for back-analysis of elastic consolidation problems." Proc. 7th Int. Conf. Computer methods and Advanced in Geomechanics, Cairns. 2. 949-954 (1991) ▼

- [Publications] H. Ohta, A. Iizuka, Y. Mitsuhashi & M. Nabetani: "Deformation analysis of anisotropically consolidated clay foundation loaded by 5 embankments." Proc. 7th Int. Conf. Computer methods and Advanced in Geomechanics, Cairns. 2. 1017-1022 (1991) ▼
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- [Publications] H. Ohta: "Embankment and excavation under construction" Proc. 9th Asian Regional Conf. Soil Mech. & Foundation Engrg, Bangkok. 2. (1991) ▼
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