Soils and Foundations 63 (2023) 101362 https://doi.org/10.1016/j.sandf.2023.101362

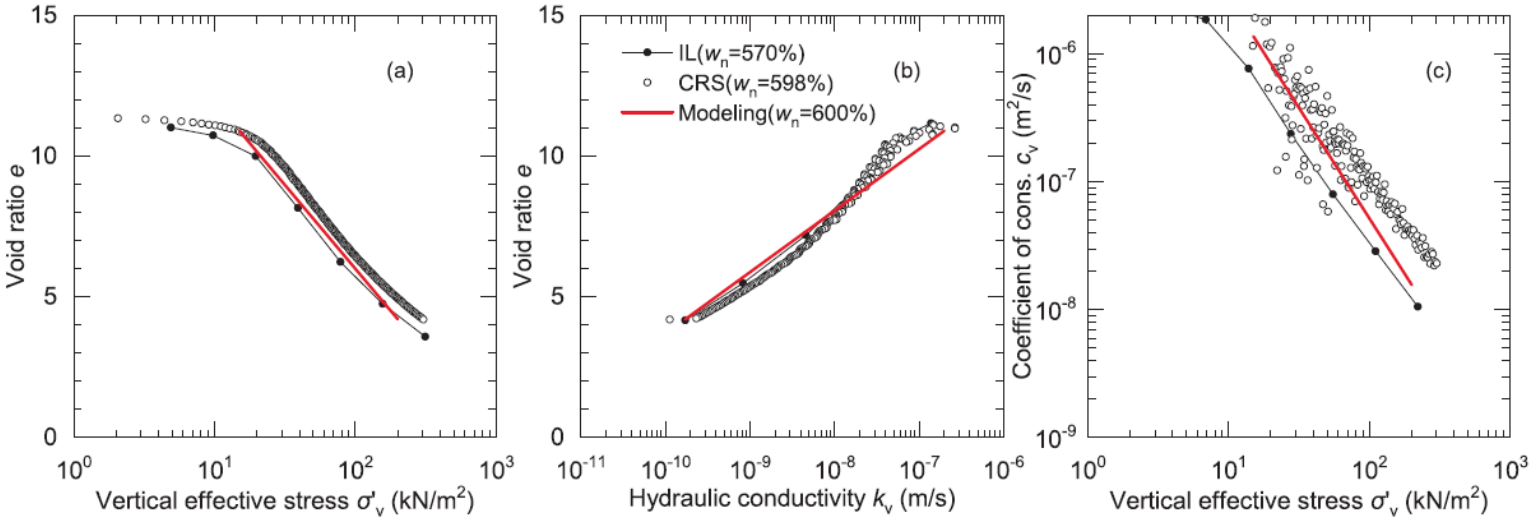
# Analysis of long-term settlement of road embankment on peat ground during its service period

Nobutaka Yamazoe, Hiroyuki Tanaka, Satoshi Nishimura, Hirochika Hayashi

[Background]

stringent requirements of roads on peat ground.

Applicability of FEM on residual settlement of peat.




[Methods]

Based on laboratory test results, isotach viscoplasticity applied for peat behavior.

Peat residual settlement = Stress-dependency $c_v$ & viscosity-2nd consolidation

Validation: Hokkaido, Japan's case history.

Address settlement with installation of prefabricated vertical drains (PVDs).

[Results]

Viscoplastic parameters determined from standard oedometer tests.

1st consolidation (stress-induced cv): PVD effective

2nd consolidation: PVD no effective

Considering different mechanism of 1st and 2nd consolidation is important

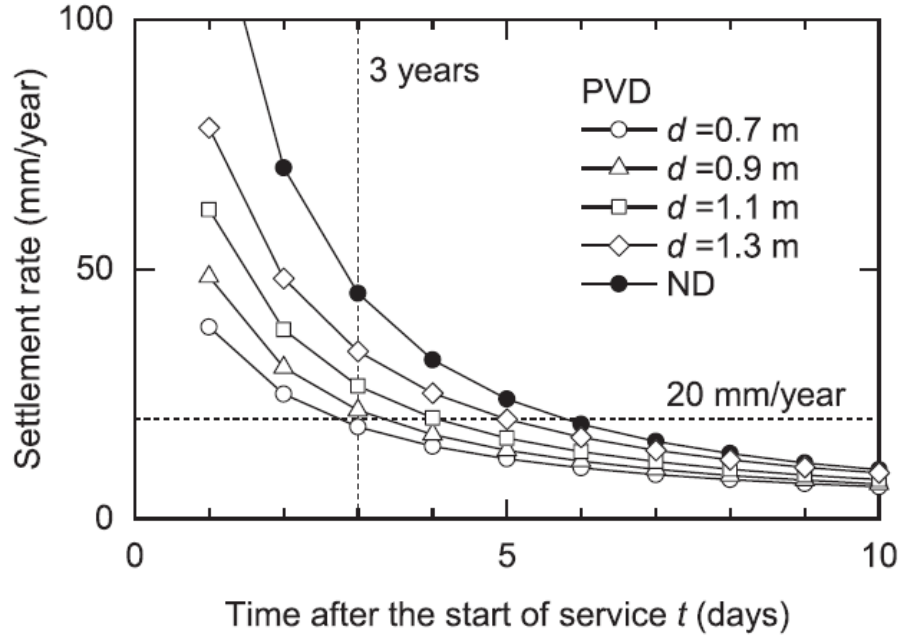



Fig. 24. Effect of drain interval on settlement rate during service.

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# Effects of seepage flow on liquefaction resistance of uniform sand and gap-graded soil under undrained cyclic torsional shear

Sanjei Chitravel, Masahide Otsubo, Reiko Kuwano

[Background]

Internal erosion: transportation of soil particles due to seepage flow.

Affecting mechanical and hydraulic behavior.

Predicting liquefaction resistance of eroded soil is challenging.

This study investigates seepage flow impact on undrained cyclic behavior of 2 type soil

1. uniform sand 2. gap-graded soil with 20% fines content.

[Methods]

1. Uniform sand (#5 silica sand) 2. gap-graded soil (mixture with 20% silica powder).

Hollow cylindrical torsional shear test with control seepage.

Through air pluviation (AP) and moist tamping (MT) methods.

[Results]

$\gamma_d$ and initial *w* influenced pore size distribution and *e*, and $G_0$ & CRR were correlated.

Uniform sand:

MT specimens showed higher liquefaction resistance than AP specimens.

After seepage flow, liquefaction resistance of eroded MT specimens was lower than non-eroded AP specimens.

Downward seepage reduced liquefaction resistance more than upward seepage.

Gap-graded soil:

Removal of fines increased liquefaction resistance (increased stable contacts of particles).

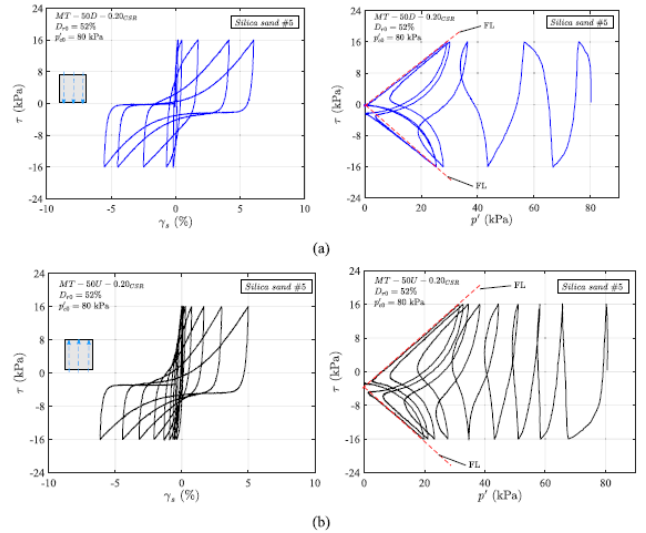


Fig. 7. Effect of seepage direction on stress–strain curves and effective stress paths of medium-dense (M) uniform sand (moist-tamped specimen, MT) under undrained cyclic loading (CSR = 0.2): **(a)** downward seepage and **(b)** upward seepage.

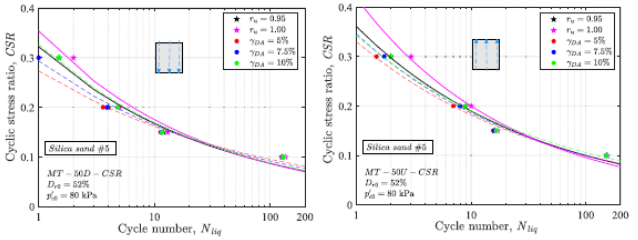


Fig. 8. Effect of seepage direction on liquefaction resistance curves of medium-dense (M) uniform sand (moist-tamped specimen, MT) in terms of 5%, 7.5%, and 10% double-amplitude shear strain ($\gamma_{DA}$), and 95% and 100% excess pore water pressure ratio ($r_u$): **(a)** downward seepage and **(b)** upward seepage.

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# Effects of stabilizers on CO2 fixation capacity in neutralization of alkali construction sludge

Su Myat Mon, Aya Sakaguchi, Shovon Raihan, Nguyen Duc Trung, Kimitoshi Hayano

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# Energy-based insight into characterization of shakedown behavior of fully weathered red mudstone

Kang Chen, Shengyang Yuan, Shenxin Pan, Jie Ma, Xianfeng Liu

[Outline]

Characterization of shakedown behavior in weathered red mudstone.

[subgrade materials in high-speed railways]

Understanding permanent deformation behavior under cyclic loading.

{Previous - suited to granular materials}, {limitations when applied to clayey soils}

[Methods]

26 cyclic triaxial tests → $\varepsilon$ and unit dissipated $E$ under various cyclic stress

New criteria for…

distinguishing between plastic creep ↔ incremental collapse based on $E_d$, CSR

[Results]

$\rho_{dmax}$ & $w_{opt}$ for the red mudstone were 2.01 g/cm³ and 8.7%

$E_d$ decreased initially with $N$ and then stabilized, indicating structural reorganization

$\dot{\varepsilon}$ and $\varepsilon_{ap}$ showed dependency on unit $E_d$ level, with ↑ $E$ levels leading to ↑ permanent deformation

New criterion provided a clearer distinction between **plastic creep** and **incremental collapse**

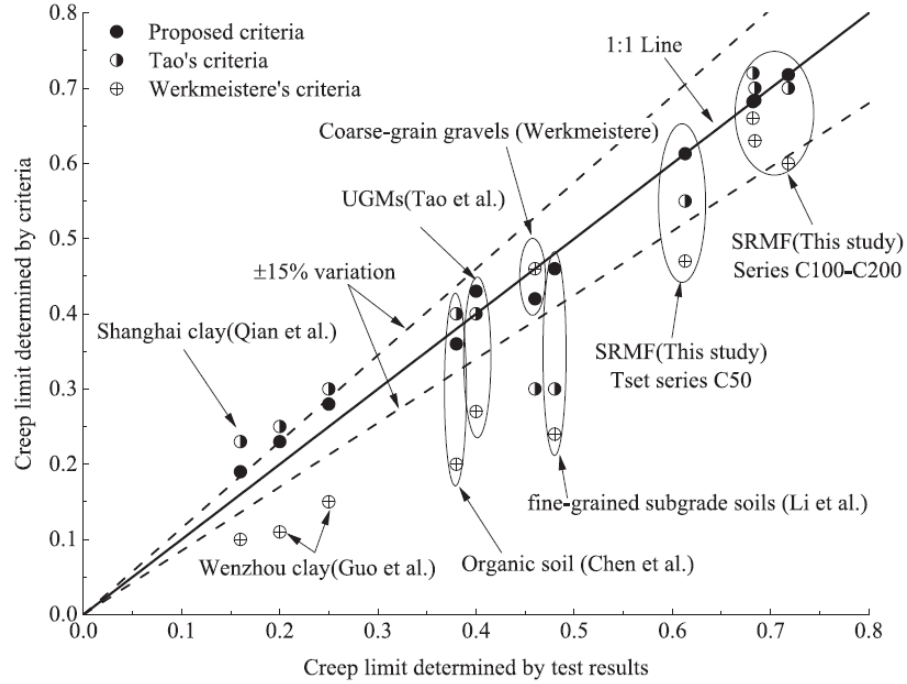


Fig. 8. Comparison of creep limit determined by test results with various criteria.

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Excavation analysis of large-scale slope considering effects of folded structure and in-situ stress

Kaixuan Yuan, Yuusuke Miyazaki, Wataru Kunimatsu, Kohei Miki, Tomihiko Ohishi, Kiyoshi Kishida

[Outline]

Impact of folded geological structures and deformation of large slope during excavation.

Deformation in a cut slope (geological structures, weathering, and tectonic stresses)

For improving slope stability assessments and designing effective mitigation measures.

[Methods] FDM FLAC2D. Data from geological surveys.

[Results]

Folded structure induced significant compressive $\sigma$ at fold bottom, leading to larger D than stratified structure.

Anisotropic $\sigma$ condition influenced deformation behavior, with ↑ horizontal $\sigma$ leading to shear failure at mudstone layer base

Max D vectors shows folded structures result in greater slope deformation, with a 9.1% than stratified structures.

$\gamma$ concentrations were observed at critical points in the folded structure, correlating with observed deep crack and failure

Anisotropic stress state, with a (K) over 1.4, reproduced deformation patterns similar to those observed at the excavation site.

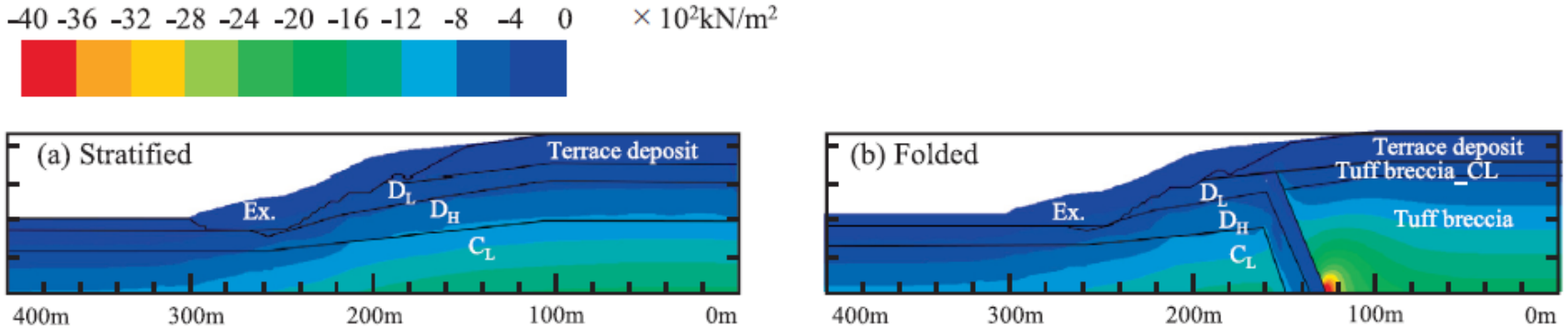



Fig. 7. Heat maps of vertical stress distribution with different geological structures after self-gravity analysis: (a) stratified structure and (b) folded structure (Negative stress indicates compression).

Soils and Foundations 63 (2023) 101359 https://doi.org/10.1016/j.sandf.2023.101359

Experimental investigation into effects of lignin on sandy loess Gaochao Lin, Wei Liu, Jixiang Zhao, Pengchao Fu

[Outline]

Potential of lignin, eco-material, to improve mechanical properties of sandy loess

Poor geotechnical properties of sandy loess, which pose risks of geo disasters

By using lignin, enhance soil's strength and stability

[Methods]

Curing tests, wet-dry cycle tests, freeze-thaw cycle tests, triaxial tests, X-ray diffraction (XRD) tests, and scanning electron microscopy (SEM) tests.

Sandy loess amples - lignin contents (0, 2, 4, 6%)

[Results]

- Curing Test: Lignin-modified sandy loess completed curing in 21 days, achieving max compressive strength, which increased with higher lignin content.
- Wet-Dry Cycle Test: Lignin did not enhance resistance to wet-dry cycles, but improved compressive strength maintained higher overall strength.
- Freeze-Thaw Cycle Test: Lignin improved resistance to freeze-thaw cycles, reducing the rate of strength loss and maintaining mechanical properties.
- Triaxial Test: Lignin altered the $\sigma$-$\varepsilon$ relationship, enhancing cohesion while maintaining $\phi$, indicating improved shear strength.
- Microstructural Observations: lignin played roles in cementation, bonding, fiber reinforcement, primarily affecting fine-grained particles & improving soil structure

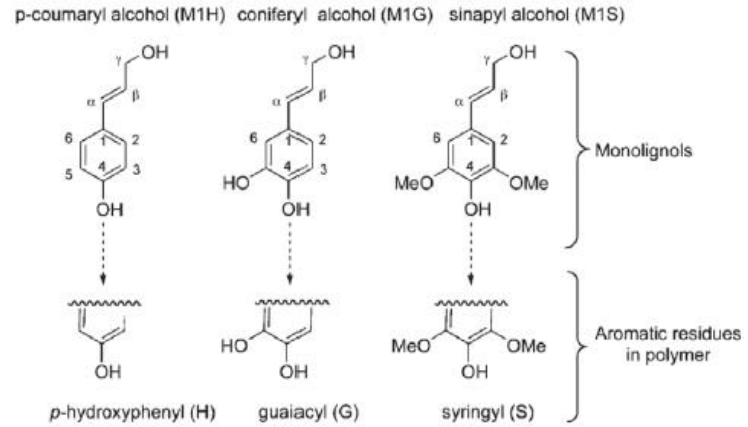



Fig. 2. Scheme of the monolignols and corresponding residues for lignin (after Calvo-Flores et al., 2015).

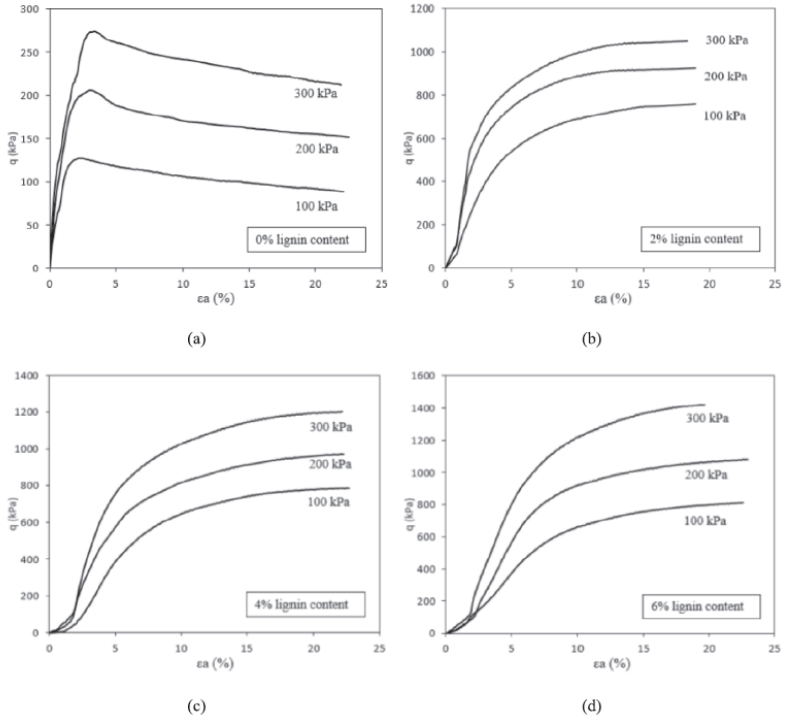



Fig. 12. Deviator stress against axial strain of triaxial CU tests for lignin-modified sandy loess.

Soils and Foundations 63 (2023) 101372 https://doi.org/10.1016/j.sandf.2023.101372

# Kinematic and inertial effects on piled rafts in soft ground supporting isolated and non-isolated buildings observed during the 2011 Tohoku earthquake

Kiyoshi Yamashita ⇑, Junji Hamada

Soils and Foundations 63 (2023) 101361 https://doi.org/10.1016/j.sandf.2023.101361

# Mechanism of sampling disturbance for peat ground and its influence on mechanical properties

Nobutaka Yamazoe, Hiroyuki Tanaka, Toshihiro Ogino, Satoshi Nishimura

[Outline]

Mechanism of sampling disturbance in peat and its impact on their mechanical properties.

High compressibility and low strength of peat,

→ Sensitive to sampling disturbances that affect accuracy of test results

[Methods]

Soil investigations in peatlands:

1. Stationary piston sampling & Open-drive sampling: {$w$ changes, $G$, compressibility, $S$}
2. Laboratory tests: {constant-rate-of-strain consolidation, unconfined compression, triaxial compression, and bender element tests}

[Results]

$w$: Stationary piston sampler maintained $w$ ↔ open-drive sampler resulted in $w$ loss.

$G$: Generally higher in samples collected with the stationary piston sampler, indicating less disturbance compared to the open-drive sampler.

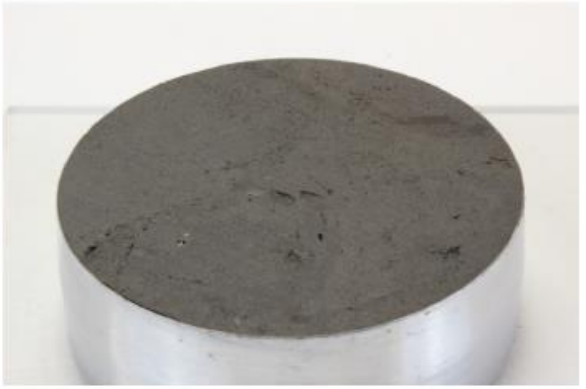
Compressibility: Samples from stationary piston sampler exhibited higher compressibility indices

$S$: Open-drive sampler samples showed higher shear strength due to densification caused by water loss during sampling, potentially leading to overestimation of in-situ strength.

Sample Recovery Ratio: Recovery ratio was higher for the stationary piston sampler, with values close to 100%, compared to 40-90% for the open-drive sampler, indicating better sample quality


(a) Fibrous peat (Namporo)

(b) Fibrous peat (Kitamura A)



(b) Clay (Tokoro)

Fig. 1. Photographs of fibrous peats and clay trimmed to 60 mm in diameter (Namporo peat was contaminated with larger wood chips than those shown in the photograph).

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# The physical and mechanical properties of recycled aggregates strengthened by enzyme induced carbonate precipitation

Yuru Chen, Angran Tian, Xinyu Luo, Yu Zhou, Qiang Tang, Satoru Kawasaki