Cite this article
Moinet WW (2024)
Editorial: Field and Laboratory Geotechnical Testing.
Proceedings of the Institution of Civil Engineers – Geotechnical Engineering **177(3)**: 209–211,
https://doi.org/10.1680/jgeen.2024.177.3.209

Editorial

Geotechnical Engineering

Editorial: Field and Laboratory Geotechnical Testing

Way Way Moinet ACGI, MSc, DIC, PhD, CEng
MICE Director, Consult Moi LTD, UK

This month's *Proceedings of the ICE – Geotechnical Engineering* is a special issue focussing on Field and Laboratory Geotechnical Testing. I have the pleasure to present to you a total of 8 technical papers on wide ranging topics from consolidation properties of problematic soft soils to dynamic response of rock to high pressure gas blasting. The authors present on a plethora of types of laboratory testing from consolidation testing and triaxial testing to scaled model and field testing.

We start with four papers tackling the improvement of soft ground, with the first two papers looking at ground improvement using vacuum consolidation, the third using dry air to assist consolidation and the fourth using pervious concrete piles. The first is a paper by Hayashi and Hashimoto (2024) from CERI (Civil Engineering Research Institute for Cold Region), Sapporo, Japan, who quantify the increase in S_u of soft peaty ground through CPT measurements of a trial embankment with consolidation accelerated using vacuum consolidation through PVDs (Figure 1). The second paper, by Wang *et al.* (2024) developed a test chamber to model a PVD unit which could be instrumented and monitored in the laboratory to improve the representation of the effects of clogging of PVDs under vacuum consolidation in analytical models. The third paper by Sivakumar *et al.* (2024) reports on dry-air technology tested at model scale in the laboratory. The technique, which contrary to vacuum consolidation where water is pulled out of the soft ground to improve strength and stiffness, employs dry-air circulated at low pressure through slender granular columns to dewater the soft soil. Umaiyan and Muthukkumaran (2024) from the National Institute of Technology. Tiruchirappalli, India continue the theme of consolidation testing looking at the radial consolidation of soft clays using pervious concrete piles (PCP) which are effectively a cemented stone columns used to reduce consolidation times and increase soil strength in soft soils. Umaiyan & Muthukkumaran test two types of soft clay in a 60 cm diameter consolidometer to compare the radial consolidation characteristics of pervious concrete piles in comparison to stone columns and sand drains.

Continuing the theme of drainage, Chen *et al.* (2024) discuss the response of superstructure-quay-wall -systems with rigid drainage piles (RSQW) to seismic loads and their ability to limit lateral spreading using 1G shaking table tests (see Figure 2). They present experimental evidence for the reduction of pore water pressure and lower lateral displacements resulting from the presence of the rigid drainage piles.

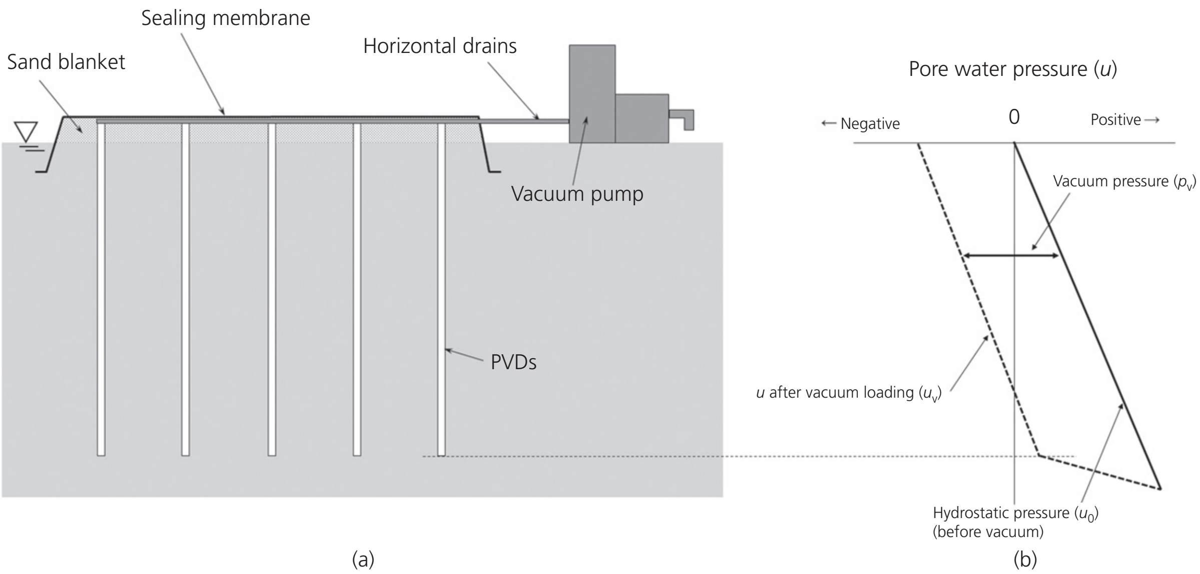


Figure 1. Schematic diagram of vacuum consolidation by Hayashi and Hashimoto

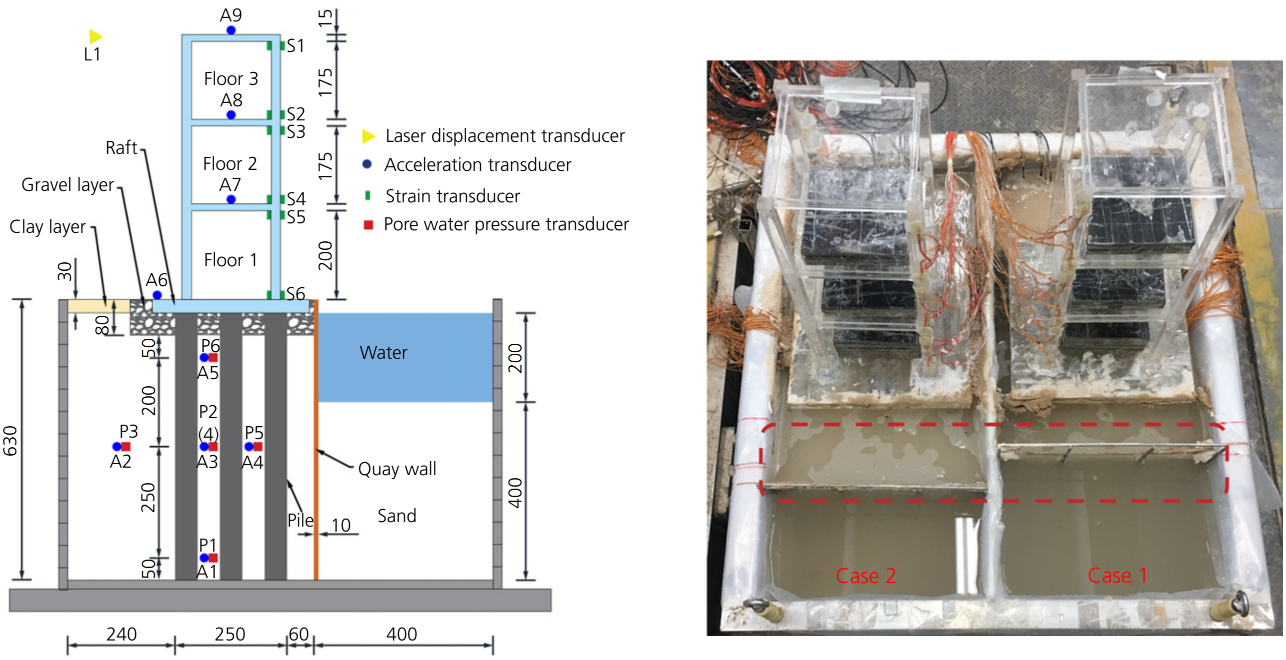
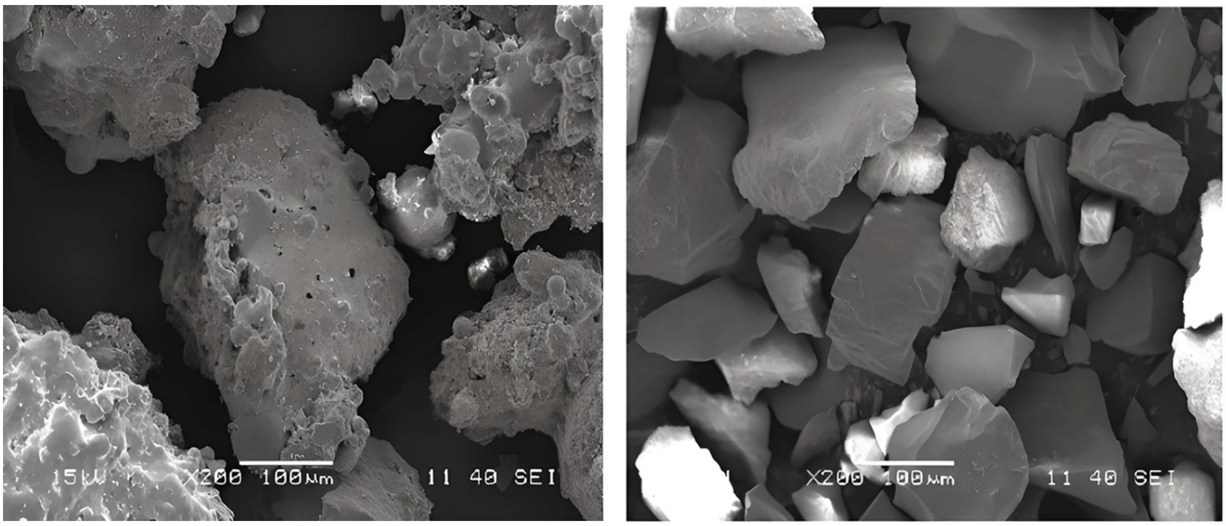


Figure 2. (Left) Schematic longitudinal section of model tests, dimensions in mm, (Right) macrophenomenon of the horizontal displacement after shaking (Chen *et al.*, 2024)



(a)

(b)

Figure 3. SEM images of (a) pond ash and (b) sand by Rout & Singh

Khodabakhshi and Arabani (2024) use large-scale oedometer and direct shear tests to quantify the compression characteristics of sand mixed with shredded waste HDPE plastic as a potential practical reuse of a problematic waste material within civil engineering. To me this is reminiscent of previous exploration into the use of waste tyre materials, in the form of tyre chips and tyre shreds which I also explored during my Doctoral studies, presented by Banzibaganye and Vrettos (2022); Soltani *et al.* (2019); Balunaini *et al.* (2014) and Sim *et al.* (2012) to name a but a few.

On the ground improvement theme the paper presented by Rout and Singh (2024) both from Odisha, India examines at the potential for using a waste material 'pond ash' from thermal power plants in place of sand in landfill liners. Rout and Singh explore the compaction properties, UCS, hydraulic conductivity and shrinkage of pond ash versus sand with the same grading mixed with 20% bentonite by weight at different relative water contents. They provide convincing evidence to support the use of pond ash in the place of sand for landfill liners and is particularly interesting for its examination of the influence of particle shape on the resulting bentonite mix properties (see Figure 3). Back in the UK a similar study was performed by Binns *et al.* (2008) on Lias clay to examine its viability as a landfill liner.

We close out this issue with Wei *et al.* (2024) who look at High Pressure Gas (HPG) blasting through a combination of theoretical calculations, experimental tests and numerical simulations. Their laboratory based experimental component involved the fabrication of Layered Rock Mass (LRM), a combination of soft and hard rock using specified mixes of sand, cement, plaster and water, samples for testing. The LRM's were instrumented with piezoelectric film sensors to monitor the dynamic strains from the blasting induced stress waves. Readers might also be interested in a related case study from 1996 by Chakraborty *et al.* looking at peak particle velocities from blasting in the vicinity of a operational hydro-electric powerhouse.

REFERENCES

Balunaini U, Mohan VKD, Prezzi M and Salgado R (2014) Shear strength of tyre chip-sand and tyre shred-sand mixtures. *Proceedings of the ICE – Geotechnical Engineering* **167(6)**: 585–595, https://doi.org/10.1680/geng.13.00097.

Banzibaganye G and Vrettos C (2022) Sand-tyre chips mixtures in undrained and drained cyclic triaxial tests. *Proceedings of the ICE – Ground Improvement* **175(1)**: 23–33, https://doi.org/10.1680/jgrim.20.00046.

Binns A, Robinson PNJ and Eccles CS (2008) The properties of Lias Clay for landfill liners. *Proceedings of the ICE – Geotechnical Engineering* **161(4)**: 197–207, https://doi.org/10.1680/geng.2008.161.4.197.

Chakraborty AK, Murthy VMS and Jethaw JL (1996) Innovative cautious blasting technique for excavation close to a running hydro-electric powerhouse – A case study. *Proceedings of the ICE – Geotechnical Engineering* **119(1)**: 57–63, https://doi.org/10.1680/igeng.1996.28136.

Chen Z, Liu C, Wang C *et al.* (2024) Response of rigid drainage pile–superstructure–quay wall system under lateral spreading. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **177(3)**: 259–274, https://doi.org/10.1680/jgeen.22.00147.

Hayashi H and Hashimoto H (2024) Increasing the undrained shear strength of soft ground improved by vacuum consolidation. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **177(3)**: 212–227, https://doi.org/10.1680/jgeen.21.00154.

Khodabakhshi M and Arabani M (2024) The compression characteristics and lateral earth pressure coefficient of sand–HDPE mixtures. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **177(3)**: 275–290, https://doi.org/10.1680/jgeen.22.00174.

Rout S and Singh SP (2024) Effect of compaction water on strength and hydraulic properties of bentonite-based liner. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **177(3)**: 291–302, https://doi.org/10.1680/jgeen.22.00173.

Sim WW, Towhata I, Yamada S and Moinet GJM (2012) Shaking table tests modelling small diameter pipes crossing a vertical fault. *Soil Dynamics and Earthquake Engineering* **35**: 59–71, https://doi.org/10.1016/j.soildyn.2011.11.005.

Sivakumar V, Pandey P, Tripathy S *et al.* (2024) Dry-air technology for stabilising weak deposits. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **177(3)**: 239–246, https://doi.org/10.1680/jgeen.21.00231.

Soltani A, Deng A, Taheri A and Sridharan A (2019) Consistency limits and compaction characteristics of clay soils containing rubber waste. *Proceedings of the ICE – Geotechnical Engineering* **172(3)**: 174–188, https://doi.org/10.1680/jgeen.18.00042.

Umaiyan U and Muthukkumaran K (2024) Improved radial consolidation in soft clay using pervious concrete piles. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **177(3)**: 247–258, https://doi.org/10.1680/jgeen.22.00046.

Wang P, Yang XT, Zhang J and Ge X (2024) Vacuum consolidation of soil: clogging effect, varying permeability and compressibility. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **177(3)**: 228–238, https://doi.org/10.1680/jgeen.21.00237.

Wei H, Wang C, Zhu J, Yang X and Chu H (2024) Propagation of stress waves in layered rock mass under the impact of high-pressure gas. *Proceedings of the Institution of Civil Engineers – Geotechnical Engineering* **177(3)**: 303–322, https://doi.org/10.1680/jgeen.22.00116.