Popular scientific summary of master thesis in geotechnical engineering, LTH, Lund University.

Relationship between Shear-Wave Velocity and Consolidation Parameters of Peat

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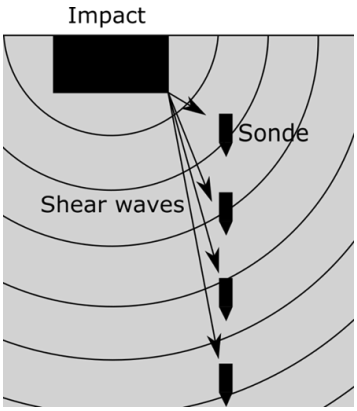
Peat is an organic soil that is highly compressible and mainly consists of water. It is therefore a difficult material for construction and is avoided if possible. One method to use if peat cannot be avoided is to preload the soil before construction, of a road for instance. It is then of big interest to know how much of the long-term settlement is developing during the time of preloading. It is critical to determine the consolidation parameters to make a useful approximation of the settlement.

It is hard and costly to obtain undisturbed samples for evaluation of the consolidation parameters in peat. In order to evaluate them, time demanding laboratory work must be performed. It is much cheaper and faster to determine the shear wave velocity for a soil profile. It is possible that a correlation between the shear wave velocity and the consolidation parameters for peat can be found. This thesis investigates the possible relationship. It is done by comparing the shear wave velocity to consolidation parameters for peat from three different sites.

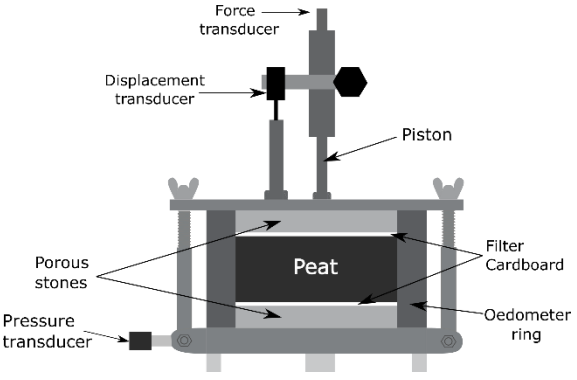


Method used to determine the shear wave velocity.

Shear waves are elastic body waves whose velocity traveling through soil can give an indication of the soil properties. Moreover, the shear wave velocity can be measured for the full peat depth. That means, if there exists a useful relationship between the shear wave velocity and the consolidation parameters, it would be possible to estimate the parameters for the full profile.

There is however no analytical relationship between the shear wave velocity and consolidation parameters. Instead, as the name suggests, the shear wave velocity is linked analytically to the parameter describing the resistance to shearing. Despite this, recent research has found an empirical relationship between the shear wave velocity and consolidation parameters for Norwegian clay.

In this thesis 13 undisturbed peat samples were tested in the laboratory and the consolidation parameters were determined. This was done by compressing the samples, the displacement was kept at a constant rate during the test. The lateral displacement was prescribed to zero, displacement was only allowed vertically and water was drained from above.



Equipment used to determine the consolidation parameters.

The undisturbed samples were excavated from three sites in Sweden and the shear wave velocity was also measured at these sites, making a comparison possible. In addition to this, the peat has been characterised by determining to what degree it is decomposed and its water content. The water content is very high for peat which allows for a large consolidation, thus making it important to measure.

Field site at Ageröds mosse in Scania, Sweden

The data in this work was not sufficient to make any definite conclusions about a possible relation. However, a weak indication of a relationship was seen for one of the parameters. Moreover, the shear wave velocity was generally increasing with depth, as could be expected since one of the controlling variables is the effective vertical stress.

Although no definitive answer of whether a relation exists between the shear wave velocity and the compression parameters was found, the data can be complemented in future studies. Generally, the knowledge of geotechnical properties for peat is limited compared to what is known about clay and there is a further need of developing methods to evaluate material parameters.

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