**Expanded Clay Aggregates: Investigation on the Effect of Side Friction between LWA and Polypropylene**

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**Abstract**

This project was an investigation on the effect of side friction between LWA 10-20mm filled in a polypropylene pipe for different fill heights. Both FEM analysis and hand calculations have been used to investigate the shear and horizontal stress distribution alongside the pipe-wall for the different sample height.

The pipe was 1.2m long with an inner diameter of 0.187m. The testing was preformed by filling up a sample height with LWA, incrementally applying load on the pipe with load plates until failure occurs and registering the maximum force which is carried by shear. Due to practical reasons, the sample height was limited to 0.2 to 0.4m. The testing was preformed at NTNU in Trondheim. As a part of the project, FEM modelling and hand calculation with silo formula were done for comparison using the test results.

The material tested was produced at Rælingen, Norway, and has been used in research for a considerable period of time so far, with a substantial experience. The test results were mainly to evaluate the effect of the side friction on the material characteristics from the testing procedures used by different organizations. Comparison of results shows some deviation, but after some adjustments in the curve fitting, the material parameters used in different calculations were within reasonable range.

Main conclusions

- Side friction is increasing almost exponentially with sample height and would in oedometer test contribute significantly to a higher stiffness of the LWA material.

- Distribution of shear and horizontal stresses is going from more triangular to exponential distribution with increase in sample height.

- The earth pressure coefficient is not constant along the sample height after compaction. Comparison between the results from measured testing results, FEM modelling and calculation with silo formula, indicates a decrease in earth pressure coefficient with increase in sample height.

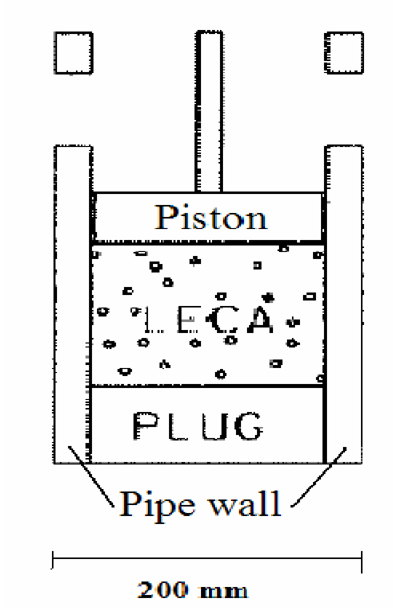


**Figure 4.1.1: Cross section of compacting procedure** **Figure 4.1.2: Compacting procedure**

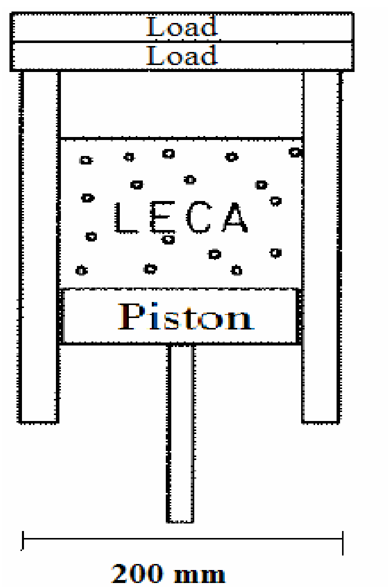


**Figure 4.2.1: Cross section of loading procedure** **Figure 4.2.2: Loading procedure**

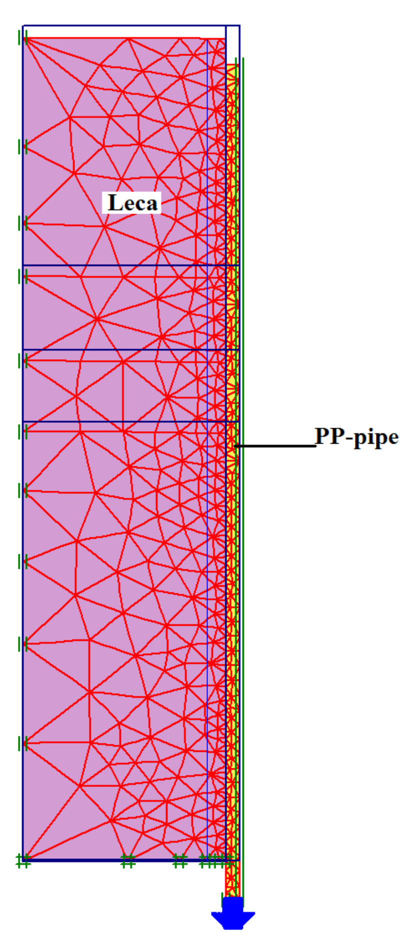


**Figure 6.3: Deformed mesh**