# UNIVERSITI TEKNOLOGI MARA

# INTERFACE SHEAR STRENGTH BETWEEN GEOTEXTILE AND SOIL-SODIUM BENTONITE LINER

**NUR AISYAH BINTI KASIM**

Thesis submitted in fulfilment
of the requirements for the degree of
**Master of Science**
**(Civil Engineering)**

**Faculty of Civil Engineering**

**April 2019**

# ABSTRACT

Landfill liner system is designed to provide maximum protection to the environment. Installation of the liner system is supervised and inspected to ensure that it meets or exceeds environmental standards. The installation of geotextile on landfill is spread by layers and will be overlapping between each layer about 0.5 m to 1.0 m. However, the occurrence of the soil movements is always expected to occur. Due to the soil movement, the geotextile actuates and hence the activity will increase the leakage probability of the leachate into the environment. Therefore, an additional material to improve the stability of the soil liner is required. In this study, the movement of geotextile on the soil liner design can be reduced by mixing the soil liner with sodium bentonite. Three (3) soil samples from the reserved site for future landfill in Jengka Ten (10) Maran, Pahang were taken for this study. The laboratory tests conducted on the samples were to determine their physical properties, the compaction and direct shear tests. In order to estimate the interface shear strength, rigid block glued with geotextile and containing compacted soil samples at maximum dry density and optimum moisture content were prepared for direct shear test. From the direct shear test, the best value of friction angle (δ) with appropriate percentage of sodium bentonite can be determined. In this study, the best percentage of sodium bentonite added to the soil sample was found to be 15% of sodium bentonite. This is because interface shear strength becomes optimum at 15% of sodium bentonite being added. That was based on some of other properties of the soil sample added with sodium bentonite which has shown that sodium bentonite can improve the soil sample properties and meets the requirement of soil liner design at 15% of sodium bentonite. Hence, the results from this study can serve as a guideline in designing the soil liner for future landfill that is going to be built soon in reserve lot for new landfill in Jengka 10, Maran and for other landfills that have the same type of soil as the landfill area chosen in this study.

# ACKNOWLEDGEMENTS

Alhamdulillah. Praise be to Allah the Most Gracious and Most Merciful that has created mankind with knowledge, wisdom and power.

I would like to express my special thanks of gratitude to my supervisor Dr. Mazidah Binti Mukri and my co-supervisor Dr Haryati Binti Awang who gave me the golden opportunity to do this wonderful research on the topic of the interface shear strength between geotextile and soil liner with the presence of sodium bentonite, which also helped me in doing a lot of study and i came to know about so many new things I am really thankful to her.

Besides that, I would like convey laboratory staffs Mr. Akhbar for their valuable help in handling the laboratory equipment. I would also like to thanks my parents Kasim Bin karim and [redacted] my siblings Nor Hidayu, Nur Ain, Nur Hidayah and Mohd Aiman, my brother in law Kamarudin and my friends who helped me a lot in finalizing this thesis within the limited time frame.

Thanks to all.

# TABLE OF CONTENTS