# UNIVERSITI TEKNOLOGI MARA

# COMPARATIVE STUDY ON STANDARD STATIC PACKING PRESSURE (SSPP) AND STANDARD PROCTOR LABORATORY COMPACTION METHODS

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Thesis submitted in fulfilment of requirements
for the degree of
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## AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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# ABSTRACT

The most recognizable development of compaction test is known as the Standard Proctor Test, which is used to estimate the density value of soils. However, the laboratory concept produced by Proctor (1933) has a few imperfections in determining the value of Maximum Dry Density (MDD) and Optimum Moisture Content (OMC). It also has some imperfections in application where the method that is applied in the field and laboratory to measure the density of soil are different. The compaction technique applied on the subgrade road layer for cohesive soil is by using roller compactor machine (static technique) while the technique that is applied in the laboratory is by dynamic compaction method. Thus, a new laboratory compaction method has been developed to determine the density, shear strength, and CBR values by using Standard Static Packing Pressure (SSPP) efforts in order to close the gap between laboratory and field data. In this study seven (7) types of soil based on plasticity chart were tested in several tests to obtain the important engineering parameter such as density ($\rho_d$), water content ($w_c$), shear strength ($C_u$), compaction energy (E) and CBR value of soils. Based on the laboratory results, it was found that the SSPP method is more practical and sensible than the dynamic compaction. The SSPP for Soil B obtained MDD was 1.86 Mg/m$^3$, OMC 14.32%, the amount of energy input ($E_{SSPP}$) 544.5 kJ/m$^3$, shear strength ($C_u$) 259 kPa, and CBR value 22.62%. Then, soil B for dynamic compaction obtained MDD of 1.74 Mg/m$^3$, OMC 16.31%, the amount of energy input ($E_{Dy}$) 597 kJ/m$^3$, shear strength ($C_u$) 115 kPa, and CBR value 20.14%. Therefore, the SSPP reached the higher MDD, Cu and CBR value, although the soil samples require less amount of energy compared to the dynamic method. An equivalent amount of energy input; $E_{(Dy)}$ is imposed on all types of soil through dynamic compaction method, while energy input by SSPP; $E_{(SSPP)}$ is different for each type of soil. In this research, a new laboratory compaction method has been developed to improve engineering parameter, especially for road construction design. The SSPP and dynamic compaction OMC values are used in preparing soil samples for CBR test. Based on the experimental results, the CBR values obtained from SSPP tests were higher than dynamic compaction method. In conclusion, higher CBR value can minimise the road design thickness and consequently reducing the cost of road construction.

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