HORIZONTAL PERMEABILITY OF UNBOUND GRANULAR AGGREGATES IN HIGHWAY BASE AND SUB-BASE

by

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DEDICATION

To my father and mother, my beloved wife Zoliah Atan and my children Muadz, Hamzah, Ahmad Syauqi, Najihah, Nabil and Aimi Nabilah

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ABSTRACT

The horizontal permeability characteristics of unbound granular materials are important in many Civil Engineering applications including as filter in dams, and as unbound layers in highway pavements. In general, the gradation criteria and specification for highway base and sub-base require the aggregates to fall within a given particle-size distribution envelope. Further criteria for the unbound aggregates are the required minimum value of permeability of the aggregates. The horizontal permeability parameters of unbound aggregates have been identified as the important cause of road failures. In recent years, the cost of maintenance for such road failures has been very high. It can be reduced if we fully understand these important parameters.

Two types of aggregate, namely crushed granite for base, and sand for sub-base were examined. From these specimens, three levels of gradation categories were examined: well graded, uniformly graded and gap graded. These grading were related to JKR practice and Singapore practice and also related to the mean of both codes of practices. The horizontal permeability was measured by using horizontal permeameter.

This research is intended to characterise horizontal permeability of unbound aggregates in highway base and sub-base. The relative deviation, D_r, from the specified gradation envelope was measured with several new criteria. With these new criteria, their relationship to horizontal permeability of granular material was examined.

On the basis of the results obtained, increasing the porosity will increase the permeability, while as increasing relative deviation, D_r, to the specification will decrease the horizontal permeability. However, by increasing the average of 10% retained materials above the diameter, R_{10}, this will cause an increase to the permeability.