INTI INTERNATIONAL UNIVERSITY

Faculty of Engineering and Quantity Surveying

EFFECT OF AGGREGATE TO CEMENT RATIO ON THE PERFORMANCE OF PERVIOUS CONCRETE

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SUPERVISOR'S DECLARATION

This project report entitled (Effect of Aggregate to Cement Ratio on the Performance of Pervious Concrete) is prepared and submitted by (KIEW JIE FU) as partial fulfilment of the requirement for Bachelor of Engineering (HONS) in Civil Engineering, INTI international University.

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STUDENT'S DECLARATION

I hereby declare that the final year project is based on my original work except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at INTI INTERNATIONAL UNIVERSITY or other institutions.

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ABSTRACT

Pervious concrete is a special concrete mixture designed to allow water infiltration. The effect of aggregate to cement ratio on the performance of pervious concrete is evaluated. The optimized aggregate to cement ratio used in pervious concrete had been indicated. Several test such as compressive strength test, density test, porosity test, and constant head water permeability test were conducted to determine the optimum aggregate to cement ratio incorporating 3:1, 4:1, 5:1, and 6:1. Specimen with higher aggregate to cement ratio achieve higher compressive strength and density but lower porosity and permeability. The result shown that specimen with 3:1 aggregate to cement ratio achieved highest average density of 1974 kg/m^3 and lowest porosity of 26.3 percent. Besides, specimen with 3:1 aggregate to cement ratio also achieve highest average compressive strength of 12.14 MPa and acceptable water permeability and porosity content at 28th day. On the other hand, the result indicate the specimen with 6:1 aggregate to cement ratio achieved lowest average compressive strength of 5.04 MPa and highest water permeability of 2.93 cm/s. Flaky shape of coarse aggregate which limited the compressive strength of pervious specimen achieved is not recommended to use.

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ACI	American Concrete Institute
A/C	Aggregate to cement ratio
ASTM	American Society for Testing and Materials
BSI	British Standard Institution
NRMCA	National Ready Mixed Concrete Association

CHAPTER 1

INTRODUCTION

1.1 Background

Permeable concrete or better known as porous concrete or pervious concrete is a unique concrete with open graded system which allow water to pass through by its porous properties. Pervious concrete generally consist of cement binder, water, coarse aggregate, admixture and little or no sand. The slump value from the slump test is around 0 mm to 25 mm in order to produce a dry mixes that can be used in paving machines with high-powered vibration (Ćosić *et al.*, 2015). Due to the high porosity, the strength and durability are relatively decreasing compared to conventional concrete. Thus, pervious concrete is normally used in low traffic volume road, parking areas, residential streets and sidewalk or pedestrian walkway (Ćosić *et al.*, 2015). Pervious concrete is very useful for flood control, handling water runoff, and increase skid resistant because of its high porosity. Centre for Watershed Protection, a non-profit organisation stated that installing pervious concrete is very economical due to the lower installation cost compare to traditional gutters, curbs, piping, retention basins, and storm drain inlets which cost approximately three times more than pervious concrete. Besides, pervious concrete can also improve the land utilizations by neglecting the require of detention basin (Ibrahim *et al.*, 2014a). On the other hand, pervious concrete save extra land for installation of additional filter system and large ponds in order to retain storm water. In additional to all the economical factor, pervious concrete also reduce the heat island issue by its light colour and open cell structure (Ajamu *et al.*, 2012). In general, pervious concrete have to satisfy the properties such as void content between 18 to 35% , size of connected pores range between 2 to 8 mm and range of 2.8 to 28 MPa compressive strength (Tho-In *et al.*, 2012).