

UNIVERSITI TEKNOLOGI MARA

**TECHNICAL VIABILITY OF USING
EGGSHELLS POWDER IN
CONCRETE MIX**

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ABSTRACT

The evident rise of cement demand in some developing countries as well as the upsurge concerns on environmental issues regarding to cement resources and solid waste dumping has call for the usage of alternative cement materials from different sustainable resources that can deliver less negative impacts to the environment. The usage of Eggshells Powder (ESP) is commendable as an alternative for cement due to its similar chemical composition with the Ordinary Portland Cement (OPC) where both materials are principally composed of Calcium Carbonate (CaO). The Eggshells Powder (ESP) used in this study is a food waste from a bakery shop whereby the utilisation of food waste as a partial replacement material in concrete mix corresponds with the significant efforts on addressing environmental issues on solid waste dumping caused by rapid urbanisation in most developing countries. In this sense, environmental issues can be potentially resolved by recycling the food waste to produce applicable construction components. Therefore, this research deals with the viability and suitability of food waste material in concrete mixes. The objective of the research is achieved into four main phases which are determination of chemical and physical properties of ESP, designation of mix proportions of ESP using the replacement level of 0%, 1% and 2.5% with w/c ratios 0.47, 0.55 and 0.70 and the specimens were tested for 3 to 28 days, consideration of engineering properties including compressive and flexural which are important for the performance evaluations of the ESP concrete as compared to the natural cement concrete (NCC) and assessment of the durability performance of ESP concrete, where resistance to carbonation and sulphate attack were conducted. Consistency, setting time, compressive strength, flexural strength, carbonation depth and sulphate attack test were subsequently. From the strength point of view with various w/c, the ESP concrete compared well with the natural cement concrete. The mechanical properties of ESP concrete increased with the proportion of natural cement. The results indicated that higher concrete strength was obtained from the mixtures with optimum percentage of 2.5% ESP as a replacement of the cement for all various w/c used. The compressive strength of the ESP concrete is found to be higher than NCC, showing that the higher the w/c ratio, the lower the strength of the concrete. As for durability, ESP concrete produces higher durability at low w/c ratio exhibited good durability performance compared to NCC. It was found that it is feasible to utilise ESP as a partial cement replacement with the percentage replacement of cement up to 2.5% and its potential for reduction of cement demand as well as to address the environmental problems.

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