

Optimising concrete enhancement of local ready-mix concrete partially replaced with local fly-Ash

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Abstract. Concrete performance and workability can be improved by using an optimum amount of fly-ash. This leads to the purpose of analysing the percentage of fly-ash that can replace a certain amount of Portland cement in the concrete until it reaches the maximum strength. The experiment was conducted using G25 and G45 concrete supplied by a local ready-mix concrete plant in Kuching, Sarawak. The cement content of each concrete grade was replaced with various fly-ash percentages of 20, 30, 40, 50 and 60 collected from waste materials in Pending Sarawak. The specimens used in the studies were made of 150mm concrete cubes. Specimens were tested for compressive strength at the ages of 3, 7, 14, 28, 56 and 90 days. The curing age extended to 56th and 90th-day to participated slow pozzolonic reaction process contributed by fly-ash. Based on the test results for both concrete grades with enhancements, the compressive strength significantly increases from 7 days to 56 days, and then slightly increases on the 90th-day. The G25 concrete has an optimum strength with a fly-ash replacement of 30% cement content, followed by 40%, 20% and 50%. Similarly, the G45 concrete achieved an optimum strength with a fly-ash replacement about 30% cement content, followed by 20%, 40% and 50%. In addition, both grades of concrete tested have a cut-off cement replacement level of 60%, beyond which the compressive strength falls below that of the control mixtures.

1. Introduction

The initial economic cost of construction materials is the purchase price. This usually determines the decision on which material to use. Meanwhile, considerations on the durability and long term environmental effect are also playing main important role in the selection of construction material. Cement is the most widely used as construction material that is responsible for production of about

