THESIS TITLE : THE USE OF GRAVEL FOR HIGH-STRENGTH CONCRETE

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ABSTRACT

This experimental study has been carried out to study the practicability of using gravel as coarse aggregate in the production of high-strength concrete. The study is aimed to determine the optimum sand content as well as the percentage of paste overfill which are required for producing concrete of high compressive strength, workability, and modulus of elasticity.

The concrete mix is composed of Portland cement type 1, water, natural sand, gravel from the Maekhong River collected from three sites at Nongkai, Mukdahan, and Nakornpanom Provinces, 2% of Sikament-FF superplasticizer, and a 0.25 water-cement ratio. The maximum size of gravel is 3/4" (19.0 mm.). The mix design of high-strength concrete was based on a volumetric approach , a maximum density theory , and a percentage of paste overfill.

It is found that the densest packing of aggregate can be achieved at a sand content of 48%. The percentage of paste overfill has a major influence over the

workability of the mix due to the low water-cement ratio. The optimum percentage of paste overfill is found to be 10%. Above this value, segregation is likely to occur.

Compressive strength of the concrete at the age of 28 days, based on the test results of 100x100x100 mm. cube specimens, ranges from 417 to 770 ksc. A strength gain of 70% occurs during the first 24 hours. The Modulus of Elasticity ranges from 400,000 to 490,000 ksc..

The prospect of using gravel in high-strength concrete production is promising. Cost analysis reveals that a cost reduction of up to 14% can be achieved if gravel is used in lieu of crushed rock in the areas where gravel is readily available.