Thesis Title	A Study of Compressive Strength of High Strength Concrete Mixed with Condensed Silica Fume, Classified and Ground Coarse Fly Ashes
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Abstract

This thesis is a development of fly ash to be used as a substitution of condensed silica fume, which is expensive and is imported to produce high strength concrete. Fly ash from Mae Moh power plant was processed to have high fineness as well as high specific surface area. The mean particles sizes of classified and ground coarse fly ashes are 3.2 and 3.8 microns, respectively. Each fly ash was replaced by Portland cement type I 0, 15, 25, 35, and 50 percent by weight of cementitious material in order to produce high strength concrete. Compressive strength and cost of high strength concrete were investigated and compared with high strength concrete mixed with condensed silica fume. For high strength concrete mixed with condensed silica fume, the condensed silica fume was replaced by Portland cement type I with 5, 10, 15 percent by weight and condensed silica fume mixed with fly ash was also used to replace Portland cement type I with 15, 25, 35, and 50 percent by weight of cementitious material. Besides, the modulus of elasticity of high strength concrete was also investigated.

The results revealed that the control concrete with Portland cement of 554 kg/m^3 had compressive strength of 749 ksc at 28 days. The amount of suitable condensed silica fume to produce the highest compressive strength were about 10-13 percent of the cementitious material. The use of ground coarse fly ash to substitute

Portland cement with 15-50 percent could be used to replace 5-15 percent of condensed silica fume because it gave the same compressive strength of concrete at 7-day and the cost was cheaper about 13-55 percent. The classified fly ash was suitable to replace Portland cement with 15-25 percent and comparable to concrete with 5-15 percent of condensed silica fume since the concrete had the same strength at 180 days and the cost was cheaper about 28-63 percent.

Concrete mixed with condensed silica fume of 10-13 percent and ground coarse fly ash of 2-40 percent gave compressive strengths between 102-154 percent of the control strengths. If condensed silica fume was mixed with classified fly ash of 2-25 percent, it gave compressive strength between 95-133 percent of the control strengths. This investigation suggested that the use of suitable mixture of condensed silica fume and classified or ground coarse fly ashes gave better compressive strength than the use of only condensed silica fume in concrete. In addition, concrete mixed with classified or ground coarse fly ashes of 12-50 percent tended to gain higher strength after the age of 180 days. Finally, the values of modulus of elasticity of high strength concretes measured from this experiment were between 414,600-519,100 ksc or 3.59-22.82 percent higher than those predicted by ACI 363.

Keywords : High Strength Concrete/ Condensed Silica Fume/ Classified Fly Ash / Ground Coarse Fly Ash / Modulus of Elasticity