

Thesis Title	Effect of Magnesium Sulfate on Compressive Strength and Expansion of Mae Moh Fly Ash-Cement Based Material
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Abstract

In this thesis, effect of magnesium sulfate attack on mortars and concretes mixed with fly ash from Mae Moh was studied. Fly ash was classified by air classifier into two different finenesses. The original fly ash and the two classified fly ashes had specific surface area in term of Blaine of 3602, 6571, and 14671 cm^2/g , respectively. Each size of fly ash was used to substitute Portland cement type I of 20, 30, 40, and 50 percent by weight. Fly ash-cement based material was mixed to form standard mortar cubes, concrete cylinders, and mortar bars of 2.5×2.5×30 cm. All specimens were tested in three cases. Case I, the specimens were cured in saturated lime water. Case II, the specimens were cured in saturated lime water for 28 days, then immersed in 5% of magnesium sulfate solution. Case III, the specimens were immersed in the magnesium sulfate solution immediately after removing from the molds. Fly ash-cement specimens were tested and compared with the specimens made from Portland cement type I and V. Compressive strength of standard mortar cubes and concrete cylinders were investigated at the age of 28, 63, 91, 182 days while the expansion of the mortar bars were measured every 14 days up to 476 days.

The results showed that the mortars mixed with very fine fly ash and cured in saturated lime water gave the highest compressive strength. The mortars cured in saturated lime water for 28 days and immersed in magnesium sulfate solution (Case II) had slightly lower compressive

strength than the ones immersed immediately in the sulfate solution (Case III) up to the age of 385 days. The expansion due to magnesium sulfate solution of fly ash-cement mortar bars in Case II due to magnesium sulfate solution were lower than the ones in Case III. The higher the replacement of fly ash in cement based material, the expansion of mortar became lower. The expansion of mortar bars made from Portland cement type V were lower than those made from Portland cement type I. However, the mortar bars made from very fine fly ash and Portland cement type I had lower expansion than the ones made from Portland cement type V. In addition, the mortar bars mixed with received fly ash expanded more than the mortars mixed with classified fly ashes, in both Case II and III. The effect of magnesium sulfate on compressive strength of concrete was little up to the age of 406 days. This may be due to the surface area of cementitious material in concrete is not as high as mortar and the use of fly ash makes concrete more dense, less permeability, thus it is more difficult of sulfate to attack.

Keywords : Fly Ash / Magnesium Sulfate / Expansion / Concrete / Mortar / Compressive Strength