

Thesis Title	A Study of Strength Activity Index and Particle Effect of Mae Moh Fly Ash Mixed with Portland Cement Type I
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### Abstract

In this thesis, strength activity index and particle effect of Mae Moh fly ash mixed with Portland cement type I were studied. Strength activity index of fly ash-cement mortar was contributed from the hydration reaction, pozzolanic reaction, and effect of small particle of fly ash. However, the value of strength activity index contributed from particle effect was not known. Strength contributed by particle effect can be determined by using insoluble material which has the same size of fly ash and has no pozzolanic reaction to replace Portland cement. Both mortars with fly ash and insoluble material were tested for their strength activity index and compared. In addition, the relationships between strength activity index of fly ash-cement mortar with different particle size and curing ages were also investigated. A proposed model was developed to predict strength activity index when fly ash with different finenesses was used to replaced Portland cement type I.

The results revealed that the highest strength activity index was obtained when the finest fly ash was used in the mixture. At the age of 28 days, the strength activity indices with control flow and control water-cementitious material ratio were

112 and 108%, respectively. However, the strength activity indices of the coarsest fly ash was only 65%, both by control flow and control water-cementitious material ratio. Strength activity index depended on the fineness of fly ash. The higher the fineness of fly ash, the higher the strength activity index was resulted. The study also indicated that packing effect of fly ash depended on the particle size of fly ash. With smaller particle size, the packing effect had more influence on increasing the strength activity index than the bigger one. Fly Ash with particle size bigger than 150 micron contributed very little compressive strength on mortar. An Ideal Pozzolanic Activity Index (IPAI) increased with the increased of fly ash fineness. Finally, the proposed models for strength activity index were developed as follows:

For flow of mortar between 105 to 115

$$\text{SAI (FF)} = (0.4126A + 110.272) - (0.0432A + 9.69)\ln(x)$$

For water-cementitious material ratio of 0.485

$$\text{SAI (FW)} = (0.3498A + 104.101) - (0.0548A + 7.7067)\ln(x)$$

where

SAI = strength activity index of fly ash-cement mortar (%)

A = the curing age of mortar between 3 to 90 days (day)

X = the mean particle size of Class F fly ash between 3 to 160 micron with 20% cement replacement by weight (micron)

Both models were tested with satisfactory and the predicted results were more accurate with the small size of fly ash.

**Keywords :** Fly Ash / Insoluble Material / Compressive Strength / Packing Effect / Strength Activity Index / Models