Sawasdichai Jermtaisong 2009: Datum Temperature and Activation Energy of Fly Ash Concrete. Master of Engineering (Civil Engineering), Major Field: Civil Engineering, Department of Civil Engineering. Thesis Advisor: Associate Professor Suvimol Sujjavanich, Ph.D. 240 pages.

This thesis aimed to investigate the datum temperature, activation energy and microstructure of concrete using fly ash from local source, as affected by temperature and curing time. To predict the long term strength of concrete by maturity method, datum temperature and activation energy (E) are essential. Typical value of -10 degree Celsius for datum temperature and 40000 - 45000 Joules/mol for E have been typically used. Different values may be expected for fly ash concrete. In the study, concrete with designed compressive strength of 240 and 350 ksc and fly ash percentages of 0, 15, 25 and 35 were used. The chosen curing temperatures were 28, 40 and 60 degree Celsius.

The results indicated that, the effect of increase in temperature on setting time for normal concrete was similar to those of fly ash concrete at the percentage replacements of 15 and 25. At percentage replacement of 35, the higher compressive strength concrete revealed the less sensitivity on setting time as the temperature increased. The datum temperature of fly ash concrete was higher than that of normal concrete. However, the E value was lower than that of the normal concrete. The E value was also affected by the level of cement replacement and the design strength. At replacement level of 0, 15, 25 and 35, the datum temperatures of 240 ksc design strength concrete were -8.46, 0.85, 1.79 and 2.27 degree Celsius and -7.22, -4.15, -0.24 and -0.01 degree Celsius for those of 350 ksc design strength. The E value for 240 ksc design strength concrete were 14561, 19644, 23349 and 22405 Joules/mol as well as 16513, 17650, 19823 and 18117 Joules/mol for 350 ksc for the above replacement levels. The microstructure study conducted on the chosen mixture of 240 ksc design strength with and without 25 percent fly ash, cured at 40 degree Celsius. The matrix of control cement paste at the age of 28 days, was denser compared to that of early age. For cement paste with 25 percent replacement of fly ash at the age of 28 days, the microstructure appeared to be denser with less cracks, compared to those of 14 days and normal paste at the same age. It also showed continued pozzolanic activity and a reduction in calcium hydroxide from the former to the latter.

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