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SHRINKAGE COMPENSATING CONCRETE IN POST-TENSIONED STRUCTUERS

A Thesis submitted in partial fulfillment for the requirements of the degree of Master of Science in Structural Engineering

by

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STATEMENT

This thesis is submitted as a partial fulfilment of the degree of Master of Science in Civil Engineering (Structural) , Faculty of Engineering, Ain Shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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Abstract of the M.Sc. Thesis Submitted by

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ABSTRACT

Drying shrinkage in post-tensioned elements acts differently than in the case of non-pre-stressed elements and this is because it is responsible for about 50% of the total amount of long term losses in prestress forces; accordingly small drying shrinkage strains generate large unnecessary stresses causing severe cracking leading to the deterioration of concrete and all the other crack accompanied problems. The use of shrinkage-compensating concrete which expands in volume due to the presence of expansive cements or expansive agents has shown efficiency in eliminating drying-shrinkage cracking.

In this study, shrinkage compensating concrete was produced using dead burnt lime as an expansive agent with dosages of 4%, 8%, and 12%. The effect of combining this expansive agent with each of shrinkage reducing admixture (SRA) and silica fume on the expansion potential and compressive strength of concrete was investigated. The use of shrinkage compensating concrete in post-tensioned beams was also studied.

Twelve concrete mixes divided into three groups were used in this study. The first group consisted of mixes incorporating CaO only. The second group consisted of mixes incorporating CaO as well as a shrinkage reducing admixture (SRA) with a constant dosage of 1.25% by weight of cement. The third group consisted of mixes incorporating CaO and silica fume as a cement replacement with 7.5% by weight of cement. The restrained expansion of shrinkage compensating concrete mixes

was determined by measuring the length change of concrete specimens for 200 days.

From the analysis and the discussion of test results obtained in this research, it was found that the increase in CaO content increases the expansion of concrete. The combined effect of the used shrinkage reducing admixture reduces both strength and expansion of concrete, while the use of silica fume increases the expansion of concrete incorporating 8% and 12% of CaO. Shrinkage-compensating concrete incorporating 8% CaO without any additional admixtures showed acceptable expansion within the permissible limits.

The use of dead burnt lime as an expansive agent showed to be very promising in the production of shrinkage compensating concrete to be used in post-tensioned beams.

Keywords: **Dead burnt lime, Expansive agents, Length change, restrained expansion, Shrinkage, Shrinkage reducing admixtures.**

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