

Thermo-Hygral Analogue for Determination of Shrinkage Related Stresses in Concrete Structures

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Rapid moisture loss in concrete and the coupled shrinkage strain in concrete elements cause distress in structural members at early ages. The shrinkage stresses and the associated cracks can be reduced by controlling the rate of the moisture loss. However, under some circumstances, controlling the rate of the moisture rate is not practically possible which may add additional cost to the concrete construction. A finite element based technique is suggested in this paper to predict the shrinkage stresses and consequently predict the possibility of having shrinkage cracks. The technique utilizes the analog between the heat transfer and moisture diffusion, thermal stresses and shrinkage stresses. The analysis was performed using thermal and structural modules in the commercial finite element software ANSYS. The process described in this work makes the determination of restrained shrinkage stresses in problems of concrete structures readily accessible to design, repair and construction engineers.