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Study on shrinkage prediction models and crack formation in post-tensioned slabs

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ABSTRACT

Crack formation in reinforced concrete structures can significantly affect the performance and lifespan of buildings. Usually, when developing the structural design of a building, deflection-induced cracking is analyzed and measures to prevent serviceability issues regarding deflection are considered in the design of concrete structures. However, crack formation in concrete structures is developed by other causes apart from deflection effects, such as the case of restrain-to-shortening effects. (Aalami and Barth, 1988). Structural engineers can often overlook the importance of creep-and-shrinkage-induced strain estimation and restraining crack mitigation details in their slab design.

The first part of this study focuses on the comparison of seven published shrinkage and creep calculation models that aim to predict a concrete member's volume-changing behavior. The second part of this study presents a series of architectural configuration prototypes analyzed using a finite element software, where the selected shrinkage and creep model strain results are used to determine the combination of shrinkage-and-creep-induced volumetric changes and restraint configuration that can lead to cracking in unbonded post-tensioned slabs.

REFERENCES

Aalami, B. O., & Barth, F. G. (1988). Restraint cracks and their mitigation in unbonded post-tensioned building structures. Phoenix, AZ: Post-Tensioning Institute.

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