

# Analysis of a 'self-compacting concrete' structure with considering the shrinkage effect

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## ABSTRACT:

When concrete is casted in a place with a high congestion of reinforcement or in an unreachable place where vibration is impossible, special types of concrete such as Self-Compacting Concrete (SCC) is generally used to alleviate the problems.

SCC is a highly flowable, non-segregating concrete that can spread into place, fill the framework and encapsulate the reinforcement without any mechanical consolidation. The higher volume of paste and the lower aggregate content often results in an increase of shrinkage in SCC.

Shrinkage of a concrete structure as the concrete dries after hardening could lead to substantial shortening movement and, if the movement is restrained, excessive stresses are formed in the structural elements. These excessive stresses which could lead to serious cracking or in some cases the failure of the structural elements should be considered in analyzing and designing the structures.

To minimize the amount of shrinkage of SCC, different methods are used. It is a common practice to use fibers such as polypropylene to reduce the shrinkage without changing the mix design of concrete while improving the ductility of the material. It is seen that reduction in shrinkage could result in reduced internal stresses for structural elements. These reductions could result in slimmer sections, thereby reducing the final cost of the structure.

To investigate the effectiveness of polypropylene fibers in reducing the excessive stresses caused by shrinkage, the shrinkage behavior of SCC mixtures with different percentages of polypropylene fibers is studied in this paper. The results are then used to analyze a dome structure with considering the effect of shrinkage. Reduction in the total deflection of the structure and in the stresses of structural elements due to the application of polypropylene fibers is then evaluated.