

Effects of Time-Dependent Deformations on the Behavior of Reinforced Masonry Columns

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Abstract:

The investigation reported in this paper examines the effect of the time-dependent deformations of creep and shrinkage on the behavior of reinforced masonry member. The experimental investigation includes testing ten pairs of reinforced and grouted two-core concrete block masonry columns. One column in each pair was preloaded to about 45 percent of the compressive strength of masonry prism ($0.45f_m'$) the other being the non-preloaded control specimen. The time-dependent strains of all specimens were observed for ten months before testing to failure. Variables considered in the experimental program are size and percentage of the vertical reinforcement.

The test results indicate that the effect of creep and shrinkage on the behavior of the column is significantly affected by the reinforcement percentage rather than by the size of the steel bars. These time-dependent deformations cause a redistribution of stress between the constituent materials. As a result, load was transferred from the cementitious materials to the steel reinforcement, increasing its efficiency in resisting the load.

The behavior of the columns at ultimate load was influenced considerably by reinforcement area and whether or not the column was preloaded before being tested to failure. The most significant effect of the time-dependent deformation is to have the reinforcement yield at failure. This suggests that real columns may be considerably more ductile than laboratory columns tested under short-term loading. Although the effect is not significant, preloaded columns appear to sustain higher ultimate loads.

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