Shrinkage

Shrinkage is a time-dependent volumetric change associated with the drying and moisture transfer, thermal effects and gradients, and autogenous behavior (early-age chemical and structural reactions) of restrained reinforce-concrete (RC) systems. Shrinkage may cause aesthetic, serviceability, and even stability issues with the onset of cracking, curling/warping, and reduced load-carrying capacity.

Restraint conditions which affect shrinkage behavior may be external, as with supports, connections, and boundary conditions, or internal, as with differential drying and reinforcement. Shrinkage cracking is mitigated with increased amounts of reinforcement at decreased spacing, and with the inclusion of coarse aggregate which is dense, hard, and less compressible. The proper early-age handling and curing of concrete further mitigates shrinkage while enhancing long-term life expectancy and structural performance.

Shrinkage and other time-dependent material behaviors, including creep, aging, and tendon relaxation, may be applied to structural objects using staged-construction analysis. Staged construction is a nonlinear-static application available to CSI Software with Ultimate Levels and Features. Additional information may be found in the CSI *Analysis Reference Manual* (Staged Construction, page 396).

Related Content

Articles

Tutorials

- Time dependent properties first steps (SAP2000)

Test Problems

- Bridge shrinkage example

See Also

- Creep section