

Calculating Drying-Shrinkage Stresses – Readily Available Software Tools can be used for Analyses of Concrete Structures

Baluch, M.H., Rahman, M.K. and Mahmoud, I.A.,

Concrete International, Vol. 30, No. 7, July 2008, pp. 37-41.

Many practicing engineers have access to multiphysics finite element software packages with heat transfer and stress analysis modules and elements. Those packages may not, however, include modules formulated for evaluating diffusion problems, so it can be difficult for engineers to analyze a concrete structure or component for the effects of moisture loss over time. The technique described in this article takes advantage of the analogy between the diffusion equation and the heat transfer equation, allowing engineers to use commonly-available software tools to analyze concrete structures for stresses arising from restrained drying shrinkage. The procedure is a two-step process. After establishing the analogy of the diffusion problem with the heat transfer problem, the first step is to determine moisture movement in concrete using the heat transfer module of a commercial finite element program. In the second step of the process, an empirically-derived coefficient is used in the stress analysis module of the same program to obtain stresses due to constrained shrinkage strains.