Chemical Prestressing of Concrete

Hosam Eldin Hasan Seleem, Dr. A H. El-Zanaty, Dr. F. El-Refaie, Dr. A. A. Shawky,

Cairo University
Giza, Egypt

Doctorial (PhD) Thesis, 2001

Abstract

Chemical prestressing is produced by introducing an expansive component within a concrete mix constituents. The expansive potential of the concrete mix is utilized to stretch the reinforcement and consequently create the prestressing. In the present investigation, the work proceeded in three main phases. The first one was carried out on mortar and paste mixes for recognizing the expansive potential, and the mechanical and chemical aspects of the expansive mixes. The second phase was conducted to investigate the mechanical properties and the expansion behavior of concrete mixes. The main parameters were the contents of the expansive component and the mineral admixtures, the (w/c) ratio, the amount of restraint (reinforcement) and its distribution. In the third phase, the effect of chemical prestressing on the behavior of small-scale beams, designed to exhibit different modes of failure, was studied thoroughly. Test results revealed that a valuable improvement in the overall performance of the chemically prestressed reinforced concrete beams was achieved. Based on test results, the methods of testing and evaluating the concrete strengths were refined. Also, methods of strength and serviceability calculations were proposed.

Keywords

Expansive cement, Self-stressing, Chemical prestressing,