KANOK-ORN KEAWNIRAT: OPTIMUM DESIGN OF PARTIALLY PRESTRESSED CONCRETE BEAMS BY THE SIMPLEX METHOD, THESIS ADVISOR: PROF. THAKSIN THEPCHATRI, Ph.D. 88 pp. ISBN 974-03-1372-8

This research presents an optimum design method of partially prestressed concrete beams which satisfy the ultimate strength criteria, serviceability criteria recommended by ACI Building Code (ACI 318-99) and the minimum cost simultaneously. The design algorithm based on "Partial Prestressing Ratio (PPR) " concept suggested by Naaman and Siriaksorn is used in the design process while the Simplex Method is used in the optimization process.

In the Simplex Method, the cost of beam is the objective function, while the constraints are computed in accordance with the design critria of partially prestressed concrete beams. Variables in the objective function and the constraints are the area of prestressed reinforcement, the area of nonprestressed reinforcement, the distance from extreme compression fiber to centroid of prestressing steel and the stirrup spacing. The objective function and constraints thus obtained will consist of non-linear terms. The linearization of above equations is done by using the first and second terms of Taylor series. In the linear programming solver process, the computation will repeat until the solution satisfies all original constraints and the difference of the two consecutive values of the cost is less than 0.05%.

From the study, it has been shown that the Simplex Method can be successfully used in optimizing cost of partially prestressed concrete beams. Results from the selective examples showed reduction in beam cost at approximately 5% compared to those obtained from normal design.