

MULTI-OBJECTIVE MODEL FOR TIME-COST TRADE-OFF IN REPETITIVE CONSTRUCTION PROJECTS

SANJAY BHOYAR¹ & DHANANJAY K. PARBAT²

¹Assistant Professor, National Institute of Construction Management and Research, Pune, Maharashtra, India

²Lecturer (Selection Grade) in Civil Engineer, Government Polytechnic, Sakoli, Maharashtra, India

ABSTRACT

Repetitive construction projects are very common in construction industry. In such projects, a number of tasks are repeated in a specific sequence over a number of similar units or sections, by a set of dedicated resources. Overall performance of repetitive construction projects can be attributed to the efficient use of these dedicated resource crews for early completion of the project with minimum total project cost. Existing methodologies optimize the schedule with respect to a single objective, to minimize project duration or maximize resource work continuity or minimize project costs. However, scheduling decisions for repetitive construction projects are multi-objective and hence a balance between resource work continuity, project duration and project total cost must be established.

In this paper, a genetic algorithm based multi-objective optimization model for scheduling repetitive construction projects is presented. The model comprises three modules: a resource-driven scheduling module; a cost module; and a multi-objective optimization module. The scheduling module ensures minimum project duration and maximum crew work continuity for a set of resource crew formations. The cost module computes project total costs. The optimization module generates several trade-off solutions between project duration and project total cost. Construction project planners can use this trade-off information to select resource crew formations for each task and the corresponding project schedule. A numerical example from the literature is analysed to illustrate the use and capabilities of the model.

KEYWORDS: Repetitive Construction Projects; Optimal Scheduling; Crew Work Continuity; Genetic Algorithms; Linear Schedule; Multi-Objective Optimization; Time-Cost Trade-Off