ABSTRACT

Yen, Chung-I. Ph.D., Purdue University, December, 2004. Simulated Annealing for Optimizing Linear Scheduling Projects with Multiple Resource Constraints (First Draft). Major Professor: Luh-Mann Chang.

Many construction projects, such as highways, pipelines, tunnels, and high-rise buildings, contains activities that repeated at different locations. Research has shown that the Critical Path Method (CPM) is not efficient in scheduling linear construction projects that involve repetitive tasks. Since the early 1960s many other techniques have been developed to schedule linear construction projects, such as the Line of Balance Method (LOB), the Vertical Production Method (VPM), and the Linear Scheduling Method (LSM). Although LSM has been regarded as a technique that provides significant advantages over CPM in linear construction projects, it has been mainly viewed as a graphical complement to CPM. There are two limitations that prohibit LSM being adopted and widely used in linear construction projects: 1) it is not as computational-ready as traditional network methods; and 2) studies with resource constraints are limited. This research addresses these two issues.

To overcome these limits, this research models the linear scheduling problems restricted by multiple resource constraints. It provides a quantitative analysis mechanism to the Linear Schedule Model. Two objective functions of the model, minimizing project duration and resource usage fluctuation, achieves the goal of considering resource allocation and leveling simultaneously. A two-stage solution-finding procedure is established to solve the proposed problem. The first stage utilizes a heuristic multiple resource allocation algorithm to generate a feasible initial solution. The second stage incorporates the Simulated Annealing search technique with the heuristic resource allocation algorithm for improving the initial solution. Two

example projects, a housing project and a highway pavement project, are studied and are both improved by shortening the project durations.