

The Differences Between CPM and Resource-Loaded Scheduling and How They Applied to the Martinez Tesoro Refinery Flare Header Replacement Project

THE INTERVIEWS



General Contractor



CM-Agency



Scheduling Expert

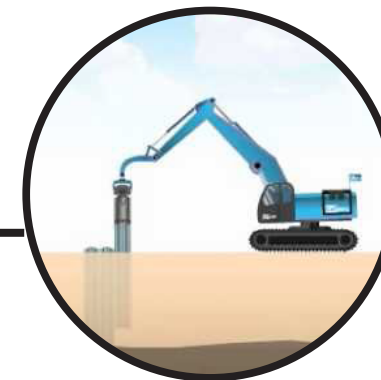
Construction Mangement

ABSTRACT

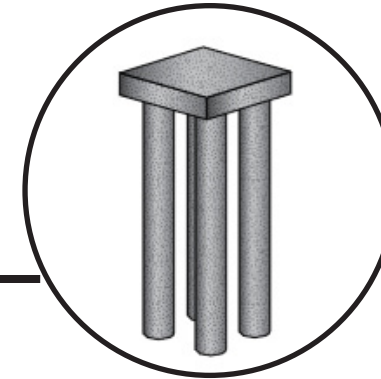
A case study was conducted to analyze the scheduling challenges faced on a refinery construction project in Martinez, California. The main issues on the project were complications experienced by the general contractor in fulfilling a requirement to produce a resource-loaded schedule. Unable to create one, a CPM schedule was produced instead. Research on the differences between a CPM and resource-loaded schedule was conducted in order to uncover how they applied to the refinery project. The most significant differences between the two scheduling methodologies is that a CPM assumes infinite capacity, while resource loading recognizes that resources have finite limits in terms of availability, capability, and proficiency. Consequently, resource-loaded schedules are substantially more advantageous to projects in terms of feasibility, tracking productivity, controlling cost overruns, and eliminating schedule impacts. Three separate interviews were conducted with the GC, CM, and a scheduling expert to gain further insight on the matter. Information from the interviews led to the discovery of the main scheduling differences between MS project and Oracle P6, the disadvantages of resource-loading, and where the future of the construction industry is going in terms of using efficient scheduling methodology.

PROJECT SCOPE

58 Piles to 60' Depth



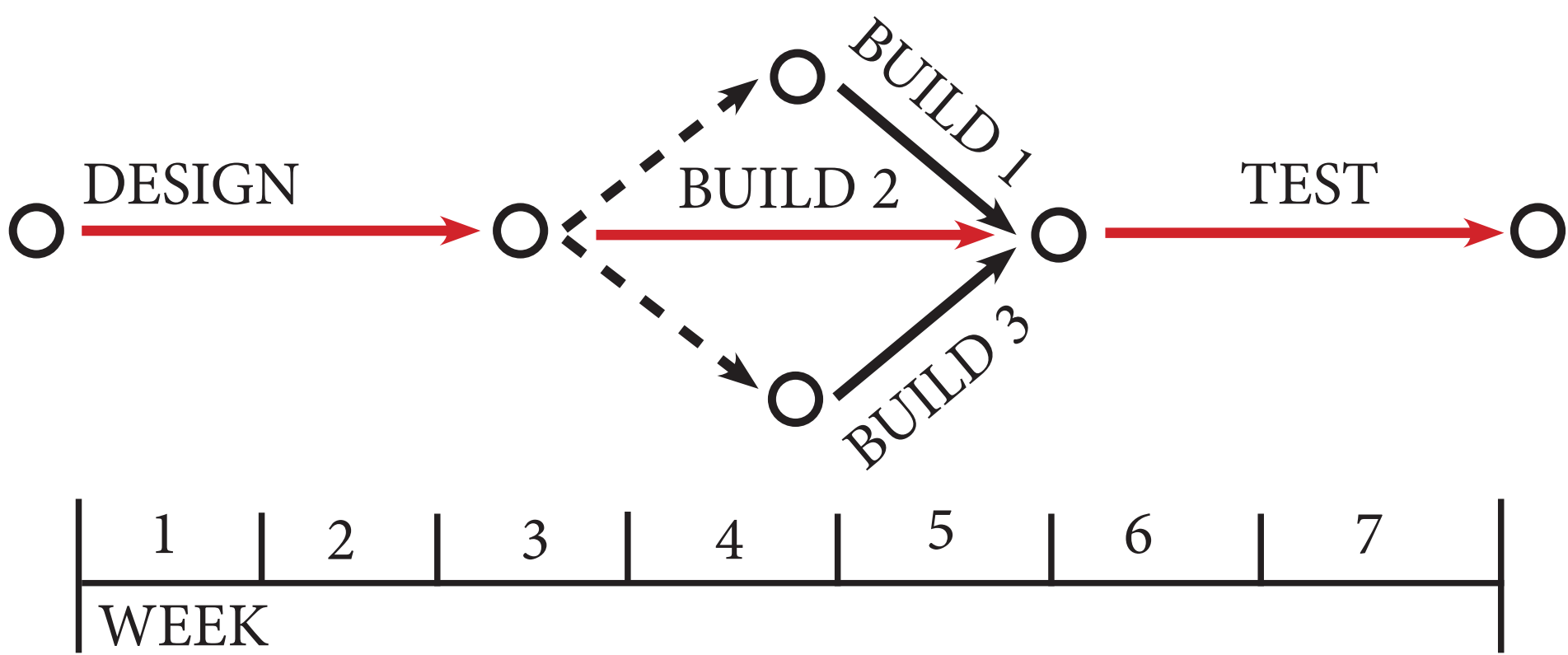
11 Pile Caps



14 Week Duration



CPM EXAMPLE

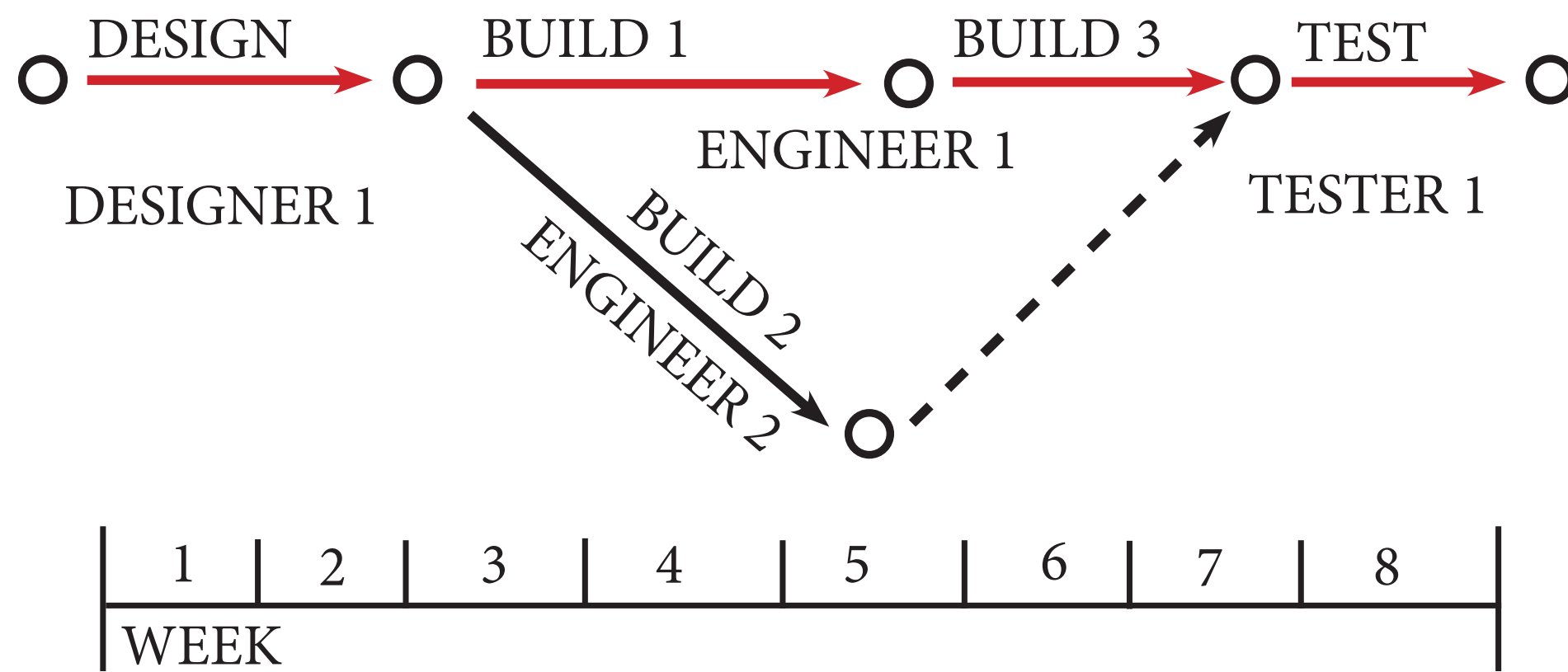


- 1.) Who is going to work on these activities?
- 2.) Can we assume this project is standing alone, or is it one of twenty, or more projects, of differing priorities?
- 3.) Can we assume unlimited resources available for each project and is each resource able to spend full time on all activities assigned?
- 4.) Can we assume that Build 1, Build 2 and Build 3 will be assigned different, and available resources?

CPM AND RESOURCE-LOADED DIFFERENCES

Attributes	Critical Path Method	Resource-loaded Scheduling
1. Activity/resource relations	Activity relationships are stable	Resource relationships are temporal and dynamic
2. Network Logic	Assumes that all logic is based on actual precedence relationships	Incorporates natural precedence and environmental preferential precedence relationships
3. Critical Variables	Time	Time and or/resources
4. Treatment of resource constraints	Assumes infinite capacity	Recognizes finite capacity (resource constraints)
5. Resource activation and utilization assumptions	Resource activations and utilization times are the same	Resource activation and utilization times can be different
6. Float time and critical paths	Based on duration and logic	Based on duration, logic, resource requirements, resource availabilities, and resource utilization patterns and processes

RESOURCE-LOADED EXAMPLE



- Resource-loaded scheduling is different from CPM because it loads physical resources into the scedule.
- Encompasses resource loading, resource leveling, and time analysis (critical path) all in one dynamic schedule.
- Prioritization of task activities based on resource utilization strategies, determination of resource availabilities, and the utilization of alternate resources.
- After evaluating a resource-loaded schedule, it will better help determine if the planned approach, schedule, and project cost are all feasible.