



U.S. Department of Transportation
Federal Highway Administration

IMPROVED
CONSTRUCTION
AND
MAINTENANCE
TECHNOLOGIES

new strategies to enhance the quality
performance of highway systems



Improving Safety, Reducing Delays: Finishing on Time, on Budget With the Critical Path Method

Finishing the job quickly has never been more important. Demands on the Nation's highway system are at a new high at a time when many portions of the infrastructure require replacement or rehabilitation. Extended construction and maintenance activities increase travel time and costs for highway users, affect the flow of commerce, and prolong safety risks to motorists and highway workers. A recent survey showed that although public satisfaction with the overall condition of the Nation's major highways has risen over the past 5 years, dissatisfaction with traffic flow (43 percent dissatisfied) and work zones (32 percent dissatisfied) increased during the same period. Road work is perceived by the public as a major cause of congestion and delays.

To meet the challenge of minimizing traffic disruptions while necessary projects proceed, State and local transportation agencies are turning to planning and scheduling tools that improve the efficiency and predictability of projects. The computerized critical path method (CPM) is one tool that can meet in part the Federal Highway Administration (FHWA) goal of optimizing highway performance through strategies to improve project organization and scheduling. This tool identifies the "critical" path—the scheduling path that will finish a project in the shortest amount of time.

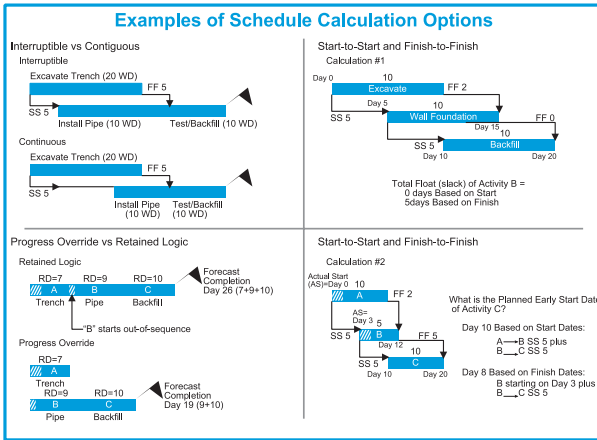
BENEFITS OF USING THE CRITICAL PATH METHOD

CPM enables highway officials to complete projects more quickly by plotting the most efficient sequence of tasks, sparing the public unnecessary delays and safety risks and reducing workers' exposure to work zone hazards. And, because scheduling is more reliable, the agency can more accurately inform the public about predicted delays, work zone conditions, and completion dates. Unexpected delays are reduced, and motorists can plan alternative routes or travel times.

The public also benefits from cost-savings. Efficient scheduling helps agencies and contractors avoid expensive project delays, manage resources effectively, anticipate problems, and contain costs.

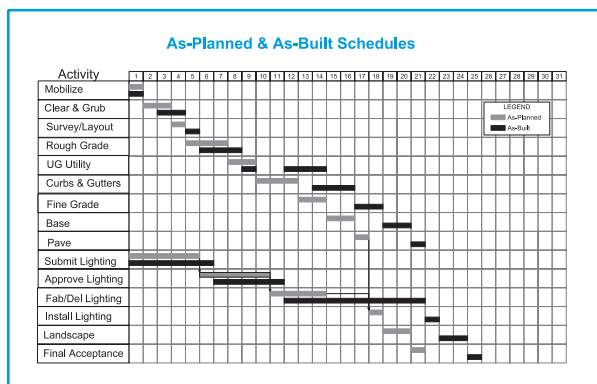
CPM scheduling is a valuable management tool for owners to monitor contract progress and resolve complicated job schedule problems. Computer-generated CPM schedules can be used to verify that the work plan complies with all time restrictions or weather-related temperature restrictions. In claim situations, CPM documentation has been used successfully to verify the actual effect of specific events.

COMPUTER-SUPPORTED CALCULATIONS



CPM analyzes a complicated project, calculates the minimum amount of time in which it can be completed, and prioritizes the activities to fit that time frame. This is done by mapping all the relevant data (CPM software such as Primavera Project Planner or Microsoft Project or other available commercial software can assist with this) and organizing the work so that contractors' jobs do not overlap.

In the initial stages of CPM, the engineer or project manager lists all the activities in a planned project, their estimated duration, and whether they are sequential (dependent upon completion of some other activity) or parallel (doable at any time during the project). Then the tasks are plotted on a "Gantt" or "PERT" chart that assesses the relationship between activities on a time line. Using the same software, both the owner and the contractor can assess the impact of alternative start dates. In the end, the method shows the path that should be taken to finish a project in the shortest amount of time. Once the work has begun, actual start dates and adjusted time frames can be entered to verify timeliness. Proposed delays can be analyzed to determine their effect.



LEARNING THE CRITICAL PATH METHOD

The National Highway Institute (NHI), training arm of FHWA, has developed a two-day course for transportation engineers and officials on the use of

CPM. Called "Critical Path Method for Estimating, Scheduling, and Timely Completion," the seminar teaches effective construction and maintenance planning for time-sensitive projects to Federal, State, or local project engineers and managers as well as related field personnel and private contractors, regardless of previous scheduling experience. In a hands-on approach, participants complete actual CPM tasks:

- Create a CPM chart for a sample project using basic components (project definition, milestones, Gantt charts, work and work breakdown schedules, activity network).
- Calculate resource needs and reserves and propose resource leveling strategies.
- Prepare a risk analysis/management plan for the sample project.
- Use a complex CPM to determine the status of a project, identifying slack or float and delays.
- Describe methods for managing multiproject scheduling.

For more information about the NHI course, contact Chris Newman (phone: 703-235-0524; e-mail: christopher.newman@fhwa.dot.gov). To schedule a course, contact Lynn Cadarr (phone: 703-235-0528; e-mail: lynn.cadarr@fhwa.dot.gov).

For more information about using CPM, contact your local FHWA division office or: Celso Gatchalian, Construction Management Engineer
Telephone: 202-366-1342 • Fax: 202-366-9981 • E-mail: celso.gatchalian@fhwa.dot.gov
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Computer-generated CPM graphs and schedules illustrate the relationships between project tasks, identify contingencies and conflicts, anticipate resource needs, and allow managers to easily project the impacts of alternative schedules.

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