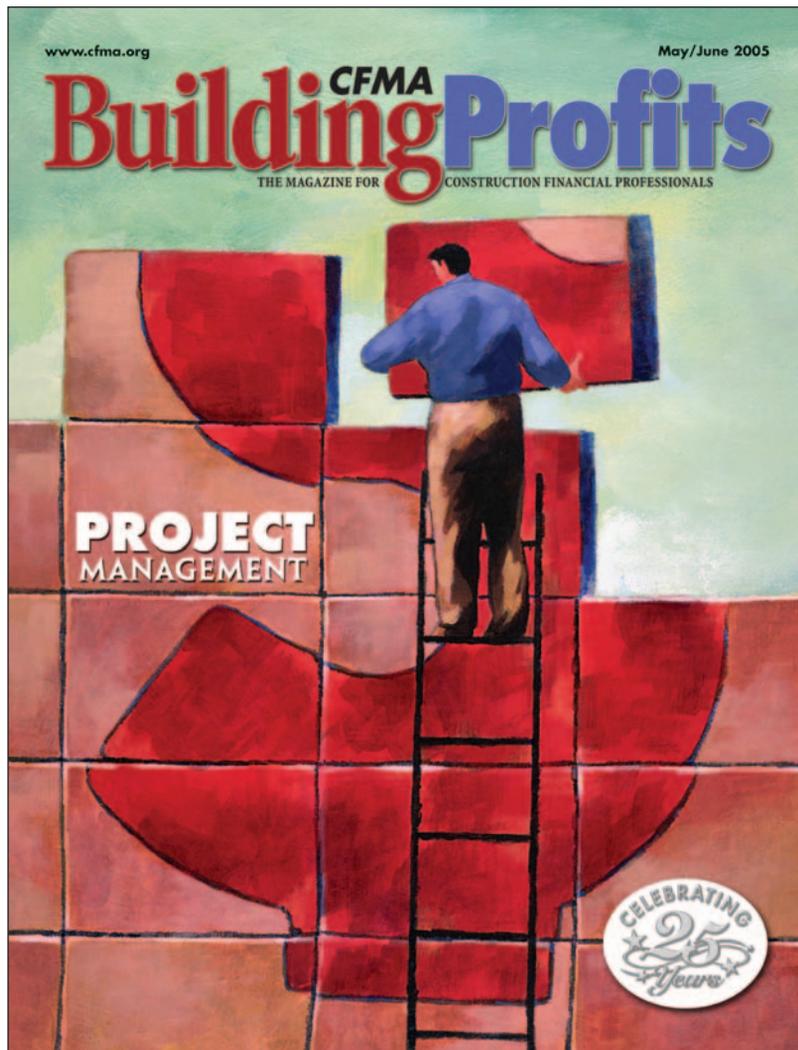


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The Source & Resource for Construction Financial Professionals

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CPM & RECOVERY SCHEDULES: *Braving the Seas of Project Change*



A construction project is like a giant ship churning through the waters of risk and change. Throughout the voyage, the ship endures rough weather and unavoidable delays.

When a job leaves familiar waters and enters the great unknown, sophisticated contractors revise their CPM Schedule to create a Recovery Schedule. Sadly, few contractors maximize the survival power of this important tool.

As we stated in our January/February 2005 article, “Using CPM Scheduling to Successfully Manage and Complete Projects,” a computerized CPM Schedule is a powerful management tool that focuses on critical project activities that affect project productivity, completion, and profitability.

Like any planning and control management tool, the CPM Schedule allows contractors to: **1)** establish a performance standard, **2)** measure and analyze actual performance, **3)** develop and implement corrective actions, and **4)** review and revise standards. In fact, you can think of a CPM Schedule as:

- 1) *A Nautical Chart:*** As your PM monitors job progress, a reliable and relevant CPM Schedule helps keep the job on course.
- 2) *A Flare:*** When difficulties arise, an accurate CPM Schedule alerts the contractor’s team right away.
- 3) *The Keel:*** When adjusted to accommodate a project’s inevitable changes, the CPM Schedule helps your PM “right the ship.”
- 4) *A Life Preserver:*** An accurate CPM Schedule provides the job’s history to justify a contractor’s request for time extensions and price adjustments in times of change.

Charting the Course

In the past, despite these tangible benefits, CPM Schedules were created only when required by contract or when the project involved a very large GC.

The reluctance to use CPM Schedules has two main sources. First, creating a CPM Schedule is a daunting task that requires the collection, organization, and coordination of information about the project's scope and resources from multiple stakeholders.

Second, unless the contract specifies otherwise, responsibility for the CPM Schedule typically falls on the contractor's PM. This is unfortunate because a PM has many responsibilities, including a host of time-sensitive tasks. For instance, a PM coordinates the work assignments and work areas for the GC and its subcontractors, addresses design issues, coordinates owner-supplied equipment, and meets all the contract requirements within the project's time and budget constraints.

But, while old habits die hard, this reluctance is slowly changing as contractors recognize the decision-making power inherent in this tool.

The As-Planned Schedule

While all this activity takes place, the PM also prepares the *As-Planned Schedule*, an expansion of the contractor's initial plan or *Preliminary Schedule*. As shown in Exhibit 1, this is the first of many changes to the CPM Schedule.

The PM gathers input from the contractor's purchasing department, subcontractors, suppliers, and other project

stakeholders. Detailed information is added to the Preliminary Schedule, including:

- Scope of work breakdown
- Major milestones
- Procurement schedule
- Project phases
- Coordination with other contractors
- Material deliveries
- Construction equipment deliveries
- Temporary construction
- Labor limitations
- Work-hour limitations
- Project access limitations
- Submittal requirements
- Regulatory requirements
- Owner usage and special requirements
- Permit requirements
- Owner furnished equipment and materials
- Weather considerations
- Special testing

The transition from the Preliminary Schedule to the As-Planned Schedule is complicated; unfortunately, the owner typically requires this revised schedule within 30-90 days from the Notice to Proceed.

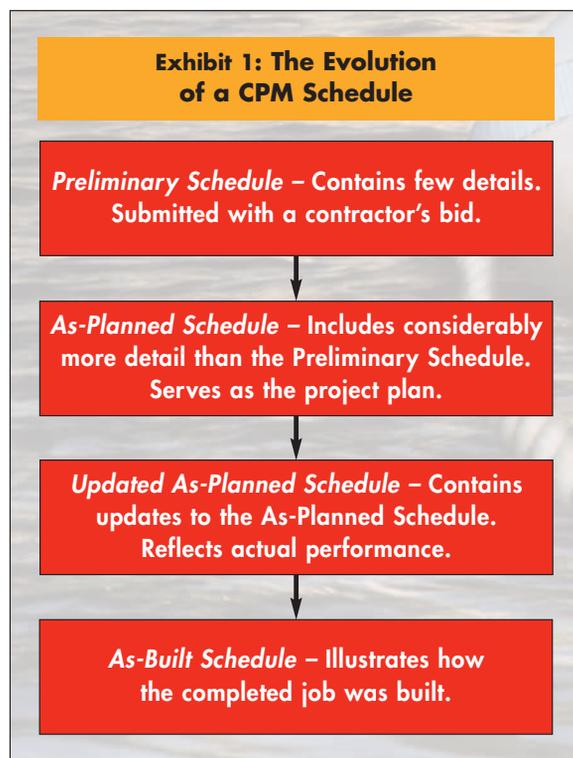
Considering a PM's responsibilities within this tight time frame, it's easy to see why some contractors only use CPM Schedules when absolutely necessary. Also, because percentage of completion drives revenue and measures job performance, it's normal for a PM to focus on the job, sometimes at the expense of the CPM Schedule. If your PM is too busy to maintain the CPM Schedule, assign an internal scheduler to the project or outsource the scheduling duties to a third party.

The Updated As-Planned Schedule

After the owner approves or indirectly accepts the As-Planned Schedule, it must be updated regularly. The modified schedule, or *Updated As-Planned Schedule*, is usually updated with the actual start and projected finish dates and any changes to the work plan, such as:

- Changes in the sequencing of events (logic)
- Weather-related delays due to rain/mud, etc.
- Changes due to differing site conditions
- Changes to the scope of work
- Work delays due to holds or other owner-related causes
- Late delivery of owner or contractor equipment

The Updated As-Planned Schedule allows contractors to manage three of the four control requirements of a project. Specifically, it measures and analyzes actual performance, helps management design and implement corrective actions, and allows contractors to review and revise standards.



Like any management tool used for control purposes, a partial and inconsistent CPM Schedule is incapable of providing a thorough analysis of the project. Consequently, when unplanned events start to affect productivity and project completion, and the owner demands a solution, the contractor is unprepared to develop a Recovery Schedule.

From Shallow Waters to Deeper Seas: The Recovery Schedule

Construction projects take place in unpredictable and risky environments. Several events or problems can have a major impact on a project's completion date:

- Unusually severe weather
- Differing site conditions
- Late deliveries
- Owner interruptions
- Material shortages
- Labor shortages
- Defective materials
- Design errors
- Change orders
- Scope changes
- Lack of productivity
- Subcontractor issues
- Changes in work sequence

When delays extend the projected completion date past an acceptable time, a stakeholder, usually the owner, demands

that the contractor figure out how to bring the project back on track. The acceleration plan, or *Recovery Schedule*, speeds up the remaining work.

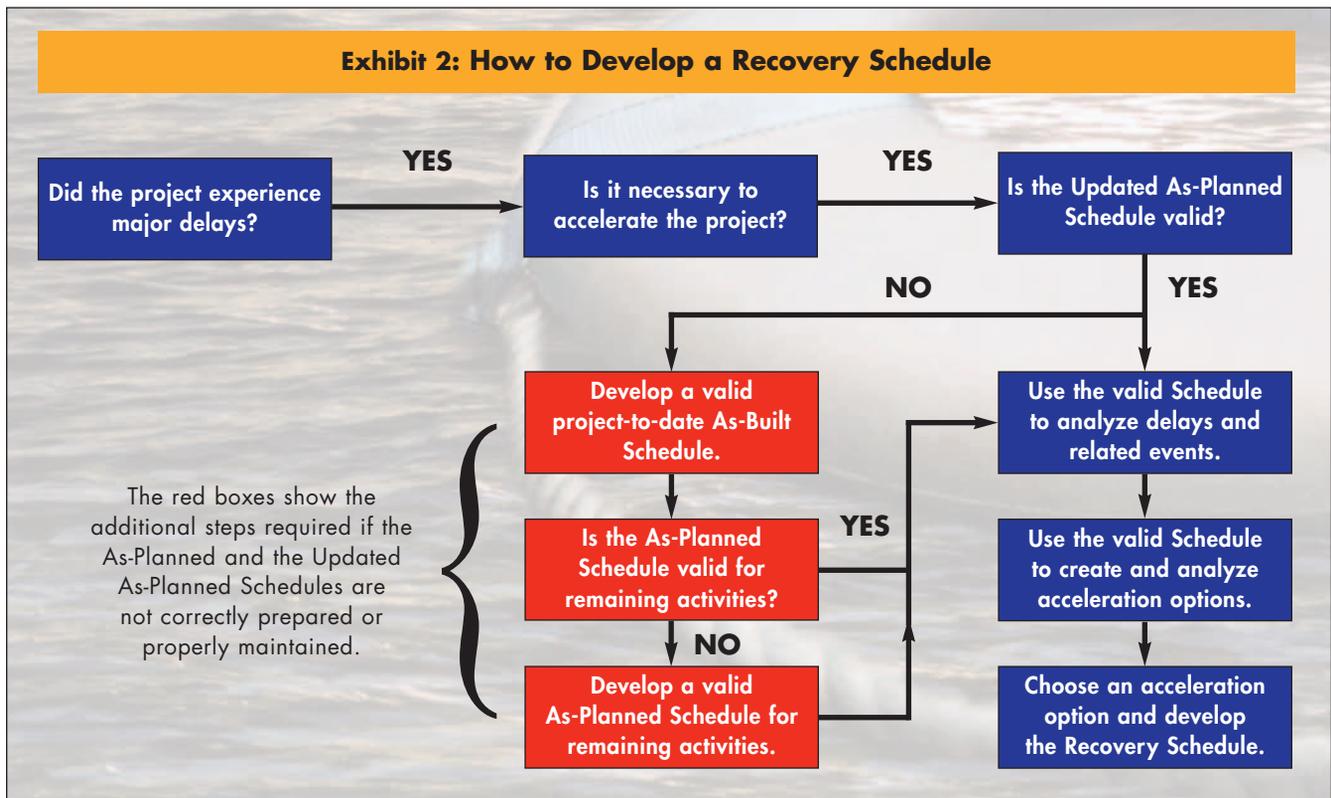
The objective of the Recovery Schedule? To develop a plan with an acceptable completion date at minimal additional cost. With a Recovery Schedule, the owner, contractor, and scheduler can immediately consider acceleration or other alternatives, such as a reduced scope or late completion.

When CPM Schedules Go Bad

However, a successful Recovery Schedule depends upon an accurate Updated As-Planned Schedule.

CPM Schedules may be purely *time-based* or they may be *resource-loaded* with information on costs, manpower requirements, or equipment needs. When resource-loaded with cost information, the Updated As-Planned Schedule tells the history of the project and forecasts the cost and the projected completion date of all incomplete activities.

When a CPM Schedule has not been properly updated, it cannot accurately reflect the history of the job. In addition, it cannot forecast the cost or completion dates of all incomplete activities. In this case, creating a Recovery Schedule becomes much more complicated.



As Exhibit 2 illustrates, without an accurate Updated As-Planned Schedule, the contractor must build a valid Updated As-Planned Schedule based on project documentation and interviews with project personnel. This is a potentially expensive and time-consuming undertaking.

If a CPM Schedule Were a Budget . . .

A flawed CPM Schedule is analogous to a budget without correctly recorded actual costs. With an inaccurate budget, management could, and probably would, form incorrect conclusions regarding profitability. Unless the actual costs are completely recorded, a budget is a useless, and possibly harmful, management tool.

To continue the analogy, imagine a CFM had to develop a plan to cut a project's costs. However, 80% of the material costs, 50% of equipment costs, and 20% of labor costs were not booked. To verify that the financial statements reflect all project costs, the CFM would, at a minimum:

- Check purchase orders and delivery tickets to ensure all vendor invoices were submitted and booked.
- Analyze timesheets to identify unrecorded labor costs.
- Identify unrecorded costs for company-owned equipment.
- Identify such committed costs as subcontracts.

Like a CFM correcting incomplete cost records, the PM or scheduler must develop a valid CPM Schedule before creating a Recovery Schedule. To do so, the PM or scheduler must update the CPM Schedule with project documentation and staff interviews, and ask several questions:

- Is the activity logic, or each task's sequence and inter-relationships, correct?
- Is the schedule for the remaining activities realistic?
- Is the critical path, the series of tasks with the longest overall completion time, correct?
- Are project resources appropriate and sufficient?

Once this update process is complete, the PM or scheduler will have a valid Updated As-Planned Schedule that shows completed and partially completed tasks. This revised schedule also serves as the CPM Schedule for uncompleted activities. In addition, with the valid Updated As-Planned Schedule, the contractor analyzes how to accelerate the project and develops the Recovery Schedule.

How to Create a Recovery Schedule

Some acceleration options involve little or no additional cost. These options involve changing the *activity durations*, the

length of time allotted to complete a task, and/or the activity logic.

Other types of project acceleration come at a price. For example, GCs may pay a premium to get materials delivered sooner or they may direct their subcontractors to mobilize additional equipment, which creates additional transportation costs. Or, they may stack the crafts, although the crowded work environment could lower overall productivity.

To determine the best solution, a valid Updated As-Planned Schedule can simulate different plans of action. One possible solution may require large amounts of overtime to save 30 days. Another may emphasize transporting additional craftsmen from another state to save 35 days. A third solution may supplement the current workforce by hiring additional subcontractors for short-term work at premium rates to save 45 days.

The PM or scheduler reviews each solution to find the best balance between the benefits of an earlier completion date and the costs of accelerating the schedule. To reach the optimal solution, the scheduler may:

- Reduce the duration of activities
- Run activities concurrently
- Assign additional project supervision, especially staff experienced in resolving similar issues
- Add subcontractors
- Add craftsmen
- Authorize overtime
- Schedule additional premium shifts
- Expedite materials
- Rent additional equipment from outside vendors
- Rent equipment from subcontractors with surplus equipment
- Revise the logic and sequencing of project activities

These actions, and their additional costs, are weighed against the desired completion date. Once the PM or scheduler finds the optimal solution, the contractor develops the Recovery Schedule and submits it to the owner.

The owner-accepted, resource-loaded Recovery Schedule and supporting project documentation substantiates any proposed change orders. If the owner fails to pay the contractor for the compensable project acceleration, this documentation justifies the contractor's request for equitable price adjustments.

Contractor-Initiated Recovery Schedules

If a project is behind schedule, the owner may be satisfied with the extended completion date, but the contractor wants to accelerate the project. In fact, even though it means absorbing the additional cost, the contractor may seek to accelerate the schedule for the following reasons:

- General condition costs exceed acceleration costs
- Unabsorbed home office overhead exceeds acceleration costs
- The contract contains an early completion bonus
- A new project requires the expertise of the current project's field supervisors and support staff

When the contractor decides to accelerate the project, the resource-loaded CPM Schedule helps identify and quantify the required resources and assists with cash flow decisions.

For instance, the accelerated schedule may identify the need for additional funding, such as a short-term loan or a line of credit. This could easily occur if the contractor accelerates a project to earn a bonus and has to absorb the project costs until the owner accepts the completed work.

Conclusion

Many uncontrollable events affect construction projects. When seeking the safe harbor of project completion, maintain a regularly updated, resource-loaded CPM Schedule. A valid CPM Schedule shows the project to date and forecasts how, and when, the remaining work will be completed. It tracks project costs and expended resources and can predict the resources needed to complete the project.

In addition, a valid CPM Schedule warns stakeholders of unanticipated issues that may delay the project. And, when the project is extended by a major delay, an accurate CPM Schedule encompasses all the variables necessary to predict the outcome of the project.

With this tool, contractors can react quickly to the winds of change and – at the owner's request or their own desire – accelerate the project. **BP**

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A longtime CFMA member, he has served on the Houston Chapter's Board of Directors. Nationally, Marc is Vice Chairperson of the Education and Technology Committees, serves on the Publications Committee, and helped develop CFMA's Specialized Knowledge Module, "Foundations of Construction IT." He is also a member of the Institute of Management Accountants (IMA).

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