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PinnacleOne is a national construction consulting firm that provides sound advice, strategic solutions and peace of mind to its clients. Its diverse, highly trained professionals guide its clients through every step of the design, construction and contract closeout process to help them achieve their goals, and at the same time, avoid and manage risk. PinnacleOne's unimpeachable objectivity, along with a proven approach to planning and attention to detail, has earned the company a reputation as one of

Construction Scheduling 101

Construction scheduling has come a long way in the last 25 years. Unfortunately, despite the widespread use of computerized scheduling on construction projects today, there still exists a large disparity in the level of understanding of those involved in construction in the proper use of this powerful tool. Some even say there is a crisis in the construction industry because they believe scheduling software is being misused to assert delay claims and there is, in their view, a predominance of poor quality schedules. Whether this is true or not, everyone involved in design or construction - owner, architect, engineer, contractor, subcontractor, or attorney - could use a refresher course in "Construction Scheduling 101."

Owners - Do You Have the Right Answers to These Questions?

"Time is the scarcest resource of the manager; if it is not managed, nothing else can be managed."

This is an astute observation by respected management consultant and educator Peter Drucker. While he probably wasn't talking about construction in this quote, it is certainly true of the construction process. A good construction schedule can help the project team make the best use of the scarcest resource - time. This article discusses and answers a number of key questions that will improve the effectiveness of the construction schedule as a time management tool.

Is the Critical Path Reasonable?



[Jennifer Frank, P.E.](#)

Jennifer Frank is a Scheduling and Construction Claims Analyst in PinnacleOne's Middletown, CT office. She has over 25 years experience in construction management working on a wide variety of projects including offices, schools, hospitals, prisons, pharmaceutical and water treatment plants. As a scheduler for a large construction management firm, Ms. Frank had primary responsibility for the development, updating, and analysis of CPM schedules for the design and construction phases of building projects throughout the Northeast United States with construction values up to \$80 million. In this

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The initial critical path should always be reviewed carefully to see if it makes sense. Having a correct critical path will help the project team prioritize shop drawings and field work. If delays occur, it will identify what work to focus on in order to reduce further slippage or make up lost time. Without an accurate critical path, Contractors can make good progress on non-critical activities, while the forecast end date is actually slipping, undetected. A good rule of thumb on public projects is that no more than 10-15% of the schedule activities should be critical or near critical. Utilizing this practice allows for the normal minor slippage and delays in some areas that occur on any construction project.

Resources, particularly manpower, are often the real limiting factor and dictate the timing of work activities and the critical path, rather than the activity sequencing. Most schedules are not resource-loaded, so the impact of limited resources is sometimes difficult to see and address. A narrative of planned manpower and crew sizes at different phases of a project can help an Owner evaluate whether the schedule provided is realistic or not.

The critical path in the Contractor's schedule can be manipulated by the Contractor to a certain degree and may not reflect the actual critical path of the project. The Contractor may link work areas in the schedule that are not really dependent on each other, add mandatory start dates, or otherwise use the scheduling software to make the critical path include work activities to support a future delay claim.

Is the Contractor's Schedule a "Steep Staircase" Schedule?

Does the Contractor's schedule show a large number of work activities scheduled to be done at the same time? In particular, look out for "stacking" during the last half or third of the project time frame. This may indicate an unbalanced schedule with too much time provided for the structure and building shell and not enough time for interior finish work and completion activities, such as start-up and commissioning. A steep staircase schedule may also result from inadequate consideration of manpower when work activities slip on projects with delays. This is sometimes referred to as "schedule compression."

On most projects, a well planned schedule, whether it is a baseline schedule or a

capacity, she led teams of contractors, owners, and designers in the interactive development of schedules using the "card trick" process.

Since joining PinnacleOne, Ms. Frank applies this experience and her skills in CPM scheduling to analyze delay claims and she is an instructor of the PinnacleOne Institute where she conducts seminars on CPM scheduling-related topics. Ms. Frank is a registered professional engineer in Connecticut and New York.

Ms. Frank can be reached through PinnacleOne's Middletown, CT, office at (860) 704-6117.

schedule update, will have an even distribution of activity bars in time rather than a steep staircase of work activities. Too many activities shown going on at the same time is usually not realistic and schedules like these are often not achievable. To assess this situation, think about the manpower or number of crews that would be required to start and finish 25 or 30 activities (or more) in a month, and think about the manpower likely to be provided by the subcontractors. Will there be adequate manpower?

Does the Contractor's Schedule Allow Enough Time for Completion Activities?

The Contractor may not worry about all the things an Owner needs to do after construction is substantially complete to make the project fully useable by the Owner. Typical completion activities include preparing and completing the punchlist and clean-up, validation or start-up and testing of special systems (fire alarm, smoke evacuation, telephone and data, CCTV), move-in and installation of Owner furnishings and equipment, and contractor closeout (as-builts, O&M manuals, warranties). It is important to include these activities in the schedule, so that all parties have a clear understanding of what will occur at the end of the project and the Owner's true occupancy date.

Are You Late Before You Start?

You may be surprised to hear this, but in my experience this happens a lot. Significant time lost at the project's front end is made up simply by compressing the construction schedule, thus creating a "spring-loaded" schedule. Unless significant resources are added, the schedule will most likely "spring back" to a more realistic duration. The effect of work shifted into different weather periods can also have cost or schedule impacts. When there is slippage of more than one month up front for a construction schedule of twelve months or longer, Owners should resist the temptation to shorten the construction duration and adjust their overall project schedule instead.

Do You Have the Expertise to Review the Contractor's Schedules?

While it is generally the Contractor's responsibility to put together the detailed

construction schedule, most contracts provide for the Owner's approval or acceptance of the initial construction schedule. This is an important opportunity for the Owner and their representatives to provide input to the Contractor that may help the project get off to a better start and to minimize schedule surprises. Considering the importance of the schedule as a time management tool, it is important that Owners be able to understand the schedules that are submitted to them and answer the questions above.

There are, of course, many ways to sequence a construction project. There may be honest disagreements between the Owner or design team and the Contractor. These can be documented and the Contractor may choose to incorporate logic changes or not. In either case, it is important that some form of the schedule be agreed on near the beginning of the project, preferable within the first two or three months of construction, if not earlier. In my experience, the project is sometimes harmed far more when the Owner and Contractor wrangle over the schedule for six months or a year. These unresolved schedule disputes are often among the issues that lead to claims at the end of a project.

A thorough review of the Contractor's schedule is best done by someone who is knowledgeable about what is being built and the scheduling process. The review also requires the ability to access the schedule in its electronic form so that relationships, constraints, and work sequences can be reviewed and evaluated. Work period gaps, bad or missing logic, and erroneous critical paths can sometimes be found and corrected in the early stages of a project.

Owners, do you have the expertise to make these assessments? This is the most important question that you must ask yourself. If not, you are missing a valuable opportunity to participate in creating a successful schedule and you may eventually find yourself involved in disputes regarding the schedule. In short, you may be exposing yourself to schedule-related claims.

My comments are not intended to scare or discourage anyone about CPM scheduling, but simply to help you be aware of some of the pitfalls inherent in the scheduling process. Schedules are sometimes put together quickly by people who are also busy with other tasks and errors occur through oversight as much as anything else. And, yes, there are Contractors who think they can gain an advantage by playing games with their schedules. Common sense and an

independent review are your best tools to assure a good schedule and maximize your most limited resource - time.

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