

The Tactical Use of CPM Schedule Analysis in Trial

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I. Introduction

In order to ensure that one's case benefits from an expert's CPM schedule analysis, sound strategy must be employed by counsel and his/her supporting team. This strategic sequencing of the schedule expert's analysis at trial must be carefully considered by counsel in order to effectively present what happened, why it happened, who was responsible, what was done subsequently, and how much it cost.

Development of this strategy includes:

- Determining when to best present the schedule analysis testimony of the expert;
- The utilization and timing of the fact witnesses in such a manner that they tell their own coherent story and facilitate the analysis and testimony of the schedule expert;
- Preparation of the expert witness prior to his testimony; and,
- Presenting the supporting analysis and its soundness.

It is important for opposing counsel to take stock of the expert's presentation and determine if, and to what magnitude, that analysis is flawed.

The following discussion takes a deeper look at each of the abovementioned items and looks at the issue from the perspective of both the counsel presenting the schedule expert, and opposing counsel cross examining the schedule expert.

2. The Expert Witness and the Timing of the Schedule Expert's Testimony

Counsel's first task at trial is to qualify his expert witness in order for his testimony to be received into evidence. Counsel must establish the expert's educational background, his occupation, relevant experience, memberships in various related organizations, and any authored and relevant publications. In short, counsel must convey his expert's

qualifications in such a manner that it means something to the jury and the jury understands and recognizes the expert's area(s) of expertise.¹

Most construction disputes that result in either arbitration or trial typically involve an assertion of schedule delay. Critical to the litigation strategy is the timing of the schedule expert's testimony and presentation of the CPM schedule delay analysis. Counsel must decide the testifying sequence he believes presents the case in its strongest sense, depending on the claim issues being litigated by the parties, and the number of witnesses, both fact and expert that are needed to opine on the issues.

Experience has shown that the most effective placement of the schedule expert's testimony is near the end of the case prior to damages being presented and after both fact and other expert witnesses. In a sense, the schedule expert is like a clean-up hitter in baseball. He must reinforce all of the issues and analysis testified to by prior witnesses in such a manner that both judge and jury will recognize the entitlement to the damages incurred by their client. The schedule expert is often the only witness who can discuss all the facts of the case, put all the facts of the case in perspective, and tie important concepts and issues identified by earlier witnesses into a coherent and compelling story.

3. Fact Witnesses and Their Role in the CPM Schedule Analysis

The role of the fact witness relative to the CPM schedule analysis is to: (1) establish credibility of the schedule, and (2) establish the importance and sequence of actual events so as to reinforce the points that the schedule expert will later discuss. Counsel should structure their questions to establish the important items that are critical to confirm. The items to establish the credibility of the schedule include:

- Confirmation of the soundness of the baseline schedule and its representations;
- That the baseline schedule and its subsequent updates represented the complete work scope;
- That the schedule was updated and analyzed regularly in accordance with the contract;
- That the schedule represented the construction execution approach and it used as a tool for scheduling the Work in the field; and,

¹ Robert C. Clifford, *Qualifying and Attacking Expert Witnesses*, § 320, 3-10 (rev. 17, James 2004).

- That the schedule made “sense,” in that; the work scheduled each month, given its timing and required progress, was reasonable and achievable.

Since CPM experts usually rely upon actual sequences and events, it is imperative that these events, particularly the significant events, have a proper foundation laid. This foundation includes a factual basis, but more importantly, the context as to why the event happened, when it happened, and what was the significance of its occurring when it did. Generally the fact witnesses need to establish:

- How does the witness know it happened
- What happened
- When it happened in relation to other events
- Why the event occurred
- What happened prior to the event that explains the event’s occurrence
- What was the result of the event – what happened next

The abovementioned points must be established by prior to presenting the schedule expert’s analysis. Having a fact witness lay the foundation in a preliminary fashion facilitates the expert’s ability to reinforce these points during his/her own testimony.

4. Preparing the Expert for Trial

Adequate preparation is vital to effectively presenting a CPM schedule through an expert witness’s testimony at trial. By the time the trial approaches, it is more than likely that the expert has studied, analyzed and perhaps prepared an expert report. In addition, some preparations have occurred in advance of the expert’s deposition. The deposition of the expert is often the first chance for him to be formally questioned by the opposition and may demonstrate how the expert and his findings will present at trial. Opposing counsel may inadvertently reveal some of his trial strategy through questioning of the expert. If for example opposing counsel avoids issues of the validity of the baseline schedule, it may be because he plans to attack its validity when the expert is on the stand. What was presented during deposition must be reviewed prior to trial in order to find any inconsistencies with the expert’s ultimate conclusions. Any weaknesses in the expert’s analysis that were brought out in deposition should be analyzed to determine how to diminish or explain them at trial.

In preparing a schedule expert for trial, all elements of his testimony should be considered. This is important for in the eyes of the fact finder, the expert must appear confident and believable to give his opinion testimony weight.² While the preparation session may prove as a helpful tool in smoothing the expert's presentation, it is important to remember that over-scripting can be lethal, especially if there are unforeseen questions from the bench or from opposing counsel.³ Thus, the best preparation will include extemporaneous speech and not just a reading of the expert report.

The language and tone of the expert's presentation is also important to consider. The expert should appear as neutral and unbiased as possible in his presentation. Inflammatory language should be avoided, rather, presenting the results of the expert report as an unbiased, technical analysis. Another strategy is to bring out both positive and negative elements of your parties claim on direct examination. This will not only support the expert's propriety of neutrality but will reduce the ability for such negative points to be presented in cross examination and neutralize their effect.

While on the witness stand, the schedule expert may use documents to refresh his recollection.⁴ These documents, if used, are available to inspection by the opposing counsel.⁵ Thus, a careful review of what will be brought to the stand with the expert should be performed.⁶ These demonstrative exhibits should be limited to these items to the expert report, and other information that was available through discovery.

5. Presenting the CPM Schedule Analysis at Trial

The process as to how the expert formulated his opinions and conclusions must be clearly understood by both the judge and jury.⁷ Notwithstanding whether the expert's opinion is based on his direct knowledge or information that he received indirectly, good experts can and should be able to cogently explain how and why they developed their opinions. Further, the strength of the schedule expert's delay quantifications is no better than the strength of his baseline schedules and updates. Therefore; it is incumbent on the schedule expert to communicate and demonstrate upfront that his schedule basis is solid and will withstand the scrutiny of further investigation.

² Presenting the expert as favorably as possible is important because of a trial judge's significant discretion in admitting expert testimony. *US v. Bynum*, F.3d 769 (4th Cir. 1993) Cert. denied 114 S.Ct. 1105 (1994) (where the Fourth Circuit reaffirmed the well settled principle of trial judge's broad discretion over expert testimony).

³ See Robert F. Cushman, John D. Carter, Paul J. Gorman & Douglas F. Coppi, *Construction Disputes - Representing The Contractor*, § 15.08, 471-472 (Aspen Publishers 2001) (discussing the danger in over-scripting an expert's testimony).

⁴ Fed. R. Evid., 612 (most jurisdictions follow this same general rule).

⁵ *Id.*

⁶ Robert C. Clifford, *Qualifying and Attacking Expert Witnesses*, § 313, 3-8 (rev. 17, James 2004).

⁷ *Id.* at § 330. 3-15.

Typical qualities that the expert must explain regarding the schedule baseline and subsequent updates include:

- The baseline schedule should be a full-term schedule;
- The schedule and its updates should provide sufficient level of detail and represent the entire “contracted for” scope of work;
- The schedule and its updates must meet the Contract requirements;
- The Critical Path must make sense: and,
- The schedule and its updates must be reasonable.

The ensuing discussion will focus on these points as well as discuss opposing counsel’s tactics in discrediting the schedule analysis before it “gets out of the box.”

5.a. Full-Term Project Schedule

One of the first points a schedule expert will make is that the baseline schedule is or is not a full-term project schedule. The phrase “full-term project schedule” relates to whether the project schedule starts and completes on the dates designated by the contract. It is important for the fact finder to understand whether the period reviewed covers the entire project or just a portion – and why. Generally, it is better to have a “full term project schedule” since it provides a more complete understanding of the events – not just a portion of them.

Sometimes project schedules are early completion schedules meaning that they anticipate work being finished prior to the required contract completion date. In the case of an early completion schedule, sometimes delay is asserted to occur when the early completion date is delayed, even if prior to contractual completion. Opposing counsel will argue that the schedule expert’s delay calculation is overstated or that the delay does not occur until the contract completion date is missed. Sometimes the agreement between the parties indicates that in the case of an early completion schedule no delay occurs until the contract completion date is delayed. However, some courts have allowed the contractor to be awarded damages for not being able to finish earlier than the contractual final completion date, on the basis that the contractor has a right to work free of interferences.⁸ Typically the contractor bears the burden of proof in such cases.⁹

⁸ *Grow Constr, Co. v. New York*, 391 N.Y. S. 2d 726 (1977).

⁹ *Elrich Contracting, Inc. v. General Services Administration*, GSBCA 10936, 93-1 BCA ¶125,316.

5.b. Schedule Level of Detail/Represent the Scope of Work

Some contracts require that the project schedule be a specific level of detail. The schedule expert must review the activities in the project schedule and determine if the contractual level of detail was met or if a breach occurred. The schedule as issued must also represent the complete project scope of work. If the contract scope includes engineering, procurement, construction, and start-up/commissioning then the baseline schedule and its subsequent updates should include these activities. For example, the details surrounding all of the activities required to start-up or commission a facility are typically not known at the time the baseline schedule is issued. Notwithstanding this, start-up and commission activities should be provided in the baseline schedule and detail added as it becomes available during project execution.

A schedule that does not include the project's total scope will result in its being challenged by opposing counsel thus diminishing the effectiveness of the schedule analysis. Opposing counsel may focus their argument on the critical path being prejudiced and erroneous due to the absence of part of the work scope from the schedule.

5.c. Schedule Meets the Contract Requirements

Construction contracts and specifications often contain requirements for a CPM schedule to be submitted at the beginning of the project. This initial schedule, often is referred to as the "original baseline schedule," may have several uses, from measuring performance to determining the impact of changes. The requirements for the baseline can vary from detailed to vague depending upon the size and type of project as well as the owner's requirements. A review of what those contract requirements are, and whether the contractor is in compliance with them, should be examined by the expert to see if there has been a breach.

Often, the baseline schedule must not only have a final, duly accepted version but must also comply with contract requirements in order to avoid a breach.¹⁰ However, not all breaches are created equal. A very minor, non-material breach regarding schedule requirements could undermine the legitimacy of your expert's testimony if brought to the fact finder's attention and is perceived as splitting hairs. For example, if the contract requires a resource loaded schedule, yet a few activities in the baseline schedule do not have resources assigned, this may be considered a non-material breach. Making this supposed breach the center of controversy in order to discredit the quality of the schedule or to claim a material breach of contract would likely fail, especially if the contractor utilizes a manpower loading system outside of the electronic schedule file.

¹⁰ *Williams Enterprises, Inc. v. Strait Manufacturing & Welding*, 728 F. Supp. 12 (D.D.C. 1990) (contract schedule used to establish breach of contract when it was submitted and approved by Owner); See also *Gymco Const. Co. v. Architectural Glass and Windows, Inc.*, 884 F.2d 1362 (11th Cir. 1989).

Conversely, if a level 3 schedule (a reasonable detailed schedule) is required by contract but only a level 1 schedule (a summary level schedule) is ever submitted for approval, this may be considered a material breach. This is because the level of detail provided in such a schedule would be insufficient on the whole.

Periodic updates of the schedule are also a common contract requirement. Failure to provide these may constitute a breach. Again, a judgment as to how material the breach is should be considered. A single weekly update missed over the course of several months would not be considered material, but a failure to provide any updates would. Regardless of the specificity of the contract requirements to update the schedule, failure to regularly update the schedule may result in a court finding it not reliable to use in evaluating delays.¹¹

Also, straying from the planned sequence found in the contract's baseline schedule can be a material breach of contract.¹² It may be viewed as a part of the expressed conditions of the contract and if not followed, and damages result, a breach can be asserted for recovery. This may be true for subcontractor's claims as well as owner's claims.¹³ While this position is not common or particularly well regarded it should be considered in presenting any deviations from the baseline schedule.¹⁴

5.d. Critical Path Makes Sense

Inherent in the CPM schedule analysis is that the critical path must make sense. In its simplest terms, this means that based on experience and knowledge of related projects that the critical path of these types of projects generally contains a certain string of activities. For example, if the project includes designing a new distributive control system ("DCS") that has not been designed and consistently produced before or has features that are, in essence, prototypes, and the sequence of design, construct, test and checkout activities are not on the project's critical path, then its absence is something that would not make sense. (Typically a DCS is an automated control system that monitors and controls a plant wide operating system to ensure its efficient operation and reliability) Opposing counsel could make a compelling argument that the critical path was misrepresented, and discredit the schedule analysis if such an item of magnitude like the DCS was omitted from the project critical path. They may further argue that the critical path as presented (without the DCS on it) was incorrect and

¹¹ *Fortec Constructors v. United States* 8 Cl. Ct. 490 (1985) (discussing the importance of regular updating in order for a CPM schedule to be used in evaluating delays presented); See also *Appeal of Ealahan Elect. Co. Inc.*, 90-3 B.C.A. (CCH) ¶ 23177, (D.O.T. Cont. Adj. Bd. 1990) (expert's testimony discounted for ignoring actual project performance).

¹² Barry B. Bramble & Michael T. Callahan, *Construction Delay Claims*, § 13.02, 13-6, 13-7 (3rd ed., Aspen 2000).

¹³ *Id.*

¹⁴ *Batteast Construction Company, Inc.*, ASBCA No. 35841, 91-3 BCA ¶ 24,352 (stating that the network analysis schedule lacks logic and is unreliable for use in computing additional time).

replete with logic errors, thus requiring opposing counsel to prove why the critical path was wrong and the schedule needed to be corrected

5.e. Schedule Must Be Reasonable

Within the parameters of determining if a schedule is reasonable, the schedule expert must convey that the baseline schedule will pass the scrutiny of reasonable activity durations, reasonable overall project duration, correct and sound logic, a reasonable staffing and de-staffing plan, and a reasonable monthly earned progress projection. Weaknesses in any of the abovementioned items will undoubtedly improve opposing counsel's opportunity to discredit the analysis.

Relative to determining if the activity durations are reasonable, the schedule expert will review a sampling of activities, and their durations and resources applied. With an understanding of the work scope involved for each activity, the schedule expert will determine if the durations are reasonable. If his findings are that the activity durations are reasonable then no further action is warranted. If he finds a significant percentage of durations that he believes are too short, he may decide to widen his scope of analysis.

With respect to the overall project duration, the schedule expert should know either from personal experience or through a comparison of related projects, if the overall schedule duration to complete the project was reasonable.¹⁵ For example, if it has been an expert's experience that certain combined cycle power plant projects from design to provisional acceptance have an overall duration of twenty-four to thirty months, and the baseline schedule that he is presenting does not fall within that time period range, then he must stand ready to explain why it's not within that range and why the schedule(s) are nonetheless reasonable.

Incorrect schedule logic, a significant number of activities without logic ties (open ends), and out of sequence progress can be detrimental and diminish the effectiveness of the schedule analysis. Relative to schedule updates that have activities with out of sequence progress, it is imperative that the schedule expert determine if the out of sequence progress is indicative of preferential logic or required logic. Preferential logic that causes out of sequence progress is not fatal to the analysis. Conversely, breaches of the required logic erode the confidence level of the schedule calculation, thus diminishing the delay quantification and findings of the analysis. Notwithstanding an owner's approval of a CPM schedule, it is notable that where the schedule contains hidden logic errors or duration problems, it will be discounted as a basis of establishing delay.¹⁶

¹⁵ *In Re Hensel Phelps Const. Co., 99-2 B.C.A. (CCH) No. 49270 ¶ 30531 (ASBCA 1999)* (stating, "Appellant's delay claim also suffers from terminal infirmities. The fact that the Government approved the early completion schedule does not mean, as appellant suggests, that the schedule is per se reasonable.").

¹⁶ *In re Hensel Phelps Const. Co., 99-2 B.C.A. (CCH) ¶30531, 1999 WL 669351 (Armed Serv. B.C.A. 1999).*

Additionally, if the schedule or schedule updates have a significant number of open ended activities, the representation of the critical path may be flawed to the extent that the schedule is nothing more than a bar chart and fails to permit a critical path analysis.¹⁷

The schedule expert should determine if the project has a reasonable staffing and de-staffing plan. The schedule expert must review the project's manpower requirement over time to determine if the manpower requirements are reasonable and in concert with the work to be performed. Also, the schedule expert must review the manpower requirements in the context of "trade stacking" and manpower density issues. These stacking/density issues typically result in disruption and delay. Courts recognize that it is only possible to introduce so many workers on the same jobsite at the same time before they interfere with each other's performance.¹⁸ The reasonableness of the staffing and de-staffing plan will be analyzed by opposing counsel to determine if the schedule was ever reasonably achievable. For instance, if the manpower curve shows a peak in manpower toward the project completion date or a steep de-staffing of the project, experience has shown that these scenarios typically do not occur and is often a precursor to delay. This fact may weaken the overall schedule analysis as it challenges the reasonableness of the schedule.

The schedule expert should also review the planned progress curve for the project and determine if the plan was reasonable. For example, if the project is essentially an outdoors facility and in an area where cold weather may affect schedule and labor performance, and the planned progress curve shows that the most progress to be earned on the project is during those cold weather months such as November and December, the reasonableness of the plan would be highly questionable. Actual project progress would most likely demonstrate that point.

6. Presenting the CPM Schedule Analysis

CPM schedules are very complicated, and not very interesting to the typical fact finder. The CPM expert's task is to make a complicated and uninteresting topic comprehensible and interesting. Not an easy task.. After establishing the credibility of the baseline schedule and its updates and laying the factual foundation through fact witness, it's time for the clean-up witness.

The schedule expert must consider the audience when presenting his analysis. Presenting confusing, complex charts and analysis to a novice audience will result in a misunderstanding of even basic concepts. Since most audiences are novices on this topic, the schedule expert must prepare demonstrative exhibits and present pictures, if

¹⁷ See *Mega Const., Inc. v. U.S.*, 29 Fed. Cl. 396, 425-435 (1993).

¹⁸ Barry B. Bramble, Albert E. Phillips, *Construction Litigation: Strategies and Techniques* § 6.7, 112-113 (Wily, 1989) (citing to *McCarty Corp. v. Pullman-Kellogg*, 571 F. Supp. 1341 (M.D. La. 1983)).

applicable, that reduce the complex concepts into ideas that are comprehensible. It is important for these demonstrative exhibits to have been part of the expert report, supplemental reports, or a pretrial disclosure. New exhibits not previously seen or produced for opposing counsel will result in objections, trial extensions, or even having the exhibit excluded.

The style or method of the expert's testimony can range from a simply directed examination to a slide presentation that interacts with the demonstrative exhibits. Crucial to the schedule expert's delay quantification is the causation/responsibility analysis. The ability of the schedule expert to substantiate that link and communicate it to his audience will determine the success or failure of his analysis, notwithstanding his performance under cross examination. Counsel must ensure that his expert fully explains what his analysis and charts are indicating as the understanding of such by his audience is the key to success.

[7] Conclusion

The above discussed guidelines for the presentation of CPM schedule issues in litigation can be condensed into several simple rules – rules that litigators will see apply to all forms of expert (and lots of lay) testimony. First: Be sure your expert is knowledgeable as to the facts and analysis, in other words, well prepared. Second: be sure that a sound foundation is laid for his testimony. Third and finally, be sure the expert tells his story in simple, direct and comprehensible terms.

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