



GHOST SCHEDULES – WHAT, WHY & WHAT’S THE RISK?

A Research Perspective Issued by the
Navigant Construction Forum™

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Notice

The authors have been involved in projects where two or more sets of schedules were found during the process of preparing or defending a claim. One set of schedules was, inevitably, the baseline or as-planned schedule and updates to that schedule that were submitted by the contractor to the owner. A second, and sometimes even third, set of schedules, created by either the owner and/or the contractor, may also be found to exist on the project. These schedules are, generally, referred to as Ghost Schedules¹.

While Ghost Schedules are not uncommon, the Navigant Construction Forum™ noted there is precious little literature on the subject. The Forum decided to look deeper into the creation and use of Ghost Schedules and explore issues and risks arising from the use of Ghost Schedules.

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¹ The term “Ghost Schedule” is known in the construction claims business and well recognized by construction claims consultants. However, little has been published on Ghost Scheduling, which is why this research perspective has been prepared.

Purpose of Research Perspective

Ghost Schedules are employed behind the scenes on construction projects for various reasons and purposes. Contractors use them to record their original plan when owners refuse to approve early completion schedules or fail to promptly grant time extensions, as well as to manage the activities of subcontractors and suppliers to earlier finish dates than the official project schedule. Ghost Schedules are used for planned early completion schedules; as “target” schedules; to get commitment from other project participants concerning early completion; and to influence contemporaneous project decisions. Such schedules may be used to create what some refer to as a “schedule contingency”. Finally, the U.S. Court of Federal Claims ruling that contractors are “...not required to advise the owner of its planned early completion...” affects active scheduling and delay analysis and often gives rise to the use of Ghost Schedules by contractors.

Owners and their representatives at times create Ghost Schedules when contractor schedules or updates are deemed unreliable and unusable. An accurate as-built schedule, even when prepared by someone other than the contractor, may provide owners a tool that allows for independent

delay analysis. Owner prepared Ghost Schedules may allow provide what owners consider better contemporaneous project decisions about potential change orders.

Ghost Schedules are *not* project schedules. As such there are pros and cons concerning the use of these schedules. This research perspective defines the term and discusses why Ghost Schedules are created by both owners and contractors. The research perspective explores how such schedules are used and tackles the question of whether or not Ghost Schedules pose additional legal issues. The research perspective also discusses how Ghost Schedules are implemented. The Forum also presents a list of pros and cons concerning the use and implementation of Ghost Schedules and offers recommendations should a party to the contract decide to prepare and employ a Ghost Schedule. The purpose of this research perspective is to show why Ghost Schedules are created and how they may be useful to one or both parties for better project control, decision making and faster resolution of claims. This research perspective also introduces the concept of how both parties may openly use a Ghost Schedule *together* as a type of partnering tool. Finally, the research perspective identifies some of the risks with deploying and relying upon a Ghost Schedule.

What Is a Ghost Schedule?

Ghost Schedules have been used in the background on capital construction projects for many years and for various purposes by the different project stakeholders and participants. A Ghost Schedule is a schedule other than the current project schedule. It is, typically, a schedule kept by one of the parties to the contract and results from the perceived or desired need to have a more reliable schedule. Ghost Schedules are also referred to by a number of other names, including Secret Schedules, Shadow Schedules, Concurrent Schedules, Second Schedules, Side Schedules, Production Schedules, Target Schedules, Parallel Schedules, and Early Completion Schedules. Occasionally Ghost Schedules have also been termed As Should Have Been Planned or As Should Have Been Submitted Schedules. To keep things simple this research perspective will use the term Ghost Schedule.

It is prudent to discuss what a Ghost Schedule is *not*. A contractor's Ghost Schedule is *not* a schedule maintained *in lieu* of submitting a baseline schedule and schedule updates per the contract. Even if the contractor is using a Ghost Schedule, it still must comply with the contract's scheduling requirements. An owner's Ghost Schedule is *not* a tool that is used to compare against the project schedule in progress meetings, thereby creating an adversarial relationship on the project. Such Ghost Schedules tend to undermine and contradict the reason for having a project schedule. Rather, an owner's Ghost Schedule is typically treated as being more accurate than the contractor's project schedule submittals. It is believed by owners to be more accurate because their Ghost Schedule is created by the owner or their construction manager, neither of whom

are trying to play games with schedules and updates². It is used by the owner in the background to make project decisions such as whether to grant a requested time extension or make scope changes.

Why Are Ghost Schedules Created?

Ghost Schedules may be created and maintained for a multitude of reasons, depending upon the user. They may be used by the contractor for a planned early completion; as production or target schedules to drive subcontractors and suppliers to complete their work early; to obtain buy-in from others for a planned early completion; to record a contractor's original plan based upon its bid estimate; or to contemporaneously update a contractor's schedule when the owner no longer has any faith that the project schedule submittals are realistic. In each situation when a Ghost Schedule is employed, no matter by who, project decisions and overall project strategy are often based upon the Ghost Schedule, not the project schedule.

A Ghost Schedule may be a separate schedule maintained by the project owner, the owner's representative or the owner's construction manager ("CM") consisting of their interpretation of the project status without input from the contractor. In that case, the owner or its CM has its own schedule to monitor the project and analyze schedule trends and projections. That is, the owner's representatives will record what they believe are the actual start and complete dates for schedule activities, changes in planned logic, progress override, etc. While the owner's schedule does *not* replace the contractor's schedule as the project schedule, all too often the owner's project decisions are based upon its Ghost Schedule, *not* the project schedule.

² Amanda Amadon, Emily Federico, Steve Pitaniello & James G. Zack, Jr., [Construction Scheduling Games Revised & Updated](#), Navigant Construction Forum™, May 2014.

When a contractor employs a Ghost Schedule it is often thought of by the contractor as its As Should Have Been Submitted schedule. For example, when an owner refuses to approve the contractor's planned early completion schedule, or wrongfully rejects the contractor's time extension requests either to an early completion schedule or any other type of schedule due to an excusable delay, a contractor may create a Ghost Schedule to status the project "properly". In some instances, one of the authors observed the contractor in a design/build arrangement with a design professional joint venture partner create and maintain a Ghost Schedule. When asked why contractors would do this, the author was told that in a previous project the architect of a design/build joint venture produced all drawings and specifications based on the late dates in the project schedule. The result, the contractor pointed out, was to consume much of the float in the design/build schedule during the design phase to the detriment of the constructor side of the joint venture.

Even if the contractor has not submitted an early completion schedule, it may utilize a Ghost Schedule as a production or target schedule tool to manage subcontractors and suppliers to earlier finish dates than shown in the project schedule in order to provide a schedule contingency, minimize risk, pursue schedule incentives and/or reduce its general conditions costs. Subcontractors may also employ Ghost Schedules to develop delay claims to the contractor that may or may not be passed on to the owner.

How Are Ghost Schedules Used?

Before discussing the implementation and potential pitfalls of Ghost Schedules, the need and use for a Ghost Schedule should be defined. The difference between a contract or project schedule and a Ghost Schedule must be clearly recognized. The term "project schedule" has been defined as the "... output of a schedule model that presents linked activities with planned dates, durations, milestones and resources" and the term "schedule model" is defined as "a representation of the plan for executing the project's activities including durations, dependencies and other planning information, used to produce project schedules along with other scheduling artifacts."³ With these definitions in mind, a project schedule is the official schedule prepared by the contractor and submitted to the owner in accordance with the requirements of the contract and accepted/ approved by the owner.

A Ghost Schedule, as its name implies, is *not* the project schedule *nor* is it defined or recognized by the contract. Instead, a Ghost Schedule is set apart from the project schedule by the party by whom it is employed. Like the project schedule, it is updated regularly, analyzed, discussed and revised as necessary by its creator/ user(s). Unlike the project schedule, it is *not* typically shared with all project personnel, hence the nickname *Ghost* Schedule. It is often kept throughout the duration of the project and brought to light only at the end of the project in order to justify, or defend against, delay claims.

3 Project Management Body of Knowledge, 5th Edition, Project Management Institute, Newton Square, PA, 2012.

Use by Contractors

As mentioned earlier contractors *may* create and maintain Ghost Schedules when owners refuse to approve the contractor's early completion schedules. Although a contractor's intent may have been to finish early, the possibility of using a Ghost Schedule does **not** mean that all contractors employ them when early completion schedules are rejected, whether properly or not. Another way to create an early completion schedule is for the contractor to create interim milestone dates with earlier dates which have the effect of driving an early completion date for substantial completion or final completion, whichever date alleviates the imposition of liquidated damages. Alternatively, if the contract has a series of embedded interim milestones then the contractor can achieve the same result simply showing these dates earlier than called for in the contract.

At other times, a contractor who is actually ahead of schedule part way through the project may face an owner or CM who takes the attitude that "...we will not accept a schedule showing anything other than on time completion." In such a case, a contractor may prepare and maintain a Ghost Schedule to document when they would have completed the project.

When faced with these situations contractors decide whether to create and continually update a Ghost Schedule for the remainder of the project. The contractor must also decide on the purpose and the use of the Ghost Schedule. If an owner formally rejects the contractor's planned early completion schedule, the contractor is generally required to prepare a schedule to match the contractual completion date(s) in order to submit an approvable project schedule and gain acceptance or approval by the owner. At the end of the project, in

order to file and prevail on a delayed early completion claim, the contractor must prove their intent to complete work early to the trier of fact.

"...contractor intent is the factor on which most early completion claims turn. Operative facts, as opposed to simple expressions of intent, are the focal point in an analysis of the contractor's intent."⁴

Thus, if the contractor still wants to use a Ghost Schedule to pursue early completion after owner rejection, assuming it is **not** prohibited by the contract, the contractor will need to maintain both the project schedule showing on time completion and its Ghost Schedule reflecting early completion. However, the contractor will have to plan and execute its work per the early completion schedule in order to finish early. The contractor **must** maintain the early completion schedule to demonstrate that it planned early completion and then implement its Ghost Schedule to actually achieve early completion.

A Ghost Schedule may be used to prove owner delay against its early completion schedule. On the other hand an owner may take the position that a contractor's early completion schedule simply created schedule contingency or float even though the contractor was actively pursuing its early completion schedule. And, if the contract contains a Joint Ownership of Float clause owners may contend that even though the contractor created float, the owner has the same right to that float as the contractor on a first come, first serve basis. If the owner delays the contractor's early completion schedule the contractor may be able to use its early completion schedule to prove delay and recover extended general conditions instead of absorbing these costs.

⁴ Thomas H. Gourday, Jr., *Constructive Acceleration and Concurrent Delay: Is There a "Middle Ground"?*, 39 Pub. Contr. L. J. 23, Winter 2010, citing Skyline Painting, Inc., ENGBCA No. 5810, 93-3 BCA P 26,041 at 129,459.

Without its Ghost Schedule, the contractor may *not* be able to prove a delay to its early completion since the project schedule would *not* reflect any delay until the early completion allowance was exhausted.

Another use of Ghost Schedules by contractors is when the owner and the contractor disagree over the execution of, or updates to, the project schedule. While the owner may insist that the approved project schedule be updated and submitted as the owner sees the project, the contractor could submit another version of the project schedule reflecting potential problems and delays that it has already incurred or expects to incur. Thus, the contractor maintains the project schedule and a Ghost Schedule.

A third use of a Ghost Schedule is when the contractor is attempting to finish earlier than the project schedule but did *not* inform the owner. In this case, the planned but unrevealed early completion helps establish the contractor's schedule contingency.⁵ When a contractor issues an early completion schedule that is accepted by the owner, the owner may revise the contract completion date via change order or contract modification, thereby binding the contractor to the earlier date. When a contractor is trying to finish early but is unwilling to accept the risk of a contractually enforceable early completion date, a contractor may use a Ghost Schedule to drive the actual work, all the while submitting and updating a project schedule based on the full duration of time allowed under the contract. However, a contractor who plans to complete work early but decides *not* to tell the owner by submitting a planned early completion schedule may be needlessly increasing their own risk. As noted by one author,

"The contractor need not notify the Government of its intent to complete the work early, although providing notice evinces a contemporaneous intention to complete early, as well as advising the Government of the proposed early completion, enabling the Government to seek to minimize any actions the might interfere with the contractor."⁶

Ghost Schedules may also be used as production or target schedules. A production schedule includes activity durations and associated production rates (i.e., quantity/work day, quantity/manhours, etc.) that contractors and subcontractors must achieve in order to meet an early completion schedule. A production schedule can be used several ways. First, the production schedule can be the supporting details of an early completion schedule (approved or not). Second, the production schedule can be used as a more aggressive schedule than the project schedule, or as contingency against the project schedule, particularly on projects with high liquidated damages or other risks. Third, a production schedule may be employed on the site to push subcontractors and suppliers to meet activity early start and finish dates in order to beat the project schedule date. Using the production schedule to try to beat the project schedule will most likely create float on the project schedule and provide the contractor with more flexibility in managing its resources.

Use by Subcontractors

As projects have become more complex and subcontractors have updated their internal project controls, it has become common for subcontractors to maintain

5 The authors have, on occasion, worked on projects with contractor clients who have a company policy that all Baseline Schedules will have "x%" schedule contingency in order to protect the project against unforeseen events. Such a policy almost demands an unrevealed early completion schedule be created and used to manage the project in order to comply.

6 Thomas H. Gourday, Jr., *Constructive Acceleration and Concurrent Delay: Is There a "Middle Ground"?*, 39 Pub. Contr. L. J. 23, Winter 2010, citing *Oneida Construction, Inc./David Boland, Inc.*, ASBCA No. 44194, 94-3 BCA P 27,237 at 135,727.

their own schedules, but *not* necessarily share them with contractors or advise them of their existence. Regardless of disclosure, the subcontractor's schedule could be considered a form of a Ghost Schedule, although it may not be thought of that way by the contractor or other subcontractors. Since there are typically many subcontractors on a project, the possibility exists for multiple Ghost Schedules on a single project. Contractors do not always share the electronic version of the project schedule with subcontractors, instead choosing to give the subcontractors hard copy printouts of the overall schedule, current critical path and/or three-week look ahead schedules from the overall schedule for short and long term planning at the weekly subcontractor meetings. As a result, subcontractors often maintain and update their own schedules of their scope of work and try to mimic the restraints on their work from the overall schedule. Subcontractors also use their Ghost Schedules for their own early completion or manpower leveling (regardless of whether the contractor is pursuing an early completion), and identification and submittal of a delay or impact claim. Subcontractor Ghost Schedules record and become the subcontractor's as-built history of the job.

Use by Owners

The most common circumstance under which an owner creates and uses a Ghost Schedule is when they, or their representatives, become convinced that the contractor's schedule updates are inaccurate and unusable. In that case, the owner may create and maintain a "more accurate" Ghost Schedule based on the project schedule with the "proper adjustments" observed by the owner's staff or representatives in the field to "more accurately reflect" the status of the project and future projections. The potential problem resulting from this situation is

that once the owner or its representative has "adjusted" the schedule "properly" the owner tends to use the Ghost Schedule to make time related decisions on the project, thereby creating the possibility of a contractor claim.

On the other hand, some owners may have a Ghost Schedule from the outset of the project even if the contractor is submitting accurate monthly updates. As project controls and owner oversight continues to grow, owners often have their own schedulers assigned to the project, either onsite or offsite. Owners may create a Ghost Schedule of the project schedule from the outset as a means to track and analyze the project schedule independently. As the design is often not complete at the time construction begins (and is normally completed through the submittal process) and the contractor schedule has been approved, the owner may use its Ghost Schedule to determine the potential impact of design changes, either a scope addition that may extend the project or a scope deletion that may reduce the project duration. Such analyses would take place *before* the owner issues the change order to the contractor. The owner could also use its Ghost Schedule to analyze the benefit, or detriment, of expediting or deferring the delivery of owner furnished/contractor installed ("OFICI") equipment in various combinations. Essentially, the owner is free to use its Ghost Schedule to test a variety of "what if" scenarios before bringing the changes to the contractor and possibly disrupting the current project.

Are Ghost Schedules Legal?

To date, there appears to be minimal case law dealing with the use of Ghost Schedules. A significant case concerning Ghost Schedules and their use is *Jackson Construction, Inc. v. United States*.⁷ In this case, the U.S. Court of Federal Claims

⁷ *Jackson Construction Co., Inc. v. The United States*, 62 Fed. Cl. 84; 2004 U.S. Claims.

stated that a contractor is under no obligation to advise owners of its planned early completion. The Court stated:

“The contractor is not required to notify the Government of its intent to finish early as ‘it would seem to make little difference whether or not the parties contemplated an early completion’”⁸

The Court added an important qualifier to its finding:

“The record, however, must contain concrete evidence of the contractor’s intent, such as bid, estimate, or any other contemporaneous documentation of its planned early completion.”⁹

An as-planned or Baseline Schedule showing an early completion date would logically be a part of the “contemporaneous documentation of its planned early completion” noted above. Another author commented in this regard in the following manner:

“...the contractor must show that the early completion schedule alleged by the contractor was feasible, and performance in accordance with the contractor’s proposed schedule would have led to early completion, absent unreasonable government caused delay.”¹⁰

The Court also commented on the notice of early completion as an element of proof in a delayed early completion claims situation:

“Notice to the Government, while not required, may be sufficient evidence of intent.”¹¹

As numerous papers have been written about notice of early completion schedules over the years, it seems unnecessary to comment further.¹²

Other cases that refer to Ghost Schedules or related issues include the *Appeal of Blackhawk Heating & Plumbing*¹³, *E.C. Ernst, Inc. v. Koppers Company, Inc.*¹⁴, and *Titan Pacific Construction Corp. v. United States*.¹⁵

In the *Appeal of Blackhawk Heating & Plumbing*, the General Services Board of Contract Appeals (“GSBCA”) cited *WRB Corporation v. U.S.*¹⁶ wherein that the Court struck down the plaintiff’s total time argument because of its lack of proof of Government delay coupled with the unreliability of both its initial bid estimate and its overhead cost figures. The Court’s language in dealing with one of plaintiff’s breach of contract claims makes this apparent:

“On its unnumbered claim for overhead and interest costs incurred because of the Government’s delays, ***the plaintiff urges that its recovery should be the difference between***

8 *Wickham Contracting Co. v. United States*, 12 F.3d 1574, 1582 (Fed. Cir. 1994) quoting *Metropolitan Paving Co. v. United States* 163 Ct. Cl. 420, 423, 325, F.2d 241, 242-43 (1963); accord *Weaver-Bailey Contractors, Inc. v. United States* 24 Cl. Ct at 578-79.

9 *Wickham*, 12 F.3d at 1582.

10 Thomas H. Gourday, Jr., *Constructive Acceleration and Concurrent Delay: Is There a “Middle Ground”?*, 39 Pub. Contr. L. J. 23, Winter 2010, citing *Interstate General Government Contractors v. West*, 12 F.3d 1053, 1058-59 (Fed. Cir. 1993).

11 *Wickham*, 12 F.3d at 1582.

12 See, for example, James G. Zack, Jr., *Early Completion Schedules: The Newest Form of Contingency Bidding, Stratagem*, Spring, 1985; Evans M. Barba, *Government Contract “Early Completion” Delay Claims, Construction Briefings – Second Series*, Federal Publications, Inc., No. 92-12, November 1992; and Roy Mendelsohn, *Early Completion Schedules: The Promises & Pitfalls*, *Journal of Management in Engineering*, Vol. 10, No.1, American Society of Civil Engineers, January/February 1994.

13 *Appeal of Blackhawk Heating & Plumbing v. United States*, 76-1 BCAP 11649, GSBCA No. 2432, 1975 WL 1482 (G.S.B.C.A.).

14 *E.C. Ernst, Inc. v. Koppers Company, Inc.*, 520 F. Supp.830.

15 *Appeals of Titan Pacific Construction Corporation*, 87-1 BCAP 19626, ASBCA No. 24148, ASBCA No. 24616, ASBCA BCANo. 21692, 1987 WL 40610 (A.S.B.C.A.).

16 *WRB Corporation v. U.S.*, 183 Ct. Cl. 409, 427 (1968).

the months it estimated the project would take and the actual time consumed, multiplied by its monthly charges for interest and overhead. A ‘total time’ approach is no less susceptible to inaccuracies than the total-cost theory.¹⁷ Plaintiff’s presentation does not support its dependability here. There are at least three weaknesses. We are not persuaded that the quantum of delay arrived at through this mode of computation is attributable to the Government rather than the builder or its subcontractors.

There is a serious conflict in the evidence as to exactly what the plaintiff’s pre-bid estimate was. The plaintiff’s calculation of monthly overhead and interest is, at best, disputable.”
(Emphasis provided.)

The Ghost Schedule being referred to in this case was the plaintiff’s schedule showing the estimated number of months it would take to complete the work of the project. In this case, the Court did *not* believe that the pre-bid estimate reflected the Ghost Schedule.

In *E. C. Ernst, Inc. v. Koppers Company, Inc.*, the trial judge indicated that the total number of delay hours was overstated because it was based on an erroneous estimate of how many hours it would have taken Ernst to complete the project had no delay occurred. Again, the Ghost Schedule being referred to is the schedule allegedly showing the shortened duration and reduced manhours Ernst said they had scheduled for this project.

In *Titan Pacific Construction Corp v. United States*, the Court commented on Titan Pacific’s schedule which they used at trial to attempt to prove Government

caused delays. The Court’s comments on the reliability of this schedule leads one to believe that the Court considered the schedule to be a Ghost Schedule:

“... appellant’s “as-planned” CPM schedule indicated that Voudouris planned to perform a number of activities involving the moisture-sensitive soils during the “wet season” ... including stripping top soil, grading roads and turnouts, grading building sites, and tank excavation ... Appellant contends that ... because of Government pressure and refusal to grant time extensions in the dry season between June and October for earthwork delays resulting from adverse weather and unsuitable soils conditions, Voudouris “moved around from place to place in a largely unproductive operation looking for suitable materials to use as fill,” attempted to accelerate its operation by expanding its operation to 10 hours per day, six days per week, using double shifts, and attempting to obtain additional equipment.”

Along these same lines:

“Determination of the feasibility of a contractor’s alleged accelerated schedule is a question of fact. The record should indicate that the proposed schedule was reasonable given the existing conditions at the job site, the method proposed by the contractor, and the contractor’s actual operations.”¹⁸

In performing the research for this report, the Forum realized how little case law exists concerning Ghost Schedules. Given the large number of claims the authors have been involved in where a delayed early

¹⁷ Referring to *Laburnum Construction Corp. v. United States*, 163 Ct. Cl. 339, 342-43, 325 F.2d 451, 453 (1963).

¹⁸ Thomas H. Gourday, Jr., *Constructive Acceleration and Concurrent Delay: Is There a “Middle Ground”?* 39 Pub. Contr. L. J. 23, Winter 2010, citing Lloyd H. Kessler, Inc., ASBCA No. 88-170-3 BCAP 23,802 at 119, 191.

completion was alleged, the lack of case law seems counterintuitive. However, this may be the result of what the construction bar refers to as the “vanishing trial”. In regard to this issue, it is noted that:

“In 1938, about 20% of federal civil cases went to trial. By 1962, the percentage was down to 12%. By 2009, the number has sunk to 1.7%. The percentage of jury trials in federal civil cases was down to just under 1%, and the percentage of bench trials was even lower. So between 1938 and 2009, there was a decline in the percentage of civil cases going to trial of over 90% and the pace of the decline was accelerating toward the end of that period...”¹⁹

In a private presentation in March 2012, Andrew D. Ness, then Chair-Elect of the American Bar Association Forum on the Construction Industry addressed this issue. As Mr. Ness pointed out, in the U.S. legal system “construction law” is derived primarily from case law – prior legal decisions.²⁰ Mr. Ness pointed out that as the construction industry changes and evolves (i.e., project delivery methods, Building Information Modeling, green construction, location based scheduling, etc.) so too must construction law. The unintended consequence of the vanishing trial is that construction law stops evolving.

CPM in Construction Management by O’Brien and Plotnick is often cited by schedule practitioners and the industry in general as being one of the leading books on construction scheduling.²¹ In this edition O’Brien and Plotnick discuss a situation where the owner’s representative demanded a schedule submission differing

from what the contractor believed to be reality and recommend that the contractor create a Ghost Schedule.

“Occasionally a contractor may be faced with an engineer who demands a submission of an update or revision differing from what the contractor believes is factual. The owner and the owner’s representative, the engineer, must be provided with what is required in the specification [the engineer’s position]. However, providing additional information (clearly marked FYI only [the contractor’s position]) relating to problems encountered may bring the engineer into the process of mitigation and correction. If the owner, rather, chooses to consider this adversarial, then the additional reports provide abundant notice.

The maintenance of the schedule in two configurations (e.g., the approved schedule and the contractor’s version of the schedule) at the same time is recommended in such situations and is supported by several court decisions.”

O’Brien and Plotnick further discuss what should be done when a good as-planned schedule network did *not* exist or the one used was so flawed or inadequate as to be unreliable. This recommendation can be used during an active project to complete the work or when the project is in dispute.

“In this case, an As-Should Have Been network can be produced. Obviously, what is desired here is to recreate the “plan of execution” envisioned by the project team

19 Robert P. Burns, *What Will We Lose If The Trial Vanishes?*, Northwestern University School of Law, Public Law and Legal Theory Research Paper Series No. 11-48, 2011. See also, Marc Galanter and Angela Frozena, *‘A Grim Without A Cat’: Civil Trials in the Federal Courts*, 2010 Civil Litigation Conference, Judicial Conference Advisory Committee on Civil Rules, Durham, N.C., May 2010.

20 Andrew D. Ness, *The Future of Construction Law and Claims*, 51st Annual Western Winter Workshop, AACE International, Lake Tahoe, NV, March 2012.

21 O’Brien, James J., Frederick L. Plotnick, *CPM in Construction Management*, 7th Edition. McGraw Hill, New York, 2009.

at the time the work was starting and not to use 'Monday morning quarterbacking' to create a CPM of how the work should have been planned. Obviously ... the credibility of the scheduler will come into play, thus, it is important to document the sources used to recreate the As-Should Have Been to become the As-Planned CPM. Thus, the terminology means 'As-Should Have Been Submitted' and not 'As Should Have Been Planned.'"

This recommendation is a variation or different application of the Ghost Schedule concept discussed earlier. As recommended by O'Brien and Plotnick this form of a Ghost Schedule replaces a poorly drafted schedule or the lack of a planned schedule.

Another frequently cited book, *Construction Schedules: Analysis, Evaluation and Interpretation of Schedules in Litigation and Dispute Resolution*, by Callahan and Hohns, also addresses the topic of "Shadow Schedules" as useful when parties disagree over the schedule data used in the update. For example, an aggressive construction manager or unrealistic designer may refuse to recognize the delay causing events and either refuse to include additional activities or extend the duration of affected activities. Some contractors may also prepare a "... Shadow Schedule with the version of the data that the contractor believes is accurate..." The Shadow Schedule may be maintained for considerable amount of time until the owner and the contractor agree, eventually, on the information. The Shadow Schedule records and updates the contractor's version of current progress or the real effect of a change or delay that the owner or construction manager chooses to ignore. Submitting a Shadow

Schedule (of the current update) *may* also satisfy the notice requirements for claims or time extensions.²²

Other potential legal issues

Since the term Ghost Schedule implies that one party is *not* sharing all of its information with the other party, there are other potential legal issues that may arise. For example,

- » **Partnering Agreements:** Since the purpose of a Partnering Agreement is for the project participants to work together in the best interest of the project, through totally open and honest open communication between the two parties does the use of a Ghost Schedule, not shared amongst all parties, violate the spirit of the agreement?
- » **Assumptions in the early completion schedule:** If the contractor's early completion schedule included assumptions about owner deliveries or responsibilities that appeared to the contractor to be reasonable at the time of bid but are *not* explicitly in the contract, is the contractor's early completion claim compromised?
- » **Reconciliation of Project Schedule versus Early Completion Schedule:** Depending on the differences between the project schedule and the early completion schedule, the critical paths in the schedules may be different and may be delayed by different events. Since the project schedule is the operative or controlling schedule during project execution, the contractor can only negotiate and accept time extensions based on the project schedule. However, the early completion schedule could be delayed by a totally different set of facts and circumstances than the project schedule. It should also be noted that when multiple schedules are used,

²² Michael T. Callahan, H. Murray Hohns, *Construction Schedules: Analysis, Evaluation and Interpretation of Schedules in Litigation and Dispute Resolution*, 4th Edition, JURIS Publishing, Inc., New York 2011.

the incremental gains/losses in the monthly updates will vary between the project schedule and the Ghost Schedule. At some point, it is possible that both the project schedule and the Ghost Schedule will be reporting “on time” completion with respect to the contract. However, while the project schedule has not been delayed (yet), the Ghost Schedule representing the early completion schedule may be reporting delay. If the contractor still pursues an early completion schedule delay claim, what schedule governs and do the separate analyses need to be reconciled? In regard to this issue, one author pointed out the following:

“Contractors frequently attempt to establish an early completion claim through the use of progress schedules. These schedules should be scrutinized carefully. In many instances the schedules are not prepared contemporaneously with contract performance. The problem underlying these “after the fact” progress schedules is that the assumptions contained in the progress schedule cannot be tested against the purported performance and the alleged impact of the government caused delay.”²³

- » **Incentive Clauses:** How are early completion schedules and project schedule incentive clauses reconciled?

How Are Ghost Schedules Implemented & Run?

As described above, the *Jackson* decision states that contractors do **not** have to advise owners of their intended early completion,

which raises the issue of whether or not contractors should disclose their intent to finish early. It is the authors’ opinion that contractors who bid the work on an early completion basis and have a legitimate intent and workable plan to complete the project earlier than required can protect themselves and their plan better if they advise the owner of the intended early completion. One author offered the following observations in this regard:

“In *Interstate General Government Contractors v. West*²⁴, the court held that the contractor must establish “...that from the outset of the contract it (1) intended to complete the contract early; (2) had the capability to do so; and (3) actually would have completed early, but for the government’s actions.”

...

Additionally, *Interstate General* itself made clear that the schedule under consideration must have existed at the time of bid, turning a highly skeptical eye to any after-the-fact projections by noting that “...the record contains no pre-delay performance schedule whatsoever.”²⁵

The same author, citing another case noted that “Additionally, to the extent a contractor contends it had a schedule depicting its intent to complete early, the courts and boards basically have demanded that such schedules be introduced into evidence.”²⁶

Owners should remember, or contractors may have to remind them, that the owner has already received the benefit of the early completion as the contractor’s bid included

23 Thomas H. Gourday, Jr., *Constructive Acceleration and Concurrent Delay: Is There a “Middle Ground”?*, 39 Pub. Contr. L. J. 23, Winter 2010, citing *Bell Coatings, Inc.*, ENGBCA No. 5787, 93-2 BCA P 25,805 at 128,450.

24 12 F.3d at 1059

25 David B. Wonderlick, *Claims for Delays to a Planned Early Completion Date, or, “The Project Was Completed on Time: Why Am I Facing a Delay Claim?”*, 33 Constr. Lawyer 15, Spring 2013.

26 Wonderlick, citing *CATH-dr/Balti Joint Venture*, 05-2 B.C.A. (CCH) at 163,816.

less field and home office overhead costs as well as a reduced markup cost resulting in a lower bid cost. Second, most owners should be delighted to have their project completed earlier than planned as the project will go into operation earlier and the owner will have incurred lower project management costs. Finally, if the contractor truly intends to complete work earlier than required by the contract terms the contractor will need cooperation from the owner – cooperation that likely will *not* be as forthcoming if the owner does *not* know of the early completion plan. For example, if the owner does not know of the planned early completion and the contractor actually appears to be “substantially ahead of schedule” the owner’s staff may become lackadaisical in responding to submittals or RFIs, slow in issuing change orders, all to the detriment of the contractor’s early completion plan, thus raising the risk of a contractor claim.

Implementation by Contractors

If the owner formally rejects the early completion schedule, the contractor is generally directed to submit a schedule to match the contractual completion date(s) in order to produce a project schedule that will be accepted or approved by the owner. Compared to the early completion schedule, the project schedule would, at a minimum, include different activity durations across the project schedule to increase the overall execution period to match the contract completion date. Depending on how the contractor planned to achieve early completion, the project schedule typically uses the most likely means and methods to complete the project within the contract duration. Thus, the construction logic, crew flow, delivery dates for contractor supplied materials,

and so forth, will be different in the project schedule than the more aggressive and risky early completion schedule. As a result, the contractor’s early completion schedule and its approved project schedule will be different and the differences will vary based on the complexity of the project and the assumptions made by the contractor in its early completion schedule.

It should be noted that when multiple schedules are used, the incremental gains/losses in the monthly updates will vary between the project schedule and Ghost Schedule. At some point, it is possible that both the project schedule and the Ghost Schedule will be reporting “on time” completion with respect to the contract. However, while the project schedule may not have been delayed (yet), the Ghost Schedule representing the early completion schedule will be reporting delay internally to the contractor and its home office management.

If the owner delays the contractor’s early completion schedule, the contractor could, once the project was completed, use its early completion schedule to demonstrate delay to the planned early completion and recover extended general conditions instead of absorbing those costs. Without its Ghost Schedule, the contractor could *not* prove a delay to its early completion since the project schedule would *not* reflect any delay until the early completion allowance was exhausted. One author noted that:

“...the early completion schedule must exist prior to the claimed delay, and some analysis demonstrating its viability will be necessary to satisfy the second element [of the three part *Interstate General* test set forth above].”²⁷

27 David B. Wonderlick, Claims for Delays to a Planned Early Completion Date, or, “The Project Was Completed on Time: Why Am I Facing a Delay Claim?”, 33 *Constr. Lawyer* 15, Spring 2013.

Since contractors are *not* obligated to advise owners of their intention to complete the work earlier than called for in the contract or, if they do inform the owner and the owner demands a “on time” schedule submittal, then it appears obvious that they are not required to provide copies of their Ghost Schedules to the owner. Further, contractors are under no obligation that the authors could find to provide the monthly updates to the Ghost Schedules to owners either. In fact, it is the authors’ experience that contractor created Ghost Schedules are withheld from the owner until a delayed early completion claim is filed around the end of the job.

Implementation by Subcontractors

There are two situations where subcontractors are likely to use their own Ghost Schedules. First, subcontractors may use a Ghost Schedule to drive their sub-subcontractors, suppliers and material men to complete their work or make their deliveries by the Ghost Schedule’s early or complete no later than dates in order to protect themselves against late completion. The second situation is somewhat less likely. A subcontractor may employ a Ghost Schedule in order to establish the groundwork for a delay claim against the prime contractor. Much as a contractor’s Ghost Schedule may be used as the basis of a delay claim, so too will the subcontractor’s Ghost Schedule. Having said this, it must be recognized that most subcontract forms bind the subcontractor to the prime contractor’s schedule and often have a No Damages for Delay clause.²⁸ Either or both of these clauses may defeat the use of a subcontractor’s Ghost Schedule.

Implementation by Owners

The most common justification for an owner to create and maintain a Ghost Schedule is when the owner concludes that

the contractor’s updates are inaccurate, unreliable and unusable. Frequently, however, the owner may not realize that the contractor’s updates are incorrect until well into the project after the contractor has submitted enough schedule updates for the owner to determine that the schedule updates are inaccurate. As some authors have pointed out in this regard²⁹:

“...contract specifications should clearly identify the submission requirements. Updates should include:

- » Corrected logic that reflects actual and planned events in the field
- » Revised durations that reflect actual experience
- » Revised logic that corrects out-of-sequence work
- » Identification of logic tie changes
- » Accurate actual start and finish dates
- » Written narrative...

Schedule updates that fail to meet these criteria may be deemed useless in any subsequent proceedings under the theory that they fail to accurately represent the project.³⁰

At that point in time, owners may feel the need to begin maintaining their own version of the project schedule with the correct dates and logic, to the best of their ability. Failure to do so may result in the following situation:

“Once the schedule cannot be used to document the project history, there is a risk of the Contractor attempting to create a false history of the project. This

²⁸ Thomas F. Peters and James G. Zack, Jr. *Pricing and Proving Subcontractor Delay Claims*. Navigant Construction Forum™, Boulder, CO, 2011.

²⁹ John C. Livengood and Patrick M. Kelly, *The Law of Schedules*, 2012 AACE International Transactions, Morgantown, W.V

³⁰ Appeal of J.A. Jones Construction, 00-2 BCA 31,000 (2000)..

attempt, whether intentional or careless, is often seen in changes in the as-built side of the schedule in the actual dates of started or completed activities from one schedule update to another. Many forensic schedule analyses identify a multitude of inappropriate changes in actual dates. This can rise to the level where the identification of correct data is subject to debate. This is a dangerous situation, and it takes a serious effort at capturing actual data to position the Owner to prove the facts and halt efforts to confuse the issues and capitalize on the confusion.

The first step in this as-built effort is to develop and maintain a daily record of progress, called a Daily Specific As-Built (DSAB) record, for use in the forensic analysis. The DSAB is time consuming, but with a good system, can be accomplished. The benefit of this effort is that it captures contemporaneous information from daily project record, at the time of the daily records. This allows for clarification and verification of the data, so as the DSAB is advanced through the project, the data is validated.³¹

Regardless of the contractor's schedule's accuracy or inaccuracy, the owner must always maintain a copy of the contractor schedule as submitted as part of the project's record. If the contractor has demonstrated its schedules were reliable, the owner may use the as-built dates and remaining durations from the contractor's monthly submissions and import them into its own Ghost Schedule.

If the owner ultimately uses its Ghost Schedule to prove that its imposition of liquidated damages is justified, the owner will need to prepare its claim similar to how a contractor prepares a delay claim to the owner. However, instead of using the contractor's schedules as submitted, the owner may be able to use its Ghost Schedule with the corrected dates and logic to demonstrate the true controlling delays. Owners are likely to use their own Ghost Schedule to show different dates for various activities on the schedule in order to discredit the contractor's forensic schedule analysis as part of their defense against a delay claim. Alternatively, owner may use the dates in their Ghost Schedules to justify imposition of liquidated damages.

Implementation of Common Use by Owner, Contractor and Subcontractors

While it is likely that the some projects already have used, or are currently using, a side schedule to benefit the project, the authors suggest a way to further such a concept. Essentially, owners and contractors could share and use a common side schedule as a means to perform studies to mitigate potential forecasted delays, to jointly re-schedule work once a delay has occurred, to level manpower to alleviate schedule and/or labor density problems in certain areas, or to resolve the many challenges that arise on construction projects. The parties would use the side schedule, no longer a Ghost Schedule since it is known to all parties, to perform and create real time solutions to incorporate into the project schedule. Since all parties would participate in such actions using the side schedule, upon agreement the revised schedule could be incorporated into a change order where all parties could be compensated for the schedule re-alignment, as necessary, thereby

31 Chris Carson, *Dealing with Contractor's Schedules that Cannot be Approved*, 2012 AACE Annual Transactions, Morgantown, W.V.

minimizing later claims and expediting contract closeout. If a partnering agreement was established at the project outset, the partnering agreement could define how the side schedule would be administered. Additionally, the contract would probably need to address the use of the side schedule. The concept of the potential joint use of a side schedule will be addressed in a future white paper or research perspective.

A potential alternative to this common use scheduling concept is for the keeper of the Ghost Schedule (either the contractor or the owner) at some point in the project, to share its Ghost Schedule with the other party. In this manner, both parties can view the project schedule from each other's perspective prior to making time related decisions. Revelation of the Ghost Schedule may also promote an open discussion concerning the progress of the work, delays or potential delays, unresolved extension of time requests, etc.

The Pros & Cons of Ghost Schedules

There are certainly many advantages of a Ghost Schedule. Conversely, as with any project management technique, the use of a Ghost Schedule carries with it certain risks. In construction, the biggest unknown is risk. In terms of risk management, the authors believe that employment of a Ghost Schedule is a "known unknown". That is, while risk managers recognize that Ghost Schedules have some risk, the potential impact of that risk is, in fact, unknown and most likely unpredictable. While the risk can be managed, the implementation of a Ghost Schedule may introduce more risks and unknowns into the project that must weighed against the benefits of a Ghost Schedule.

Benefits to Contractors

The benefits to the contractor with respect to creation and use of a Ghost Schedule, representing either an early completion schedule or a target or production schedule to provide schedule contingency, seem to be the following:

- » Documentation of its intent, plan and capability to complete the project early;
- » Documentation that the contractor followed the early completion plan at least until the point where the owner's actions made this impossible;
- » Documentation of delays, disruptions and impacts as they occur to show how the planned early completion was, in fact, delayed through no fault of the contractor;
- » Deliberate buy in, or unknowing acquiescence, by subcontractors and suppliers and/or joint venture partners to the early completion dates;
- » Creation of a schedule contingency to reduce the risk of late completion and assessment of liquidated damages;
- » Ability to perform "what if" scenarios concerning changes, impacts and other disruptions on an early completion schedule; and
- » Similar to the above, the ability to make overall company business decisions on an early completion basis for this particular project and its effect on the company's other projects.

Risks to Contractors

The contractor's underlying problem of maintaining multiple schedules is "Which one is your real schedule?" Thus far, the authors have introduced several schedules: the project schedule, the production or target schedule and the early completion schedule (submitted or unsubmitted).

As a result, with multiple schedules in play, could the contractor be accused of submitting a False Claim if the project was executed and reviewed against the project schedule, but a claim is based on a Ghost Schedule? Or put another way, was the contractor lying then (with the patent project schedule) or is the contractor lying now (with the latent Ghost Schedule)?

A contractor may take on risk based on the assumptions used in its Ghost Schedule. While the assumptions could very well be reasonable at the time the Ghost Schedule was created, such assumptions could be compromised by subsequent project conditions or simply turn out to be wrong. In the case where a contractor does not submit its early completion schedule (as in the *Jackson* case) and it has not advised the owner of its assumptions/clarifications to the schedule, like it does when it submits a project schedule (or early completion schedule) for approval, the contractor may well have increased its own risk.

A negative aspect of Ghost Schedules, which is ultimately shared and/or felt by all parties, is that open communications about the past, current and future status of the schedule may be suppressed. One or more of the parties may be posturing for a claim, and will often withhold information so as not to tip its hand. The authors have observed this taking place when a contractor or a subcontractor has underbid and/or mismanaged the project, while the owner may do so when its design was not as complete as advertised in the bid documents.

Another risk of maintaining a Ghost Schedule, whether it is a production or target schedule or an early completion schedule, is the added cost for maintaining multiple schedules. When multiple schedules are used, the contractor may also be doing monthly reconciliations of its schedules, which can create confusion among its

management and field supervision about home office management's true short and long terms goals.

Benefits to Subcontractors

Although subcontractors often maintain their own schedules, particularly on larger, more complex projects, these schedules are not always "hidden" from the general contractor or the Construction Manager at Risk ("CM@Risk"). This is a form of contract where the owner signs a single contract with a contractor who, in turn, subcontracts 90%-95% of the work leaving the contractor to manage, at its own risk, all of the trade contractors it has hired to perform the work of the project. This form of contract is distinctly different than a typical construction management arrangement where the CM is simply the owner's representative on the project – most often referred to as an "agency CM". However, it is the subcontractor's record of the project schedule and it can be used for claims against the general contractor or CM@Risk as well as a *defense* of claims from the general contractor or CM@Risk. The subcontractor's schedule also allows it to better manage resources and criticality among all of its active projects. Ghost Schedules used on all its projects may also help the subcontractor understand its current commitments and restraints when it plans to bid other projects.

Risks to Subcontractors

A subcontractor's risk concerning the use of a Ghost Schedule, whether hidden or not, is mostly when its Ghost Schedule differs from the project schedule the general contractor or CM@Risk is using to manage the work, which ultimately will likely be the project schedule used for time extensions. Thus, the subcontractor's schedule must be generally aligned with the project schedule, with differences noted

and recorded monthly by the subcontractor should a reconciliation or explanation later be required while negotiating an impact or delay claim with the contractor. The added work may over-extend a project manager who is handling multiple projects.

Benefits to Owners

The benefits of Ghost Schedules to an owner are the following:

- » An accurate database of actual start and finish dates by activity.
- » A record of the actual logic of the work.
- » The ability to determine whether various events actually caused contemporaneous delay.
- » Elimination of the need to recreate the project's as-built schedule after project completion.
- » The ability to make and implement project decisions contemporaneously.
- » The ability to make and implement stakeholder business decisions promptly.³²

Risks to Owners

As it is with contractors, there is a cost to maintaining a Ghost Schedule while at the same time monitoring the official project schedule that must be weighed against its potential benefits. The owner must staff the project with sufficient personnel to document actual progress, start and completion dates, maintain the Ghost Schedule, monitor the project schedule and perform "what-if" studies for its own use, probably on both the project schedule and the Ghost Schedule. However, on high risk, costly projects, the benefit may outweigh the added cost.

Should the owner determine that the contractor's project schedule has *not* been maintained accurately, the owner's dilemma is how much of its data should it share with the contractor? Generally, an

owner's review of the contractor's monthly schedule updates points out errors or raises questions about status, critical paths, logic errors and other technical issues with the CPM calculations. However, if the owner does not share all of its contemporaneous knowledge and data with the contractor, does that mean that "superior knowledge" prevents them from using its data later should claims and/or counterclaims arise? Further, since the contract prescribes that the project schedule and updates must be used for the purposes of calculating time extensions, what schedule should the owner use when analyzing delays and potential delays? Regardless of whether the contractor's schedules are accurate or inaccurate, the owner should always maintain a copy of the contractor schedules as submitted as part of the project record, since they ultimately may be used for claim analyses.

If the owner opts to make time related decisions based upon its own Ghost Schedule rather than the project schedule, it is likely that the owner may be increasing the chances of a constructive acceleration claim³³ as owners are likely to deny time extensions or grant less time than sought by the contractor. An additional but unquantifiable risk for owners who rely on their own Ghost Schedules, should delay claims go to arbitration or litigation, is whether owners can defend their decision making concerning time extensions when their decisions were based on an unrevealed schedule.

When owners use a Ghost Schedule to prepare what-if scenarios, the owner must take proper care to ensure its schedule is reconciled to the contractor's schedule since a modification to its Ghost Schedule may yield a different result when compared to the contractor's schedule, which could lead to disputes over the true impact of

³² Further discussion of the benefits to owners of a Ghost Schedule may be found in a paper by Hector Arias, Alberto Martinez, Efe Eray Tuncay, *Benefits of an Effective Construction Manager's Shadow Schedule*, *Transactions of the 2014 AACE Annual Meeting*, AACE, Morgantown, WV.

³³ For further information on constructive acceleration claims see Patrick Noaker, *Constructive Acceleration*, *Contractor's Corner*, November 2013.

the owner's changes. Further, the owner must perform its what-if schedules with due diligence to ensure that the outcome can be achieved based on all known facts. Should the owner issue a change based on projections from its Ghost Schedule, then the owner must be prepared to accept the risk of resulting added costs should its assumptions prove wrong. For example, if the owner directs the contractor to accelerate its work to be ready for a proposed earlier delivery of OFCI equipment, the owner must accept the risk of its vendor's ability to deliver the equipment in a timely manner. If the delivery is later than the revised earlier date, the owner may also be responsible for the contractor's idle time and/or disruption or re-sequencing claim.

A risk of Ghost Schedules to all users is clear – open communication between the participants is likely to be stifled when one or both parties are using and relying upon Ghost Schedules than on a project where all parties work collaboratively for a mutually successful project. The authors do not mean to imply that a Ghost Schedule prevents mutual collaboration, but in our opinion communication typically suffers, at least somewhat, when either party employs a Ghost Schedule.

Recommendations

In project execution, all parties must understand and honor their contractual obligations. As with the use of the project schedule and other project management tools, the use of a Ghost Schedule must be done without violating the terms of the contract and good faith dealings with the other parties. Additionally, all parties must recognize and accept the risks associated with Ghost Schedules.

When Ghost Schedules are utilized, the following parameters should be considered to provide the best possible results.

Contractors

1. In order to best document its case for an early completion schedule, the contractor should maintain its working files used to prepare its early completion bid and schedule, similar to how a contractor should maintain its working files to prepare its baseline schedule ultimately submitted to the owner for approval.
2. Recommended documentation for the baseline early completion schedule is the following:
 - a. Assumptions and the basis used to develop the early completion schedule.
 - b. Production and productivity analyses to support durations in the early completion schedule.
 - c. Appropriate resource loading to support the planned productivity necessary to accomplish the early completion.
 - d. Bid estimate that comports with the early completion schedule.
 - e. Correspondence from subcontractors and suppliers indicating agreement with early completion.
 - f. An archived version of the electronic early completion schedule that defines its date of preparation at the time of bid or Notice to Proceed, whichever is the relevant date.
 - g. Explanation and documentation for why it deviated from the early completion schedule, either due to the owner or its own decisions.

3. Recommended documentation for updates of the early completion schedule is:
 - a. For activity start and complete dates, a set of its daily reports or the contractor's daily reports to support the dates.
 - b. Photographic evidence.
 - c. Daily webcam of the project.
 - d. Logs to define submittal histories, delivery dates, inspection dates, testing dates and other key dates.
4. Recommended documentation for when the contractor and owner disagree over what the monthly update should show:
 - a. Project records that demonstrate why the contractor's version of the update differed from what the owner required the contractor to report.
5. Recommended documentation for when the contractor pursues a claim against a subcontractor or supplier for not meeting its early completion commitments.
 - a. Written correspondence from subcontractors and suppliers of their original and revised commitments (bids, quotes, proposals and other correspondence).
 - b. Subcontracts, purchase orders and modifications.
 - c. Contemporaneous correspondence.
 - d. As-built construction dates, manpower log, progress reports, payment records.
 - e. Delivery dates, shop drawing logs.
 - f. Archived versions of the baseline and updates schedules to define dates prepared.

Subcontractors:

1. In order to prepare claims against the general contractor or, if necessary, defend against claims from the general contractor, the subcontractor should keep detailed, accurate records.
2. Recommended documentation should consist of:
 - a. For activity start and complete dates, a set of its daily reports or the contractor's daily reports to support the dates.
 - b. Photographic evidence.
 - c. Logs to define submittal histories, delivery dates, inspection dates, testing dates and other key dates.

Owners:

1. Since the owner's most likely use of a Ghost Schedule is to create an accurate record of the as-built schedule, the owner must also maintain a record of its sources of the actual start and completion dates by activity, plus any other relevant records regarding delay periods, weather days and actual logic restraints or constraints. Accurate documentation of the data in the as-built schedule can be used to address challenges from the contractor.
2. Such documentation should consist of:
 - a. For activity start and complete dates, a set of its daily reports or the contractor's daily reports to support the dates.
 - b. Photographic evidence.
 - c. Daily webcam of the project.
 - d. Logs to define submittal histories, delivery dates, inspection dates, testing dates and other key dates.

3. In the case of when the owner and the contractor disagree over an update, the owner should maintain contemporaneous documentation of its position to rebut the contractor's potential claim.
4. If the owner ultimately uses its Ghost Schedule to document justification for assessment of liquidated damages, the owner will need to prepare its claim similar to how a contractor would prepare its delay claim to the owner.
5. Vigilant review of the meeting minutes published by the contractor to correct inaccurate key issues or dates in the minutes. Typically, meeting minutes become an official part of the project record as written unless a participant raises a disparity and the minutes are revised.
6. Regular schedule related contemporaneous correspondence to the contractor where the owner notifies the contractor of errors in its schedule or its other concerns with schedule.
7. The owner must also realize that contractors are the experts in construction, means and methods and project execution. If the owner uses its Ghost Schedule with differing logic than the project schedule to make project decisions, the owner must accept the risk and the consequences of those decisions should such assumptions be proven false. Should a decision based on its Ghost Schedule causes changes or delays to the project, the owner must not try to recover its damages with actions against the contractor.

Conclusion

So, what does all this talk about Ghost Schedules mean? Are they here to stay? Will their use increase? Will new uses be found for them?

The answer lies with the industry and its practitioners. Ghost Schedules have already been utilized by contractors, subcontractors and owners for different reasons for many years. The most important recent development concerning Ghost Schedules is that the contractor's use of a Ghost Schedule to prove it always intended to complete the project early without notifying the owner is legal, as seen in the *Jackson* case. When used properly and for the right reasons, Ghost Schedules can serve a valuable purpose to the project's stakeholders and participants.

While Ghost Schedules can be a positive addition to projects under some circumstances, the most negative aspect of Ghost Schedules is that they may harm open communications between the key stakeholders, particularly on troubled projects. By their very nature, Ghost Schedules can be construed as secretive, disingenuous and contradictory to any partnering agreement.

Finally, Ghost Schedules, whether used by owners, contractors or subcontractors, must be used properly to protect their individual interests but *not* in an attempt to intentionally harm the other parties. While Ghost Schedules can be used behind the scenes for a number of reasons, all parties must be vigilant about the use and benefit of the project schedule and watchful of how the Ghost Schedule is used.

The concept of a common use second or side schedule is intriguing. The authors perceive some potential advantages arising from this concept but have not yet been able to flesh out the idea sufficiently. As a result, the authors are actively soliciting comments from project controls personnel and construction claims consultants about this common use of side schedules – both pro and con. If enough input is collected, a future paper exploring this new concept will be prepared.

It is the authors' hope that this paper will generate further discussion in the industry as to how Ghost Schedules can improve project delivery and partnering efforts.

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