This article presents a logical case for preparing contemporaneous claims analysis and entitlement determination as part of regular schedule updates.

Typical updates consist of information collection, data input, recalculation, and results comparison. If the recalculated completion date exceeds contract requirements, the contractor adjusts the schedule to regain the required date. This process is repeated until the required completion is achieved.

If, after the first accurate update, a previous period critical path review is made, and critical path delays are identified, it is possible to provide a reasonable, inexpensive, and timely assessment of the causes for delay. Then, the appropriate parties can be notified, and those parties can be stakeholders in mitigation of delays. Benefits of this procedure are that the contractor does not take on the costs of delay mitigation caused by others, the owner and subcontractors are put on notice for their delays and participate in mitigation decisions.

BACKGROUND—THE PLAYERS RESPONSIBLE FOR SCHEDULE UPDATES

In a typical construction project, it is likely that the general contractor (GC) handles scheduling and schedule updates in-house, usually with a project management person who has other responsibilities outside of schedule control. Even if there is a separate scheduling professional involved in the project, more than likely, that person is working under the direction of the project manager and dependent on the project manager’s cooperation in order to provide good scheduling services.

Those other project management responsibilities can encompass an entire range of tasks, often including budgeting, resource planning, materials take-offs, materials procurement, identification of subcontractor scopes, negotiation of subcontractor agreements, review and approval of subcontractor and supplier invoices, preparation and approval of contractor invoices to the owner, resolution of plans and specification discrepancies, progress of submittals from the subcontractors and suppliers, communications, information dissemination, scope of work conflicts, field office personnel management, chairing meetings, quality control, and reporting to senior management. Rarely do these responsibilities allow for a reasonable work week for the project management staff, with the project manager working nights and weekends just to stay abreast of the project.

This normally over-worked project manager, who is typically responsible for schedule maintenance, rarely has a background in formal CPM scheduling philosophy and analysis, dispute resolution, contract law, or claims preparation and defense. In fact, the project management mentality is often more oriented towards problem solving and proactive resolution of delay issues on a daily basis with minimal regard for the legalities of critical path delay. The old adage, “time is money” often is taken to mean that a quick resolution of issues is the best and most economic option to dealing with potential delays.

Most contractors rely on reputation and repeat business in order to maintain a profitable workload, and this need can provide other pressures on the project manager or scheduling professional. Fear of alienating the owner, a need to partner or team with the owner, or a need to please the owner or client, can all contribute to project management failures to present uncomfortable or controversial subjects, especially involving time and costs. Successful contractors are generally proud of their corporate culture which very often involves getting the job done on time at any price, a refusal to shuffle paper, aggressive management of the field personnel including the subcontractors, and a lack of understanding of scheduling legalities.

With the background and experience of project managers, and the corporate motivation and pressures on the project manager, it is no wonder that the schedule update is rarely used to provide routine and timely analytical time impact results.

RATIONALE AND MOTIVATION

Part of the intention of this article was to give project management personnel good subcontractor management tools, to allow them to deal with delay and disruption issues while still fresh in everyone’s mind, to minimize the costly claims disputes that arise at the end of the project, and to generally help those good contractors that sincerely want to get the job done on time, make the client happy, and maintain their reputation, all while remaining profitable enough to provide rewards for the very hard work of contractors in the construction industry.
The ideas described in this article bubbled up out of a cornucopia of over 30 years of experiences across the range of construction services, including:

- Work experience as a project manager with scheduling responsibilities;
- Creating senior management reports for projects, overseeing schedulers and project managers from the senior management perspective;
- Training schedulers and project managers, providing in-house and consultant time impact analysis and analytical scheduling;
- Providing claims analysis requiring identification of causal critical path activities and the drilling down to forensically detail the actual issues that drive those causal activities in the schedule; and
- Research of delays and disruptions along with attempts to assess entitlement costs.

In addition, the use of claims methodology, where the logic changes are identified and separated out from the actual progress when performing a schedule analysis, helped to reinforce the awareness of the numerous claims avoidance mistakes that many contractors make in attempting to get a job done on time.

**THE TYPICAL TECHNICAL SCHEDULE MAINTENANCE ROUTINE**

**Data Collection and Schedule Statusing**

To highlight some of the weaknesses in schedule management that happen on many projects, here is a description of how that process often and typically works. If you, as the reader, work for a contractor in a scheduling role, and are honest with yourself, you should find this to be very familiar.

Assuming that there is a periodic update requirement for providing a progressed schedule to the owner or owner’s representative, the contractor starts the update process by printing the most recent schedule and sending or taking it to the field personnel for input. This input is accumulated as follows:

- Collect progress data about the field work from the field project management.
- Gather submittal and approval status from the project records, usually submittal logs.
- Gather status of administrative tasks, such as progress of paperwork for utility connections, from the field management personnel.
- Gather status of owner-controlled activities, such as owner applications for utilities, from the owner or owner’s representative.
- Collect current status of procurement operations for any materials purchase orders or subcontracts that are not released.
- Collect current status of in-house ordered materials, or lead times for the fabrication and delivery of materials, from project management personnel.

- Collect current status of subcontractor-ordered materials, or lead times for the fabrication and delivery of subcontractor materials, directly from subcontractors.
- Verify availability of scheduled resources.

After the fairly onerous task of collecting this update information, the actual and predicted start and finish dates are input into a copy of the most recent schedule. Once data is input, the schedule is calculated and reviewed for reasonableness.

**Analysis and Schedule Updating**

With the schedule calculated, in the event of a constrained completion date, the Total Float values are examined for negative float values. If there is no negative float, then the current schedule shows the project forecasting on-time completion, the schedule is submitted, and there is no need for this paper. If there is no constrained finish date, then the new predicted finish date is compared to the contractual completion date, and, again, if the project is showing on-time completion, the schedule is acceptable and submitted to the owner. These periods of simple on-time completion generally do not contribute to claims issues at a later date in any case, and everyone is content.

If there is negative float in the case of a constrained finish date, or the project shows the new completion to be later than the contract required completion, then the project is currently showing late completion. The anticipation is that if the schedule shows that the project is finishing late, then it is the contractor’s responsibility to determine how the project can finish on time.

Ignoring, for now, the possibility of a clear directive, problem, or request for a proposal that would create an obvious critical path delay by the owner, all the scheduler sees is that the project is behind, and the project manager or senior management have expectations that the project will finish on or ahead of time. The discussion that a late completion will force upon the project manager, as soon as the schedule is presented in this condition, is not a discussion that the project manager is happy to endure, both inside the company with senior management, and outside the company with the owner or owner’s representative. Again, the pressure is on the project manager or scheduler to show on-time completion, especially if the schedule is showing late by just a few days, and no blatantly obvious owner-caused delays have occurred. A secondary, lower pressure is the need to provide the field with an updated schedule for use as a project management tool.

The typical next steps in this process, although not clearly defined, and certainly not formally acknowledged, are as follows:

- The scheduler and/or project manager review the immediate next week or so of scheduled activities and verify that they appear to match the field expectations and commitments.
- Next, the critical path, usually total float values less than or equal to the variation in completion dates, is reviewed, and critical activities are identified.
- Any critical activities that are not actual work items are examined carefully, with an eye to shortening those activity durations, such as lead or fabrication times, based on the gut-feel-
The changes are made, and the schedule is re-calculated. The results are again compared to the contract requirements, and if the schedule shows on-time completion, it is submitted to the owner or owner's representative.

If the schedule still shows late completion, then the logic driving the schedule is examined. The scheduler first looks at soft logic, logic without physical constraints, and makes a determination if any of those logic ties can be broken, especially in those activities which have as their successors finish-to-start relationships with different trade work. This would allow for out-of-sequence work to be performed by different trades, with minimal negative feedback from the subcontractor's workers, who often do not understand what is happening. Breaking of the logic ties will be done either by changing the relationship type to finish-finish, or start-start, or choosing another predecessor for the subsequent work activity so as to allow it to operate concurrently instead of sequentially.

Sometimes, instead of resorting to concurrent work, the scheduler, in an attempt to simplify the update process, will change calendars or shorten durations of various activities. This decision is normally based on the depth of experience of the scheduler; the less experienced, the more likely he or she is to resort to calendar or duration changes.

This routine of changing sequential work to concurrent work, or whatever methodology is used to recover the schedule, would be continued until the schedule shows on-time completion, and the schedule is submitted. When the schedule is cost-loaded and used for invoices, this routine is expedited in order to quickly get the invoice turned in for approval.

The scheduler or project manager, working under the pressures identified above, will rarely recognize this schedule adjustment as a genuine recovery effort schedule.

At this point, the scheduler submits the updated schedule, showing on-time completion, and again, everyone is content; no additional paperwork, no confrontation, no analysis, no documentation. The completion-driven contractor has just made it through another month and met all expectations, without thought for the legal ramifications or the future. A representative flow chart for this process is shown in figure 1.

Dealing with Obvious Owner Delays or Changed Conditions

In the event of a serious owner delay, or a clear directive from the owner for additional work that will cause a delay, the contractor performs an analysis of the delay. In this case, a number of weaknesses generally occur in the contractor's process, as noted here:

- The analysis is focused on the owner generated delay.
Recovery turns potential delay claims into disruption claims
This eliminates delay claim potential, especially by failure to
By recovering the schedule, GC takes on the subcontractor
ous other costly results such as:

- The contractor often misses owner caused delays, causing numer-
- Subcontractor-caused concurrent delays are rarely examined.
- Subcontractor-caused concurrent delays are rarely identified.
- No identification of possible recovery efforts by the contrac-
tor are made, even efforts of minimal or no cost, due to focus
on owner-caused delays.
- The time impact analysis is generally secondary to the change
order preparation and much more time is spent on the costs
of the change.
- The time impact analysis is rarely a carefully thought out,
well documented, and technical analysis that will cover all
the legal bases.

These problems with typical contemporaneous analyses
reduce the effectiveness and accuracy of those analyses, and
the proposals are only occasionally agreed upon, but normally negoti-
ated down by the owner or representative, and sometimes just
ignored until the contractor forces the resolution by the contrac-
tual legal means.

Increased Risks Associated With The Typical Update Process
Some of the less obvious problems with this traditional rou-
tine of updating schedules are as follows:

- Once the contractor submits a schedule showing on-time
completion, all delays prior to that schedule are effectively
mitigated, eliminating any potential time extensions.
- Generally the decisions made in the rush to submit an
invoice schedule are not the correct decisions for the health
of the schedule or the project.

The act of making minor adjustments can cause numerous other
problems such as:

- Removal of contingency float that may very well be need-ed
later;
- Making decisions about subcontractor recovery efforts
without subcontractor collaboration or buy-in;
- Not identifying the subcontractors responsible for delays, so
the superintendent is often in the position of having to ask for
favors to receive help in reducing time from the very subcon-
tractors that caused the delays;
- Accepting blame for the delays so the GC pays for resolution;
- Ignoring GC resource availability; and
- Ignoring subcontractor resource availability.

The contractor often misses owner caused delays, causing numer-
ous other costly results such as:

- By recovering the schedule, GC takes on the subcontractor
claims and removes the owner from liability.
- This eliminates delay claim potential, especially by failure to
provide notification.
- Recovery turns potential delay claims into disruption claims
which are much more difficult to quantify, determine entitle-
ment, price and settle.
- Subcontractor delays are often missed, so subcontractor is not
obligated or notified to assist in recovery efforts and costs.
- Claims documentation is not maintained, so in the event of
a later claims, the costs to research and document are easily
ten times the costs of maintaining the schedule and clearing
up claims as the project progresses.

The reasons why contractors fall into the trap of updating in
this manner are easy to recognize. Analytical scheduling appears
to take additional time and effort, without recognition that one
disputed delay claim will far outweigh the daily maintenance
required to update analytically. In addition, a quick and easy
schedule update doesn’t require the analytical skills on the part of
the scheduler. No feedback is required from subcontractors, no
paperwork for notification, documentation, and reports is
required, and there is no need for any potential confrontational
discussions with the owner.

**THE PROPOSED TECHNICAL SCHEDULE MAINTENANCE ROUTINE**

If one looks at the health of the project and compares it to
health of a vehicle, the comparisons are striking. People who
ignore routine maintenance of a vehicle typically experience pre-
mature breakdowns and exorbitant repair costs that could be
traced directly back to the lack of maintenance. If a contractor
ignores routine maintenance of a project by taking the easy
approach of updating schedules, the outcome is very likely to be
an expensive repair in the form of a claims battle and often a
claims loss, or even missed opportunities. The analogous condi-
tion in a construction project to a routine vehicle maintenance
program is a good technical schedule maintenance program. The
author of this article believes that the substance of a good sched-
ule maintenance program, in addition to the steps that most good
schedulers recognize and perform, is to include a contemporane-
ous claims analysis in each schedule update.

**Data Collection and Schedule Statusing under the Proposed Process**
The data collection and statusing of the schedule remains
unchanged; that is, a good, detailed, and accurate capture of the
current progress has to be made. The attitude when the data is
used to prepare an analytical review of the project will tend to be
more inclined to promote accuracy and timeliness in the produc-
tion of status data.

**Analysis and Schedule Updating Under the Proposed Process**
After the data collection is complete and the schedule is sta-
tused, however, the sequence of tasks should follow this entirely
different flow:

- Identify previous period, beginning of this update period, crit-
cical path, based on the longest path and verifying the accuracy
of this path.
- Identify current critical path after the update is complete.
Compare the completion date with the contract baseline date.

If the project is on time, record the critical path for historical benefit, and for use in the subsequent period analysis.

If the project critical path has slipped, identify any changes to the critical path.

Review the critical path, and identify the causal activities that are driving the changes to the critical path, by comparison with previous update.

For these causal activities, identify and calculate four potential changes in the causal activities; start gains, start delays, production gains, and production losses.

Quantify the delays by working through the project from the beginning of the first causal activity change. At this point, the activities which have driven the schedule to a critical path delay are identified, and the extent of the critical path delay is established.

Research the issues behind the causal activities. This is done by interviewing the project management personnel, reviewing issue files, minutes from GC and owner meetings, RFI logs, submittal logs, daily field reports, photographs, and any other detailed project information. This is normally quickly done because the problems are normally in the forefront of everyone's mind, so the project management staff, including subcontractor management, can usually direct the researcher to the appropriate files and information.

Identify driving issues behind the delays to the causal activities.

Assess responsibility for the driving issues. This includes responsibility for any schedule acceleration or recovery that is made during the period. Often, there is a hodge-podge of delays and recoveries, with multiple entities involved.

Review the concurrency for multiple delays, or for multiple issues that drive multiple or single delays.

Work through the concurrent delays from the beginning of the first delay, identifying the first, driving delay, up until the first date for the next, concurrent delay.

Do a formal, detailed concurrent delay analysis, recording the concurrent delays in a clear, graphical format.

Assign the responsibilities for all portions of the concurrent delays. If there are no concurrent delays, assign responsibilities for all delays.

If subcontractors are assigned responsibility for any delays, at a face-to-face meeting, provide the details showing their responsibility for the delays. Be prepared in this meeting with rough costs attributable to the delays caused by the subcontractor(s), and discuss the ramifications with the subcontractor(s). Collaborate with the subcontractor(s) to mitigate their delays, and get a commitment from the subcontractor management as to their contribution, and prepare a recovery plan to resolve the delays.

If the owner is responsible for any delays, just as with subcontractors, at a face-to-face meeting, provide the details and discuss the ramifications with the owner for the delays. In a collaborative effort with the owner, determine the best way to mitigate the delays or modify the contract to accommodate the owner-caused delays.

Figure 2—Typical Contractor Schedule Update

Assess responsibility for the driving issues. This includes responsibility for any schedule acceleration or recovery that is made during the period. Often, there is a hodge-podge of delays and recoveries, with multiple entities involved.

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If the owner is responsible for any delays, just as with subcontractors, at a face-to-face meeting, provide the details and discuss the ramifications with the owner for the delays. In a collaborative effort with the owner, determine the best way to mitigate the delays or modify the contract to accommodate the owner-caused delays.
• Of course, if the GC is the one responsible for all delay, then a formal recovery schedule meeting should be held with project management staff, and a recovery plan needs to be made. At that time, the schedule can be recovered.
• Revise the schedule to reflect mitigation, acceleration, delays, or change order time extensions, and publish the updated schedule.

This process is graphically demonstrated in the flow chart in figure 2. Of course, in the event of a specific owner requested or caused delay, or changed conditions, a time impact analysis would still be performed mid-period, if it occurred and was recognized between updates. That time impact analysis would still have to take into account the previous period analysis, which would make for a stronger and more accurate analysis of the delay.

Benefits Derived from the Proposed Process

Clearly, this process will take more time and effort than simply resolving and hiding the problems in the typical contractor update scenario as identified in the first section. This proposed process will rapidly turn into a regular routine, if followed carefully, the management time impact is not as severe as it would appear.

There are significant benefits from the use of this process. Issues are dealt with immediately and during the time period when they occur. Timely discovery allows minimization of costs to resolve. All parties understand the issues. There is minimal confusion due to memory issues. There is minimal confusion due to poor or incomplete records. This process keeps the schedule current, accurate, and a good source of documentation. Research, if needed at all, is done contemporaneously so it is quicker, costs less, and is more readily understood. Often, the research includes walking out onto the jobsite and looking at the problem. Documentation is done as part of the investigation, so it is more thorough, with good historical documenting done. Better single-issue photography is normally developed, so the problem is captured more extensively.

The appropriate subcontractors are involved, which bestows benefits on the subcontractors as follows:

• Subcontractors participate in identification of problems.
• Mitigation of delay is timely and therefore not excessive.
• No surprise backcharges are sent to the subcontractor.
• The process promotes a team approach to problem resolution.
• Subcontractors contribute to resolution only when due to their responsibility for delay.
• Subcontractors gain timely time extensions when warranted.
• Elimination of formal dispute resolution costs for defense.
• Subcontractors are given immediate notice to improve performance when lagging, so the problem does not become a multi-period delay claim.

The owner is involved immediately upon recognition of an owner-caused delay, which benefits the owner as follows:

• The owner is involved in the identification of problem.
• The owner has input into mitigation efforts and can make decisions based on owner needs and abilities.
• The owner can determine the importance of issues that cause delays, and could minimize delays while still on-going.
• Future decisions can be made based on current knowledge of budget and time expenditures.
• Delay issues are easier for the owner to understand and recognize the ramifications of those delays, and it is less likely that a bogus or inaccurate subcontractor delay claim will be passed along to the owner.
• Solving delay issues at each schedule update will eliminate the bulk of formal dispute resolution costs.
• Time extensions are applied contemporaneously, and used to revise the official schedule.

This process results in minimal money spent prior to the resolution efforts; so

• The solution is achieved as part of the team project management and no attorney costs.
• Schedule analysis costs are part of any change orders issued.
• The discussion and resolution allows for pacing other work based on time extensions, without pacing delay issues to confront.

The owner winds up being happier with the process and the final results at the end of the project, due to involvement in delay resolution, so that owners can budget effectively for construction costs, and owners can track real completion dates. So, owner planning is better for:

• Grand openings,
• Advertising plans,
• Fixture and furnishings delivery,
• Utilities connections, shut-downs, and disconnections,
• Hiring employees and move-in coordination if the owner is the end user,
• Better forecasting for the end user if not the owner, and
• Budgeting of owner’s general conditions costs is better.

In the case of uncooperative owners and construction managers, there are also benefits to the GC and subcontractors, such as:

• Lower costs to resolve delays caused by the owner.
• Small time extensions are more easily negotiated with the owner.
• Smaller change order pricing is easier to accommodate in the owner’s budget
• Elimination of learning curve costs for attorneys getting up to speed on a project.
• The process automatically puts the owner on notice, so the contractor’s rights are maintained.

The process provides options, other than litigation, for contractors, such as:
• Stopping of work prior to vast expenditure of money and resources;
• Good documentation of formal notification;
• Charges for interest on change orders not approved are easier to negotiate; and
• Issues are easier to understand when everyone is not confused by a claims-oriented backwards look from the end of the project.

The process provides for a fair assessment of delays through:

• Partnering opportunity for resolution of issues;
• Minimal confrontational discussions between GC and Owner, and GC and subcontractor;
• Current documents are used, no need to do extensive research into months old documentation;
• Reduction of memory losses since the problems are recent;
• Reasonably exact time-delay losses can be assessed, and agreed upon in a timely manner; and
• Teamwork, since each party is part of the solution, not just part of the dispute resolution legal team.

Identification of concurrent delays are rendered much simpler to identify and quantify since they are traditionally very hard to resolve from the end of the project, looking backward, and contributing factors are very easy to miss when researching problems. The missing bearing plates immediately come to mind when discussing reasons why the steel joists are not being set and responsibility is easier to identify. In project management meetings, the missing bar joists delivery date is known and anticipated, so the driving issues for any critical delays are quickly identified.

Risks Associated With the Proposed Process

Of course, as in any process, there are some risks and disadvantages to the use of this proposed process. As occasionally heard from scheduling and claims consultants, “Pay me now, or pay me later.” with the later pay being much greater, not even counting the additional costs of attorneys. Claims avoidance is considerably less profitable than claims preparation and defense for an entity that also does claims work, since billing rates tend to be much higher for analysis.

The analytical work associated with this proposed process does require a more highly trained and experienced analytical scheduler for it to work effectively. More time and consequently more money is required to maintain the schedule in this manner.

In addition, an uncooperative owner or owner’s representative will often impede the timely and contemporaneous resolution of problems by refusing to respond to this approach, refusing to partner in the identification of delay responsibility, and pushing the resolution into the legal system. A case can be made, however, that this type of owner would always force resolution of issues into the expensive legal arena, so with or without this process, this risk is alive. Of course, a well done claims analysis performed during each routine schedule analysis will certainly put the contractors in a much stronger position for the fight that will be required to gain fair treatment from an owner or owner’s representative when they are uncooperative.

C hanging the contractor mindset, from just getting the schedule update off the project manager’s desk and submitted into an analytical tool for monitoring the progress of the project, testing the health of the project, and resolving problems that always occur during construction, will allow the CPM schedule to perform a valuable function. This function has been visualized by good schedulers all over the world who recognize that a well maintained schedule can provide claims avoidance as well as documentation and forecasting services.

If a claims analysis is prepared in conjunction with each schedule progress update, there are major benefits for the owner, the GC, the subcontractors, and all consultants. These benefits of simplified and vastly decreased cost resolutions, coupled with the accuracy of the analyses when done contemporaneously, and the strength of contemporaneous time impact analyses in litigation, all speak to the need to try this approach.

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