

The Case for Construction Schedule Validations and Periodic Audits

By Earl Glenwright, PE, MBA, PSP

Construction projects represent substantial investments at risk both for owners and contractors. Owners invest massive amounts of money to get a final product of acceptable quality, whereas contractors invest hugely to deliver a profitable product.

Today's construction operations rely on each contributor performing to the agreed upon work plan and schedule. And that work plan and schedule must be valid, reasonable, rational and achievable if the project is to be successfully and profitably completed.

Today more capable scheduling hardware and software have made construction scheduling a highly sophisticated engineering specialty. Old practices have been replaced by complex practices, processes, and techniques.

These factors contribute to create today's situation in which construction schedule practices contain many misuses or omissions. For instance:

- Illogical activity logic and relationships are common.
- Resources [the basis of all schedules] are either not considered or, if they are, then they are either not scheduled 'forward' to reduce usage peaks and valleys, or 'backwards' to prevent end-of-project buildups. (Only one in eight contractors even consider resources to develop their schedules.)
- Earned Value and Earned Schedule concepts are infrequently used to monitor performance and progress.
- Date constraints are overused, effectively forcing a workplan into a preconceived schedule.

- Work calendars are used inappropriately.
- Line-of-balance scheduling for specific trades is not considered; and
- Outright abuses set the stage for future claims.

Construction planning and scheduling practices have become more complex as they have matured and can produce a greater degree of management and control, but they also are vulnerable to incorrect procedures, illogical sequencing, misuse, and outright abuse.

Even if supporting explanations and data are provided there can still be many hidden tricks and techniques that were used to develop the schedule.

This means all of the underlying aspects of the construction schedule need to be checked and validated for the sake of transparency and contractual balance between the parties involved.

In a world of increasingly complex projects, progressively tighter deadlines and shortage of available resources, validation and auditing are important tools to ensure the proper management of the schedule, and in increasing its transparency.

If today's construction schedules are properly prepared, Construction Managers, owners, suppliers, and subcontractors have an efficient and effective management tool to control complex construction projects accomplished by a diverse array of suppliers, and specialty subcontractors.

However, the *if* needs to become *when*. And this means all of the underlying aspects need to be checked by an independent, qualified and experienced master construction scheduler's validation-auditing team.

Before you begin on your construction journey, it is better to know where you are really going, rather than later learning where you were (*and wish you weren't*).

It is routine to find investors resorting to second and third evaluations, e.g. due-diligence appraisals by mortgage investors, to gain a level of confidence in the outcome and the return on their investment. This typical process is not a common practice in construction, but owners and contractors can have solid benefits by adopting scheduling validation procedures and periodic progress audits.

What is schedule validation?

Schedule validation is a process by means of which owner and contractor resort to the expertise of a third party to validate the project schedule in all its features and components.

Validation is thus an external analysis to ensure that a foremost contract instrument, the schedule, is correct in scope and assumptions, as well as free from all sorts of *pitfalls* and *booby traps*. The validated schedule should represent the model of how the contractor intends to carry out the work plan's activities, and how the owner is supposed to get the project delivered.

Once the baseline schedule developed by the contractor is submitted to its client, the "validators" run a general sanity check, assessing the reasonableness of the schedule in terms of observance of the milestones and completion date[s], productivity rates and resource allocations, and the contract's logical work sequence. The validating team then checks if the entire scope of work is contemplated in the schedule, the means and methods proposed, requests adjustment of some assumptions, raises questions to the contractor and points out problems regarding the form and/or the content of the schedule to both the contractor and owner.

In the validation process the electronic database used to prepare the proposed schedule is broken down to reveal all of the date constraints, resource restraints, tools, processes, and techniques applied to the work organization, and schedule activities. All of this information is analyzed given the contractor's means and methods.

Standard practices and experienced judgment are then used to validate the correct application of schedule preparation and development principles and then determine the reasonableness, realism, and risk of the proposed work plan and schedules.

The final product, or deliverable, of the validation process is the *validated baseline*, a schedule that can efficiently serve as a reference for monitoring and controlling the progress of the project. The contract management issues such as delays and claims resolution can then be carried out based on the validated baseline schedule.

What is schedule auditing?

As progress proceeds, auditing of performance in relation to the planned schedule baseline must be done. Typically a construction schedule is statused at least monthly. It is the contractor's responsibility to assess the status of progress, enter that status into the current schedule database and analyze its outcome. In each one of these reviews deviations from the original plan invariably occur, due to fluctuations of labor and/or equipment productivity, unforeseen and differing site conditions, labor shortages, external interferences, design defects, change orders, owner-directed or contractor-initiated accelerations, and *force majeure*.

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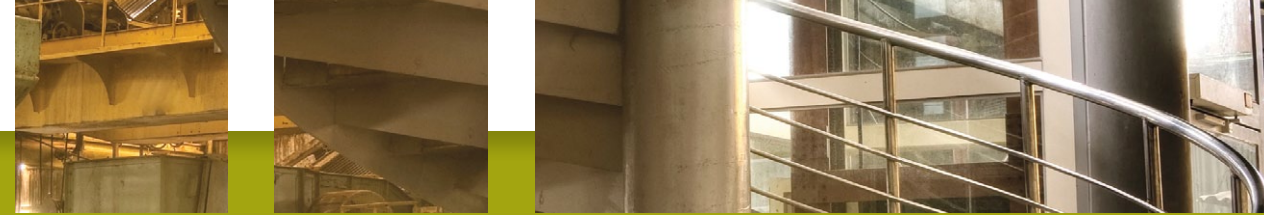
The current schedule database is audited for the correct entry of actual dates, resource utilization, and performance as to both productivity and in relation to the planned schedule.

A comparison of actual start and finish dates to the planned dates is made and actual versus planned resource histograms are charted.

In addition, the earned value charts for all significant resources (earnings, man-days, pacing resources, and/or material placement) are statused with the progress and performance as of the audit date, and a current earned schedule analysis is prepared.

This is why the initial validation alone is not enough. The validation process also calls for a schedule auditing procedure that complements it and keeps transparency in the schedule.

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Whereas the focus of the initial schedule validation was on *quality*, completeness and adequacy of form, in auditing the focus shifts to performance. Stating a schedule is all about monitoring how much modification it has undergone since the previous review. The modifications can be in scope, logic, durations and project completion date.

The main questions to be made by the schedule auditors are:

- Has the project reasonably proceeded according to plan?
- Have the change orders approved by the owner been incorporated into the work plan and schedule?

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- Is their scope of work reasonably described in terms of new activities (or adjustment to planned activities)?
- Has the progress in the current period impacted the project completion date?
- Have all changes and impacts been documented and addressed to the owner?

Who can benefit from schedule validation and audits?

Owners and contractors will both benefit from schedule validations and audits.

From the owner’s point of view, it is necessary to know that the contractor’s plan and schedules are realistic and achievable as these documents also indicate what actions the owner must accomplish

in order not to delay the contractor’s progress while avoiding submittal review and approval overload.

A valid, reasonable, and rational work plan and schedule minimize the inherent risks of budget overruns and late delivery of the project’s product.

For owners, some of the benefits are:

- Schedule validation and auditing can be used to minimize the impact of construction conflicts because it can detect the issues at the beginning or in due time to allow corrections and negotiations.
- Assurance of a valid, reasonable, rational and feasible schedule;
- Assurance of adequate timing and phasing of the contract scope of work;
- Minimization of schedule manipulation by claim-oriented contractors;
- Assurance of proper project progress status;
- Assurance of proper documentation and traceability;
- Better information for contemporaneous project analysis;
- Immediate detection of delays, deviations, and trends;
- Issues are raised in time to allow for corrective and preventive measures, analysis of alternatives, scope adjustments, etc;
- Less susceptibility to late claims by contractors;
- Less need of arbitration as a last resource to solve disputes.

Contractors also need to know that their subcontractors and suppliers can perform as needed and promised, and also that the contractor’s own forces can function effectively and efficiently.

For contractors, subcontractors and suppliers, some of the major benefits are:

- Detection of errors in scope definition, relationships between activities, milestones, resource allocations, etc;

- Upon being validated and audited, the schedule becomes more reliable and technically stronger to preserve the contractor’s and owners rights when preparing claims and requesting compensation;
- The presence of validators/auditors induces the contractors to better plan and control the job.

When should validation and audits be done?

Validation occurs when the original work plan and the project schedule developed by the contractor, sub-contractors and suppliers is submitted to the owner prior to the start of any construction field-site work, with the possible exception of mobilization, site preparation, ordering of long-lead time equipment or materials, permits, excavation, and installation of in-ground site utilities. It is then evaluated by and approved as valid, reasonable, rational, and achievable:

- **Valid**, to be accepted and recognized as an official instrument of communication and commitment;
- **Reasonable**, because based on assumptions that do not go beyond the limits of common sense;
- **Rational**, because it incorporates proper construction methods, production rates, calendars and resource availability compatible with the environment and location of the project; and
- **Achievable**, because its goal is meeting the construction of the project’s requirements in terms of scope, time and resources.

Validation is an extensive process and can be time consuming both initially and after each re-submittal of the proposed baseline ‘planned’ construction schedule until a valid baseline schedule is accepted by all significant stakeholders: owner, contractor, subcontractors, suppliers, financing entities, and permitting agencies.

Auditing must occur several times during the execution phase of the contract. The first such audit should be done at about 20 percent completion to recheck the initial durations, resources, and productivity estimates. This audit may coincide with the completion or near completion of the excavation and installation of the in-ground utilities. At that point the major ‘unknown unknowns’ and risks are resolved. In consideration of the actual results, a revised work plan and development of a new baseline schedule in accordance with the known conditions and better estimates can be made.

A second time for auditing and reappraisal is when the erection of structures are “complete” and the finishing work done by multiple specialty trades can begin. At this point a new “estimate to complete” and “estimate at completion” can be made.

The final time when an audit is desirable and/or required is at the completion of the project to document the as-built schedule. When validation and auditing are performed, analysis of schedule related claims and their resolution becomes a quick process.

Conclusion

Construction work scheduling has become a complex process as it attempts to model the real world of building a project. Consequently a schedule becomes vulnerable to inappropriate practices, misuse, abuse, and gamesmanship.

Contractors and owners have too much invested to ignore the benefits of an independent baseline validation and periodic audits. The validation expense is nominal: the return on investment is large. **CM**

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