

119 Schedule Update Checks is a Complete Review

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[Editor's note: This paper was written referring to specific Primavera P3 settings but can be used to guide reviews for other, more current CPM software solutions.]

OVERVIEW OF A SCHEDULE UPDATE REVIEW

I have been a Construction Scheduler since 1974. I have participated on over 30 scheduling project and performed more than 20 delay analyses. From the start, I have been looking for generalized techniques for reviewing schedule updates. When that list became longer than I could or would do manually, I began to automate the process. The software package Update Checker in the Schedule Analyzer suite of programs is the culmination of this effort. This paper will tell the secrets of the design and algorithms behind this software in hopes that you can take some or all of the ideas back to use in your work.

To start at the beginning, a good schedule update submittal should contain a Narrative and the schedule files. The only paper you need is the submittal cover letter and the narrative. Don't get sloppy and forget the submittal letter. You can't complain later about a delay in reviewing the schedule if you never submitted it in the first place.

A Narrative is as important as the schedule itself, especially to the Contractor. It is the place where you state what you were trying to do with the schedule. In case you performed a poor schedule update and hurt your chances for documenting your delay claims later, a good narrative that says what you were trying to show may save your professional life. In addition, if you state the changes you made to the schedule in your narrative, the Owner can hardly claim that you were trying to 'sneak the changes by' him or her. The schedule update narrative gives the Contractor the chance to state what happened on the project in his or her own words first, before the Owner gets their say. This fact alone makes a schedule update narrative imperative for the Contractor.

Narratives are important to the owner as well. They warn the reviewer of missing data, upcoming changes, documented delays, and other facts that may be hidden in the schedule. They help with the new nomenclature that the Contractor may be using that would otherwise baffle the reviewer. In some cases, the narrative is the first warning (and notification) that the Owner will get of potential delays to the project. Always read the narrative carefully before beginning the other parts of your review. It is an important part of the submittal.

Next, save a tree and dispense with the requirement for paper. Paper reports done in several different sort and groupings. Paper barcharts. Paper network plots. Paper lies.

How do you know that the Contractor hasn't made a 'mistake' and accidentally forgot to include some of the critical or embarrassing activities? For that matter, it is a simple process to display the report on the screen, change anything desired, and then print the report. Are you really going to spot a change in the lag of a relationship from a paper report? If you were an auditor, would you accept hand-written summaries of the month's transactions or would you want to see the real books?

Take a copy of the schedule files on disk and create your own reports and graphics. It is the only way you are ever going to be sure that you have the correct information. Don't forget; the schedule is the files, not the paper reports.

A word about files is in order here. As soon as you get your schedule files, load them and make sure that they are complete. Don't do like I did and forget to do this until a week later just to discover that the files were bad. It is downright embarrassing to have to ask for new files a week after you received them.

If you are running P3, before you review the schedule, be sure to run the Primavera utility PFXW on your schedule. This utility is included with P3. It checks and corrects for corrupted and damaged relational files that comprise your schedule. If you forget to do this and later discover that the files are damaged, you will have to start your review all over again. P3 file corruption occurs a lot more often than most people know.

Now you throw your 119 schedule update checks against the schedule update. This will be the topic of the remaining portion of this paper. When reviewing the schedule, assume then the previous schedule update was approved. You are only interested in the changes to that last schedule.

Schedules are large and many things occur. It is not to your advantage to try to understand and memorize every change. Instead, you should focus on the important changes. The way you do this is by organizing the changes into narrowly-focused topics. Prioritize the items in each topic and research further the critical or suspicious items. Next, note what did not change that could or should have. Finally, summarize the important issues.

Now that you have a good understanding of the changes and their importance, you must write your own review of the schedule update. The review should be weighted heavily toward the risk factors and make it clear what your intent is. This review must be then returned to the Contractor. This is what we in the trade call, "communicating." First the Contractor communicates to you and then you reciprocate.

Don't think that you are fooling anyone by saying that you are protecting your interests by not responding. Let's face it; writing a good schedule review requires skill and hard work. Those are the real issues that people are ducking.

Besides, the courts have stated that Owners have an 'implied consent' with regard to silence about a schedule submittal. Just as the Narrative is the Contractor's chance to define the schedule issues. The Review is the Owner's chance to go on record as opposing or questioning changes and additions. If the Owner lets his or her Scheduler get away without producing a well thought out review, then the Owner deserves what they are about to get. Let's look at the specifics of a good schedule review.

119 SCHEDULE UPDATE CHECKS

Schedule reviewers without a plan just 'look at everything' and try to note the interesting things. Reviewers with a plan (we call them "Professionals") organize their searches and systematically cover every know issue. The outline of my plan is as follows,

- System Checks
- Activity Checks
- Relationship Checks
- Constraint Checks
- Cost Checks
- Resource Checks
- Log Checks
- Overall Review

In the following discussion, I will address specific issues and scheduling features. For clarity, I will limit myself to the features that are found in Primavera Project Planner (P3) software.

System Checks

I am amazed at how many people review a schedule and forget to check the system settings. It doesn't do any good to make a review until you first determine if any of the scheduling rules have been changed.

There is a total of 23 different settings that should be checked, five of them having to do with project dates. You should check to see that the Project Start date, Calendar Start dates have not changed; this will modify the work day numbers. This also interferes with automated schedule checking software. Changing Required Completion date will change the project float. Changing a schedule from days to hours also confuses automated schedule checking software and might be an attempt to position themselves for a loss of productivity claim.

Every CPM calculation is translated into dates using the Workday and Holiday Calendars. Change a calendar setting and you can contract or extend the project. Every calendar change should be closely monitored or you will lose control of your project over time.

P3 has a number of rules for defining how costs are computed. These are called the Autocost Rules. Changes to the Autocost rule settings will change your project costs.

Finally, and most importantly, there are settings that tell P3 how to handle computing the CPM in certain conditions. Out of sequence progress can be made to automatically delete relationships. Mismatched dual predecessors can automatically stretch-out activity durations. Open strings of activities can automatically be made critical or not. Total Float can be computed using one of three different formulas.

An interesting point to be made here is that a change in any of these above rules might not even be noticeable on the update that the change was made. The effects of a change might only be noticeable months after the change, when it is now too late to object to it.

Activity Checks

Now that the changes to the system settings have been analyzed, it is time to look at the activity specifics. A CPM schedule is mainly dependent upon three basic parts; activities, relationships, and constraints. We are now going to look at 41 different activity checks.

Before proceeding, check for missing status. Unfortunately, P3 allows you to status an activity without also supplying actual start and actual finish days. The Contractor has a responsibility to supply the start and finish dates for every activity. It is the Owner's responsibility to demand any dates that are missing.

Determine the Project Critical Float. There may not be any activities with zero float, there may even be negative float. Look for the lowest float value so you will know it when you see it in later reports. Compare this figure with the float or floats on the Longest Path to see if your list of critical float values is complete.

Deleted Activities

Now let's look at the deleted activities. To better understand the significance of each occurrence, it is best to break them down into three categories; Deleted As-Built Activities, Deleted On-going Activities, and Deleted Planned Activities.

As-built Activities are those activities that have already finished as of the last update. You should not be deleting such activities in later updates; they form a record of past submitted events. The

work has already been accomplished, certified, and reviewed. I cannot imagine a good reason for deleting these.

On-going Activities had an Actual start and presumably some reported progress in the last update. This start and reported progress must be accounted for in some other activity elsewhere in your schedule. If not, then just as with deleted As-Built Activities you have removed reported progress for the schedule.

Deleting As-Planned Activities indicates that either the Owner has eliminated some contract work or that the Contractor has modified the work plan. If the plan has been modified, then the original work must be identified in some other (perhaps added) activity.

One last word on deleted activities. You should never re-use the Activity ID from the deleted activity as an Activity ID for a new, added activity. This not only confuses the 'checker' programs, it makes statistic-keeping and post-mortems of your project very difficult. When you deleted activities, also retire the Activity ID.

Added Activities

Adding and deleting activities should be encouraged if they are done in a way to communicate the change in the work plan. It does no good for the Owner or the Contractor to insist on 'sticking to the baseline Schedule,' staking the activities as they are completed even though the work is no longer being packaged in the manner that was originally planned.

Very little useful information can be obtained from an Actual Start and Finish dates if the activity did not describe the way the work was accomplished. Activities by their nature imply that work was being prosecuted continuously. If the work no longer proceeds in the manner envisioned, the starts and stops of work within an ill-defined work activity will make that activity no more informative than a hammock activity.

To better understand the significance of each added activity, it is also best to break them down into three categories; Added As-Built Activities, Added On-going Activities, and Added Planned Activities.

If an event was not envisioned at the time of the last update but occurred and completed in this update period, I would call this an Added As-Built Activity. It is far better to note its occurrence than to ignore it (it won't go away.) The real danger for the Scheduler is the fact that this activity never existed as a planned activity, and thus has never had a float calculation. Was this added activity a critical one? That is up to the Scheduler to find out through further research.

Added On-going Activities at least show their float values. At a glance, the Scheduler can determine the relative importance of such an addition. Now is the time to verify the Actual Start date and if any constraints to the start of the activity were also added. Constraints are not needed here, until you destatus the schedule to analyze delays. An unexpected event without a predecessor relationship should also have a start-no-earlier-than constraint for this purpose.

Added Planned Activities are frequently the result of deleting some other activity and re-packaging planned work. Look to the Deleted As-Planned list to try to link these two events into a common purpose. Check to see that no contracted work is accidentally dropped in this deletion/addition process.

Modified Activities

If an activity was neither deleted nor added, it still may have been modified. That is the topic of the remaining portion of this paper. It is not 'wrong' that activities are modified. After all, the Owner expects progress to be made and that involves modification of activities. The trick for a Scheduler reviewing the schedule is to only note those modifications to activities that are other than expected progress. The key to spotting these types of modifications is to analyze the modifications in narrowly defined topics.

Actual Dates

Any modification to an existing actual date should be accompanied with an explanation for the change. The obvious reason for this that there is only one 'correct' date. The Contractor earlier certified that the first actual date was correct. Now he or she is revising that certification. Or are they?

If you fail to unambiguously affirm which is the 'correct' date, the original one or the new one, then in the event of a claim the Contractor can claim that either of the dates is the correct one. Was the first date correct and a new one inadvertently changed or was the revision due to an audit of the daily log? Which of the two dates works best in the Contractor's favor?

In addition to modified actual dates, you should also look for newly added actual dates that do not fall within the update period. You should not accept new dates that just happen to fall in the future. You would think that the program would prevent this from occurring, but it occurs surprising often.

Much more subtle is a newly added actual dates that fall before the start of your last update period. Last month you reviewed a schedule that showed this activity was incomplete. Now you are looking at a schedule that says that you reviewed the wrong schedule last month. Has the critical path for last month's schedule moved? Should you consider having the Contractor re-submit last month's schedule?

Suspend/Resume Dates

A schedule submittal is a formal, recognized medium of communication from the Contractor to the Owner. On occasion, the addition of a Suspend Date to the schedule is the first notification of a delay that the Owner may get. Don't get caught napping; always look for changes in the Suspend and Resume Dates.

Besides noting date changes, also look at progress made. Suspended activities should not be making progress during the suspended period.

Changed Activity Types

There are many types of activities other than the standard, fixed duration 'Task.' Properly configured Resource activities have variable durations depending upon driving resource requirements. Hammocks or Level Of Effort activities are not really activities at all; they do not affect the computation of the CPM. Changing the activity type can radically modify the CPM duration of an activity now or in later updates (when it will be too late to object about the change.)

Changed Activity Calendars

Activity calendars determine when the remaining duration of a task will be applied. Changing the work calendar for a 20-day task from a standard work-week to a 7-day per week calendar can shave 11 or more days off the expected finish of that task without changing the task's duration.

Changing activity calendars is a great way to 'make-up' time on a late schedule without ever changing the durations. You can watch the durations all day and never figure out how the project completion date improved unless you also watch for activity calendar changes.

Modified Activity Descriptions

The description for a task is a description of the work to be performed. Modifying the task description may be an indication of a reduced scope of work. You don't want the Contractor to eliminate parts of a task without adding it elsewhere.

Modified Original Durations

Original duration should remain unaltered throughout the project; only remaining duration should change. Original durations will be used at the end of the project to confirm that the original, planned estimates (original duration) were appropriate in light of the actual durations.

Progress Analysis

By their very nature, schedule updates are supposed to reflect progress. The following reports focus on logical evaluation of progress issues.

Progress but No Actual Start Date

If task remaining duration goes down or the percent complete goes up, then there should also be an actual start. This report lists those activities making 'immaculate progress.' The Contractor should supply the actual start date or restore the remaining duration back to the original duration.

Actual Start with No Progress

If an activity has started, then there should be some progress shown or there should be an explanation provided for the discrepancy. The Contractor should be asked to remove the actual start date on tasks without progress.

The addition of an actual start date is enough to completely rewrite the CPM logic of a schedule when the schedule calculation mode is set to "Progress Override." This won't just allow the activity to start early; it orphans the predecessor activity with the accompanying float change and starts a whole new logic chain for all successor activities.

Active Activities with No Progress

Once an activity starts, it should continue making progress every update period until the activity is complete. This is a sign of good management and planning. Is the inactive activity halted due to a delay and if so, who is responsible? Was the work mis-planned and should it be packaged into two activities? Perhaps the task was just overlooked in the statusing process.

Newly Completed Activities

Review this list and compare this with what you see on the field. You will never be in a better position to confirm the actual finish date than you are now. It may be difficult to confirm the exact finish date of a task, but anyone can tell if this task is still being worked on.

In-Progress Activities

Compare this list to what you see on the field as well. Ignore the percent complete and focus on the remaining durations. Are any complete tasks on this list?

Unstarted but Ready Activities

The activities on this list do not have any logical reason why they haven't already started. The Contractor isn't required to start these activities but the lower their float, the more important their start becomes.

I like to take this list into the weekly progress meetings. Anytime something delays the work of Contractor, I pull out this list and say, “you can always divert your workers over to these tasks.”

Total Float Changed More Than the Number of Days in the Reporting Period

Float for an activity is supposed to change. There isn't much point of closely watching this change. This lists only notes changes in float greater than the number of work days in the past update period.

If there were 20 work days in the past period, then you should expect float to not vary by more than 20 days. If the change is greater, then you can expect to see a logic change and new work plan here.

Milestone Analysis

Milestones warrant special attention over the standard activity because of their implied importance; they mark special events. The next checks look at these special events.

Milestones Changed into Activities

Regardless of the Activity Type, any activity with 0 original and remaining durations is a milestone. If a 0-duration milestone suddenly acquired durations, then something significant has occurred.

Activities Changed into Milestones

The event of planned work turning into a progress signpost is fundamentally flawed. Was the work deleted from the scope of work?

Delayed Milestones

A delay in the expected finish of project milestones is an important issue. Besides knowing the change in expected project completion, the knowledgeable Scheduler knows the status of all milestones as well.

Milestones with Changed Actual Dates

Milestones mark important contractual dates. This means that you should be especially diligent in monitoring changes in milestone actual dates. All changes here must be reviewed and concurred with.

Relationship Checks

Relationships are the second 'leg' of the three-legged stool that holds up CPM. Unless you are looking at a well-organized time-scaled logic network diagram, relationships are very difficult to visualize and thus difficult to analyze.

Bogus Relationships

'Illogical' logical relationships should not occur. This is indicative of a corrupt database. Any errors here indicate that it is past time to run the PFXW P3 program.

Deleted Relationships

We break down deleted relationships into two categories to help lower the number of 'important' relationships to review.

Relationship Intentionally Deleted

The predecessor and successor activities still exist in both schedules but the relationship is missing. We can only assume that the Contractor intended to delete this relationship. Are they inserting a new activity or is an entire re-write in the process? This is a list that you will have to track one by one.

Relationship Deleted Due to Deleted Activity

If the predecessor or successor activity were deleted this update, then naturally the relationship would also be deleted. This may be an important issue, but don't look at the missing relationship to understand the change; look to the deleted activity. You can usually skip this list when researching the schedule update.

Added Relationships

We break down added relationships into two categories to help lower the number of 'important' relationships to review.

Relationship Intentionally Added

The predecessor and successor activities still exist in both schedules and the relationship is new. We can only assume that the Contractor intended to add this relationship. Are they completely re-writing the schedule in this process? This is a list that you will have to track one by one.

Relationship Added Due to Added Activity

If the predecessor or successor activity were added this update, then naturally a relationship would also be added. This may be an important issue, but don't look at the added relationship to understand the change; look to the added activity. You can usually skip this list when researching the schedule update.

Modified Relationships

Changes to existing relationships can be divided into the following two categories,

Extensively Modified Relationships

The ramifications of changing an existing relationship from one type to another type is very difficult to predict without looking at each change on a case-by-case basis.

Lag Only Was Modified

The schedule is being 'stretched' or 'shortened' in a way that is very difficult to notice. This is especially true if a lot of small changes have been made to several relationships. Many small changes can add-up to one large change. You will only note this trend if you list all of these changes together in one list.

Newly Orphaned Activities

After making a number of logic changes to a schedule, it is very easy to overlook 're-attaching' the existing predecessor to the appropriate section of the network. This will cause the float of the orphaned activity to increase to the number of work days left in the project. Other than for the last task, all activities in the schedule should have a successor activity.

Interruptible Relationships

When two activities are related by both a Start-To-Start and Finish-To-Finish relationships a possibility exists that the relationships contradict each other. The Start-To-Start relationship may want to start the successor activity before the Finish-To-Finish relationship will allow for. This is called an "Interruptible" relationship.

P3 has a CPM computation setting that allows the successor's duration to 'stretch' in this situation (called, "Interruptible") or not stretch but delay the early start of the activity (called, "Continuous.") P3e and P3e/c only has the Continuous setting available. You should check for this situation in every update. Even activity pairs that were initially not interruptible can later fall into this situation once progress starts being registered in the predecessor activity.

Active Activities Without a Finish Relationship

It is perfectly 'normal' to see activities that are only related using start relationships. A string of activities related with Start-To-Start activities will form a useable CPM network. The problem arises once one such activity starts and does not complete.

Because this delayed activity does not have any finish successors, the network will not delay any succeeding activities. Only project completion is dependent upon the completion of this activity. It is impossible to demonstrate the effects of a delay in such activities once started without modifying the network after the fact.

Constraint Checks

Constraints are the third 'leg' of a schedule. Activities, Relationships, and Constraints 'define' a majority of characteristics of a CPM schedule. One constraint can completely revise an entire CPM schedule.

Activities plot out as big boxes. Relationships look like skinny lines. Constraints are completely invisible on a chart. Unless you look into the data base for this specific activity 'detail,' you will never see them at all.

We break down deleted constraints into two categories to help lower the number of 'important' constraints to review.

Constraint Intentionally Deleted

The constrained activity still exists in both schedules but the constraint is now missing. We can only assume that the Contractor intended to delete this constraint. Personally, I feel that every constraint deleted only improves a schedule. Never the less, you really should review the purpose for the deletion.

On a side note, constraints to completed activities should not be deleted. You want to document the earlier constraint for As-Built and delay analysis purposes.

Constraint Deleted Due to Deleted Activity

If the activity was deleted this update, then naturally the constraint would also be deleted. This may be an important issue, but don't look at the missing constraint to understand the change; look to the deleted activity.

Added Constraints

We break down added constraints into two categories to help lower the number of 'important' constraints to review.

Constraint Intentionally Added

The activity exists in both schedule and the constraint is new. We can only assume that the Contractor intended to add this constraint. Be sure that the constraint added is contractually required and as unrestrictive as possible.

Constraint Added Due to Added Activity

If the activity was added this update, then the constraint is also a part of the addition. This may be an important issue, but don't look at the added relationship to understand the change; look to the added activity.

Many times, a milestone or delay activity will be added to the schedule without relationships to mark an event. The constraint is added in lieu of relationships to make the activity occur where intended. This is a poor method to show delay but is generally acceptable to the Owner.

Modified Constraints

When an existing constraint is modified from one type to another, this is generally acceptable as long as the constraint is made less restrictive and the date is not changed. Start On constraints are more acceptable than Mandatory constraints. Start-No-Earlier-Than or Start-No-Later-Than constraints are more acceptable than Start On constraints.

Out of date Expected Finishes

Finish dates should be computed based upon remaining duration, not the other way around. That said, many people like to use Expected Finishes to compute the remaining duration necessary to meet that date. Once used, the Expected Finish constraint should be deleted once the CPM has been computer (the results will remain the same.)

It is easy to forget to remove these constraints from completed activities. These 'out-of-date' constraints should be removed to prevent interference in delay analyses performed later.

Cost Checks

Why Cost Checks? Why should a Scheduler review the costs in the cost section? Because it's there. You don't want to sign-off on a submission with obvious cost errors. In this section we will look at basic cost checks that every Scheduler should look at if costs are provided.

Budgeted Costs

The first Rule of Schedule Cost Updates is, "Protect the existing budget."

Deleted Activities with Budgeted Costs

Don't forget that when an activity is deleted, then so is the budgeted costs for that activity. Unless you are modifying the budget, then this budgeted cost must be inserted somewhere else in the schedule.

Added Activities with Budgeted Costs

Note those added activities with budgeted costs. Are those costs authorized in the existing budget?

Activities with Modified Budgeted Costs

Often the budget from deleted and added activities is rectified in the budget of existing activities.

Summation of Budgeted Costs and Changes

When all is said and done, what are the total changes to the budget? Add the added budgets and modified budgets and subtract the deleted budgets to the earlier schedule and compare this to the new schedules total budget.

Earned Value

Earned Value measures schedule progress by noting the portion of the budgeted costs you have earned so far. There are certain 'no-brainer' checks then you should make for Earned Value.

Earned Value Less than Zero

Earned Value starts at 0 and increases as progress is made up to the total budget for any task. It should never be less than zero.

Earned Value Greater than Budgeted

You can't earn more than 100% of the total budget for an activity. Earned Value should never be greater than budgeted.

Diminishing Earned Value

The only circumstance to explain a diminishing Earned Value is damage to the existing work or a revised activity scope and budget.

Summation of Earned Value and Changes

Just as with budget, you should total the earned value for all increases, modifications, (and decreases) to see if this matches with the change for Earned Value from last update to this one.

Actual Costs

Actual costs are different from Earned Value. You can expend labor and material without earning any value. The limits are not defined.

Negative Actual Costs

Negative actual costs means that your work is earning money instead of costing you. This should not occur.

Actual Costs Greater than Budgeted

Unlike negative actual costs, actual costs greater than budgeted does occur on projects (we just wish that it did not.) This is a condition of cost overrun. The Contractor is spending more money on that task than anticipated.

When reviewed on a total project basis, there may not be any actuals greater than budgeted. It is only when we look at this tally for every activity does this problem come to light.

Schedulers should be cautious of activities that are costing the Contractor more money that they are earning to work on it. Look for short-cuts, substitutions, and delay claims. Incidents that would be glossed-over in good times suddenly become claims when the Contractor is losing money. This is just human nature.

Diminishing Actual Costs

When actual costs get smaller over time, look for 'cost balancing' throughout the project. Are those actual costs being re-distributed into other activities? This action defeats the reason for monitoring the costs of a project.

Summation of Actual Costs and Changes

Now is the time to roll-up the summation of the changes to the actual costs to see if it matches the current situation.

Actual Costs versus Earned Value

The comparison of actual costs to Earned Value is the key to making a profit and completing the project on schedule. Our challenge is to understand this process on the activity level instead of the project level.

Change in Actual Cost without Earned Value Change

Costs incurred without any increase in Earned Value is a definite warning signal to problems. The main exception to this rule is when major equipment is paid for. Even this should not occur as equipment should not sit on the field un-installed and such purchases are usually payable 30 to 90 days after delivery. Installed equipment should be earned value unless you have rules to the contrary.

Change in Earned Value without Actual Cost Change

Earned Value cost money to achieve (even slaves have to be fed.) Investigate all instances of this fact.

Summation of Actual Costs and Earned Value

Now is the time to compare total Earned Value to actual costs. The warning we made earlier about possible Contractor motivations when losing money on an activity is only speculative. When the Project is losing money in Earned Value compared to Actual Costs, this warning becomes a 'call to arms.'

If the Contractor is smart, he or she will be looking for ways to economize costs and increase earnings. If they do not, then their continued existence as a Contractor is in question. The fact that this does not occur more often is that many Contractors wait until the end of the project to see if they made a profit. With margins at 5% - 10%, this is no way to guarantee security to their families.

Resource Checks

As with Costs, checking resources is another chore that Construction Schedulers usually do not tackle unless forced to do so. In our experience, adding resources to a schedule is not often done in the 'real world.' Building a good Baseline Schedule takes time and money. When the CPM schedule is ready to be used, the project is well underway and the schedule is needed now, not in another month after the resources are input.

On the other hand, inserting non-driving resources into a Baseline Schedule is an excellent way for the Contractor to indicate his or her bid plan. Later, when the Owner complains of understaffing or wants a work hour increase 'to meet the plan,' the Contract has ready proof of their original manpower intent.

The real cost in using resources in a schedule is in the maintenance of these little time-wasters. Just because you have resources built into the Baseline Schedule does not mean that you are required to keep it updated from month to month (unless the contract requires it.) Code all resourced activities as "Tasks" and just say that it was your Bid Plan and leave them alone.

The real Schedule Update issue is in the situation where you have resource-dependent activities and driving resources. Resource activities without driving resources assigned to them act just like Task activities with fixed durations. Even Resource activities with non-driving resources assigned to them are 'safe'; their assigned durations remained fixed.

When dealing with Resource activities with driving resources, the normal activity checks are ineffective (or non-informative.) The factors affecting the assigned resource determines the activity's remaining duration and cannot be overridden. As an Owner, don't require resourcing, approve the Baseline Schedule and then complain that the durations of the activities are changing from update to update. You asked for, even demanded it and now you are stuck with it.

In this case, you will need to review the data hidden inside the database. You will need to analyze the resources to see why they are modifying the activity durations. If any resources are driving in the Baseline Schedule, then it seems to me than any resource can become driving in the future. You are not going to be able to get away with just reviewing driving resources. A non-driving resource may be added in one update and turned into a driving one in the next update. The following are the checks that I make for updated resources,

Added Resources

Look at all added resources. Does the type of resource added seem appropriate for that activity? Why were they not added earlier in the Baseline Schedule?

Deleted Resources

Deleted resources may be part of a transfer of resources from one activity to another. On the other hand, maybe the Contractor is contemplating cutting the specialty contractor out of the contract and substituting their own workers, who are “just as good” (and cheaper.)

Modified Resource Budget

If resources define the activity’s duration, then the original duration for that activity is the driving resource budgeted amount. You need to ‘protect’ resource budget just as you do for Original Duration.

Modified Resource Percent Complete

Instead of monitoring the change in activity percent complete or remaining duration, you now need to monitor resource percent complete. As an Owner’s Representative, you know a lot less about the Contractor’s resource expenditure than you do about activity estimated remaining duration, but hey; you are the one that asked for resource loading. Now live with it.

Log Checks

Activity Logs are potentially your biggest claims exposure weak-point! A log entry can be considered a notification from the Contractor to the Owner. If you wouldn’t risk not reading a letter sent to you from the Contractor, then why would you dare ignore the activity logs? Never miss an addition to the logs.

Added Activity Logs

We are not interested in reviewing all activity logs, only those that have changed. This first look is for added log entries. Logs are an excellent place for a Contractor to note delays and field instructions.

Logs are also an excellent place to insert a note saying “The Owner accepts all responsibility for delaying the project...” Don’t have a fit; just note the item and your disagreement with the statement in your review of the schedule.

Deleted Activity Logs

Logs once entered should generally not be deleted. Does the very act of deleting a statement make another statement? You are not paranoid if everyone is out to get you.

Modified Activity Logs

Sometime the log is modified over time to correct grammar and spelling errors. Sometimes the modification is posturing for a claim. Now is the time to consider the changes.

Overall Review

We have now looked at all specific issues. Now is the time to put it altogether and look at the big picture. This final section is a collection of reports intended for this purpose.

Milestones Awaiting Status

Milestones are events, not tasks. It does not cost a cent to status a milestone complete if all predecessor work is complete. So, what is the hold-up? Why hasn't the listed milestones been statused complete?

Activities Starting Later than Necessary

Sometimes, I call this "The Due Diligence Report." The Contractor is not required to start activities even if all predecessors are complete. On the other hand, this is an indication that not all of the work is being diligently pursued. The longer the list, the lower the float values, the bigger the problem.

Activities Starting Earlier than Allowed

You might think that this check is the opposite of the previous one. If delay is bad, then early starts must be good. This might give physical proof of aggressive prosecution of the work.

On the other hand, it might indicate that the Contractor is not following the schedule but working to another plan. If most of the work is starting before the schedule says it is allowed to, then very possibly the network logic should be revised to indicate the new constraints.

This condition occurs frequently on projects where the Contractor is forbidden to revise contract logic (or the process is made so difficult or time consuming as to prevent revisions) in the mistaken belief that you can prevent delays by preventing revision. All you get is a schedule that does not accurately predict project completion and an unusable As-Built Schedule as well. Not bad; you get a delayed project and no way to settle the dispute as to cause. Lawyers love this.

Critical Activity Summary

This last summary puts the entire update onto a single piece a paper. If you can't understand the import of the update looking at this review, then perhaps you are wasting you true talents. Perhaps Cost Engineering is for you.

This summary paper will have four columns. The first column is for the Target (earlier) Schedule's critical path (or Longest Path.) Write the Activity ID for each activity on a separate line, beginning with the activity with the earliest early start (or actual start if available,) and proceeding to the last activity on the list with the latest early start.

Now do the same for the second column using the Update (most recent) Schedule and sorting by early start. Here is the first trick; line-up matching Activity IDs from the target Schedule to the Update Schedule. Never list two different Activity IDs on the same line. Skip down to the next match with the schedules, inserting blank lines wherever necessary to keep the two lists in sync. Unless the two lists match perfectly, there will be gaps in the two lists where the Activity IDs don't match.

The third column is reserved for the change in the activity's Actual Duration plus Remaining Duration. In other words, the formula is,

$$(\text{Update Actual Duration} + \text{Update Remaining Duration}) - (\text{Target Actual Duration} + \text{Remaining Duration}).$$

The last column contains the Activity's description and a summary of every finding you made of that activity in the entire previous review. Small issues tend up add-up to a very interesting whole when you take the time to re-write all findings.

Now, looking down the first two columns, you can easily see where the critical path jumped off and back on to the earlier critical path. The Effective Duration column will indicate the problem area where the change occurred. The fourth column will then summarize just what that project-changing revision was. Congratulations, you now have instant understanding!

CONCLUSION

Good schedule reviews don't just happen; they take a lot of work. The great thing about it is that this is interesting work. Puzzles and mysteries, Red Herrings and 'Dead Bodies' abound! When the review is complete and you hand in your report, I love the puzzled looks from project management. "How did you figure all of that out from a couple of dates?" they say. And the sullen glares from the Contractor's Scheduler over the table during the monthly schedule review are more precious than jewels.

Add Them Up. We have covered

- 23 System Checks
- 16 Activity Checks
- 16 Relationship Checks
- 13 Constraint Checks

- 15 Cost Checks
- 4 Resource Checks
- 3 Log Checks
- 4 Overall Review Checks

and 119 schedule review checks is a complete review!