



Schedule Maintenance, Revision, or Re-Baselining: Where to Draw the Lines?

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- Senior Scheduling Engineer, AECOM Technical Services
- Worked for James J. O'Brien, "a pioneer in the use of critical path method (CPM) scheduling for construction" for more than 20 years, starting as a college co-op.
- He holds:
 - B.Arts in Biology, and
 - B.Sc. In Chemical Engineering from Bucknell University
 - PSP Certification with AACE International
 - Fellowship with AACE International
- Chair of the AACE Technical Board
- President of the North Florida Section of AACE
- Something you may not know about me:
 - My first logged pilot training hours were in a WWI-era open-cockpit biplane (de Havilland Tiger Moth)





Presenter: John P. Orr, PSP FAACE

The Great Debate: Contractors vs. Owners

AACE Conference, Orlando, FL

- Contractors: Jeff Milo, Donna Nardella
- Referee: Hannah Schumacher,
- Owners: John Orr, Julie Owen

- Project Schedules
- Baseline Schedules
- Schedule Updates
 - The Control Schedule
- Re-Baselined Schedules
- Lean Planning Schedules
 - Revisions for Additional Detail



- Changes to the Schedule
- Contract Provisions Regarding Schedule Changes
- Cost-Loaded Schedules used for Progress Payments
 - Incorporated Schedule Fragnets
 - Cost Placeholders
- Schedule Maintenance
 - Maintenance versus Revisions
- Discussion Questions and Debate

● Definitions:

- Baseline Schedule: Is a **static** schedule which does not change (unless it is “re-baselined”)
- Schedule Updates: Are **dynamic** schedules which include progress and actual dates, but can also add “revisions” or “maintenance” changes
- Control Schedule: The most current schedule update (with progress) that is used in the daily management of the project

- **Baseline Schedule Development:**
 - Project Scope
 - Schedule
 - Cost
 - Quality
- Owner will hold the Contractor to cost, schedule & quality commitments
- Contractor will hold the Owner to scope commitment

- **Baseline Schedule Development Assumptions:**
 - Created and Updated by the Contractor
 - Submitted to Owner for Review
- **Exclusions:**
 - Pre-bid schedules
 - The “schedule of record”
 - GMP schedules

- Schedule Update Purpose:
 - Capture actual progress
 - Create snapshot of current project status
 - Keep stakeholders informed and equipped
 - Basis for assessment of:
 - Impacts
 - Trends and Deviations
 - Changes / Time Impacts

- Schedule Update Process:
 - Data acquisition
 - Review/agreement on status
 - Inputs to the schedule
 - CPM Calculations
 - Reviewing results
 - Finalization
 - Frequently includes a narrative report

● Focus of Schedule Updates:

- Status or recorded progress
- Changes made to the activities
- Changes made to the logic sequences
- Delays and unplanned events
- Constraints to the project
- Status and changes in resource availability and usage

● CPM Schedule Development:

➤ Related AACE Recommended Practices:

24R-03 Developing Activity Logic

32R-04 Determining Activity Durations

37R-06 Schedule Levels of Detail

38R-06 Documenting the Schedule Basis

45R-08 Scheduling Claims Protection

Methods

48R-06 Schedule Constructability Review

49R-06 Identifying the Critical Path

50R-16 Trending and Forecasting of CPM
Schedules

52R-06 Prospective Time Impact Analysis

53R-06 Schedule Update Review

54R-07 Recovery Scheduling

70R-12 Schedule Contingency

Management

78R-13 Baseline Schedule Review

84R-03 Planning and Accounting for
Adverse Weather

90R-17 Stating the CPM Schedule

109R-19 Schedule Change Management

- Why do we re-baseline?
 - The current baseline is no longer useful
 - Actual progress has deviated significantly from planned progress
 - Changes to means and methods
 - Project scope, requirements or objectives have changed
 - Project involves incremental or iterative development
 - Effectiveness and efficiency of the original project execution plan is in question

- Revisions to provide Additional Details
 - CPM = 15 workday limit: Lean = less than 3 days
 - Managed by commitments made to dates and workflows
 - Include administrative items not in CPM schedule
 - Incorporation of pull planning details makes it difficult to:
 - Evaluate progress
 - Prepare forecasts
 - Demonstrate delay impacts

- Changes to any schedule activity field:
 - Changes to Administrative Schedule Settings
 - Calculation settings
 - Changes to Activity Types
 - Changes to Calendars
 - Adding activities
 - Activities added to reflect contract change orders and modifications
 - Activities added to reflect refinements in or additions to the contract scope
 - Cost placeholder activities (for progress payments via cost-loaded CPM schedule)
 - Activities added for detail (including the incorporation of lean planning, rolling wave, pull planning “Make-ready” detailed plans as trades are brought on board)
 - Deleting activities

- Changes to schedule activity fields:
 - Changes to Original Durations
 - Changes to Remaining Durations
 - Increases in Remaining Durations (negative progress)
 - Remaining Durations greater than Original Durations
 - Assignment of Actual Start/Finish dates
 - Modified (previously assigned) Start/Finish dates
 - Changes to Suspend and Resume dates
 - Changes to Percent Complete (physical, duration, units)
 - Changes to Activity Codes
 - Changes to Activity Constraints
 - Changes to Resource Assignments
 - Changes to User-Defined Fields, Memo/Document/Issue/Steps

● Changes to Activity Logic Relationships:

- Added relationships
 - Relationships added with newly added activities
 - Relationships added to completed as-built activities
- Deleted relationships
- Modified relationships
- Modified relationship types
- Modified lag factors



- A Contract is in Force
- There are Contract Provisions Regarding:
 - Submittal of Baseline Schedules
 - Preparation of Schedule Updates
 - Making Changes or Revisions to Schedules

- Other than the addition of progress and actual start/finish dates is considered a change to the schedule, requiring submission of a formal revision for approval
 - The updating process of the IPES and BPES is limited to the input of Actual Data; any other addition or deletion shall be treated as a change to the baseline. Provisions to change the baseline schedule are included below in this Section.

- The Wisconsin DOT directs the contractor, “With each schedule update, include the following:
 - Additional activities as necessary to depict additions to the contract by changes and logic revisions as necessary to reflect changes in the contractor’s plan for prosecuting the work.
 - ...Justify changes to the CPM Schedule in the narrative by describing associated changes in the planned methods or manner of performing the work or changes in the work itself.”
 - “Revisions” are addressed as follows:
 - A CPM Progress Schedule Revision may be submitted, prior to the next CPM Monthly Update, if necessary due to changes in the Work or project conditions as authorized by the engineer. Prepare the CPM Revision in the same format as required for CPM Monthly Updates, including justification for changes to the schedule. The process for comment and acceptance of a CPM Revision will be the same as for CPM Monthly Updates. If the CPM Revision is accepted, prepare the next monthly update based on the revised CPM. If the CPM Revision is rejected, prepare the next monthly update based on the previous month’s update.

- Other specifications require the contractor to make changes to their schedule to correct logic that has resulted in “out-of-sequence” performance.
 - The original baseline logic must be re-worked to reflect the actual sequence of performance

- These specifications include a description of “minor project management adjustments” as follows:
 - Changes that constitute more than simply adjusting logic to reflect minor project management adjustments to the means and methods shall not rise to the level of revisions, however major changes made during the progress update process will not constitute official revision to the Contractor's baseline until approved by the Owner.
- These same specs also require the schedule update narrative report to contain:
 - Actions planned to correct or mitigate any lost time, including descriptions of any planned alterations to means and methods which may include, but not be limited to, changes to sequence of work, or changes to manpower or equipment resource levels, changes in work hours or numbers of shifts.

- Contract requirements to use cost-loaded schedule updates in support of payment applications
 - Contract modifications must be accounted for by adding new activities
 - This can be done with schedule fragnets or cost placeholders
 - Cost placeholders distort Earned Value Management planned S-Curves

- The basis for “Schedule Maintenance” is that planning and scheduling require a continuous effort to ensure that the current schedule continues to accurately model the project’s:
 - Current Scope
 - Physical Progress
 - Activity Sequences, Durations, Resources, Costs ...
 - Actual Means and Methods of Construction

- How do we differentiate between a revision to the schedule and maintenance of the schedule?
 - Maintenance to the schedule includes “minor changes necessary to keep the schedule as a good model of the contemporaneous means and methods.”
 - A Revision to the schedule includes changes that reflect alterations to the project plan and is much more extensive than maintenance. Revisions alter the control schedule from previous updates and can often change the forecasts, critical and near-critical paths, and necessary resources.

- **Maintenance** = minor changes necessary to keep the schedule as a good model of the contemporary means and methods. These changes should not require a formal submission/request for a revision to the schedule. Maintenance changes can be sequence changes to resource-driven logic which are made to correct or avoid out-of-sequence reporting.

- **Revision** = changes to the schedule that reflect alterations in the project plan, more extensive than maintenance. The contemporary (control) schedule is altered, which can change the prediction/forecasts of critical and near-critical work. Schedule Revisions should be submitted to the owner for approval because:

- Schedule **Revisions** should always be submitted to the owner for approval when:
 - They reflect a change in planning
 - They can change dates on which the owner has previously relied.

- Intentional changes to the control schedule, either in the form of maintenance or revisions are necessary to:
 - Account for changes to the project
 - Improve on the previously chosen means & methods

- Example: Curtainwall installation scheduled N-E-S-W
- Design change (or delivery delay) at East elevation
- Schedule is revised to a counter-clockwise installation sequence, North, West, South, East.
 - Change made prior to work commencing; Maintenance
 - Crew has started, been stopped, and re-mobilized (relocating scaffolds) to the West elevation; Revision

- Schedule revisions can also reflect changes or “work-arounds” based on constructability restrictions:
 - Weather disruption
 - Design-related work area access
 - Utility restrictions
 - Local agency – third party interference
 - Traffic/access control to the site
 - Physical constraints that were not contemplated in the baseline schedule
 - Procurement or material delivery delays

1. **No changes** to the baseline are permitted for any reason. The control schedule activities must reflect exactly the baseline activities to allow continuity of comparison (“apples to apples”).
2. **Any change** to the schedule other than the input of actual data is considered a revision and must be submitted formally for review and approval by the owner.

3. **Correction of out-of-sequence progress** is required to conform the actual progress with the baseline plan.

4. Contract modification activities included in a cost-loaded schedule must be more than **cost placeholders**; the (modified) scope must be scheduled and incorporated into the control schedule.
 - a. If the contract modification work has started and has actual progress, the **new contract modification activities must be incorporated into a prior update** such that the schedules show a point at which there is zero progress (planned status). This is particularly important with earned value management.

5. Any approved contract modification that includes a contract time extension must be incorporated into the contemporary (control) schedule following approval. **A revision to the contract completion date automatically makes this a re-baselining effort and the resulting schedule is a new baseline.**

6. AAACE RP 90R-17 Statusing the CPM Schedule states that **“statusing” does not involve logic changes**. Changing the logic of un-started schedule activities would therefore always be considered as a revision.
- a. What about logic changes reflecting crew-re-mobilization to a new area resulting in a change to forecast completion dates of **non-critical activities**?
 - b. What about logic changes reflecting crew-re-mobilization to a new area driven by a **delay or disruption**?
 - c. What about resource re-allocations or additions (a second crew) resulting in **two areas now being worked concurrently** when they had been planned to be sequential? Does it matter if the change affects critical or non-critical sequences?

7. AAACE RP 109R-19 recommends the **tracking of “Potential Changes.”** AAACE RP 10S-90 defines “Trend” as “the first indication of potential change that must be tracked and properly dealt with. A trend may later be identified as a **deviation** (not normally reimbursable) or a **change** (which is typically reimbursable in time and/or money).”
 - a. Is the distinction between a deviation (non-reimbursable) and a change (reimbursable) important?

8. Changes to the **original durations of un-started activities** should never be done without explanation and justification (new crew? adjusted productivity rate? additional resources?) Such changes would always be schedule revisions (not maintenance) because they reflect a change in planning.
 - a. If changes to original durations **affect the critical path and/or forecast of project completion**, it might also be considered re-baselining (under a rule of thumb that anything that adjusts the completion date be considered re-baselining).

The goal of this presentation has been to develop definitions that distinguish between schedule maintenance, schedule revisions, and re-baselining. We trust that the proposed definitions and examples of contract specification language have helped to clarify the expectations of the Owner and the Contractor, and to provide guidance and understanding.



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