

Retrospective TIAs – Is There a Better Way?

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- › I was bitten by a rattlesnake last year



Rattlesnake



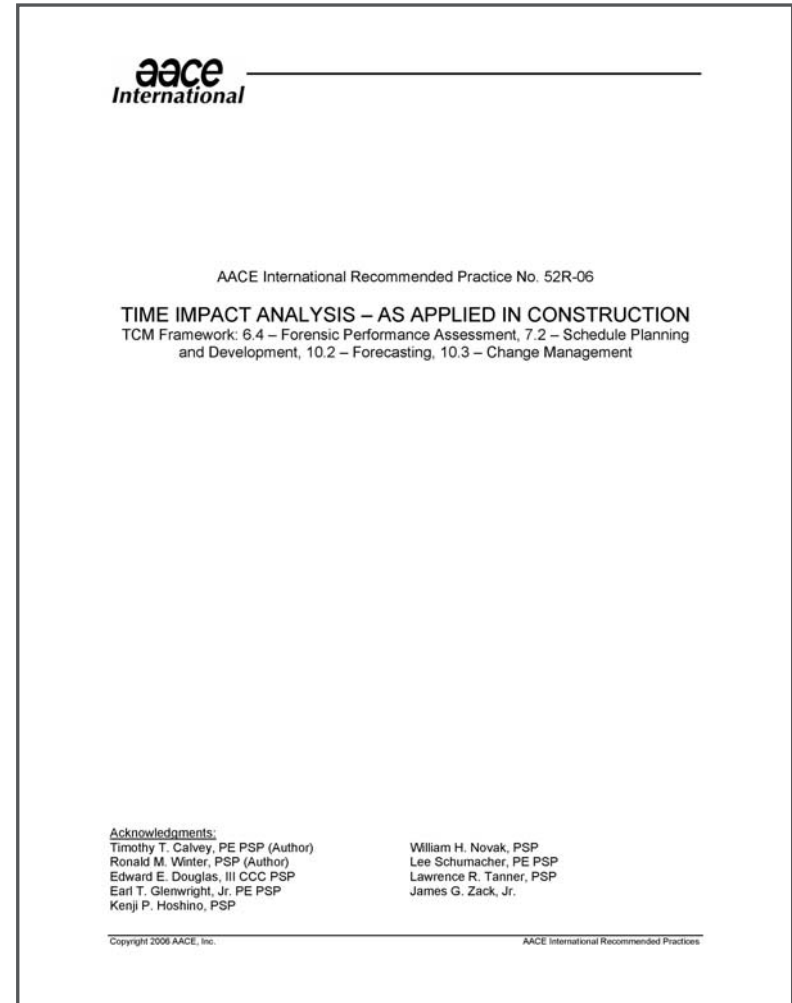
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INTRODUCTION

- **The power of Time Impact Analysis (TIA) methodology is undeniable**
- Preferred method to establish entitlement for time extensions
- AACE's RP 52R-06 (2006), provides a detailed explanation of how to perform
- Yet, Retrospective TIAs pose significant methodological issues
- TIA's accuracy were discussed in my 2008 AACE paper "Retrospective TIAs – Time to Lay Them to Rest?"
- **Has anything changed?**

INTRODUCTION

TIME IMPACT ANALYSIS – AS APPLIED IN CONSTRUCTION RP52R-06



INTRODUCTION

- **Prospective TIAs are here to stay**
- **There is often confusion regarding exactly how or when to perform the TIA**
- **Even AACE's RP on Forensic Schedule Analysis, 29R-03 provides little "how-to" information**
- **Retrospective TIAs have a huge range of "accuracy"**
- **Underlying accuracy of the schedule updates is crucial**
- **Integrity of the expert performing the analyst**

INTRODUCTION

FORENSIC SCHEDULE ANALYSIS RP29R-03



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AAACE® International Recommended Practice No. 29R-03

FORENSIC SCHEDULE ANALYSIS
TCM Framework: 6.4 – Forensic Performance Assessment

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BACKGROUND

Early CPM

- **CPM schedules invented in the late 1950s**
- **Development of the UNIVAC computer**
- **J. Mauchly and J. Kelley on behalf of DuPont**
- **Initial trials proved immediately that CPM scheduling worked**
- **Navy's Polaris Program started developing PERT**
- **Fundamentals of CPM were essentially in place by 1960**
- **Working on ancient computers**
- **By mid-1960, TIA techniques were used on Apollo Moon Project**

- **Prospective TIAs are an essential tool for the project scheduler**
- **Predict the likely impacts of changed conditions on a project**
- **Requirement in the contract to establish proof of entitlement to a time extension**
- **Prospective TIAs are an essential tool for the **project manager****

BACKGROUND

Typical Contract Provision

•3.7.2 Submission Requirements

•**Submit a justification for each request for a change in the contract completion date of less than 2 weeks based upon the most recent schedule update at the time of the NTP or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:**

- **A list of affected activities, with their associated project schedule activity number**
- **A brief explanation of the causes of the change**
- **An analysis of the overall impact of the changes proposed**
- **A sub-network of the affected area**
- **Identify activities impacted**

UNIFIED FACILITIES GUIDE SPECIFICATIONS, July 2008

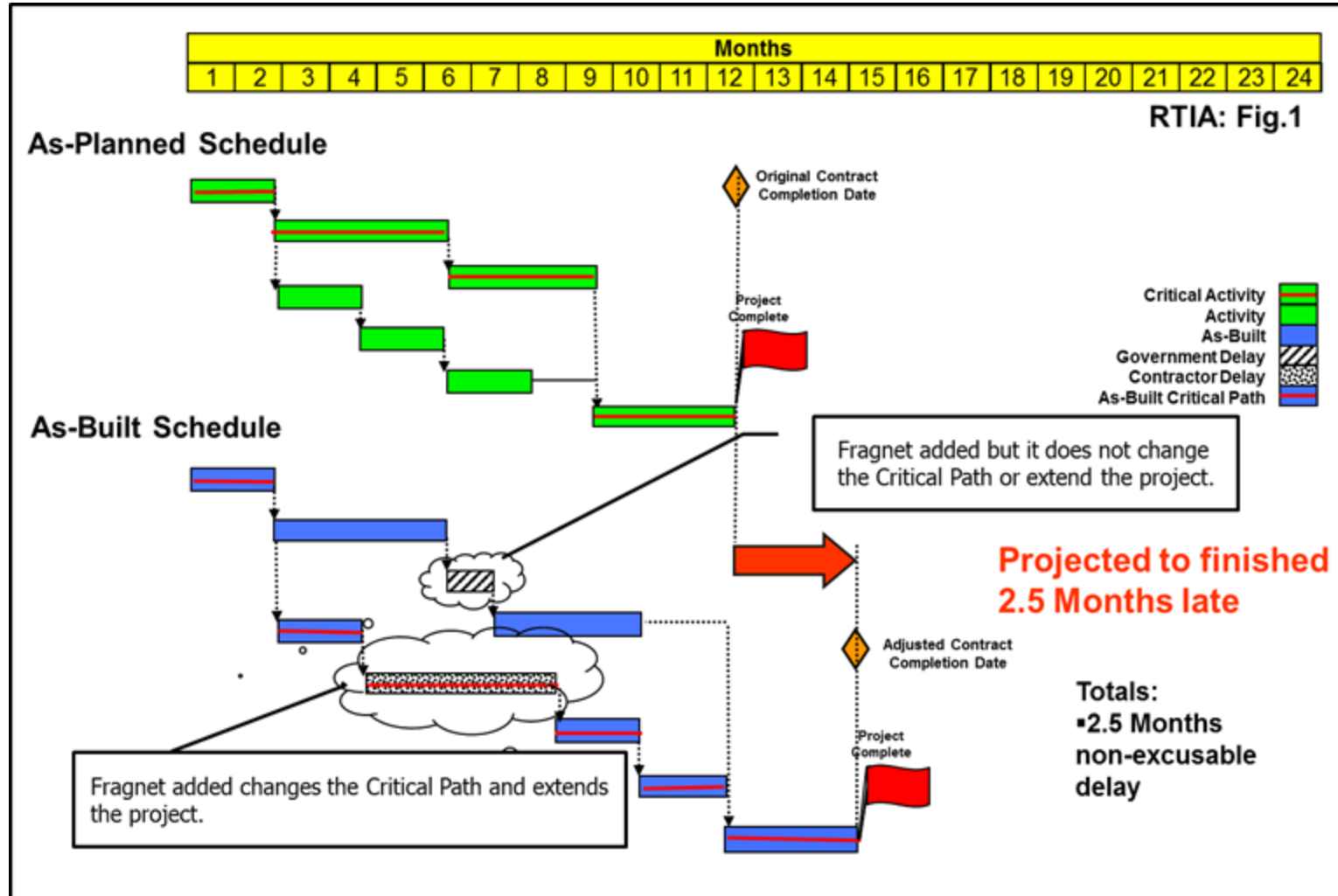
Division 01 – General Requirements, Section 01 32 01.00 10, PROJECT SCHEDULE

- **All the durations of activities forward (to right) of the data date are estimates only**
- **Comparing the estimated impacts into estimated durations of the activities**
- **AACE's RP 52R-06, "Time Impact Analysis - As Applied in Construction," identifies: **Best practice Prospectively****
- **After the added work has been completed**

- **Conceptually Similar to the Prospective TIA**
- **RP 52R-06 warns about using Prospective TIAs in a Retrospective situation:**
- ***“This practice is not recommended for a retrospective (forensic) view taken when the impact has already been absorbed into the schedule”***

WHAT IS RETROSPECTIVE TIA?

Graphic



- **Retrospective and Prospective Linkage**
- “Delay and Disruption Protocol” is a UK based guide book/manual on schedule delay analysis (Society of Construction Law Protocol)
- Document discusses the relative merits of various methodologies
- The SCL Protocol identified the Retrospective TIA as the “**best methodology**” and went on to state:
 - *The Protocol recommends [the TIA] methodology be used wherever the circumstances permit, both for prospective and (where the necessary information is available) retrospective delay analysis.*

BACKGROUND

Prospective TIAs

- **Prospective TIAs are an effective way to establish entitlement to a time extension.**
- **Construction Scheduling: Preparation, Liability and Claims, Jon Wickwire et al. spent an entire chapter extolling the virtues of prospective TIAs**
- **Barry Bramble et al., in the well-regarded book, Construction Delay Claims, calls TIAs the “*most favored method for measuring delay.*”**
- **Bruner and O’Connor On Construction Law state:**
 - **“*[T]o prove the effect of time impacting events, a time impact analysis using critical path methodology is clearly favored because of its perceived ability to discriminate between critical and non-critical delays, even in the context of concurrent delays.*”**

- **There is slight disconnect between RTIAs and RTIAs in Wickwire's book**
- **The laudatory appreciation of the Prospective TIA has spilled over into RTIAs**
- **The Wickwire book supports “chronological and cumulative”**
- **The book cites numerous court cases where that test has been met, where the actual methodology was NOT a TIA .**
- **Instead an “as-planned vs as-built” or a “windows” approach**

BACKGROUND

Retrospective TIAs

- **AACE RP29R-03, “Forensic Schedule Analysis,” uses no laudatory language**
- **Identify seven specific observations of the TIA:**
 - **Considers the chronological order of delays**
 - **Easy to perform prospectively**
 - **Takes into consideration changes to the critical path as they occurred on the project**
 - **Requires that schedule updates were developed throughout project life**
 - **This method does not identify concurrent or pacing delays**
 - **This method can be used to identify and quantify acceleration**
 - **No as-built schedule required**

- **RTIAs need to be developed carefully and are subject to abuse.**
 - *The term CPM time impact analysis in fact is little more than a “buzz word” used to describe a host of analysis methods – some valid and some not – that utilize various software programs all too often allowing manipulation of the results and the creation of ‘rotten bananas’ schedules.*
 - **Bruner and O’Connor On Construction Law**

WHAT IS RETROSPECTIVE TIA?

Retrospective TIA

- **Retrospective TIA - work has been completed**
- **Improper mixture of planned and actual**
- **Ignore the effects of progress on unimpacted work**
- **Overly long and unrealistically pessimistic fragnets**
- **This “shift” critical paths to preferred locations**
- **Skewed apportionment of delay**

WHAT IS RETROSPECTIVE TIA?

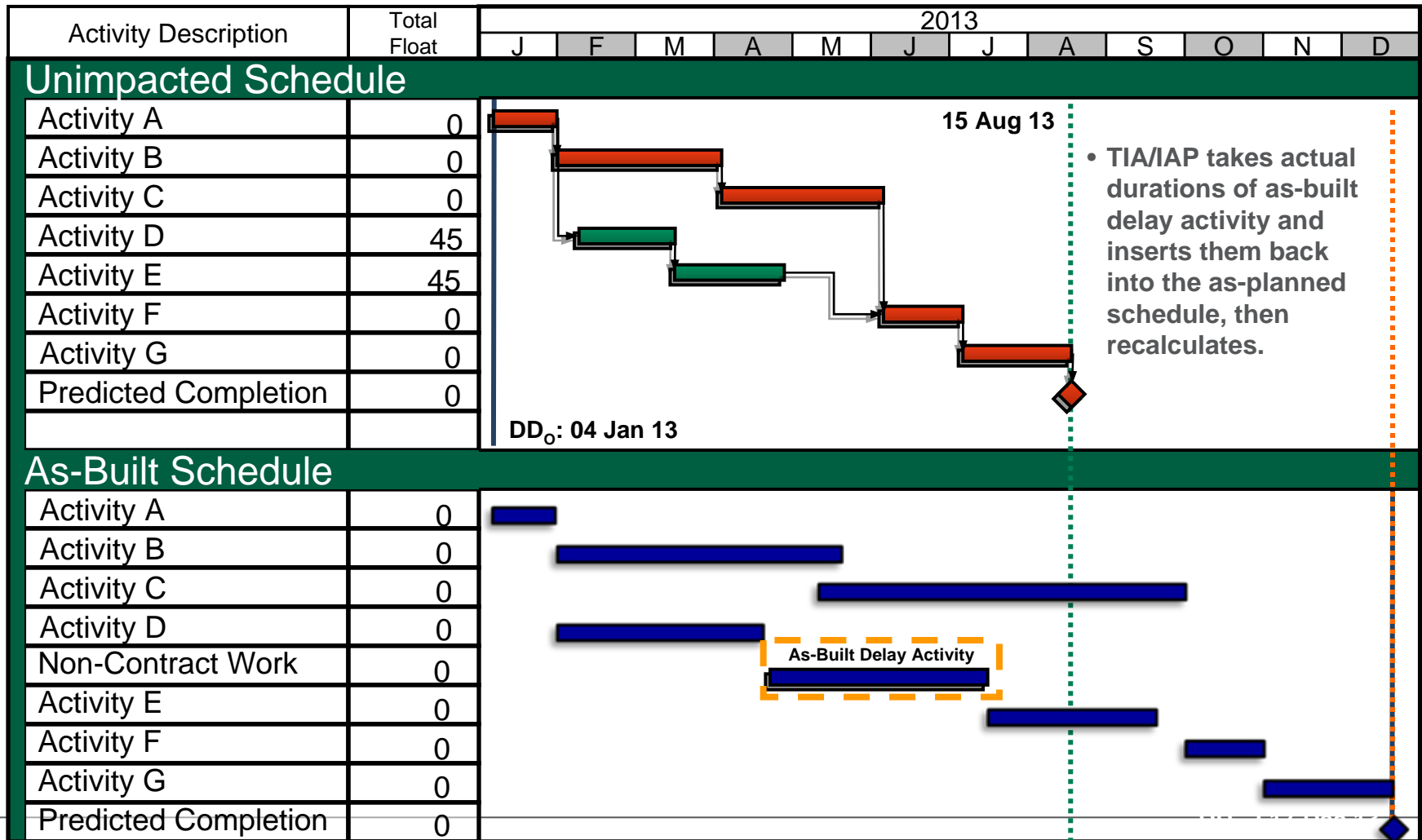
Retrospective TIA

Steps in Doing at RTIA

- 1. Recognize all contract time extensions granted**
- 2. Identify and Quantify Delays**
- 3. Select the Appropriate CPM Update**
- 4. Chronological Fragnet Insertion**
- 5. Insert Fragnet durations and recalculate the schedule**
- 6. Repeat this process for all Fragnets in the Update**
- 7. Compare to Next Update**
- 8. Repeat Process for each Schedule Update**
- 9. Tabulation**

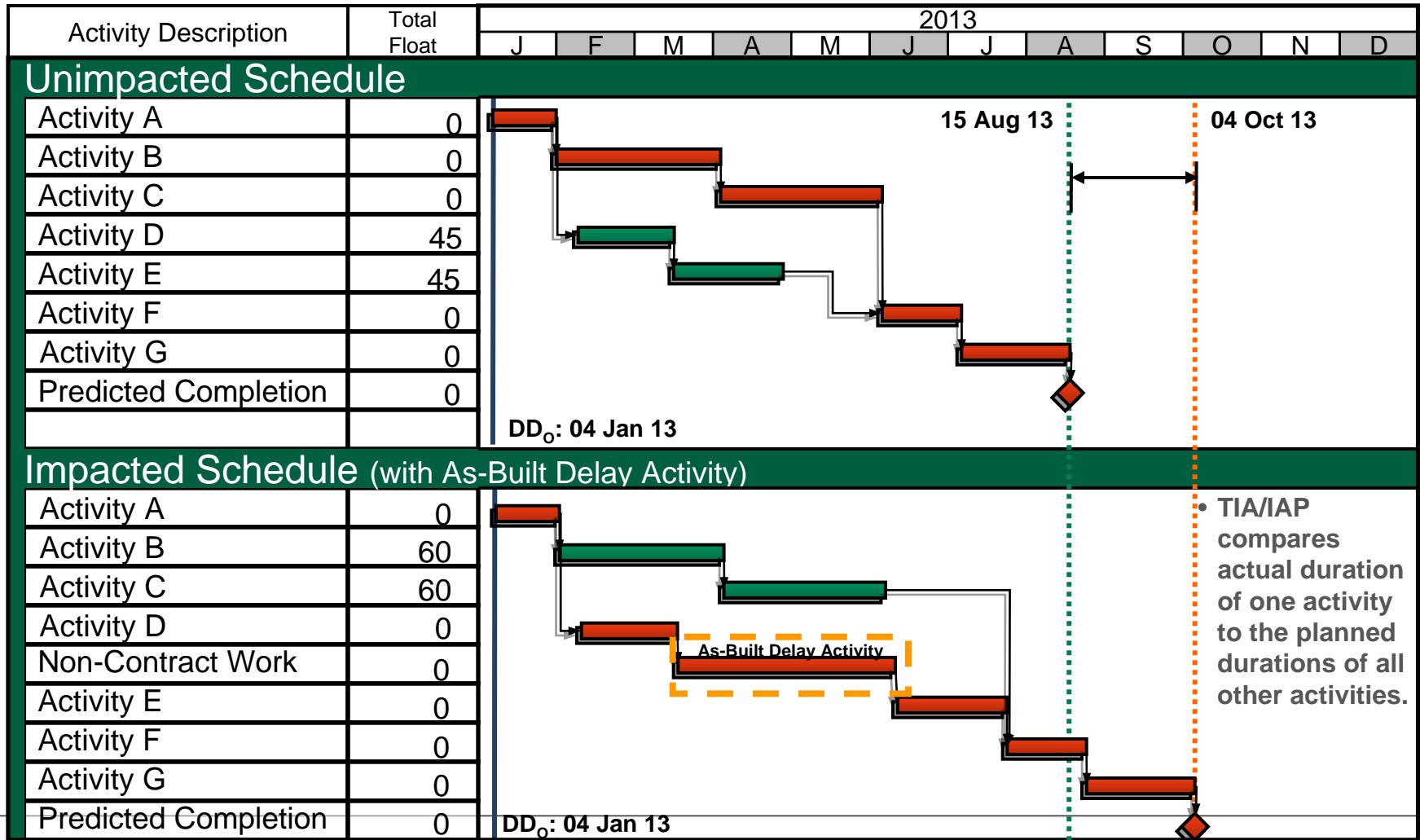
WHAT IS RETROSPECTIVE TIA?

Graphic



WHAT IS RETROSPECTIVE TIA?

Graphic



- TIA/IAP compares actual duration of one activity to the planned durations of all other activities.

WHAT IS RETROSPECTIVE TIA?

1. Recognize All Contract Time Extensions Granted

- In the order in which they happened.
- Incorporate the time extension when it is acknowledged and agreed to by the owner
- Danger if incorporated before officially recognized
- Problem if long lag between recognition and “agreement”
- Both contractors and owners change their behavior
- **WHY IS THIS IMPORTANT?**
- **Essential that model be as accurate as possible**

WHAT IS RETROSPECTIVE TIA?

2. Create Fragnet - One

- **Contractors identify events**
- **Detailed History of the event:**
 - **Durations, logic ties, and contemporaneous rational**
 - **De-briefing of project staff**
- **Included duration:**
 - **Actual duration; such a calculation will not accurately represent the FORENSIC impact**
 - **Contemporaneously estimated duration. If contemporaneously planned durations are used - hypothetical and not based in reality**
- **The events surrounding each impact should then be converted into a time-scaled bar chart showing logic connections**

WHAT IS RETROSPECTIVE TIA?

2. Create Fragnet - Two

- Events that are greater than one update period
- For example, planned for 20 days but actually 80 days
 - If 80 days - mixture of projected and actual durations over a three month period. Could misrepresent the second and third month.
 - If 20 days - subsequent updates will have to have new fragnets with revised estimated durations. This reflects on-site planning by the project management -- “the contemporary understanding of criticality.”[See P. Kelly]
- Durations for 2nd and 3rd month’s fragnets?
- What did management think?
- **What if they didn’t think?**
- **ALL OF THIS IS IMPORTANT**

WHAT IS RETROSPECTIVE TIA?

3. Select the Appropriate CPM Update

- Identify the CPM Update - the “unimpacted” schedule
- Should immediately precede the event
- Could be Baseline
- Status IMMEDIATELY before event?
 - Generally difficult
 - Wickwire preferred technique
 - Likely be a linear interpolation
 - Detailed as-built information good source
 - **WHY IS THIS IMPORTANT?**
 - **Accuracy**

WHAT IS RETROSPECTIVE TIA?

4. Chronological Fragnet Insertion

- Chronologically within Updates
- Updates chronological also
- Connect to appropriate predecessor and successor fragnets
- **WHY IS THIS IMPORTANT?**
- **A longer fragnet could shadow a shorter fragnet.**
- **If inserted in the incorrect order, this longer fragnet could hide an earlier potential CP event**

WHAT IS RETROSPECTIVE TIA?

5. Zero Out the Duration

- Analyst should reduce the fragnet duration to zero
- Re-run the schedule to confirm that the logic adjustments
- Should not change predicted dates
- Improperly tied fragnets and will have to reflect revised logic
- WHY IS THIS IMPORTANT?**
- A zero-duration fragnet should have no impact on the network.**
- **If it does, the logic of the network has been changed, no longer reflecting the intent of the fragnet.**

WHAT IS RETROSPECTIVE TIA?

6. Insert Fragnet Durations and Recalculate the Schedule

- After confirming no impact with zero durations
- Recalculate with durations
- Record results
- Unlikely to match contemporaneous update for the next month
- **WHY IS THIS IMPORTANT?**
- **Unless ALL impacts to an update are included as fragnets, there is bound to be some faster, and some slower activity progress that will effect the projected completion date.**

WHAT IS RETROSPECTIVE TIA?

7. Repeat This Process for all Fragnets in the Update

- Repeat for all fragnets in update
- Confirm at least one continuous critical path
- **WHY IS THIS IMPORTANT?**
- **Not all fragnets will impact the CP. Tabulation shows which actually do impact the CP.**
- **By alternate insertion, potential concurrent impacts can be identified.**

WHAT IS RETROSPECTIVE TIA?

8. Compare to Next Update

- If only impacts are TIA events, analysis should match contemporaneous updates
- This is because the TIAs that have been inserted into the schedule supplant or replicate actual events.
- What if they don't match? It is because non-TIAs have impacted schedule
- **WHY IS THIS IMPORTANT?**
- **Provides a check on what's actually happening**
 - **Additional delay not captured by the inserted fragnet, or**
 - **Acceleration undertaken by the contractor**

WHAT IS RETROSPECTIVE TIA?

9. Tabulation

- Tabulation should summarize the variances and reconcile the total
- Not all Fragnets will be on CP
- Likely no perfect performance
 - Corrections to work
 - Low Productivity
- Check for update manipulation
- **WHY IS THIS IMPORTANT?**
- **Allows after-the-fact confirmation of analysis**

Half Done

WHAT'S WRONG WITH THE RETROSPECTIVE TIAs?

Retrospective TIA

- **RP29R-03 MIP 3.8 and 3.9**
- **Too Hypothetical**
- **Fails to Identify ALL Impacts**
- **Subject to Manipulation**
 - **Accidental**
 - **Intentional**
- **Sensitive to Insertion Order**

WHAT'S WRONG WITH THE RETROSPECTIVE TIAs?

1. Too Hypothetical - One

- **Relies on the baseline schedule and updated schedule**
- **No detailed as-built data**
- **Even if actual durations are used in the fragnet**
- **Predictive aspect may be short-lived due to next update**
- **Predictive analyses do not represent the actual events**

WHAT'S WRONG WITH THE RETROSPECTIVE TIAs?

1. Too Hypothetical - Two

- **Superficial support for TIAs in many court cases – recall Bruner’s comment**
- **TIAs are only appropriate when supported by detailed as-built information and technical support of actual occurrences**
- **This additional requirement, implies that the Contemporaneous Period Analysis (Windows) would be more likely to support a finding of critical path delay**

WHAT'S WRONG WITH THE RETROSPECTIVE TIAs?

1. Too Hypothetical - Three

- **For example, a court rejected a prospective TIA methodology and stated:**
 - ***Even within the terms of Appellant's argument, the insertion of allegedly excusable delays in a CPM contemporaneously with the delay event proves nothing that is critical to this case. ... More importantly, it says nothing regarding succeeding events including subsequent delays. ... Appellant claims that no "concurrent" delays exist, but this is a mere assertion made in the context of this theory....*** [Appeals of Harrison Western Corp.]
- **If the analysis is performed without knowing what actually happened, the value of the analysis is greatly diminished**

WHAT'S WRONG WITH THE RETROSPECTIVE TIAs?

1. Too Hypothetical - Four

- ***If the CPM is to be used to evaluate delay on the project, it must be kept current and must reflect delays as they occur. The [subject] update did not consider delays in work performed prior to the update, nor, obviously, in work that occurred after the update through the date of acceptance of the project by the Corps.***[Fortec Constructors v. U.S.]
- In **Appeal of Ealahan Elect. Co., Inc.**, the Board found the expert's testimony unreliable because he ignored actual project performance.
- In **Sunshine Construction & Engineering, Inc. v. U.S.**, the Court criticized an expert's attempts to break a project into fragments rather than comparing the actual schedule updates with the planned schedule to determine the critical path on the project

WHAT'S WRONG WITH THE RETROSPECTIVE TIAs?

1. Too Hypothetical - Five

- In one case, a CAB held that when the CPM schedule must reflect actual conditions:
 - *It is essential that any changes in the work and time extensions due to the contractor be incorporated into the progress analysis concurrently with the performance of the changes or immediately after the delay and thus integrated into the periodic computer runs to reflect the effect on the critical path. Otherwise, the critical path chart produced by the computer will not reflect the current status of the work performed or the actual progress being attained. [Continental Consolidated Corp]*
- Therefore, the criticism of TIAs is that they rely on forward looking CPM schedules that may not reflect actual events. It is a hypothetical analysis.

WHAT'S WRONG WITH THE RETROSPECTIVE TIAs?

2. Fails to Identify ALL Impacts - One

- **Retrospective TIA relies on expert analysis**
- **All impact events.**
- **Some Easy to identify**
 - **Change Orders**
 - **Work stoppages**
- **Some have no explicit event**
 - **Productivity**
 - **Out-of-sequence**
- **Without a fragnet can't be modeled**

WHAT'S WRONG WITH THE RETROSPECTIVE TIAs?

2. Fails to Identify ALL Impacts - Two

- **Impacts that are not included in the fragnet are excluded**
- **At any moment of recalculation, any yet-to-be-inserted impacts are not represented.**
- **It could be argued that this represents actual project management conditions where future impacts and events are unknown, but this is seldom true. The usual condition is that project managers know many of the impacts before the start date indicated in the fragnet.**

WHAT'S WRONG WITH THE RETROSPECTIVE TIAs?

3. Subject to Manipulation - One

- **All forensic delay methodologies can be manipulated.**
- **TIA is particularly prone to this manipulation because**
 - **More expert decision-intensive**
 - **More opaque to analysis**
 - **Seemingly scientific**

WHAT'S WRONG WITH THE RETROSPECTIVE TIAs?

3. Subject to Manipulation - Two

- **Unintentional manipulation**
 - **Unconscious**
 - **Ignorant inclusion exclusion of critical elements in the analysis**
- **Tremendous opportunity for mistakes or decision-driven assignments of dates, logic, duration, and update insertion points when creating the fragnet**
- **Even the best analysts may bring a certain pro-client interpretative bias**
- **Simple magnitude of decision made in the analytical process can create unintended mistakes**

WHAT'S WRONG WITH THE RETROSPECTIVE TIAs?

3. Subject to Manipulation - Three

- **Intentional manipulation**
 - **TIA methodology is not alone in its decision-intensive analysis, but...**
 - **A significant aspect of this extensive decision process is that it can often remain hidden**
 - **Buried in detailed back-up analysis supporting the basis of the fragnet**
 - **Other methodology decisions are more evident**
- **Underlying data reliability**
 - **Require accurate updates**
 - **If the contractor attempts to depict the future critical path in update any TIA will be incorrect**

WHAT'S WRONG WITH THE RETROSPECTIVE TIAs?

3. Subject to Manipulation - Four

- **Perceived apparent scientific nature**
- **Appear more reasoned and supportable**
- **TIAs hard to explain**
- **Befuddle experienced lawyers, arbitrators, and judges**
- **Confuse/deceive opposing expert**

WHAT'S WRONG WITH THE RETROSPECTIVE TIAs?

4. Sensitive to Insertion Order

- **Fragnets should be inserted chronologically**
- **In the order they occurred.**
- **Often difficult to identify when they occurred**
- **Longer impact fragnets can create a “shadow” that hides other fragnets**
- **Overall results for any particular month could be significantly changed by the insertion order.**

ALTERNATIVES TO RETROSPECTIVE TIAs

General

- **All FSA methodologies have shortcomings**
- **There is no one best methodology for every situation**
- **No best alternative to a TIA for every situation**
- **Some alternatives that overcome some of the problems with TIAs but have their own disadvantages**

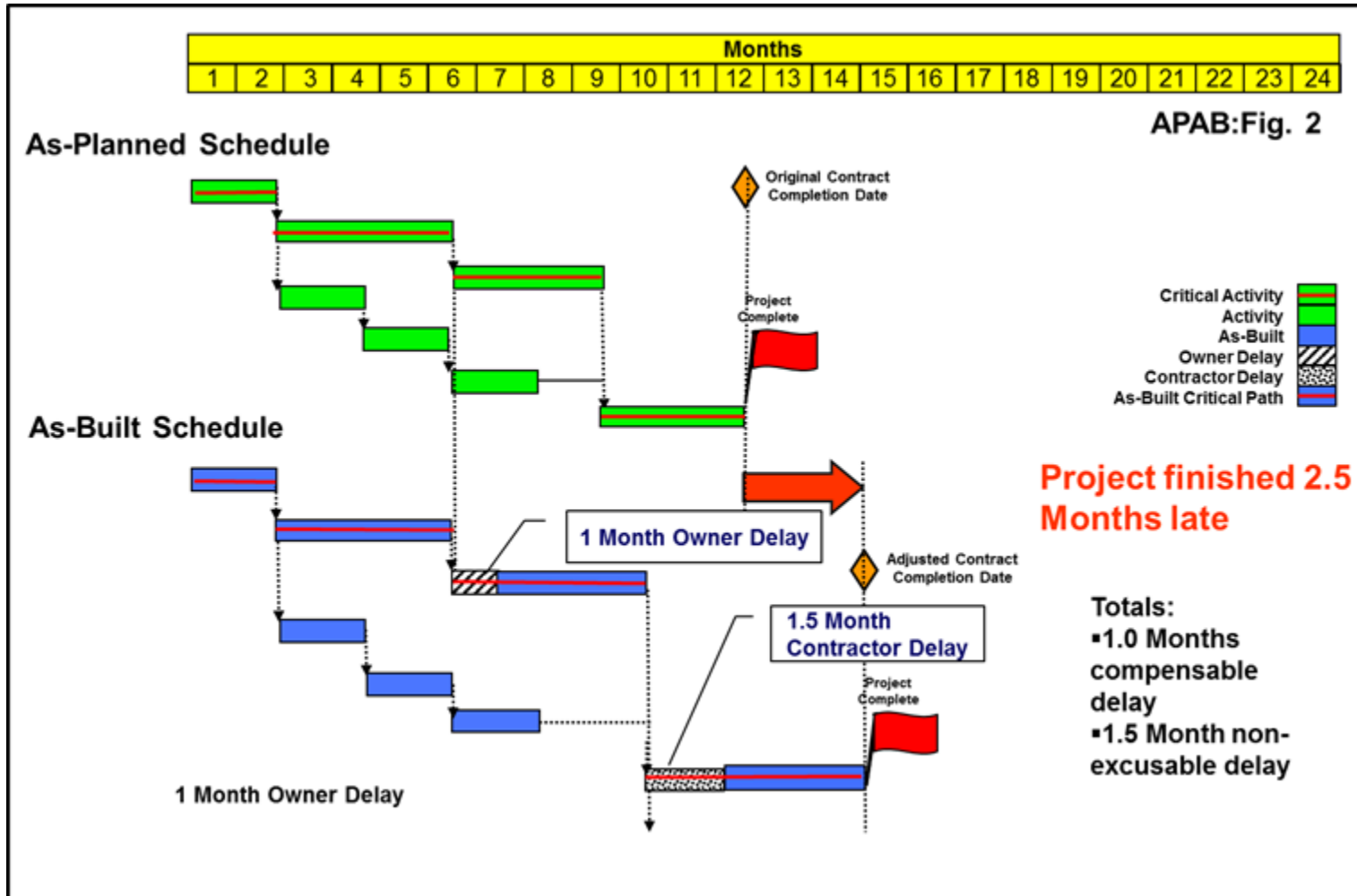
ALTERNATIVES TO RETROSPECTIVE TIAs

As-Planned v As-Built - One

- **RP29R-03 MIP 3.1 and 3.2**
- In 2008 I argued that a sophisticated variation of the As-Planned vs As-Built (APAB) was the best alternative
- I believe this is still true
- An APAB that reviews the actual occurrences on a daily basis and compares that to the planned schedule can provide a sophisticated and supportable analysis of the as-built critical path.
- **Daily Delay Measure (DDM)**

ALTERNATIVES TO RETROSPECTIVE TIAs

As-Planned v As-Built - Two



ALTERNATIVES TO RETROSPECTIVE TIAs

As-Planned v As-Built - Three

- **Considered too dependent on expert opinion**
- **Not easily reproducible**
- **Fails to reflect changes in logic**
- **Because many projects are in-fact built in a manner significantly different than planned, the ABAP may be suitable in only rare situations**

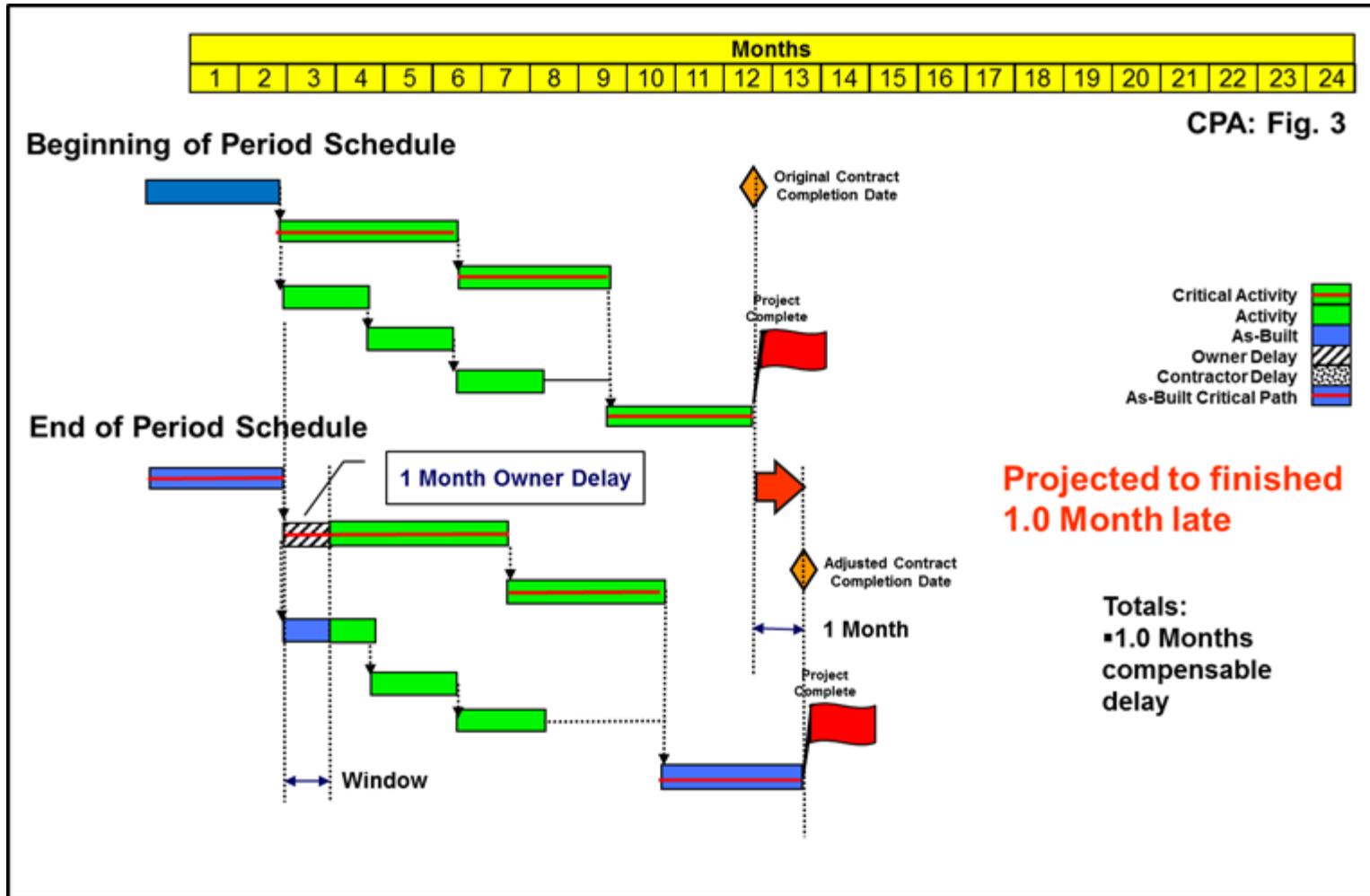
ALTERNATIVES TO RETROSPECTIVE TIAs

Contemporaneous Period Analysis - One

- **RP29R-03 MIP 3.3, 3.4 and 3.5**
- Also known as “Windows”
- Widely used and many experts
- Often viewed as the most accurate methodology
- Details
 - Contemporaneous Period Analysis (CPA)
 - Contemporaneous schedule updates
 - Compares beginning of the month with the end of the month
 - Several variations, including bi-furcated
 - ~~The size of the time frame is usually one month~~

ALTERNATIVES TO RETROSPECTIVE TIAs

Contemporaneous Period Analysis - Two



ALTERNATIVES TO RETROSPECTIVE TIAs

Contemporaneous Period Analysis - Three

- **RP29R-03 recognizes three forms of CPA**
 - **Regular**
 - **Bi-Furcated**
 - **Reconstructed**
- **Courts and practitioners recognize the CPA method because of its use of contemporaneously unaltered or modeled CPM schedules**

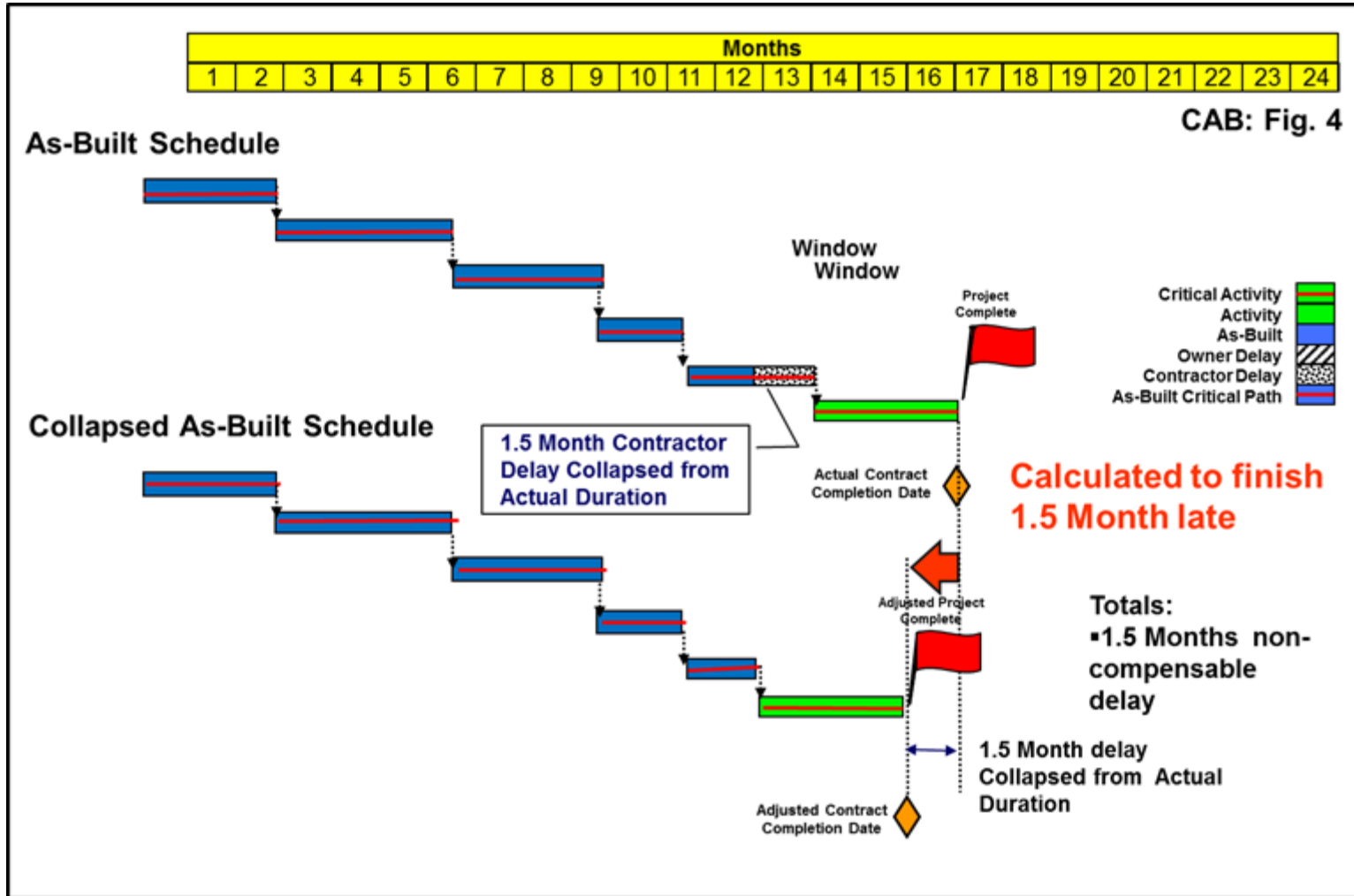
ALTERNATIVES TO RETROSPECTIVE TIAs

Collapsed As-Built (CAB) - One

- **RP29R-03 MIP 3.8 and 3.9**
- Also known as the “but-for” analysis
- Details:
 - Starts with the development of an accurate as-built schedule.
 - Develops implied logic for CPM - mimic, as closely as possible, the CPM logic and durations that would have been used to build the project.
 - Delete selected delay activities
 - Identified as the responsibility of the opposing party
- Recalculates the schedule

ALTERNATIVES TO RETROSPECTIVE TIAs

Collapsed As-Built (CAB) - Two



ALTERNATIVES TO RETROSPECTIVE TIAs

Collapsed As-Built (CAB) - Two

- **Single step or Periodic**
- **One party's delays remain**
- **Difficult and time-consuming to perform**
- **Not accepted well by courts**

CONCLUSION

TIAs – The Upside

- **Incredibly useful tool for schedule analysis**
- **Recognized by Courts**
- **Common prospective tool**
- **Quantifies acceleration**

CONCLUSION

TIAs – The Downside - One

- **TIAs have the illusion of being scientific and computer driven**
- **Subject to the vagaries of expert opinion**
- **Can hide manipulation**
- **Fragnets are complicated**
- **Detailed and fully functional baseline schedule and updates**
- **If Analytical modifications needed – even more problematic**
- **The critical path generated is always a projection and may not accurately reflect the actual events on the project**

CONCLUSION

TIAs – The Downside - Two

- **The alternative FSA methodologies each have their own disadvantages, some of which are shared with TIAs.**
- **Therefore, it is in the best interest of the expert to always use the most appropriate methodology for the given set of facts and never “default” into a retrospective TIA just because the contractor used Prospective TIAs during the job.**

QUESTIONS?

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