Chapter

35

Other Claim Methods

The methodologies for analysis of responsibility for delays and disruptions discussed in Chapters 33 and 34 are recommended by the authors, but they are not the only methods that have been successfully presented in a mediation or litigation setting. A compilation of many of the other delay claim methodologies that have been used in one setting or another was published by a committee of the Association for the Advancement of Cost Engineering, International (AACEi) in 2007, and it continues to be refined by that committee on an ongoing basis. The compilation was published under the nomenclature of 29RP-03, or "Recommended Practice #29 of AACEi." However, as indicated even in the comments of its editors, it is not intended to be a recommended practice or even an endorsement of the committee on the efficacy or appropriateness of any of the methods listed.

Numerous articles and presentations on these topics have been promulgated by this and other professional associations such as the American Society of Civil Engineers (ASCE), Construction Management Association of America (CMAA), and National Society of Professional Engineers (NSPE); a similar, if not larger, number of such associations have been provided by the American Bar Association Forum for Construction and various state and local bar associations.

A common thread among all these groups is to catalog the various methodologies used with special note of in what forum a particular methodology has been presented in the past and with what result. While such information may be very useful, it is extraneous to the question of which method is, in fact, most accurate in determining causes and responsibilities for delay. Stated perhaps less politely, the fact that in some small village, and many years ago, the expert whose analysis was based upon the readings found on the entrails of a goat prevailed over an expert consulting the skull of an ancestor is useful information, but not a proper basis for endorsement by a committee of a technical association, and certainly not for inclusion as a preferred means and method endorsed by this text. But perhaps more to the point, the question is not whether a forensic method has weathered the test of time, but rather whether a better forensic method has been developed and whether this new model has withstood peer review.

There are numerous methodologies for calculating or claiming responsibility for the delays to a project. Even if all are faithfully and honestly performed, there can be only one correct answer. At the end of the day, the educated fact finder must choose. The authors of this text believe that the methodologies discussed in Chapters 33 and 34 (on delay analysis and disruption analysis) are more likely than the others discussed in this chapter to be used to reach an unbiased and honest conclusion as to responsibility for the costs associated with these occurrences. And despite some level of authorship of these means, should a more accurate methodology be demonstrated, such would readily be incorporated into this text.

This has in fact occurred with substantive changes incorporated after peer review of "our" method by the authors and editors of the AACEi 29RP-03 and SEI publications. These publications describe various methods that already have been favorably received in a court or other resolution venue, have excellent material on the necessary verification of data used in any analysis (including as described in Chapter ?, and have best practices on how to parse data and perform an analysis. They do not, however, go beyond to test the mathematics and create new analyses to improve upon those methods previously reported.

This will happen, sooner or later, and preferably sooner. The advances of computing, including capabilities of concurrent processing with multicore CPUs and quantum computing, along with the advances (and mainstream recognition) of statistical and risk analysis merged with the basic CPM algorithms, will lead to yet better methodologies for determination of responsibility for delay and disruption.

This text is referenced in many specifications as authoritative on the development and use of CPM, especially (but not exclusively) as used in the construction industry. Thus, to the extent that such specifications suggest a differing method for determination of responsibility for delay and disruption, an inconsistency arises.

35.1 *Frye* versus *Daubert*

The various technical associations reviewing methodologies for forensic determination of responsibility for delays to projects tend to focus upon methodologies that have been tested in court. This is perhaps reasonable on two levels. First, a practitioner desires a methodology that "works." Whether the methodology is correct is often a secondary consideration. Second, the committees of such associations that are usually charged with the task are in fact composed largely of very practical forensic experts and attorneys.

Theorists and college professors tend to congregate in other committees. The "collaborative" peer review process tends to discourage dissenters, and a committee chair may well lament that it is far easier to recruit another member to the committee who desires to showcase his novel or proprietary method than to recruit members to subject these to a test-to-destruction review.

The tendency of the courts to accept what has been acceptable in the past only exacerbates this tendency. The traditional test of whether an expert may opine, using any methodology, has been that of *Frye v. United States*, 293 F. 1013 (DC Cir. 1923). The standard set by *Frye* is that an expert may testify if his or her proffered methodology has been "generally accepted" by a meaningful segment of the associated scientific community. Therefore, the fact that a proposed expert has presented a new methodology to a number of technical associations and other forums may help get acceptance by a court. The gold ring is taken once it is admitted to any court, for then most other courts will note the "general acceptance" that such entails. Perhaps a close second is the listing of a methodology as officially recognized by an established national technical society.

Such general acceptance does not guarantee that the methodology is correct. For example, at the trial of Galileo, the generally accepted wisdom and consensus of the academic community were that the sun revolves around the earth. By the late 1980s, public sentiment had begun to question the wisdom of accepting experts and their testimony based upon the mere fact that previous courts had accepted such. The change came in the early 1990s, epitomized by the case of *Daubert v. Merrell Dow Pharmaceuticals*, 509 U.S. 579 (1993). The new standard of the federal courts, and an increasing number of state courts, is that the judges, as "gatekeepers" of what evidence may be presented in their courts, must for each case independently ascertain if the proffered methodology is sound. Thus, in these courts, it is the duty of the judge to review *in limine* (or out of the hearing of the jury) the validity of the proffered methodology. Acceptance by one court is by itself not a basis for acceptance by another and may constitute reversible error. To quote one judge, when questioned on how he could reject an expert admitted to and having testified in 50-some other trials, "I am not responsible for the errors of my brethren." Similarly, rejection by one court, although persuasive, is similarly not a basis for rejection by another—the promoter may be better able to explain the methodology this time.

The *Daubert* standard places a premium on the proposed expert to explain in lay terms to a judge, who has probably had little technical training in mathematics or the sciences, how each methodology works, why one should be admitted and the other not admitted. Once again, reference to endorsement by a technical association, a text, a professor, or another expert accepted by this court or acceptance of this expert in another court is not sufficient, and sole reliance thereon may be the basis for appeal.

35.2 AACEi 29RP-03

The compilation of the Association for the Advancement of Cost Engineering International (AACEi) 29RP-03 discusses and categorizes many of the numerous methodologies to ascertain and/or assign responsibility for delay to a project that have been presented in one forum or another. 29RP-03 begins by correctly noting that each of the names of methodologies presented by various experts has different meanings to other experts, and that one methodology may be known by several names.

For example, the label "time impact analysis" is noted as having been used to describe 7 of the 13 methodologies cataloged by 29RP-03. "Window analysis" is similarly noted as having been used to describe 5 of the 13 methodologies cataloged. (These 13 methodologies are then combined into eight method implementation protocols (MIPs) that are further discussed in this 105-page document.) Note that the methodologies suggested in this text—time impact evaluation, zeroing out to a collapsed as-impacted logic network, and window analysis (as defined in this text)—are not included in the compilation of 29RP-03, despite having been published since 1984 (or, for the Windows approach, 1993) and having been tested in many, many courts and other fact-finding venues by a great number of practitioners.

Also note that although 29RP-03 states that 5 of the 13 methods reported may be called a "window analysis" by some practitioners, none of these appear to be what the authors of this text consider to be such an analysis, or even a variation thereof. The authors of this text have seen many variations of the window approach over the years and have attempted to consolidate the best features of each into the model espoused in this edition (and prior editions) of the text. The hallmark, or common feature, of these window analyses is provided below (methods observed but not endorsed by the authors of this text in [brackets]). Additional comments are provided as footnotes on this page.

The original as-planned logic is updated to [about] the date of the first [significant] causative event, then impacted with that event, with such impact being recorded.[1] The now impacted update is then again updated to the next causative event and the process repeated, until the end of the project is reached.[2] If a large number of causative events have occurred, some practitioners will choose "significant" incidents only. Or all may be included setting individual windows to incorporate any number from one month to the

[1]Some practitioners next modify the logic of the impacted update to include known changes in the plan, perhaps from contemporaneous updates or other sources. The authors of this text permit changes to the logic only if pursuant to a mutually agreed and uncoerced change order or constructive change order clearly indicating the party's intent to voluntarily abandon the pre-existing plan.

[2]Several methods utilize incorporation of significant events to the next submitted and approved "update." The update may also be mixed with a revision to show actual logic followed in the past period, or to incorporate revised logic indicating a new and possibly short-term direction.

next, or from one "more significant" incident to the next. In such situations, practitioners may choose to utilize some form of the zeroing out procedure outlined in Section 36.12 or 36.17.

As noted, variations on this procedure are endless. One example is the varying means to deal with assignment of remaining durations to started-not-completed activities of reconstructed updates (between the officially submitted updates) which may coincide with the date of a new causative event. (The point of window analysis is to see the impact of the incident to the project on the day it occurred, not 2 weeks before or after). In any meeting of three practitioners, all of whom agree with the base definition above, there will be at least four variations suggested. Unfortunately, the correct answer is neither a collaborative effort nor subject to a vote, and may become apparent only after repeated use and destructive testing of each model espoused.

29RP-03 first splits these many methodologies into prospective and retrospective, then suggesting that prospective models "may not evolve into a forensic context." The authors of this text disagree, suggesting that a "what if this continues" or "potential impact of this change order" analysis may well be the basis for award by a dispute resolution board (DRB) during the course of a project and may certainly be used to persuade more amicable resolution between the parties in a less formal context.

The next split is between observational and modeled methodologies. The definition and examples are provided in Figure 35.2.1. The opinion of the authors of this text is that the observational methodologies are not based upon CPM (which is based upon analysis) even if the bar charts used in the analysis were created by CPM software or represent a static picture printed from CPM software during the course of the project. This is akin to comparing the steel design drawings for two buildings, one which stands and the other which failed, observing that the steel in the former is more robust and reaching the conclusion that the failure must therefore be due to inadequate

1. Observational

The observational method consists of analyzing the schedule by examining a schedule, by itself or in comparison with another, without the analyst making any changes to the schedule to simulate a certain scenario.

Contemporaneous period analysis and As Built versus As Planned are common examples that fall under the observational basic method.

2. Modeled

Unlike the observational method, the modeled method calls for intervention by the analyst beyond mere observation. In preparing a modeled analysis the analyst inserts or extracts activities representing delay events from a CPM network and compares the calculated results of the "before" and "after" states.

Common examples of the modeled method are the collapsed As-Built, time impact analysis and the impacted As-Planned.

Figure 35.2.1 Division of methodologies into observational and modeled from 29RP-03 25JUN07, p. 12.

design (rather than perhaps poor installation or other causes). Observation of the steel design, without a structural analysis, proves nothing. Placement of the opposing experts in a clearing, each armed with a stave of wood or a dueling pistol, and seeing who emerges as a means of fact finding is probably no better or worse than these observational methodologies.

While it is certain that some courts may still accept such a presentation, the lack of analysis provided by these methods should not survive a *Daubert* review, and acceptance by a court may, in federal court and many states, constitute reversible error. On the other hand, if the value of an adverse judgment does not warrant the additional expense of an appeal, or the value of the claim does not warrant the cost of a proper analysis, these are methods that have been and are being submitted to various tribunals and often with success.

Next, 29RP-03 divides the retrospective methodologies cataloged into 13 groups, discussed in eight MIPs as noted above. Figures 35.2.2 and 35.2.3 provide the details of this classification. By dismissing the first five of these (classified as observational), the remaining three may be loosely described as forms of impacted as-planned, impacted updates, and collapsed as-built logic. As discussed in Chapter 36, the impacted as-planned methodology, if performed properly, is suggested as the preferred method for determination of possible extension of time to avoid damages for delay (liquidated or otherwise). And it has been used for that purpose (as well as for determining compensable delay) since the early 1960s.

However, as discussed in Section 35.14, it is no longer the suggested or recommended practice (of these authors and many others) for determining compensable delay as the method fails to account for mitigation by the injured party, and perversely may calculate an extension greater than that actually experienced. This situation and possible use thereof in assessment of costs for mitigation or acceleration are also discussed in Section 35.14.

The authors of this text also suggest that the other two "modeled" methodologies presented in 29RP-03 are fatally flawed. The impacted update

Taxonomy	1	RETROSPECTIVE												
	2	OBSERVATIONAL							MODELED					
	3	Static Logic			Dynamic Logic				Additive				Subtractive	
	4	3.1 Gross	3.2 Periodic		Contemporaneous Updates (3.3 As-Is or 3.4 Split)		3.5 Modified/ Reconstructed Updates		3.6 Single Base[2]		3.7 Multi Base[1]		3.8 Single Simulation	
	5		Fixed Periods	Variable Windows	All Periods	Grouped Periods	Fixed Periods	Variable Windows	Global Insertion	Stepped Insertion	Fixed Periods	Variable Windows or Grouped	Global Extraction	Stepped Extraction
Common Names		As Planned versus As-Built		Window Analysis	Contemporaneous Period Analysis, Time Impact Analysis, Window	Contemporaneous Period Analysis, Time Impact Analysis, Window Analysis	Contemporaneous Period Analysis, Time Impact Analysis	Window Analysis, Time Impact Analysis	Impacted As Planned what-if	Time Impact Analysis Impacted As-Planned	Time Impact Analysis	Window Analysis, Impacted As-Planned	Collapsed As-Built	Time Impact Analysis Collapsed As-Built

Footnotes
1. Contemporaneous or Modified/Reconstructed
2. The single base can be the original baseline or an update

Figure 35.2.2 Classification of cataloged methodologies from AACEi, 29RP-03 25JUN07, p. 11.

Method implementation protocols consist of the following:
3.1 Observational/Static/Gross (MIP 3.1)
3.2 Observational/Static/Periodic (MIP 3.2)
3.3 Observational/Dynamic/Contemporaneous As-Is (MIP 3.3)
3.4 Observational/Dynamic/Contemporaneous Split (MIP 3.4)
3.5 Observational/Dynamic/Modified or Recreated (MIP 3.5)
3.6 Modeled/Additive/Single Base (MIP 3.6)
3.7 Modeled/Additive/Multiple Base (MIP 3.7)
3.8 Modeled/Subtractive/Single Simulation (MIP 3.8)

Figure 35.2.3 Detail of 29RP-03 classification of methodologies from AACEi, 29RP-03, 25JUN07, p. 31.

methodology discussed is not much different from the observational contemporaneous period analyses previously dismissed, other than the addition of the same causative events that were used in the impacted as-planned analysis to then observe the impact on an unexplained detour from or modification to the contractor's initial plan of execution. Changes to the as-planned logic, as part of these updates (or rather updates mixed with undocumented revisions), not only are permitted, but also are suggested as the 29RP-03 preferred method. See Figure 35.2.4.

Whether the changes made in the revision (misnamed as an update) are part of an approved change order, or perhaps a contractor's effort to reduce the impact of delays beyond his or her control (constructive change orders) or within her or his control (mitigation) or even to accelerate or pace the work for commercial advantage, is not addressed by this analysis as presented.

Rarely will the causative events line up with the reported updates. Perhaps a combination of this 29RP-03 procedure with that of the contemporaneous split and re-created update observation methods discussed in that document may alleviate some of these issues. However, any methodology that assumes that the actual performance and actions taken in the past period, and revised logic proposed for the future (and probably in an effort to mask or alleviate the impact of past performance), were voluntarily adopted is again not much more than observational, if not totally speculative. For example, consider

> 3.7 is a multiple base method, distinguished from 3.6 as a single base method. The additive simulation is performed on multiple network analysis models representing the plan, typically an update schedule, contemporaneous, modified contemporaneous or recreated. Each base model creates a period or a window of analysis that confines the quantification of delay impact.
>
> Because the updates typically reflect nonprogress revisions, it is a dynamic logic method as opposed to a static logic method.

Figure 35.2.4 29RP-03 definition of an impacted update analysis from AACEi, 29RP-03, 25JUN07, p. 63.

your departmental schedule update, after an upper management directive that you cut 10 percent from your budget, and yet not reduce the quantity, quality, or timeliness of departmental production. Now throw in a change order and determine the impact thereof, using this new schedule.

The collapsed as-built methodology is similarly flawed, as previously discussed in Section 35.7. The logic assigned as to why an activity was planned to start on Tuesday, rather than Monday, simply because it did, is speculative at best. And yet, as the last of the methodologies discussed in 29RP-03, it may (at least inadvertently) be promoted as the best. Figure 35.2.5 includes an excerpt that states the committee's distinction between an as-built schedule and as-built logic network using their terms of "fully progressed CPM" and a "collapsible as-built CPM schedule."

29RP-03 indicates this creation of an as-built logic network as having several common names, including collapsed as-built (CAB), but-for analysis, as-built less delay, and modified as-built. As discussed above, these nomenclatures may have similar meanings to some practitioners and totally differing meanings to others. Should a consultant claim use of a but-for analysis, there is less than an even likelihood that the procedure followed by that consultant will match that provided in 29RP-03. Moreover, as discussed above, use of any variation of an as-built logic methodology for forensic purposes is fatally flawed.

As an example of how an analysis based upon an as-built logic may yield unreliable results, consider Figure 35.2.6 (Figure 5 of 29RP-03). Apparently because there may be an "owner-caused event" which ended about the time that activity "lay pipe" commenced, several important details of the as-built logic have been presumed by this forensic expert. These details may include the following: the reported actual durations to clear, excavate, lay pipe, and backfill are correct; the reported actual durations to clear, excavate, lay pipe, and backfill resemble the durations planned by the project team (or superintendent) when bid or at the start of the project; the contractor intended to wait until excavation was 100 percent complete before beginning the laying

> The fundamental difference between a fully progressed CPM and a collapsible As-Built CPM schedule is in the schedule logic. The fully progressed CPM schedule can graphically illustrate the As-Built condition using the actual start and actual finish dates assigned to each schedule activity. However, the schedule cannot be used for calculation because it has been fully progressed. Therefore the activity duration (OD) and the logic ties are no longer controlling the network calculation. On the other hand, the collapsible As-Built is a CPM model of the As-Built condition. The schedule logic is revised by assigning actual durations to the activities and tying them together with actual relationships so that the actual start and the actual finish dates are simulated in the schedule as calculated start and finish dates. For a step-by-step procedure please refer to MIP 3.8.

Figure 35.2.5 The 29RP-03 definition of a collapsible as-built analysis from AACEi, 29RP-03, 25JUN07, p. 25.

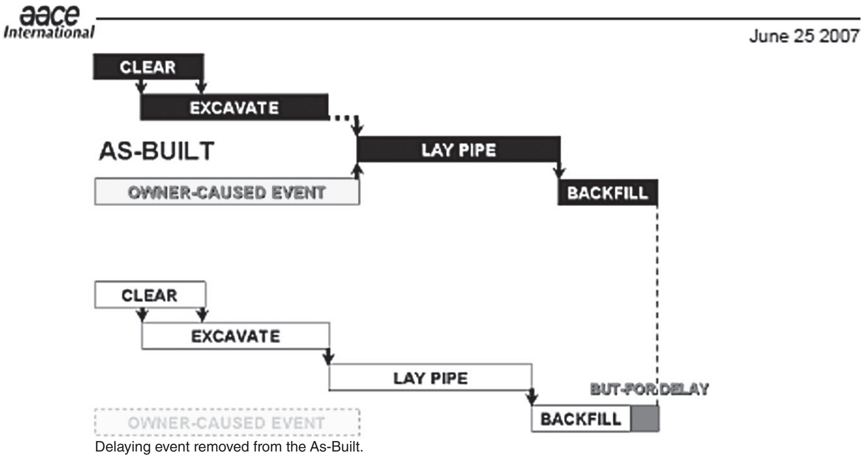

Figure 35.2.6 An 29RP-03 example of a collapsed as-built analysis from AACEi, 29RP-03, 25JUN07, p. 59.

of pipe; and other causative events occurring during this period did not have an impact upon the critical path.

A further comment should be made about the reported actual dates. Examples of other methodologies provided in 29RP-03 which are based upon a pre-existing as-planned logic all depict a logic of clear, then excavate. This methodology, retrospectively creating a logic network from the "reported actual dates," indicates the two as overlapped. As noted in Chapter 25 on updating the schedule, field personnel often misreport an opportunistic perfunctory and provisional false start as an actual start with associated progress. Thus, while clearing and removing several large trees, "excavation" of the roots thereof may have been the sole work now attributed to excavation, this all leading the expert to retrospectively presume that the contractor had an expectation of overlapping excavation with clearing while achieving a degree of productivity.

To return to this example, the truth of the situation may have been far different. The expert for the owner may well claim the following: excavation was estimated to, and should not have taken any longer than, the clearing activity; excavation did take longer because the contractor pulled equipment off the job for several days before returning to complete this activity (as supported by daily logs, photos, etc.); the contractor initially planned to start laying pipe when excavation was 50 percent complete (as supported by bid documents and the initial schedule (CPM or bar chart) submitted at the preconstruction conference), and pipe was delivered late and not until the day before the "Lay Pipe" activity actually started.

Other factors that should be part of an analysis may include: the "owner-caused event" was the late response to an RFI, the owner knew the response to the RFI was not needed until the pipe was delivered, the contractor now claims it chose not to deliver the pipe (requiring double handling for storage and risk of damage) until the RFI was resolved.

It is possible that determination of WHY the installation of the pipe was delayed may become an ultimate decision of fact that must be determined by the judge or jury and may not even be a matter of speculative testimony by an expert. Faced with the competing "pictures" painted by the two experts preparing competing "as-built logic networks," a court may well throw up its hands, as in *United States vs. Citizens and Southern National Bank*, 367 F. 2d 473 (1966), and throw out the two competing claims, as discussed in Chapter 33 on Delay Analysis.

A perhaps even more serious issue with a document labeled as a recommended practice is the detailed instructions provided for preparation of a collapsible as-built CPM schedule. At 29RP-03 MIP 3.8 K 2 (page 72 of 105, et seq.), it is specified that the entire analysis shall be performed using a 7-day (no holiday) calendar. An activity actually starting on a Friday and finishing on Monday is to be assigned a 4-day duration for all subsequent analyses. For a Thanksgiving weekend, this 2-day activity would be recorded as having been planned to take 6 days. Anomalies caused when work is shifted to midweek by subtraction of a listed causative event are dismissed as "the system tends to balance itself out." This may be true in a macro view of total job length, but is certain to cause serious issues with tying observed behavior caused by such causative events to the job diaries, logs, and photos. The 4-day discrepancy, when costed at $12,000 per day as L/D's, may well exceed the expert's fee.

Figure 35.2.7 (Figure 6 of 29RP-03) displays the instructions for conversion from a provided as-planned logic network and schedule (presumably submitted and approved) to the as-built logic network and schedule to be used for the CAB analysis. The two activities of the example are not named; for purposes of this discussion we will call such Activities A and B. It is noted that the reported actual finish for A is 1/5/95, rather than the planned early finish of 1/4/95. It is also noted that the reported actual start of B is 1/4/95, rather than the planned early start of 1/5/95. Because these two date anomalies have been reported, it is to be assumed that the contractor actually planned to overlap the two activities, and the Finish-to-Start restraint between them should now be replaced by a Start-to-Start restraint with a three-day lag. How many of the principles of this text have been violated by this instruction is hard to say. The reporting of the dates, rather than the dates themselves, are most likely an anomaly. As crews planned to start work on B, they may have reported an actual start for preparatory work prior to actually beginning production. Similarly, crews finishing on A may well have reported the

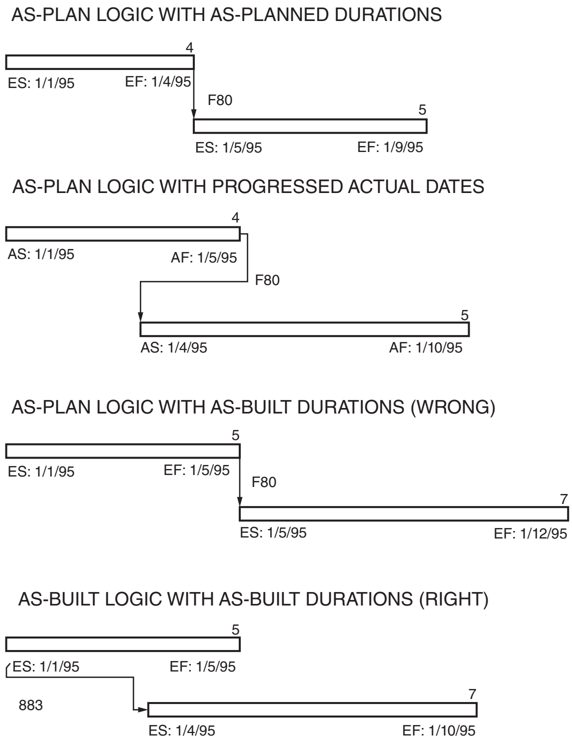

Figure 35.2.7 29RP-03 Conversion of as-planned to as-built logic from AACEi 29RP-03 25JUN07 Page 72 of 105.

cleanup efforts rather than the need to continue progress through the next day. The tendency for such misreporting is noted in Sections 10.1 of this text.

The replacement of a Finish-to-Start with a Start-to-Start restraint with lag is also very troubling. As noted in Section 11.1 of this text, the default (if not only) interpretation of an SS3 lag by available commercial software is to schedule Activity B to start 3 days after the reported start date of A, rather than when after 3 days of A have been reported performed (as in Original Duration – Remaining Duration = 3). So if after this conversion, opposing counsel should question what would be the impact of a new causative event stopping work on A on 1/3/15, the expert using this model could blithely say, and demonstrate, "no impact." Also note that such a new causative event disrupting completion of A would have not further impact on any activities in the network as the finish of A has now been effectively orphaned from the rest of the project.

But perhaps the strongest drawback to this "recommended practice" is the laugh factor. If the original as-planned logic submitted shows this 5-day A to be followed by B, it is unlikely that any project superintendent would voluntarily choose to overlap the two activities to this extent without some strong reason. An expert using this "recommended practice" may well open him- or herself up to ridicule or even professional discipline.

Despite criticism in this section of some portions of 29RP-03, this 137-page review of many of the methods that have been used for analysis (or at least argument) of responsibility for delays to a project should be read by any scheduler who expects to testify in such a case. Much of the work, especially in Section 2 on source validation, is similar to, or even goes beyond, what is covered in this text.

The key issue remains that 29RP-03 discusses some of the methods that may have been accepted in some venues rather than noting which may have been rejected in some venue, and then providing an analytical review to determine why. The RP acknowledges "[b]ecause individuals generally work for one party to a dispute, there is often skepticism about the impartiality of the particular methodology chosen." It is the hope of this text to promulgate a standard methodology which to the greatest extent is party neutral.

35.3 Comparison of Three Methods for John Doe Project

A comparison of the various methods utilizing the John Doe project may be instructive. Figure 35.3.1 is shown with the addition of noting the impact of the two causative events (late delivery of the well pump and late delivery of steel) to the project, as well as to the fragnet. Thus two diamonds are shown above concluding Event 80, showing the combined impact of both to day 321 (rather than early completion to day 286.) If this is zeroed-out, only 27 days (rather than the full 35) would be attributed to the late steel; the next driving path would be to the late well pump which is responsible for 8 days delay; and finally then to NTP.

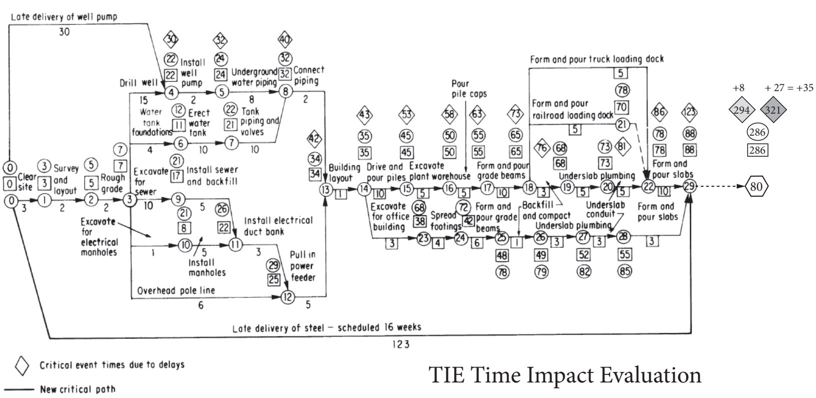

Figure 35.3.1 Time-scaled network drawing showing steel delay, TIE analysis.

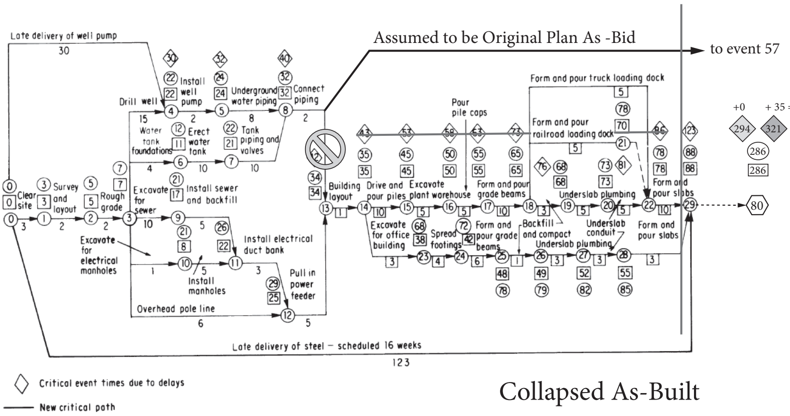

Figure 35.3.2 Collapsed as-built (but-for) analysis.

In Figure 35.3.2, the as-built logic schedule shows that the activity "Connect Piping" was actually succeeded by Event 57, rather than Event 8, and thus attributes the entire delay to the late steel. Thus, this would be the preferred method to promote to a court if the contract was subjected to early changes and disruptions by the expert's client, while later causative events are attributed to the other side. An unscrupulous owner placing knowingly incomplete contract drawings for bid and anticipating many change orders early in the project may choose to specify this methodology. One may hope the court notes the inherent dishonesty of such an approach.

In Figures 35.3.3, 35.3.4 and 35.3.5, the window technique (at least as so defined by the authors of this text) is demonstrated, starting with

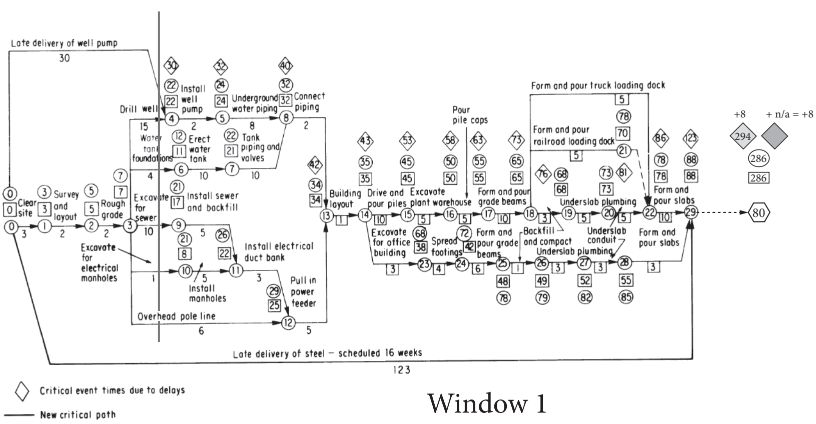

Figure 35.3.3 Window analysis, Window 1.

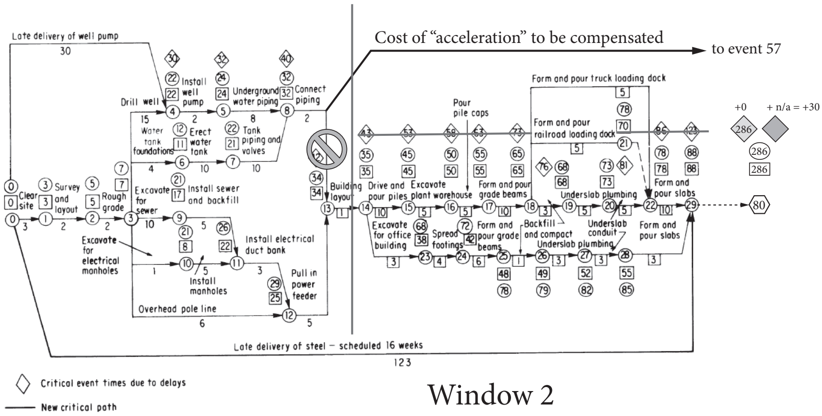

Figure 35.3.4 Window analysis, Window 2.

Window 1 being the application of the first causative event (the late well pump) causing a delay of 8 days. Window 2 shows the second event, the declared constructive change order (at a price to be determined) for deciding to connect the piping after the erection of the building, rather than before, and thus bringing the project back on schedule. Finally, Window 3 shows the impact of the late steel to the new "delayed but mitigated" schedule.

Finally we should note an alternate scenario, shown in Figure 35.3.6. If the well pump delay may be attributed to the contractor and the steel delay to the owner, but notice of the late steel delivery was communicated prior to the actual date of delivery of the well pump, the contractor had no need

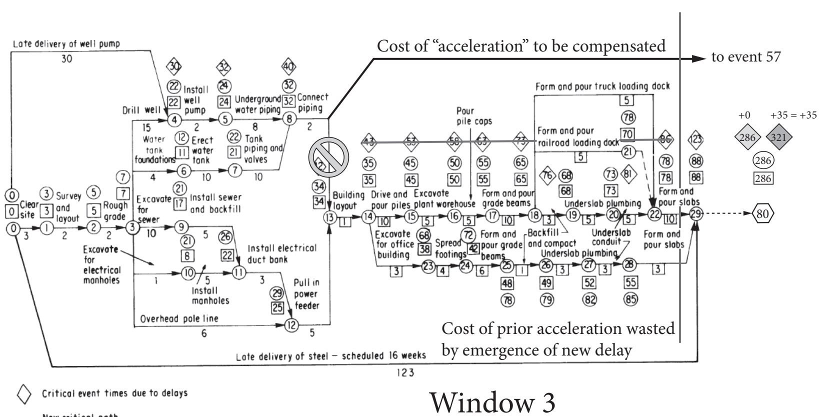

Figure 35.3.5 Window analysis, Window 3.

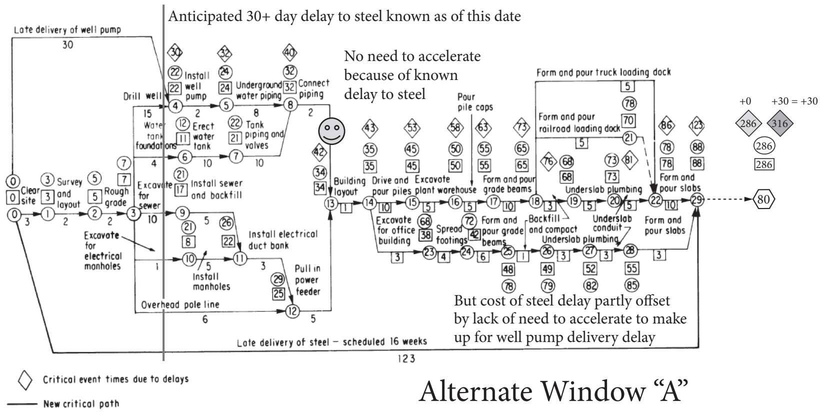

Figure 35.3.6 Window analysis, Window 1, alternate A.

to choose the more expensive alternative to avoid responsibility for 8 days of delay to the project. It is important to note that causative events include such provision of notice to provide the other party the ability to mitigate or pace its work accordingly.

35.4 Evolve or Die

Many of the approaches noted in 29RP-03 have been successfully used by experts in one court or another. And many of the methodologies derided by both the committee providing 29RP-03 and the authors of this text were at one time preferred. Two reasons for this are (1) the tradition prior to *Daubert* of blind acceptance of an older technology that had previously been accepted by a court and (2) the rapidity of improvement of analysis with the growth of computers in the past 50 years since the development of CPM.

Previously noted was the speed with which courts embraced CPM analyses over bar charts. But the CPMs of the 1950s and 1960s were typically run on large mainframe computers, often limited to one run per night (in non-prime-time mode) and at great expense. The TIE methodology noted in this text and several similar but perhaps more proprietary ones (and which might be claimed by their proponents to be capable of performance only by their firms) were developed in this environment. The development of the personal computer and rapid increase in the computing power of these devices permitted greater analysis to be brought to bear on delay claim investigations.

And so the ability of multiple calculations of the CPM at reasonable prices led to the development and implementation of window analyses. As a result, the TIE analysis, previously accepted by so many courts, was immediately understood by leading practitioners to now have flaws in determining and proving claims for extended overhead. It is almost serendipitous that the old TIE methodology was found to remain a viable and accurate tool for determining relief from damages (liquidated or otherwise).

And what of tomorrow? Most, if not all, knowledgeable practitioners will agree that a delay to an activity having 1 day of float (on a 3-year-long project) should be construed to be concurrent with one that is on the critical path. Reasonable controversy may exist if the near-critical path has 2, 5, or 10 days' float. There may even be instances where one party's pacing (deliberately deferring work) to the known (and hopefully properly noticed in writing) delay of the other party may now overrun by 1, 2, or more days, thus technically making less important work appear to be on the critical path. Thus, the concept of a near-critical path being a factor in an analysis is understood.

Software products such as Pertmaster, OpenPlan, Risk+, and Monte Carlo, while previously niche products, are becoming better known. All compute the likelihood of an alternate critical path, rather than merely a near-critical path. An alternate path having 30 or even 60 days of float in the deterministic CPM model, this path consisting of a number of activities with a high correlation (which means when one is late, they are all likely to be late), may be calculated to have up to a 49 percent likelihood of becoming the new critical path.

As these software products become more mainstream, and as new methodologies are developed to harness them in analyses of delays, what will the future *Daubert* judge say about our current windows methodology?

35.5 The 50 Ways

The compilation of methods that have been submitted to a court (or other fact-finding body) extends far beyond those included in AACEi's 29RP-03. To suggest that there may be 50 methods to perform a delay analysis is a gross understatement. The myriad variations submitted to various courts. claimed to be a "window analysis," are but one group. Defining exactly what the term "window analysis" entails does provide a service to the industry in avoidance of miscommunication and misunderstandings. For example, a specification requiring a contractor to submit with its claim a "window analysis" has been rendered almost meaningless by 29RP-03's myriad definitions of the term.

What is required, then, is either a commonly agreed taxonomy (which is unlikely, given the disagreements within and between the technical associations) or a more detailed reference, such as the "window analysis method as provided in *CPM in Construction Management*, 8th edition." Note that the reference is merely requiring that the contractor submit such an analysis, and does not attempt to tell the parties, or presume to dictate to the court, what is the ultimate means of determining the truth. A contract clause dictating exactly "what" form of analysis shall be conclusive may be enforced by a judge; or if a judge can be convinced that such method was chosen with the intent to deceive the fact finder, it may backfire spectacularly.

For example, directing a court to use a window analysis for determination of relief from liquidated damages would be wrong. It would improperly penalize the contractor who voluntarily accelerated.

The proper type of analysis in this situation is a TIE, or time impact evaluation. Since such mitigation cannot be held against the contractor, at law (and despite anything that may be written into a specification) such language may be construed by a court to be overreaching.

And where a court has previously ruled that a specific methodology is lacking, such as in the 1972 Appeal of Minmar Builders, Inc. discussed in the historical information on legal recognition of CPM in Section 3.3, the court may be less than enthused with the rebranding of a "bar chart analysis" with an "observational analysis of bar charts created by static screen printouts of an as-planned versus as-built CPM analysis."

Compilations of various methods, such as 29RP-03, may also improperly encourage practitioners to try one method, and then another, until achieving the desired result. Therefore, it is suggested that the practitioner research the various methods available, choosing the one most likely to calculate the correct (if not desired) result, and lock into that one method, avoiding such temptations. To quote from the refrain, "Just drop off the key, Lee, and get yourself free."

Minimization of subjective bias and maximizing reproducibility of results should be high on the list of criteria for such a decision. Knowledge of other methods, such as cataloged in 29RP-03, may be useful, and where presented with other methods by experts on "the other side," it may be useful to then run "alternate" conclusions, applying differing biases and freely noting the errors of such methodologies. But being able to testify consistently (even where alternate methods may render a better result) should convey quite a bit more credibility.

35.6 Summary of Other Delay Claim Methodologies

There are numerous other methodologies for calculating or claiming responsibility for the delays to a project. A number of these predate the invention of CPM. Since the development of CPM, various methods have evolved as computers have become more powerful and capable of supporting more detailed (and we hope more accurate) analyses. A similar development has evolved in the court system which had previously favored old-but-tried methods, but now increasingly demands these old methods be tested against the newer methods. This is characterized as the evolution from the standard of *Frye* to that of *Daubert*.

The AACEi compilation 29RP-03 is deemed by the authors of this text to document a number of, but clearly not all, methodologies that have been used in one trial setting or another. 29RP-03 does provide a number of tips to practitioners on source validation and on providing the operating parameters of a number of methodologies purported to have been accepted in at least one forum. However, the authors of this text believe that none of these approaches, as provided in 29RP-03, should pass a *Daubert* review.

Moreover, the authors foresee the day when the methodologies provided in this text will similarly fail when compared to new analyses powered by more powerful analytical tools.