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CONSTRUCTION LEGAL EDGE

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ARTICLES CONTAINED IN THIS ISSUE OF THE CLE:

Superior Court of PA Again Calls on Legislature to Amend Workers' Compensation Law to Permit an Injured Employee of a Subcontractor to Recover Damages Against a General Contractor

The immunity provided a statutory employer who does not pay workers' compensation benefits has been affirmed but assailed by a panel of the Superior Court in Doman v. Atlas America, Inc., 2016 PA Super 233 (Pa. Super. October 27, 2016). Rock Doman was killed as a result of a blow-out at an oil and gas drilling site in Fayette County, Pennsylvania. Mr. Doman was employed by Gene D. Yost & Son, Inc., a drilling contractor hired by general contractor, Atlas America, Inc. As a result of Mr. Doman's death, Yost paid workers' compensation benefits to Mr. Doman's fiancée for the benefit of Mr. Doman's dependent minor child. The Doman Estate filed suit against Atlas, and Atlas prevailed on its motion for summary judgment on the basis of the immunity granted a statutory employer under Section 302(a) of the Workers' Compensation Act, codified at 77 P.S. § 461.

On appeal, the Estate argued that Atlas was not entitled to immunity as a statutory employer because it stood in the shoes of the owner, and because Atlas did not pay workers' compensation benefits. The Superior Court affirmed, holding that Section 302(a) specifically includes in the definition of statutory employer those contracted to perform work involving the "removal, excavation or drilling of … minerals". Atlas, as the general contractor that subcontracted the drilling process at the well to Yost, was thus held to be a statutory employer as a matter of law. In an opinion by Judge Musmanno, the Superior Court stated that it was "constrained" by the terms of the Act and by the Supreme Court's opinion in Patton v. Worthington, 89 A.3d 643 (Pa. 2014), which held that the immunity is based on the statutory employer status alone, even where the statutory employer has not been required to make any actual benefit payments.

While compelled to follow the terms of the Act, the Superior Court panel nevertheless pointed out that the requirement that all employers provide workers' compensation coverage allows general contractors to remain insulated from tort liability resulting in "a windfall immunity shield." Citing Justice Baer's concurring opinion in Patton, the Superior Court panel called on the legislature to eliminate the doctrine of blanket immunity to general contractors that serves to "thwart a victim's right to recover from a tortfeasor."

FOR MORE INFORMATION, CONTACT MARK T. CALOYER AT
MTC@PIETRAGALLO.COM

Preserving & Collecting Electronically Stored Information for Construction Litigation

Today's construction industry depends on data: data in CAD files used to design and model buildings, electronic communications between contractors and customers, and social media discussions; data used to manage activities, such as Microsoft Project files; weather, traffic and other data used to determine when and where to work; data sent to, received from, and stored on machines used on constructions sites; data from sensors in bridges and buildings; and so much more.

That means that for today's construction litigation, preserving and working with information kept in electronic form (electronically stored information, or ESI) has become as important as finding and evaluating more traditional forms of evidence – paper, information from witnesses, and tangible items.

Where to begin?

Preserve & Collect: When you anticipate litigation is likely, begin your preservation and collection efforts. It is unlikely you will try to preserve all of a client's ESI; even a small business can have terabytes of data. And it is the rare case where there is no ESI to at least consider preserving. Begin by trying to identify, based on what you know about the case, the most likely sources of data that will be pertinent to the lawsuit.

You might start with the **people** you think were the key actors: perhaps a project manager or a construction supervisor, maybe a sales person, probably some executives. Notify those people that they are subject to a legal (or litigation) hold. Preserve their data, or at least as much of it as seems appropriate. Typical starting points for finding that data are their mobile devices, their laptop or desktop computers, wherever their email and other electronic communications are stored, places where they store data on the company's computer systems, and, increasingly, places where they store data in the cloud.

There probably also will be **systems** that contain data critical to the lawsuit such as email systems, perhaps Microsoft Exchange on a company's network or Office 365 in the cloud; project or construction management systems such as Procore, WorkflowMax, or Sage's construction software; or business systems such as Oracle's PeopleSoft applications.

There also will be particular **files types** to look out for. Microsoft Project files are an obvious example, as are computer-assisted-design (CAD) files, but other file types, such as PDF, BMP or TIFF image files can contain important content.

There are many ways to preserve data. It might suffice to lock a computer in a drawer. Perhaps a forensic copy needs to be made of a hard drive. Maybe collecting data from a system in a forensically sound fashion will suffice.

Process: If you want to work with some or all of the data you preserved and collected, chances are someone will have to process that data for you. In essence, this means using appropriate tools and techniques to unpack compressed data, gain access to protected data, extract text and metadata where practical, use optical character recognition or similar technology to make text in image files searchable, and then index as much of that data as practical. At the same time, processes can be used to identify and set aside data that most likely has no bearing on the lawsuit.

Review & Analyze: At this stage, you can start searching data, look for potentially pertinent information, and try to identify privileged information. You also can use this data as you build your case, testing the case against the data and the data against the case. You can look for communication patterns that support or refute the story you want to tell. You can look for gaps that suggest missing data. And those are only the beginning!

GEORGE SOCHA, MANAGING DIRECTOR, BDO CONSULTING

Is Liquid Concrete Potentially an "Unreasonably Dangerous" Product for Purposes of a Personal Injury Claim?

In a January 2017 opinion, the Pennsylvania Superior Court said yes. The name of the case is High v. Pennsy Supply, 2017 WL 127834, ___ A.3d ___ (Pa. Super. January 13, 2017). It was brought by two brothers, do-it-your-selfers, who set out to lay a concrete floor in the basement of Jeffrey High's residence. They had been advised, by an employee of Pennsy Supply, to purchase flowable fill concrete, but it turned out that the concrete delivered to the residence was regular concrete. Although one brother signed a delivery ticket which included a warning about Portland Cement's irritating qualities and the other brother was otherwise aware of similar warnings, they went ahead, after determining it was not self-leveling, and worked directly with the concrete, with a minimum of protection, the end result of which was that they both sustained both second and third degree chemical burns.

The brothers each brought a products liability case against Pennsy Supply, alleging that the concrete was defective because it had a pH in excess of 11.5 and was capable of causing burns upon prolonged expose. Pennsy Supply then filed a motion for summary judgment, asserting that under Pennsylvania's new, strict product liability standard, at least for a design defect claim, set out in Tincher v. Omega Flex, 104 A.3d 328 (Pa. 2014) which requires proof, in the alternative, either of the ordinary consumer's expectation as to the product or as to the risk-utility of the product, the brothers could not prove that the wet concrete they encountered was an "unreasonably dangerous and defective product." In granting Pennsy Supply's motion, the trial court, noting there was no Pennsylvania precedent as to whether wet concrete is unreasonably dangerous as a result of its caustic nature, surveyed case law from other jurisdictions, finding that in most cases, courts had concluded that the caustic properties of the liquid concrete were common knowledge, including on the part of laymen, and therefore there could be no liability.

In reversing the trial court's grant of summary judgment, the Superior Court essentially held that a jury should be allowed to determine whether the concrete had a "design defect" under the standard set out in Tincher, specifically under the "consumer expectations" test, rejecting Pennsy Supply's position, supported by the Pennsylvania Aggregates and Concrete Association, that the brothers could not sustain their burden of proof under this test "as the danger of concrete's high pH was knowable and acceptable to the average person." The Superior Court, while questioning whether the plaintiffs had properly raised a theory of liability based on a failure to warn, also held that the trial court should resolve these issues as well.

A dissenting opinion would have affirmed the trial court in this "wet concrete" case on a "design defect" theory of liability, but would have reversed if viewed as a failure to warn case.

The takeaway from all of this is that suppliers of wet concrete, at least in Pennsylvania, should watch to see what happens next, if anything in High v. Pennsy Supply as far as the courts are concerned, specifically whether the Supreme Court, if an appeal is filed, reinstates the trial court's opinion or how a jury rules on the issues presented. In the meantime, they should be aware that a potential product liability case is out there, whether brought under a design defect or failure to warn theory, particularly if the purchaser/plaintiff is a neophyte in the use of concrete. As to such purchasers, prudent suppliers might well consider how best to warn them of concrete's potentially dangerous properties.

FOR MORE INFORMATION CONTACT MARTHA S. HELMREICH AT MSH@PIETRAGALLO.COM.

A Tale of an Architect's Office: Design for the 21st Century Office

Thirty years ago IKM Incorporated moved from the (then) PNB Building at 5th and Wood to the 2nd Floor of the PPG Tower. The firm renewed its lease for 3 consecutive ten year terms through the early part of this year. The practice of architecture has matured profoundly in those 30 years. The way we work as teams and the way we interact with the office space we occupy is significantly different from 1987. In 1987 the facsimile machine was a high volume and highly-used document processor. All design and drafting work was performed by hand. Drawing review required multiple blue-line prints with the accompanying ammonia fumes wafting through the drawing studio. A midsized office had a design staff to support staff ratio of 6 to 1. Individual work stations had multiple tables and high partitions. Architects were on the telephone with engineers/clients/contractors all day and needed the high walls around their desks for sound attenuation. There was no email. Administrative spaces included refrigerator sized impact printers with sound absorbing covers. The "smokers' room" was often abandoned after 5 pm and cigarettes smoldered away at architect's fingertips.

The office of the '80's was a noisy, compartmentalized, smoky environment.

Fast forward to 2017. We knew we needed to completely renovate our existing offices, or start with a clean slate in a new location. Ultimately, it was the aversion to moving out and back in – a double move – that started us down the road to exploring new space and landing at 11 Stanwix St.

For accountants, it's who does their own tax return. For lawyers, who reviews the lease for their own office space? And with architects, who designs the new office? In our case many hands DID make for light work. Through interactive workshops, we designed an office that allows for spontaneous collaboration by anyone at any time. The open plan workspaces and client-specific base camps now make it easier to bring innovative and informed design solutions to life.

Thirty years later, the individual desk with 12 linear feet of work surface is now just 6 feet. In an area where 2 people fit, now 4 can work and work comfortably. Double flat screen monitors on pivots are up and off the desk allowing for maximum work space. Staff reaction so far is highly positive. Much of the work occurs in groups in the team rooms. The smaller workstations are a nice balance of open/private that eliminates the feeling of isolation in the old office.

Where once we had 3 meeting rooms and 1 team space, now we have 3 client facing conference rooms, an all-hands break room, 7 team spaces and an unassigned work/break area overlooking the Point at confluence of the three rivers – the Allegheny, the Monongahela, and the Ohio – on the western edge of Pittsburgh, PA.

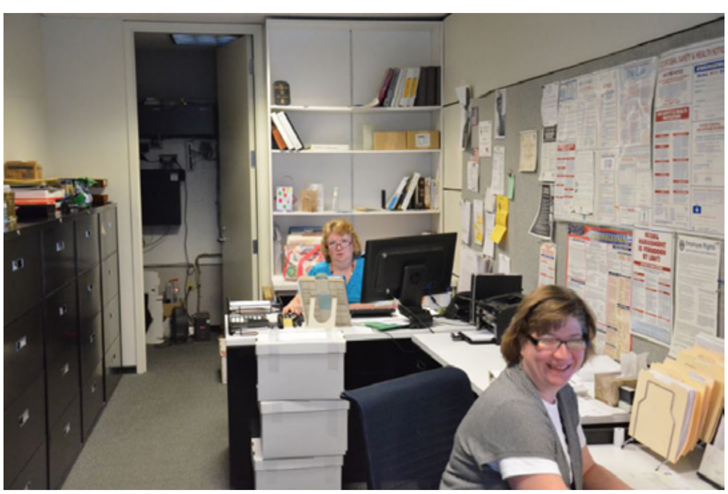
There are now seats for 65 staff where before it was only 50 – with the same square footage as before.

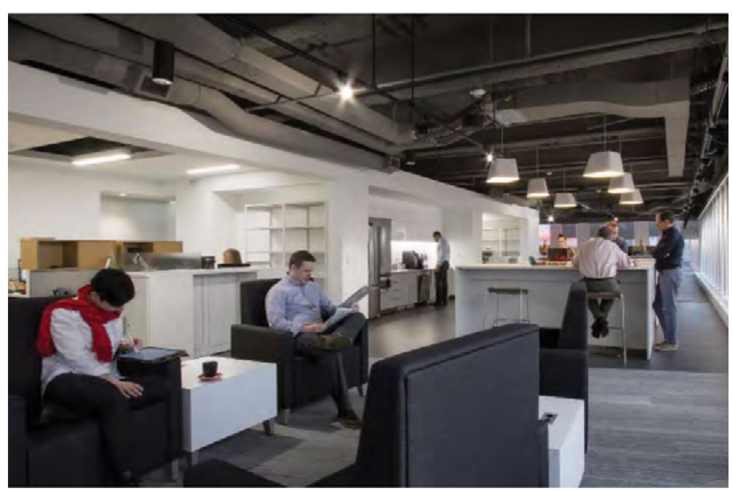
The old office had just two large format wall-mounted monitors. Now there are 12. Meetings and review sessions consume far less paper since drawings, notes, submittals, and meeting minutes can be reviewed on-screen. Partners' offices, team rooms, conference rooms and hallways all have writable wall surfaces. Design can – and does – happen everywhere.

IKM is signatory to the American Institute of Architect's 2030 initiative. More information can be found at: https://www.aia.org/resources/6616-the-2030-commitment Our new space will be submitted to the US Green Building Council for a Gold level of certification.

The ownership has listened and learned from the newest generation of architects to graduate from college and enter the workforce. Collaboration was their watchword in school, and that spirit of teamwork is what they expect – and thrive on – in the 21st century office.

JOEL BERNARD, AIA, NCARB, LEED AP OF IKM INCORPORATED





The Misuse of Estimates in Forensic Delay Analysis: Forensic Schedule Analyses & As-Built Critical Path Analysis

Forensic delay analysis takes center stage in disputes involving the late completion of construction projects. Adjudicated resolutions often focus on the "battle of the experts" with each side presenting some form of forensic analysis to support their position pertaining to the nature of and cause for each project delay. There is a considerable amount of controversy among forensic analysts about the appropriate methodology. The Association for the Advancement of Cost Engineering, International (AACE) added to this controversy by publishing "Recommended Practice No. 29R-03, Forensic Schedule Analysis," which has been criticized for its authority on the matter and its presentation of various forensic delay analysis methodologies. The ultimate authorities are the adjudicators—the arbitrators, trial judges, and appellate courts judges, who decide if a methodology and its application meet the standards of admissibility and who weigh the evidence to determine the victor.

This article draws the important distinction between those delay analysis methodologies that rely on "forensic schedule analyses," which are simply forensic estimates rather than an analysis of actual events, and the "as-built critical path analysis" method, which relies on actual events during the course of a project, and their acceptance in the courts of law. For purposes of the discussion, the approaches to delay analysis that rely on estimates rather than events are referred to as "impacted schedule" methodologies, and include (1) modified update analysis, (2) windows analysis, and (3) impacted as-planned analysis.

Relying on estimates in forensic delay analysis is particularly problematic. For example, how would you determine last year's rainfall total? Is it more accurate to (1) use last year's weather forecasts, or (2) use last years' historic rainfall data? The obvious answer is the second: use last year's historic or actual rainfall data. Similarly, when a change order for additional work cannot be agreed on based on the contractor's estimate of costs, and the work continues under protest, with the contractor recording actual costs on a contemporaneous basis, typically the ultimate resolution will be based on the actual costs. Yet when it comes to analyzing actual project delays, these impacted schedule methods rely on forensically generated schedules that are estimates of delay and not the actual delay. To understand the evolution, a basic understanding of a few critical path method (CPM) scheduling principles is necessary.

Fundamentals of CPM Scheduling

Understanding the fundamentals of CPM scheduling requires understanding what a critical path method schedule is, what the critical path is, how the dates are calculated, and the role a computer plays in the method.

What Is a CPM Schedule?

A CPM schedule is a network of interconnected activities. It is a schedule that defines for each activity what preceding work must be completed to start the activity and what subsequent activities are dependent on the preceding work's completion. As one court defined it:

> [T]he critical path method is an efficient way of organizing and scheduling a

> complex project which consists of numerous interrelated separate small projects. Each subproject is identified and classified as to the duration and precedence of the work. . . . The data is then analyzed, usually by computer, to determine the most efficient schedule for the entire project. Many subprojects may be performed at any time within a given period without any effect on the completion of the entire project. However, some items of work are given no leeway and must be performed on schedule; otherwise, the entire project will be delayed. These latter items of work are on the "critical path." A delay, or acceleration, of work along the critical path will affect the entire project.

Haney v. United States, 230 Ct. Cl. 148, 676 F.2d 584, 595 (1982).

Thus, the CPM schedule is an estimate of how long it will take to complete a project based on both the sequences and durations of activities necessary to perform the remaining work.

What Is the Critical Path and How Is It Determined?

The critical path is the longest continuous chain of activities through the network schedule that establishes the minimum overall project duration. The critical path is determined by the activity durations and relationships established by the scheduler. It is not a function of the computer or the scheduling software. The dates for all the scheduled activities, including the critical path, are the result of simple arithmetic calculations, based solely on the network logic and activity durations.

How Are the Dates Calculated?

The planned dates in a CPM schedule are the result of simple addition and subtraction. Starting with the first activity on day one, the duration of that activity is added to the start date to determine the early finish date of that activity. The early finish date then establishes the early start date of the next activity in the network. This process is repeated for every activity in the network, with the last activity's completion being the projected completion date of the project.

The late start and finish dates are calculated by repeating this process, starting with the projected completion date and working backwards though the network, subtracting the duration from the calculated dates.

The Role of the Computer in CPM Scheduling

Calculating dates for small networks can be performed manually; however, most construction schedules include thousands of activities and relationships, making manual calculations impracticable. That is where the number-crunching capabilities of a computer come into play. The computer does not make decisions and does not determine the critical path. That role is performed by the scheduler.

It is important to note that features have been added to today's scheduling software that can override the fundamental CPM calculation. When the scheduler uses these features, the result, while presented as a CPM schedule, may fail to meet the standard industry definition.

The Use of CPM Schedules During Construction

Before we can evaluate the appropriateness of the CPM schedule in a forensic delay analysis, we must know how the parties intended to use the schedule in planning and executing the construction project.

Initial Planning

A contractor's baseline or as-planned schedule should represent how the contractor intended to construct the project. This schedule represents the contractor's estimate at the time of the bid. While the contractor is responsible for means, methods, and procedures, the baseline schedule also includes the activities of the other project stakeholders, such as the owner and the designer. Accordingly, the owner must review and accept the baseline schedule. Having an agreed-to schedule is an essential requirement if the baseline schedule is to be effective as the basis for managing the project and evaluating delays on a contemporaneous basis.

Monthly Updates

Most projects require that the project schedule be updated on a monthly basis to include actual progress, changes in the contractor's plan, and any design changes or known factors that will affect a project. The goal is to have the best estimate to complete a project at a given point in time. By incorporating the most current project status, the project stakeholders can evaluate the effects of any changes to the original plan on a contemporaneous basis and negotiate any time extensions that may be appropriate, based on the current estimate to complete the work.

When the scheduling process is transparent and the stakeholders agree to the reasonableness and accuracy of the schedule projections, time extensions can be granted on a contemporaneous basis, and the project is completed without dispute. When the stakeholders fail to agree on a baseline schedule or schedule updates, resolving delays based on contemporaneous estimates becomes impossible, leading to some form of dispute resolution. If a schedule is not mutually accepted, it may be due to its fundamental flaws or improper updates. So if flawed estimates lie at the heart of a dispute, what justifies using those estimates in forensic delay analysis when actual data is available?

The Evolution of the Use of Estimates in Forensic Analysis

Good project management practices strive to address the cost and schedule impacts on a contemporaneous basis. Typical project specifications require that the cost of a proposed change or impact be estimated before performing the work. The owner evaluates the estimate and negotiates with the contractor to issue a change order. When the parties cannot reach an agreement based on the estimate, the contractor has three choices: (1) do not perform the work, (2) perform on a time and material basis, or (3) perform under protest.

Similarly, most specifications require the contractor to estimate the impact of a change on the project completion date based on the project schedule. The contractor is required to estimate the impact by reflecting the added or revised activities to the most current schedule update. This approach is typically referred to as a "time impact analysis."

Typical specifications address the procedure for estimating delays using the schedule updates as a basis for granting a contemporaneous time extension. The outlined procedures do not specify how delays are to be evaluated on a forensic basis. In this vacuum, some analysts have justified the use of forensic schedule estimates by improperly claiming the methodology is sanctioned by the specifications.

Types of Forensic Impacted Schedule Methodologies

Delays only need to be evaluated forensically when the specified contemporaneous methodology was not followed, most commonly due to a seriously flawed schedule or update. Accordingly, the application of any of the following forensic estimating methodologies requires that the schedules first be "corrected." The AACE Recommended Practice No. 29R-03 for forensic schedule analysis states:

> Due to the complex nature of construction projects and the fact that CPM schedules are models of reality, not reality itself, the analyst will inevitably encounter an instance when the contemporaneous project schedule contains an anomaly that could affect the assessment of the critical project delay. Instead of completing the analysis using a schedule with an anomaly or entirely abandoning the schedules because of the anomaly, the analyst has the option to correct the contemporaneous project schedule and use the corrected schedule as a basis for the analysis.

AACE International, supra, note 1, at 30. As AACE acknowledges, its "Recommended Practices" employ CPM schedules that are simply "models of reality, and not reality itself."

Impacted schedule analyses, including the modified update, windows, and impacted as-planned methods all uses a similar methodology. The only difference among these impacted schedule methods is the number of schedules analyzed. With the impacted schedule concept, the analyst modifies the schedule to account for any flaws or deficiencies in the schedule logic, or to add the logic necessary to "prove" a delay, the result being the "corrected" as-planned schedule. This "corrected" as-planned schedule then becomes the basis to model impacts. The analyst then adds a fragnet reflecting the impact to the "corrected" as-planned schedule and recalculates, resulting in the impacted schedule. The result is the projected delay and not necessarily the actual delay.

It is significant to note that an analyst must know all potential schedule impacts before applying these methodologies. There is no way to identify independently a project delay using an impacted schedule approach.

Rather than being an objective analysis, the schedule logic revisions or "corrections" made to the baseline or updated schedule are very subjective. The resulting schedules do not represent any schedule that was relied on in the planning or execution of the project. They are purely an academic, forensic exercise. The results of the subsequent impacted schedule calculations are merely forensic estimates to complete remaining activities at a given point in time. There is no evaluation or quantification of actual delays.

These impacted schedule methodologies all share this fundamental flaw, but each has its own additional inherent limitations.

Modified Update Analysis

The earliest application of forensic scheduling attempts to recreate each monthly update as it should have been performed and evaluate the delays as projected, not necessarily as they occurred.

The Modified Update Analysis Theory

Revise each schedule update to reflect any changes or impacts to determine the effect on the projected completion date of the project.

The Modified Update Analysis Methodology

For each change or impact, the analyst develops a fragnet. The analyst then incorporates the fragnet into the schedule update and recalculates, yielding a new forecasted completion date. The analyst reviews results of the recalculation to determine if there was any schedule slippage attributed to the revised work. He or she then applies the process to each schedule update for the entire project duration.

The modified update approach arguably represents schedules as they should have been updated, not as they actually were. The parties never used these schedules in managing the project, nor do the resultant projections reflect actual delays. Advocates of this approach improperly justify its use based on the argument that a contract specifies this methodology. However, while the contract specification may require this approach to estimate delays contemporaneously, it is unsuitable for forensic analysis.

Windows Analysis

The modified update method is a tedious and expensive approach that has led to the development of windows analysis. While there is no absolute definition of what constitutes a windows analysis, there is a characteristic that this common to all.

The Windows Analysis Theory

Project delays can be evaluated by modeling a few representative periods in which the delays occur, in lieu of modeling each monthly update, according to the windows analysis theory.

The Windows Analysis Methodology

The analyst under a windows approach selects "snap shots" or windows representing time frames in which in the impact occurred. The analyst uses the schedule update corresponding to the selected window as the basis for that window's model. He or she then adds fragnets to the window model and evaluates as one would in the modified update analysis method. The analyst then repeats the process for each selected window.

The window analysis approach shares all the weakness of the modified update method, plus one significant additional one: the estimated delay can vary greatly depending on the window selection.

Impacted As-Planned

The impacted as-planned method evolved as a simplified approach, requiring only one window or "snapshot."

The Impacted As-Planned Theory

By adding all of the owner changes impacts or both to a contractor's original as-planned schedule, the result will be the earliest date that the project could have been completed due to the added work.

The Impacted As-Planned Methodology

The impacted as-planned approach only uses the as-planned or baseline schedule for the delay analysis. The analyst develops and adds a fragnet for each change or impact into the as-planned schedule. Once the analyst incorporates all of the fragnets into the as-planned schedule (now referred to as the "impacted as-planned schedule"), he or she recalculates, projecting an impacted project completion date. The difference between the original planned completion date and the impacted completion date is the delay attributed to the changes or impacts.

The impacted as-planned approach makes no pretense to evaluate how a project was actually constructed, and therefore it is impossible to evaluate concurrent delays. Its only utility is to estimate the effect of added work on the original schedule.

As-Planned Versus As-Built Method

The "as-planned versus as-built" method is referred to as a "total time" approach and is discussed in the decision in *Morganti National v. United States*, 49 Fed. Cl. 110 (2001), *aff'd*, 2002 U.S. App. Lexis 13075 (Fed. Cir. 2002), in which the United States Court of Federal Claims rejected the approach, drawing an analogy to the equally unsatisfactory total cost method. This is true for an analysis that quantifies delay simply as the difference between the as-planned baseline and the as-built condition.

However, as with the windows analysis, there is no absolute definition of the as-planned versus as-built method. Accordingly, AACE failed to consider the most common and recognized variant of the as-planned versus as-built method: the as-built critical path analysis method.

The As-Built Critical Path Analysis: The Superior Method

Rather than relying on forensic estimates of delay, the as-built critical path approach evaluates delays based on actual events. Common sense dictates that if you are going to opine on how a project was delayed, you must first know how the project was constructed. The as-built critical path method can be summarized by the following steps.

1. **Develop the as-built schedule:** Using contemporaneously created records such as daily reports, inspection reports, and construction photos, the analyst plots the actual work progress on a timescale to create an as-built schedule.

2. **Determine the as-built critical path:** Using basic CPM principles and a knowledge of construction sequences, the analyst determines the as-built critical path based on evaluation of the as-built schedule. The significance of determining the as-built critical path is that these activities actually controlled the completion of the project, and only delays to these activities would result in delays to the project. Acknowledging that this is arguably the most subjective step in this

approach, this is where the construction and scheduling expertise of the analyst is most critical. Nonetheless, determining the as-built critical path is far less subjective than the logic manipulations analysts undertake in the impacted-schedule-estimating techniques. Thus, anyone contesting how the as-built critical path was determined must base his or her challenge on actual events, not theoretical relationships.

3. **Identify and quantify critical delays:** The analyst compares the as-planned activity duration to each of the as-built critical path activities to determine which activities took longer than planned and by how much, resulting in a project delay. Unlike the impacted schedule methodologies, no "correction" to the as-planned schedule is required. Applying the as-built critical path analysis method, we start with knowing that the actual project delay is the difference between the planned and the actual project completion dates (as opposed to the projected delay), and proceed to identify the actual discrete impacts by determining the variances in durations of the as-built critical path activities to the corresponding as-planned activities. In stark contrast to the impacted schedule method discussed above, which requires the analyst to know all potential impacts before he or she can analyze the delays to the project, the as-built critical path method can independently identify the actual discrete impacts that caused the project delay.

4. **Establish entitlement:** For each of the critical delays identified, the analyst reviews the project record and establishes responsibility for the delay.

Agreement on an analysis methodology will not necessarily resolve a dispute because there can always be a difference of opinion regarding the interpretation of the facts. But when a schedule dispute cannot be resolved by the parties directly involved, it should be decided by a "trier of facts," not a "trier of estimates."

Meeting the Burden of Proof

Forensic delay analysis takes center stage in the litigation of two primary types of opposing claims: contractors seeking delay damages, and owners seeking liquidated damages. In the first scenario, a contractor pursuing the owner's liability for delay must prove the extent of the delay, the harm that the contractor suffered from the delay, and that the owner caused the delay. *Catel, Inc. v. United States*, 2012 U.S. Claims Lexis 927 at *106-07 (July 13, 2012); *R.P. Wallace, Inc. v United States*, 63 Fed. Cl. 402, 409 (2004). In the second scenario, once the owner meets its initial burden to establish that the contractor failed to complete the project by the contract deadline, the burden shifts to the contractor to prove that the delay was excusable under the terms of the contract. *Id*. at *105–06. A litigant's successful outcome likely will hinge on the selection of its testifying analyst and the forensic method used.

Critical Path Analysis: The Gold Standard

As the previous discussion highlights, before a court can analyze causation and liability, the first step is establishing the delay: when did it occur, how long did it last, and how did it impact the project completion? The predominant view among the courts is that a party cannot answer these questions without presenting a critical path forensic analysis.

> Rarely does the construction of a complex project advance without variation to its original schedule. As the original grouping of interrelated activities realigns and creates a reorganized sequence of work, the critical path may evolve. As work proceeds, items not originally on the critical path can become critical. Consequently, in order to grasp accurately the delays that a project takes on, the critical path should be updated regularly. An *ex post facto* determination of the critical path is crucial to the calculation of delay damages in that only construction work on the critical path had an impact upon the time in which the project was completed.

Fireman's Fund Ins. Co. v. United States, 92 Fed. Cl. 598, 666 (2010) (internal citations and quotations omitted).

Thus, while a delay may cause inconvenience, and it may require the contractor to alter its intended schedule and shuffle the order of tasks, it is not actionable unless the delay affects the overall completion of the project; i.e., the delayed task must have been on the critical path. *See Sauer*, 224 F.3d at 1345 (Fed. Cir. 2000) ("the unforeseeable cause must delay the overall contract completion; i.e., it must affect the critical path of performance."); *K-Con Bldg. Sys. v. United States*, 115 Fed. Cl. 558, 574 (2014) (same); *Wallace*, 63 Fed. Cl. at 409 (same); *ADP Marshall, Inc. v. Noresco*, LLC, 710 F. Supp. 2d 197, 222 (D. RI 2010) (same); *Morganti Nat'l v. United States*, 49 Fed. Cl. 110, 131 (2001) (same); *In re M.E.S., Inc.*, 2006 PSBCA Lexis 1, at *29–31 (Postal Bd. Contract App. Jan. 31, 2006) (same). While the courts view CPM as a key element in delay analysis, the mere purported use of CPM does not assure that the forensic analyst's conclusions are reliable. The courts have recognized the weaknesses and have discounted several of the methods critiqued in the technical discussion above.

As-Built Critical Path Analysis Is the Superior Means to Satisfy the Burden of Proof

Prevailing with a claim arising from construction delay, whether from the contractor's or owner's perspective, requires three sequential steps. First, the claimant must properly identify and quantify each period of delay. Second, to prove that the delay is actionable, the claimant must show that the delayed task was on the critical path, and therefore delayed the entire project. Third, the claimant must prove causation, i.e., who was a fault for the delay.

To meet the first two elements, the forensic analyst must base his or her analysis on the factual evidence of how the project was constructed. As the *Fireman's Fund* court noted, when construction projects go off-course, the critical path can shift. Thus, to be reliable, the forensic method must reconstruct the critical path throughout the course of the project based on an adequate record of the construction activities. This approach minimizes estimation and speculation and enhances credibility. *United States ex rel. CMC Steel Fabricators v. Harrop Constr. Co.,* 131 F. Supp. 2d. 882, 891 (S.D. Tex. 2000), *aff'd,* 2003 U.S. App. Lexis 3108 (5th Cir. 2003) ('The Court favors Mr. McCullough['s testimony] for the most part because his approach appears more faithful to a critical path analysis."). The courts' analyses in the following cases support this proposition.

Morganti National v. United States involved the construction of a 1,000-bed federal detention center in Brooklyn, New York. *Morganti Nat'l,* 49 Fed. Cl. at 114. The original contract provided a performance period of 730 days, and the schedule required tracking more than 7,000 activities. *Id.* The project was rife with contract changes (over 350), design changes, weather delays, and contractor and subcontractor performance problems. Concluding that the contractor had completed only 76 percent of the work while expending 110 percent of the contract time, the Federal Bureau of Prisons terminated the contract for default. *Id.* at 121.

In support of its claim for excusable delay, during the trial the contractor presented the testimony of a scheduling expert who purported to have performed an as-built critical path analysis of the project. *Id.* at 125–26. Rejecting this analysis, the court held:

> Although [Morganti's expert] purported to compare Morganti's as-built performance against Morganti's as-planned Schedule A and WC01 schedule, his analysis is in essence a "total time" approach, which is of virtually no value. [Morganti's expert] "simply takes the original and extended completion dates, computes therefrom the intervening time or overrun, points to a host of individual delay incidents for which defendant was allegedly responsible and which 'contributed' to the overall extended time, and then leaps to the conclusion that the entire overrun time was attributable to defendant." It is well settled that this "total time" theory of proving delay is insufficient to meet the contractor's burden to prove that government-caused delay actually delayed the overall completion of the project. The "total time" approach to proving delay is "as unsatisfactory as the 'total cost' method of proving damages," because it assumes that the government is responsible for all of the delay. *Id*. at 134 (internal citations omitted).

The court found this "total time" approach "wholly lacking" when faced with contemporaneous schedule updates showing discreet delays attributable to the subcontractors. *Id.* at 138.

In *ADP Marshall, Inc. v. Noresco, LLC*, 710 F. Supp. 2d 197 (D. RI 2010), Noresco contracted with the Rhode Island Department of Mental Health, Retardation and Hospitals to design and construct a $27.5 million cogeneration facility. *Id*. at 202. Noresco subcontracted with ADP Marshall (ADPM) for construction and management services. *Id.* The dispute centered on the parties' opposing claims regarding whether compensable work was performed outside the original scope of the subcontract and liability for delays. ADPM tendered the opinions of its scheduling expert, who undertook a "time window analysis." *Id.* at 226. The expert's approach was to identify 10 "time windows" during which the project was delayed and determine the significant events that occurred during the window and whether they had any impact on project completion. *Id.* Considering the expert's testimony, the court held:

> Having now had the opportunity to digest all of the evidence presented, the Court is of the opinion that the testimony presented by [ADPM's expert] carried little weight because [he] failed to offer an opinion on the cause of the various delays during the Project. Instead, [His] testimony merely confirmed certain facts that are essentially undisputed in this litigation, *i.e.*, that the Project was significantly delayed and that the Milestone deadlines were not met.

> [He] conceded on cross examination that, in order to establish that a delay is compensable, a claimant must prove, *inter alia*, that the delay was not the claimant's responsibility. [His] findings, which were entirely based on selected Project records and documentation, shed no light on the cause of such delays, nor did [he] ascribe responsibility for such delays to a particular party. Given the lack of any independent analyses, including whether the CG01 baseline schedule could be reasonably achieved, [ADPM's expert's] "general opinion" as to responsibility for the delays is insufficient to support ADPM's claims related to Project delays. *Id*. at 226–27.

In deciding the issue, the court sided with Noresco's scheduling expert, who performed a detailed critical path analysis that established that ADPM's delays were neither excusable nor compensable. *Id.* at 228.

Fireman's Fund Ins. Co. v. United States, 92 Fed. Cl. 598 (2010), arose from the $186 million contract with the U.S. Army Corps of Engineers to construct the Montgomery Point Lock and Dam Project on the White River in eastern Arkansas. *Id.* at 602. The original contractor was a joint venture between J.A. Jones Construction Company and Guy F. Atkinson Construction Company. *Id*. The plaintiffs were the sureties that completed the project upon J.A. Jones' bankruptcy. *Id.* At about the same time the U.S. Army Corps of Engineers issued the notice to proceed, Atkinson filed bankruptcy, leaving J.A. Jones as the sole contractor. *Id.* at 608.

The contract provided 1,687 days from the notice to proceed to substantial completion and $6,494 per day in liquidated damages. *Id.* at 608. The plaintiffs alleged that the U.S. Army Corps of Engineers was liable for faulty concrete design specifications and for creating a labor shortage. *Id.* at 602. In support of their delay damages claim, the plaintiffs offered the testimony of their scheduling expert, who performed an "as-planned critical path analysis" described as "a hypothetical order of work linking a series of planned activities marked by eight 'reality' milestones, or turning points in the project." *Id.* at 668. It is worthy of note that the plaintiffs' scheduling expert was the same individual whose total time analysis was rejected by the *Morganti* court. *Id*. at 669, n. 88.

While the plaintiffs' expert claimed that his opinions were founded on an as-planned versus as-built critical path analysis, the court noted that it had an "uncanny resemblance to a 'total time'" analysis. *Id.* at 669. The court observed that the plaintiffs' expert's "critical path" was nothing more than a bar chart of activities that were not constrained by preceding or succeeding activities or substantial completion, and therefore, bore no relation to the true critical path. *Id.* at 672. In rejecting the plaintiffs' expert's analysis, the court held that he had failed to "correctly reflect the overall progress and interrelationships of the project activities." *Id.* at 673.

In *Catel, Inc. v. United States*, 2012 U.S. Claims Lexis 927 (July 31, 2012), Catel had contracted to construct a Fleet Recreation Center for the Navy in New Jersey. *Id.* at *1. After several contract modifications that included increased costs and extensions to the completion date, both Catel and its surety failed to meet the contract deadlines, and the Navy completed the work through another contractor. *Id.* at *1–2. Catel sued to recover the unpaid contract balance, as well as reimbursement for liquidated damages and expenses incurred from its surety alleging that the Navy had delayed and interfered with its performance. *Id.* at *3,100.

The Navy countered that both its contract administration and assessment of liquidated damages were proper.

The court rejected Catel's claims in large part for failing to prove excusable delay through a critical path analysis. *Id.* at 111. Reviewing Catel's evidence, the court held:

> Catel generally asserts – without elaboration or explanation – that "[n]one of the delays . . . [was] attributable in any way to Catel's actions or inactions." This statement is wholly insufficient to establish excusable delay and instead evidences Catel's complete reliance upon the "total time" theory. The "total time" theory, however, cannot be used to meet Catel's burden of proving that the Navy delayed its performance. *Id.* at *110–11.

In *Allstate Interiors & Exteriors, Inc. v. Stonestreet Construction LLC*, 907 F. Supp.2d 216 (D. R.I. 2012), the United States District Court for the District Court of Rhode Island granted judgment to the general contractor against the owner after determining that the contractor's as-built critical path analysis was superior to the owner's "total time" analysis. *Id.* at 219, 237–240, 247–48. The heart of the dispute arose from the general contractor's third-party claims against the owner arising from the construction and renovation of a hotel. *Id.* at 220. The work suffered several delays, the most significant being the delay in providing permanent power to the new addition to the hotel. *Id.* at 223.

To support its claim for liquidated damages, the owner tendered the opinion of its scheduling expert who, rather than employ a critical path analysis, simply subtracted the number of days planned for the construction from the numbers of days actually expended and offered the conclusion that the delay was attributable to the contractor. *Id.* at 247–48. The court concluded that this evidence was insufficient to prove that the owner was not in whole, or in part, responsible for the delay. *Id.* at 248.

In contrast, the court accepted the contractor's expert's as-built critical path analysis, which was based on the contract, specifications, drawings, subcontracts, correspondence, inspection reports, change order requests, meeting minutes, schedules, pay applications, deposition testimony, interviews, and a visit to the project. *Id.* at 237. In describing the expert's methodology offered to support the contractor, the court noted:

> [The expert's] ultimate conclusion was that the Project's critical path was delayed by two primary obstacles: (1) until the January 2009 time frame, the lack of permanent power, and (2) following completion of permanent power and into March 2009, the fire protection and life safety system design. Because [the owner] controlled both of those issues, [the expert] deemed [the owner] responsible for the critical project delays.
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> To illustrate his conclusion that no concurrent delays affected the Project, [the expert] generated a 4-page graphic which showed (1) the impact of [the contractor's] approved extension requests on the schedule, (2) the discrepancy between planned and actual schedule dates for critical completion activities, (3) the impact of Owner-controlled activities on the critical path, and (4) a summary of

critical and non-critical *activities and delays*. *Id*. at 239.

Lastly, the as-planned versus as-built total time method was condemned in the case of *J. Wm. Foley, Inc. v United Illuminating Co*. 2013 Conn. Super. Lexis 2028 (Dec. 3, 2013). That case arose from a project to construct a six-mile underground power transmission line. *Id.* at *1. Foley contracted to construct a series of underground duct banks and splice chambers along the length of the project. *Id*. Nearly from the outset the project was fraught with problems and delays. The greatest physical obstacles were utilities and conditions that Foley encountered that were not shown on the drawings. *Id.* at *10–11. While the plans accounted for 415 underground interferences, Foley encountered 1,209 interferences over the course of the work. *Id.* at *11. Many of the obstacles forced Foley's subcontractor to alter its trenching methods, which significantly affected productivity. *Id.* at *11–13. Foley also contended that its subcontractor suffered additional significant delays due to "property and easement acquisitions, permitting, design problems, existing utility location conflicts, local noise ordinances and allowable work hours, soil contamination and work areas occupied by other construction projects." *Id.* at *14. Additional evidence offered by the defendant showed that there were performance issues on the part of Foley and its subcontractors that delayed the work as well. *Id.* at *15.

To support a delay claim, the contract required Foley to prove an "actual demonstrable delay in the Critical Path." *Id.* at *44–45. The court defined Foley's burden of proof as (1) showing what the critical path was when the delay occurred, (2) identifying the delay, and (3) establishing who was responsible for the delay, which must take into consideration all of the events surrounding the critical path at that time. *Id.* at *45. While Foley submitted multiple versions of its delay claim while it was completing the work, it never supported its claim with a critical path delay analysis. *Id.* at *32. Similarly, Foley eschewed a critical path analysis when presenting its delay claim to the court. The court engaged in a lengthy criticism of Foley's purported delay analysis offered at trial. To wit,

> [Foley's expert] did not present a critical path delay analysis to the court. Thus, instead of determining the critical path of the Project as the Project progressed and then looking at what caused the critical path to be delayed and who was responsible for the delay, [the expert] did a "Planned vs. Actual Schedule" that compared how the Project was intended to be built and how it was actually built. [He] then annotated his actual, or "asbuilt," schedule with events that delayed the Project. He then concluded that the "Longest path" of the Project ran through the area of Singer substation to Splice Chamber 3. Because this was the longest path, [he] also concluded it was the critical path. He further concluded that because delays attributed solely to UI occurred on this longest path, UI was responsible for the entire thirteen-month delay in completing the Project.
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> . . . [Foley's expert] did not look at each change order and show the actual, demonstrable impact each had to the critical path, as the Contract requires. Instead, he employed a total time approach in that he looked at the anticipated schedule and the final schedule to determine the amount of delay to the Project. He then determined, in hindsight, the longest path of the Project and deemed that the critical path. In taking this approach, he ignored records created during the

> life of the Project, that he in fact reviewed, that showed that the critical path was not always what he determined to be the longest path. The evidence showed that the critical path often changed depending on what issues were being encountered on the Project.
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> Furthermore, [Foley's expert] did no critical analysis of Foley's performance on the Project. The evidence showed that there were clearly issues in how Foley and its subcontractors performed their work. [He] made no attempt to weigh those issues against the problems he attributed to UI. He also made no attempt to determine whether any of those issues affected any activities on the critical path of the Project. Instead, it appears that he focused solely on Foley's complaints about UI. The court agrees with [defendant's expert] that such an approach is neither a fair nor appropriate way to do a delay analysis.
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> In the end, the court concludes that [Foley's expert's] analysis is simply a dressed up version of the "global cost approach." *Id.* at *36–37, 45–47.

These cases support the conclusion that meeting the burden to prove construction delays and their causes is best accomplished through a forensic delay methodology that includes a precise reconstruction of the critical path as it evolved over the course of the project built on contemporaneous project records. This ensures, as most courts demand, that to be compensable, a delay must affect the critical path, and thus the overall project completion. This is not to say that other methodologies of delay analysis have no utility, or that they will never be successful in a litigated action. However, astute litigants will heed the lessons from the case law to decide which expert to engage and methodology to use under the specific circumstances and demands of the particular case.

Conclusion

It is important for construction project participants and their legal counsel to understand the important differences in the forensic delay analysis methods used by consultants and endorsed by various industry organizations. When disputes arise, whether a party is pressing a claim for delay damages, or defending against liquidated damages, the party should understand the limitations and advantages of the different forensic methodologies to maximize the chances of success.

The as-built critical path analysis, when properly employed, and based on a robust record from the project, affords the highest degree of precision and reliability. However, while several of the other methods may purport to undertake a critical path analysis, their outcome depends heavily on the analyst's subjective estimates rather than the relevant facts from the course of the project. Both state and federal courts rightly have criticized these estimation methodologies for their inability to satisfy the burden of proof, and thus, counsel should be familiar with the extant case law in their jurisdictions to give their clients the best opportunity to succeed.

ERIC FRUCHTMAN, P.E., SAN FRANCISCO BAY AREA & A. SCOTT MCDANIEL, ESQ., OF MCDANIEL ACORD, PLLC, TULSA, OKLAHOMA.

WHERE IN THE WORLD?

Construction Mystery: Houses are not just for people, the indigenous tribes of this country built spirit houses to honor their deities. At times, certain areas were solely spiritual sites, but more often landscapes combined the spirit world with practical needs like food production. The natives of this island country even today are divided into approximately a hundred tribes. The first king of these diverse groups was chosen in 1858. Before Christianity was introduced, religion primarily meant living in harmony with nature. These people were not native to the islands, but arrived in voyaging canoes over 1,000 years ago. They currently make up 14% of the country's population.

Question: What is the name of this country?

Last Issue Answer: Forbidden City, Beijing, China

CONTRIBUTED BY JANE OCKERHAUSEN, TRAVEL EDITOR

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