THE JOURNAL OF AACE INTERNATIONAL | THE AUTHORITY FOR TOTAL COST MANAGEMENT

COST ENGINEERING

JANUARY/FEBRUARY 2022

Timing Your Time Extensions and General Conditions Costs

ALSO:

"Concurrent Events" and Other Scheduling Issues in the News

The Top Ten Mistakes Made in Forensic Analysis

AACE INTERNATIONAL

The Top 10 Reasons
To Join AACE International

Ready to advance your career and begin enjoying the advantages that our members enjoy? Whether you are an experienced cost engineer or a student, we have a membership ready for you.

1 Time

Gain access to a wealth of resources that will save you time and money! You'll stay informed about the complexities of the cost and management profession - plus you'll have access to discounts on educational programs, publications, and more!

2 Information

Locate thousands of technical papers and publications in the Virtual Library. AACE's database is keyword searchable for quickly locating appropriate reference articles.

3 Career

Members can post resumes at no additional cost in our Career Center and keep your career on track through information sources such as our annual Salary and Demographic Survey of Project and Cost Professionals.

4 Learning

We offer numerous online learning courses on estimating and project management. The Approved Educational Provider program helps maintain high quality development courses and providers. AACE also holds many seminars throughout the year.

5 Resources

Starting with the TCM Framework and Recommended Practices that are available for free only to members to our bi-monthly publication Cost Engineering featuring articles for cost professionals around the world. Through the AACE International website, the Cost Engineering journal is a great current resource for members and as a member, you gain access to an archive of past issues.

6 Technical Development

Increase your knowledge and expertise by joining one of AACE International's many technical subcommittees, subcommittees, and Special Interest Groups (SIG's) at no additional cost to members. Discuss industry problems with your peers or help experts develop new and improved techniques and practices for the profession.

7 Networking

By attending a local section or our annual Conference & Expo for interesting speakers, informational tours, social dinners and much more. The online Membership Directory is an excellent source for a list of contact information on thousands of members. Join one of our many technical subcommittees and participate in the AACE Communities - a great way to tap into the collective wisdom and experience of our worldwide membership.

8 Excellence

Our certification programs are independently accredited by the Council of Engineering & Scientific Specialty Boards. AACE certifications are a recognized credible standard in the cost management field. A recent study shows that individuals with an AACE Certification earn 17.4% more than their counterpart without a certificate.

9 Discounts

On products and services ranging from AACE International Conference & Expo registration fees, archived webinars and presentations, certification examination registrations, and more!

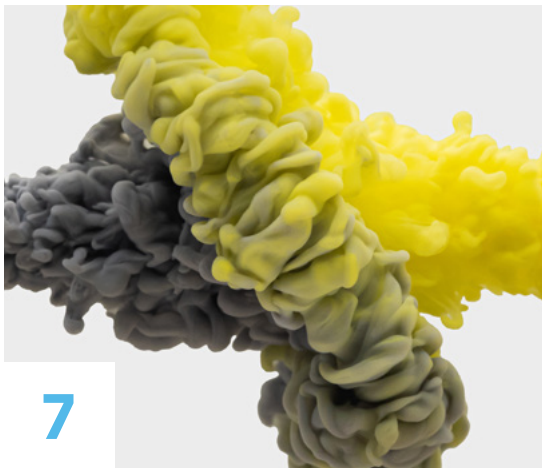
10 You!

We are your professional partner bringing you information and support you can trust. Join and become part of a unique network of individuals who are dedicated to improving the cost and management profession.

JOIN TODAY! web.aacei.org

CONTENTS

JANUARY/FEBRUARY 2022



7

16

23

TECHNICAL ARTICLES

ALSO IN THIS ISSUE

For additional industry news and updates, you can always visit us at **web.aacei.org**.

NEW!

AACE INTERNATIONAL ANNOUNCES NEW CERTIFICATION INSTITUTE

In 2022, AACE International is launching the AACE International Certification Institute, an affiliated organization, to manage its renowned certification program and activities.

The Institute will develop, oversee, and manage professional certification programs associated with Total Cost Management and related practices, and promote such certification programs to individuals and businesses in furtherance of the cost management profession.

The AACE International Certification Institute will function under its own volunteer Board of Directors and oversee the strategic direction of the certification program, which currently includes nine certifications: Certified Cost Professional (CCP), Certified Cost Technician (CCT), Certified Estimating Professional (CEP), Certified Forensic Claims Consultant (CFCC), Earned Value Professional (EVP), Decision and Risk Management Professional (DRMP), Project Risk Management Professional (PRMP), Certified Scheduling Technician (CST), and Planning & Scheduling Professional (PSP). The CCP, CCT, CEP, CST, EVP, and PSP certifications are independently accredited by the Council of Engineering and Scientific Specialty Boards (CESB). There are currently over 4,000 AACE International certification holders worldwide.

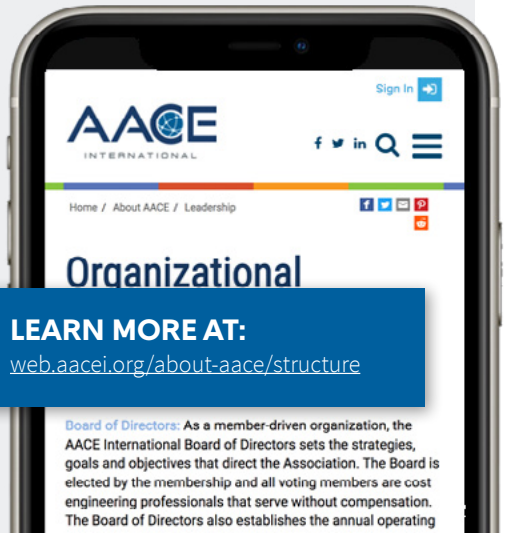
The AACE International Board of Directors is embarking on this initiative for various reasons, including following the advice of legal counsel. The intent is to elevate the profile of its certification program and to align with association best practices, providing more autonomy between the certification program and AACE International.

AACE International Board President Jim Krebs, CCP, FAACE noted: "Since the CCP was first established in 1976, our certifications have been a highly valued AACE program with one goal in mind: to recognize skilled professionals in the cost engineering industry. The program will remain an integral part of the AACE family and we're very excited about this next chapter and the opportunities for growth."

AACE Certification Associate Board Chair Charlie Bolyard, PSP, CFCC, FAACE, Hon Life, CCM, FCMAA remarked: "It is exciting to witness and participate in the growth of AACE's certification program as it extends its global certification offerings to an even broader audience with the support and strategic guidance of a dedicated oversight board."

About AACE International
AACE International has been serving the total cost management community since 1956. It currently has over 7,000 members in 100 countries and is committed to the constructive exchange of ideas between members, development of technical guidance, and delivery of quality education. AACE members work in a variety of disciplines across many industries.

For more information, please contact:
Debra L. Lally, CAE
Executive Director/CEO
AACE International
Phone: 304.296.8444 x1102
Email: dlally@aacei.org
Website: www.aacei.org



LEARN MORE AT:
web.aacei.org/about-aace/structure

COST ENGINEERING

ESTABLISHED 1958 | Vol. 64, No. 1 January/February 2022

MANAGING EDITOR Marvin Gelhausen
mgelhausen@aacei.org

GRAPHIC DESIGN Little Fish Design Company
info@littlefishdesigncompany.com

ADVERTISING SALES Business Development Coordinator
Joanna Boggs
+1.304.296.8444 x1122
jboggs@aacei.org

AACE INTERNATIONAL
+1.304.296.8444
web.aacei.org

AACE® International - The Authority for Total Cost Management®

OUR VISION - To be the recognized technical authority in cost and schedule management for programs, projects, products, assets, and services.

OUR MISSION - The members of AACE® enable organizations around the world to achieve their investment expectations by managing and controlling projects, programs, and portfolios; we create value by advancing technical knowledge and professional development.

Cost Engineering (ISSN: 0274-9696/22) is published digitally on a bi-monthly production schedule by AACE International, Inc, 726 Park Avenue #180, Fairmont, WV 26554 USA.

Access to the bi-monthly **Cost Engineering** journal digital files is a benefit of AACE International membership and requires a member login and password. There is no subscription service for the **Cost Engineering** journal other than AACE membership. Digital access is on an individual use basis and not available on any group access basis. **Cost Engineering** is a refereed journal. All technical articles are subject to a review by the AACE International **Cost Engineering** Journal Review Committee. Abstracts are only accepted in our annual AACE "Call for Papers" for our Conference & Expo. Accepted abstracts must be followed up with a full approved manuscript that is presented and attendee evaluated at one of our Conference & Expo events. Top rated manuscripts will be considered for publication in the **Cost Engineering** journal. Any unsolicited abstracts received at other times throughout a year will receive e-mail notice to submit in our next "Call for Papers."

ADVERTISING COPY: Contact AACE International, Inc, 726 Park Avenue #180, Fairmont, WV 26554. Telephone: 304.296.8444, extension 1122. E-mail: marketing@aacei.com for rates. Advertisers and advertising agencies assume liability for all content (including text, representation, and illustrations) of advertisements published and also assume responsibility for any claims arising and made against the publisher. The publisher reserves the right to reject any advertising that is not considered in keeping with the publication's mission and standards. The publisher reserves the right to place the words "advertisement" with copy which, in the publisher's opinion, resembles editorial matter. All advertising accepted for publication in **Cost Engineering** is limited to subjects that directly relate to the cost management profession. Current rate card available on request. **COST ENGINEERING DEADLINES:** Submissions for **Cost Engineering** must be received at least 30 days in advance of the issue date. Send to: Business Development Coordinator, AACE International, Inc, 726 Park Avenue #180, Fairmont, WV 26554 USA. Deadlines do not apply to technical papers.

Policy Concerning Published Columns, Features, and Articles

Viewpoints expressed in columns, features, and articles published in Cost Engineering journal are solely those of the authors and do not represent an official position of AACE International. AACE International is not endorsing or sponsoring the author's work. All content is presented solely for informational purposes. Columns, features, and articles not designated as Technical Articles are not subject to the peer-review process.

LETTER FROM THE

EDITOR

BY MANAGING EDITOR **MARVIN GELHAUSEN**

Building a Technical Article

Happy New Year! To start off 2022, we will be publishing three claims dispute resolution technical papers first presented at the 2021 AACE Conference & Expo.

TECHNICAL ARTICLE 1

CDR-3622, *Timing Your Time Extensions and General Conditions Costs,* by Brian J. Furniss, PE PSP CFCC and Matthew G. Nichols, PSP

TECHNICAL ARTICLE 2

CDR-3732, *"Concurrent Events" and Other Scheduling Issues in the News,* by Christopher J. Brasco, Matthew D. Baker and Dakus Gunn

TECHNICAL ARTICLE 3

CDR-3743, *The Top 10 Mistakes Made in Forensic Analysis,* by Glen R. Palmer, CFCC PSP FAACE, and Christopher W. Carson, CEP DRMP PSP FAACE

TECHNICAL ARTICLE ONE

TIMING YOUR TIME EXTENSIONS AND GENERAL CONDITIONS COSTS, BY BRIAN J. FURNISS, PE PSP CFCC AND MATTHEW G. NICHOLS, PSP

Something you may not know about these two authors is that Brian Furniss says, "I love coaching my kids' sports teams. Coaches made a big difference in my life, and I love seeing the kids learn new skills and realize that working hard can pay off on the field and life." Matt Nichols says, "I collect vinyl records for modern metal bands. I enjoy it for both the inconvenience and the expense."

The authors believe the reader should take away the following two key points:

- "Regardless of your position as an owner, contractor, or other project participant, it is beneficial to promptly resolve time extension requests. Putting off the resolution results in larger risks to all parties and the project. Of course, there are exceptions to this, but those are the exception – not the rule.
- When it comes to cost, we too often see parties choose a preferred method that fits their desired outcome. One side likes to use the middle of the bell curve and the other likes to use the tail. Neither is an acceptable "go to," as the results depend on the effects of the change and how the change delays the plan to complete the work. We

> "The topic was selected because of how frequently we were seeing these recurring issues. We wanted to write something that, perhaps, made people consider the benefits of analyzing and resolving these issues earlier in the project."
>
> **BRYAN PAYNE, PE CCP CFCC ESQ.**

encourage participants to dig deeper than the position, and to make a proactive decision based on the numbers and objective reasoning."

The authors report that they "wrote the article toward construction." However, they note that, "the same concepts apply to many other industries where there is a deadline, an owner, and a contractor that has to finish by the deadline." They add, "We based the examples on an actual projects and situations, but we changed the parties and the facts "to protect the innocent."

In explaining the creation of their article, the authors say, "The topic was selected because of how frequently we were seeing these recurring issues. We wanted to write something that, perhaps, made people consider the benefits of analyzing and resolving these issues earlier in the project." They also note that, "The AACE review process was smooth and improved the final submission." The authors said, "This year, we did not receive feedback from the presentation, but we usually do and it's always helpful to understand how we can improve the presentation."

As published authors, the two are willing to share what they have learned with others who may be submitting technical articles for the first time. Brian Furniss says his advice is to, "Pick a topic that interests you and that you see repeatedly. Write about that topic from the perspective of informing and helping someone in the industry. There is a good chance that others are encountering the same issue, and your paper and discussion will benefit someone attending. It also bolsters your credentials by adding to the body of knowledge in the industry. Matt Nichols says, "There are two reasons why you should write a paper: 1) You have special knowledge of a topic 2) You want to grow your knowledge of a topic. If you have something in mind that meets either of those criteria, then just start writing. Getting an idea out of your head and on to paper can be a cathartic experience."

The two authors participated in the 2021 AACE International Conference & Exp virtually. They say, "we're looking forward to seeing folks back in-person. Offering a virtual option is a helpful alternative, but nothing beats making the connections and learning in-person."

Brian Furniss says he has presented approximately five papers. Two of these were published in Source and Cost Engineering. He has been involved in the AACE conference for approximately seven years. Matt Nichols says he has presented three papers. He adds, "This is my first paper to be published." He has been involved with the AACE Conference for approximately three years.

The authors say "COVID-19 continues to be a consideration, but we're seeing a slight increase in in-person meeting requests. Technology has allowed us to resolve many meeting situations virtually but meeting with clients in-person is more beneficial in certain situations."

TECHNICAL ARTICLE TWO

"CONCURRENT EVENTS" AND OTHER SCHEDULING ISSUES IN THE NEWS, BY CHRISTOPHER J. BRASCO, MATTHEW D. BAKER AND DAKUS GUNN

Due to the tight production deadline resulting from the holidays, the authors of the second technical article were unable to receive and return responses to the Building a Technical Article questions. We apologize to readers for any inconvenience.

TECHNICAL ARTICLE THREE

THE TOP 10 MISTAKES MADE IN FORENSIC ANALYSIS, BY GLEN R. PALMER, CFCC PSP FAACE, AND CHRISTOPHER W. CARSON, CEP DRMP PSP FAACE

"It is important that the readers understand that a long report is not necessarily a better report and that it is very important to know who the audience of the report will be." This is the main takeaway that author Glen Palmer offers readers of technical article 3. Author Chris Carson offers the following takeaways:

- Experts find it easier to succeed when they engage with AACE and embrace the AACE Recommended Practice No. 29R-03, "Forensic Schedule Analysis", because it helps ensure that we meet the general testimony requirements, such as Daubert. Since the analysis must be a scientific product, following the RP means we are using an industry-recognized method, the method has been peer reviewed, and the source validation protocols require accurate and appropriate actual data to be used in the report.
- It is the expert's professional opinion that should drive the choice of methodology for analysis, and that opinion should be based on the appropriateness of the methods. The RP has an excellent section on how to choose a methodology and engagement with AACE provides networking opportunities with many very talented experts.
- The expert must balance the need to perform the detailed, technical analysis with the need to provide a straightforward and simplified report so that any reader will understand the complex issues without compromising the analysis.

Palmer says, "This article is primarily for those people in the dispute resolution business, their clients and their legal team." Carson adds that he believes the article is useful for, "All construction industries where there are disincentives for late completion. These industries will necessarily need to resolve disagreements which require technical analyses, even without formal dispute resolution requiring testimony."

Palmer explains that the article is based upon the combined experience of the authors from dozens and dozens of projects. Carson

says, “We are using past projects for each of our list of the top ten mistakes to avoid.” In this article, Carson says he and Palmer, “Actually recommend and discuss the most useful disruption/inefficiency claim analysis methods, and our preferred delay analysis methodology when the conditions are appropriate, which happens frequently.”

Palmer says he and Carson regularly collaborate in authoring and presenting technical article presentations. “We take turns in choosing our topics based on problems we see in the industry and try to address those issues.” Carson adds that he and Palmer “discussed our experience with other experts, particularly the opposition experts in our cases, and found that there were common mistakes that those experts made, and we recognized that those mistakes were some that we avoided by use of our standard processes and helped us prevail over those other experts.”

Palmer says, “I personally find AACE's submission and review process too strict and labor intensive. I believe the process should encourage speakers and not make it so difficult.” However, Carson says the “Submission is straightforward, and the review comments typically seem to fall into two categories: writing style/quality and technical content. AACE Headquarters is very helpful in the technical writing, so the review helps clean up issues that we did not notice. Volunteers who review the content are very good about challenging broad statements and forcing us to evaluate our conclusions.”

“We generally get extremely positive feedback from our presentations and get many requests to travel and present,” notes Palmer. Carson says since the conference was virtual, “most of the feedback was through the questions and our room host/facilitator.” He adds, “When we do live presentations, which is our preference, we get much more feedback from attendees. This is likely due to our interaction with the conference attendees over several days instead of primarily just during the presentation.” Carson notes that Steve Warhoe was their host, and that he and Steve discussed an idea for a paper and have submitted it for 2022. He said, “This is typical of how we identify good topics.” Carson summarizes this by saying, “Everyone has an expertise in something that would be valuable to others, and we all have an obligation to give back to the community. If we do not train our replacements, we cannot grow, and the industry will not grow. Many of us have learned things that it would take others a long time to figure out, so we can help dramatically with careers if we pass along those techniques and tips that we use to streamline and improve our reports and service.”

Turning to advice for a potential author who has never submitted for an AACE Conference & Expo, Palmer responds, “My advice for a new speaker would be find a veteran speaker to co-present for your first effort and get the process understood and get the feedback to incorporate into their first solo presentation.” Carson adds, “Everyone has something that they do during their routine technical workload that is exceptional and/or unique, or that just works really well. They should choose that technique, summarize the purpose and technique, and identify the benefits from the use. Those types of papers and presentations are the most valuable.” He continued, “None of what we write (well, at least none of what I write, Glen might be different) is rocket science, it’s more practical, common sense (to us), methods and techniques that have worked for us in our careers. We are both deep enough into our careers that we have seen so much in the way of technical work product, and mistakes, that we can jump right to a good solution. And we both have our war stories that are usually valuable in evoking the attendees’ emotions since they have fallen victim to or seen similar situations. We often hear that people are either just in agreement with our suggestions, or they have never heard anything like them and so they can walk away satisfied that they learn something. All of our papers and presentations offer solutions that someone can walk right out and start implementing; that’s a lot of the popularity.”

The 2020 and 2021 AACE Conference & Expo were virtual events. Palmer says, “We did participate in both events, and I personally do not care for online presentation. I believe the direct real time audience feedback is the reward that makes me want keep doing this.” While Glen and Chris both participated in the virtual conferences, Chris also participated in the 2021 in-person Retreat (and felt it was valuable enough to pay his own way without company reimbursement). He says, “We really miss the in-person events, in fact, we almost withdrew from 2020 virtual due to our concern that it might be too disappointing not to be in person.” He adds, “We don’t like the virtual conferences very much, they spread the sessions out over too much time and work gets in the way when we don’t go to a conference in person. We miss the networking and feedback, as well as the opportunity see old friends and to meet and mentor new friends.”

Palmer says “Chris and I have co-presented 8 to 10 times. I have had several other co-presentations, presented on my own, and been part in some debates and panel discussions (20 combined more or less). I think this is Chris' and my third or fourth published presentation. I have somewhere between 15-20 conferences that I have attended.” Carson says along with the papers he and Glen have presented together; he has presented 31 AACE papers altogether. By his count, Chris believes this is their third paper published together, and Chris has had 16 published in AACE Cost Engineering Journal and Source magazine. Chris has been involved with the AACE Conference & Expo for the past 15 years.

Palmer says, “There is no change where I live on COVID restrictions. I have been working from my home office for more than 20 years. I use zoom and Teams, but also meet in-person.” Carson says, “Restrictions have been lifted in Virginia, the media is panicking over the variants but it’s not affecting restrictions at this time.” He says he “works from home and has not worked in the office in about eight years, which started mostly due to my travel schedule, so I didn’t use the office enough to maintain a presence.” He also explains that his employer Arcadis is using MS Teams virtual technology to meet whenever possible. I found that the restrictions in 2020 meant that many of my clients who insisted on in-person meetings and training have shifted to virtual so there is much reduced need for travel.”

In sharing something that you may not know, Palmer says, “I just became a grandfather for the first time to a four-month-old baby girl. In my spare time I work on restoring my 1965 Mustang Convertible.” Carson says he is teaching his grandchildren engineering, physics, and other life skills, using engineered kits and sometimes Boy Scout Merit Badge training manuals. He says, “the grandkids can “box” the compass and use a compass to navigate around a treasure hunt.” Carson also says he is a voracious reader. He adds, “several years ago discovered a wonderful video resource for online college-level courses called, “The Great Courses” – I pick them up on sale, and now have a digital library of 64 course with 1,500 lectures on everything from math and science to natural healing and communications, all shared with the family. I am greatly enjoying watching the lectures by college professors on topics I would not have the opportunity to see. My wife and I use our subscription TV service to watch mostly stand-up comics from many countries. Learning keeps you young, and laughter keeps you healthy.”

Timing Your Time Extensions and General Conditions Costs

BY **BRIAN J. FURNISS, PE PSP CFCC;** AND
MATTHEW G. NICHOLS, PSP

ABSTRACT

Resolving time extensions and extended general conditions are challenging issues for contractors, subcontractors, and owners. Submission timing is often key to resolving a time extension favorably, and if there is no resolution, that timing may be important to preserving one's ability to successfully resolve a claim. Further complicating resolution are the different methods available for quantifying extended general conditions costs and how general conditions may vary over time. Using the costs incurred during the delay period may yield quite different results than using the costs at the end, or tail, of the project. This article will provide a brief introduction on how the timing of time extensions is crucial for successful resolution of change orders and claims. It will also provide recommendations for how to accurately price extended general conditions costs in various project scenarios. This article was first presented as CDR-3622 at the 2021 AACE International Conference & Expo.

Introduction

Submitting and resolving time extensions can be challenging processes. Contract requirements may not specify how to perform the time impact analysis; prior experience, whether positive or not, may impact the teams' effectiveness of completing a coherent submission and effective review; the contractor and owner may not have staff that adequately understand critical path method scheduling; or the parties may have strained relationships, funding issues, or there may be other considerations that further complicate the process. Whatever challenges that need to be overcome during the process, it benefits all parties to contemporaneously submit and resolve the time extension request and associated costs.

This technical article will explain why it benefits all parties to resolve time extensions and additional cost requests contemporaneously and expeditiously, thereby preventing unnecessary increased project costs that result from disputes and other project losses. The article also discusses increased costs that result from delay, along with various methods for pricing extended general conditions costs. Lastly, the article provides an illustrative example, applies the various pricing methods, and opportunities for improvement for both contractors and owners facing this situation.

Time Extensions

THE PURPOSE OF TIME EXTENSION REQUESTS

Time extension requests are made by a contractor when an excusable delay occurs which delays a contract milestone. An owner's approval of a time extension request allows more time for the contractor to complete the work required by a specified contract date.[1] Adequate knowledge of the contract terms, critical path method (CPM) scheduling, and analytical skills are required to effectively prepare and evaluate a time extension request.

Almost all projects have at least one time-based requirement where the completion of a defined amount of work is required by a specific date or duration after start. These time limitations are not only important for the contracting parties to clearly discern what is wanted and when it is wanted, but also for the parties to have an objective time requirement to use for accurate estimating and pricing, planning, and coordination of the work.

The quantity and type of time-based requirements (contract milestones) vary by contract. Several examples are:

1. **Apartment Complex** – A two-story apartment complex may require substantial completion of the contract work by a specific date. As an alternate method, the owner may not know when the project will start and, instead, establishes a project duration in the contract that will determine a finish date once the contract time starts. An example is when the contract specifies that substantial completion is required within 350 calendar days after the issuance of Notice to Proceed, but the forecasted notice to proceed date is unknown at the time of contract.

2. **Amusement Park** – An amusement park addition is being constructed at an existing facility, adding three new rides and adjacent merchandising and "customer experience" areas outside each ride. All three of the rides are valuable to the completion of the park, but one of the rides (Ride 1) is projected to provide higher revenues than the combined revenues of the other two rides. Therefore, the owner wants to expedite the completion of the higher-revenue ride, Ride 1, via a contract milestone date, along with providing escalated incentive and disincentive clauses. The other two rides, Rides 2 and 3, will have contract milestones with liquidated damages assigned to each milestone. The lost revenue for missing the contract dates for Rides 2 and 3 is less for the owner, so a reduced liquidated damages amount is assigned when compared to the damages associated with not completing Ride 1 by the required contract milestone date.

3. **Liquified Natural Gas Plant** – A liquified natural gas (LNG) plant is being constructed with outputs through three separate process trains. Except for ancillary supporting works required to operate any and all trains, the output value is equal for each train and the revenue stream resulting from each LNG train is extremely high. As a result, the contract defined the completion of each train separately, but made the liquidated damages associated with each train equal.

In these and other situations, it is reasonable to presume that both the owner and contractor will incur additional costs if the projects take longer than defined in the contract. At a minimum, oversight and management of a project will cost more if a project takes 100 days than if the same project took 75 days.[2] As a result, management of that time is crucial to control the costs that are a by-product of time spent on the project.

THE IMPORTANCE OF TIMELY TIME EXTENSION REQUESTS

Because of the inherent cost-risks of missing a contract milestone, the contract should address *how* to manage situations that cause project delays, who is responsible for those situations, and, most importantly for the purposes of this article, when the parties are expected to communicate and resolve the causes and effects of those situations. Even without some or all of that language, it is reasonable to presume that delays, responsibility for the delays, and effects of the delays should be discussed and resolved as soon as the delays are known and reasonably quantifiable. Communicating and resolving issues contemporaneously allows each party to properly understand how the risk and cost profile of the project changed and allows each to proactively reduce any negative effects as soon as possible.

The converse of contemporaneous communication and resolution of these issues is to procrastinate or, in other words, use a "wait and see" approach.[3] As discussed later, procrastinating or protracting the submission or resolution of time extensions favors no party, as it serves to foster distrust, creates inequitable positions[4], results in inaccurate cash flow and revenue projections, and raises the likelihood of increased costs to the parties.

---

[1] For the purposes of this article, the two parties with the contractual relationship will be addressed as "contractor" and "owner." However, the foundations of this article apply to various other contractual agreements including, but not limited to, contractor-to-subcontractor, owner-to-financier, and supplier-to-subcontractor.

[2] For reasons of simplicity, this ignores how increased loan costs, financing, direct costs, and other project costs may also be affected by delays. Other cost types are important considerations for any additional cost calculation pertaining to project delays.

[3] The benefits of contemporaneous resolution versus a "wait and see" approach is also described in other industry sources including, but not limited to, the Society of Construction Law Delay and Disruption Protocol, 2nd edition, February 2017. [3]

[4] Some examples include a contractor that incurs extended general conditions in the hopes of recovering them later; owners that increase their risk of incurring constructive acceleration costs by adopting a "resolve it later"/ "wait and see" approach; and a steel fabricator that expends money to re-fabricate steel due to a change without proper assurance that it will be properly compensated for its re-work.

Time extension requests are primarily submitted by the contractor, as the contractor is often the party seeking an alteration of the time-related contract performance obligations. It is in the best interests of all parties to price and resolve time extensions in a prospective manner, if possible. However, there are situations where a contractor may be unable to properly and completely submit a time extension request either prospectively or contemporaneously. Several examples of situations that may hinder the timing of a contractor's time extension request include:

- An indefinite suspension of the work directed by the owner
- A prolonged, unclear direction from an owner regarding a change
- The contract requires a retrospective analysis method to substantiate delay
- The owner directs a "wait and see" approach, or requires the contractor to submit a time extension in a retrospective manner

In each of these scenarios, it is still important that the parties meet and discuss the delay issue and how it affects project time and agree on a path forward toward resolution.

In addition, it is recommended that the contractor and owner include the known, prospective effects of a delay or change within the project schedule. Doing so promotes an accurate plan to complete the work and, even more importantly, initiative-taking discussions on how the effects of the issue can be mitigated by the responsible party.

THE TIMING OF TIME EXTENSIONS AFFECTS RESOLUTION

Contractors and owners alike benefit from the contemporaneous resolution of time extension requests because it enhances their ability to accurately identify, place, and manage the risks with the proper parties.

THE CONTRACTOR'S TIME EXTENSION REQUEST

For the contractor, a delay causes additional costs for field management and other general administration of the project. Additional costs may also be incurred for other direct labor and equipment, materials, and subcontractors. At a minimum, a contractor will have to spend additional time and money to develop a time extension request along with the systems to manage and segregate the delay costs. A prudent contractor recognizes this increased risk and takes action to mitigate it but does so cautiously so as not to further increase its risks or additional costs without assurance of recovery from the party responsible for the delay.

One of the recommended risk mitigation procedures is to notify the owner that the issue has occurred, along with any potential costs reasonably foreseeable and quantifiable at the time. This not only helps protect the contractor's entitlement to recover the additional costs and other risks, presuming it intends to recover these items from the owner, but it should also prompt discussions with the owner on how to potentially reduce or eliminate the effects of the issue. Whether acceleration or mitigation options are promptly implemented or not, it is still in the contractor's interest to provide timely notice of the delay and subsequently provide a time extension request in accordance with the contract requirements.

Providing a proper time extension request may allow the contractor to recover additional acceleration costs should the owner improperly reject or delay the appropriate resolution of the time extension. It is also appropriate for the contractor to contemporaneously create issue files that include the underlying facts and documents and track costs pertaining to the delay issue. At a minimum, this will place the contractor in a more-prepared position to evaluate the delay effects expeditiously and accurately in real-time, decreasing the risk of missing key costs and documents pertaining to the delay. In addition, the timing of the submission greatly affects the pricing of the extended general conditions resulting from the delay. The cost-related issues pertaining to time will be discussed in a subsequent section.

In addition, from a negotiating perspective, the contractor's leverage to recover its additional costs from the owner often diminishes as the contractor completes more work. The contemporaneous submission and resolution of changes for additional time inhibits this leverage transfer and is consistent with most change order clauses within contracts.

Alternatively, if the sole or recommended remedy for change resolution was to "wait and see" until project completion, why the need for a change order clause in the first place? Preventing the "wait and see" situation promotes more informed and timely decision making. It is the very reason that change order clauses exist in the contract, as many contracts promote expedient and equitable resolution by offering various mechanisms to resolve the change. Otherwise, the contract would simply direct that the resolution of all changes follow the claims and dispute resolution procedures and, as a result, the project parties would have no knowledge of and what magnitude of claims were coming at the end of the project and, perhaps more importantly, would have no ability to take action at the time of the change to reduce the impacts and costs.

A contractor that has not asserted its contractual rights in a timely and proper manner, but at the same time agrees to finish the project without dispute, has potentially reduced its negotiating leverage with the owner and triers of fact. In essence, the contractor that has not properly pursued the recovery methods allowed by the contract; not properly documented its facts, effects, and costs pertaining to the issues; incurred and paid the additional costs in the hope of recovering; and completed and turned the project over to the owner has significantly decreased its chances of resolving the dispute on favorable terms and recovering the costs due.

THE OWNER'S TIME EXTENSION EVALUATION

For the owner, delays to the project end date also cause extended project oversight costs, management costs, and potentially other project financial and funding issues. As a result, it is in the owner's best interest to proactively prevent delays in real-time and make time-related decisions to mitigate any additional costs to the owner and other project participants. In any event, the prudent owner:

- promotes the discussion of delay events with the contractor and contemporaneously gathers the facts relating to the delay issue, creating an issue file to document and gather the key documents relating to the delay issue.
- communicates regularly with the contractor and documents the format and details of the discussions; and
- timely evaluates and responds to time extension requests.

The last bullet is the most misunderstood and overlooked responsibility of the owner. If the contractor is appropriately due a time extension and the owner does not respond in a timely manner to the contractor's time extension request, the owner may be increasing its risk of incurring other additional costs via constructive acceleration.[5] It cannot be ignored that an owner's timely and appropriate evaluation and response to time extensions is key to preventing increased risk to the owner, contractor, and project costs. There may be owners that convince themselves that

[5] The concept and details for constructive acceleration are not the subject of this paper. See[2].

prolonging or postponing the resolution of time extensions due under the contract allows the project team to focus more on getting the project done; that mid-project delays are uncertain and the project time needs to actually expire before project delays are actually incurred and should be evaluated; that prolonging the resolution increases the owner's negotiation leverage; or some other reason why prolonging the proper resolution is beneficial. The prolonged resolution, whether implemented for perceived project betterment or not, has an adverse effect on all parties and may increase the owner's risk of being responsible for delay, acceleration, and other additional costs.

From a negotiating perspective, the owner's protracted resolution of a time extension may be perceived as a short-term benefit. Yes, the owner receives more, or all, of its project before resolving the claim, which places the owner in a potential revenue-gaining situation before claim resolution. However, at that point, the owner has no ability to control the costs that were already incurred, and if the contractor has taken the proper steps along the way, the owner may now be liable for some portion, if not all, of the increased costs that resulted from the owner's inability to resolve the issue contemporaneously. The perceived short-term gain of delaying resolution may result in significant long-term losses for the owner.

In what may appear contrary to practice, there are also situations where an owner benefits by evaluating the potential time extensions *before* the contractor submitted the request. For example, whether a request was submitted, or the delay has ended, it may be a prudent risk mitigation tool for an owner to address whether it plans to provide a time extension request for the delay being incurred and, if possible, an assessment of the additional time measured, to date. Doing so provides the contractor assurance on the agreement of entitlement to delay recovery for the issue, allows a contractor to pace other work unrelated to the issue, and prevents the contractor from later including other acceleration or delay damages that could have been prevented with an owner's assurance of time for the issue. While these types of decisions may not always be practical given the project circumstances, contemporaneous discussions of this kind may reduce the risks of both parties and put the owner in an even stronger position than waiting for the contractor's submission.

Certainly, there are instances where the owner has adequate reason to not resolve the time extension quickly. For example, if the request is incomplete, does not allow for an adequate or accurate measurement of delay, or does not comply with the contract requirements, it may be necessary for the owner to reject the request, explain the reasons for the rejection and, as a result, extend the resolution. However, it benefits the owner to shift the performance risk back to the contractor as quickly as possible in situations where the requests are not perfect but are within an acceptable time or cost range. In addition, there are situations where an owner justifiably requests increased detail and support of costs, only to find out that its request allowed the contractor additional time to discover and include more time and delay costs that were previously excluded. Again, in these instances, an owner benefits from accepting the submission in a timely manner if the amounts requested are within an acceptable range, which shifts the performance risk back to the contractor.

The urgency for resolving time-related issues may be further exacerbated if the project is already beyond its required contract date, and the parties know that the contemporaneous issue is being resolved while liquidated damages are being threatened or withheld, and while extended general conditions are occurring. At this point of the project, there is no debate regarding whether the project will slip beyond the contract date – it already has. Certainly, a "wait and see" approach in this situation is not helpful as the parties are already incurring the additional costs and, as a result, may be more aggressive in spending the additional costs to mitigate, or accelerate, the delay costs being incurred. Another unnecessary effect is that the parties may become more entrenched in their respective positions, further resulting in increased time and costs to resolve the issue.

No matter the situation, it is best for all parties to seek resolution of time extensions at the time the delays occur. Not only does it improve the risk profile of the parties and allow for equitable resolution during the project, but it also serves to prevent increased costs from unnecessarily being incurred by the project parties.

Requests for Additional Costs

As with time extensions, the resulting additional costs are best resolved contemporaneously. Prudent contractors and owners will emphasize the analyses and review of impacts resulting from the delay issue first, making the cost discussions secondary, as the additional costs result from the delay and impacts incurred. As stated in AACE's Recommended Practice 52R-06:

> *The time impact must be quantified prior to determining any potential cost implications. [1, p. 2]*

Following the preceding guidance establishes the fundamental cause-and-effect relationship between impacts and costs.

The subsequent sections identify some categories of additional costs that may result from delays. However, as emphasized in the time extension section, the purpose of this article is to focus on delays to the contract milestone and any associated extended general conditions. As a result, many of the cost categories resulting from delays will be introduced, but not discussed in detail.

TYPES OF DELAY COSTS – BOTH CRITICAL AND NON-CRITICAL PATH

Delays, whenever possible, should be segregated into critical and non-critical delays, allowing the costs to be accurately quantified based on the type of impact incurred.

Costs from Critical Delays

Critical path delays to the project cause contractors to incur extended general conditions. General conditions are those costs that are a function of time on the job including, but not limited to:[6]

- **Extended Project Management Staff** (PMs, engineers, project controls, change management, safety, administration, IT, etc.)
- **Extended Project Office Costs** (trailers, computers, phones, bathrooms, IT, water, training, electricity, etc.)
- **Extended Site and Traffic Maintenance Costs** (SWPPP, traffic control, signage, safety equipment, etc.)
- **Escalated General Conditions Costs** (same cost types identified above, but the planned general conditions costs could escalate when incurred later in the project)

General conditions costs often ramp up at the beginning of the project, reach and maintain a relative peak, and then decrease near the end of the project. The acceleration or deceleration of the ramp up and down are a

[6] Projects may have more than one contract or project milestone. Depending on the project and contract, these time-related costs may be further segregated by milestone to more accurately determine whether the time-related costs are a function of the overall project or a specific milestone.

function of many factors, and the same is true for the variability and duration of the peak period. Figure 1 is an example of a planned general conditions curve over the duration of a project.[7]

In addition to extended general conditions, critical path delays may also have direct cost increases to labor, equipment, materials, suppliers, subcontractors, and other (LEMSCO) items. The delays and impacts causing LEMSCO additional costs must also be substantiated through analysis *before* getting into the resulting costs. Some examples of L EMSCO additional costs resulting from delays include, but are not limited to:

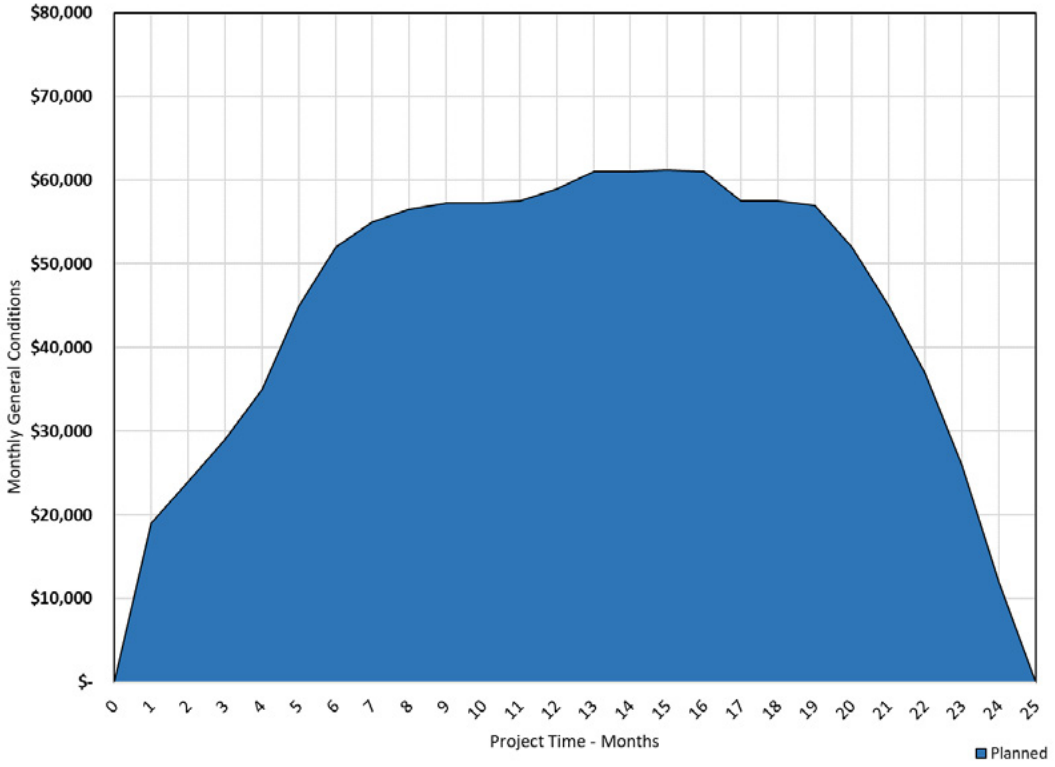


FIGURE 1 Planned General Conditions for Project

- **Extended Craft Labor, Supervision, and Equipment Costs**–These may include direct labor and equipment costs, stand-by labor and equipment, cost-of-living allowances, housing expenses, and other costs resulting from delays extending craft labor and equipment.
- **Escalated LEMSCO Costs**–If the delay caused work to push into a time where labor, equipment, or materials are more expensive, then these costs must be analyzed to determine the cost escalations resulting from the delays.
- **Demobilization and Remobilization Costs**–If the delays are severe enough, the contractor may choose to demobilize and remobilize labor and equipment to mitigate additional costs. The delays may also result in increased demobilization and remobilization costs to other project work areas because of the delay.
- **Extended Subcontractor Costs**–If subcontractor performance is also extended, subcontractors may also have their own extended management costs and other LEMSCO costs.

As previously stated, owners also incur costs that are a function of time on the project. Examples are liquidated damages; increased loan and financing costs; delayed or lost revenues; extended oversight, inspection, supervisory, design, and testing costs; and other costs that are a function of project time. However, owners should have significantly fewer costs resulting from non-critical delays to direct field work. As with the contractor, the owner should establish a causal relationship between the delays incurred and the categories and damages incurred.

Costs from Non-critical Delays

Non-critical and critical delays share many of the same types of damages, except for damages that are a function of the overall project time. Costs that are a function of extending the overall project time, such as extended general conditions, liquidated damages, and other indirect costs, do not result from non-critical delays. However, as with critical delays, non-critical delays may still cause cost increases to field and other work and should also be monitored and quantified as a component of the delay cost.

For example, presume a contractor was performing non-critical work installing drainage along an existing highway and did not have the contractual risk for unmarked utilities in the right of way. During the performance of that work, the contractor encountered an unmarked utility line that stopped the remaining drainage work. It took an additional month for the utility to be relocated, which extended the time that the drainage crew was used to perform work in that area. The extended cost for the drainage crew, its equipment, and other impact costs may be tracked for potential recovery even if the delay was non-critical.

THE GENERAL CONDITIONS RATE – THE PEAK OR THE TAIL

When delays occur during a project and a contractor provides a price for the extended general conditions costs, a discussion about the timing of the costs often arises. Some typical questions are:

- Which rate should the contractor use to price the extended general conditions – the rate incurred before, during, or after the delay?
- If the owner is extending the project, is the owner simply extending the tail of the project or the peak of the project?

Certainly, there are other questions to address prior to, and during, a discussion about extended general conditions, but the simple answer to the prior two questions is one unrelated to cost – it depends on what the delay and impact analysis shows.

WHAT RATE SHOULD BE USED TO PRICE GENERAL CONDITIONS

The question that must be answered regarding which rate to use is: how does the delay extend the project and what are the general conditions costs during that time?

[7] The planned general conditions curve will also be used in an example later in this article.

The contractor faced with pricing extended general conditions during the project has several methods to choose from. There is not a one-size-fits all approach, as the method to price the extension most-accurately is based on how the delay or impact affects the project and, resultingly, the general conditions costs.

For example, presume a contractor is in month 5 of a 10-month project and receives a change order request from an owner. The contractor reviews the change and determines that the additional work resulting from the delay will occur in month 9 when the project staffing and general conditions are decreasing. As a result, while the contractor is in its peak of the general conditions in month 5, the delay does not extend the general conditions during the peak; the delay extends the general conditions during the tail. As such, the contractor would appropriately price the extended general conditions based on the planned general conditions to be expended in month 9.

Had the change order request extended the month 5 costs, or the owner's delay stopped progress of the critical path in month 5, then the general conditions rate may be quite different. Under this scenario, the contractor would appropriately price the extended general conditions based on the month 5 general conditions rate when the project is, most likely, at its peak, as using another method or time period would result in the contractor underpricing the cost of extending the project during month 5.

Examples of other methods for prospectively pricing extended general conditions include:

1. Cumulative average before the delay to price the general conditions rate
2. Near-term rolling average (e.g., 2-month or 4-month)
3. Latest monthly actual cost
4. Latest monthly actual cost, while also adjusting for how the general conditions may further increase, or decrease, during the delay period
5. Bid-specified or agreed-upon contract rate

While each of these methods has strengths and weaknesses, each method is better used in specific circumstances to most-accurately model the pricing of the extended general conditions. These methods will be further discussed and applied through the example in the following section.

Example of General Conditions Pricing Methods

The following example demonstrates when using certain methods of pricing are more appropriate than others.

EXAMPLE: DELAY STARTS IN MONTH 13 OF A 24-MONTH PROJECT

During the completion of a design-bid-build contract on a wastewater treatment plant, a contractor encountered a design change during the construction of a digester. The delay event started at the beginning of month 13, and at the time the delay was encountered, the digester construction controlled the critical path of the project. The designer took an additional 1.5 months to re-design the digester foundation and wall rebar and concrete and required significant structural increases that were not shown in the original design. It took the contractor an additional two weeks (½ month) to price the direct costs and create a plan to complete the changed work. At the end of the two weeks (beginning of month 15), the contractor submitted a time extension request for the two months of delay already incurred, to date, along with a request for three months of additional time resulting from the additional rebar and concrete required for the digester. For the purposes of this example, presume that the contractor's time extension request was submitted and substantiated appropriately. Included with the contractor's request was the change order pricing for additional direct and time-related costs resulting from the delay.

The owner immediately directed the contractor to proceed with the additional work in the field, verbally assuring the contractor that it would be compensated on a time-and-materials basis until the lump sum change order was negotiated and resolved. By the end of the third month (beginning of month 16), the owner agreed to compensate the contractor for the included additional direct LEMSCO costs for the additional work. In addition, the owner agreed with the time included for the first two months of delay, and with the contractor's pricing for that two months, which used a cumulative average of the monthly general conditions expended to date. However, the owner disagreed with the other three months of delay requested and priced by the contractor, which used the month 12 actual price as a basis to forecast the additional three months of delay. The owner also disagreed with the contractor's extended general conditions costs for those three months, asserting that the costs were too high, and that the contractor would be able to mitigate the delay by completing subsequent work faster. As a result, the owner provided the contractor the following time-related resolution contemporaneously:

- A time extension of two months and extended general conditions based upon the cumulative average costs incurred by the contractor before the delay started. And,
- No additional time or extended general conditions for the remaining three months, as the owner believed the contractor could mitigate the three months of additional work and that its pricing method incorrectly used forecasted general conditions costs and not the average general conditions costs used for the first two months of delay.

The contractor notified the owner that it reserved its rights to recover the extended general conditions included in the change order and notified the owner that it was constructively accelerating the contractor.

Given this situation, several questions arise:

Question 1: Did the contractor correctly price the first two months of delay it incurred by using the cumulative average monthly cost to date?

Figure 2 summarizes the cost-to-date through month 12 that was incurred by the contractor, along with three methods of pricing that the contractor considered.

The contractor's proposed and accepted method was to use the cumulative average through month 12, which was accepted by the owner. Other options available were to use a rolling average (2-month rolling average used in Method 2) or the amount for month 12 by itself, each multiplied by the two months of delay experienced through month 14. Given the contractor's understanding that its monthly general conditions costs were not expected to decrease during the delay, it would have been more appropriate for the contractor to use the month 12 general conditions amount for its request instead of the cumulative average. Table 1 summarizes the method used by the contractor, along with the amount

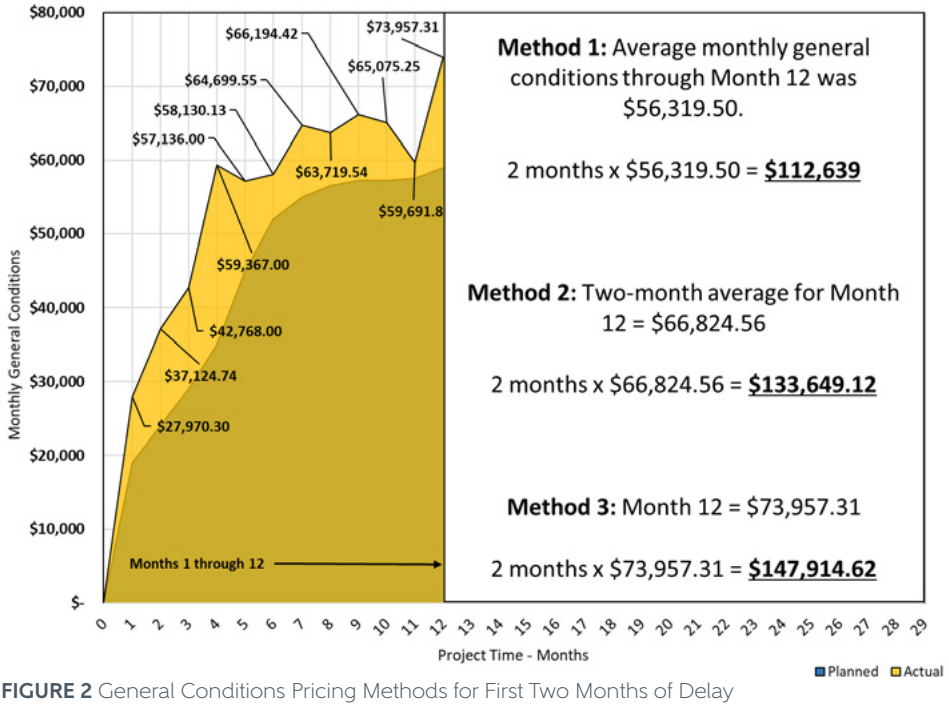


FIGURE 2 General Conditions Pricing Methods for First Two Months of Delay

Method	Method Type	Amount Quantified for 2 Months GCs	Increase Compared to Amount Accepted
1	Cumulative Average - Method Proposed and Accepted	$ 112,639.00	$ -
2	2-Month Average	$ 133,649.12	$ 21,010.12
3	Month 12 Total	$ 147,914.62	$ 35,275.62

TABLE 1 Examples of Methods for Measuring Delays Already Incurred

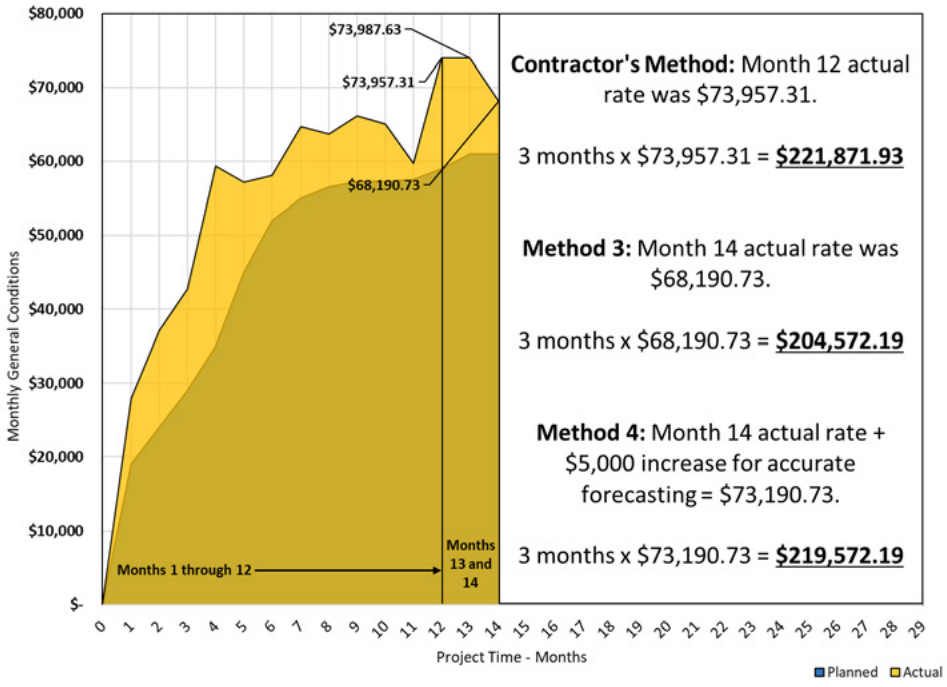


FIGURE 3 Forecasting General Conditions Costs

unclaimed (lost revenue) by the contractor for the first two months that could have been recovered using other methods.

In summary, the contractor underpriced the extended general conditions during the first two months of excusable, compensable delay. The underpricing resulted from including the general conditions costs during the project's ramp-up period in the monthly average, which lowered the monthly average and was not a comparable basis for when the delay occurred. Had the contractor priced the first two months based on the month 12 price, it would have included an additional $35,275.62 in its request. As a result of its underpricing, the contractor lost money for the extended months of months 13 and 14, as monthly general conditions costs were not expected to decrease.

Question 2: Which other methods could the contractor use to price months 15 through 17, and what are some considerations that would go into the pricing?

As previously stated, the contractor used the actual rate for month 12 to forward price the extended general conditions in months 15 through 17. To prospectively price months 15 and 17, the contractor should determine:

- The costs currently being incurred nearest to the forecast (months 13 and 14). And,
- If those costs are forecasted to change in months 15 through 17.

The contractor's pricing submission occurred at the beginning of month 15, so there are two additional months of actual general conditions in months 13 and 14 that could have been used to forecast the rate of extended general conditions instead of simply using month 12. However, the contractor would still need to consider whether it should adjust the month-15-through-17 forecast and combine that adjustment with the most-recent actual monthly rate.

As shown in Figure 3, the rate for month 13 was comparable to the rate of month 12, while the rate of month 14 decreased by over $5,000. This would cause the contractor to consider whether the month 14 rate decrease was an anomaly and should be discarded from projecting the extended general conditions for months 15 through 17, or whether month 14 was an accurate forecast for the next three months.

In either situation, the owner rejected the contractor's time and pricing at the beginning of month 15. Given this action, it may be advantageous for the contractor to update its actual general conditions incurred monthly, notify the owner of those costs, and amend

the pricing if the costs change. In addition, it may also be advantageous for the contractor to include the constructive acceleration amounts and any known supervision and direct cost changes resulting from the acceleration within its monthly update.

Question 3: Was the owner's rejection of the additional three months of extended general conditions prudent? How did this affect the owner's risk for the project?

These questions cannot be accurately addressed with the information provided within this article. To accurately address this, the owner would need to review the contractor's performance to date and, with the information known about the contractor's planned resource usage in the future, forecast whether that information supported that the contractor would be able to reduce the additional three months of delay *without incurring additional acceleration costs*. In summary, owner's response was a gamble without a review of the project facts and the contractor's historical performance and remaining plan.

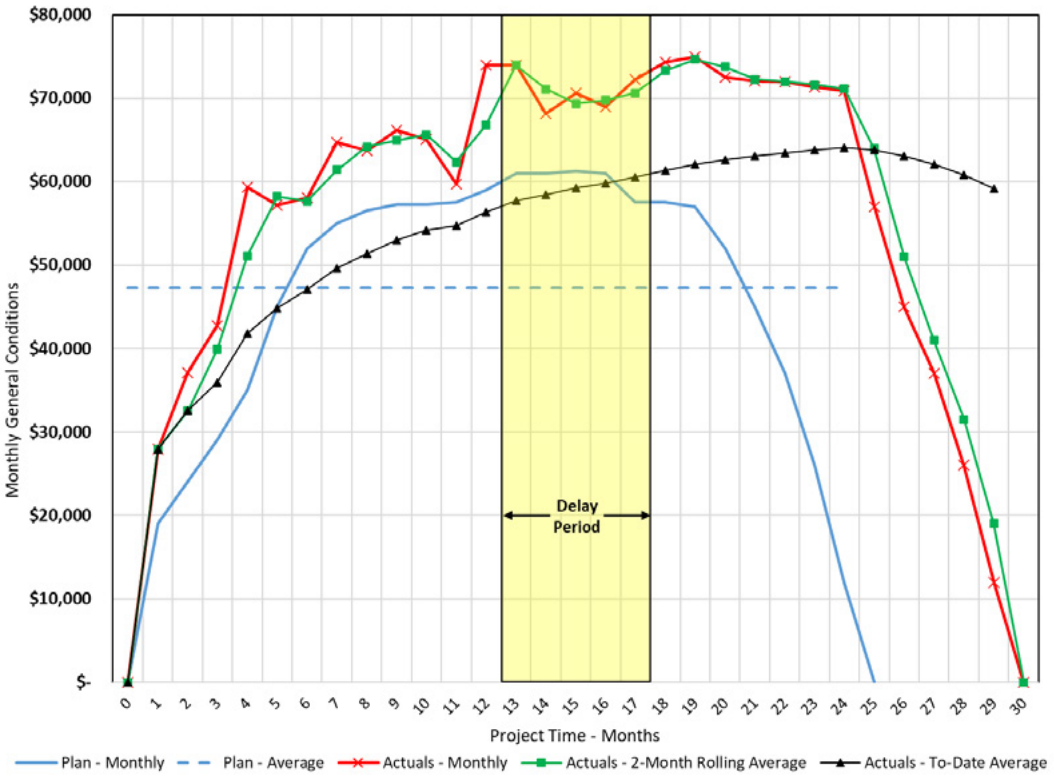


FIGURE 4 Comparing GC Pricing Methods Using Example Project

The data also shows that the contractor was in the middle of the project (month 12 of 24) when the delay began. Therefore, the contractor was experiencing its peak general conditions period and would expect to remain in that peak rate for at least the remaining three months. Given those assumptions, it would not appear that the contractor's rate would vary significantly from the rate incurred in month 12. Therefore, the owner's rejection would appear to be unwise from a cost and risk standpoint, as it only heightened the owner's risk for paying constructive acceleration costs.

Question 4: What alternatives were available to the owner to reduce its risk of constructive acceleration?

To reduce its risks, the owner could have agreed to resolve the change order time and costs in a two-step process. First, the owner could have provided a unilateral, non-compensable time extension for months 15 through 17, while also assuring the contractor in written format that a review of the time-related costs would follow. This would have eliminated the contractor's concern that the owner would assess liquidated damages, while also reducing the owner's exposure to constructive acceleration and, potentially, other increased costs.

Next, the owner could continue to collaborate with the contractor to resolve the additional costs. The owner could have also required the contractor to submit its actual costs during months 15 through 17, monitored those costs, and if the contractor actually incurred the three months delay during that time, paid the contractor the extended general conditions at the end of the delay (end of month 17). Should the parties not reach an agreement on the total value of the additional costs resulting from the delay, the owner may execute a unilateral change order to the contractor for the additional costs supported, further reducing the owner's exposure to additional costs, and providing the contractor compensation for at least some of the requested amount.

The contractor could file a claim for any unresolved and disputed additional time and costs, but the owner's unilateral actions in this example would have reduced the owner's exposure, while also preventing further damage to the parties' relationship.

COMPARISON OF METHODS FOR GENERAL CONDITIONS

As discussed in the preceding example, there are a multitude of ways to calculate extended general conditions. Figure 4 uses the cost information from the preceding example and compares what the monthly general conditions rate would be using various methods.

In general, Figure 4 shows that the monthly actuals and 2-month rolling average were similar throughout the project duration. There are instances where these two cost methods could vary more but without significant cost fluctuations, these two pricing methods provide equivalent results, and the rolling average tends to "smooth" some of the variations that happen monthly.

In addition, only in month 25 and thereafter does the to-date average equal or exceed the monthly actuals and 2-month rolling average. Using the to-date average method would undercompensate the contractor until after month 24 compared to the other actual cost methods.

Lastly, for most of the project, using the plan average[8] method would further undercompensate the contractor compared to using

[8] The planned average in this example is a method comparable to using a pre-bid average or any other method where a contractor is either required, or chooses, to base the pricing on a uniform rate

actual costs. Compensation for delays that occur through month 3 or after month 26 would be higher compared to the contractor's actual costs; however, during the rest of the project, the contractor would be undercompensated compared to its actual costs. While this method may be agreed upon before the contract or provide a more-efficient process for resolving the extended general conditions, the parties using this method must understand that it provides inherent risks of over and under compensation and is more dependent on when the delays occur rather than what costs resulted from the delay.

Conclusion

It benefits both contractors and owners to contemporaneously submit and resolve time extensions, along with any additional costs associated with those time extensions. Adopting a "wait and see" approach tends to only strain the parties' relationships and increase the risks for all parties. Of course, the contemporaneous resolution of these items must be based on reasonable, acceptable, and demonstrable facts and projections, which are the foundation of any resolution of changes involving time and cost.

Contractors should be careful to only request time and costs t substantiated by facts and logic. Likewise, owners should be practical and consider whether the risks of not approving minimal, apparent cost differences outweigh the risks of a protracted resolution. In many instances, shifting the risk, closing the issue, and turning the focus to completing the remaining work is the best move that can be made by all parties.

Last, the contractor should evaluate the impact, and then price the additional costs using the method that most-accurately demonstrates the cost increases resulting from those impacts. Extended general conditions are often best quantified using the actual costs incurred at the time of the delay, a rolling-average that "smooths" the monthly costs, a forecast for when the additional work will be performed, or a combination of these and other methods. Remember, there is no "one size fits all" method for pricing delay costs. The parties submitting and evaluating the pricing must not only be well versed in the various pricing methods, but how the causal impact affected the remaining work and caused the increased costs.

References

1. AACE International, **Recommended Practice 52R-06**, *Prospective Time Impact Analysis - As Applied in Construction*, Morgantown, WV: AACE International, Latest revision.
2. Furniss, B.J. and C. Milburn, "Technical Paper **CDR-3214**, *Understanding and Applying the Elements of Constructive Acceleration*," AACE International, 2019.
3. Society of Construction Law, **Delay and Disruption Protocol**, 2nd edition, Society of Construction Law, February 2017.

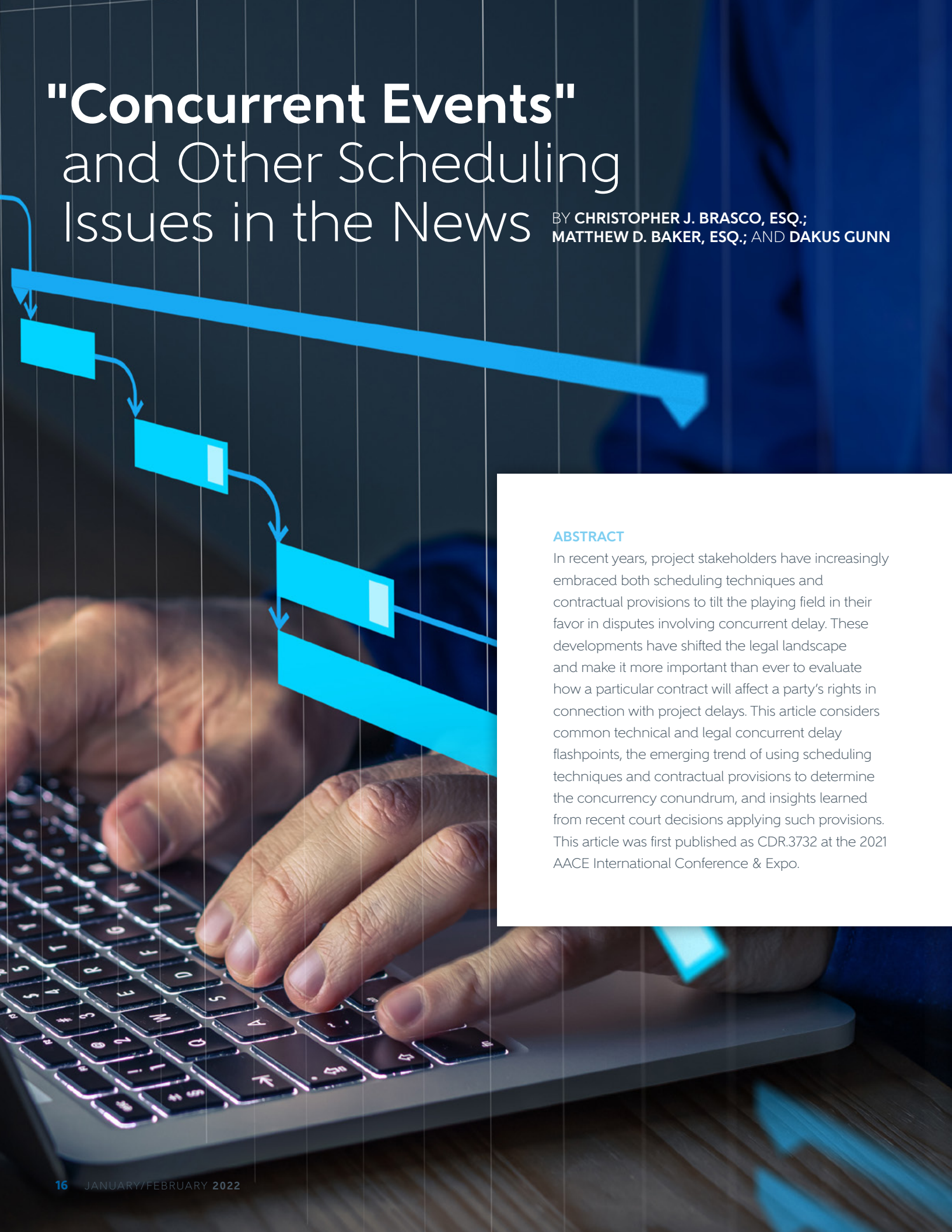
ABOUT THE AUTHORS

Brian J. Furniss, PE PSP CFCC, is with the Point Construction Advisory Group. He can be contacted by sending an email to: **bfurniss@pointcag.com**

Matthew G. Nichols, PSP, is with the Delta Consulting Group. He can be contacted by sending an email to: **mnichols@delta-cgi.com**

"Concurrent Events" and Other Scheduling Issues in the News

BY **CHRISTOPHER J. BRASCO, ESQ.; MATTHEW D. BAKER, ESQ.;** AND **DAKUS GUNN**



ABSTRACT

In recent years, project stakeholders have increasingly embraced both scheduling techniques and contractual provisions to tilt the playing field in their favor in disputes involving concurrent delay. These developments have shifted the legal landscape and make it more important than ever to evaluate how a particular contract will affect a party's rights in connection with project delays. This article considers common technical and legal concurrent delay flashpoints, the emerging trend of using scheduling techniques and contractual provisions to determine the concurrency conundrum, and insights learned from recent court decisions applying such provisions. This article was first published as CDR.3732 at the 2021 AACE International Conference & Expo.

I. Concurrency: The Backstory

Concurrent delay plays a central role in allocating responsibility for project delay. Its technical definition and legal effect have been the subject of substantial scholarship and not a few legal opinions. The Association for the Advancement of Cost Engineering International ("AACE International") defines concurrent delay as "[t]wo or more delays that take place or overlap during the same period, either of which occurring alone would have affected the ultimate completion date."[1] In practice, this definition ultimately raises more questions than it answers regarding the technical meaning of concurrent delay. Nevertheless, it provides a working explanation of the concept to enable further exploration.

As opposed to its technical definition, some consensus exists regarding the legal effects of concurrent delay once it is established. Delays are often classified as compensable, excusable, or non-excusable. From the perspective of the contractor, a compensable delay is attributable to the owner,[2] an excusable delay is one for which neither party is ultimately contractually responsible,[3] and a non-excusable delay is one attributable to the contractor.[4] [5] Most courts and scheduling consultants also agree regarding the legal effect of the coinciding occurrence of these categories of delay. For example, when a compensable delay occurs concurrently with an excusable delay or a non-excusable delay, the contractor is not entitled to compensation and its sole remedy is generally an extension of time.[6] When a non-excusable delay occurs concurrently with a compensable or excusable delay, an owner is generally not entitled to access liquidated damages.[7] Moreover, an owner-caused compensable delay may impact the propriety of the owner's termination of the contract of the contractor. The generally understood effect of common combinations of parallel delays can be summarized as shown in Table 1.[8]

Concurrent delay can affect project stakeholders either positively or negatively depending on the specific circumstances. For example, concurrent delay generally provides a contractor with a defense to an owner-asserted claim for liquidated damages. However, concurrent delay can defeat the same contractor's affirmative claim for compensation. Consequently, project stakeholders' views of concurrency are generally situationally dependent. Indeed, with concurrency being a dual-edged sword, neither owners nor contractors as groups have adopted consistent advocacy positions on concurrent delay concepts. The resulting crossfire is perhaps responsible for some of the lack of consensus on what constitutes concurrent delay.

Delay Type No. 1	Delay Type No. 2	Legal Effect
Owner-Caused Compensable Delay	Contractor-Caused Non-Excusable Delay	No Compensation / Time for Contractor
Owner-Caused Compensable Delay	No-Fault Excusable Delay	No Compensation / Time for Contractor
Contractor-Caused Non-Excusable Delay	No-Fault Excusable Delay	No Compensation / Time for Contractor

TABLE 1 Delay Types and the Legal Effect

AACE International has identified six primary areas of debate regarding the meaning of concurrency on any particular project, including:

- Whether concurrency is determined literally or functionally
- Whether responsibility for delay is determined based on least-value float or negative float value
- Whether concurrency is determined on the cause or the effect of delay
- The frequency, duration, and placement of the analysis interval
- The order of delay insertion or extraction in a stepped implementation
- Whether the analysis is done using hindsight or blindsight (knowledge-at-the-time).[9]

A high-level overview of some of these common areas of conflict illustrates the inherent complexity of concurrency and the potential for divergent viewpoints.

Whether concurrency should be determined from a literal or functional perspective revolves around whether two delays must exactly overlap or merely both occur in the scheduling period being analyzed.[10] The literal theory, the use of which is generally less likely to produce a concurrency finding, requires the applicable delays to occur "at the same time" while

---

[1] AACE International **Recommended Practice No. 10S-90**, "*Cost Engineering Terminology*" (October 10, 2019) http://library.aacei.org/terminology/

[2] *Id.* (defining a "compensable delay" as "[d]elays that are caused by the owner's actions or inactions. Contractor is entitled to a time extension and damage compensation for extra costs associated with the delay.")

[3] *Id.* (defining an excusable delay as "[a]ny delay beyond the control and without the fault or negligence of the contractor or the owner, caused by events or circumstances such as, but not limited to, acts of God or of the public enemy, acts of interveners, acts of government other than the owner, fires, floods, epidemics, quarantine restrictions, freight embargoes, hurricanes, tornadoes, labor disputes, etc. Generally, a delay caused by an excusable delay to another contractor is compensable when the contract documents specifically void recovery of delay costs.")

[4] *Id.* (defining inexcusable delay as "[a]ny delay caused by events or circumstances within the control of the contractor, such as inadequate crewing, slow submittals, etc., which might have been avoided by the exercise of care, prudence, foresight, or diligence on the part of the contractor.")

[5] Co-author Dakus Gunn prefers to view the classification of delays through a decision-tree paradigm which first determines whether a delay is excusable and then proceeds to determine whether the delay is compensable or non-compensable under the parties' contract.

[6] *Morganti Nat., Inc. v. United States*, 49 Fed. Cl. 110, 132 (2001), aff'd, 36 F. App'x 452 (Fed. Cir. 2002) (citation omitted) ("However, the fact that the contractor may also have caused concurrent delay is not fatal to the contractor's claim for additional time due to excusable delay. 'If a period of delay can be attributed simultaneously to the actions of both the government and the contractor, there are said to be concurrent delays, and the result is an excusable but not a compensable delay.'"); *Fireman's Fund Ins. Co. v. United States*, 92 Fed. Cl. 598, 666 (2010) (citation omitted) ("Further, determining responsibility for delay is essential, as '[a] contractor typically may not recover if government-caused delay is concurrent with additional delay not caused by the government, such as weather or contractor delay.'")

[7] *K-Con Bldg. Sys., Inc. v. United States*, 115 Fed. Cl. 558, 575 (2014) (quoting FAR 52.249-10(b)(1)) ("As defendant notes, federal procurement law provides that the government cannot assess liquidated damages against a contractor for a failure to timely complete work under a contract if '[t]he delay in completing the work arises from unforeseeable causes,' such as acts of the government, that are 'beyond the control and without the fault or negligence of the contractor.'").

[8] AACE International **Recommended Practice No. 29R-03**, "*Forensic Schedule Analysis*" at p. 100-01 (2011).

[9] *Id.* at p. 104.

[10] *Id.*

[11] *Id.* at 104-06.

the functional theory will find multiple delays to be concurrent when they occur "within the same analysis period."[11] The decision regarding which one of these conceptual approaches should be employed can be dispositive of a delay dispute.

The conflict between the least float and the negative float theories involves different views regarding how a project's critical path is determined. The critical path is generally understood to be "[t]he longest continuous chain of activities (may be more than one path) which establishes the minimum overall project duration."[12] Only delays to activities on the critical path generally create entitlement to an extension of time. Consequently, the identification of the critical path has significant consequences. Under the least float or longest path theory, the critical path runs along the activity path that has the least amount of float or, said another way, the most negative float.[13] In contrast, under the negative float theory, any activity path with negative float bears on the analyst's determination of fault.[14] Whether the critical path is mapped under either the least float / longest path theory or negative float theory can be determinative of whether a specific delay event can be considered to be a concurrent delay.

Concurrency analysis is further complicated by whether a delay's start date should be determined based on its effect or its cause. If the effect of a delay is determinative, then a delay does not begin until the scheduled duration of the impacted activity expires.[15] However, if the underlying cause of delay is determinative, then a delay's commencement date is the beginning of the event which caused the delay.[16]

Disagreements also frequently emerge regarding what time period should be analyzed when evaluating concurrency. For example, should concurrency be evaluated across the project's entire duration or only during a specific time period? If a specific time period, how should that time period be determined? Under the functional theory, how the period of analysis is determined can alter the results of the concurrency analysis. The functional theory permits two delays occurring in the same period of analysis to be considered concurrent. However, if the period of analysis is defined to exclude one of these two delays, the two delays cannot be concurrent under the functional theory.[17]

An even more technical issue involves the order of the insertion or extraction of delay events in connection with certain methods of delay analysis. For example, inserting delay events in a specific order can remove concurrency as a consideration if the first delay event is substantially longer than the second delay event. However, reversing this order to permit the shorter delay event to be inserted first can establish concurrency.[18]

Finally, whether the project's critical path is determined from the perspective of hindsight or blindsight can affect the analysis of concurrency. In hindsight analysis, "the analysis uses all the facts, regardless of the contemporaneous knowledge, in determining what occurred in the past."[19] In blindsight analysis, "the analysis evaluates events as-if standing at the contemporaneous point in time, with no knowledge of subsequent events." Hindsight analysis usually looks to the as-built schedule to determine the final, critical path for the project. In regard to forensic analysis, often times these approaches are blended where progress schedules or schedule updates are viewed to determine the historic critical path at a specific point in time in light of the as-built data.

The many debates surrounding what constitutes "concurrency" illustrate some of the challenges facing any concurrency risk assessment. Dueling experts can reach diametrically opposed conclusions based on the methodology employed. Consequently, project stakeholders have endeavored to build increased certainty regarding what constitutes concurrent delay into their contracts.

II. Float: The Real News

One means by which stakeholders have sought increased certainly in delay disputes generally has been by controlling float. Two associated concepts when dealing with float are total float and free float. Total float is commonly understood as the number of days an activity can be delayed before becoming critical.[20] Free float is the number of days an activity can be delayed before delaying its successor activity(ies) and, in turn, affecting the float values of the logic path(s) of which the activity is a member.[21]

The scheduling concept of float is integral to understanding and resolving issues of criticality. As float determines when an activity becomes critical, it will also influence when delays to such activity may potentially be considered concurrent.

Float has significant value when determining the cause and effect of individual project delays. Moreover, as the precursor to criticality, stakeholders often wrestle over to whom a project's float belongs. Contractors claim entitlement to a project's float based on their control of the means and methods of construction and responsibility for developing and updating the project schedule.[22] Owners claim entitlement to a project's float on the grounds that they have "purchased" all services provided by the contractor and own all resulting benefits.[23] However, unless the contract provides otherwise, float is most commonly viewed as belonging to the project.[24] Under this view, float is a "shared commodity" to be used for the benefit of the project as opposed to individual stakeholders.[25]

---

[11] *Id.* at 104-06.

[12] AACE **Recommended Practice No. 10S-90**, "*Cost Engineering Terminology*) (October 10, 2019) (defining critical path).

[13] See, *infra*, Sec II.

[14] *Id.* at 106.

[15] *Id.* at 106-07.

[16] *Id.*

[17] *Id.* at 107.

[18] *Id.* at 108.

[19] *Id.* at 108.

[20] *Id.* (defining "total float" as "[t]he maximum number of work periods by which an activity can be delayed without delaying project completion or violating a target (milestone) finish date.")

[21] *Id.* (defining "free float" as the "[m]aximum amount by which an activity can be delayed beyond its early dates.")

[22] See Kenney & Sams, P.C. "*Who Owns the Float*," December 19, 2017, https://kslegal.com/who-owns-the-float/ (outlining contractor's argument for ownership of the float).

[23] *Id.* (outlining owner's argument for ownership of the float).

[24] AACE, **Recommended Practice 29R-03**, § 1.5(B) (2011) ("In the absence of contrary contractual language, network float, as opposed to project float, is a shared commodity between the owner and the contractor. In such a case float must be shared in the interest of the project rather than to the sole benefit of one of the parties to the contract.")

[25] *Id.*

Express contractual provisions investing ownership of the float in one party are hardly new.[26] Such provisions and their associated risks, however, can be easily overlooked during contract formation. Even more insidious, stakeholders have recently used more indirect methods to take control or sequester float.

A. Float Sequestration by Owners

Owners typically have significant control over the drafting of project contracts. Accordingly, owners have an opportunity to incorporate provisions outlining project processes and procedures to sequester float for themselves. These float sequestration provisions are frequently buried deep in a contract's technical scheduling specifications. However, far from being mere scheduling boilerplate, such provisions can significantly affect the parties' rights. For example, float consumption provisions, by determining which parties have priority to use float, can at least partially inoculate a party from the consequences of its own delays by permitting it to avoid responsibility for concurrent delay. For example, a typical float consumption provision is as follows:

> *All float in the schedule shall first be for the benefit of the owner, the engineer, the design engineer and then for the benefit of the contractor.*[27]

Float consumption provisions can also be drafted to provide that specific types of activities will have priority to the usage of float. Such provisions can be more subtle in their effect and who they favor than float consumption provisions providing priority based on party identity. For example, float consumption provisions specifying that activities for which the owner is traditionally responsible (*i.e.*, submittal review) will have priority in connection with float consumption effectively hand owners' control of the float.

Owners can also gain control over the schedule and build float into the schedule for their own use through contract mandated review/approval durations. A common example of this is found where the owner mandates a 14-day review period for any required submittal. While an owner/designer will rarely need to engage in a full design review for minor revisions and resubmittals, the owner/designer may avail itself of the 14-day provision in order to implement change in the project and use the 14-day review duration to declare such change as non-critical. Such provisions sequester additional durations for the owner with each rejection and resubmittal thereby providing owners with a means of creating float for their own use.

Owners may also impose scheduling requirements on contractors to reduce float in contractor-controlled activities. For example, activity duration limits or not-to-exceed-activity-durations prevent contractors from creating summary activities while also increasing the number of schedule activities. The practical import of the foregoing is to preclude contractor efforts to build float into activity durations and increase the number of points where a contractor-delay could affect the critical path. Similarly, owners can structure anticipated weather day provisions to more effectively limit float in contractor-controlled activities. For example, specifying an anticipated number of weather days for the entirety of the project rather than an individual month, which makes it less likely based on the law of averages that a single unusual weather event will entitle the contractor to an extension.

B. Float Sequestration by Contractors

Contractors generally use the project schedule to sequester float. Although the owner may be able to control the project schedule's format, contractors generally control the sequence of activities and their intended durations. In constructing the schedule, contractors can sequester float for themselves through a variety of scheduling techniques.

Perhaps the simplest way for contractors to sequester float is by inflating anticipated activity durations. If a contractor uses an activity duration that is 10% longer than necessary to complete an activity which the contractor performs, the contractor has effectively created float which it can control. The contractor unlocks this float when it completes the activity ahead of schedule. Similarly, contractors can create float which they control by grouping multiple activities into a single summary activity. Such a technique creates float for the total summary activity if a task included in the summary activity is finished early. Summary activities also provide contractors with an opportunity to catch-up and avoid delay to the critical path if an initial task included in the summary activity is finished late.

Contractors can also create float by scheduling activity durations using workdays (5-day weeks) instead of calendar days (7-day weeks). When a contractor schedules an activity, whose duration is in reality determined based on calendar days using workdays, the contractor can create float when the activity overlaps a weekend. For example, concrete cures within a certain number of calendar days. However, if the contractor schedules concrete cure durations in terms of workdays, the contractor can create float where the activity spans the weekend.

Float sequestration, whether employed by owners through contract specifications or by contractors through schedule preparation, can significantly affect the outcome of scheduling disputes. By making it more likely that delay runs through activities controlled by a single party, float sequestration makes concurrent delay less likely and increases the opposing party's exposure for critical path delay. Consequently, a party's ability to establish concurrency is becoming increasingly determined at the beginning of the project based on how the table is initially set.

III. Contracting Around Concurrency: The Rest of the Story

In addition to using float sequestration techniques to pre-determine delay disputes, project stakeholders are also increasingly incorporating provisions

[26] *Constr. Enterprises & Contractors, Inc. v. Orting Sch. Dist. No. 344*, 121 Wash. App. 1012 (2004) (unpublished) (involving a contractual provision specifying that "[t]he inclusion of float time in the activity listing of the Contractor's Construction Schedule shall be owned entirely by the owner.")

[27] *Stellar J Corp. v. Smith & Loveless, Inc.*, Case No. 3:09-CV-00353-JE, Magistrate Findings and Recommendations (DKT 85) at *3-4 (D. Or. Aug. 4, 2010).

"reinterpreting" concurrent delay into their contracts. Such provisions may contractually define concurrent delay, stipulate to the effect of a finding of concurrent delay, or provide procedural prerequisites to establishing and claiming concurrent delay. The proliferation of these provisions further illustrates how concurrency disputes may be determined by the contract documents more so than the parties' performance.

A. DEFINING CONCURRENT DELAY

Parties use contracts to allocate project risks. Consequently, it is not surprising that project stakeholders would attempt to use contract provisions to create increased certainty in delay disputes. Such provisions are increasingly addressing delay exposure by addressing schedule criticality and its inter-related forerunner – concurrency.

A cursory review of standard construction contract specifications used by state transportation departments illustrates not only the trend of defining what constitutes "concurrent delay" but also the possible implications of such definitions. Several states have adopted specifications that would appear to define "concurrent delay" narrowly at least when such definitions are read by themselves. For example, the Ohio Department of Transportation's Construction and Material Specifications provides in relevant part that "[c]oncurrent delays are separate critical delays that occur at the same time."[28] The Colorado Department of Transportation's Standard Specifications for Road and Bridge Construction define "concurrent delay" as "[i]ndependent delays to critical activities occurring at the same time."[29] Similarly, the Idaho Transportation Department's Standard Specifications for Highway Construction notes that concurrent delays "[a]re independent critical activity delays occurring at the same time." [30]

However, other state departments of transportation have adopted specifications which seem to define "concurrent delay" in a manner that would appear to be more consistent with a broader approach. For example, the Utah Department of Transportation's Standard Specifications define "concurrent delay" as "a non-compensable delay that occurs when both the contractor and the department independently delay work on critical path activities during *approximately* the same time period."[31] Such an approach may leave open the possibility that delays occurring within the same analysis period could be considered concurrent.

Finally, some state departments of transportation have adopted definitions of concurrency which may have other implications. The Minnesota Department of Transportation's Standard Specifications for Construction interestingly states in relevant part that "[c]oncurrent delays are independent sources of delay that occur at the same time."[32] Such a definition, at least standing on its own, may permit delays to activities with a negative float path but not the longest negative float path to be considered concurrent delays.

B. DEFINING THE EFFECT OF CONCURRENT DELAY

A different genre of contract provision attempts to stipulate what effect concurrent delay will have including if and when a contractor will be entitled to a time extension. A contractor is generally entitled to a time extension when a contractor-caused delay occurs concurrently with either an owner-caused compensable delay or a no-fault excusable delay. However, some owners are incorporating provisions into their contracts that alter these well-established principles. For example, provisions such as the following seek to limit when concurrency will entitle the contractor to a time extension:

> *Concurrent delays are separate critical delays that occur at the same time. When an excusable, non-compensable delay is concurrent with an excusable, compensable delay, the contractor is entitled to additional time but not entitled to additional compensation.* ***When a non-excusable delay is concurrent with an excusable delay, the contractor is not entitled to a time extension or additional compensation.***[33]

The above provision seeks to preclude the contractor from obtaining a time extension when its own delay is concurrent with an excusable, no-fault delay and possibly even a compensable owner-caused delay. The following similar provision even more unambiguously limits the contractors' entitlement to a time extension in the face of concurrent delay:

> *If an unexcused delay occurs concurrently with either an excusable delay or a compensable delay, the maximum extension of the contract time shall be the number of days, if any, by which such excusable delay or compensable delay exceeds the number of days of such unexcused delay.*[34]

Under this provision, the contractor is not entitled to a time extension until its own delay is resolved and either a compensable owner-caused delay or an excusable delay is the sole source of delay. Such provision largely eviscerates the concept of concurrency and significantly increases the contractor's exposure to delay risks.

C. PROCEDURAL HURDLES TO ESTABLISHING CONCURRENT DELAY

Notice of claim provisions are a common feature of most construction contracts. How strictly such provisions will be enforced varies by jurisdiction. However, many a compensable delay claim has faltered in the face of contractual notice problems. Concurrent delay is frequently viewed

---

[28] State of Ohio Department of Transportation, Construction and Material Specifications, § 108.06(F) (2019 Edition) (Online Version 7/17/2020) http://www.dot.state.oh.us/Divisions/ConstructionMgt/OnlineDocs/Specifications/2019CMS/2019_CMS_07172020_for_web_letter_size.pdf

[29] Colorado DOT, Standard Specifications for Road and Bridge Construction," § 108.08(c)(3) (2019) https://www.codot.gov/business/designsupport/cdot-construction-specifications/2019-construction-specifications/2019-specs-book/2019-standard-specifications

[30] Idaho Transportation Department, "2018 Standard Specifications for Highway Construction," § 101.04, https://apps.itd.idaho.gov/Apps/manuals/SpecBook/SpecBook18.pdf

[31] Utah Department of Transportation, "2020 Standard Specifications for Road and Bridge Construction," § 00777, 1.4(F)(2) accessed from https://www.udot.utah.gov/connect/business/standards/ (emphasis added)

[32] Minnesota DOT, Standard Specifications for Construction, § 1806.2(D) (2018 Edition), http://www.dot.state.mn.us/pre-letting/spec/2018/2018-spec-book-final.pdf

[33] Tennessee DOT, "Standard Specifications for Road and Bridge Construction," § 108.07 (January 1, 2015), https://www.tn.gov/content/dam/tn/tdot/construction/old_web_page/TDOT_2015_Spec_Book_FINAL_pdf.pdf (defining "excusable, non-compensable delays" as those "that are not the fault of either the Contractor or the Department" and "excusable, compensable delays" to be "delays affecting the critical path of work that are determined to be the result of changes in the work.")

[34] Examples of this provision can be found at https://www.lawinsider.com/dictionary/unexcused-delay

as a defensive shield. Such delay can protect an owner from a compensable delay claim, as well as protect a contractor from a liquidated damages assessment. However, some courts have recently applied notice of claim and other procedural provisions to preclude parties who have failed to follow contractual requirements from raising concurrent delay as a defense.

For example, in *Greg Opinski Constr., Inc. v. City of Oakdale*, 199 Cal. App. 4th 1107 (Ct. App. 2011) the intermediate California Court of Appeal enforced various procedural/notice provisions to preclude the contractor from raising concurrent delay as a defense to the owner's assessment of liquidated damages. *Id*. at 1117–18. As a defense to the assessment of liquidated damages, the contractor argued that the delay at issue was caused by the owner. *Id*. at 1109. However, the contract contained certain provisions conditioning the contractor's entitlement to a time extension on timely notice and submission of a request for a time extension. *Id*. at 1111-1113. The contractor failed to follow this procedure. Id. at 1113. Consequently, the trial court entered judgment against the contractor for liquidated damages. *Id*. at 1114-15. On appeal, the contractor argued that liquidated damages could not be awarded if the owner caused the delay regardless of whether the contractor followed the contractor's procedural requirements. *Id*. at 1115. However, the appellate court rejected this argument and affirmed the trial court's decision reasoning that:

> *If the contractor wished to claim it needed an extension of time because of delays caused by the city, the contractor was required to obtain a written change order by mutual consent or submit a claim in writing requesting a formal decision by the engineer. It did neither. The court was correct to rely on its failure and enforce the terms of the contract. It makes no difference whether Opinski's timely performance was possible or impossible under these circumstances. The purpose of contract provisions of the type [at issue] ... is to allocate to the contractor the risk of delay costs–even for delays beyond the contractor's control–unless the contractor follows the required procedures for notifying the owner of its intent to claim a right to an extension.*

Id. at 1117-1118. Potential grounds exist to challenge the outcome reached in *Opinski*.[35] However, *Opinski* serves as a warning that courts may be willing to enforce procedural contract provisions to preclude a party from asserting concurrent delay as a defense.

IV. Legal Updates: Breaking News

Courts across the country have begun to weigh-in on the wave of scheduling specifications and contract provisions that attempt to refashion the meaning and effect of concurrent delay. These initial decisions provide some insights into how the legal system may handle scheduling specifications and contract provisions which attempt to re-define concurrency.

As an initial matter, courts continue to hold divergent views on the meaning of concurrent delay. For example, the D.C. Court of Appeals recently indicated that "'concurrent delay' has a special meaning in government contract law and refers to the delay that 'occur[s] when two or more causes have a simultaneous effect on contract performance.'" *Rustler Constr., Inc. v. D.C.*, 211 A.3d 187, 195 (D.C. 2019) (citation omitted). However, the intermediate Court of Appeals of Washington noted that "[c]oncurrent delay occurs when both parties to the contract cause some kind of delay" and that "concurrent delay does not need to exactly overlap; rather, the delay need only be related by circumstances, not necessarily over the same period of time." *Cortinas Painting & Restoration, Inc. v. Corp Inc.*, 200 Wash. App. 1068 (2017) (Unpublished) (citation omitted).

Several recent decisions have addressed attempts to use contract provisions to upend traditional delay concepts including concurrency. In *Star Dev. Grp., LLC v. Darwin Nat'l Assurance Co.,* 813 F. App'x 76, 79 (4th Cir. 2020) (Unpublished), the U.S. Court of Appeals for the Fourth Circuit affirmed the confirmation of an arbitral award rejecting an attempt to use a contract provision to strip a party of its concurrent delay defense. In the arbitral proceeding, the owner sought damages from the contractor for delays for which the arbitral panel found both parties "concurrently responsible." *Id.* at *79. The contract provided:

> *[I]n no event shall Contractor [] be entitled to an extension of the Contract Time, nor to recover Extended General Conditions nor to recover any other damages, costs or expenses of any kind as a result of a delay or suspension, if such delay or suspension for which Contractor claims entitlement: (a) was caused in whole or in part, directly or indirectly, by the wrongful acts or omissions or other default of Contractor or any other Contractor Party; and/or (b) is concurrent with a delay caused in whole or in part, directly or indirectly, by the wrongful acts or omissions or other default of Contractor or any other Contractor Party.*

Id. (emphasis added/revised). The owner argued based on the above provision that the contractor could not obtain a time extension for any delays to which the contractor contributed, and that the contractor was further precluded from arguing that the owner's concurrent delay barred the owner's claim for delay damages. *Id.* The arbitral panel rejected the owner's argument by finding that the owner's design changes, and other conduct waived the substantial completion date so that the above clause precluding a time extension for concurrent delay was inapplicable. *Id.* at *79-80. In addition, the arbitral panel found that a clause purporting to award delay damages to the owner for concurrent delay was unenforceable under applicable state law. *See Id.* at *80 n.4 (brackets in original) (noting the arbitral panel's finding that under the circumstances "neither party [could] make the requisite showing of cause and effect that is needed to recover breach of contract damages..."). The district court confirmed this decision and the 4th Circuit affirmed. *Id.* at *80, 90. Although arbitral decisions are deferentially reviewed, the inability of the owner's theory to gain traction at any stage of this dispute is noteworthy.

In *Cent. Ceilings, Inc. v. Suffolk Constr. Co., Inc.*, 91 Mass. App. Ct. 231 (2017) the court rejected the use of a no-damages-for-delay clause to defeat a loss of productivity/constructive acceleration claim. *Id*. at 236-39. On the project at issue, the contractor was found to have failed to fulfill its obligation to coordinate the work of its subcontractors among other failures. *Id*. at 233. Facing significant liquidated damages on the project, the contractor advised its subcontractor that no extension of time would be granted. *Id*. at 236. The subcontractor completed its work on time but incurred significant additional labor costs. *Id*. at 234-35. The contract between the contractor and subcontractor provided that the subcontractor:

[35] Christopher J. Brasco, Kathleen O Barnes, James G. Zack, Jr., Kenji P. Hoshino, and Matthew D. Baker, "*Damages Without a Cause: Liquidated Damages Are a Penalty When Owners Recover Damages for their Own Delay*," AACE International Technical Paper CDR-3260 (2019).

shall have no claim for money damages or additional compensation for delay no matter how caused, but for any delay or increase in the time required for performance of this Subcontract not due to the fault of the Subcontractor, the Subcontractor shall be entitled only to an extension of time for performance of its Work.

Id. at 235. The contractor attempted to use this provision to defeat the subcontractor's affirmative claim. *Id*. The trial rejected this argument on two grounds: (i) by indicating no time extensions would be granted, the contractor deprived the subcontractor of any remedy and (ii) the subcontractor was not seeking damages for delay. *Id*. at 236-238. The appellate court affirmed.

Several takeaways are apparent from these recent decisions. First, lack of consensus among courts regarding the definition of concurrent delay suggests contractual definition may be prudent. Second, contractual provisions redefining the meaning and effect of traditional delay concepts such as concurrency may have limits. Courts and/or arbitral panels may be reluctant to enforce contract provisions in a manner that would produce an inequitable result at odds with traditional legal principles. Finally, courts are likely to narrowly construe specialized contractual provisions. Unless such provision is directly and clearly applicable, courts may be adverse to efforts to invoke its application.

Conclusion

Scheduling disputes are increasingly being determined by virtue of contract formation rather than the circumstances surrounding the delays to the project. Scheduling techniques and specialized contract provisions can effectively predetermine scheduling disputes. It remains to be seen how far courts will permit parties to go in using such techniques and provisions to tilt the scales in their favor when contracting for construction work. There do appear to be limits. Nevertheless, going forward, stakeholders cannot discount the effect these contract provisions and scheduling techniques may have on project risks.

References

1. AACE International **Recommended Practice 10S-90**, "*Cost Engineering Terminology*," (October 10, 2019). http://library.aacei.org/terminology/
2. AACE International **Recommended Practice 29R-03**, "*Forensic Schedule Analysis*" (2011).
3. Brasco, C. J., Barnes, K. O., Zack, J. G., Jr., Hoshino, K. P., and Baker, M. D., "*Damages Without a Cause: Liquidated Damages Are a Penalty When Owners Recover Damages for their Own Delay*," AACE International Technical Paper CDR-3260 (2019).
4. Colorado Department of Transportation, "*Standard Specifications for Road and Bridge Construction*," (2019). https://www.codot.gov/business/designsupport/cdot-construction-specifications/2019-construction-specifications/2019-specs-book/2019-standard-specifications
5. *Constr. Enterprises & Contractors, Inc. v. Orting Sch. Dist. No. 344*, 121 Wash. App. 1012 (2004) (unpublished).
6. *Fireman's Fund Ins. Co. v. United States*, 92 Fed. Cl. 598, 666 (2010) (citation omitted).
7. Idaho Transportation Department, "*2018 Standard Specifications for Highway Construction*," https://apps.itd.idaho.gov/Apps/manuals/SpecBook/SpecBook18.pdf
8. *K-Con Bldg. Sys., Inc. v. United States*, 115 Fed. Cl. 558, 575 (2014).
9. Kenney & Sams, P.C. "*Who Owns the Float*," December 19, 2017, https://kslegal.com/who-owns-the-float/
10. Minnesota Department of Transportation, "*Standard Specifications for Construction*," (2018 Edition). http://www.dot.state.mn.us/pre-letting/spec/2018/2018-spec-book-final.pdf
11. *Morganti Nat., Inc. v. United States*, 49 Fed. Cl. 110, 132 (2001), aff'd, 36 F. App›x 452 (Fed. Cir. 2002)
12. State of Ohio Department of Transportation, "*Construction and Material Specifications*," (Online Version 7/17/2020). http://www.dot.state.oh.us/Divisions/ConstructionMgt/OnlineDocs/Specifications/2019CMS/2019_CMS_07172020_for_web_letter_size.pdf
13. *Stellar J Corp. v. Smith & Loveless, Inc.*, Case No. 3:09-CV-00353-JE, Magistrate Findings and Recommendations (DKT 85) at *3-4 (D. Or. Aug. 4, 2010).
14. Tennessee Department of Transportation, "*Standard Specifications for Road and Bridge Construction*," (January 1, 2015).
15. https://www.tn.gov/content/dam/tn/tdot/construction/old_web_page/TDOT_2015_Spec_Book_FINAL_pdf.pdf
16. Utah Department of Transportation, "*2020 Standard Specifications for Road and Bridge Construction*," https://www.udot.utah.gov/connect/business/standards/

ABOUT THE AUTHORS

Christopher J. Brasco, Esq., is with Watt, Tieder, Hoffar & Fitzgerald, LLP. He can be contacted by sending an email to: **cbrasco@WattTieder.com**

Matthew D. Baker, Esq., is with Watt, Tieder, Hoffar & Fitzgerald, LLP. He can be contacted by sending an email to: **mbaker@WattTieder.com**

Dakus Gunn is with the Delta Consulting Group. He can be contacted by sending an email to: **dgunn@delta-cgi.com**

The Top Ten Mistakes Made in Forensic Analysis

BY **GLEN R. PALMER, CFCC PSP FAACE;** AND **CHRISTOPHER W. CARSON, CEP DRMP PSP FAACE**

ABSTRACT

Project team members and experts are not always accurate in how they analyze a project's forensic history. These inaccuracies range from using incorrect analysis methodologies to "cherry-picking" only data that supports their case and everything in between. These mistakes are common and happen for many different reasons. They can result from an analyzer not having enough experience or they can be made purposely in an attempt to mislead someone. The authors of this article will discuss ten biggest mistakes made in forensic analysis today and how to recognize and confirm that each is in fact mistake. In addition to the identification, the article will also discuss the proper way to perform each analysis where the mistake was made, using lessons learned from project controls, forensic analysis/dispute resolution experience, and AACE's Recommended Practices. These top ten mistakes will be discussed in ascending order of importance starting with least important, but the authors believe that all ten are vital to avoid when performing a forensic analysis. This article was first presented as CDR.3743 at the 2021 AACE International Conference & Expo.

Introduction

Project team members and experts are not always accurate in how they analyze a project's forensic history. These inaccuracies range from using incorrect analysis methodologies to "cherry-picking" only data that supports their case and everything in between. These mistakes are common and happen for many different reasons. They can result from an analyzer not having enough experience or they can be made purposely in an attempt to mislead someone.

The authors of this article will discuss ten biggest mistakes made in forensic analysis today and how to recognize and confirm that each is in fact mistake. In addition to the identification, the article will also discuss the proper way to perform each analysis where the mistake was made, using lessons learned from project controls, forensic analysis/dispute resolution experience, and AACE's recommended practices.

These top ten mistakes will be discussed in ascending order of importance starting with least important, but the authors believe that all ten are vital to avoid when performing a forensic analysis.

Mistake NO. 10 – "Failure to Research all Available Documentation Correctly"

There is nothing worse than being a testifying expert and be presented with a contemporaneous document that contradicts his/her opinion during testimony. Large projects can have hundreds of thousands of documents on file that require review, so it is important to perform this review correctly.

IMPORTANT DISCUSSION POINTS

1. Contract Documents
2. Monthly/Weekly/Daily Reports
3. Emails
4. Project Specifications/Project Manuals
5. Depositions
6. Schedule Updates

DETAILED DISCUSSION POINTS

1. Contract Documents

   Reviewing the contract and the associated documents that define the project delivery method, the scope of work, the schedule, the dispute clause, notice, contract definitions, LD's (if present), and the payment process are essential and must be accomplished early by the claim's consultant. Many consultants only review these key documents once. These documents must be reviewed again later in the process when the consultant has more project knowledge, which gives the contract requirements more context or meaning.

2. Monthly/Weekly/Daily Reports

   Analyzing monthly reports can provide a claim consultant the quickest way to get up to speed on an unfamiliar project. Even if the reports are very high level, it can help understand the basic elements of the scope of work, the schedule, the planned progress versus actual progress, and the actions that were taken to mitigate problems. Comprehensive monthly reports which are more detailed can also show productivity issues, how aggressive the engineering and construction progress curves are planned, staffing requirements, staff turnover (including management), procurement status, the number of engineer issues (RFI's), the quality of the work performed, and the magnitude of changes to the project. Weekly and daily reports can give the consultant the detailed specific issues pertaining to the items mentioned above that impacted productivity, as well as weather details. It is important to review all these documents. Many construction supervisors (especially the gray-haired guys) keep a daily logbook that can detail important information such as phone calls, discussions in the field, and other issues that are otherwise not documented. Not asking for these and reviewing them can lead to important project history that is lost or worse, history that is only found by the opposing side.

3. Emails

   It is not unusual these days, to be involved in a project that is governed mostly through emails rather than official letters on letterhead. There can be thousands of emails on a project. Many clients are reluctant to pay a consultant a high hourly rate to read all these emails. Many consultants are reluctant to read thousands of emails. Most disputes today use a searchable database for project documentation, including emails. Some of these databases work well and some are very cumbersome. Disputes can be won or lost due to finding or not finding one or two specific emails. It is amazing what people will put in an email. Many consultants do not put the correct amount of effort into reviewing emails due to cost and effort, especially for any management people that left the project early.

   Example

   On one project where Mr. Palmer was hired by a GC to defend a lost productivity claim by a subcontractor, he found an email discussing the subcontractor's lack of productivity. During the project, the first construction manager admitted to working unproductively in an email to the GC's project manager, saying:

   "The early work that was performed was done in single silos, and this was causing many activities to be worked out of sequence along with started work being left unfinished for long periods of time. We are now working more activities in multiple work fronts and in a sequential manner."

   There were several more emails admitting the same types of internal issues at different times during the project. After the first construction manager was fired, the replacements (the second one was fired too) had no record of what the first CM had put on paper and were not able to alert upper management of the emails that existed. No one in the company had reviewed the first CM's emails and the claim for lost productivity was embarrassingly settled during a negotiation meeting.

4. Project Specifications / Project Manuals

   The root cause of many disputes is poor project management skills, which can be a result of inexperience, lack of time, or lack of resources. It is time consuming and expensive to correctly manage a complex project. It is also time consuming and expensive to correctly analyze project management execution on a project. It requires a complete understanding of all the commitments made by the management team in the project execution manual, the project controls manual, and of the rest of the manuals and specifications. Many consultants do not put the correct amount of effort into reviewing the manuals and specifications prior to completing an expert report.

5. Depositions (if available)
   Depositions are often not available when a consultant gets brought into a dispute. However, in some instances some are available and when this happens it affords the consultant the opportunity to get up to speed on many of the main issues very quickly. It allows the consultant to take advantage of the deposing law firm's many hours of work preparing for the deposition and gives the consultant knowledge of many of the legal team's strategies. The key mistake often made – not reviewing depositions as soon as they are available.

6. Schedule Updates
   Many projects that fail today are projects where the project was poorly planned, scheduled, and managed. It is common on a failed project to find that the schedule's critical path was not analyzed monthly or not analyzed correctly, which can result in the project team working on the wrong activities and losing control of the project. The importance of determining these types of issues by the consultant cannot be understated. Many consultants reviewing schedule critical paths have never been on a project execution team on the type of project being analyzed.

IMPORTANT ADVICE

A thorough examination of project documents is necessary to win a dispute, but the review also must be accomplished by the correct people.

MISTAKE NO. 9 – "Not Checking Work Performed by Others – Risking Subpoena for Staff"

As a forensic schedule analysis professional developing the analysis and expert report, there seems to be two fields of thought; those who believe they need to perform all work by themselves and those who believe they can use other staff for portions of the analysis. The distinction is a serious one, and those who believe only the expert can provide analysis have a good point and one which can plague the expert if not followed. However, the shortcoming of this approach is that the expert is limited in time and can only perform the analysis capable of development in the time allotted which might be very short. This is especially true in a large claim, a very complicated claim, or a lengthy time period associated with the claim.

IMPORTANT DISCUSSION POINTS

1. Potential Limitations on Testimony
2. The Risks Associated with Sharing Analysis Responsibilities
3. The Benefits of Sharing Analysis Responsibilities
4. The Need to Check All Work Used in Analysis

DETAILED DISCUSSION POINTS

1. Potential Limitations on Testimony
   When the attorneys are identifying potential experts, they typically qualify the expert based on a number of factors; relevant education, certifications and registrations, publications and public alignment with industry best practices (including previous testimony, posts, presentations), relevant experience in the industry sector, relevant experience in the type of claim (delays, acceleration, critical or non-critical path networks, disruption and inefficiencies), training and presentation skills, and ability and track record for objective analysis reports.

   Federal rules of evidence are referred to as "Rule 702" and generally require the trial judge to act as a "gatekeeper" to prevent unreliable expert testimony in a case. The rule allows the testimony of an expert if they are "qualified by knowledge, skill, experience, training, or education" and meet the following four requirements:

   (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue.
   (b) the testimony is based on sufficient facts or data.
   (c) the testimony is the product of reliable principles and methods; and
   (d) the expert has reliably applied the principles and methods to the facts of the case."[1]

   If the expert has little to no experience in the industry sector outside the specifics of the case, the expert should not attempt to opine on anything related to those outside issues. If the expert is a delay analysis expert with little expertise in disruption, the report by this expert should confine itself to the delay and not attempt to analyze issues related to disruption even if requested by the opposition attorney.

   This limitation includes other topics like legal issues; Mr. Carson once was requested by a contractor client to include in the expert report a glossary of legal terms, quoted from *Black's Law Dictionary*. He refused the contractor's demands, and in defense raised the issue with the attorney, who promptly supported the refusal, noting that Mr. Carson was not a legal expert, and including even a list of terms from a legal dictionary could be subject to challenge and potentially disqualify him as the expert.

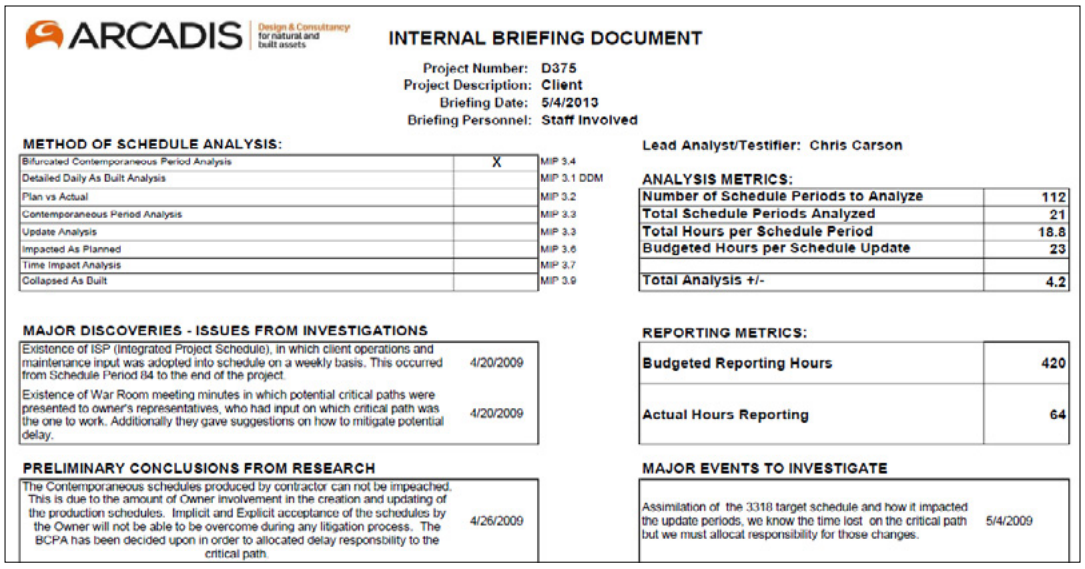
   However, when there is not enough time or the claim is too large for the sole expert to perform the full analysis, or the analysis process allows, support staff may be used for portions of the analysis. This can be very useful in some areas, such as using a Primavera Project Management (P6) practitioner to import and export files, develop exhibits, provide comparisons or other analysis, or run clarifying reports. It also allows much better staff development, mentoring, and improvement in staff qualifications, which is good for the staff, the company, and the industry. Assigned tasks such as these can be done by support staff without jeopardizing the expert's report, if the expert is responsible for the analysis and conclusions.

2. Risks Associated with Sharing Analysis Responsibilities
   Certainly, the expert must provide all expert judgment in the analysis and report. If a staff member is responsible for producing analysis and supplying conclusions without the expert supervision and analysis, the report quality could be inferior. Attorneys often question whether the expert performed all analysis in their own report, and failure to attest to this will draw further questions from the attorney, such as the name of the person who performed any of the analysis, and the extent of conclusions drawn by that person. The opposition attorney

[1] "Rule 702. Testimony by Expert Witnesses", Federal Rules of Evidence, Legal Information Institute, Cornell Law School, Pub. L. 93–595, §1, Jan. 2, 1975, 88 Stat. 1937; Apr. 17, 2000, eff. Dec. 1, 2000; Apr. 26, 2011, eff. Dec. 1, 2011.

can subpoena anyone who was involved in the analysis if they can show that the person provided expert judgment in the report, and when support staff who are not qualified as an expert are placed in deposition, there is a high risk of challenges to the expert and the report.

Mr. Carson was involved in one case where, during deposition, it became clear that the opposition expert did not fully understand his own expert report, and after establishing that he did not write it entirely, the attorney was preparing to subpoena the support staff when the expert withdrew his report. The opposition case was dependent upon their expert's report, so the withdrawal undermined their position considerably, and the case was quickly settled.



ARCADIS Design & Consultancy for natural and built assets

INTERNAL BRIEFING DOCUMENT

Project Number: D375
Project Description: Client
Briefing Date: 5/4/2013
Briefing Personnel: Staff Involved

METHOD OF SCHEDULE ANALYSIS:

Bifurcated Contemporaneous Period Analysis	X	MIP 3.4
Detailed Daily As Built Analysis		MIP 3.1 DDM
Plan vs Actual		MIP 3.2
Contemporaneous Period Analysis		MIP 3.3
Update Analysis		MIP 3.3
Impacted As Planned		MIP 3.6
Time Impact Analysis		MIP 3.7
Collapsed As Built		MIP 3.9

Lead Analyst/Testifier: Chris Carson

ANALYSIS METRICS:

Number of Schedule Periods to Analyze	112
Total Schedule Periods Analyzed	21
Total Hours per Schedule Period	18.8
Budgeted Hours per Schedule Update	23
Total Analysis +/-	4.2

MAJOR DISCOVERIES - ISSUES FROM INVESTIGATIONS

Existence of ISP (Integrated Project Schedule), in which client operations and maintenance input was adopted into schedule on a weekly basis. This occurred from Schedule Period 84 to the end of the project.	4/20/2009
Existence of War Room meeting minutes in which potential critical paths were presented to owner's representatives, who had input on which critical path was the one to work. Additionally they gave suggestions on how to mitigate potential delay.	4/20/2009

REPORTING METRICS:

Budgeted Reporting Hours	420
Actual Hours Reporting	64

PRELIMINARY CONCLUSIONS FROM RESEARCH

The Contemporaneous schedules produced by contractor can not be impeached. This is due to the amount of Owner involvement in the creation and updating of the production schedules. Implicit and Explicit acceptance of the schedules by the Owner will not be able to be overcome during any litigation process. The BCPA has been decided upon in order to allocated delay responsibility to the critical path.	4/26/2009

MAJOR EVENTS TO INVESTIGATE

Assimilation of the 3318 target schedule and how it impacted the update periods, we know the time lost on the critical path but we must allocat responsibility for those changes.	5/4/2009

FIGURE 1 Dispute Resolution Briefing Document

If support staff who have never testified are deposed due to their expert engagement in the analysis report, the likelihood is high that lack of experience and qualifications will invalidate at least parts of the report and could even be responsible for complete disqualification of the expert and report. And even if the report is not disqualified, testifying in a deposition or trial with no experience could reveal new weaknesses for the opposition to exploit.

3. The Benefits of Sharing Analysis Responsibilities

In most large forensic schedule analysis projects, there are numerous areas where extensive work must be done, from importing and renaming schedule files to documentation research. It is not a requirement for the high-cost, qualified expert to perform all the tasks personally, many of which are more clerical in nature. This frees the expert to put his or her time into review and validation of data and analysis of the case, leading to the clear and detailed expert report that provides expert judgment value to the report. The leverage from using a good staff in a reasonable approach will yield many benefits, but primarily freeing up the expert's time and secondarily, blending costs and providing a better final price.

4. The Need to Check All Work Used in Analysis

Just as all work products should be checked by a peer in any deliverable, in an expert report, it is even more vital that data, analysis, and conclusions are all verified. With respect to use of documentation in an analysis, the relevant recommended practice notes that source validation protocols (SVP) require validation of schedules, research documents, and any other facts or data used in the analysis. It states that, "The approach of the SVP is to maximize the reliable use of the source data as opposed to assuring the underlying reliability or accuracy of the substantive content of the source data."[2]

Use of work product or analysis performed by supporting staff should be considered input data that also requires a high level of validation. Standardized procedures for development of work product or analysis help to ensure a high-quality output and simplify the validation. They also help fill the need for a scientific approach to analysis, and since a step-by-step procedure can be followed by any practitioner, it limits the risk that it could be seen as expert analysis that must be prepared by only the expert when it is a standard report or output.

IMPORTANT ADVICE

Recommendations for Implementation when Developed by Multiple Analysts

The first recommendation is to ensure that all expert opinions are the expert's own, including technical conclusions and judgments. This should be part of the operation and it can be supported by developing standard procedures and processes and require all supporting staff to follow those procedures carefully. The expert should author, review, and ensure reliability of the procedures and verify that they are followed.

Then an important approach to documenting that an expert report is developed by the expert is weekly progress meetings and the use of a detailed briefing document. This document is the place where the expert gives assignments to the staff, reviews their work, and follows with questions or direction for further research or analysis, and documents the lead role of the expert in assigning tasks that do not rise to the level of the expert analysis. If necessary, these documents could be produced to show the expert's comprehensive control of the project and limit the challenge that support staff were producing analysis as experts.

An example of a briefing document is shown in Figure 1.

Develop standardized procedures as much as possible and ensure support staff adherence, develop a plan for the analysis, and manage the effort with detailed briefing documents to ensure the analysis inputs are directed and reviewed by the expert. The expert must fully understand and verify any work product that is used in the analysis, and never assign tasks that require expert judgment to support staff. Always keep in mind that the expert analysis and report must be truly developed by the expert using input data that was validated by the expert and relied upon to come to conclusions about the claim.

[2] AACE International, "*Forensic Schedule Analysis*" **Recommended Practice 29R-03**, (2011), AACE International, Morgantown, WV, Section 2. Source Validation. [1]

MISTAKE NO. 8 – "Not Analyzing Disruption with a Measured Mile Analysis When Project Data Supports One"

The authors have both seen many instances where an expert has performed a disruption analysis using a bulletin such as the MCAA (Mechanical Contractors Association of America) Bulletin or a similar document to estimate disruption, when the actual project data was available to perform a more precise methodology. Although these documents have their place in the industry, there are much better accepted approaches to use, based on the level of detail history tracked on the project.

IMPORTANT DISCUSSION POINTS

1. Bulletin Subjectivity
2. Minimum Information Required
3. AACE Recommended Practice 25R-03

DETAILED DISCUSSION POINTS

1. Bulletin Subjectivity

   Most of these bulletins are very subjective to use. They can be a shopping list of disruptive elements than can impact a project with the user "cherry-picking" the elements to use and assigning the percentage value of disruption based on his/her review of the contemporaneous documentation. This is the reason many users favor this methodology. Alternatively, a measured mile analysis compares actual work accomplished in an undisrupted or less disrupted timeframe versus a disrupted timeframe. This comparison allows the analyst to calculate the difference in efficiency of these timeframes mathematically. These calculations are determined by an estimating process and like any estimating process, the approach used should be repeatable by multiple estimators within a certain percentage of accuracy. Using the bulletin or shopping list method does not easily lend itself to being repeatable.

   Example

   These Bulletins use a list such as shown in Figure 2.

   These lists are essentially a shopping list of disruption impacts the user can choose from and determine his/her own interpretation of the values of disruption. There is little wonder why these approaches are considered so low on the list disruption calculation approaches.

2. Minimum Information Required

   A measured mile analysis is an analysis of work performed. It requires a measure of work performed and a measure of the cost of the performance of that work. Originally, the measured mile was only used to compare very similar types of work, such as installing building framing structural steel in two different timeframes. The construction industry has evolved whereby more specialty subcontractors perform work on major projects. Many of these contractors' resist keeping detailed timesheets tracking work performed daily by cost item. Usually, however, they must keep great records on work completed because that is the basis of their invoices. Generally, the expended worker hours are at least kept in total because it is a requirement of site safety records, even on a fixed price contract. A disruption calculation by total subcontract is still substantially less subjective than using a bulletin method.

Element	Min. Impact (9.9%)	Ave. Impact (19.9)	Max. Impact (29.9%)
Resequencing		19.9	
Stacking			29.9
Extended OT	9.9		

FIGURE 2 Bulletin List

3. AACE International **Recommended Practice 25R-03**

   AACE International **Recommended Practice 25R-03** (see Figure 3) is a great reference on the many methodologies available to perform a productivity analysis. [1] It is currently in the process of being revised whereby it should become even more valuable. There will eventually be a Recommended Practice for each methodology which will make the estimation process even better. Use AACE International Recommended Practices to guide the analysis process.

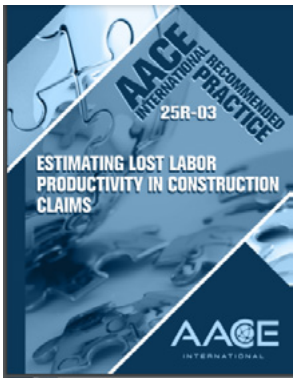


FIGURE 3 Recommended Practice No. 25R-03

IMPORTANT ADVICE

Let the level of detail collected for expended hours and progress determine the methodology used to estimate disruption and where possible, always use a "measured mile" approach.

MISTAKE NO. 7 – "Not Linking a Productivity Analysis to the Schedule or the Staffing Curve"

Many analyses of time or costs require evaluation of the resources and productivity of those resources, so resource analysis is a common task in project controls. Productivity is a quantity of work produced for a certain amount of labor hours or costs and is defined as a "relative measure of labor efficiency, either good or bad, when compared to an established base or norm as determined from an area of great experience."[3] Disruptions from outside influences such as unforeseen events, owner interference, or even third-party interference, can cause cost overruns to the contractor which are outside of his control. A productivity analysis is most commonly performed to determine the impact on productivity from some constraint, but once the impact is calculated, it is still necessary to link the lost productivity to the impact event or action, and then quantify the loss.

At the heart of most project failures and claims is some type of resource shortage or labor performance

[3] Recommended Practice No. 25R-03, "Estimating Lost Labor Productivity in Construction Claims", McDonald, D. and Zack, J., and contributing authors, AACE International, Rev. April 13, 2004. [2]

issue which requires a productivity analysis in place of or in addition to a delay analysis. Resource usage on a project is significant when the resources tend to stack and require too many crews, as well as overwhelm the project with the need for too many workers. There is a limit to the number of workers who can perform at a given time, and productivity will vary based on the total worker count.

The authors have seen too many so-called "productivity" analyses that simply attempt to compare the planned resources to the actual resources in a spreadsheet but those tend to ignore the time-phased productivity or even the issue of productivity in general and address only production.

IMPORTANT DISCUSSION POINTS

1. Why Perform a Productivity Analysis?
2. What Complicates a Productivity Analysis?
3. Why Link it to the Schedule?
4. Why Link it to the Staffing Curve?

DETAILED DISCUSSION POINTS

1. Why Perform a Productivity Analysis?
   Contractors are entitled to perform their work without interference from outside influences, and when impacts occur from those outside influences, they need a mechanism to prove the claimed excess costs.

2. What Complicates a Productivity Analysis?
   Productivity analyses are complicated because productivity is not typically monitored until after the labor costs are sunk into the project. While production is generally monitored monthly at worst case, productivity most often comes from contractor job costs that are generated after all timecards are processed and may not be itemized and aligned with the quantities of work. This causes lost productivity claims to be submitted well after the work is done, often it is difficult to identify the source of the disruption as well as the responsible party, and they are dependent upon the quality and accuracy of records of time and production.

   Productivity analysis is also not limited to one best approach or methodology, and the source documents available may not allow the best or preferred method to be used. Reliability of productivity analyses can be a problem since it can be very difficult to ensure adequate documentation. Courts have reinforced this concern by recognizing that it is not necessary to provide a high level of accuracy in the analysis due to the difficulties in the documentation and causation issues.

3. Why Link it to the Schedule?
   Sources of lost productivity include time-related issues like acceleration, weather impacts, change management, trade stacking, poor quality of the scope definition in the drawings, overtime, coordination, out-of-sequence work, site access, slow owner responses with decisions, requests for information, review and approvals issues, and schedule compression, all of which are schedule related.

   One preferred method for productivity analysis is that of the measured mile approach which requires comparison between unimpacted work to similar impacted work and the schedule is a good medium to make that comparison. Disruption also sometimes affects delay so a comprehensive approach to delay and disruption which is useful and may lead to discovering delay impacts from loss of productivity.

   As noted above, disruption in the form of loss of productivity or inefficiency can result from overcrowding spaces or a contractor forced into too many workers or crews of the same trade working concurrently which can lower productivity. Analysis of this and other factors requires an examination of the plan and the actual performance on a time scale to help show cause and not just correlation with an impact event or action.

4. Why Link it to the Staffing Curve?
   Since the number of workers on the project at any one time can affect productivity, aligning productivity with the time-phased workers or staffing will often help show why productivity losses occurred, connecting the decreases of productivity to specific events which is important to prove the case of loss of productivity.

   The staffing curve is most commonly a histogram of daily, weekly, or monthly planned labor compared to the same for actual labor, so it provides an assessment of performance against the plan. The planned labor histograms can be calculated for cumulative labor which results in an S-curve based on when the labor is expected to be applied, and the most common choices are early dates, late dates, and average/midway dates. Observing the curves help with correlating the worker or crew count with the impact events and help direct the research toward the causes of disruption.

IMPORTANT ADVICE

Recognize that productivity is time-phased and carries risks depending on the extent of workers in both similar and dissimilar trades working in the same locations at the same times. Linking the analysis to the schedule helps with the assignment of cause and effect and linking the analysis to the staffing curves help with the quantum of productivity losses. Productivity efficiency is monitored and analyzed with costs loaded into the schedule and analyzed.

MISTAKE NO. 6 – "Performing a Faulty Causation Analysis"

Whether a consultant is working on a delay claim, a disruption claim, or an acceleration claim, it is imperative that he/she performs as detailed a causation analysis as possible. Proper causation analysis relies on being able to prove "*cause and effect*." This means, in a perfect world, that the consultant needs to find a document that demonstrates what caused every impact and how that ties into the resulting effect/effect. This is not a perfect world, but consultants need to get as close to this as possible to prove causation.

IMPORTANT DISCUSSION POINTS

1. Scatter Diagrams
2. Concurrency
3. Documentation

DETAILED DISCUSSION POINTS

1. Scatter Diagrams
   Scatter diagrams are useful in demonstrating only the frequency of disruptive events, but they do not prove cause and effect, only potentially show correlation. It is important to go to a lower level of causation.

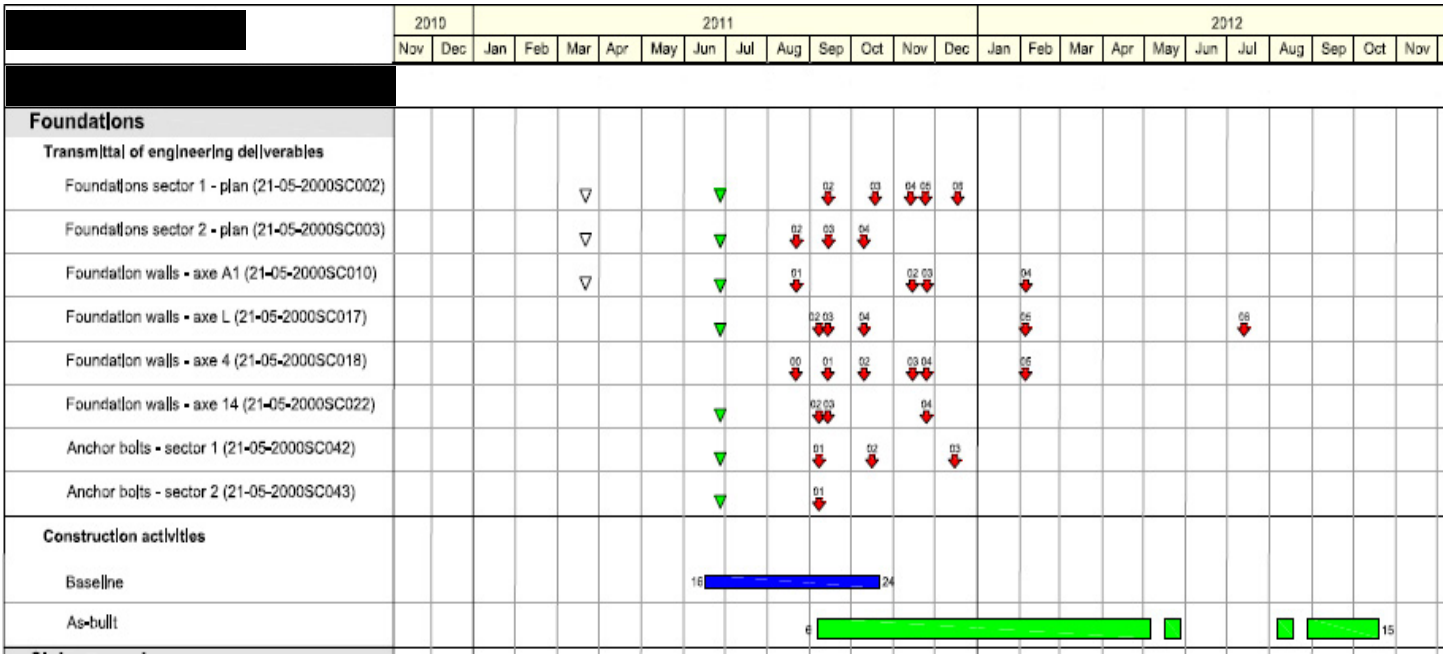


FIGURE 4 Scatter Diagram

The scatter diagram shown in Figure 4 attempts to show that drawing revisions were the cause of a late start to foundation construction and because of it the project's end date was extended. Even though it looks like it might be the reason, a proper causation analysis should show that:

- The predecessor did not drive the delay and the foundation work could not have started earlier.
- One or more of these engineering drawings should have shown up on the project's critical path.

2. Concurrency
   It is not enough to prove causation. It is necessary also to demonstrate that the assessed effect is accurate. Consultants need to ensure that they look at concurrency to make sure that two or more delays, caused by different parties, are not concurrent and impacting delay calculations. This becomes more complicated when performing a delay analysis using the "as-planned vs. as-built" (MIP 3.1/3.2) forensic methodology. Ensuring that a secondary path did not impact the project becomes more difficult because most consultants only look at the primary critical path using this methodology.

3. Documentation
   Proving cause and effect relies, for the most part, on the quality of the project documentation. Whether it be letters, emails, specifications, schedules, or other documents, the only controllable element for a consultant on a dispute is a thorough review of these records. If the owner or the contactor did a poor job in keeping the records, that is out of the consultant's control.

IMPORTANT ADVICE

Use a thorough examination of documents to prove cause and effect and do not just rely on scatter diagrams for this purpose.

MISTAKE NO. 5 – "Poor Choice of Analysis Methodology"

As noted in the AACE **Recommended Practice 29R-03**, *Forensic Schedule Analysis*[4], there are various reasons for choosing a methodology, and there are multiple methods that can be used to provide analysis of delays. The reasons drive the methodology choice, but each method requires certain source documents before that method can be implemented. Section 2. "Source Validation" identifies source validation protocols used to "maximize the *reliable use* of the source data...", for baseline schedules, as-built schedule sources, schedule updates, and identifying impact events. The goal for a forensic analysis is to provide a reliable analysis and conclusion, so appropriate choice of methodology is important, but the appropriate use of source documents is vital in meeting this goal. No matter the methodology chosen, there will be challenges to the expert's ability to be impartial, the objectivity of the implementation, and the reliability of the analysis based on the data chosen. Cases are lost because of an inappropriate choice of methodology similar to a poor implementation of even an appropriate methodology.

It is vital that the choice of methodology is made early, based on available data, and is supported in the expert report. Mr. Carson, along with peers, developed a process called a "claims triage"[5] which helps walk the expert through the decision process to ensure a reasonable and appropriate choice. The author also uses this process to review opposition analyses and identify challenges to his/her report.

IMPORTANT DISCUSSION POINTS

1. Reasons for the Choice of Methodology
2. Ensuring the Choice is Appropriate
3. Review and Potential Challenges

DETAILED DISCUSSION POINTS

1. Reasons for the Choice of Methodology
   While some of the reasons for choosing a forensic method are related to the ability of the expert to perform the analysis, more are unrelated to

[4] AACE RP 29R-03 [1]

[5] "*Use of a Claims Triage Workshop to Choose an Analysis Method*", Kelly, Carson, Kelly Jr., 2011 AACE Annual Conference, Anaheim, CA, Conference Proceedings. [3]

the actual analysis itself and are based on conditions of the project, timing, or costs. Section 5, "Choosing a Method" of the FSA RP indicates eleven factors to be considered in the choice, and the first three primarily speak directly to the technical analysis. Failure to consider Factor 1, "*Contractual Requirements*", elevates the risk of implementing a methodology that is not allowed under the contract, so this is the first check that should be made. Careful consideration of Factor 2, "*Purpose of the Analysis*" helps ensure that the chosen method is technically capable of providing an appropriate conclusion to meet the needs, and ensuring adherence with the guidelines in Factor 3, "*Source Data Availability and Reliability*" will produce more reliable analyses. Ignoring these factors could result in a weak analysis easily undermined by the opposition. The other factors revolve around details about the dispute, the time and budget, the expertise of the analyst, the forum and forum requirements, and the opposition. Standardizing the process is helpful as it can evolve into a checklist of sorts, similar to the partial screen capture of a checklist by Carson, in Figure 5.

		Retrospective Methodology and RP #29R-03 Reference:			
Selection Factors (RP #29-03 Section 5)	**Discussion**	**Impacted As-Planned** *3.6*	**Time Impact Analysis** *3.7*	**Contemporaneous Period Analysis** *3.3, 3.4*	**Daily Specific As-Built** *3.1/3.2 with no As-Built Schedule*
5.1 Contract Requirements	*Some contracts mandate a retrospective methodology, but most only discuss prospective techniques*	Not typically mandated	Potentially mandated (popularly mandated for prospective delays)	Potentially Mandated	Not typically mandated
5.2 Purpose	*Delay is of a general sort?*	No analytical potential	Acceptable analysis	Acceptable analysis	Acceptable analysis
	Delay is a result of a specific event?	Acceptable analysis	Acceptable analysis	Acceptable analysis	Acceptable analysis
	Concurrency Issues?	No analytical potential	Only with two analyses to separate delay responsibility	Acceptable analysis	Potential analytical value
	Acceleration Issues?	No analytical potential	Constructive acceleration	Acceptable analysis	Acceptable analysis
5.3 Source Data Reliability	*How much data is available?*			Requires	Requires substantial data
	Baseline Schedule	Needed	Needed	Needed	
	Schedule Updates		Needed	Needed	
	As-Built Record	Needed	Needed	Needed	Preferable
	Daily Reports (Electronic or Paper)	Needed	Preferable	Preferable	Needed
	Progress Meeting Minutes	Needed	Preferable	Preferable	Needed
	Pay Applications		Useful	Useful	Needed
	Resource Information		Useful	Useful	Needed
5.4 Size of the Dispute	*Does the size of the dispute limit the type of analysis?*	Inexpensive	Expensive	Moderately Expensive	Moderately to Very Expensive
5.5 Complexity	*Duration of project*	Less than a year	Any duration	Any duration	Any duration
	Complexity of construction	Only low complexity	Any complexity	Any complexity	Any complexity
	Complexity of dispute - what sorts of claim issues are raised, and can the methodology analyze that sort of issue?(refer to Table 5, p. 101)	Cannot handle compelx issues	Handles most issues	Handles most issues	Handles most issues
5.6 Budget	*Cost of analysis in relation to client's available budget*	Lower cost	Higher cost	Moderate Cost	High Cost
5.7 Analysis Time	*More complicated and detailed analysis require more time. If only a limited time is available, then less complicated method should be used.*	Short time frame necessary - first period after baseline	Heavy research, identifying delays to model	Moderate time needed, research time targeted to delays	Long development time necessary

FIGURE 5 Analysis Methodology Choice Checklist

2. Ensuring the Choice is Appropriate

   One of the benefits of the Forensic Schedule Analysis RP is that it has helped produce guidelines (recommendations) for performing a forensic analysis, so if the appropriate method is chosen, the RP offers expert authority support for the choice. Use of the triage approach walks through the chapter on choosing a method from the RP, defining steps to be taken for each factor and assure reliability in the method use. The methodology choice will be fortified by listing each of the relevant factors in the expert report, with a description of how that factor was considered, the steps taken to ensure the method choice fits the factor recommendations, and an explanation of where the analysis may not fit or meet the recommendations.

3. Review and Potential Challenges

   The expert report should provide a solid explanation of the choice of method including how the choice meets the recommendations of the eleven factors. This forestalls challenges which could come from failure to meet any conditions of the factors, and helps the reader understand why the particular method was chosen. Done well, this will remove the threat of many of the typical challenges and combined with careful implementation of the chosen method and explanations of how the implementation meets the RP recommendations, the expert report will withstand scrutiny and challenge.

In addition, when reviewing the opposition's expert report, evaluating it against the eleven factors can expose weaknesses in the report that can be successfully challenged. Mr. Carson has used this approach successfully in many reports, and in one situation, the opposition expert withdrew his report after deposition questioning revealed his lack of compliance with any of the factors, claiming he had made mistakes. This was likely due to a complete lack of understanding of the RP and, as a result, the choice of an inappropriate method. In that case, he used a single method implementation protocol (MIP) 3.7, Time Impact Analysis to attempt to prove compensable delay, ignoring the contractor's own delays. If he had read the RP, specifically Figure 17 under Factor 2, "*Purpose of the Analysis*", he would have seen clearly that his implementation method was not well suited for the purpose, and he could have investigated other methods or how to strengthen his method.

Some of the challenges that the authors have encountered or presented include:

- **Methodology**—Use of an observational method when the contract required modeling the delays, sometimes only the attorney's interpretation of the contract. It is not uncommon for delay or claims clauses to be silent on methodology but for the changes clauses to require the prospective time impact analysis (MIP 3.7), and attorneys will often prefer to use this method for forensic analysis just because it is the only method referenced in the contract.
- **Methods that do not fit the purpose**—Time impact analyses are commonly used and too often the analyst does not recognize that a single MIP 3.7 is not the best choice for compensable or a right to finish early claim.
- **Source data problems**—This is the most common challenge that the authors have offered, and some of the issues have been as-planned vs. as-built (MIP 3.1) analysis with the wrong baseline schedule (the as-planned). Other challenges have been the use of variable windows, with one case undermined by

the opponent's choosing two windows for a complex project, using MIP 3.1, and ensuring that the window timing allowed them to ignore a two-month project shutdown by the state over hazardous conditions. Comparing the author's monthly bifurcated contemporaneous period analysis (MIP 3.4) analysis revealed the obvious manipulation of the opposition's analysis and completely undermined their conclusion.

- **Inadequate Budget/Timeframe**—The authors have elected not to participate in claims when the budget or time frame was woefully inadequate for the complexity of the project. The reason for a shallow investigation of a project does not matter, because once the expert report is completed, the expert will be deposed and questioned about the full project and all known conditions. Failure to take into consideration all the issues and provide the necessary research will provide weaknesses for the opposition to exploit.
- **Lack of Experience**—Mr. Carson reviewed an opposition report that used a collapsed-as-built analysis (MIP 3.8), and it was so clear that the expert had never performed one or followed the RP's guidelines that it became obvious under careful questioning at deposition. That expert withdrew before he could be disqualified.
- **Ignoring Information**—In an arbitration hearing, one opposition expert admitted that he had ignored a physical constraint because the contractor failed to include logic to require fabrication and delivery of large steel pipe materials before installation, so he was able to also ignore the owner-responsible delays in changing the specifications for that pipe. From a practical basis, it was impossible to install the pipe if it was not delivered, and the fabrication started as soon as approval was received for the newly specified pipe, was a reasonable timeframe, and the site accepted the delivery and started installation.

IMPORTANT ADVICE

The chapter on choosing a method in the RP provides a good checklist of potential challenges, just like the implementation guidelines. An expert is well advised to ensure that his/her report follows the guidelines and shores up any guidelines that the report has not been able to meet. This is also a great place to find potential challenges to the opposition analysis. Use of a formalized process, like Mr. Carson's claims triage process helps provide the structured approach that improves the analysis and exploits opposition weaknesses.

MISTAKE NO. 4 – "Making an Expert Report Too Long and Too Difficult to Follow"

The authors have both seen many instances where an opposing expert has produced an expert report that is long and difficult to follow without having to reread sections previously read. The authors believe this provides no one involved in the dispute any benefit.

IMPORTANT DISCUSSION POINTS

1. Report Length
2. Report Format
3. Clients Versus Arbitrators and Judges

DETAILED DISCUSSION POINTS

1. Report Length

   Report length has no connection as to whether the report is a good quality report or not. An expert report should be a thorough examination of the dispute issues with a concise opinion where required and nothing more. Repeating portions of the report over and over is not necessary, unless the report has a layout such as *Executive Summary*, *Report Analysis*, and *Report Summary*. If this is the case, the opinions being repeated should be brief.

   Example

   In 2007, a law firm hired Mr. Palmer to assist in the evaluation of a claims company work product. The claims company had been on the project for one month at the time of the meeting between teams. The project was a process plant expansion, and Mr. Palmer's client was $11 million over budget on a fixed price project. The claims company gave a PowerPoint presentation of nearly 50 slides discussing only the $11 million costs. There was no discussion of schedule, no discussion of strategy, no discussion of anything other than the loss. The claims company had spent hundreds of hours on the project at that point in time and that was all they had to discuss. This $11 million dollar loss could have and should have been discussed in less than ten pages, not to mention the value for the dollars spent. That company was replaced within several days.

2. Report Format

   Many reports have a layout or organizational approach that by definition necessitates a lot of repeating of portions of the report or requires the reader to reread previously read portions to keep track of what the early discussion said.

3. Clients versus Arbitrators and Judges

   Many expert reports appear to be trying to give the client a lot of content to make the cost per page lower than it otherwise would be. However, this approach can be a bad decision when it comes to the arbitrator/arbitrators or judge presiding over the case. These individuals have so many documents to read on a case to get up to speed, that something long and difficult to follow can leave them with a poor opinion of the author. These people are the main audience an expert report should cater to, and they need a report that tells the story completely and is easy to follow.

IMPORTANT ADVICE

An expert report's length should be determined by how many pages it takes to produce a clear, concise, and accurate report that is easy to follow. It should be written with the arbitrator/arbitrators or judge in mind as the primary readers.

MISTAKE NO. 3 – "Not Performing a Half-Step Analysis When Appropriate"

When an updated schedule is submitted by the contractor, that schedule is comprised of two parts; the as-planned, future work, to the right of the data date, and the as-built, completed work, to the left of the data date.

Assuming validated actual dates, the as built is the true performance due to the actual start and finish dates, and even the remaining duration estimates, used for activities that have started but not completed, are generally reasonably accurate.

The half-step, or bifurcated, contemporaneous period analysis (CPA) (MIP 3.4), also called a CPA-split method, is a forensic analysis method that separates the progress on the as-built side from the as-planned predictions.

IMPORTANT DISCUSSION POINTS

1. Risks of Accepting an Updated Schedule
2. When to Perform a Bifurcated Analysis
3. How to Perform the Bifurcated Analysis
4. Results from the Bifurcated Analysis

DETAILED DISCUSSION POINTS

1. Risks of Accepting an Updated Schedule

   If changes have been made on the as-planned side of the update, while those changes are the contractor's update reflecting his intentions, they are still estimated or planned steps to be taken in revising the logic or scope or mitigating delay. Those revisions provide a plan, but there is no guarantee that the plan will be followed or met until the subsequent periods when the actual performance shows the results. Accepting an update without understanding how much of it is progress related and how much is wishful thinking can be detrimental to the project and any forecasting efforts during the project and even worse results in attempting to understand the critical path and delay drivers.

   Worse than just not understanding the revisions made by the contractor is the risk that not separating the non-progress could result in an assumption that those revisions are appropriate and accurate when they are not.

2. When to Perform a Bifurcated Analysis

   The half-step should be performed for any schedule that has any revisions except simple actualization of planned start and finish dates and estimates of remaining durations. This includes any other changes. Separating the progress-only from the revisions helps understand what actually happened on the project, as the progress-only update reveals the view or result that the scheduler experienced when the update was performed, as the first step in an update would have been to create the as-built. The understanding of the status from that actual performance is very useful and important in a forensic analysis.

3. How to Perform the Bifurcated Analysis

   The bifurcated analysis is performed by importing the actual start, actual finish, and remaining duration dates from the current schedule into a copy of the previous schedule, changing that data date to match the current schedule, and re-calculating the updated previous schedule with the new data date. This effort yields a temporary schedule that is based on the previous update's logic and plan but containing the current update's actual progress. This allows an analysis of the current critical path as driven by the actual progress as well as the current critical path as driven by the progress and any non-progress changes made by the contractor. Failure to work the plan is one of the main reasons for delays and this is a great way to understand how the project performed against the previous schedule plan. See the paper by Nagata and Carson[6] for detailed implementation steps and actions.

4. Results from the Bifurcated Analysis

   As noted in the above-referenced paper by Nagata and Carson, "This methodology splits the analysis of delays between progress and schedule revisions so each can be evaluated separately and allows identification/monitoring of lessons learned from forensic analysis such as re-planning failures and erosion of necessary float through casual mitigation efforts. The paper will discuss the steps in this process, provide examples of how the method works, and discuss the evaluation of the results." Non-progress revisions include changes to logical relationships (such as changing a finish-start relationship to a start-start relationship), original durations, lags, leads, activities, calendars, and constraints, in short anything outside of the imposition of actual dates and remaining durations.

   The method also mimics the way the contractor scheduler updated the schedule, by recording progress, estimating remaining durations for work started but not completed, calculating the schedule, and showing the scheduler's view of the schedule progress at that point. Then the scheduler would make a judgment based on the progress as to whether the CM team should be involved to discuss mitigation of any delays or changes in the field plan. This is an important result to review and helps understand the purpose behind schedule revisions.

   Also, when reviewing the schedule update, evaluation of the reasonableness of the revisions is a necessary practice. If the revisions are arbitrary, not explained, and tend to sequester float or unreasonably position the contractor for a claim, the as-planned revisions might need to be rejected.

IMPORTANT ADVICE

Always develop a bifurcated, or split, contemporaneous period analysis (MIP 3.4) to evaluate progress only and to ascertain the effects of any as-planned revisions. Since developing a split CPA can be straightforward and simple, it makes sense to perform this analysis on any schedule as the first step. If there are no non-progress revisions, the non-progress view and the update view will be identical.

MISTAKE NO. 2 – "Not Adequately Preparing for Testimony"

The several days prior to testifying can be a very anxious time in a consultant's life, especially the first time. Depositions can be tough but testifying in an arbitration or court is much more difficult to prepare for and there are several things to keep in mind to make this somewhat easier.

IMPORTANT DISCUSSION POINTS

1. Sleep (Rest)
2. Know the Audience
3. Know Every Detail of Self-Generated Reports
4. Be Nice
5. Short Concise Answers
6. Anticipate Questions

[6] "*The Contemporaneous Period Analysis – Split Methodology Forensic Delay, MIP 3.4*", by Nagata, M, and Carson, C, AACE International 2017 Annual Meeting, Orlando Florida [4]

DETAILED DISCUSSION POINTS

1. Sleep (Rest)
   The night before testifying will be a hard night to get to sleep. The brain will be going over facts and trying to anticipate questions. Even if sleep is not going to happen, it is important to lay down and rest and try to get the body ready for a long day or two.

2. Know the Audience
   Preparation for testimony for a deposition, an arbitration, or a judge with/without a jury are all different to prepare for; due to each having a different background in engineering and construction. A lawyer deposing an expert can have a varied level of experience in engineering and construction but will generally use the opposing expert to guide him/her through the deposition. Generally, arbitrators are chosen based on their well-rounded experiences in the industry and that will allow for answers that are more technical in content. Whereas a judge, with or without a jury, likely has very little experience in the industry and answers to questions asked must be simple explanations.

   Example
   In 2011, Mr. Palmer was testifying in an international arbitration in London. The opposing expert had prepared a report on delay and disruption. This expert was someone Mr. Palmer had heard of but did not know. He contacted a friend in London who was also in the claims business and knew this expert. The friend's opinion was that this expert knew little about scheduling and likely had another person do the schedule analysis. Once the legal team was made aware of this, it was decided to sit the opposing expert down in front of Mr. Palmer's computer during the arbitration and ask him to switch on Primavera and open the project's last schedule update. The expert was unable to do so and embarrassingly admitted to the arbitration panel that he did not know Primavera and had someone else do the schedule analysis. He looked bad in doing so and was continually queried thereafter if he had performed the analysis work himself on the other issues.

3. Know Every Detail of Self-generated Reports
   Every consultant has to know his/her report and its exhibits backwards and forwards to make sure there is consistency - every verbal answer given must mirror what that report says.

4. Be Nice
   Be polite and professional because many lawyers try to make witnesses angry to throw them off their game. Do not allow this to happen as nothing good for the client can come because of this.

5. Short and Concise Answers
   Answer questions accurately with the least number of words possible. While testifying, a consultant has already proven that he/she has the required background and there is no need to try to impress anyone. In addition, volunteering any information may just open a new line of inquiry for the opposition attorney.

6. Anticipate Questions
   A consultant should use his/her deposition (if one exists), the opposing expert's report, and the rest of the depositions and fact witness documents to try and figure out what questions may be asked during testimony. Concentrate first on the differences of opinion of the opposing experts. After, move on to the rest of the information.

IMPORTANT ADVICE

Be rested and do the required homework to be prepared to testify. Not being prepared will be a horrible experience for the consultant and his/her client.

MISTAKE NO. 1 – "Failure to Identify the True Delay Drivers"

(or Assuming Delay Drivers are Always Activities in the Schedule)

The only way that the CM team can properly make decisions about priorities and actions needed for mitigation is if the critical path is accurately identified and the reasons for delays, called delay drivers, are identified, and evaluated. Recommendations for action items should include recognition of the history and cause of delays so those symptoms can be monitored going forward.

Too often, the analyst provides a shallow identification of the source of the delay, sometimes just assuming that the delayed activity is the driver, which does not fully identify the true as-built critical path. Without this identification, the team might focus their attention on the wrong path of activities, allowing the true critical path to be delayed unnoticed. When performing a forensic analysis, the expert must be careful to perform the research and carefully identify the critical path, recording documentation that supports the conclusion.

IMPORTANT DISCUSSION POINTS

1. What was Delayed?
2. What are the Delay Drivers?
3. Requirement for Research?

DETAILED DISCUSSION POINTS

1. What was Delayed?
   A well-maintained schedule will show the effects of delay; that is the basic premise and an important one. No matter what happens in a project, if the schedule is updated accurately and there were delays, there will be some activities that were delayed which can be identified mathematically.

   The delay driver is whatever caused the activity that was delayed to miss its start or finish date. Delay drivers can be identified by a root-cause analysis, using research into the project records to trace back from the delayed activity to the source.

2. What are the Delay Drivers?
   Sometimes the cause of a delay to one activity is a delay from another activity and that might be the delay driver, but that is not always true. It is just as common for the delay driver to

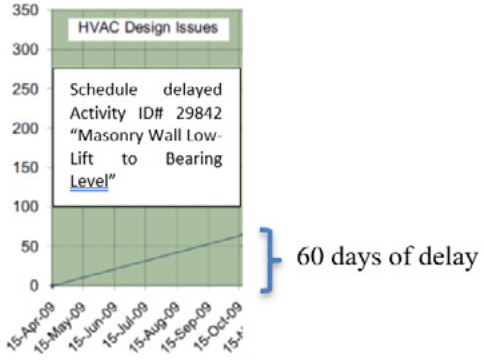


FIGURE 6 Delayed Activity Identification

Causal Issues Log and Worksheet					Printed 03/29/21						
Period No.	End of Period	Act. ID	Activity Description	Location	Issue Details	Start Date	Finish Date	Loss Time	Trade	Quantum	Documents
3	19-Nov-02	1A1090	HIGH CMU BEARING TO ROOF	1A1	B&G Poor workmanship, walls not to grade, out of level & plumb, built to wrong elevation, bearing plates wrong, mortar strength problem	10/28/02	11/19/02	22		22	SBB letter, 8/21/02, Non-compliance, missing joint reinf , need full bead mortar MBP Non-Compliance Notice #1, 8/27/02, Unacceptable foundation block MBP Non-Compliance Notice #2, 9/04/02, Remove & replace CMU laid in water MPB letter, 09/05/02 Quality control improvements required, mortar cracking, foundation wall CMU must be filled MBP Repair Notice #1, 10/2/02, Reinforcement left out of 12" gym wall MBP Corrective Action Required #5, 11/14/02, Low mortar strength, need review SBB letter, 15Nov02, listing of 14 separate quality issues required to correct
7	31 Jan 03	1B1065	CMU BEARING WALLS TO 2nd LVL	1B1	JWF Missing lintels , waiting on JWF, East end balcony CMU wall, lintels not critical up to 1/15/03	01/07/03	01/28/03	21			1) SBB Minutes #19, Item #8.2, 1/7/03 Steel lintels holding up 1st lift of CMU 2) SBB letter, 1/8/03 Need lintels 3) SBB letter, 1/24/03 From Steve Ballard 4) SBB letter 02/26/03 Missing embeds (released 4 months earlier), delay Gym 1D1, provides itemized inventory and list of lintels needed, and list of door openings missing lintels 5) PCO 535
7	31-Jan-03	1B1065	CMU BEARING WALLS TO 2nd LVL	1B1	B&G Masons suspended work on job due to replacement of masonry superintendent., unhindered critical work available	01/15/03	01/31/03	16		10	SBB letter, 1/20/03, Need to replace superintendent for quality of superintendence SBB Minutes #18, Manpower log
7	31 Jan 03	1B1030	SET STEEL COLUMNS	1B1	JWF late two story columns delivery, masons could have worked this area if on site	01/01/03	01/31/03	30			SBB Minutes, 1/28/03, beams and columns needed before 2nd lift CMU
8	28 Feb 03	1B1065	CMU BEARING WALLS TO 2nd LVL	1B1	B&G manpower slow remobilization with new superintendent - replaced due to performance	02/01/03	02/10/03	9		9	Manpower logs
8	28-Feb-03	1B1065	CMU BEARING WALLS TO 2nd LVL	1B1	JWF missing lintels for wall supporting elevated deck slab, waiting on galvanized lintels	02/01/03	02/11/03	10			
8	28 Feb 03	1B1065	CMU BEARING WALLS TO 2nd LVL	1B1	B&G wall supporting elevated deck slab built to wrong height, reworked multiple times	02/11/03	02/28/03	17		6	

FIGURE 7 Delay Analysis Issues Log

be some underlying issue that never showed up in the schedule, or a string of issues that trace back one-by-one to the beginning of the delay sequence. For example, in Figure 6, the actual delayed activity in the schedule was a masonry wall construction activity.

3. Requirement for Research

It is vital that research is performed; the mathematical and schedule software analysis is straightforward and quick to perform, but the research is much more time-consuming. In the example above, research revealed that the masonry wall halted construction at the level of bar joist bearing plates, which were redesigned and re-procured. But just when it looked like a structural steel delay driver, research showed that the bar joists were changed, and then drilling back into the reason for the change was a re-designed roof top HVAC unit. After further investigation, it turned out that the state changed their requirements for fresh air and so an entirely new unit had to be designed and procured. That took the delay driver from the masonry halt to structural steel, to bar joists, to the mechanical contractor, to the owner's redesign, and finally to the state requirements change. In the process, responsibility went from contractor (masonry/structural steel/bar joists) non-excusable to excusable compensable (owner responsibility) to third party non-compensable (state). The research also must search for and identify any concurrent delays – these could be in the schedule, they could be concurrent issues that drove delays, or there could be an underlying issue not in the schedule that is concurrent with an activity in the schedule. Therefore, research is so vital to a proper delay analysis.

Carson uses a spreadsheet to help calculate and monitor forensic analysis and one tab on the spreadsheet is dedicated to an "Issues Log." This log provides a place to record the period, date of end of period, an activity and activity ID, location details and the issue start and finish. This provides a place to record all the underlying issues that might contribute to delays and display them in a dated format to identify which issue may be driving another issue, as well as to start the investigation into concurrent delay among the underlying issues. This process has been extremely helpful in identifying the true underlying issues that are delay drivers, as well as help to identify concurrency in the issues and activities. See the issues log in Figure 7.

IMPORTANT ADVICE

The delay drivers in a schedule analysis might be activities that were originally in the schedule, activities added during routine updates, activities added specifically to model delays, or underlying issues that never show up in the schedules at all. If the schedules are maintained properly, they will show the effects of delays, and while most people may call these "causal activities," in reality, they are the results not the causes of delays. Once a consultant identifies which activities were delayed, it is vital to perform the research to determine what was the root cause or driver for each delay. This may yield a string of predecessors, each of which drove delays into the successors, and this is true for activities in the schedule or underlying issues.

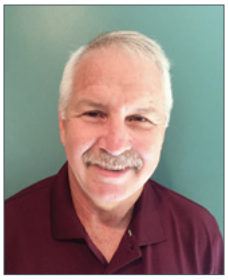
Summary

The top ten mistakes made in forensic analysis as experienced by the authors:

10. Failure to Research All Available Documentation Correctly
9. Not Checking Work Performed by Others – Risking Subpoena for Those Others
8. Not Analyzing Disruption with a Measured Mile When Project Data Supports One
7. Not Linking a Productivity Analysis to the Schedule or the Manpower Curve
6. Performing a Faulty Causation Analysis
5. Poor Choice of Analysis Methodology
4. Making an Expert Report Too Long and Too Difficult to Follow
3. Not Performing a Half-Step Analysis When Appropriate
2. Not Adequately Preparing for Testimony
1. Failure to Identify the True Delay Drivers (or Assuming the Delay Drivers are Always Activities in the Schedule)

References

1. AACE International, **Recommended Practice 29R-03**, *Forensic Schedule Analysis*, Morgantown, WV: AACE International, Latest revision.
2. AACE International, **Recommended Practice 25R-03**, *Estimating Lost Labor Productivity in Construction Claims*, Morgantown, WV: AACE International, Latest revision.
3. Kelly, R.D., R. D. Kelly, Jr. and C. W. Carson, "(CDR.637) *Use of a Claims Triage Workshop to Choose an Analysis Method*," in **AACE International Transactions**, Morgantown, WV, 2011.
4. Nagata, M.F. and C. W. Carson, "(CDR-2620) *The Contemporaneous Period Analysis - Split Methodology Forensic Delay, MIP 3.4*," in **AACE International Transactions**, Morgantown, WV, 2017.



ABOUT THE AUTHORS

Glen R. Palmer, CFCC PSP FAACE, is with GR Palmer Consulting Services, LLC. He can be contacted by sending an email to:
gpalmer@gpalmer.com

Christopher W. Carson, CEP DRMP PSP FAACE, is with Arcadis U.S., Inc. He can be contacted by sending an email to:
chris.carson@arcadis.com

AACE INTERNATIONAL

ENERGIZE YOUR CAREER

Becoming a **Certified Cost Professional** is a proven way to enhance your value to employers and clients by providing an impartial endorsement of your knowledge and expertise.

Earning your **Certified Cost Professional (CCP) Certification** shows your professional commitment and ability to your peers, supervisors, and clients, and may give you that competitive "edge" when being considered for a promotion or future opportunity. In addition, AACE International salary surveys reveal that **Certified Cost Professionals** earn more at all steps throughout their career than those without certification.

Spark change, become a

CERTIFIED COST PROFESSIONAL

For more information visit **web.aacei.org**