Time, like money, is a resource spent in building a construction project. In one sense, construction project schedules are a kind of budget or estimate for the way a contractor expects to spend time to build a project. Since the 1960’s, critical path method (CPM) scheduling has grown in use in the construction industry as a tool contractors employ to plan and budget the time available to construct a project.

As with any budget or plan, there is always risk that unexpected events will disrupt the plan and result in an overrun—a construction schedule delay in the context of construction scheduling. Construction schedule delays in turn can lead to disputes and claims. Disagreements about the causes of delays, their impact on the construction process, and which contracting party must bear the consequences can become contentious. However, by working with and analyzing CPM construction schedules, often it is possible to quantify and determine with reasonable certainty the cause of and responsibility for delays occurring on a project. Courts, boards, and agencies in many jurisdictions favor the use of CPM construction schedule analysis in deciding legal claims for construction delays.

Forensic Construction Schedule Delay Methods

The growth in CPM construction scheduling for the past fifty years has brought with it a number of different methodologies for analyzing construction delays. It also has given rise to a specialized discipline—forensic construction schedule delay analysis. Forensic schedule delay analysis is the study and investigation of events using CPM scheduling methods to establish the cause and extent of delays and to resolve construction delay claims through negotiations or legal proceedings. It is a field for experts trained and experienced in CPM scheduling.

Various approaches to analyzing construction schedule delays have evolved over the years, but no standard method has emerged. AACE International (formerly the Association for the Advancement of Cost Engineering) in its Recommended Practice 29R-03 Forensic Schedule Analysis (2011), sets out basic technical principles and guidelines for CPM scheduling in forensic schedule analysis. It offers nine “method implementation protocols” for analyzing delays. Robert D’Onofrio and Anthony Meagher have described fourteen different schedule delay analytical methods, What is a Schedule Good For? A Study of Issues Posed by Schedules on Complex Projects, Construction Lawyer, Vol. 33, No. 1, Winter, 2016. The AACE’s Forensic Schedule Analysis publication observes that forensic schedule analysis is both science and art involving professional judgment based on knowledge and experience, which suggests there are as many methods of forensic schedule delay analysis as there are analysts. Although there isn’t a consensus, John Livengood has suggested that methods of forensic schedule delay analysis can be grouped into four major families in terms of measuring days of delay, The Future of Forensic Schedule Delay Analysis, Insight from Hindsight, No. 7 (February, 2016).

- As-planned vs. as-built – measures delays that occur on the days
they occur and delays that have actually accrued at a specific point compared to the plan;

- Contemporary period analysis (Windows) – measures a combination of accrued delay to the start of an evaluation period and projected delays through the end of the project;

- Retrospective time impact analysis – measures projected delays at the start of an evaluation period as reflected in CPM schedule updates and calculates additional delay at the end of the project by inserting a fragnet (a network fragment, or a portion of the project schedule that relates to the specific delay) into the evaluation period, and

- Collapsed as-built – compares actual dates and events with after-the-fact assumptions about what hypothetically should have been planned.

Selecting the method of evaluating a delay is important because various methods of forensic schedule delay analysis will produce different results even when applied to the same set of facts. Moreover, each method has its own strengths and weaknesses. Further, practical considerations may render a particular analytical method useless or infeasible in a given situation. For instance, contractual constraints, such as a contract clause requiring the use of a particular method to analyze project delays, the project records and source schedules available, the cost and time to prepare a forensic schedule delay analysis, or the forum in which the delay analysis will be presented can make one method more suitable than another.

**Pros and Cons of General Methods of Forensic Schedule Delay Analysis**

Because no consensus exists regarding a single method of analyzing schedule delays to be followed in every situation, selecting the analytical method most appropriate for a given situation is vital. The general strengths and weaknesses of the basic methods of analyzing schedule delays always should be weighed. Using the four general methods of delay analysis as a framework, some basic pros and cons for each analytical approach can be identified.

- As-planned vs. as-built – comparison of an as-built schedule to an as-planned schedule

  **Pros**
- Relatively easy to perform
- Simple to present and easy to understand
- Can be persuasive if performed correctly
- Useful when data is limited

**Cons**

- Susceptible to manipulation through selection of as-built data
- Not generally accepted by many courts
- Causation is based on experts' opinions
- Does not measure concurrent delays
- Not suitable for complicated projects or projects built significantly different than planned

  - Contemporaneous period analysis (Windows) – measures accrued delay at start of evaluation period and projected delays to end of project

**Pros**

- Accurate when there are regular CPM schedule updates
- Measures each delay and documents causation
- Can be performed on an ongoing project
- Difficult to manipulate and accepted by many courts and agencies.

**Cons**

- Can be difficult to present and expensive and time consuming to perform
- CPM updates may not be accurate
- May not adequately consider concurrent delays

  - Retrospective time impact analysis – measures projected delay as reflected in CPM schedule updates and inserts fragment into evaluation period to calculate delay at end of project

**Pros**

- Useful for analyzing complicated CPM schedules
- Measures each delay and documents causation
- Can be performed on an ongoing project and measure evolving delay
- Can determine concurrent delays
- Accepted by many courts and agencies

**Cons**

- Can be difficult to present and expensive and time consuming to perform
- Can be subject to excessive decision making by analyst
- Can be susceptible to manipulation

  - Collapsed as-built – compares actual dates and events with after-
the-fact assumptions about what should have been planned or could have been done

**Pros**

- Easy to present and understand “but for” analysis
- Theoretically measures concurrent delays by separate “collapse runs” for contractor delays and owner delays
- Offers documented evidence of causation

**Cons**

- Reconstructing as-built schedule is costly and time consuming and may be seen as after-the-fact analysis
- Limited acceptance by many courts or agencies
- Susceptible to manipulation
- Requires substantial decision making by analyst

**Conclusion**

Deciding which method of CPM schedule delay analysis is the most suitable for evaluating a particular construction delay is a crucial step in evaluating the cause and impact of a given delay. While no consensus exists regarding a standard analytical method that is appropriate for every situation, the pros and cons of various methods should be kept in mind. When an unexpected event disrupts and delays a construction project, using a sound analytical method to identify the cause and quantify the extent of the delay will be important for negotiating a fair result or for obtaining a fair outcome in arbitration or litigation.