
Chapter
32

CPM in Claims and Litigation

32.1 Introduction

An important function of scheduling in the construction industry, for both the owner and those doing the construction, is to evaluate claims based on failure to meet schedules. CPM can affect claims in two ways.

1. It establishes a realistic schedule through CPM planning, which can furnish a legal basis for the enforcement of damages.
2. Perhaps even more important, it can be used to evaluate actual claims through the reconstruction of a project's history or the use of an existing CPM plan to indicate the effects of changes on the original schedule.

In one instance, a contractor, a consortium, was asked by a bridge authority to show why it should not be pressed for \$550,000 in liquidated damages. The authority believed that the contractor had done a good job, but because of the public trust involved, it felt that it needed tangible proof of good performance.

In response, the contractor used a construction as-built CPM plan to demonstrate the effects of three different unforeseen circumstances: unusually bad weather, loss of special equipment by fire, and time lost in doing work claimed as extra. The presentation demonstrated the combined effect of the three causes (which was less than the serial effect) and the effects of any one or two of them alone and together. Thus, if any one or two of the factors had been deemed nonexcusable, the effect of the remaining factor or factors was still quantified. On the basis of the finite presentation, the bridge commission did not press for the liquidated damages.

In a complex multimillion-dollar suit and countersuit, the owner, an airport authority, used a detailed as-built CPM to realistically evaluate the overall effects of the changes that both the owner and the contractor had imposed on the project. The network, set up on a historical basis, could be run to consider the combined effect of the changes as well as the separate effects of individual changes.

Information from daily, weekly, and monthly field reports was used to prepare the historical CPM network. The calculated results were invaluable to the owner's engineer for preparing a factual testimony. The pretrial and trial periods extended over a number of years, and without the historical network, factual testimony would have become almost impossible.

In negotiating extra work, contractors often neglect the effects a change order will have on work time, so they request either no time extension or an extension equaling the total period they estimate the additional work will require. However, extra work on a project usually affects float areas, and any time extension granted should be less than the total incremental time needed to complete the additional work. At Cape Canaveral, the combined emphasis on time and public pressure to complete projects reversed this situation. Contractors recognized more clearly the time–money relations and usually made substantial requests for additional time as well as for extra money to implement changes. The U.S. Army Corps of Engineers and NASA required network analysis for the basic work on most of the major projects undertaken.

Thus, most of the contractors prepared network-oriented fragnets to demonstrate the effects that additional work would have on scheduling. There were abuses, but in the long run, CPM was used fairly by both parties to evaluate requests for time extensions, and many claims were settled without the drudgery of formal lawsuits.

Also at Cape Canaveral, a new type of claim evolved: a claim for acceleration charges. Contractors would often accept extra work items and agree to perform them in the originally allotted time span. To balance the obvious inequity of additional work but no time extensions, a fee for work acceleration would be charged to compensate for the costs of overtime and other problems that arose, such as inefficiencies generated by overstaffing particular areas of work.

The type of contract originally signed for a project impacts whether there is a potential for easy resolution or settlement of claims, should they arise. Construction management and negotiated contract claims in the private sector can often be resolved by an objective report based on schedules and other factual information. Objective evaluation is important not only in regard to the legalities of the settlement proceedings, but also as documentation for proving to both plaintiff and defendant that a proper settlement has been reached. Claims in the public sector are usually not so easily settled, however, and an increasing number of disputes are running the full course of litigation.

32.2 Early Legal Recognition

The courts gave early recognition to the validity of CPM. In 1972 (Appeal of *Minmar Builders, Inc.*, GSBCA No. 3430, 72-2 BOA), the court rejected a claim based on bar graph schedules, stating: “The schedules were not prepared by the Critical Path Method (CPM) and, hence, are not probative as to whether any particular activity or group of activities was on the critical path or constituted the pacing element for the project.”

Also in 1972, a Missouri court (*Natkin & Co. v. Fuller*, 347 F Supp. 17) stated that bar charts did not “afford an overall coordinated schedule of the total work covered by the contract.” An Illinois court (*Pathman Construction Co. v. Hi-Way Electric Co.*, 65 Ill. App. ad 480, 382 N.E. 2d 453,460) in 1978 noted that “technological advances and the use of computers to devise work schedules and chart progress on a particular project have facilitated the court’s ability to allocate damages.”

Early courts stressed the transparency of the original CPM presentations. This may be compared to the court’s reaction to the modern variant of PDM as cited in *Donahoe Constr. Co.* ASBCA 47,310 et al. 98-2 BCA30.076 (1998). This case, as discussed in *Construction Scheduling, Preparation, Liability and Claims*, 2d edition, by Jon Wickwire, Thomas Driscoll, Stephen Hurlbert, and Scott Hillman (Aspen), notes that the court found “the utility of the baseline CPM schedule as a benchmark for measuring delays in a window analysis was rendered largely ineffective due to improper use of leads and lags.” Perhaps the most succinct comment by the court in this 1992 case was that the court found incredible the contractor’s expert analysis that “only the first five days of each activity (footings and slab on grade) were on the critical path.” Perhaps only a portion of the footing and slab was critical, but since there was only one activity each without detail, the court was not going to take the “say so,” by even a well-respected expert.

Thus the shift from more difficult code to a computer but transparent ADM to the easier to enter to a computer but opaque PDM could not come at a more problematic time than as the courts transformed from the *Frye*, or “follow the expert you feel more credible,” approach to the *Daubert*, or “show me, Mr. Expert, what you did,” standard now used in federal and many state courts. The key to the early legal recognition of CPM was its total simplicity once it was explained. But as computers got more powerful, software incorporated new features and extensions that might not be deemed as simple.

32.3 Evidentiary Use of CPM

During the 1960s, CPM schedulers, technicians, and engineers anticipated that the critical path method would be used as a tool in construction claims and litigation at some time. In fact, as early as 1963–1964, consultants to the

litigants on both sides of a case involving the Atomic Energy Commission used CPM to prepare their positions, although a case citation is not available and no wide exposition of the results was made. In the 1970s, 1980s, and 1990s, CPM techniques were often used in presenting and defending delay claims cases. In no case in which O'Brien-Kreitsberg & Associates (OKA) was involved was the use of CPM questioned by opposing counsel or the court. Some of the cases include the following (dates are approximate):

- *IBM v. Henry Beck Construction*, Federal Court, Florida, 1973
- *Somers Construction v. H. H. Robertson*, arbitration, Philadelphia, 1973
- *E. C. Ernst v. City of Philadelphia*, Eastern Federal District Court, Philadelphia, 1976
- *Arundel v. Philadelphia Port Corp.*, Commonwealth Court, Pennsylvania, 1979
- *Buckley v. New York City*, New York State Court, 1982
- *Kidde-Briscoe v. University of Connecticut*, Connecticut State Court, 1980–1982
- *Keating v. City of Philadelphia*, Eastern District Court, Philadelphia, 1981
- *Glasgow v. Commonwealth of Pennsylvania*, Commonwealth Board of Claims, 1982–1983
- *PT & L Construction v. NJDOT*, New Jersey State Court, 1983
- *I. DuPont Hospital v. Gilbane et al.*, mini-trial, Delaware, 1985
- *White Oak Construction v. Connecticut*, arbitration, Hartford, 1987
- *G.E. Environmental Systems v. Chevron*, arbitration, Philadelphia, 1988
- *Santa Fe Construction v. U.S. Navy*, Armed Services Board of Claim, Alexandria, VA, 1989
- *Shoemaker-Driscoll v. Smith Kline Beckman*, mini-trial, Philadelphia, 1989
- *Mergentime v. Washington Metropolitan Area Transit Authority*, U.S. District Court, Washington, DC, 1992, retried 200
- *Cris Tech v. Joint Meeting (EUC)*, arbitration, Somerset, NJ, 1993
- *Brooks Construction v. British Petroleum*, Commonwealth Court, Philadelphia, 1995
- *Newmont Gold Co. v. Lurgie et al.*, Arbitration under international rules, NYC, NY, 1998
- *Blake Construction Co. Inc./Poole & Kent JV v. Upper Occoquan Sewage Authority (UOSA)*, Fairfax County Court, Fairfax, VA, Feb. 2005

In many more OKA cases entered and en route to trial, CPM was a factor in the settlement. In the early 1970s, several lawyers researched the question of

CPM as an evidentiary tool. A series of articles and presentations followed, a number of which used the same thread, starting with the article “The Use of Critical Path Method Techniques in Contract Claims,” by Jon M. Wickwire and Richard F. Smith, in the *Public Contract Law Journal* of October 1974. Extracts (used with permission) from that article follow:

Judicial acceptance of CPM analyses as persuasive evidence of delay and disruption has been slow to develop, primarily due to technical errors in the analysis submitted or a failure of a presentation to realistically portray the work as actually done. In spite of the early reluctance to accept CPM presentations, the current state of the law is that use of CPM schedules to prove construction contract claims has become the standard, rather than the exception. Scheduling techniques which cannot display activity interrelationships are not favorably regarded as evidence of delay and disruption. In *Minmar Builders, Inc.*, GSBICA, 3430, 72-2 BCA ¶ 9599 (1972) the General Services Administration Board of Contract Appeals commented upon Minmar Builder’s construction schedules (bar charts) which were offered to show project completion delay due to government’s failure to timely issue ceiling change instructions.

Although two of Appellant’s construction schedules were introduced in evidence, one which had been approved by the government and other which had not, neither was anything more than a bar chart showing the duration and projected calendar dates for the performance of the various contractual tasks. Since no interrelationship was shown as between the tasks the charts cannot show what project activities were dependent on the prior performance of the plaster and ceiling work, much less whether overall project completion was thereby affected. In short, the schedules were not prepared by the Critical Path Method (CPM) and hence are not probative as to whether any particular activity or group of activities was on the critical path or constituted the pacing element for the project.

The greatest difficulty encountered by contractors using CPM techniques in claim presentation is the requirement for the presentation to be thoroughly grounded in the project records. The failure of contractors to properly document CPM studies has been held controlling in many board decisions

Guidelines for the use of CPM presentations were set forth in the General Services Administration Board of Contract Appeals decision in *Joseph E. Bennett Co.* (GSBICA 2362, 72-1 BCA ¶ 9364 (1972)) which . . . affirms the need to properly update a CPM and support the study with accurate records. The contractor’s claim in this appeal was founded on a letter from the contracting officer ordering completion of the work by the contract completion date. The contractor argued this requirement was an acceleration order, which was denied by the contracting officer because of a lack of meaningful evidence. The contracting officer rejected the accuracy of the contractor’s critical path method construction plan on the basis of errors in the interrelationships of activities.

At the board, the appellant presented a computer analysis of the CPM used on the project to isolate the delays caused by government activities.

The board held that the usefulness of this analysis was dependent upon three things:

1. The extent to which the individual delays are established by substantial evidence—this requirement is concerned with the project records and evidence available for the appellant to show the underlying causes of delay.
2. The soundness of the CPM system itself—this requires the contractor to demonstrate the logic of the CPM and show that its theoretical and scheduling analyses are sound.
3. The nature of and reason for any changes to the CPM schedule in the process of reducing it to a computer program—this relates to the exactness and accuracy with which the appellant has reduced the CPM network to a computer analysis and how effectively this analysis can be used in a claim presentation. As expected, the appellant in Bennett argued that the CPM was the proper basis for any analysis of the project since the plan was submitted by the appellant and approved by the government.

However, the board rejected the appellant's CPM analysis because it

1. Contained numerous mathematical errors
2. Failed to consider foreseeable weather conditions
3. Changed the critical path and float times without reason
4. Was prepared without the benefit of any site investigation and after the project was already completed

The gradual acceptance of CPM presentations when properly documented is demonstrated in the case of Continental Consolidated Corp. ENG BCA 2743, 2766, 67-2 BCA ¶¶ 6624 (1967).

In this case a claim was submitted for extra costs due to suspension of work and subsequent acceleration directed by the government. The appellant alleged it was entitled to time extensions due to government delay in approving shop drawings. The government's failure to grant time extensions for these delays made the work appear to be behind schedule as of certain dates when in fact, if proper time extensions had been granted, the appellant would have been on schedule. As a result, government directives to work overtime and/or extra shifts would have been unnecessary. The contract set completion dates for various elements of the work which in effect required a critical path for each element within an overall work plan. With the use of the appellant's CPM analysis, the board was able to separate out the delay costs due to the appellant and the additional costs incurred due to a compensable acceleration order. This evidentiary tool allowed the board

to identify the periods of delay and actual progress on the job and thereby determine when an acceleration order was properly issued from that point in time when such an order was compensable because the contractor was back on schedule.

Thus the boards have recognized the value of a CPM developed contemporaneously with the work or subsequent to the work so long as it is based upon the relevant records available. The records may include daily logs, time sheets, payroll records, diaries, and purchase orders. While the boards have accepted the CPM as an evidentiary tool, this tool cannot rise above the basic assumptions and records upon which it is founded. The board can accept the theoretical value of a CPM presentation, but reject its conclusion for failure to base the analysis on the actual project records. (See *C. H. Leavell & Co.*, GSBICA2901, 70-2 BCA ¶ 8437 (1970); 70-2 BCA ¶ 8528 (1970) [on reconsideration] where the contractor failed to establish the accuracy of the input data for its computer analysis of delays due to design deficiencies.) Where the board has received persuasive evidence that the CPM network is either logically or factually inaccurate, incomplete, or prepared specifically for the claim, the board will discount its evidentiary value. A CPM must be linked to the job records, as a CPM analysis is primarily concerned with visually portraying the job records to establish the cause of delay or disruption.

The extent to which a CPM presentation may be used to document a claim can be seen in *Canon Construction Co.* (ASBCA 16142, 72-1 BCA ¶ 9404 1972) where the contractor gained total acceptance of its CPM schedule to establish a delay claim. In this opinion, the board recognized the underlying logic and evidence presented in the appellant's original CPM schedule and the value of CPM techniques to prove extended overhead costs.

In *Canon*, the contractor was awarded his overhead costs determined by the difference between the actual date of completion and the date the contractor would have completed the work absent government fault and performance of changed work. But the recovery of extended overhead costs was held to be limited by either the extended period of performance time or the aggregate net extent of delays caused by government fault or change work, whichever was the lesser. Using this formula, the board recognized that the contractor was not entitled to recovery for the group of excusable but noncompensable delays including weather delays, reasonable suspensions of work, etc.

The *Canon* decision is extremely important since it shows that a properly prepared and presented CPM schedule will be accepted by the board as the basis for computing project delays. In this regard note that the board clearly indicated that it was "relying principally on the CPM chart and only using the witness' testimony to ascribe an aspect of reasonableness to the chart."

The Canon decision is also significant because it provided further guidance to the application of CPM principles to claims. For example, the board acknowledged that delays incurred off the critical path would not delay ultimate performance. Further, the board found that where the sequence established by the network was violated, costly start and stop operations would result and implied that the contractor's planned network operations need not be the only way to accomplish the work shown, but must be shown to be economical in both cost and time. (Reference:

In 1975, coauthors Paul J. Walstad, Jon M. Wickwire, Thomas Asselin, and Joseph H. Kasimer wrote a book titled *Project Scheduling and Construction Claims, a Practical Handbook*, which was published by A. James Waldron Enterprises. On page 14-1, the authors note:

There was reluctance at first to accept the use of CPM analysis as evidence of delays and disruption. Of paramount concern were possible technical errors in the system or a failure of the system or analysis to realistically portray the work as actually done. See e.g., A. Teichert & Sons, Inc., ASBCA No. 10265, 68-2 BCA ¶ 7151 (1968). . . .

This concern no doubt stemmed from early presentations which based CPM analysis to a great extent on speculation, inferences, or innuendo rather than hard, documented facts. Thus, even though the CPM has become recognized as a competent source of evidence . . . its usefulness in providing a claim has been held dependent upon at least four factors:

1. The soundness of the CPM schedule itself. . . . This requires proof of the reasonableness and feasibility of the schedule so as to show that on a theoretical basis the scheduling was sound;
2. The extent to which any individual delays can be established by substantial evidence. This goes to the basic records and evidence available to the claimant to show the underlying causes of delay and disruption;
3. The nature of any changes to the CPM schedule made during the claim analysis process. This relates to the exactness and accuracy with which the claimant has analyzed the project scheduling in making his presentation;
4. Proof that the work sequence shown was the only possible or reasonable sequence by which the work could be completed on time.

In the late 1970s and early 1980s, *Engineering News-Record* presented a series of professional seminars on claims and litigation. Paul J. Walstad, Esq., has been a leader in the formulation and presentation of a number of these. The comments on the evidentiary value of CPM continue as previously described. By 1980, Walstad had added the following in this regard:

In Blackhawk Heating & Plumbing Co., Inc., GSBCA No. 2432, 75-1 BCA, the contractor claimed 403 days as a result of ductwork design deficiencies.

The Board found the deficiencies were the fault of the Government. However, the Board indicated the main question was whether the duct-work delay had

extended contract completion; the Government contended a delay involving electrical fixtures was the critical item. In support of its position, the Government produced its own CPM analysis, which had been prepared after the delays had occurred. The Government CPM showed the ductwork design problems were not on the critical path; the activities which the contractor had contended were delayed actually had "float" time remaining even after the delay was considered, and the critical path ran through the electrical fixture approval, delivery and installation cycle.

The Board carefully analyzed the Government's CPM, and found it . . . established a sound network diagram and computer run showing just how the project was actually constructed up to the date of substantial completion on December 7, 1970. . . .

After reviewing the delay analysis set forth in the Government CPM, the Board further concluded it had provided "a sound basis upon which to evaluate various project delays." Based upon the finding the electrical fixture delay was the factor which delayed ultimate completion, the Board then proceeded to allocate responsibility for the fixture delays. Upon reconsideration, the Board refused to modify its original decision, indicating the as-built CPM was the best evidence of delay.

The use of CPM as an evidentiary tool in claims and court proceedings is not confined to administrative boards. In *Brooks Towers Corporation v. Hunkin-Conkey Construction Company*, 454 F.2d 1203 (10th Cir. 1972), the owner claimed delay damages from the contractor. The Tenth Circuit Court of Appeals affirmed an award in favor of the contractor, and in so doing placed great weight on the CPM analysis provided by an expert witness:

"The testimony of Richard N. Green, a Construction Consultant, is corroborative of Ratner's grant of some 185 days extensions and significant in relation to the 'clockwork' scheduling of work components required to accomplish the original contract completion schedules. Green's study took into consideration the plans and specifications, the computerized Critical Path Scheduling program, all Bulletins, formal Change Orders, related correspondence, Daily Progress Report and Monthly Pay Requests. He computed some 394 days involving requests for extensions. He eliminated those of an 'overlapping' nature and those which were not critical. He did not consider delays resulting from labor disputes or severe weather conditions. He arrived at a total of 180 days extension of time to which the Contractor was entitled." In its decision of July 18, 1983, the General Services Administration Board of Contract Appeals (GSA BCA) complained about the misuse of CPM schedules in a claim by Welch Construction, Inc. Welch filed a claim for damages as a result of owner delay in the modification of a geological survey center.

When presenting its claim, Welch used CPM diagrams that purported to present As-Planned and As-Built schedules. In its opinion, GSA BCA, denying the claim, stated: Candor compels us to admit that we may not have figured out what it was that Appellant thought its exhibits would show. If so, Appellant has only itself to blame . . . [One] of the surest ways of losing a case for lack of proof is submitting complex exhibits to a trier of facts

with no attempt to explain what they show or how they relate to the other evidence in the record.

The Board believed that the schedules used in presenting the claim ignored both contractual and actual completion dates.

32.4 Summary

An important function of scheduling in the construction industry is to evaluate claims of disruption and delay. Following proper procedure in preparing, updating, when necessary revising, and analysis of the CPM schedule may determine who was right and who was wrong. But the ultimate finder of fact is not your professor in the classroom, but rather a judge, arbiter, or member of a jury. From the outset of the development of CPM, many practitioners understood that CPM provided for the first time a scientific means to establish who should prevail in a dispute. While we now know much of this was based upon watered-down mathematics to fit the limits of computing software (as well as some theoretical considerations) presentation to the judge or other fact finder has become a big dollar industry. The earliest cases cited in this chapter harken back to the early 1970s. Broad principles relating to the impact of CPM on the rule of law relating to construction are set forth in these selected cases. The latest ones run all the way to the mid-2000s. More recent cases are either still in the appeals courts, or there are no published written records of the outcomes because they were decided by private arbitration.

32.5 References

1. Jon M. Wickwire and Richard F. Smith, "The Use of Critical Path Method Techniques in Contract Claims," *Public Contract Law Journal*, October 1974.
2. *Project Scheduling and Construction Claims, A Practical Handbook*, 1975.
3. ENR Advanced Course on Construction Claims, May 1 and 2, 1980.

The principal reference document for most of the case references in this chapter is the omnibus work by Jon M. Wickwire, Thomas J. Driscoll, Stephen B. Hurlbut, and Scott B. Hillman, *Construction Scheduling: Preparation, Liability, and Claims*, 2d ed., Aspen Publishers, 2003. The 271-page supplement was published in 2005.