

# Aspects of Construction Scheduling

By MARK E. HANSON



At all levels, public contracts for construction frequently specify preparation and use of network schedules to plan, determine, and manage progress, assess status, anticipate and overcome potential delaying events, measure payments against progress, and determine extensions of time. Although network scheduling, typically called

the critical path method (CPM), generally has seen its most stringent tests in litigation over the 40 years since its introduction to construction, its principles and associated legal concepts are applicable equally in the performance and administration of a project that experiences events delaying construction progress.

Some of the principles discussed herein have been well established for much of the time during which systematic network scheduling has been in use and are familiar to those experienced in construction and litigation of related disputes. Acquiring familiarity with and the ability to grasp and inquire into CPM techniques, methodologies, and conclusions is essential to construction managers, contract administrators, as well as counsel who may not have such experience. Moreover, techniques, specifications, and the knowledge, understanding, and experience of experts, judges, arbitrators, mediators, and practitioners have advanced over the last two decades, leading to maturation of the field and efforts to standardize its practice as a construction discipline, not unlike the various engineering disciplines.<sup>1</sup> This article presents several basic elements of network scheduling, particularly as it relates to construction law, and some more recent developments further solidifying the requirements of acceptable scheduling practices.

## What Is Critical Path Scheduling?

Schedules prior to the advent of critical path method scheduling, while attempting to coordinate the numerous activities that are involved in performing complex manufacturing or construction, suffered from their lack of integration of the time, spatial, and resource relationships between separate activities.<sup>2</sup> Critical path method scheduling is “a graphic presentation of the planned sequence of activities that shows the interrelationships and interdependencies of the elements composing a project.”<sup>3</sup> Its network of activities that enables analysis in schedule-related

claims is the most frequently used method for planning and managing construction and for the proof and assessment of schedule-related claims.<sup>4</sup> The critical path method establishes a planned sequence of activities, their durations, and their interrelationships and defines the “critical path”; the minimum duration that will be required to complete a project. A delay to any of the critical path activities will extend day-for-day the planned completion date of the project unless other adjustments or changes are made to the relationships between activities or the resources brought to bear to perform the affected activities.

Only those delaying events that affect the schedule’s critical path, or that increase the duration of an activity such that it “gets on” the critical path, are relevant to extension of the contractually required completion date and claim analyses involving accelerated or extended performance. Delays are usually identified as excusable or nonexcusable with the former supporting extension of the time for performance, and the consequences of the latter falling exclusively on the contractor.<sup>5</sup>

## What Is Float and Why Does It Matter?

Scheduled activities not on the critical path are, by definition, those activities having “float”; an amount of time for which delay of that activity will not affect the critical path and extend the time for completion.<sup>6</sup> A critical path activity has no float.<sup>7</sup> Total float is the amount of time an activity can be delayed without delaying the project completion date. It is the difference between the early start and late start or early finish and late finish for a given activity or an entire path of activities in a schedule network.<sup>8</sup>

Float allows a manager the ability to reschedule resources and work, yet not delay the project so long as the float is not consumed. Because of this flexibility associated with float, the question of whether the owner, contractor, or the project “owns” float and is entitled to use it remains a significant issue, particularly in the context of multiple delays that exceed total float. For example, an owner-caused delay consumes available float causing subsequent activities in the chain to be critical, and the contractor is then responsible for an unexcused delay. Depending on the answer to the question “who owns the float?” the outcome can be quite different. If it is a resource owned by the contractor and the owner deprived it of that resource (to absorb its unexcused delay) resulting in increased time, for example, to work around the stalled activity, compensation should be due. If a scheduled activity having float is delayed and the delay does not use up the float and cause the activity to become critical, generally no compensation for time-related costs is involved because there is no delay to the overall project completion date—no critical path effect and, therefore, no extended period of performance during

---

Mark E. Hanson is a partner with Smith Pachter McWhorter, PLC, in Vienna, Virginia, and cochair of the Section of Public Contract Law Construction Division.

which unanticipated costs are incurred.

Absent a contract clause, float can be considered a management tool for the contractor's use, and at least one decision held that float should belong to the party performing the schedule activity having float and that party is "entitled to consume or use the float as he sees fit or necessary."<sup>9</sup> The general approach, however, even in the absence of a contract clause, is that float is a shared resource not the property of the contractor or the owner. This neutral approach effectively means that the party that first uses the float owns it.<sup>10</sup> A contractor can probably recover for increased costs proved to be solely due to owner-caused delays that consumed float, as these circumstances could disrupt the contractor's planned sequencing of work, thus potentially increasing costs as discussed above. The primary problem, as is the case with many construction claims, is developing proof that establishes the causal link between the delay(s) and the contractor's increased costs.<sup>11</sup>

### What Makes for a Reliable Schedule?

Where a contract specification requires the contractor to develop a CPM schedule, typically there is also a requirement that the contractor uses the schedule as a management tool in constructing the project and creates a record of project performance through monthly updating, entering start and finish information for the previous month, and reforecasting as necessary. Contractually required schedules generally may not be abandoned without the risk of liability for damages due to other parties' reliance.<sup>12</sup> An obsolete schedule may mislead other parties and subject the party that promulgated the schedule to claims for damages.<sup>13</sup>

Updating the schedule in accord with contract requirements is essential, not only because of likely contract requirements, but because courts have determined that "accurate, informed assessments of the effect of delays upon critical path activities are possible only if up-to-date CPM schedules are faithfully maintained throughout the course of construction."<sup>14</sup> The critical path method, and analyses based on CPM schedule networks, are widely accepted by courts and judicial bodies for analyzing delay-related claims for time extension and other effects upon construction.<sup>15</sup> In fact, CPM may be the only way to demonstrate delay and its effects, even if the contract does not require the use of the method.<sup>16</sup> There must be proof establishing through a CPM analysis that the claimed event, such as the late return of submittals, caused delay to the critical path.<sup>17</sup> The recognized method is essentially the comparison of (1) the as planned schedule with (2) the as built schedule developed from project records, principally monthly updates, and (3) analysis of activities performed in longer or shorter time periods than originally planned to identify delays and determine causes and responsibility.<sup>18</sup>

As to the importance of the requirement that a schedule offered to support a claim must be used to manage the project and updated throughout, *Turner Construction Co. v. GSA* recently involved efforts by GSA to prove spoliation of evidence. GSA sought a presumption that the contractor's missing schedule updates would have supported GSA's

case and harmed the contractor's case. However, Turner had actually never prepared the updates, thus there was no destruction of evidence, willful or otherwise. Of greatest interest in this case is the board's "observ[ation] that it is appellant who may be prejudiced by the allegedly missing scheduling update data. It is appellant's burden to establish the fundamental facts of causation, liability and damage. . . . Appellant's statements that it did not use Primavera during the later stages of the project, or provide schedule updates as required by the contract, raise questions as to whether appellant will be able to prove delay during the stages of the project for which update data is missing."<sup>19</sup>

### Is It Really a Concurrent Delay?

The issue arises because a delay to project completion may be caused by more than a single event. The contractor and owner each may be responsible for one or more of the potential causes of the delay. There may be any number of activities not completed when planned and the question in the face of undeniable extension of project completion is the underlying cause(s) of the delays to completion.

"[T]here can be but a single delay over a given period of time, and when that delay has multiple, indivisible causes, it is attributable not to either party but to both. Hence, it would probably be more accurate to speak not of concurrent delays but of a single delay with concurrent causes."<sup>20</sup> This conclusion illustrates the historic problem the courts faced in attempting to address competing, simultaneous causes of delay and led to the general rule that "inextricably intertwined" causes of delay will not permit the contractor to recover extended duration costs or the owner to recover liquidated damages for late completion.<sup>21</sup>


While the courts struggled with how to deal with concurrent causes of delay, including compensable delays concurrent with noncompensable delays, the current approach, given the availability of CPM analysis, is to require the claimant to carry its burden of proof by segregating or apportioning the delays and the associated expenses that are the responsibility of each party.<sup>22</sup> "Concurrent delay is not fatal to a contractor's claim for additional time due to excusable delay, but precludes the recovery of delay damages."<sup>23</sup> A contractor may be required to prove when it would have completed "but for" owner-caused delays. However, this requirement subsumes the principle that the contractor must establish that the compensable, or owner-caused, delay affected the critical path while the contractor-caused delay was to an activity or activities that were not critical and carried float.<sup>24</sup> In view of this, a "delay" of an activity carrying float is not a "delay" at all in relation to concurrent delay, as recently confirmed in *George Sollitt Construction*.<sup>25</sup>

However, there is some confusion in the federal contracting decisions as to whether or not the contractor must disprove its responsibility for possible concurrent delays. *MCI Constructors*<sup>26</sup> and *Bechtel Environmental*<sup>27</sup> establish this is not necessary, but *PCL Construction* effectively requires the contractor to demonstrate the government was the "sole proximate cause" of the delay to the exclusion of the possibility that any other concurrent cause would have

delayed the project.<sup>28</sup> One commentator suggests the court's expression may have been prompted by the contractor's assertion of a "total time" claim that attributed all delay to the government.<sup>29</sup>

Frequently, a contractor's failure to perform to planned sequences and activity dates once it has experienced critical path delays attributable to the owner is asserted as concurrent delay; that is as an independent cause of the delay. There have been several cases essentially finding that the contractor "is not necessarily required to conduct all of its other construction activities exactly according to the pre-delay schedule, and without regard to the changed circumstances resulting from the delay. The occurrence of a significant delay generally will affect related work, as the contractor's attention turns to overcoming the delay rather than slavishly following its now meaningless schedule."<sup>30</sup> Thus, a contractor is permitted to not "hurry up and wait" and can effectively relax its performance of work that is not on the critical path thereby avoiding valid assertions of concurrent delay.<sup>31</sup>

## Conclusion

As time is the single most important component in a construction project, many of the problems that occur during construction relate to the project schedule. CPM schedules and analysis therefore are a key resource whether the problem is addressed contemporaneously or in dispute resolution. This article has introduced just a few of the basic principles of scheduling and associated requirements essential to understanding the nature of construction scheduling and its treatment by the courts and boards of contract appeals. Such topics as the use of scheduling in relation to analyzing effects upon construction productivity and acceleration of performance may be the subject of future articles. Sources of more in-depth information about construction scheduling are cited herein and reference to those works is recommended. To grasp these topics more fully, however, there is no substitute for review of the decisions of the Court of Federal Claims and the boards of contract appeals. State and local jurisdictions may vary somewhat. 

## Endnotes

1. See, e.g., publications of The Association for the Advancement of Cost Engineering (AACE), The Society of Construction Law, Associated General Contractors and the Project Management Institute (PMI).

2. JON M. WICKWIRE et al., CONSTRUCTION SCHEDULING: PREPARATION, LIABILITY, AND CLAIMS 23-24 (Aspen 2003).

3. *Id.* at 24.

4. Hubert J. Bell, Jr. and Gene J. Heady, *Expertise That Is "Fausse" and Science That Is Junky: Challenging a Scheduling Expert*, PROCUREMENT LAW., Vol. 35, No. 1 at 7 (Fall 1999). Precedence Diagram Method (PDM) is another form of CPM that is increasingly used.

5. *Id.* at 11 n.1.

6. Maron Constr. Co. v. Gen. Servs. Admin., GSBCA No. 13625, 98-1 BCA ¶ 29,685; *Galaxy Builders, Inc.*, ASBCA No. 50018,50136, 00-2 BCA ¶ 31,040.

7. *Uteley-James, Inc.*, GSBCA No. 5370, 85-1 BCA ¶ 17,816.

8. *Maron Constr.*, 98-1 BCA at 147,109.

9. *Turner Construction Co.*, ASBCA No. 25447, 29472, 29591, 29593, 29830, 29851, 29852, 90-2 BCA ¶ 22,649. See also *Joseph E. Bennett Co.*, GSBCA 2362, 72-1 BCA ¶ 9364, n.7 (1972); *Heat Exchangers, Inc.*, ASBCA No. 8705, 1963 BCA ¶ 3881 (1963); cf.

*Blackhawk Heating & Plumbing Co.*, GSBCA No. 2431, 75-1 BCA ¶ 11,261, *on recon.* 76-1 BCA ¶ 11,649 (1975).

10. ADRIAN L. BASTIANELLI III, ANDREW D. NESS, JOSEPH D. WEST, FEDERAL GOVERNMENT CONSTRUCTION CONTRACTS 428 (ABA Pub. 2003) (citing WICKWIRE et al., CONSTRUCTION DISPUTES: REPRESENTING THE CONTRACTOR 519, 538 (3d ed. 2001)).

11. *Id.*, at 436-37, 446-47, 462-69.

12. *Natkin & Company v. George A. Fuller & Western Electric Co., Inc.*, 347 F. Supp. 17 (W.D. Mo. 1972) (owner and prime contractor abandoned schedule and became liable for subcontractor's damages).

13. *Compare Natkin*, 347 F. Supp. 17 and *Edwin J. Dobson, Jr. Inc. v. Rutgers State University*, 90 N.J. 253 (1982) (A party is generally free to schedule a project as it sees fit).

14. *Blinderman Constr. Co., Inc. v. United States*, 1997 WL 719912 at 57 (Fed. Cl. 1997); *Fortec Constructors v. United States*, 8 Cl. Ct. 490, 506 (1985); *Continental Consol. Corp.*, ENG BCA Nos. 2743, 2766, 67-2 BCA ¶ 6624 at 30,715 (1967).

15. See, e.g., *Fischbach & Moore Int'l Corp.*, ASBCA No. 18146, 77-1 BCA ¶ 12,300 (1976); *American Int'l Contractors, Inc./Capitol Indus. Constr. Groups, Inc.*, JV, ASBCA Nos. 39544, 42663, 42855, 42878, 44393, 44395, 44470, 44485, 95-2 BCA ¶ 27,920 (1995); *Kelso v. Kirk Bros. Mechanical Contractors, Inc.*, 16 F.3d 1173, 1177 (Fed. Cir. 1994).

16. See *G. Bludzius Contractors, Inc.*, ASBCA Nos. 42366, 42368-42370, 93-3 BCA ¶ 26,074 at 129,593 (1993); *Sunshine Construction & Eng'g, Inc. v. U.S.*, 64 Fed. Cl. 346, 368-69 (2005) (only recognized methods of CPM analysis are acceptable proof).

17. *Turner Construction Co. v. GSA*, GSBCA Nos. 15502, 16055, 16551, 2005-1 BCA ¶ 32,898 at 162,986.

18. *Sunshine Constr.*, 64 Fed. Cl. at 368-69.

19. *Turner Constr.*, 05-1 BCA ¶ 32,895 at 162,968 (citations omitted). Primavera Project Planner is one of the currently available scheduling software programs.

20. *Uteley James, Inc.*, 85-1 BCA ¶ 17,816 at 89,109.

21. See, e.g., *Commerce Int'l Co. v. United States*, 338 F.2d 81 (Ct. Cl. 1964); *C.D. Murray Co.*, ENG BCA No. 5018, 89-1 BCA ¶ 21,275; *United States v. United Eng'g & Constructing Co.*, 234 U.S. 236 (1914).

22. *Blinderman Construction Co. v. United States*, 695 F.2d 552, 559 (Fed. Cir. 1982).

23. *R.P. Wallace v. U.S.*, 63 Fed. Cl. 402, 410 (2004) (noting the basis of the rule is absence of causation). This case also includes an enlightening discussion of the unsettled law regarding the effect of causes of delays attributable to each of the parties that occur seriatim.

24. See *Uteley James, Inc.*, 85-1 BCA ¶ 17,816; *Fischbach & Moore Int'l Corp.*, ASBCA No. 18146, 77-1 BCA ¶ 12,300.

25. *George Sollitt Construction Co. v. United States*, 64 Fed. Cl. 229, 240-41 (2005).

26. *MCI Constructors, Inc.*, DCCAB No. D-924, 1996 DCBCA LEXIS 71 (June 4, 1996).

27. *Bechtel Environmental, Inc.*, ENG BCA Nos. 6137, 6166, 97-1 BCA ¶ 28,640.

28. See *PCL Construction Services, Inc. v. United States*, 47 Fed. Cl. 745, 801 (2000).

29. Andrew D. Ness, *Delay, Suspension of Work, and Acceleration in FED. GOV'T CONSTRUCTION CONT.* (2003). A total time or modified total time approach may still prevail where it appropriately takes into account the factors that have been established for use of the total cost or modified total cost approaches with regard to delay and concurrent delay. See *Hardrives, Inc.*, IBCA Nos. 2319/2514, 2375/2475, 2414/2515, 2510, 2511, 2516, 2518, 2519, 2524, 94-1 BCA ¶ 26,267 at 130,683 (citing *Norair Eng'g Corp.*, ENG BCA Nos. 3804, 3823, 4075, 4105, 4135, 4202, 4379, 4559, 4579, 90-1 BCA ¶ 22,327 at 112, 209).

30. *John Driggs Co.*, ENG BCA No. 4926, 5061, 5081, 87-2 BCA ¶ 19,833 at 10,388; see also *Hardrives*, 94-1 BCA at 130,683-84.

31. *Uteley James, Inc.*, 85-1 BCA ¶ 17,816; *MCI Constructors, Inc.*, DCCAB No. D-924, 1996 DCBCA LEXIS 71 (June 4, 1996); *Bechtel Environmental, Inc.*, ENG BCA No. 6137, 6166, 97-1 BCA ¶ 28,640.