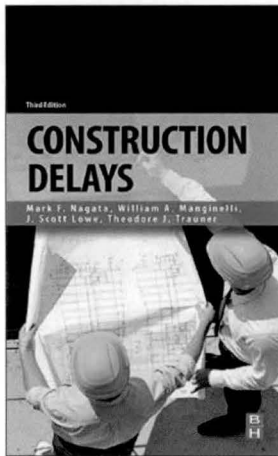


# Construction Delays



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Construction is one of the riskiest businesses with inherent difficulty estimating the duration accurately despite the sophisticated scheduling and managing tools available. The small profit margin, significant risks, and complexity add to the conflicts resulting in delays. Most construction projects encounter delays, making it difficult for the parties to assess and quantify the uncertainties. This book addresses the topic of construction delays, their effects, and damages. This failure to meet schedules can result in severe consequences with unprecedented cost implications. This book provides a practical insight into the area of construction delays. This book provides details on the delays, time extensions, and delay costs that help in preventing its occurrence, avoiding unprecedented litigations. The eighteen chapters in this book provide insight into time constraints and possible modifications to scheduling and monitoring. These modifications sighted are borrowed from supply contracts, research and development projects, manufacturing projects, in addition to traditional construction projects.

*Chapter 1* on the Project schedule deals with scheduling, the need for scheduling, and various methods used in project scheduling, including linear projects. It also lays down the need to update the project schedule. The computation of delay based on the float and critical path related to the contract is envisaged in *Chapter 2*, along with multiple project calendars and concurrent critical paths.

*Chapter 3* on Reviewing the project schedule provides various practical aspects related to construction

projects. This chapter highlights the approval of the baseline schedule and reviewing the schedule update and its relation to the contractual provisions, mitigation measures for the delay during the project's progress based on the milestones achieved and targeted. The definitions of delay and its classification of delays, detail excusable, non-excusable, compensable, and non-compensable delays, and force-Majure provisions on federal contracts are described in *chapter 4*. This also details activity delay, project delay, no damage for delay clause, and concurrent delays in the contract.

*Chapter 5* provides details of five principles of delay analysis based on the type and quality of documentation available. The chapter offers practical examples based on the construction project to evaluate the delay when multiple stakeholders, contractors, and subcontractors are involved in construction. A detailed description of computation of delay using bar chart using the principles envisaged is explained in *chapter 6* along with snowball effect of delay in project's progress.

The delay analysis based on the critical path method deals with prospective and retrospective Time Impact Analysis (TIA) on changed or added activity in Frgnet (Fragmented Network) is explicated in *chapter 7*. The chapter also highlights the difference between them and the steps to carry out both TIAs. Along with the insight to Computer-Aided Schedule Evaluation (CASE), the chapter details the need for correct interpretation of results obtained from various commercial software by the analyst using as-built information and project communications. *Chapter 8* details the delay analysis, carefully reviewing the project documents in case of the absence of a planned project schedule or project update. *Chapter 9* provides the various delay analysis techniques viz., as-planned versus as-built analysis, impacted as-planned analysis, collapsed as-built analysis, retrospective time impact analysis, windows analysis and but-for analysis. This chapter provides insight on how the monetary value of the work done is not related to the time progress of the job. This chapter provides an insight into the limitation of the S-curve to analyze the progress of the project.

*Chapter 10* details the damages the owner can recover from the parties involved during a delay. This chapter deals extensively on liquidated damages, its estimation, the need for milestones in the contract and quantifying the damage fees that would graduate with time, bonus, and incentive in case of early completion. This chapter also deals with the enforceability of the liquidity damage clause and the anomalies in estimation. *Chapter 11* details the contractor's delay calculation of costs attributable to delay supported by the relevant contract provisions and the relevant facts supporting change or claim from the project documents, cost records, testimony, or other evidence.

*Chapter 12* deals with home office overhead calculation and its significance due to the delay of one project at a time and multiple projects. The chapter provides insight into the Eichleay formula, Canadian method, and Allegheny Formula and concludes that the burden on contractor to prove the degree of incurred loss due to delay. The miscellaneous damages due to delay, escalation of labour, additional supervision, equipment, reduced efficiency, interest, loss of opportunity/profit, and legal and consulting costs are described in *chapter 13*. *Chapter 14* deals with inefficiencies arising from delays, the various instances that reduce productivity, and the methodology to quantify inefficiency.

*Chapter 15* deals with the acceleration of the project, constructive acceleration, and its impact on the critical path. This chapter explains the significance of the time-cost trade-off along with the need to manage the acceleration. The methods to fix the responsibility based on documents and contracts are presented in *chapter 16*. The chapter explains three aspects, viz., allow the owner to investigate the problem, give the owner and the contractor time to develop a strategy to mitigate the delay, allow the owner to document the delay contemporaneously.

*Chapter 17* deals with the risks associated with the delays. The analytical processes enable project managers to identify risks early and adjust for them efficiently. The chapter deals with the details on risk

factors that need to be assessed by the project stakeholders, viz, owner, contractor, subcontractor and suppliers, designer, and consultant. Chapter 18 concludes the book with the provisions in the contract that need to deal with project schedule, time extension, and cost.

#### **About the Editors**

**MARK F. NAGATA** is a recognized expert regarding the analysis of Critical Path Method (CPM) schedules. Mark was a contributing author and continues to provide updates and revisions to the AACE International's (AACEi) Recommended Practice No. 29R-03 for Forensic Schedule Analysis (RP-FSA). He writes and speaks nationally and internationally on construction claim topics.

**WILLIAM A. MANGINELLI** has extensive experience in project management, scheduling, construction change analysis, and surety completion on many types of projects, both in the real estate and infrastructure sector. His expertise lies in construction management and the analysis of construction impacts, including delays, inefficiency, acceleration, and damages.

**SCOTT LOWE** has directed and performed all types of analyses related to claims, including delay and inefficiency, assessed responsibility for contract changes, and calculated various delay damages. He has evaluated problems and offered solutions on almost every infrastructure construction project, large and small, throughout the US and internationally.

**THEODORE J. TRAUNER** has managed construction or evaluated problems on infrastructure and real-estate projects. He is a nationally recognized construction expert in scheduling, management, cost overruns/damages, construction means and methods, and delay and inefficiency analysis.

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