

# Table of Contents

## PART I. FOUNDATIONS

### CHAPTER 1. FRAMEWORK FOR DELAY ANALYSIS

- § 1:1 Types of delay
- § 1:2 —Compensable delay: time is money
- § 1:3 —Excusable but not compensable delays: shared fault or no fault
- § 1:4 —Inexcusable, noncompensable delay: liquidated damages
- § 1:5 *Daubert* issues and the art of analysis

### CHAPTER 2. CRITICAL PATH METHOD (CPM)

- § 2:1 History
- § 2:2 —Origins of critical path method
- § 2:3 —Origin of schedule delay analysis methods
- § 2:4 — —Time Impact Analysis
- § 2:5 — —As-planned versus as-built
- § 2:6 — —Impacted as-planned
- § 2:7 — —As-built critical path
- § 2:8 — —Collapsed as-built/“but-for”
- § 2:9 —Evolution of methods over time
- § 2:10 Float
- § 2:11 Critical path
- § 2:12 —Longest path or zero float path
- § 2:13 —Delays after the expiration of contract time
- § 2:14 —Resolution
- § 2:15 —Float on the critical path
- § 2:16 Logic and updates
- § 2:17 —Means of schedule constraint—Logic ties
- § 2:18 — —Leads and lags
- § 2:19 — —Long duration activities
- § 2:20 — —Open-ended activities
- § 2:21 — —Assigned constraints
- § 2:22 — —Calendar constraints
- § 2:23 —Categories of scheduling constraints
- § 2:24 — —Physical constraints
- § 2:25 — —Contractual constraints

- § 2:26 — —Preferential sequencing constraints
- § 2:27 —Resource loading or cost loading the schedule
- § 2:28 —Intermediary milestones
- § 2:29 —Progress updating
- § 2:30 — —Updating schedule to reflect actual progress
- § 2:31 — — —Incorrect dates
- § 2:32 — — —Retained logic vs. progress override
- § 2:33 — —Revising the schedule to reflect changes and revisions to the plan going forward
- § 2:34 — —Adjusting the contract completion date to account for excusable delay
- § 2:35 —Responsibility for failing to update schedules
- § 2:36 —Subcontractor harmed by owner changes
- § 2:37 —Corrections to CPM schedules after-the-fact

### **CHAPTER 3. LEGAL ISSUES IN DELAY ANALYSIS**

- § 3:1 Burden of proof
- § 3:2 —Delay to critical path required
- § 3:3 —CPM is dynamic/updated CPM schedules required
- § 3:4 —Contemporaneously granted time extensions
- § 3:5 Delays vs. suspensions under federal contracts
- § 3:6 Right to early completion
- § 3:7 —Incentive bonus payments
- § 3:8 Acceleration
- § 3:9 Concurrency
- § 3:10 —Pacing
- § 3:11 —Noncritical delay/delay absorbing float
- § 3:12 —Offsetting delay
- § 3:13 —Apportionment
- § 3:14 —Acceleration
- § 3:15 Schedule impossibility
- § 3:16 Waiver of completion

### **CHAPTER 4. DELAY DAMAGES**

- § 4:1 Generally
- § 4:2 Equitable adjustments vs. damages
- § 4:3 —Equitable adjustments
- § 4:4 —Breach damages
- § 4:5 Mitigation of damages
- § 4:6 Common types of delay damages
- § 4:7 —Labor costs
- § 4:8 —Material costs
- § 4:9 —Equipment costs
- § 4:10 —Direct overhead (extended project overhead costs)

## TABLE OF CONTENTS

- § 4:11 —Indirect overhead (unabsorbed home office overhead costs)
- § 4:12 Disruption vs. delay
- § 4:13 Liquidated damages
- § 4:14 Proving delay damages

## CHAPTER 5. NO DAMAGE FOR DELAY

- § 5:1 The basics
- § 5:2 —Source of the rule
- § 5:3 —“No damage for delay” clauses
- § 5:4 Common law exceptions to contractual provisions
- § 5:5 —Preference afforded to remedy granting provisions
- § 5:6 —Active interference
- § 5:7 —Abandonment or delays unreasonable in length
- § 5:8 —Waiver
- § 5:9 —Material breach of contract
- § 5:10 Legislative responses to “no damage for delay”
- § 5:11 Federal contracts

## PART II. ANALYSIS AND METHODS

### CHAPTER 6. OVERVIEW OF SCHEDULE DELAY ANALYSIS METHODS

- § 6:1 Method introduction
- § 6:2 Categories of schedule delay analysis methods
- § 6:3 Time impact analysis (TIA) category
- § 6:4 Collapsed as-built category
- § 6:5 As-built critical path category
- § 6:6 Impacted as-planned category
- § 6:7 Total time category
- § 6:8 Fact pattern

### CHAPTER 7. TIME IMPACT ANALYSIS

- § 7:1 Time impact analysis
- § 7:2 Time impact analysis (adjusted)
  - § 7:3 —Example implementation
  - § 7:4 —Judicial analysis
- § 7:5 Windows (unadjusted)
  - § 7:6 —Example implementation
  - § 7:7 —Judicial analysis
- § 7:8 Prospective TIA
  - § 7:9 —Example implementation
  - § 7:10 —Judicial analysis
- § 7:11 Wide windows
  - § 7:12 —Example implementation

- § 7:13 —Judicial analysis
- § 7:14 Summary of cases involving time impact analysis

## CHAPTER 8. COLLAPSED AS-BUILT

- § 8:1 Collapsed as-built method
- § 8:2 A cautionary tale: *Youngdale & Sons Construction Co. v. U.S.*
- § 8:3 Negative treatment of the collapsed as-built method
- § 8:4 Positive treatment of the collapsed as-built method
- § 8:5 Traditional collapsed as-built implementation (remove owner delays)
- § 8:6 Collapsed as-built (removing contractor delays)
- § 8:7 Collapsed as-built (stepped removal)
- § 8:8 Collapsed as-built (using contemporaneous updates)
- § 8:9 Treatment of major delay types
- § 8:10 Summary of cases involving collapsed as-built method

## CHAPTER 9. AS-BUILT CRITICAL PATH

- § 9:1 As-built critical path
- § 9:2 Positive treatment of the as-built critical path method
- § 9:3 —*Cogefar-Impresit USA*
- § 9:4 —*Sunshine Construction & Engineering, Inc.*
- § 9:5 Negative treatment of the as-built critical path method
- § 9:6 Example implementation: as-built critical path
- § 9:7 Example implementation: as-built critical path using schedule updates and as-built data
- § 9:8 Treatment of major delay types
- § 9:9 Summary of cases involving as-built critical path method

## CHAPTER 10. IMPACTED AS-PLANNED

- § 10:1 Impacted as-planned method
- § 10:2 Historical treatment of the impacted as-planned method in the United States
- § 10:3 —Early acceptance
- § 10:4 —Suspicion
- § 10:5 Example implementation: impacted as-planned global insertion
- § 10:6 Example implementation: impacted as-planned compare owner/contractor impacted schedules
- § 10:7 Example implementation: impacted as-planned stepped insertion
- § 10:8 Treatment of major delay types
- § 10:9 Summary of cases involving impacted as-planned method

TABLE OF CONTENTS

**CHAPTER 11. TOTAL TIME/AS-PLANNED  
VS. AS-BUILT**

- § 11:1 Total time method
- § 11:2 —Total time method and total cost method
- § 11:3 —Historical treatment
- § 11:4 Example implementation
- § 11:5 Treatment of major delay types
- § 11:6 Summary of cases involving total time/as-planned vs.  
as-built method

**CHAPTER 12. METHOD COMPARISON  
STUDY**

- § 12:1 Method comparison study results
- § 12:2 Method comparison study conclusions
- § 12:3 Summary of U.S. cases referencing schedule delay  
methods
- § 12:4 Summary of international cases referencing schedule  
delay methods
- § 12:5 Global schedule delay method comparison

**PART III. GUIDANCE AND  
RECOMMENDATIONS**

**CHAPTER 13. GUIDELINES FOR  
SCHEDULE DELAY ANALYSIS**

- § 13:1 Guidelines for schedule delay analysis—Checklist
- § 13:2 —Details

**CHAPTER 14. SCHEDULE CONTRACT  
SPECIFICATIONS AND RESPONSIBILITIES**

- § 14:1 Example schedule specification provisions
- § 14:2 Recommended schedule contract and specification  
topics
- § 14:3 Owner's (or owner's agent's) schedule administration  
best practices
- § 14:4 Contractor's (or subcontractor's) schedule best  
practices

**CHAPTER 15. ASCE STANDARD ANSI/  
ASCE/CI 67-17 SCHEDULE DELAY ANALYSIS  
SUMMARY AND REVIEW**

- § 15:1 Summary of ASCE Standard ANSI/ASCE/CI 67-17  
Schedule Delay Analysis

- § 15:2 Summary of ANSI/ASCE/CI 67-17 Schedule Delay Analysis Standard—Critical path
- § 15:3 —Float
- § 15:4 —Early completion
- § 15:5 —Chronology of delay
- § 15:6 —Concurrent delay
- § 15:7 —Responsibility for delay
- § 15:8 —Changing schedules after the fact
- § 15:9 —Acceleration
- § 15:10 Review of ANSI/ASCE/CI 67-17 Schedule Delay Analysis Standard

## **CHAPTER 16. SOCIETY OF CONSTRUCTION LAW DELAY AND DISRUPTION PROTOCOL SUMMARY AND REVIEW**

- § 16:1 Summary of Society of Construction Law Delay and Disruption Protocol
- § 16:2 —22 Core Principles
- § 16:3 —Guidance sections
- § 16:4 Review of Society of Construction Law Delay and Disruption Protocol
- § 16:5 —Changes from 2002 Protocol to 2017 Protocol
- § 16:6 — —No longer recommending a (prospective) time impact analysis time distant from the delay
- § 16:7 — —Reversing the Protocol position on offsetting delay
- § 16:8 — —Time at large and waiver of the completion date
- § 16:9 —Comparison with industry standard

## **CHAPTER 17. AACE RP29R-03 FORENSIC SCHEDULE ANALYSIS SUMMARY AND REVIEW**

- § 17:1 Summary of RP29R-03 Forensic Schedule Analysis
- § 17:2 —Organization and scope
- § 17:3 —Source validation
- § 17:4 —Method implementation
- § 17:5 —Analysis evaluation
- § 17:6 —Choosing a method
- § 17:7 Review of RP29R-03 Forensic Schedule Analysis

## **PART IV. DISRUPTION**

### **CHAPTER 18. DISRUPTION, INEFFICIENCY, LOSS OF PRODUCTIVITY**

- § 18:1 Construction productivity

## TABLE OF CONTENTS

- § 18:2 Causes of disruption, inefficiency, and loss of productivity
- § 18:3 Disruption vs. delay
- § 18:4 Proof of disruption
- § 18:5 Disruption damages
- § 18:6 —Discrete pricing
- § 18:7 —Specificity of damages
- § 18:8 —Methods for proving loss of productivity
- § 18:9 — —Utilizing multiple methods
- § 18:10 Impact of changes on unchanged work—Cumulative Impact
- § 18:11 Contractual limitations on loss of productivity

## CHAPTER 19. MEASURED MILE

- § 19:1 Measured mile
- § 19:2 —Implementation
- § 19:3 —Preferred method for proving disruption
- § 19:4 —Requirements for Selection of periods
- § 19:5 —Requirements for selection of periods—Comparing similar work
- § 19:6 — —Adequate sample size
- § 19:7 —Selection of periods—Causal basis rather than result based
- § 19:8 Measured mile positive treatment
- § 19:9 Measured mile negative treatment
- § 19:10 Summary of measured mile cases

## CHAPTER 20. COMPARISON TO BID

- § 20:1 Comparison to bid methods
- § 20:2 Earned value
- § 20:3 —Positive treatment of earned value
- § 20:4 —Negative treatment of earned value
- § 20:5 —Summary of cases
- § 20:6 Comparison to similar projects
- § 20:7 —Legal acceptance
- § 20:8 —Summary of comparison to similar projects cases
- § 20:9 Modified total cost
- § 20:10 —Lack of proof of causation
- § 20:11 —Impracticability of proving actual costs directly
- § 20:12 — —Failure to track costs or to directly price loss of productivity
- § 20:13 — —Failure to show that a better method such as measured mile, could have been used
- § 20:14 —Unreasonable bid
- § 20:15 —Reasonableness of actual costs
- § 20:16 —Inadequate acknowledgement of responsibility for increased costs

- § 20:17 —Positive treatment of modified total cost
- § 20:18 —Other negative treatment of modified total cost
- § 20:19 —Summary of modified total cost cases
- § 20:20 Total cost
- § 20:21 —Impracticability of proving actual losses directly
- § 20:22 —Reasonableness of bid
- § 20:23 —Reasonableness of actual costs
- § 20:24 —Lack of responsibility for the added costs
- § 20:25 —Positive treatment of total cost
- § 20:26 —Other negative treatment of total cost
- § 20:27 —Summary of total cost cases

## CHAPTER 21. PRODUCTIVITY FACTORS

- § 21:1 Productivity factor studies
- § 21:2 —Proof of causation
- § 21:3 —Other methods for accurately pricing loss of productivity are not possible
- § 21:4 —Bid was reasonable and lack of contractor-caused inefficiencies
- § 21:5 —Apply an appropriate and comparable study
- § 21:6 — —Application by experts
- § 21:7 — —Validity of studies
- § 21:8 — —Comparability of conditions
- § 21:9 — —Selection of factors to match period and timing of impact
- § 21:10 —Combining productivity factors
- § 21:11 Industry and academic studies
- § 21:12 Mechanical Contractors Association of America (MCAA) factors
- § 21:13 —Basis for data
- § 21:14 —Application to mechanical trades
- § 21:15 —Approximation of inefficiency
- § 21:16 —Application by expert
- § 21:17 —Improper use of factors in accordance with the manual
- § 21:18 — —Applying factors to total hours
- § 21:19 — —Applying factors to the entire project duration
- § 21:20 — —Failure to remove change order hours from the analysis
- § 21:21 — —Failure to remove contractor's own inefficiencies
- § 21:22 —Positive treatment of MCAA factors
- § 21:23 —Negative treatment of MCAA factors
- § 21:24 —Summary of MCAA factor cases
- § 21:25 National Electrical Contractors Association (NECA) factors
- § 21:26 —Legal acceptance of the NECA manual
- § 21:27 —Summary of NECA cases



## TABLE OF CONTENTS

- § 21:28 Business Roundtable
- § 21:29 —Legal acceptance of Business Roundtable study
- § 21:30 —Summary of Business Roundtable cases
- § 21:31 U.S. Army Corps of Engineers (USACE) Modification Impact Evaluation Guide
- § 21:32 —Legal acceptance of USACE Modification Impact Evaluation Guide
- § 21:33 —Summary of USACE Modification Impact Evaluation Guide cases
- § 21:34 Leonard Thesis
- § 21:35 —Legal acceptance of Leonard Thesis
- § 21:36 —Summary of Leonard Thesis cases
- § 21:37 Department of Labor Bulletin 917
- § 21:38 —Legal acceptance of Department of Labor Bulletin 917
- § 21:39 —Summary of Department of Labor Bulletin 917 cases
- § 21:40 Other published factor cases

## CHAPTER 22. VISUAL OBSERVATION/JUDGMENT

- § 22:1 Visual observation or judgment
- § 22:2 Visual observation—From site observations
- § 22:3 —Craft sampling and questionnaire method
- § 22:4 Judgment factor—Unsupported factor
- § 22:5 —Based on project record
- § 22:6 —Based on unpublished study
- § 22:7 Use of expert testimony in presenting visual observation or judgment factors
- § 22:8 Positive treatment of visual observation/judgment factor
- § 22:9 Negative treatment of visual observation/judgment factor
- § 22:10 Summary of visual observation/judgment factor cases

## CHAPTER 23. COMPARISON OF METHODS FOR PROVING DISRUPTION

- § 23:1 Comparison of legal acceptance of methods
- § 23:2 Frequency of use and legal acceptance of productivity factors
- § 23:3 Comparison between the United States and international disruption method acceptance
- § 23:4 Lessons
- § 23:5 Summary of disruption cases

**CHAPTER 24. ASCE STANDARD ANSI/  
ASCE/CI 71-21 IDENTIFYING,  
QUANTIFYING, AND PROVING LOSS OF  
PRODUCTIVITY SUMMARY AND REVIEW**

- § 24:1 Summary of ASCE Standard ANSI/ASCE/CI 71-21  
Identifying, Quantifying, and Proving Loss of  
Productivity
- § 24:2 Summary of ANSI/ASCE/CI 71-21 Identifying,  
Quantifying, and Proving Loss of Productivity  
Standard—Productivity basics
- § 24:3 —Identifying productivity loss
- § 24:4 —Establishing recoverable loss of productivity
- § 24:5 —Quantifying productivity loss
- § 24:6 —Avoiding productivity loss
- § 24:7 Review of ANSI/ASCE/CI 71-21 Identifying,  
Quantifying, and Proving Loss of Productivity  
Standard

**Table of Laws and Rules**

**Table of Cases**

**Index**