ASCE STANDARD

ANSI/ASCE/CI

67-17

Schedule Delay Analysis

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

CONSTRUCTION INSTITUTE

Approved American National Standard
ANSI

ASCE STANDARD

ANSI/ASCE/CI

67-17

Schedule Delay Analysis

PUBLISHED BY THE AMERICAN SOCIETY OF CIVIL ENGINEERS

Library of Congress Cataloging-in-Publication Data

Names: American Society of Civil Engineers, author.
Title: Schedule delay analysis.
Description: Reston, Virginia : American Society of Civil Engineers, [2017] | "ASCE STANDARD ANSI/ASCE/CI 67-17." | Includes bibliographical references and index.
Identifiers: LCCN 2017023374 | ISBN 9780784414361 (soft cover : alk. paper) | ISBN 9780784480861 (PDF)
Subjects: LCSH: Building–Superintendence–Standards. | Production scheduling–Standards.
Classification: LCC TH438.4.A44 2017 | DDC 692–dc23 LC record available at https://lccn.loc.gov/2017023374

Published by American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, Virginia, 20191-4382
www.asce.org/bookstore | ascelibrary.org

This standard was developed by a consensus standards development process that has been accredited by the American National Standards Institute (ANSI). Accreditation by ANSI, a voluntary accreditation body representing public and private sector standards development organizations in the United States and abroad, signifies that the standards development process used by ASCE has met the ANSI requirements for openness, balance, consensus, and due process.

While ASCE's process is designed to promote standards that reflect a fair and reasoned consensus among all interested participants, while preserving the public health, safety, and welfare that is paramount to its mission, it has not made an independent assessment of and does not warrant the accuracy, completeness, suitability, or utility of any information, apparatus, product, or process discussed herein. ASCE does not intend, nor should anyone interpret, ASCE's standards to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this standard.

ASCE has no authority to enforce compliance with its standards and does not undertake to certify products for compliance or to render any professional services to any person or entity.

ASCE disclaims any and all liability for any personal injury, property damage, financial loss, or other damages of any nature whatsoever, including without limitation any direct, indirect, special, exemplary, or consequential damages, resulting from any person's use of, or reliance on, this standard. Any individual who relies on this standard assumes full responsibility for such use.

ASCE and American Society of Civil Engineers—Registered in U.S. Patent and Trademark Office.

Photocopies and permissions. Permission to photocopy or reproduce material from ASCE publications can be requested by sending an e-mail to permissions@asce.org or by locating a title in ASCE's Civil Engineering Database (http://cedb.asce.org) or ASCE Library (http://ascelibrary.org) and using the "Permissions" link.

Errata: Errata, if any, can be found at https://doi.org/10.1061/9780784414361.

Copyright © 2017 by the American Society of Civil Engineers.
All Rights Reserved.
ISBN 978-0-7844-1436-1 (soft cover)
ISBN 978-0-7844-8086-1 (PDF)
Manufactured in the United States of America.

24 23 22 21 20 19 18 17 1 2 3 4 5

ASCE STANDARDS

In 2014, the Board of Direction approved revisions to the ASCE Rules for Standards Committees to govern the writing and maintenance of standards developed by ASCE. All such standards are developed by a consensus standards process managed by the ASCE Codes and Standards Committee (CSC). The consensus process includes balloting by a balanced standards committee and reviewing during a public comment period. All standards are updated or reaffirmed by the same process every five to ten years. Requests for formal interpretations shall be processed in accordance with Section 7 of ASCE Rules for Standards Committees, which are available at www.asce.org. Errata, addenda, supplements, and interpretations, if any, for this standard can also be found at www.asce.org.

The form of this Standard reflects the goals of the Schedule Delay Analysis Standards Committee of the Construction Institute of ASCE. The provisions of this document are written in permissive language and, as such, offer to the user a series of options or instructions but do not prescribe a specific course of action. Significant judgment is left to the user of this document.

This standard has been prepared in accordance with recognized engineering principles and should not be used without the user's competent knowledge for a given application. The publication of this standard by ASCE is not intended to warrant that the information contained therein is suitable for any general or specific use, and ASCE takes no position respecting the validity of patent rights. The user is advised that the determination of patent rights or risk of infringement is entirely their own responsibility.

A complete list of currently available standards is available in the ASCE Library (http://ascelibrary.org/page/books/s-standards).

This page intentionally left blank

CONTENTS

ACKNOWLEDGMENTS vii

1 INTRODUCTION 1

2 SCOPE 3

3 DEFINITIONS 5

4 CRITICAL PATH 7
- 4.1 Because the Critical Path Is Dynamic, Delays Should Be Evaluated Based on the Critical Path During Each Delay 7
- 4.2 Contemporaneous Schedules Should Be Maintained to Reflect Actual Performance, the Plan to Complete the Work, and Delay, Should It Occur 7
- 4.3 Delay Must Be Critical to the Current Adjusted Completion Date for Consideration of a Time Extension 7
- 4.4 Delay Should Generally Be Measured by the Change to the Scheduled Completion Date Caused by the Delay 7
- 4.5 Excusable Delays Are Typically Events Outside the Contractor's Control and Entitle the Contractor to a Time Extension 8
- 4.6 In Situations Where the Completion Date Is Adjusted Properly for Change Orders and the Contractor Is Behind Schedule, Owner Delays that Occur Thereafter on a Separate Path May Have a Mitigating Effect on Assessment of Damages 8
- 4.7 For a Delay to Be Compensable, It Should Be the Sole Cause of Delay 8

5 FLOAT 9
- 5.1 Activities with Float Are Not Critical. 9
- 5.2 Float Is Owned by the Project 9
- 5.3 Excessive Constraints on Activities that Interfere with a Logic-Driven Critical Path May Complicate Evaluation of Critical Delays and Should Be Considered in a Delay Analysis 9
- 5.4 If Multiple Milestones Have Delay Damages Associated with Them, a Separate Delay Analysis Should Be Performed for Each Milestone. 9

6 EARLY COMPLETION 11
- 6.1 A Plan to Finish Early Should Be Reasonable 11
- 6.2 Generally, the Contractor May Be Allowed to Collect Delay Damages to an Early Completion Schedule but May Not Collect an Excusable Time Extension Until the Scheduled Completion Date Exceeds the Contract Completion Date 11

7 CHRONOLOGY OF DELAY 13
- 7.1 Delays Should Be Evaluated as They Occur in Chronological Sequence 13
- 7.2 A Schedule Delay Analysis Should Reflect an Analysis of Prior Entitlement so as to Reflect a Current Adjusted Completion Date Prior to Evaluating Delay 13
- 7.3 Consideration Should Be Included as to How Delays Were Evaluated by the Participants During the Project 13
- 7.4 Evaluation of Delay Chronology Should Be Documented and Supported with Contemporaneous Records. 13

8 CONCURRENT DELAY 15
- 8.1 Concurrent Delay Can Be Described as a Situation Where Two or More Critical Delays Are Occurring at the Same Time During All or a Portion of the Delay Time Frame in Which the Delays Are Occurring 15
- 8.2 Concurrent Delay Typically Is Excusable but Noncompensable, Meaning a Time Extension Is Given but No Costs Are Recovered by Either Party 15
- 8.3 Concurrent Delay Should Be Apportioned Where Possible 15

9 RESPONSIBILITY FOR DELAY . . . 17
9.1 A Schedule Expert Typically Can Identify the Party Responsible for a Delay from the Contemporaneous Records, Interviewing Project Personnel, and Reading Deposition Testimony, and May Rely on Technical Experts or Fact Witnesses in Opining on Liability . . . 17
9.2 During a Project, the Contractor Should Provide the Owner with a Notice of Delay for Excusable Delays, Followed by a Request for a Change in Accordance with the Contract . . . 17
9.3 Responsibility Analysis Should Be Supported by a Factual Chronology Based on the Contemporaneous Project Performance Records and Referencing the Remedy-Granting Clause of the Contract. . . . 17
9.4 The Schedule Expert Should Attempt to Discuss the Issue with the Individual Directly Involved and Who Has Factual Knowledge of the Delay Issue, Where Feasible . . . 17
9.5 Schedule Experts Should Not Opine Beyond Their Expertise. If Necessary, a Technical Expert Should Be Engaged on Whose Opinion the Schedule Expert Can Rely . . . 18
9.6 Once a Technical Expert's Finding as to Which Party Was Liable for the Delay Event Is Formed, a Legal Review May Be Made with Counsel Consistent with Legal Precedent in the Project Jurisdiction . . . 18

10 CHANGING SCHEDULES AFTER THE FACT. . . . 19
10.1 The Schedules Should Be Presumed Correct as They Were Used During the Project, Unless Otherwise Shown to Be Inaccurate . . . 19
10.2 After-the-Fact Changes to Schedules Used During the Project Should Be Minimized and Only Made Where Necessary . . . 19
10.3 Any Changes Made to the Contemporaneous Record of Project Schedules Should Be Carefully Identified and Documented . . . 19
10.4 When Possible, the Preference for Dealing with Inaccurate Schedules After the Fact Is to Make Corrections, Rather than Abandon the Schedules, Subject to the Nature and Scope of the Corrections . . . 20
10.5 Changes to Schedules Generally May Be Made to Correct Necessary Physical or Contractual Constraints but Typically Not the Contractor's Preferential Sequencing . . . 20

11 ACCELERATION . . . 21
11.1 Parties Have the Right to Voluntarily Accelerate, Subject to Contract Terms and Conditions . . . 21
11.2 For Owner-Directed Acceleration, the Parties Should Agree on the Acceleration Plan Prior to Implementation. The Right to Direct Acceleration Unilaterally Should Be Addressed by Contract . . . 21
11.3 Constructive Acceleration Can Be Proved . . . 21
11.4 When Implementing an Acceleration Plan, Acceleration of Multiple Paths in the Schedule May Be Required . . . 21

12 REFERENCES . . . 23

INDEX . . . 25

ACKNOWLEDGMENTS

The American Society of Civil Engineers (ASCE) acknowledges the contributions of the Schedule Delay Analysis Standard Committee of the Construction Institute in assisting with development of this ASCE industry standard.

Robert M. D'Onofrio, P.E., *Chair*
John C. Anderson, P.E.
David Arditi, Ph.D.
Jesus M. de la Garza, Ph.D.
Thomas J. Driscoll
Brian J. Furniss, P.E., PSP, CFCC
David W. Halligan, P.E.
John P. Lamutt, P.E.
Frank J. Regnery, P.E.
Mark Sanders, P.E.
Ted M. Scott, III, P.E.

This page intentionally left blank

CHAPTER 1
INTRODUCTION

Critical path method (CPM) schedules, properly prepared and maintained, make it possible to demonstrate, with reasonable certainty, the impact that can occur as a result of delays on a project. Delays can be reasonably identified, isolated, and quantified, and concurrent delays segregated. CPM networking techniques can be of evidential value to demonstrate causation and liability and also to apportion delays when concurrent delays occur.

It is important for project participants to understand not only the techniques of scheduling but also that a project schedule can serve as a basis for delineating the respective rights, obligations, and warranties flowing from the schedule. A number of key issues are associated with a project schedule that have legal implications.

Also, it is important to keep the project schedule properly updated and the contract completion date timely adjusted for excusable delays. It is equally important for all parties to settle any delays and cost issues associated with changes contemporaneously. The project schedule should be revised to reflect actual performance, major changes, and delays as they occur. The contract completion date also should be adjusted for contemporaneous time extensions.

A number of schedule delay analysis methods are used in the industry. Any method used should follow the industry guidelines identified in this standard.

The 35 guidelines included in this standard generally reflect best engineering principles associated with schedule delay analysis and reflect standard of practice in the United States construction industry. However, individual cases may not follow the general standard. Parties should check the construction contract carefully for notice provisions, exculpatory clauses, and requirements for proof of delays. Less preferred risk-averse contracts attempt to shift the risk of delays and time extensions to one party, which can lead to disputes in contrast to the equitable and fair risk allocation.

This standard should be used in accordance with the schedule practitioner's professional experience and knowledge, along with facts specific to the reference project. Any legal cases referenced in this standard are for additional information only, and their relevance or application to a specific project or jurisdiction requires consultation of a duly licensed legal professional.

This page intentionally left blank

CHAPTER 2
SCOPE

The 35 guidelines in this standard allow for segmentation of responsibility for delay to intermediary milestones and to the project completion date. They also enable delay damages or liquidated damages to be calculated by utilizing critical path method schedule techniques and preparing a schedule delay analysis. The guidelines in this standard are based on principles of schedule delay analysis in the following categories:

- Critical path,
- Float,
- Early completion,
- Chronology of delay,
- Concurrent delay,
- Responsibility for delay,
- Changing schedules after the fact, and
- Acceleration.

The application of such principles should be based on the terms of the contract, contract administration, consistency in application, and legal precedent.

These standard guidelines provide commentary, support for, and explanations of this ASCE standard committee's list of guidelines. The definitions of terms is included for reference as used within the context of this standard.

This page intentionally left blank

CHAPTER 3
DEFINITIONS

Acceleration—The process of expending additional resources and/or costs to expedite contract performance. Typical examples of acceleration include adding crews, adding equipment, increasing work hours, increasing work days, increasing resources, and expediting material delivery times.

Apportionment—The act of dividing and assigning a share or responsibility for controlling delay or cost.

Concurrent—Happening at the same time; existing side by side; operating at the same time.[1]

Concurrent delay—Delay to the project critical path caused concurrently by multiple events not exclusively within the control of one party.[2]

Contract completion date—The date required by contract for substantial completion of the contract (or, in some cases final completion). The contract may attach liquidated damages to failure to meet the contract completion date. In a schedule, the scheduled completion date typically is constrained to the contract completion date.

Contract milestone—A contractually required date for partial completion of the work, which is also referred to as an intermediary milestone. The contract may attach liquidated damages to failure to meet intermediary contract milestones.

Critical delay—A delay that causes an impact to the project completion date.

Critical path—The series of logically connected tasks that define the minimum overall duration for completion of the project, also known as the longest path. There can be more than one critical path in the schedule.

Critical activities—Activities with zero or negative float in a schedule reflecting a current adjusted completion date, some of which may not be on the critical path.

Current adjusted completion date—A contractually required completion date adjusted to reflect prior excusable delay.

Delay—To impede the process or progress (work).[3]

Float—The time contingency that exists on a path of activities. Float refers to "total float" unless otherwise specified. Total float is the amount of time an activity can be delayed before it delays the completion date in the CPM network. It is measured by comparing the early and late dates on a start or finish basis. It is possible when using precedence networking that the effective float can vary between the early dates and the late dates for an activity when leads and lags are used.

Longest path—Path through a logic-driven schedule controlling the scheduled or anticipated completion of the work. This also is referred to as the critical path.

Offsetting delay—A delay that may occur when a contractor is behind schedule and the owner later causes a delay to the contract completion date. Time entitlement and damages depend on the measure of delay caused by each party.

Scheduled completion date—The anticipated or predicted date that estimates when work on the project will be complete. This date may differ from the contract completion date depending on schedule progress and delay.

[1] Garner (2004).

[2] Bruner & O'Connor on Construction Law § 15:67 (May 2007).

[3] Dictionary.com (2014).