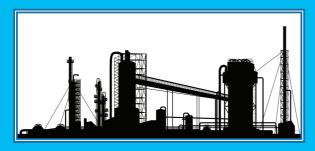
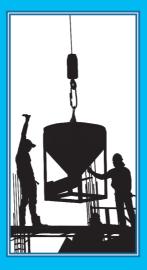
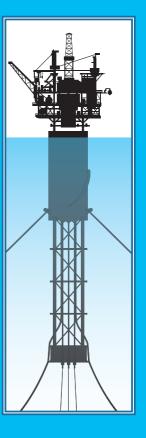
WHY CONSTRUCTION CLAIMS OCCUR AND HOW TO PREVENT THEM

RICHARD J. LONG, P.E., P.ENG.











Why Construction Claims Occur and How to Prevent Them

Richard J. Long, P.E., P.Eng.



Why Construction Claims Occur and How to Prevent Them

Published in 2021 by Virtualbookworm.com Publishing Inc., College Station, Texas 77842, United States of America.

This publication is designed to provide accurate and authoritative information in regard to the subject matter. It is sold with the understanding that the author and publisher are not engaged in rendering legal services. If legal advice is required, the services of a competent lawyer should be sought.

© 2021 by Long International, Inc. All Rights Reserved.

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or by any information storage and retrieval system, without the permission in writing from Long International, Inc. Requests for permissions to reproduce content should be directed to the Corporate Office of Long International, Inc. as identified at long-intl.com.

ISBN 978-1-63868-016-1

Library of Congress Number on file with the Publisher.

12345678910

Preface	2		xvii
About	the Au	thor	xxi
Acknov	wledgn	nents	xxiii
Chapte	er 1		
Setting	the St	age	3
1.1	Chara	cteristics of a Highly Impacted Project	5
1.2	Effect	on Project Costs	7
1.3	The C	Court's View of Contract Interpretation	7
Chapte	er 2		
Situatio	ons Ca	using Costly Claims	15
2.1	Contra	actor Practices that Cause Claims	15
	2.1.1	Inadequate Site Investigation Before Bidding	15
	2.1.2	Unbalanced Bidding Resulting from Manipulating Unit Prices and Front-End Loading Progress Payment Weighting Factors	16
	2.1.3	Bidding Below Costs and Overoptimism	
	2.1.4	Poor Planning and Use of Wrong Equipment	
	2.1.5	Inadequate Cost and Schedule Control Systems	
	2.1.6	Failure to Follow Authorized Procedures	
	2.1.7	Refusal to Proceed with Directed Work Pending a Contract Modification Despite Contract Clauses Giving the Owner the Right to Make a Unilateral Change	17
	2.1.8	Performing Defective Work	17
	219	Slow Mobilization	17

	2.1.10	Failure to Allocate Resources	18
	2.1.11	Brokering the Work and Passing All Problems to the Subcontractors without Adequate Coordination	18
2.2	Owner	Practices that Cause Claims	18
	2.2.1	Competitive Bidding	18
	2.2.2	Fixed-Priced or Lump-Sum Contracts	19
	2.2.3	Unit-Price Contracts	19
	2.2.4	Contract Language that Inappropriately Shifts Risks to the Contractor	19
	2.2.5	Failure to Grant Time Extensions for Excusable Delays	19
	2.2.6	Major Changes in the Plans and Specifications during Construction	20
	2.2.7	Mishandling of Minor Change Orders	20
	2.2.8	Unrealistic Schedules and Underestimated Costs	21
	2.2.9	Failure to Obtain Adequate Funding	21
	2.2.10	Inadequate and Ambiguous Scope Definition in the Bid Documents	21
	2.2.11	Inadequate Time Provided for Bid Preparation	21
	2.2.12	Excessively Narrow Interpretation of the Plans and Specifications	22
	2.2.13	Owner-Furnished Materials	22
	2.2.14	Incomplete and Defective Plans and Specifications	22
	2.2.15	Delays to Project Award	23
	2.2.16	Failure to Give Adequate and Timely Access to the Work Site	23
	2.2.17	Interfering with Work on the Job Site	23
	2.2.18	Letting Other Contracts in the Same Area	23
	2.2.19	Failure to Recognize Legitimate Change Order Requests	24

	2.2.20	Delaying Decisions	24
	2.2.21	Delayed Approval of Submissions, Shop Drawings or Materials	24
	2.2.22	Overzealous Inspections and Rejection of the Contractor's Work	24
	2.2.23	Inadequate Project Management Controls	24
	2.2.24	Refusal to Accept Materials or Equipment that Meet Specifications	25
	2.2.25	Bidding the Project Construction with an Incomplete Design	25
	2.2.26	Assignment of Inexperienced Staff to Oversee the Contractor's Performance	25
	2.2.27	Unanticipated Site Conditions	25
	2.2.28	Contract Requirements for Socioeconomic Objectives	26
	2.2.29	Unclear Definition of Completion of Work	26
2.3	Causes	Associated with the Contract Documents	26
	2.3.1	Exculpatory Clauses	26
	2.3.2	Mandatory Advance Notice of Claims	27
	2.3.3	Finality of Field Engineer's Decisions without Review or with a Possible Conflict of Interest	27
	2.3.4	"Differing Site Conditions" Clauses	27
	2.3.4	"Differing Site Conditions" Clauses	
		Lack of Periodic and Independent Review of	27
	2.3.5	Lack of Periodic and Independent Review of Documents before the Bid	27 27
2.4	2.3.52.3.62.3.7	Lack of Periodic and Independent Review of Documents before the Bid Use of Nonstandard and Conflicting Forms Omissions of Clauses Needed for Effective	27 27
2.4	2.3.52.3.62.3.7	Lack of Periodic and Independent Review of Documents before the Bid Use of Nonstandard and Conflicting Forms Omissions of Clauses Needed for Effective Contract Management	27 27 28
2.4	2.3.5 2.3.6 2.3.7	Lack of Periodic and Independent Review of Documents before the Bid Use of Nonstandard and Conflicting Forms Omissions of Clauses Needed for Effective Contract Management Associated with Contract Awards	272828

2.5	Cause	s Associated with Contract Administration	
	2.5.1	Lack of Timely and Effective Management Response	29
	2.5.2	Lack of Coordination of Contracting Agency Responsibilities	29
	2.5.3	Inadequate Delegation of Authority	29
	2.5.4	Unreasonable Contract Interpretation	29
	2.5.5	Inadequate Documentation of Performance	30
2.6		s Associated with Claim Settlement dures and Practices	30
	2.6.1	No Written Procedures and Process	30
	2.6.2	Discouragement of Project-Level Settlements	30
Chapte	er 3		
Why C	Constru	ction Disputes Occur and How to	
Promo	te Earl	y and Amicable Settlements	33
Promo		y and Amicable Settlementsequest for Proposal (RFP)/Bid Stage	
			36
	The R	equest for Proposal (RFP)/Bid Stage	36
	The R 3.1.1	equest for Proposal (RFP)/Bid Stage	36 36
	The R 3.1.1 3.1.2	equest for Proposal (RFP)/Bid Stage Contract Contract Documents	36 36 37
	The R 3.1.1 3.1.2 3.1.3	equest for Proposal (RFP)/Bid Stage Contract Contract Documents Question and Answers (Q&A)	36 37 39
	The R 3.1.1 3.1.2 3.1.3 3.1.4	equest for Proposal (RFP)/Bid Stage Contract Contract Documents Question and Answers (Q&A) The Bid	36 37 39 39
	The R 3.1.1 3.1.2 3.1.3 3.1.4 3.1.5	equest for Proposal (RFP)/Bid Stage Contract Contract Documents Question and Answers (Q&A) The Bid Bid Qualification	3637393941
	The R 3.1.1 3.1.2 3.1.3 3.1.4 3.1.5 3.1.6 3.1.7	equest for Proposal (RFP)/Bid Stage Contract Contract Documents Question and Answers (Q&A) The Bid Bid Qualification Project Budget	363739394141
3.1	The R 3.1.1 3.1.2 3.1.3 3.1.4 3.1.5 3.1.6 3.1.7	equest for Proposal (RFP)/Bid Stage Contract Contract Documents Question and Answers (Q&A) The Bid Bid Qualification Project Budget Communication	363739414142
3.1	The R 3.1.1 3.1.2 3.1.3 3.1.4 3.1.5 3.1.6 3.1.7 Project	equest for Proposal (RFP)/Bid Stage Contract Contract Documents Question and Answers (Q&A) The Bid Bid Qualification Project Budget Communication	363739414242

	4.1.1	Purpose	5
4.1	Introd	uction	57
Manag	ement	Performance	57
Assessi	ment o	f Problems Associated with Poor Project	
Chapte	er 4		
3.5	Summ	ary	52
	3.4.12	Post-Dispute Audit	52
	3.4.11	Mediation and More	
	3.4.10	Dangerous Practice of Inflating Claims	
	3.4.9	Commitment to the Process	
	3.4.8	Legal/Expert Advice	
	3.4.7	Realistic Expectations	
	3.4.6	Less Can Be More	
	3.4.5	Stepped Negotiations	
	3.4.4	Dispute Boards	
	3.4.3	Contract Compliance	
	3.4.1	The Contract	
3.4	3.4.1	Communication	
3.4	3.3.3	Lawyers/Expertsettlement Process	
	3.3.2	Project Losses	
	3.3.1	Balance of Power	
3.3		Project Completion	
	3.2.5	Personalities	
	3.2.4	Compliant Notice	

	4.1.2	What Is a Construction Project?	57
	4.1.3	What Is Project Management?	60
4.2	The In	mportance of Sound Project Management Practices	61
4.3	Projec	et Management Requirements Stated in the Contract	62
	4.3.1	Examples of Project Management Requirements from an EPC Contract	62
	4.3.2	Clarity and Support of Contract Requirements	65
4.4		et Management Practice Generally Accepted Industry	65
	4.4.1	PMI's PMBOK® Guide and the Construction Extension	66
	4.4.2	CII's Knowledge Structure	67
	4.4.3	Other Resources	72
4.5		rements of the Contract	73
	4.5.1	Deliverables	73
		4.5.1.1 Project Execution Plan	73
		4.5.1.2 Project Schedules	74
		4.5.1.3 Progress Reports	75
	4.5.2	Contemporaneous Documents	75
4.6		uring Conformance to Generally Accepted Project gement Practices	76
	4.6.1	Material Delays	76
	4.6.2	Change Requests and Change Orders	77
4.7		tion of Responsibility for Project Management ems to Delay and Damages Calculations	77
	4.7.1	Delay	

	4.7.2	Costs as	nd the Allocation of Damages	79
		4.7.2.1	The Cause-Effect Relationship	80
		4.7.2.2	Cost Allocation Example	82
4.8	-	•	oject Management Problems from Actual They Were Analyzed	84
	4.8.1	Failure	to Produce the Project Schedule on Time	84
	4.8.2	Failure	to Provide Commissioning Procedures	85
	4.8.3	Building	g from the Wrong Drawings	86
4.9	Summ	ary		86
Chapter	r 5			
-		ome I a	ading to Deleve Cost Organisms	
Typical	LIODI	CIIIS LC	ading to Delays, Cost Overruns,	
• •			ading to Delays, Cost Overruns, ss Plant and Offshore	
and Cla	ims or	n Proces	•	91
and Cla	ims or Gas P	n Proces rojects ciently D	ss Plant and Offshore	
and Cla Oil and	ims or Gas P Insuffi Delays Inadeo Petroc Leadir	rojects ciently D s, and Cos quate Des hemical l ng to Des	ss Plant and Offshore Defined FEED, Causing Change Orders,	92
and Cla Oil and 5.1	Insuffi Delays Inadeo Petroc Leadir Increa Inaccu Inadeo Cost C	rojects ciently D s, and Cos quate Des hemical l ng to Des se Its Cos urate Cos quate FE	ss Plant and Offshore Defined FEED, Causing Change Orders, st Overruns	92

5.5	Inadequate Documentation to Support Positions and Resolve Issues that Develop During the Execution of the Project or Retrospectively When Large Claims Develop at the End of the Project
5.6	Multiple Change Orders Are Approved During the Project or Remain Unresolved Until the End of the Project, Leading to Large Delay and Cumulative Impact Claims for Recovery of Lost Productivity Costs
5.7	Insufficient Management of Multiple Prime Contractor Design and Construction Interfaces, Leading to Design Changes, Delays, and Cost Overruns
5.8	Owners Often Do Not Have a Sufficient Number of Experienced Personnel to Manage the Technical Aspects of a Project, Leading to Delays in Reviews of Design and Procurement Packages, and Late Responses to Requests for Information from the Contractor
5.9	Inadequate Baseline Schedule Development and Updating by Contractors, Leading to Unreliable Progress Measurement, Uncertain Critical Paths, and Inability to Mitigate Delays
5.10	Owners Do Not Develop a Sufficient and Reliable Integrated Master Project Schedule that Results from Pulling Together the Work Activities from Multiple Prime Contractors
5.11	Insufficiently Sized Camp Facilities for Housing the On-Site Construction Work Force and the Owner's Startup and Initial Operations Personnel on Remotely Located Projects, Leading to Delays and Large Cost Increases for Additional Camp Construction or Hostels
5.12	For Offshore Oil and Gas Projects, Incomplete Onshore Fabrication Prior to Shipping, Leading to Large Amounts of Carryover Work Offshore at Much Higher Costs102
5.13	Failure by Owners to Have a Sufficient and Experienced Management Team in Place to Manage Change Orders, Requests for Time Extensions, and Claims

Chapte	er 6	
Claims	Prevention—Early Mitigation Steps	107
6.1	Introduction	107
6.2	Quality Contract Documents	108
6.3	Review and Approval of Detailed As-Planned Schedules	109
6.4	Constructability and Biddability Reviews	111
6.5	Management of Outside Design Professionals	113
Chapte	er 7	
Avoidi	ng Project Failure by Defining Requirements	117
7.1	The Problem-Project Failure	118
7.2	Project Requirements	119
7.3	Project Life Cycle	122
7.4	Who Should Participate?	124
7.5	The Requirements Development Plan	125
7.6	Summary	130
Chapte	er 8	
Project	Reviews	133
Chapte	er 9	
Site Inv	vestigation	153
Chapte	er 10	
Claims	Mitigation During Construction	163

Chapter 1	т тт	Chapter
-----------	------	---------

Cost Co	ontrol fo	or the Project Manager	171
11.1	Definit	ions	172
11.2	Estima	ting	173
	11.2.1	Estimate Types	174
11.3	Execut	ion Phase	174
11.4	Cost O	verruns	175
	11.4.1	Project Definition	176
	11.4.2	Contracts	176
	11.4.3	Owner	177
	11.4.4	Schedule	177
	11.4.5	Cost of Home Office and Engineering Services	178
	11.4.6	Procurement and Subcontracting	178
	11.4.7	Construction	179
	11.4.8	Joint Venture Management	179
	11.4.9	Other Important Points	180
	11.4.10	Cumulative Impact of Change	180
Chapte	r 12		
Effectiv	e Chan	nge Order Management	185
12.1	_	e Order Definition and Other e Order-Related Considerations	186
12.2	Factors	s that Establish a Change Order	187
12.3	Change	e Order Backlog	189
12.4		Resulting from Change Orders that ace a Project's Performance and Costs	189
12.5		ds for Change Order Basis of Calculation	

			ures for findading a Change Order	
	12.7	Evalua	tion and Verification of Costs	196
		12.7.1	Unit-Price	196
		12.7.2	Lump-Sum	197
		12.7.3	Time and Materials	198
	12.8	Evalua	tion of Time Impact	199
	12.9	Change	e Order Negotiations and Resolution	200
	12.10	Finaliz	ation of the Change Order	201
		12.10.1	Change Order and Change Order Log	201
		12.10.2	Monthly Project Schedule Updates	202
		12.10.3	Record or As-Built Drawings	202
	12.11	Change	e Order Procedures and Recommended Practices	205
	12.12	The Ch	nange Management Process	207
			nange Management Process	
Ch	12.13	Summa		
	12.13 apter	Summa		207
	12.13 apter	Summa 13 Succes	ary	207
	12.13 napter ys to 13.1	Summa 13 Succes What M	ssful Major Project Execution	207
	12.13 napter ys to 13.1	Summa 13 Succes What M	aryssful Major Project Execution	207
	12.13 napter ys to 13.1	Summa 13 Succes What M	aryssful Major Project Execution	207211213
	12.13 napter ys to 13.1	Summa 13 Succes What M	ssful Major Project Execution	207211213213
	12.13 napter ys to 13.1	Summa 13 Succes What M	ssful Major Project Execution Makes a Successful Project? Initiation and Stages Establish a Project Leader/Director 13.2.1.1 Proven Leadership Skills	207211213213213
	12.13 napter ys to 13.1	Summa 13 Succes What M	ssful Major Project Execution Makes a Successful Project? Initiation and Stages Establish a Project Leader/Director 13.2.1.1 Proven Leadership Skills 13.2.1.2 Type of Project.	207211213213213
	12.13 napter ys to 13.1	Summa 13 Succes What M	Assful Major Project Execution Makes a Successful Project? Initiation and Stages Establish a Project Leader/Director 13.2.1.1 Proven Leadership Skills 13.2.1.2 Type of Project 13.2.1.3 Project Location	207211213213213

			13.2.1.5	Experience in Project Controls	214
			13.2.1.6	Experience in Contract Dispute Avoidance and Contract Dispute Resolution	215
		13.2.2	Establis	sh the Project Leadership Team	215
		13.2.3		sh the Process by Which the Project Life Will Be Managed	217
		1.	3.2.3.1 A	ppraisal or Concept Development Stage	220
		1.	3.2.3.2 Se	elect Stage	224
		1.	3.2.3.3 D	refine Stage	227
		1.	3.2.3.4 E	xecute Stage	229
		1.	3.2.3.5 O	perate Stage	233
		13.2.4	Conclus	sion	234
Cha Proj	•		Motiva	tors and Demotivators	237
	14.1	Motiva	tors and	Demotivators	237
	14.2	Forem	an Delay	Survey	238
	14.3	Herzbe	erg's Prir	nciples	240
	14.4	True E	Empower	ment	242
	14.5	Life Le	essons		242
-					
Cha	•				
			C	ated If the Owner Coordinates and	
Coo	pera	ates on	Multi-	Prime Construction Projects	245
	15.1	What A	Are Multi	-Prime Construction Projects?	245
	15 2	The D	uty to Co	ordinate and Cooperate	246

15.	3 Case Example No. 1—Lack of Owner Coordination	247
15.	4 Case Example No. 2—Owner's Duty to Cooperate	247
15.	5 Case Example No. 3—Unreasonable Interference by the Owner	248
15.	6 Case Example No. 4—Owner's Failure to Coordinate	249
15.	7 Conclusion	250
Chapt	er 16	
Comn	nercial Awareness Training for EPC Projects2	253
16.	1 Contract Handover Meetings	253
16.	2 Building Blocks of Commercial Awareness Training	254
16.	3 Key Items of the Commercial Awareness Training Presentation	255
16.	4 Preparation for the Commercial Awareness Training Meeting	256
16.	5 Objectives of the Commercial Awareness Training	256
16.	6 Conclusion	257
Chapt	er 17	
Contra	actor's Risk Analysis2	:59
Chapt	er 18	
Owne	and Contractor Guidelines2	275
18.	Owner Guidelines	275
18.	2 Contractor Guidelines	277

Chapter	19		
Construc	ction Claims Analysis Checklist283		
19.1	9.1 Identify and Analyze Documentation for Claim Issues28		
19.2	Claims Analysis Related to Schedule Delay280		
19.3	Claims Analysis Related to Quantities, Man-Hours, and Costs28		
Index			
Case Cit	ations		
	List of Tables		
Table 4-1:	Ten Project Management and Two Construction Extension Knowledge Areas		
Table 4-2:	CII's 13 Knowledge Areas		
Table 4-3:	CII's Knowledge Structure		
Table 4-4:	Sample As-Planned Schedule for Subcontract Award		
Table 4-5:	Contractor's Planned Schedule for Walkdown, Inspection, and Punch List		
Table 4-6:	Contractor's Job Cost Records		
Table 8-1:	Contractor's Project Review Checklist (18 Pages)		
Table 9-1:	Site Investigation Checklist (9 Pages)		
Table 17-1:	Contractor's Risk Analysis Checklist (12 Pages)260		

(continued)

List of Figures

Figure 4-1:	Sample Cause-Effect Matrix 1	81
Figure 4-2:	Sample Cause-Effect Matrix 2	82
Figure 4-3:	Typical Cause-Effect Matrix for a Delay/Disruption Construction Claim	83
Figure 6-1:	Project Transitions	107
Figure 7-1:	Escalating Impact of Changes as the Project Moves Forward	121
Figure 7-2:	Discrete Stages of a Typical Project	122
Figure 10-1:	Overlapping Roles of Major Parties in Traditional Construction Delivery	165
Figure 10-2:	Overlapping Roles of Major Parties in Design-Build Approach	166
Figure 10-3:	Claim Resolution Process	168
Figure 11-1:	Opportunity to Influence Project Expenditures in Construction	171
Figure 12-1:	Deviation Request	193
Figure 12-2:	Initiator Change Order Request	194
Figure 12-3:	Change Order Technical Justification	195
Figure 12-4:	Change Order	203
Figure 12-5:	Change Order Log	204
Figure 12-6:	Example of a Construction Change Order Procedure	208
Figure 13-1:	Project Organization Leadership Structure: No PMC—Owner Performs Project Management	215
Figure 13-2:	Project Organization Leadership Structure: PMC Performs Project Management	216
Figure 13-3:	Project Organization Leadership Structure: PMC Performs Project Management and Directs EPC Contractor	217

Figure 13-4:	Discrete Stages of a Typical Project	219
Figure 13-5:	Integrated Involvement Throughout the Project Life Cycle	219
Figure 13-6:	Front-End Loading Influence vs. Project Expenditures	220
Figure 14-1:	Foreman Delay Survey Cycle	239
Figure 14-2:	Sample Foreman Delay Survey Results	24 0
Figure 14-3:	Herzberg's Motivation-Hygiene Theory of Motivation	241
_	Herzberg's Principles of Vertical Job Loading	241

Preface

In a perfect world, the owner never changes his mind, the engineer never alters his drawings, the contractor never malperforms, the resident engineer's decisions are perfect, and Mother Nature behaves herself. That perfect world does not exist.

In the real world, with geometric precision, the forces of owner, engineer, contractor, and Mother Nature combine to make change. The owner changes his mind. The engineer changes his drawings. The contractor fails to manage his job. Mother Nature then changes what the others have missed.

The high frequency of contract disputes must be recognized, and all reasonable measures undertaken by each party involved in today's engineering and construction projects. Technical complexities, the increasingly contentious nature of the contract environment, tight competitive bids, and owners with tough-minded and sometimes inequitable contractual attitudes have caused the final act of many construction projects to occur in an arbitration hearing or in the courtroom. Legal and expert costs for preparing and defending claims have exacerbated an already high-risk business environment for all construction contracting parties.

Although a construction project should be a mutually beneficial endeavor, adversarial relationships that can culminate in disputes are common. Owners and contractors are acutely aware of the significant monetary, labor, and equipment resources that they must commit to a construction project and the adverse effect any increase in these resource commitments would have on their bottom lines. Contractors and owners must be aware of and educated about claims and dispute resolution to protect their significant resource investment.

The possibility of being blindsided by a large claim has caused owners to question basic construction contract terms and conditions and the way they contract for design and build. Owners create exculpatory contract clauses to protect against the reoccurrence of such claims. When their workload is down, contractors take risks by accepting tough contract terms and conditions.

Owners expect more from their engineers, whether in-house or outside design professionals, but insist on lower costs and time to produce "issued for construction" documents. The engineering profession is continuously examining the quality of its product to determine if errors and omissions are increasing because of regression in professionalism or skill, or because of inadequate budgets and time for design work. If errors and omissions are increasing, how can they be better controlled? If they are not increasing, how can they be further reduced?

Professionals who prepare contracts and specifications are subjecting their work to continuous revisions to see if simplifications, exculpatory language, or new concepts are needed. Many defensive contract clauses such as "no damage for delay" and the usual subsurface exculpatory requirements to examine the site and not rely on borings have often failed as a result of improper contract administration or inadequate site investigations by the owner. Specifications are too often a "cut and paste" exercise that does not meet the varying needs of the project. Numerous claims could be avoided by knowledgeable and careful specification writing incorporating knowledge about construction law and claims.

Large value claims, when asserted successfully, may destroy the viability of a project or make construction more difficult by adding to the disenchantment between the owner and contractor. If a sizable claim is found to be valid, an owner faces serious problems. New financing may be required, later occupancy may be necessary, income from operation of the facility or rent from commercial property may be delayed or lost, and staffs may have to be funded longer than planned to administer the project.

The first five chapters of this book focus on the general topic, "Why Construction Claims Occur." Chapter 1 discusses the characteristics of a highly impacted project, the effect of claims on project costs, and the court's view of contract interpretation as it relates to the bases for contractor recovery for claims. Chapter 2 describes situations that cause costly claims. Chapter 3 describes why construction disputes occur and how to promote early an amicable settlement. Chapter 4 presents an assessment of problems associated with poor project management performance. Chapter 5 identifies typical problems leading to delays, cost overruns, and claims on process plant and offshore oil and gas projects.

The next eleven chapters of this book focus on the second general topic, "How to Prevent Construction Claims." Chapter 6 identifies claims mitigation steps that can be performed early in the project life cycle. Chapter 7 sets forth the concept of "Defining Project Requirements" to avoid project failure. Chapter 8 provides a detailed project checklist of questions that a senior-level project review team should use to ensure that all issues regarding the status of the project are covered during project reviews. Chapter 9 covers the essentials of performing a site investigation and provides detailed lists of information that need to be collected by the contractor to prepare its bid estimate. Chapter 10 covers the claims mitigation steps that should occur during construction by the owner's and contractor's project management teams. Chapter 11 describes the essential elements of cost control that need to be understood by the project manager. Change order management is discussed in Chapter 12. The keys to successful major project execution are set forth in Chapter 13 including the identification of life cycle stages of the project. Chapter 14 discusses project team motivators and demotivators that factor into determining the success of a project. Chapter 15 identifies how claims

can be mitigated if the owner coordinates and cooperates on multi-prime construction projects. Commercial awareness training for EPC projects is discussed in Chapter 16.

The last three chapters present a summary of the previous discussions. A comprehensive list of risks that should be evaluated by the contractor as part of its due diligence before deciding to pursue a potential project is provided in Chapter 17. Chapter 18 presents a list of recommendations for owners and contractors for avoiding disputes. And finally, Chapter 19 presents a comprehensive checklist of the types of construction claims that arise during EPC projects, the documentation that is needed to support these types of claims, and the analyses that are typically performed to support claims related to schedule delay, quantities, man-hours, and costs.

Richard J. Long, P.E., P.Eng.





Richard J. Long, P.E., P.Eng., is Founder of Long International, Inc., one of the world's largest construction claims consulting companies, which also provides project management consulting services. Based in Colorado with offices throughout the U.S. and the Middle East, Long International focuses its practice on owners, engineering and construction firms, and contractors performing oil and gas, petroleum refining, petrochemical, chemical, power, LNG, mineral processing, manufacturing, industrial, building, and infrastructure projects

worldwide. Mr. Long has over 50 years of U.S. and international engineering, construction, and project management consulting experience involving construction contract disputes analysis and resolution, arbitration and litigation support and expert testimony, project management, engineering and construction management, cost and schedule control, and process engineering. As an internationally recognized expert in the analysis and resolution of complex construction disputes for over 35 years, Mr. Long has provided construction claims consulting services and, in some cases, served as the lead expert on over 500 projects having claims ranging in size from US\$100,000 to over US\$2 billion. He has presented and published numerous articles and training seminars on the subjects of engineering and construction claims analysis, entitlement issues, CPM schedule and damages analyses, loss of productivity cumulative impact claims, and construction claims prevention.

Before forming Long International, Mr. Long was Senior Vice President, Contract Administration, for a major electrical and mechanical contractor. In this role, he had corporate-wide responsibility for technical management and oversight of the preparation and resolution of construction claims. In addition, he was responsible for the development, training, and implementation of project management policies and procedures to ensure that profit, cost, schedule, scope, quality, and safety objectives were achieved. For thirteen years, Mr. Long managed the construction claims practices of two large consulting firms. Prior to his consulting career, Mr. Long gained 13 years of project management and process engineering experience on petroleum refining, oil shale, synfuels, mining, and power generation projects with Tosco, Fluor, and Conoco.

Mr. Long earned a B.S. in Chemical Engineering from the University of Pittsburgh in 1970 and an M.S. in Chemical and Petroleum Refining Engineering from the Colorado School of Mines in 1974. He is a Registered Professional Engineer in the state of Colorado, and a P.Eng. in Ontario, Newfoundland and Labrador, Canada. Mr. Long is based in Littleton, Colorado, and can be contacted at rlong@long-intl.com and (303) 972-2443.



Douglas J. Nutter, Long International's Manager of Graphic Services, prepared the graphic illustrations throughout this book, as well as formatting the text for design and indexing. He has over 45 years of experience in design, illustration, cartography, and graphic production for technical support, arbitration, and litigation. Mr. Nutter is skilled in developing complex technical issues and data into concise presentations for use by counsel, juries, and arbitration panels. Previously, Mr. Nutter gained 12 years of engineering drafting, illustration and graphic design

experience on petroleum refining, oil shale, synfuels, mining, and power generation projects with Tosco Corporation. Mr. Nutter was also Manager of Graphic Services for Kellogg Corporation in Littleton, Colorado for twelve years prior to joining Long International.

Mr. Nutter currently provides graphic design, illustration, and technical support for construction claim preparation, analyses, defense, and negotiation of settlements for various parties, including owners, contractors, transit agencies, universities, sureties, financial institutions, law firms, and architectural firms. Mr. Nutter is based in Littleton, Colorado, and can be contacted at dnutter@long-intl.com.



Claire E. Crevey, Long International's Assistant Graphics Manager, provided technical editing and proofreading for this book. She has more than 16 years of experience in professional graphic design, writing, editing, and proofreading. Ms. Crevey has worked with many diverse clients with unique needs, including consulting firms, small businesses, nonprofit organizations, and the publishing industry. She has designed, edited, and proofread complex documents including books, case statements, trade catalogs, and multi-page brochures. Her experience also includes

branding, designing logos, business cards, web banners, brochures, infographics, illustrations, and websites. Ms. Crevey is based in Littleton, Colorado, and can be contacted at ccrevey@long-intl.com.

Acknowledgments

The author makes the following acknowledgments regarding certain of the material that has been included in this book:

Chapter 3, "Why Construction Disputes Occur and How to Promote Early and Amicable Settlements," is adapted from an article by Michael Harris. Mr. Harris is a Principal with Long International and has over 35 years of construction project and claims management experience. His comprehensive consulting and management background includes risk evaluation and managing and resolving complex claims and contract disputes on major construction projects throughout the U.S. and globally for a wide range of industries, including the power, water, petrochemical, industrial, commercial, healthcare, and general building sectors. Mr. Harris has extensive expertise in key construction disciplines including project design, project management, construction management, contract management, risk and claims analysis, onsite risk management, claims resolution, claims avoidance management, cost management, and expert witness report preparation and testimony. As well as his extensive project execution background, he also has considerable experience in various types of dispute resolution forums such as arbitration, litigation, and mediation proceedings in North America, Europe, the Middle East, and the Far East. Mr. Harris has also been appointed as a mediator and arbitrator on various international projects. He has been responsible for the management of numerous major projects, both from a construction and dispute perspective, ranging in size from US\$100,000 to over US\$500 million.

Chapter 4, "Assessment of Problems Associated with Poor Project Management Performance," is adapted from an article by **Truman D. King, P.E.** Mr. King was a Principal with Long International and has over 50 years of experience in engineering, procurement, and construction operations in the mining, oil and gas, refining, and real estate development industries. He has successfully completed assignments in the U.S., Middle East, and Europe. Mr. King was a Senior Project Manager for Worley Parsons, where he managed the Front-End Engineering Design and acquisition of Process Design Technology for a US\$500 million expansion of an oil refinery in the UAE to produce clean diesel fuel. He has also managed oil and gas, refining, power distribution, marine and other engineering projects and provided analysis of and resolution of contractor's claims. Mr. King has extensive knowledge of the owner's and contractor's project management responsibilities on EPC turnkey projects. He has successfully analyzed claims involving mismanagement, defective engineering, delay, disruption, and disputed change orders.

Chapter 7, "Avoiding Project Failure by Defining Requirements," is adapted from an article by **Douglas A. Bassett, P.Eng., PMP, FCIP.** Mr. Bassett was a Principal with Long International and had over 35 years of Canadian and international consulting experience involving construction project management, project leadership and project governance/review. Mr. Bassett was a seasoned project leader. During his career, Mr. Bassett was involved in all types of oil and gas energy projects with a primary focus on oil sands and refinery facilities, offshore fixed and floating drilling and production facilities, and conventional onshore production facilities. Mr. Bassett's accomplishments included serving as project leader on Canada's first offshore development production platform, project leader in a successful alliance to develop a major oil sands mine, and governance leader of project approval reviews for oil sands and offshore mega projects. Mr. Bassett passed away in September 2020.

Chapter 11, Cost Control for the Project Manager, is adapted from an article by **Philip R. Moncrief, P.E.** was a Senior Principal with Long International, and has over 50 years of U.S. and international consulting experience involving engineering and construction, contract disputes, project management, project development, engineering/construction management, and process engineering. As an internationally recognized expert in the engineering and construction industry, he has managed large projects and had profit and loss responsibility for the engineering and construction operations of four major engineering-construction companies.

Chapter 12, "Effective Change Order Management," is adapted from an article by James M. Bolin. Mr. Bolin was a Senior Executive Consultant for Long International and has over 35 years of experience in all aspects of project and construction management, preconstruction planning, and project cost/schedule controls. His qualifications include claims and change order analysis and resolution, preparation of fixed-cost proposals and budget baseline planning, site management and coordination, prime and subcontract development and administration, materials expediting and procurement, and critical path method (CPM) delay analysis, schedule development, progressing and reporting. This diverse expertise has been obtained through involvement on numerous project types, including oil production facilities, pipelines, pump stations, water and wastewater treatment plants, mineral processing facilities, water storage, hydroelectric plants, hospital/medical, transit, airports, communications, and environmental remediation.

Chapter 13, "Keys to Successful Major Project Execution," is adapted from an article by **S. Andrew McIntosh.** Mr. McIntosh is a Senior Principal with Long International and has nearly 50 years of engineering, construction, energy and management consulting experience. He has extensive international greenfield

and brownfield project development and project management experience in diverse areas such as oil and gas, including refinery, pipelines and offshore projects, LNG, petrochemical and ferrous metallics projects ranging in value from US\$20 million to US\$1.8 billion. He has provided expert analysis of technical issues and their causes and effects related to project management performance on multibillion-dollar EPCA projects. Mr. McIntosh also has extensive experience in the development of project management and project execution plans and procedures, stage-gate processes for project development, and the analysis and resolution of engineering and construction claims involving disputed change orders, schedule delay, and loss of productivity claims. He also completed expert analysis of technical issues and the causes and effects of an EPC contractor's project management performance on a major LNG project, and has prepared and submitted various independent expert reports. Mr. McIntosh has also provided expert advice to foreign governments on major LNG project development and natural gas monetizing strategies from natural gas offshore fields as well as from associated gas from offshore oil producing fields.

Chapter 14, "Project Team Motivators and Demotivators," is adapted from a chapter from On Time and Under Budget: The Ultimate Power of Team Leadership, a book written by Michael J. Vallez, P.E., M.B.A., Lean Six Sigma, published in 2014. Mr. Vallez is a Senior Principal with Long International and has over 40 years of hands-on and leadership experience in project management, engineering/construction management, cost and schedule control, change management, claims, dispute resolution, and mine and process engineering. He has served in executive management roles in industry, including both the owner and contractor sides with companies and contractors working on world-class projects for oil and gas companies, power companies, international mining companies, and other institutions. He has a proven ability to organize and integrate the work of multi-disciplined technical specialists and project construction teams to achieve corporate financial goals and objectives of ROI, safety, operational performance, cost, and time. In all, he has provided leadership on several billion dollars' worth of projects in the mining, power, oil and gas, industrial, heavy civil and commercial sectors. Mr. Vallez has written several books about construction management, safety, and effective project leadership.

Chapter 15, "Claims Can Be Mitigated If the Owner Coordinates and Cooperates on Multi-Prime Construction Projects," is adapted from an article by **Ronald J. Rider, M.B.A.** Mr. Rider is a Senior Principal with Long International and has over 30 years of comprehensive construction experience and expertise from over 100 projects in the areas of project management and dispute resolution services. He develops and monitors

critical path method schedules, and provides consulting services that include schedule delay analysis, project estimating, project cost control, project billings and payments, change order pricing and resolution, contract administration, schedule recovery, project close-out, and dispute resolution of project problems. Mr. Rider is highly skilled in cost and labor hour variance modeling, impact identification and analysis, retrospective CPM schedule delay preparation and evaluation, concurrent delay assessments, project acceleration analysis, and damages verification and quantification.

Chapter 16, "Commercial Awareness Training for EPC Projects," is adapted from an article by Roger D. Javid, M.B.A. Mr. Javid was a Senior Executive Consultant with Long International and has over thirty years of experience on large international projects ranging in size from US\$100,000 to over US\$1 billion. Mr. Javid is an expert in project management, commercial management, development of project budgets, analysis and negotiation of EPC variation orders and amendments, management of project purchasing and contracting cycles, field supervision, project close-out, insurance claims, commercial awareness training, and construction claims preparation and settlement negotiations. He also has extensive experience with FIDIC contracts, Federal Acquisition Regulations, and USAID Acquisition Regulations. His project experience includes NGL/GOSP facilities, LNG offshore platforms pipelines, petroleum refineries, and petrochemical facilities, telecommunication fiber loops, wastewater treatment facilities, power generation facilities, and theme parks and resorts.

Chapter 19, "Construction Claims Analysis Checklist," is adapted from an article coauthored by Richard J. Long, P.E., P. Eng., and Rod C. Carter, **CCP**, **PSP**. Mr. Carter is President of Long International and has over 20 years of experience in construction project controls, contract disputes, and resolution, negotiations, mediation/arbitration support, and expert testimony on scheduling, loss of productivity, and quantum issues. He has experience in entitlement, schedule, and damages analyses on over 30 construction disputes ranging in value from US\$100,000 to US\$7 billion, related to oil and gas, heavy civil, nuclear, environmental, chemical, power, industrial, commercial, and residential construction projects. Mr. Carter is proficient in the use of Primavera P6 and P3 software, and he has extensive experience in assessing the impact to engineering and construction works of RFIs, change orders, and other events. He specializes in loss of productivity, cumulative impact, and quantum calculations, and has had a lead role in assessing damages on more than a dozen major disputes. In addition, Mr. Carter has developed cost and schedule risk analysis models using Monte Carlo simulations to address the uncertainty of estimates and claims. He has

Acknowledgements

testified as an expert in construction scheduling and damages, and he has presented expert findings to an international arbitral tribunal.

Construction Extension to the PMBOK® Guide 38 AACE International 72 Access 23, 188 ADR Clauses 52 Allocation of Responsibility 77 American Institute of Architects (AIA) 72 Bid 5, 15, 16, 18, 25, 36, 39, 112, 113, 153 Ambiguities 8 Bid Contingency 94 Bid Fror 15, 16, 28 Bid Preparation 21 Bid Problems 28 Bid Qualification 41 Competitive Bidding 18 Pre-bid Q&A 39 Unbalanced Bidding 16 Underbid 16 Browley 8 Camp Facilities 101 Carryover Work 102 Cause-Effect Matrix 81, 82 Cause-Effect Relationship 80 Center for Business Practices (CPB) 73 Change Management Process 207, 231 Change Order 6, 16, 20, 24, 27, 77, 96, 163, 173, 187 Approval of Changes 6	A Guide to the Project Management Body of Knowledge (PMBOK® Guide)	
Access		
ADR Clauses		
Allocation of Responsibility		,
American Institute of Architects (AIA) 72 Bid .5, 15, 16, 18, 25, 36, 39, 112, 113, 153 Ambiguities 8 Bid Contingency .94 Bid Error .15, 16, 28 Bid Preparation .21 Bid Problems .28 Bid Qualification .41 Competitive Bidding .18 Pre-bid Q&A .39 Unbalanced Bidding .16 Underbid .16 Browley .8 Camp Facilities .10 Carryover Work .10 Cause-Effect Matrix .81, 82 Cause-Effect Relationship .80 Center for Business Practices (CPB) .73 Change Management Process .207, 231 Change Order .6, 16, 20, 24, 27, 77, 96, 163, 173, 187 Approval of Change Order .29 Blizzard of Change Order .29 Blizzard of Changes .6 Change in Balance of Power and Leverage to Settle Change Orders .47 Change Order Backlog .189 Change Order Definition .180		
Bid 5, 15, 16, 18, 25, 36, 39, 112, 113, 153 Ambiguities 8 Bid Contingency 94 Bid Error 15, 16, 28 Bid Preparation 21 Bid Problems 28 Bid Qualification 41 Competitive Bidding 18 Pre-bid Q&A 39 Unbalanced Bidding 16 Underbid 16 Browley 8 Camp Facilities 101 Carryover Work 102 Cause-Effect Matrix 81, 82 Cause-Effect Relationship 80 Center for Business Practices (CPB) 73 Change Management Process 207, 231 Change Order 6, 16, 20, 24, 27, 77, 96, 163, 173, 187 Approval of Changes 6 Change in Balance of Power and Leverage to Settle Change Orders 47 Change Order Backlog 189 Change Order Basis of Calculation 191 Change Order Definition 191 Change Order Definition 193	•	
Ambiguities 8 Bid Contingency 94 Bid Error 15, 16, 28 Bid Preparation 21 Bid Problems 28 Bid Qualification 41 Competitive Bidding 18 Pre-bid Q&A 39 Unbalanced Bidding 16 Underbid 16 Bromley 8 Camp Facilities 101 Carryover Work 102 Cause-Effect Matrix 81, 82 Cause-Effect Relationship 80 Center for Business Practices (CPB) 73 Change Management Process 207, 231 Change Order 6, 16, 20, 24, 27, 77, 96, 163, 173, 187 Approval of Changes Order 29 Blizzard of Changes 6 Change in Balance of Power and Leverage to Settle Change Orders 47 Change Order Backlog 189 Change Order Basis of Calculation 191 Change Order Definition 186		
Bid Contingency 94 Bid Error 15, 16, 28 Bid Preparation 21 Bid Problems 28 Bid Qualification 41 Competitive Bidding 18 Pre-bid Q&A 39 Unbalanced Bidding 16 Underbid 16 Bromley 8 Camp Facilities 101 Carryover Work 102 Cause-Effect Matrix 81, 82 Cause-Effect Relationship 80 Center for Business Practices (CPB) 73 Change Management Process 207, 231 Change Order 29 Blizzard of Change Order 29 Blizzard of Changes 6 Change in Balance of Power and Leverage to Settle Change Orders 47 Change Order Backlog 189 Change Order Basis of Calculation 191 Change Order Definition 186	Bid	15, 16, 18, 25, 36, 39, 112, 113, 153
Bid Error 15, 16, 28 Bid Preparation 21 Bid Problems 28 Bid Qualification 41 Competitive Bidding 18 Pre-bid Q&A 39 Unbalanced Bidding 16 Underbid 16 Browley 8 Camp Facilities 101 Carryover Work 102 Cause-Effect Matrix 81, 82 Cause-Effect Relationship 80 Center for Business Practices (CPB) 73 Change Management Process 207, 231 Change Order 6, 16, 20, 24, 27, 77, 96, 163, 173, 187 Approval of Change Order 29 Blizzard of Changes 6 Change in Balance of Power and Leverage to Settle Change Orders 47 Change Order Backlog 189 Change Order Basis of Calculation 191 Change Order Definition 186	0	
Bid Proparation 21 Bid Problems 28 Bid Qualification 41 Competitive Bidding 18 Pre-bid Q&A 39 Unbalanced Bidding 16 Underbid 16 Browley 8 Camp Facilities 101 Caryover Work 102 Cause-Effect Matrix 81, 82 Cause-Effect Relationship 80 Center for Business Practices (CPB) 73 Change Management Process 207, 231 Change Order 6, 16, 20, 24, 27, 77, 96, 163, 173, 187 Approval of Change Order 29 Blizzard of Changes 6 Change in Balance of Power and Leverage to Settle Change Orders 47 Change Order Backlog 189 Change Order Definition 191 Change Order Definition 186	Bid Contingency	94
Bid Problems 28 Bid Qualification 41 Competitive Bidding 18 Pre-bid Q&A 39 Unbalanced Bidding 16 Underbid 16 Browley 8 Camp Facilities 101 Carryover Work 102 Cause-Effect Matrix 81, 82 Cause-Effect Relationship 80 Center for Business Practices (CPB) 73 Change Management Process 207, 231 Change Order 6, 16, 20, 24, 27, 77, 96, 163, 173, 187 Approval of Change Order 29 Blizzard of Changes 6 Change in Balance of Power and Leverage to Settle Change Orders 47 Change Order Backlog 189 Change Order Definition 191 Change Order Definition 186	Bid Error	
Bid Qualification 41 Competitive Bidding 18 Pre-bid Q&A 39 Unbalanced Bidding 16 Underbid 16 Bromley 8 Camp Facilities 101 Carryover Work 102 Cause-Effect Matrix 81, 82 Cause-Effect Relationship 80 Center for Business Practices (CPB) 73 Change Management Process 207, 231 Change Order 6, 16, 20, 24, 27, 77, 96, 163, 173, 187 Approval of Change Order 29 Blizzard of Changes 6 Change in Balance of Power and Leverage to Settle Change Orders 47 Change Order Basis of Calculation 189 Change Order Definition 186	Bid Preparation	21
Competitive Bidding 18 Pre-bid Q&A 39 Unbalanced Bidding 16 Underbid 16 Bromley 8 Camp Facilities 101 Carryover Work 102 Cause-Effect Matrix 81, 82 Cause-Effect Relationship 80 Center for Business Practices (CPB) 73 Change Management Process 207, 231 Change Order 6, 16, 20, 24, 27, 77, 96, 163, 173, 187 Approval of Changes 6 Change in Balance of Power and Leverage to Settle Change Orders 47 Change Order Backlog 189 Change Order Basis of Calculation 191 Change Order Definition 186	Bid Problems	28
Pre-bid Q&A 39 Unbalanced Bidding 16 Underbid 16 Bromley 8 Camp Facilities 101 Carryover Work 102 Cause-Effect Matrix 81, 82 Cause-Effect Relationship 80 Center for Business Practices (CPB) 73 Change Management Process 207, 231 Change Order 6, 16, 20, 24, 27, 77, 96, 163, 173, 187 Approval of Change Order 29 Blizzard of Changes 6 Change in Balance of Power and Leverage to Settle Change Orders 47 Change Order Backlog 189 Change Order Basis of Calculation 191 Change Order Definition 186	Bid Qualification	41
Unbalanced Bidding	Competitive Bidding	18
Underbid	Pre-bid Q&A	39
Bromley	Unbalanced Bidding	16
Camp Facilities	Underbid	16
Carryover Work	Bromley	8
Cause-Effect Matrix	Camp Facilities	
Cause-Effect Relationship	Carryover Work	102
Center for Business Practices (CPB)	Cause-Effect Matrix	81, 82
Change Management Process	Cause-Effect Relationship	80
Change Order	Center for Business Practices (CPB)	73
Approval of Change Order	Change Management Process	207, 231
Blizzard of Changes 6 Change in Balance of Power and Leverage to Settle Change Orders 47 Change Order Backlog 189 Change Order Basis of Calculation 191 Change Order Definition 186	Change Order6,	16, 20, 24, 27, 77, 96, 163, 173, 187
Change in Balance of Power and Leverage to Settle Change Orders	Approval of Change Order	29
Change Order Backlog	Blizzard of Changes	6
Change Order Basis of Calculation	Change in Balance of Power and Leverage to Settle Change Orde	ers47
Change Order Basis of Calculation	Change Order Backlog	189
Change Order Definition		
	Change Order Definition	186
Change Order Finalization	Change Order Finalization	
Change Order Management	_	
Change Order Negotiations		

Change Order Procedures	205
Change Order Technical Justification	192
Initiator Change Order Request	192
Integrated Change Control Processes	67
Procedures for Initiating a Change Order	
Unilateral Change	17
Claims Analysis	
Construction Claims Analysis Checklist	283
Documentation for Claim Issues	284
Quantities, Man-Hours, and Costs	288
Schedule Delay	286
Claims Prevention	237–76
Claims Prevention Review	109
Contractor Guidelines	277
Owner Guidelines	275
Cold Eyes Review	93
Commercial Awareness Training	253, 257
Commissioning Procedures	85
Communications Management	67
Concurrent Delay	78–80, 96
Concurrent Operations	23
Conflict of Interest	27
Constructibility and Biddability Reviews	109–13
Construction Industry Institute (CII)	
CII's 13 Knowledge Areas	68
CII's Knowledge Structure	
Construction Management Association of America (CMAA)	
Constructive Acceleration	19
Contingency	
Owner's Contingency	7
Contract	19, 26, 28, 176
Contract Administration	
Contract Ambiguities	108, 109
Contract Awards	
Contract Documents	
Contract Form	
Contract Handover Meetings	
Contract Interpretation	

Contract Modification	17
Convert Contract Basis from Lump Sum to Reimbursable	94
EPC Contract	43
EPC Fixed-Priced Contracts	19
Exculpatory Contract Clauses	19, 26
Lump Sum	191, 197, 200
Lump-Sum Contracts	19
Time and Materials	191, 198, 200
Unit Price	16, 200
Unit-Price	19, 21, 191, 196
Contractor Responsibilities and Representations	62
Contractor's Project Review Checklist	134
Change Order Issues	141–42
Cost/Financial Issues	135–36
Documentation	150–51
Financial/Cost Reporting Issues	140
Labor/Man-Hour Issues	137–38
Other Issues	143–44
Project Information	134
Quantities Issues	139
Schedule Issues	145–49
Contractor's Risk Analysis Checklist	260
Bond Requirements	262
Change Order Procedures	268
Critical Contract Clauses	263–65
Disputes Procedure	270
Federal Government Contracts	271
Notice Requirements	266
Payment Provisions	269
Precontract/Performance Issues	260
Scheduling Requirements	267
State Lien Law Requirements	261
Coordination	18, 29, 45
Coordination Procedure	29
Lack of Owner Coordination	
Owner's Failure to Coordinate	249
Cost and Schedule Control Systems	
Cost Control	171

Cost Control Definitions	172
Cost Control During Execution Phase	174
Cost Control Procedure	
Cost Incentives	188
Cost Influence Curve	171
Cost Overruns	175
Construction Problems that Cause Cost Overruns	179
Joint Venture Issues that Cause Cost Overruns	179
Owner Actions that Cause Cost Overruns	
Poor Schedule Performance Issues that Cause Cost Overruns	177
Procurement and Subcontracting Problems that Cause Cost Overruns	178
Course of Dealing	
Critical Path	
Cumulative Impact Claim	
Cumulative Impact of Delay	68
Damages	
Allocation of Damages	
Cost Allocation Example	
Decision Management Matrix	
Defective and Deficient Contract Documents	
Defective Work	17
Delay	5–88, 91–103
Delayed Approval	24
Delayed Decisions	24
Delays to Project Award	23
Excusable Delay	19
Material Delays	76
Delay and Disruption Claims	230, 233, 246
Delegation of Authority	29
Deliverables	63
Design Modifications	187
Deviation	
Deviation Request	
Differing Site/Changed Conditions	
Changed Conditions	187

Disclaimers	25
Discovery	30
Dispute Boards	50
Dispute Resolution	30, 167
Disruption	
Documentation	30, 108
Contemporaneous Project Documentation	75
Document Management System (DMS)	229
Inadequate Documentation	95
Drawings	
Approved for Construction Drawings	86
As-Built Drawings	202
Shop Drawings	24
Duty to Coordinate and Cooperate	246
Empowerment	242
Entitlements	80
Equipment Costs	198
Errors and Omissions	27, 113, 164, 165, 187
Estimating	173
Estimate Types	174
Evaluation and Verification of Costs	196
Fast-Track	5, 21
Federal Acquisition Rules (FAR)	37
Field Work Orders	186
Financial Management	66
Float Ownership	28
Force Majeure	188
Foreman Delay Survey	239
Front End Engineering Design (FEED)	92, 226
FEED Design Basis	93
Front End Loading (FEL)	220, 221
Funding	7, 21, 23
Gatekeeper	219, 224
See Stage Gate Process	
HAZOPs, HAZIDs, and Constructability Reviews	231
Herzberg's Principles	240
Implied Warranty	164
Impossibility of Performance	26

Inaccurate Cost Estimates	94
Incomplete Design	25
Inexperienced Staff	25
Inflating Claims	52
Integration Management	66
Interference	65
Unreasonable Interference by the Owner	248
Interpretation of Specifications	22
Joint Ventures	179
Keys to Successful Major Project Execution	211
Life Cycle Phases of a Construction Project	59
Bid Phase	60
Commissioning and Initial Operations Phase	60
Conceptual Phase	59
EPC (or Execution) Phase	60
Preliminary Phase	59
Warranty Period	60
Liquidated Damages	6, 17, 19, 26, 45, 99
Management of Outside Design Professionals	113
Problems with Professional Contracts	113
Role of the Professional during Construction	114
Selection Process	114
Material Costs	197
Mechanical Completion	26, 232
Mediation	52
Milestones	109, 110
Mitigation	237–74
Mobilization	17
Monte Carlo Analysis	226
Multiple Prime Contractors	97, 245, 246
No Damage for Delay	5, 26
Normal Industry Practice	
Notice	
O&M Manuals	232
Or-Equal Specifications	
Overhead	
Overtime	
Overzealous Inspection	

Owner's Duty to Cooperate	247
Owner's Project Management Personnel	98, 103
Owner-Directed Schedule Acceleration or Slowdown	188
Owner-Supplied Services and Materials	22, 188
Performance Test Procedure	231
Planning Facilitation Techniques	128
PMBOK® Guide	
See A Guide to the Project Management Body of Knowledge	
Post-Dispute Audit	52
Procedures	17, 28–30
Procurement Management	67
Productivity	19, 21–23
Loss in Productivity	190
Profits	198
Progress Payments	17, 21, 28
Progress Reports	75
Progressive Elaboration	122
Project Budget	41
Project Definition	176
Project Execution Plan	73
Project Failure Reasons	61
See Root Causes of Project Failure	
Project Hand-over Documentation	232
Project Leadership Team	215
Project Life Cycle	
Appraise Stage	221
Business Case	123
Business Planning Stage	117
Define Stage	227
Execute Stage	229
Operate Stage	233
Project Charter	123
Project Life Cycle	122
Project Life Cycle Management	217
Project Statement of Work	
Select Stage	224
Project Losses	47
Project Management	24, 60

Project Management Duties	62
Project Management Problems	84
Project Management Requirements	62
Sound Project Management Practices	61
Project Management Institute's College of Scheduling	73
Project Management Problems	57, 76
Project Requirements	119, 129
Project Reviews	133
Project Review Checklist	133
Project Team Motivators and Demotivators	237
Punch List	232
Quality Assurance (QA) Plans	222
Quality Requirements	130
Refusal to Proceed	17
Rejection of the Contractor's Work	188
Reliability, Availability, and Maintainability (RAM) Analysis	230
Requests for Information (RFIs)	6, 25, 98
Requirements Development Plan	125
Documentation of Requirements	129
Problems with Defining the Requirements	128
Resources	18
RFP Package	39
Risk	
Risk Analysis Checklist	259
Risk Management	67
Risk with Procurement and Delivery of Equipment	45
Root Causes of Project Failures	118
Inaccurate Requirements Gathering	118
Poor Requirments Management Practices	118
Schedule	
As-Planned Schedules	110, 111
Inadequate Baseline Schedule Development and Updating	99
Integrated Master Project Schedule	
Progress Schedule	6
Project Schedule	74, 84
Project Schedule Updates	202
Recovery Schedules	199

Schedule Analysis	30
Schedule Constraints	110
Schedule Control	16, 24
Schedule Interferences	190
Schedule Updates	28
Scheduling Procedures	163
Scope Change	173
Scope Definition	21
Scope of Work	19
Additional/Reduced Work Scope	188
Project Scope	189
Settlement	30
Early Settlement	33
Lawyers/Experts	48
Settlement Procedures	30
Stepped Negotiations	50
The Settlement Process	49
Site Conditions	21
Site Investigation	5, 15, 153, 275
Site Investigation Checklist	154
1. General	154
2. Surface Conditions	155
3. Subsurface Conditions	156
4. Permits, Fees, and Taxes	157
5. Labor	158
6. Weather	158
7. Equipment/Materials	160
8. Transportation	160
9. Prices	161
10. Communications	161
11. Meetings	162
Small Tools and Consumables	198
Socioeconomic Objectives	26
Spearin	
Stage Gate Process	213
Stages of a Typical Project	
Stakeholders	126

Subcontract Cost	198
Subcontract Impact	190
Submittals	22, 25, 28, 153–66, 112, 114, 254, 276
Substantial Completion	26
Subsurface Exculpatory Requirements	5
Time Extensions	6, 19, 29
Time Impact Analysis	199
Training Program for Operations Personnel	232
Transfer of Technology Plan	231
Trend	172
Unit-Pricing Adjustments	188
Value Drivers	220
Wage Rates	197
Weather	15, 21, 111, 153
Work Breakdown Structure (WBS)	230
Work Sequencing	188

Case Citations

Blake Construction Co. v. J. C. Coakley Co., 431 A.2d 569,575 (D.C. App. 1981)	9
Bromley Contracting Company, ASBCA 14884, 16045 72-1 BCA ¶ 9252 (1972)	8
George A. Fuller Co. v. United States, 69 F. Supp. 409 (108 Ct. Cl. 1947)	8
Grow Constr. Co. v. State, 391 N.Y.S.2d 726, 729 (App. Div. 1977)	8
Jacobson & Company, Inc., GSBCA No. 5605 ¶ 14,521 (1980)	247
Metropolitan Sewerage Comm'n v. R.W. Constr., 78 Wis.2d 451, 255 N.W.2d 293-302 (1977)	8
Pierce Associates, Inc., GSBCA 4163, ¶ 13,078 (1978)	250
Pierce Associates, Inc., GSBCA No. 4163, ¶ 12,746 (1977)	247
Shea-S&M Ball v. Massman-Kiewit-Early, 606 F.2d 1245 (D.C. Cir. 1979)	8
Stephenson Associates, Inc., GSBCA 6573, 86-3 BCA ¶ 19,071 (1986)	249
United States Steel Corporation v. Missouri Pacific Railroad Company, No. 80-1935 (1982)	248
United States v. Spearin, 248 U.S. 132 (1918)	8