

CONSTRUCTION PROJECT MANAGEMENT: A Complete Introduction

Alison Dykstra, AIA, CSI

KIRSHNER PUBLISHING
San Francisco & Santa Rosa



TABLE OF CONTENTS

PART 1—CONTEXT: THE INDUSTRY, THE PROJECTS, THE PLAYERS

1: THE CONSTRUCTION INDUSTRY: OVERVIEW AND TRENDS	1
Construction sectors	1
Residential	2
Commercial	2
Industrial	3
Infrastructure (heavy or horizontal construction)	3
Trends	3
A changing workforce	4
Note: Unions	5
Changes in technology and materials	5
Costs are climbing	7
Globalization	7
Transition to green building	8
Chapter Vocabulary and Test Yourself	10
2: GREEN CONSTRUCTION: A BUILDER’S OPPORTUNITY	13
What’s all the fuss about? What does green mean?	14
Note: Greenwashing	15
Note: High performance	16
Choosing green	16
Systems	16
Site considerations	17
Indoor quality	17
Economic and social impact costs	17
A short history	17
Standards	18

USGBC and the development of LEED	19
Other energy standards.	20
Who's going green?—projects around the country.	21
Note: Zero net energy building.	23
Green building and the contractor	23
Getting ready.	25
The unions go green	26
Hiring a green contractor	26
Experience	27
The contractor's level of interest in the subject	27
Does the contractor practice what he preaches?	27
Chapter Vocabulary and Test Yourself	29
3: CONSTRUCTION PROJECTS AND PLAYERS	31
What is a project?	31
Who are the players?	33
The owner's team	33
Note: Public vs. private owners.	35
The designer's team.	35
The contractor's team	37
Note: Licensing of general and specialty contractors.	38
Note: Prime contractors	40
Other important players	41
Authorities having jurisdiction	41
Manufacturers/fabricators/product reps/suppliers	41
Testing and inspection agencies	41
Commissioning	42
Chapter Vocabulary and Test Yourself	42
4: PROJECT STAGES: AN OVERVIEW	45
Stage 1: Project feasibility	47
Stage 2: Programming and design	48
Stage 3: Bidding and award of prime contract.	49
Note: Bidding	50
Stage 4: Pre-construction and mobilization	50
Stage 5: Construction	51
Stage 6: Close-out and occupancy	52
Chapter Vocabulary and Test Yourself	54

PART 2—A PROJECT BEGINS

5: THE OWNER'S FEASIBILITY: DOES THIS PROJECT MAKE SENSE?	59
Needs assessment.	61
Site selection	61
Financial feasibility	62
Note: Remember—money isn't free	62
Schedule feasibility	63
Regulatory requirements.	63
Zoning.	63
Zoning review step 1	64
Zoning review step 2.	66
Building codes	67
Community values.	67
Chapter Vocabulary and Test Yourself	69
6: PROJECT DELIVERY	71
What is project delivery?	71
Delivery methods in construction	74
Design-bid-build (traditional) delivery method	74
Design-build delivery method	77
Note: Fast-tracking	80
Construction management (CM) delivery method	81
Agency construction management (agency CM)	81
At-risk construction management (at-risk CM).	82
Note: Agency CM using multiple prime contractors	83
Integrated project delivery.	84
Building information modeling (BIM)	84
Chapter Vocabulary and Test Yourself	86
7: PROGRAMMING AND DESIGN	89
Programming.	90
Program element.	91
Design	92
Drawings	92
Plans, elevations, sections, details	93
Schematic design.	95

Design development	96
Final design and construction documents	97
Construction documents: the drawings.	97
Construction documents: the specifications	98
Construction documents: other bidding documents.	98
Chapter Vocabulary and Test Yourself	100

PART 3—BIDDING AND THE CONTRACTOR

8: BIDDING AND AWARDING THE JOB	105
Note: Trade secrets	106
The process of bidding	106
Step 1. Architect completes bid package.	107
Note: Pre-qualification	108
Note: Addenda and alternates	109
Step 2. Owner solicits bids	110
Step 3. Contractors review	113
Step 4. Contractors develop and submit bids	113
Planning	114
Preparing the estimate and tabulating the costs	114
Completing and submitting the bid	115
Step 5. Owner analysis of bids and award of contract.	115
Note: Responsible vs. responsive.	115
Negotiated jobs	116
Note: Open or closed projects.	117
Chapter Vocabulary and Test Yourself	118
9: CONTRACTORS: FINDING AND QUALIFYING FOR THE RIGHT JOBS	121
How to find work.	121
Does this project make sense?	122
Qualifying for the job: bonding.	127
Bonding requirements.	127
Types of surety bonds in construction.	129
Bid bonds	129
Performance bonds	129
Payment bonds	130
Note: Contractor license bonds.	131

How do contractors qualify to buy bonds?	131
Surety program (rating)	132
Chapter Vocabulary and Test Yourself	134
10: FUNDAMENTALS OF ESTIMATING.	137
What are estimates and when are they done?	137
Note: Contractor and owner estimates	138
Considerations when developing an estimate	138
Categories of costs.	141
Direct project costs	141
Note: The Davis-Bacon Act	144
Indirect project costs	145
Indirect business costs (overhead)	146
Where does the estimator get the numbers?	147
What makes a good estimate?	148
Note: Value engineering	149
Chapter Vocabulary and Test Yourself	150
11: CREATING ESTIMATES	153
Types of estimates	153
Conceptual/rough-order-of-magnitude estimates	154
Preliminary/square foot estimates.	155
Problem to solve	156
Detailed/bid estimates	160
Problem to solve	161
The estimate summary	164
Chapter Vocabulary and Test Yourself	167

PART 4—THE CONTRACT DOCUMENTS

12: INTRODUCTION TO CONTRACTS.	171
Why are contracts important?	172
Primary ingredients of a contract	172
Mutual agreement.	173
Capacity	173
Consideration	174
Lawfulness	174

Chapter Vocabulary and Test Yourself	176
13: CONSTRUCTION CONTRACTS	179
Basis for selecting a contract type	179
Types of construction contracts	181
Lump-sum contract	181
Cost plus a fee contract	183
Note: The fee	184
Cost plus with a guaranteed maximum price contract	185
Unit price contract	185
Risk management and contracts	187
Chapter Vocabulary and Test Yourself	188
14: CONTRACT DOCUMENTS: THE AGREEMENT	191
Review of the contract documents	192
What is the agreement?	194
Components of all agreements	194
Forms of agreements	196
Letter agreements	196
Standardized agreements	198
Written vs. unwritten agreements	200
Chapter Vocabulary and Test Yourself	201
15: CONTRACT DOCUMENTS: GENERAL AND SUPPLEMENTARY CONDITIONS	203
What are the general conditions?	204
Forms	204
Excerpts from the AIA general conditions	204
Note: Work	206
Article 2: The owner	206
Article 3: The contractor	206
Article 4: The architect	207
Article 5: Subcontractors	207
Article 7: Changes in the work	208
Article 9: Payment and completion	208
Article 14: Termination or suspension of the contract	209
Article 15: Claims and disputes	209
Other provisions	209

Supplementary conditions	210
Chapter Vocabulary and Test Yourself	212
16: CONTRACT DOCUMENTS: THE SPECIFICATIONS	215
Note: The project manual	216
What do the specifications identify?	216
Quality of materials and products	217
Quality assurance	217
Special installation requirements	217
Submittals	217
How the specifications are organized	218
CSI MasterFormat	219
CSI MasterFormat 2004	221
CSI SectionFormat	223
Resolving contradictions in the documents	225
Chapter Vocabulary and Test Yourself	226

PART 5—CONSTRUCTION

17: PRE-CONSTRUCTION AND MOBILIZATION	231
Pre-construction	231
Organizing the contractor's team	232
Means and methods of construction	233
Adjusting the bid estimate	234
Buying out the job	234
Master construction schedule	235
Pre-construction submittals	235
Note: Insurance	236
Jobsite layout plan	237
Permits	238
Pre-construction meeting	239
Mobilization	239
Notice to proceed	240
Mobilize	241
Chapter Vocabulary and Test Yourself	242

18: CONSTRUCTION	245
Contractor services during construction	246
Coordinating administrative procedures for the job	247
Note: Back-charges	248
Daily job reports	249
Submittal tracking logs	251
Meeting minutes	255
Note: Communication.	256
Tracking, evaluating, and controlling time, costs, and quality	258
Tracking, evaluating, and controlling time	258
Note: Crashing the schedule	259
Tracking, evaluating, and controlling costs	260
Quality management	261
Managing subcontractors	262
Subcontractor performance	263
Signs of trouble	264
Chapter Vocabulary and Test Yourself	266
19: FUNDAMENTALS OF SCHEDULING	269
The value of schedules	270
Types and forms of schedules	275
Bar charts (Gantt charts)	276
Example: Microsoft Project 2007	276
Network diagrams	277
Example: Microsoft Project 2007	278
Network bar charts (time-scaled logic diagrams)	280
Example: Microsoft Project 2007	280
Chapter Vocabulary and Test Yourself	282
20: CREATING AND USING THE SCHEDULE	285
Steps in creating a schedule.	285
Step 1. Identify work activities	286
Step 2. Sequence activities	288
Step 3. Estimate activity durations	290
Step 4. Hand-draw the schedule	290
Step 5. Input the data into a computer	293
Note: Software.	293

Linking activities	293
Critical path scheduling.	294
Updating the schedule.	296
Chapter Vocabulary and Test Yourself	299
21: BUYING OUT THE JOB: SUBCONTRACTING	301
Subcontractor scope of work	302
Solicitation of bids	302
Review of bids.	303
Awarding subcontracts	303
Note: Bid shopping	305
Criteria for selecting subcontractors	305
Business competency.	305
Trade competency.	306
Price.	307
Advantages of hiring subcontractors	308
Disadvantages of hiring subcontractors	309
Procurement of materials	311
Chapter Vocabulary and Test Yourself	312
22: CHANGES IN THE WORK	315
What situations cause changes in the work?	316
What is the process for making changes?	318
Changes initiated in the field.	319
Changes initiated by the owner or architect	320
Tracking changes.	323
Impact analysis	323
Industry guidelines	324
Change directives and minor changes in the work	325
Chapter Vocabulary and Test Yourself	358
23: GETTING PAID	331
Contract types and payment.	333
Payment under lump-sum contracts	333
Payment under cost plus a fee contracts	333
Payment under unit price contracts	334
Payment procedures	334

Developing the payment request.	335
Note: Terms: one word can make a big difference	337
Payment documents	337
Schedule of values.	337
Continuation sheet	338
Application and certification for payment.	339
Retention.	341
What happens if the owner refuses to pay?.	342
Note: Profits through prompt payment.	342
Chapter Vocabulary and Test Yourself	344
24: CLAIMS, DISPUTES, AND MECHANIC'S LIENS	347
Situations that trigger disputes	348
How are disputes resolved?	349
Negotiation	350
Mediation	350
Arbitration.	351
Dispute Resolution Boards	352
Litigation	352
Mechanic's liens.	353
Who has the right to file a mechanic's lien?	355
How to avoid disputes	356
Chapter Vocabulary and Test Yourself	358
25: CLOSE-OUT AND OCCUPANCY	361
Construction close-out.	362
Completion of the physical work	362
Note: Punch list omissions.	363
Substantial completion	363
Note: Warranties.	364
Systems testing.	365
Certificate of occupancy	365
Note: Partial and temporary certificates of occupancy	366
Demobilization and final cleaning of the jobsite	366
Contract close-out.	367
Completion of contract requirements.	367
Final payment	368

Contractor's close-out	369
Occupancy	369
Chapter Vocabulary and Test Yourself	370

GLOSSARY	373
BIBLIOGRAPHY	390
INDEX	393