

CONSTRUCTION PROJECT MANAGEMENT

A Complete Introduction

Second Edition

Alison Dykstra

Index

A

ABC, 35, 106, 218, 220, 343
ACEC, 221
Activities
 durations, 321–22
 estimated, 258
 ID, 312
 linkages, 321, 326, 331
 predecessor, 320, 323, 325–26, 331
 sequence of, 256, 320–21
 successor, 321, 323, 325, 329, 331–32
Addenda, 120, 128, 211, 213, 223, 347, 359
Administrative procedures, 263, 269–70, 281, 330
AGC, 18, 220, 247, 272
Agencies, 3, 9, 29–30, 40, 42–43, 87–89, 96, 226, 263, 268
Agency construction management, *See* delivery methods
Agreement forms, 56, 128, 215, 220–21, 223, 228, 345
Agreements, 119, 198–99, 209, 211–26, 231–33, 336–37, 364–66, 376, 381–83, 421–24
AHJs, 40–41, 43, 53, 56–57, 262–63, 266, 394, 396, 400–2, 404–5
AIA 217–23, 227, 268, 272, 352, 355, 367, 370, 372, 422–23
Alternative project delivery methods, *See* project delivery
American Council of Engineering Companies, *See* ACEC
American Institute of Architects, *See* AIA
American Society of Civil Engineers, *See* ASCE
American Society for Testing and Materials, *See* ASTM
American Subcontractors Association, *See* ASA
Arbitration, 379–80, 382–84, 390
ASA, 220
ASCE, 221, 277
ASHRAE, 94, 399
Assemblies, 14, 93, 96, 151, 171, 177–81, 399, 411, 416
Associated Builders and Contractors, *See* ABC

Associated General Contractors, *See* AGC
ASTM, 158, 240, 246, 248, 250
At-risk construction management, *See* delivery methods
Authorities having jurisdiction, *See* AHJs
Award of contract, 52, 57, 84, 126, 299, 313
Awards, 47–48, 51, 97, 99, 115, 127–29, 253–54, 266–67, 347, 359

B

Bar charts, 306–9, 311, 313–14, 316
 network, 307, 311–13, 316
 simple, 309, 311, 314, 329
Baselines, 188–89, 221, 256, 258, 286, 288, 291, 297, 304, 328–29
Benefits, 86, 88, 140, 142, 159–60, 162, 196–97, 303, 342, 411–12
Bid amount, 116, 125, 135, 140, 142, 185, 203, 205, 207, 363
 contractor's, 146
 winning, 140
Bid bonds, *See* bonds
Bid estimates, 150, 152, 165, 181–82, 185–86, 188–89, 202, 254, 256–57, 315
Bidders, 117–20, 123, 129, 134, 145, 211, 241, 301
 questionnaire, 117–18, 129
 responsible, 126, 130
 winning, 128, 302
Bidding, 57–58, 83–84, 113, 115, 117, 119, 121, 125–29, 334–35, 340–41
 and award of prime contract, 47–48, 51, 61, 99, 115, 147, 253, 267, 299, 315
 competitive, 51, 56, 73, 79–80, 88–90, 115–16, 126–29, 202, 206, 340
 contractors, 117, 119, 122, 124, 126, 149, 152, 160, 181, 189
 documents, 51–52, 56, 79, 110, 115–18, 120–23, 128–29, 211–12, 223–24, 345
 estimates, 150, 152, 165, 181–82, 185–86, 188–89, 202, 254, 256–57, 315

- invitation to, 51, 122–23, 129, 168
 - opening, 126
 - packages, 115–21, 124, 126, 128, 130, 136–37, 139, 223, 225, 334
 - period, 347, 359
 - process, 38, 52, 117–18, 120–21, 126, 128, 133, 211, 257, 315
 - submittals, 51, 115–16, 122, 126, 129–30, 137
 - Bid shopping, 338, 345
 - Billing period, 204, 362–65, 367, 369, 375
 - BIM, 21, 25, 92–94, 96, 109, 221, 293, 419
 - Bonds, 31, 37, 43, 116, 118, 121, 138–40, 142–46, 422, 424
 - bid, 123, 125, 140–42, 145, 195, 258, 424
 - construction, 130, 138–39, 145–46
 - payment, 140, 142–43, 146, 275, 372, 422, 424
 - performance, 140–43, 146, 258, 265
 - requirements, 117–18, 138–39, 258
 - surety, 138–40, 146, 258
 - Budgets, 28–30, 33, 41, 53–54, 56, 61–62, 64, 148–49, 188, 205, 289
 - constraints, 30, 41, 300
 - Building codes, *See* codes
 - Building department, 85, 396, 400
 - Building information modeling, *See* BIM
 - Building performance, 12, 25, 294
 - Building permit, 2, 55, 85, 197, 216, 262–63, 269
 - Bullitt Center, 7
 - Business competency, 338, 345
- C**
- CALGreen, 16, 55, 71
 - California Code of Regulations, *See* CCR
 - Capacity, 143–45, 194–95, 198, 217, 240
 - CCR, 71
 - Certificate of occupancy, 41, 56, 263, 394, 400, 404–5
 - Certificate of substantial completion, 55–56, 264, 395–98, 400, 405, 423
 - Change(s)
 - directives, 231, 358, 360, 423
 - minor, 358
 - orders, 211, 214, 231–32, 337, 340, 347–50, 352–60, 369, 374, 422–23
 - proposals, 279, 352–57, 360, 377, 380
 - City of Sebastopol, 68
 - Close-out and occupancy, 47–48, 54, 251, 253, 393, 395, 397, 399, 401, 403
 - CM-at risk, *See* delivery method
 - Codes, 15–16, 21, 23, 25, 70–73, 288–90, 294, 296, 400, 418
 - building, 25, 33, 64, 69–71, 73, 409
 - Collaboration, 3, 13–14, 91, 100, 209, 295
 - Commercial projects, 7, 9, 22, 37, 45, 101, 190, 220
 - Commissioning, 42, 291, 297, 399, 405, 416, 418, 420
 - Completion time, 218, 327, 331, 347, 350
 - Compliance, 36, 40–41, 55–56, 263–64, 290, 405
 - Conceptual estimates, *See* estimating
 - Conflicts, 82, 203, 214, 247, 249, 349, 378–79, 381, 387–89, 391
 - ConsensusDocs, 218, 220–21, 228, 268, 336, 352–53, 356, 370, 379, 422
 - Consideration, 197
 - Constructability reviews, 9, 38, 43, 81, 88–90, 127
 - Construction
 - bonds, *See* bonds
 - companies, 3, 21, 24, 27–28, 36, 144–45, 255
 - contracts, 51–52, 54, 56–57, 193, 198–99, 201, 209, 223–25, 361–64, 397–98
 - documents, 51, 57, 79, 85, 103, 106, 108–10, 152, 378
 - fast-track, 87
 - horizontal, 8
 - industry, 1–5, 7, 9–12, 15, 17–19, 26, 295, 382, 407–8, 420
 - management, 20, 36, 77–78, 86–87, 96, 221, 421
 - managers, 22, 28–29, 32, 38, 43, 51, 78, 86–89, 226, 234
 - processes, 7, 21, 30, 79, 86–87, 89, 127, 221, 268, 300
 - projects, 27, 29, 32, 44, 47–48, 76–77, 132, 134, 289, 419
 - risk, 179, 209
 - sustainable, 12–13, 25, 272, 295
 - teams, 13, 21, 31, 38, 44, 52, 56, 82, 193, 351
 - time, 29, 57, 264, 266, 283, 304, 356, 397
 - Construction management, 20, 36, 77–78, 86–87, 96, 221, 421
 - agency, 87–88, 90
 - at-risk, 89–90
 - Construction Specifications Institute, *See* CSI
 - Consultants, 31, 33–34, 39, 83, 86–87, 89, 91, 275–276, 280, 394–95
 - Continuation sheet, 369–70, 375, 423
 - Contract documents, 191, 211–13, 221–25, 227–31, 235–37, 258, 267–69, 289–90, 347–49, 374–76
 - Contract forms, 220, 223–24, 352
 - Contractors
 - multiple, 51, 56, 78, 115–16, 129
 - project manager, 161, 255, 273, 289, 362, 402
 - qualified, 31, 79, 116, 121, 132
 - risk to, 133, 146, 224, 254, 341
 - team, 30, 34, 39, 45, 55, 125, 254–55, 316, 401, 403
 - winning, 52, 123, 127, 129
 - Contract price, 143, 203–4, 213, 223, 303, 353, 356, 360
 - Contract requirements, 29, 36, 38, 54, 78, 276, 388, 394, 401, 405
 - Contract(s), 52–57, 77–82, 86–90, 138–45, 193–205, 207–18, 222–36, 344–50, 358–66, 374–82
 - direct, 44, 230, 346, 387
 - fee, 204–5, 364
 - fixed price, 186, 201, 203–4, 210
 - lump-sum, 136, 201–5, 207–8, 210, 360, 363–66, 368, 371, 376
 - negotiated, 127, 129
 - reimbursable, 186, 201, 210
 - stipulated-sum, 210

- time, 53–54, 57, 232, 290, 302, 353, 375, 377, 379, 422–23
 - traditional, 92
 - types, 136, 199–200, 206, 208, 210, 366
 - unit price, 201, 206–7, 210, 364–65, 367
 - valid, 196, 198, 217, 222, 356
 - Contractual obligations, 35, 116, 133–34, 188, 373, 403
 - Contractual relationships, 30, 39, 77, 81–82, 92, 268
 - Control, 209, 255–56, 270, 280–81, 291–92, 296, 298–99, 303–4, 318–19, 387–88
 - Control log, 277–278, 283
 - Conventional buildings, 12, 25, 410, 414, 420
 - Conventional projects, 14, 22, 295, 409, 416–17
 - Correction periods, 55, 57, 395, 398, 405
 - Cost(s),
 - baseline, 188
 - construction, 22, 51, 87, 92, 95, 186, 200, 204, 208, 342
 - data, 21, 41, 93–94, 96, 151, 163
 - direct, 157–58, 160–61, 186, 355
 - equipment, 164, 183–85, 202
 - estimates, 125, 130, 134, 156, 166, 168, 180, 189, 199, 201–3
 - final, 85, 202, 204–5, 210
 - indirect, 156, 161–63, 162, 156, 167, 182, 185–86, 204–205, 287, 368–69
 - job, 136, 144, 156, 161–62
 - labor, 65, 110, 134, 153–54, 157–60, 165, 168, 179, 287, 289
 - operating, 160, 179, 399
 - overhead, 152, 154, 160, 162–63, 166–67, 171, 173, 179, 182–84, 186–87, 189, 204, 341
 - project, 140, 164, 168, 175, 177, 180, 203, 344, 347, 349
 - reimbursable, 217, 364
 - savings, 42, 294, 411
 - subcontractor, 182, 186, 355, 362
 - total, 125, 170–71, 179, 182, 184, 186, 206, 271
 - CPM, *See* critical path
 - Crashing the schedule, 283, 287, 297
 - Critical path, 286, 297–98, 310–13, 327–28, 331–32, 349
 - CSI, 183, 220, 241, 249
- D**
- Daily job reports, 272–74, 283
 - Delays, 188, 274–75, 280–81, 286–87, 293–94, 304–5, 327, 339–40, 348–49, 378–79
 - Delivery method (DM), 75–83, 86–92, 95–98, 128, 200, 217, 219, 268, 390, 421, 423
 - alternative, 91–95
 - construction management (CM), 86–90
 - design-bid-build (DBB), 77–83, 87, 91, 95–97, 128, 200, 219, 268, 421
 - design-build (DB), 82–83, 86, 200
 - design-negotiate-build, 82, 97
 - integrated project (IPD), 78, 91–92, 94, 97, 200, 220, 387, 389–90, 421
 - public private partnership (PPP3), 95
 - traditional, *See* design-bid-build
 - Demobilization, 394, 401, 405
 - Dependencies, 309–13, 322, 331
 - Design
 - estimates, 150–52, 166, 169, 171, 173, 175, 177, 179–81
 - information, 133–34, 145–46, 148, 180, 182, 201
 - process, 14, 34, 83, 88, 97, 111, 127, 150, 152, 181
 - stages, 51, 103–4, 106, 110
 - team, 30, 32–33, 39
 - Design-build, *See* delivery method
 - Design-bid-build, *See* delivery method
 - Designer's team, 30, 32–33, 39
 - Detailed schedule, *See* scheduling
 - Developers, 5, 49, 57–58, 62, 64, 72, 123, 40
 - Diagrams, 107, 276, 310, 313, 322–23, 326
 - Direct business costs, *See* costs
 - Dispute resolution board, *See* DRB
 - Disputes, 92, 222, 226–28, 233, 235, 292, 297, 377–83, 385, 387–91
 - resolution boards, *See* DRB
 - Divisions, 164, 183, 187, 241–45, 247, 249–50, 277
 - DM, *See* delivery method
 - DNB, *See* delivery method
 - Documentation, 203–4, 270–73, 293, 296, 303, 305, 354, 356, 367, 372
 - Documents, 50–51, 56–58, 108, 116–25, 211–15, 219–26, 233–34, 249, 366–68, 421–23
 - written, 69, 100, 103, 108, 120, 238
 - Drawings and specifications, 21, 41–42, 44, 103, 108, 110, 112, 115–17, 120, 148, 152, 189
 - DRB, 381, 383, 390
 - Durability, 25, 409, 415, 419
- E**
- EJCDC, 218, 221, 422
 - Elevations, 104–7, 109, 111, 213, 248, 262
 - Encumbrance, 146, 375, 384, 390–91
 - Energy, 9, 12–16, 22, 25, 42, 100, 407–13, 416, 418, 420
 - Engineers, 1–2, 5–6, 8–10, 32–33, 39, 44, 111, 221, 387, 389–90
 - Engineers Joint Contract Documents Committee, *See* EJCDC
 - Estimates, 65, 122, 124–25, 133–34, 147–52, 154–57, 163–71, 179–81, 185–86, 256
 - conceptual, 65, 150–51, 169–71, 180
 - detailed, 48, 148–50, 152, 166, 169, 179, 181–83, 185, 187, 189
 - design, 150–52, 166, 169, 171, 173, 175, 177, 179–81
 - summary, 185, 187, 189, 354
 - Estimators, 152–59, 161, 163–65, 167, 170, 172–73, 177–79, 182–84, 186, 190
 - Excavation, 28, 85, 104, 207, 318–21, 329–30, 351
 - Experience, 118–19, 126–27, 130, 133–34, 138, 143, 145, 154, 170, 172

F

Fabrication, 239, 246, 275–76, 279, 283, 289, 302
 Facilities, 6–7, 9–10, 30, 32, 49, 99, 101, 151, 401–2, 404
 Fast-tracking, 83–86, 88–89, 95, 204
 Feasibility phase, 50, 63, 65, 73–74, 99, 101, 148
 Fees, 127, 136, 139–40, 167, 186, 189, 200–201, 204–6, 208–10, 423–24
 Field questions, 38, 270–71, 351, 353–54, 356, 360
 Final payment, 54, 232, 365, 386, 393–95, 401–3, 405–6
 Financial risks, 64, 79, 88–89, 136–37, 145, 198–99, 203–5, 207–8, 341
 Finish dates, 309, 315, 321, 328–29
 Finishes, 182–84, 187, 242–43, 249–50, 308, 311, 317–19, 326–29, 331, 402
 First-tier subcontractors, 35, 39, 44, 334, 345
 Fixed fee contracts, *See* contracts
 Fixed price contracts, *See* contracts

G

Gantt charts, 306–7, 313
 GC, 4, 28–29, 33–39, 43–45, 86–90, 140, 270–72, 291–94, 333–46, 338–42, 351–52, 360–63, 365–68, 388–90
 General and supplementary conditions, 117, 119, 191, 225, 227, 229, 231, 233, 235
 General conditions, 211–14, 223–28, 230–36, 244, 368–69, 374, 376–77, 379, 381, 422
 General contractors, *See* GC
 General requirements, 161, 179, 241–42, 244
 Globalization, 19, 23–4, 26
 GMP, 201, 205–6, 208, 210, 363–64, 422–24
 Green buildings, 13, 25, 55, 100, 111, 154, 272, 294, 399, 408–10, 413–19
 sustainable, 25, 407–8, 415–16
 Guaranteed maximum price, *See* GMP

H

High-performance buildings, 13, 25, 100
 Hiring subcontractors, 86, 341–42, 344, 346
 Homeowner, 10, 22, 27, 63, 65, 139

I

ICC, 15–16, 71, 277
 Indirect business costs, *See* costs
 Indirect project costs, *See* costs
 Industrial sector, 7–8, 32, 44
 Infrastructure, 3, 5, 8, 10, 12, 47, 78, 95
 Instructions to bidders, 117–18, 120, 123, 129, 211, 241
 Insurance, 139, 156, 227, 233, 258–59, 265, 269, 397, 423
 Integrated project delivery, *See* delivery method
 International Code Council, *See* ICC
 Invitation to bid, 51, 122–23, 129, 168

IPD, *See* delivery methods

J

Job costs, *See* cost
 Jobsite layout plan, 52–53, 253–54, 260, 264–65
 Jurisdictions, 37, 40–41, 43, 53, 55, 57, 71, 262, 400, 412

L

Labor burden, 185–86, 189, 354–55
 Labor costs, *See* costs
 Labor hours, 28, 157–58, 184–85, 330
 Laws, 74, 160–61, 194–95, 197–98, 222–23, 229, 233, 258–59, 398, 400
 Layout, 104, 106, 110–11, 120, 237, 308, 310–12, 349
 LEED, 42, 55, 100, 111, 154, 272, 294
 Letter agreements, 217–19, 224
 Level of detail, 93, 102, 150, 245, 306, 325
 Lien rights, 384–87, 391
 Liquidated damages, 133, 136–37, 146, 213, 216, 234–35, 264, 283, 294
 Litigation, 164, 377, 381–84, 391
 Local building departments, 40, 43, 53, 71, 262
 Location factors, 174–77, 180
 Lump-sum contracts, *See* contracts

M

Major subcontractors, 91, 97, 263, 280, 296, 389–90
 Managing time, 251, 285–87, 289, 291, 293, 295, 297
 Masonry, 173, 186–87, 241–42, 249, 318, 329–30, 366, 369
 Master construction schedule, 254, 256–57, 266, 286, 300–301, 304, 306, 313, 315–16, 328
 MasterFormat, 183, 241, 244–45, 247, 249–50
 Materials, 22–23, 157–58, 164–67, 169–72, 182–87, 237–40, 259–61, 293–97, 344–46, 414–19
 and labor, 23, 153, 178, 184, 422
 and products, 5, 13, 239, 274, 291, 295, 302, 408, 415
 quantity of, 157–58, 182, 202, 330
 Mechanic's liens, 142, 146, 339, 375, 377, 379, 381, 383–87, 389, 391
 Mediation, 233, 379–84, 391
 Meeting minutes, 270–72, 279, 282, 292–93
 Meetings, 14, 75, 78, 129–30, 161, 263, 279–82, 295–96, 300, 417–18
 Methods of construction, 17, 35, 46, 254–56, 300
 Microsoft Project, 21, 308, 310–12, 318, 325, 330
 Milestones, 49, 57, 299, 306, 310, 313–14, 329, 361
 Mobilization, 47–48, 52–53, 57, 61, 84, 253–55, 257, 259, 261, 263–67
 Modifications, 173–74, 213–14, 224, 231, 238, 268, 347, 359–60
 Multiple contractors, 51, 56, 78, 115–16, 129
 Municipalities, 16, 66, 71, 412, 414
 Mutual agreement, 194–95, 198, 215, 217–18, 356, 389, 391

N

Negotiated contract, *See* contracts
 Negotiations, 38, 127, 257, 336, 353, 377, 380–81, 383, 391
 Network bar charts, 307, 311–13, 316
 Network diagrams, 307, 309–11, 313, 316, 322–25, 327–28, 331–32

O

Obligations, 54, 118–19, 144–45, 194, 196–97, 199, 212–13, 224–26, 236, 343
 contractual, 35, 116, 133–34, 188, 373, 403
 Occupancy, 41, 47–48, 54–57, 147, 149, 267, 393–97, 399–401, 403–6
 certificate of, 41, 56, 263, 394, 400, 404–5
 Office buildings, 28, 34, 64, 71, 408–9, 412
 Omissions, 124, 165, 229, 347–49, 351, 378
 Overhead and profit, 173, 179, 182, 184–85, 202, 204–5, 209, 355, 358, 363
 Overhead costs, *See* costs
 Overtime, 155, 159, 271, 287, 304
 Owner move-in, 54, 57, 299, 313, 393
 Owner's budget, 150
 Owner's agents, 4, 9, 43, 96, 135, 230, 268
 Owner's feasibility, 59, 61, 63, 65, 67–69, 71, 73
 Owner's interests, 32, 88–90, 367
 Owner's vision, 33, 49, 103, 106, 111

P

Payment, 204, 219–20, 227–30, 232–33, 257–58, 268–69, 361–77, 386, 402–3, 422–24
 requests, 12–13, 15, 362–63, 365–67, 369–71, 374–75, 408, 411–12, 416, 420
 terms, 214–15, 362, 366, 376
 Payment bonds, *See* bonds
 Performance Bond, *See* bonds
 Phases, 54, 62, 84, 107, 148, 175, 180, 204, 393–94, 400–401
 Physical work, 1–4, 28, 30, 34, 36, 51, 53–57, 264, 266–69, 394–95
 Planning, 1–3, 23, 28, 30, 32–33, 41, 44, 124, 253–54, 300–304
 careful, 124, 300–301, 303
 Plans and specifications, 85, 108, 134, 141, 145, 193, 289, 400
 Players, 27, 29, 31, 33, 35, 37, 39–41, 43, 45, 48
 PPPs, 78, 91, 95, 97
 Preconstruction, 47–48, 52, 54, 57, 96, 99, 253, 255, 257–58, 266–67
 Preconstruction and mobilization, 52, 84, 253, 255, 257, 259, 261, 263, 265
 Preconstruction meeting, 254, 263, 266
 Predecessor activities, 320, 323, 325–26, 331
 Predecessors, 321, 323–24, 329, 332
 Prime contractors, 39, 44, 52, 88, 97, 209, 384–85, 387
 Prime contracts, 47–48, 51, 61, 99, 115, 147, 253, 333, 335–37, 341

Private owners, 31–32, 44, 49, 57, 81–82, 122, 127, 132
 Product data, 92, 229, 239, 276–77, 279, 283, 402
 Productivity, 90, 153, 158, 167, 287, 289, 304, 321, 357
 Profits, 92, 133–34, 137, 155, 179, 182, 184–89, 204–5, 209, 363–64
 Programming, 50, 99–102, 111
 Progress payments, 143, 289, 336, 362–64, 368, 376
 Project costs, *See* costs
 Project delivery, 50, 73, 75, 77–79, 81, 83, 85, 87, 89–91, 417
 Project feasibility, 47–49, 61–62, 84, 99, 101, 115, 147, 149, 253, 267
 Project manager, 21, 33, 36, 44, 255, 293, 325, 401
 contractor's, 161, 255, 273, 289, 362, 402
 Project manual, 212, 224, 238, 245–46, 249–50
 Project stages, 47, 49, 51, 53, 55, 57, 84–85
 Project time, 80, 84, 269, 304, 321, 348
 Projects
 complex, 20, 24, 28, 35, 63, 81, 88–90, 104, 205
 conventional, 14, 22, 295, 409, 416–17
 green, 13, 413–14, 416–19
 industrial, 7–8, 32, 44
 large, 4, 24, 30, 33, 65–66, 88, 94, 238, 365, 367
 multiple, 213, 225–26, 235, 255
 small, 2, 28, 34, 65, 223, 226, 230, 238, 269, 325
 types, 81, 86, 88–89, 95, 219, 223, 421, 423
 Public private partnership, *See* delivery method
 Punch list, 395, 402, 406
 Purchase orders, 36, 257, 265, 274, 288, 291, 335, 345, 365–67

Q

Qualified contractors, 31, 79, 116, 121, 132
 Quality, 108, 148–49, 171–73, 237–40, 283–87, 289–91, 293, 297–98, 340–42, 388–89
 Quality assurance, 239, 246, 248, 297, 342, 344
 Quantities, 125, 130, 157–58, 182–83, 185, 206–7, 237, 240, 364, 366
 Quantity of materials, 157–58, 182, 202, 330

R

Rating systems, 100, 111, 272, 294, 399
 Regulations, 5, 9, 11, 15, 22–23, 67, 71–72, 229, 294, 296
 Regulatory requirements, 2, 33, 39, 55–57, 63–64, 66, 103, 405, 409, 419
 Requests for information, 155, 305, 349, 351, 360
 Requirements, *See* bonding
 Reimbursable contracts, *See* contracts
 Residential projects, *See* residential sector
 Residential sector, 3–6, 5–6, 10, 37, 67, 71, 81, 172–73
 Responsibilities, 33, 35–36, 52–56, 230–31, 256–57, 263–64, 290–91, 336, 404, 422–23
 Retainage, 365, 369, 372, 376, 398–99, 403, 423
 Right jobs, 131, 133, 135–37, 139, 141, 143, 145
 Risks, 91–92, 95, 136–38, 140, 142–44, 156, 199, 207–10, 220–21, 341

contractor's, 133, 146, 224, 254, 341
 Roles, 19, 30, 33, 76, 78, 87, 89, 230, 268, 294–96
 RSMean, 164, 167, 170, 172, 175, 176, 179–80,
 182–83

S

Schedule of values, 258, 366, 368–70, 376, 423
 Scheduling,
 detailed, 188, 266, 299–300, 302, 313
 information, 21, 94, 316, 318, 403
 updated, 286–87, 305, 313, 328–30
 Scope, 62, 125, 149, 203, 268–69, 272, 334–35, 348,
 357–60, 402
 Second-tier subcontractors, 35, 39, 44–45
 SectionFormat, 246–47, 250
 Sectors, 2, 5–10, 13, 47, 164
 Sequencing, 320–21, 348, 350, 353
 Small projects, 2, 28, 34, 65, 223, 226, 230, 238, 269,
 325
 Solutions, 32, 99, 103, 106, 294, 381, 391
 Specialty (trade) contractors, 3–4, 34–35, 37, 39,
 44–45, 333, 335, 338, 341–42, 345
 Specification writers, 1, 34, 120, 240–41, 245–47
 Specifications, 107–12, 115–17, 124, 211–13, 237–41,
 243–45, 247, 249–50, 276–79, 378
 Standard form of agreement, 423–24
 Start, 57, 84, 266, 291–92, 307–9, 311–13, 317–18,
 323, 326–29, 331
 Start to finish, 127, 326–27, 331
 Stipulated sum contracts, *See* contracts
 Subcontractors, 38–39, 138–40, 160–64, 229–30,
 247, 256, 268–74, 291–94, 333–46, 341–43,
 361–62, 371–76, 384–87
 and suppliers, 9, 44, 142, 146, 163–64, 257, 303,
 306, 385–86, 394
 first-tier, 35, 39, 44, 334, 345
 major, 91, 97, 263, 280, 296, 389–90
 potential, 85, 118, 164, 339, 389
 second-tier, 35, 39, 44–45
 Subcontracts, 152, 157, 161, 167, 254, 256–57,
 335–37, 341, 343, 345–46
 Submittals, 38, 41, 118, 262–63, 274–79, 283, 290,
 293, 379, 401–2
 Substantial completion, 53, 55–58, 264–65, 267, 299,
 313, 354, 394–400, 404–6, 423
 certificate of, 55–56, 264, 395–98, 400, 405, 423
 Successor activities, 321, 323, 325, 329, 331–32
 Superintendents, 36–38, 44–45, 161–63, 254–55,
 260, 274, 280, 291–93, 306, 313
 Supplementary conditions, 117, 119, 211, 213,
 224–25, 227, 229, 231, 233–36, 238
 Suppliers, 44–45, 142, 157–58, 163–65, 257, 305–6,
 344, 367–68, 384–86, 394
 Sureties, 37, 43, 118, 129–30, 138–46, 280, 294, 373,
 398, 403
 Surety bonds, *See* bonds
 Sustainability, 11–12, 100, 407, 409, 411, 413, 415,
 417, 419
 Sustainable buildings, 25, 407–8, 415–16

Sustainable construction, 12–13, 25, 272, 295
 Systems, 83–84, 106–7, 177–80, 240–42, 245–46,
 295–96, 399, 406–7, 413–16, 418–19

T

Tasks, 52, 124, 161–62, 304, 308–9, 311, 316–21,
 323–24, 327–32, 418
 Teams, 6, 30–32, 36–37, 92, 94, 96, 100–103, 255,
 263–64, 270
 Technologies, 5, 14, 20, 22, 94, 295, 389, 407, 418–19
 Time
 constraints, 86, 90, 93, 96
 frames, 28, 54, 73, 80, 82, 153, 155–56, 318–19,
 365, 371
 Timelines, 79, 92, 307, 309, 311, 313, 320, 329
 Total costs, *See* costs
 Trades, 14, 17, 26, 34, 159, 179, 291–92, 295–96, 319,
 417–19
 Transportation systems, 1–2, 9, 12, 25

U

Unit price, 201, 208, 363–64
 Unit price contracts, *See* contracts
 Units, 88, 158–59, 170, 174, 178, 182–85, 197, 250,
 321, 364
 Updated schedules, 286–87, 305, 313, 328–30
 Users, 9, 13, 32, 43, 63, 74, 94, 100, 410, 414–15

V

Valid contract, *See* contracts
 Values, 4, 140–41, 166, 168, 180, 194, 196, 350, 366,
 368–70
 schedule of, 258, 366, 368–70, 376, 423
 Vision, owner's, 33, 49, 103, 106, 111

W

Warranties, 55, 84, 246, 269, 277, 337, 341, 397–98,
 404, 406
 Water, 13, 41, 52, 72, 158, 183–84, 407, 409, 411–14,
 417
 WBS, 316–18, 322, 332
 Winning contractor, 52, 123, 127, 129
 Wood frame, 5, 10, 172–74, 180
 Work activities, 288, 315–16, 319, 332
 Work breakdown structure, *See* WBS
 Written documents, 69, 100, 103, 108, 120, 238

Z

Zero net energy, *See* ZNE
 ZNE, 412, 420
 Zoning, 40, 64, 66, 73–74, 409